



Vector-LP Radio Beacon Transmitter

Technical Instruction Manual

**VR125
VR250**

Issue 1.8.1 01 February 2015

Nautel Limited
10089 Peggy's Cove Road,
Hackett's Cove, NS, Canada B3Z 3J4
T.877 6 nautel (628835) or +1.902.823.2233
F.+1.902.823.3183 info@nautel.com

U.S. customers please contact:
Nautel Inc.
201 Target Industrial Circle, Bangor ME 04401
T.877 6 nautel (628835) or +1.207.947.8200
F.+1.207.947.3693 info@nautel.com

e-mail: support@nautel.com
www.nautel.com

IMPORTANT

This manual makes frequent references to a mode of operation called 'beacon and voice' (e.g., pages 1-1, 3-11, 3-23, 3-30, 4-4, 4-5, 4-7, 6-1 and 6-15).

Please ignore these references, as voice operation is not authorized in FCC/FAA compliant transmitters.



Warranty

by Nautel Limited/Nautel Inc. (herein after referred to as Nautel)

Nautel Limited/Nautel Incorporated, hereinafter referred to as Nautel, guarantees all mechanical and electrical parts of the equipment for a period of 18 months from date of shipment.

1. A "Part Failure" shall be deemed to have occurred when the part has become defective, or does not have the characteristics required for the specified equipment performance:
 - (a) When the equipment is operated within the design parameters, and
 - (b) When the equipment is installed and adjusted according to Nautel's prescribed procedures as stated in the instruction manual.
2. Nautel shall provide replacements for all "Parts" at no cost to the Customer when they become defective during the warranty period, and upon the return of the defective part.
3. In the event that a "Part" fails during the warranty period and causes damage to a sub-assembly that cannot be readily repaired in the field, the entire sub-assembly so damaged may be returned to Nautel for repair. The repairs will be made without charge to the Customer.
4. Where warranty replacements or repair are provided under items 2 or 3, Nautel will pay that part of the shipping costs incurred in returning the part/assembly to the Customer.
5. Warranty replacement parts and repair, which are provided under items 2 or 3, shall be guaranteed for a period of ninety days from date of shipment or until the end of the original warranty period, whichever occurs later.
6. Nautel will not assume responsibility for any charges incurred by other than Nautel employees.
7. Nautel shall have the privilege of investigating whether failures have been caused by factors beyond its control.
8. Nautel shall in no event be liable for any consequential damages arising from the use of this equipment.
9. When requesting a warranty repair/replacement, please provide complete and accurate information. Observe the instructions regarding 'Equipment Being Returned to Nautel' on page two of this warranty and provide the information requested.
10. When ordering spare/replacement parts, please provide complete and accurate information. Refer to the parts list of the Repair manual for ordering information. Provide as much of the information requested for 'Equipment Being Returned to Nautel' on page two of this warranty as is practical. The information identified by an asterisk is the minimum required.

Nautel Limited
10089 Peggy's Cove Road
Hackett's Cove NS Canada B3Z 3J4
T. 877 6 nautel (628835) or 1.902.823.2233
F. 1.902.823.3183
24hr. Answering Service 1.902.823.3900

Nautel Inc.
201 Target Industrial Circle
Bangor ME USA 04401
T. 877 6 nautel (628835) or 1.207.947.8200
F. 1.207.947.3693

Customer Service Notice

A 'Technical Assistance' and 'Plug-in Module Exchange' service is available to Nautel users.



Factory Support

TECHNICAL ASSISTANCE

Nautel's field service department provides telephone technical assistance on a 24 hour, seven days a week basis. Requests by other media (facsimile or e-mail) will be responded to the next working day if received after Nautel's normal working hours. Contact the appropriate field service centre from the following:

U.S.A. customers use:	Nautel Incorporated 201 Target Industrial Circle Bangor, Maine 04401	T. +1.207.947.8200 (24 hours) or 877 6 nautel (628835) F. +1.207.947.3693
All other customers use:	Nautel Limited 10089 Peggy's Cove Road, Hackett's Cove, NS, Canada B3Z 3J4	T. +1.902.823.3900 (24 hours) or 877 6 nautel (628835) F. +1.902.823.3183 E-Mail support@nautel.com Web www.nautel.com

MODULE EXCHANGE SERVICE

In order to provide Nautel customers with a fast and efficient service in the event of a problem, Nautel operates a factory rebuilt, module exchange service which takes full advantage of the high degree of module redundancy in Nautel equipment. This module exchange service is operated from Nautel's factory in Bangor, Maine and Hackett's Cove, Nova Scotia. These two locations allow us to provide a quick turn around service to keep our customers on the air. During the transmitter's warranty period, up to 18 months from shipment, repair and exchange of modules is at no charge to the customer. When the warranty has expired, a charge of 80% of the list price for all exchanged modules is made. If the faulty module is returned to Nautel within 30 days, a credit is issued reducing this charge by one half to 40% of the list price. U.S.A. customers are required to contact our Bangor, Maine facility. Canadian and overseas customers should contact our Nova Scotia, Canada facility.

EQUIPMENT BEING RETURNED TO NAUTEL

For all equipment being returned to Nautel and all requests for repairs or replacements:

Obtain an RMA number from Nautel (you must have an RMA number to return equipment)
Mark the item as 'field return'
Mark the item with the RMA number assigned by Nautel
Address the item to the appropriate Nautel facility

Complete and accurate information regarding the equipment being returned will ensure prompt attention and will expedite the dispatch of replacements. Refer to the nameplate on the transmitter and/or the appropriate module/assembly to obtain name, type, part and serial number information. Refer to the parts list of this manual or the appropriate service instruction manual for additional ordering information.

The following information should accompany each request:

- * Model of Equipment
 - * Serial number of Equipment
 - * Name of Part/Assembly
 - Serial number of Part/Assembly
 - * Complete reference designation of Part/Assembly
 - * Nautel's part number of Part/Assembly
 - * OEM's part number of Part/Assembly
 - Number of hours in Use
 - Nature of defect
 - * Return shipping address
- * Denotes minimum information required to order spare/replacement parts

Safety

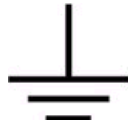
Symbols

General definitions of safety symbols used on equipment or in manuals.



DANGER – HIGH VOLTAGE

Indicates dangerous voltages (in excess of 72 V), capable of causing a fatal electrical shock, are present on or near parts bearing this label.



GROUND (EARTH)

Used with wiring terminals to indicate the terminal must be connected to earth ground before operating equipment. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electrical shock. Also used on electrical schematics to indicate a part that is connected to earth ground.

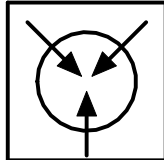


GROUND (PROTECTIVE or SAFETY)

Used with protective (safety) conductor terminals to indicate the terminal must be connected to ground before operating the equipment. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electrical shock.



OR



ELECTROSTATIC SENSITIVE

Indicates a part or assembly is or contains devices that are electrostatic sensitive. To prevent damage to these devices, ensure the handling procedures outlined in this manual are observed.

WARNING

A **WARNING** denotes a hazard. It identifies an operating procedure, condition, etc. which, if not strictly observed or adhered to, could result in injury or death to personnel. Throughout the technical manual, a **WARNING** shall immediately precede the text to which it applies.

CAUTION

A **CAUTION** denotes a hazard. It identifies an operating procedure, condition, etc., which, if not strictly observed or adhered to, could result in damage to, or destruction of the equipment. Throughout the technical manual, a **CAUTION** shall immediately precede the text to which it applies.

NOTE

A **NOTE** denotes important information pertaining to an operating procedure, condition, statement, etc., which is essential to highlight. A **NOTE** may precede or follow the text to which it applies.



Safety

Toxic Hazard Warning

There are devices used in this equipment containing beryllium oxide ceramic, which is non-hazardous during normal device operation and under normal device failure conditions. These devices are specifically identified in the equipment parts list(s) by including 'BeO' in the part's description.

DO NOT cut, crush or grind devices because the resulting dust may be **HAZARDOUS IF INHALED**. Unserviceable devices should be disposed of as harmful waste.



Contents

Page

1	GENERAL INFORMATION	
1.1	INTRODUCTION	1-1
1.2	FACTORY SUPPORT	1-1
1.3	PURPOSE AND SCOPE OF MANUAL	1-1
1.4	PURPOSE OF EQUIPMENT	1-1
1.5	MECHANICAL DESCRIPTION	1-2
1.6	TEST EQUIPMENT AND SPECIAL TOOLS	1-2
1.7	GLOSSARY OF TERMS	1-2
2	PREPARATION FOR USE AND INSTALLATION	
2.1	INTRODUCTION	2-1
2.2	PREPARATION FOR USE	2-1
	2.2.1 Transmitter Room Requirements	2-1
	2.2.1.1 Transmitter Dimensions	2-1
	2.2.1.2 Transmitter Weights	2-1
	2.2.1.3 Transmitter Clearances	2-1
	2.2.1.4 Air Flushing	2-1
	2.2.1.5 Cooling and Heating	2-1
	2.2.1.6 Work Area	2-1
	2.2.1.7 Power Source Switch	2-1
	2.2.2 Lightning Protection	2-2
	2.2.3 Station Reference Ground	2-2
	2.2.4 Ac Power Source	2-2
	2.2.4.1 Ac Wiring	2-2
	2.2.5 Antenna Feed Cable	2-7
	2.2.6 Antenna Tower	2-7
	2.2.7 External Control/Monitor Wiring	2-7
	2.2.8 Electrical Power	2-7
	2.2.8.1 Ac Voltage Source	2-7
	2.2.8.2 External Ac Switching	2-7
	2.2.8.3 Dc Voltage Source	2-7
	2.2.9 Antenna System	2-8
	2.2.9.1 RF Feed Cable	2-8
	2.2.9.2 Interface Protection Option	2-8
	2.2.10 Internal DDS Source	2-8
	2.2.11 External Interlocks	2-9
	2.2.12 Remote Control Circuits	2-9
	2.2.12.1 On/Off Control	2-10
	2.2.12.2 Charger Alarm	2-10
	2.2.12.3 Standby Code 1	2-10
	2.2.12.4 Standby Code 2	2-10
	2.2.13 Press-To-Talk Input	2-10
	2.2.14 User Assigned Information	2-10
	2.2.14.1 Carrier Frequency	2-10
	2.2.14.2 Keyed Tone Frequency	2-10



Contents

Page

	2.2.14.3	Identification Code	2-10
	2.2.14.4	Standby Codes	2-10
	2.2.15	Serial Port Features	2-11
	2.2.15.1	Remote Control and Monitoring Interface	2-11
	2.2.15.2	ATU Interface	2-11
	2.2.16	RF Monitoring Sample	2-11
	2.2.17	Parts Supplied By Nautel	2-11
	2.2.18	Parts Not Supplied By Nautel	2-11
	2.2.19	Test Equipment and Special Tools	2-11
	2.2.20	Available Options	2-11
2.3		INSTALLATION	2-13
	2.3.1	Acceptance of Shipment	2-13
	2.3.2	Unpacking Instructions	2-13
	2.3.3	Visual Inspection	2-14
	2.3.4	Cabinet Mounting	2-14
	2.3.5	Determining Control/Monitor Requirements	2-14
	2.3.6	Installing External Control/Monitor Wiring	2-14
	2.3.7	Installing Ac Power Source Wiring	2-15
	2.3.8	Installing Dc Power Source Wiring (Optional)	2-16
2.4		COMMISSIONING	2-17
	2.4.1	Precautions	2-17
	2.4.2	Turn-On Prerequisites	2-17
	2.4.3	Initial Turn-On	2-17
3		OPERATING INSTRUCTIONS	
	3.1	INTRODUCTION	3-1
	3.1.1	Precautions	3-1
	3.2	EMERGENCY SHUTDOWN	3-1
	3.2.1	Turn Off RF Output	3-1
	3.2.2	Complete Shutdown	3-1
	3.3	EXTERNAL SAFETY INTERLOCK	3-1
	3.4	ELECTROSTATIC DISCHARGE PROTECTION	3-2
	3.5	CONTROLS AND INDICATORS	3-2
	3.5.1	Front Panel	3-3
	3.5.2	Exciter Interface PWB	3-4
	3.5.3	Remote Interface PWB	3-4
	3.5.4	RF Synthesizer PWB	3-4
	3.5.5	Miscellaneous Control and Exciter	3-4
	3.5.6	Miscellaneous RF Power Stage	3-4
	3.5.7	Battery Boost PWB	3-4
	3.6	DIAGNOSTIC DISPLAY	3-18
	3.6.1	Pushbutton Switches	3-18



Contents

Page

3.6.2	Main Screens	3-18
3.6.3	Viewing Faults	3-20
3.6.4	Changeover Control	3-20
3.6.5	Viewing Events Log	3-20
3.6.6	Setting Real Time Clock	3-21
3.6.7	Setting RF Monitor Limits	3-22
3.6.8	Meter Settings	3-24
3.6.8.1	Changing Meter Groups	3-24
3.6.8.2	Selecting Analog Meter	3-25
3.6.8.3	Calibrating Analog Meter	3-25
3.6.9	Selecting Power Source	3-25
3.6.10	Configuring the Sonalert	3-26
3.6.11	Setting a Timed Shutdown	3-26
3.6.12	Changing Factory Calibrated Settings	3-27
3.6.12.1	Calibrating Diagnostic Display Meters	3-28
3.6.12.2	Setting Protection Threshold Levels	3-28
3.6.12.3	Setting Maximum Output Limitations	3-29
3.6.12.4	Using Factory Settings	3-29
3.6.13	Viewing and Setting Peripherals	3-30
3.6.13.1	Setting the Keyer	3-30
3.6.13.2	Viewing Power Module Status	3-31
3.6.13.3	ATU Controls	3-32
3.6.13.4	Testing the Standby Side	3-33
3.6.13.5	Selecting Peripherals	3-33
3.6.13.6	Checking Modules	3-34
3.6.14	Remote Control Monitor System Settings	3-34
3.6.14.1	Setting Control Points	3-34
3.6.14.2	Setting Monitor Points	3-35
3.6.14.3	Serial Settings	3-35
3.6.14.4	Automatic Reporting	3-35
3.6.15	Viewing Power Related Parameters and Setting ATU Current Feedback	3-36

4

TESTING AND ADJUSTMENT

4.1	INTRODUCTION	4-1
4.2	OPERATING PRECAUTIONS	4-1
4.3	FUNCTIONAL TESTS	4-1
4.3.1	General	4-1
4.3.2	Test Equipment Required	4-3
4.3.3	Test Prerequisites	4-3
4.3.4	Initial Turn On	4-3
4.3.5	Standard Adjustments	4-4
4.3.6	Non-Standard Adjustments	4-8



Contents

Page

5	MAINTENANCE AND TROUBLESHOOTING	
5.1	GENERAL	5-1
5.2	SCHEDULED MAINTENANCE	5-1
5.3	CORRECTIVE MAINTENANCE	5-2
5.4	ELECTROSTATIC PROTECTION	5-2
5.5	TROUBLESHOOTING FRONT PANEL ALARMS	5-3
5.6	REPLACING AN RF POWER MODULE	5-9
5.7	FET CHECKING/REPLACEMENT	5-11
5.8	EXCITER PANEL PWB REPLACEMENT	5-12
5.8.1	Exciter Interface PWB and Interconnecting PWB Replacement	5-12
5.8.2	Exciter Monitor/Generator PWB Replacement	5-13
5.8.3	Interface PWB Replacement	5-14
5.9	BATTERY BOOST ASSEMBLY REPLACEMENT	5-14
6	THEORY OF OPERATION	
6.1	INTRODUCTION	6-1
6.2	TRANSMITTER OVERVIEW	6-1
6.3	AC_DC POWER STAGE	6-1
6.3.1	Interface PWB	6-5
6.3.2	Ac/Dc Universal Input Power Supplies	6-5
6.4	EXCITER STAGE	6-6
6.4.1	Exciter Interface PWB	6-6
6.4.2	RF Synthesizer PWBs	6-6
6.4.3	Interphase PDM Driver PWBs	6-8
6.4.4	Exciter Monitor/Generator PWBs	6-15
6.5	CONTROL/MONITOR STAGE	6-16
6.5.1	Control/Display PWB	6-16
6.5.2	Remote Interface PWB	6-19
6.5.3	Front Panel Metering	6-20
6.5.4	NDB Site Interface PWB (Optional)	6-21
6.5.5	Modem (Optional)	6-21
6.6	RF POWER STAGE	6-22
6.6.1	RF Power Module(s)	6-22
6.6.2	RF Filter PWB	6-29
6.6.3	RF Power Probe PWB	6-29
6.7	MODULATION DEPTH WHEN USING A HIGH 'Q' ANTENNA	6-30



Contents	Page	
7	PARTS INFORMATION	
	7.1 INTRODUCTION	7-1
	7.2 FAMILY TREE	7-1
	7.3 HOW TO LOCATE INFORMATION FOR A SPECIFIC PART	7-1
	7.4 REFERENCE DESIGNATION LISTS	7-1
	7.5 COLUMN CONTENT EXPLANATION	7-1
	7.6 OEM CODE TO MANUFACTURER CROSS-REFERENCE	7-2
	7.7 COMMON ABBREVIATIONS/ACRONYMS	7-3
8	WIRING INFORMATION	
	8.1 INTRODUCTION	8-1
	8.2 WIRING LISTS NOT PROVIDED	8-1
	8.3 PRINTED WIRING PATTERNS	8-1
	8.4 WIRE COLOURS	8-1
	8.5 WIRING LISTS PROVIDED	8-1
	8.5.1 Connector Mating Information	8-1
9	ELECTRICAL SCHEMATICS	
	9.1 INTRODUCTION	9-1
	9.2 COMPONENT VALUES	9-1
	9.3 GRAPHIC SYMBOLS	9-1
	9.4 LOGIC SYMBOLS	9-1
	9.5 REFERENCE DESIGNATIONS	9-1
	9.6 UNIQUE SYMBOLOGY	9-1
	9.7 TROUBLESHOOTING AIDS	9-1
	9.8 IDENTIFICATION OF SCHEMATIC DIAGRAMS	9-2
	9.9 STRUCTURE OF SCHEMATICS	9-2
	9.10 LOCATING THE SCHEMATIC DIAGRAM(S) FOR A FUNCTIONAL BLOCK	9-2
	9.11 LOCATING A PART/ASSEMBLY IDENTIFIED ON A SCHEMATIC	9-2
10	MECHANICAL DRAWINGS	
	10.1 INTRODUCTION	10-1
	10.2 LOCATING ASSEMBLY DETAIL DRAWINGS	10-1
	10.3 CONTENT OF MECHANICAL DRAWINGS	10-1



Contents

Page

List of Tables

1-1	Dimensions and Weights	1-2
1-2	Recommended Site Test Equipment	1-3
1-3	Glossary of Terms	1-4
2-1	Ac Power Consumption	2-7
2-2	Dc Power Consumption	2-8
2-3	ATU Serial Interface	2-14
2-4	RS-422 Remote Interface	2-14
2-5	RS-232 Remote Interface	2-14
2-6a	RF Filter PWB Tap Settings vs Frequency (Standard Frequency Band)	2-16
2-6b	RF Filter PWB Tap Settings vs Frequency (Extended Frequency Band)	2-16
2-7	Dc Power Connection	2-16
3-1	Front Panel – System Diagram Controls and Indicators	3-5
3-2	Front Panel – Control Section Controls and Indicators	3-7
3-3	Exciter Interface PWB Controls and Indicators	3-9
3-4	Remote Interface PWB Controls and Indicators	3-11
3-5	RF Synthesizer PWB Controls and Indicators	3-13
3-6	Miscellaneous Control and Exciter Assembly Controls and Indicators	3-14
3-7	Miscellaneous RF Power Stage Controls and Indicators	3-15
3-8	Battery Boost PWB Controls and Indicators	3-17
3-9	Events Log Displays – Non Alarm Events	3-21
5-1	Troubleshooting and Replacement Tips	5-5
6-1	Battery Select Logic	6-5
7-1	Manufacturer's Index	7-4
8-1	Wiring Lists Provided	8-1
9-1	Electrical Schematics	9-3
10-1	Mechanical Drawings	10-2



List of Figures/Drawings

2-1	Vector-LP Transmitter Environment Considerations	2-3
2-2	Customer Interface to Vector-LP Transmitter	2-5
2-3	Single Ended Input Selected	2-9
2-4	Differential Input Selected	2-10
2-5	Block Diagram – Recommended Transmitter System Installation (with SPU1)	2-19
2-6	Block Diagram – Recommended Transmitter System Installation (without SPU1)	2-20
3-1	Vector-LP Transmitter Front Panel (Primary User Interface)	3-3
3-2	Vector-LP Transmitter Front Panel – System Diagram Section	3-4
3-3	Vector-LP Transmitter Front Panel – Control Section	3-6
3-4	Part of NAPI76A/02 Exciter Interface PWB A2	3-8
3-5	Part of NAPI78D/02 Remote Interface PWB A3	3-10
3-6	NAPE70C/01 RF Synthesizer PWB A5 and A8	3-12
3-7	NAPS35 Battery Boost PWB A16A1 (Optional)	3-16
3-8	Diagnostic Display – Meters Screen	3-18
3-9	Diagnostic Display – Main Menu	3-18
3-10	Flow Diagram – Diagnostic Display Functions	3-19
4-1	Exciter Panel and Rear View	4-2
4-2	CW signal set to fill display	4-15
4-3	CW signal with position adjusted to mid-point of display	4-15
4-4	MCW signal, 95% modulation	4-15
5-1	RF Power Module Securing Hardware	5-10
6-1	Block Diagram - Vector-LP Radio Beacon Transmitter	6-3
6-2	Block Diagram – Exciter/Control/Monitor Stage	6-11
6-3	Timing Diagram for PDM Differential Amplifier	6-13
6-4	Block Diagram – RF Power Stage	6-25
6-5	Block Diagram – RF Power Module	6-27
6-6	Simplified Principles of Class ‘D’ Operation	6-31
7-1	Family Tree – Vector-LP Radio Beacon Transmitter	7-5



Release Control Record

Issue	Date	Reason
1.8.1	01 February 2015	Manual to support transmitter configuration for FAA (NARB18 and custom DWAs incorporated)



Vector-LP Radio Beacon Transmitter

TECHNICAL INSTRUCTION MANUAL

Section 1 **GENERAL INFORMATION**

1.1 INTRODUCTION

The Vector-LP radio beacon transmitter:

- Automatically transmits specific beacon identification signals at pre-selected repetition rates. Special codes may also be transmitted when commanded from an external source. Provision is made for local or remote operation of the transmitter as well as antenna fine-tuning through controls on the transmitter's front panel. Emission is continuous carrier (NON), beacon keyed identification tone (A2A) and beacon with voice (A2A/A3A).
- Provides continuous carrier power for two different power configurations:

VR125	125 W maximum
VR250	250 W maximum
- Can be modulated from 0 to 95%.
- Operates in the LF/MF band (190 kHz to 535 kHz).
- VR125 has provision for extended band operation, up to 125 W, in the MF band (536 kHz to 1200 kHz and 1600 kHz to 1800 kHz).
- Has provision for a standby exciter section, which duplicates the PDM and RF drive generation circuitry and low voltage power supplies.
- Has provision for single side or dual side (A and B) RF power sections, which can be manually or automatically selected.

- Can be serially connected to Nautel's ATU-LP or ATU500 Antenna Tuning Unit, allowing a variety of control/monitoring features, including stabilization of the antenna current (ATU-LP only) by automatically adjusting transmitter power level.

1.2 FACTORY SUPPORT

Nautel provides after sales factory support. Technical assistance is available on a 24 hour, seven days a week basis. A factory service facility for repair of modules/assemblies is also available. Refer to the *Factory Support* portion of the *Warranty* pages at the front of this manual for additional information.

1.3 PURPOSE AND SCOPE OF MANUAL

This *Technical Instruction* manual provides the information required to install, operate and maintain the equipment. Where applicable, changes have been incorporated to reflect non-standard customer requests.

1.4 PURPOSE OF EQUIPMENT

When combined with an appropriate antenna system, the Vector-LP transmitter provides reliable facilities for an NDB reference station. It is ideally suited for remote or unmanned sites. Remote control facilities are incorporated to allow unattended operation from a remote location.



1.5 MECHANICAL DESCRIPTION

See Figure MD-1. The Vector-LP transmitter is a fabricated metal chassis with an attached full-depth front panel. It is intended for installation in a 19-inch mounting rack. It can be supplied with non-swivel type drawer slides (including portion attached to mounting rack).

Nautel provides four rack mounting options (see Table 1-1 for dimensions and weights).

- Deluxe Cabinet: supports 19-inch rack mount equipment, including side panels and rear door (see also 2.2.20.7 and Figure MD-1B)
- IP66 Cabinet: meets IP66 requirements (see also 2.2.20.8 and Figure MD-1C)
- Short Cabinet (with or without internal battery): supports 19-inch rack mount equipment, including side panels and rear door (see also 2.2.20.9 and Figure MD-1D)
- Tall Cabinet (with internal battery): supports 19-inch rack mount equipment, including side panels and rear door (see also 2.2.20.10 and Figure MD-1E)

All external connections are terminated at the rear of the transmitter. The RF output coaxial cable connects to an N-type connector. The ac power cable connects to a standard ac line connector. The dc power cabling, if applicable, connects to a terminal block. External input (RF drive and control) and output (status and alarm monitoring) connect to connectors on the remote interface PWB. If the transmitter is installed in the optional deluxe, short or tall cabinet, cable entry holes are provided. If the transmitter is installed in the optional IP66 cabinet, weather-proof cable glands are provided.

1.6 TEST EQUIPMENT AND SPECIAL TOOLS

Table 1-2 lists the test equipment and special tools that are required to operate and maintain the Vector transmitter.

1.7 GLOSSARY OF TERMS

Table 1-3 provides a list of unique terms, abbreviations, and acronyms used in this publication.

Table 1-1: Dimensions and Weights

VR125/VR250 (dual side installed)	DIMENSIONS			WEIGHT	
	Height	Width	Depth	Packed	Unpacked
No cabinet	21.0 in. (53.3 cm)	19.0 in. (48.3 cm)	27 in. (68.6 cm)	TBD	54 lbs (24.5 kg)
Deluxe cabinet	73.2 in. (185.9 cm)	23.0 in. (58.4 cm)	30.0 in. (76.2 cm)	345 lbs 156.5 kg)	TBD
Short cabinet	42 in. (106.7 cm)	23.0 in. (58.4 cm)	30 in. (76.2 cm)	TBD	TBD
Tall cabinet	73.3 in. (186.3 cm)	23.1 in. (58.6 cm)	30 in. (76.2 cm)	TBD	TBD
IP66 cabinet	32.4 in. (82.3 cm)	23.7 in. (60.0 cm)	26.1 in. (66.3 cm)	TBD	87 lbs (39.5 kg)



Table 1-2: Recommended Site Test Equipment

EQUIPMENT	PART/MODEL NUMBER OR TYPE (EQUIVALENT MAY BE USED)	APPLICATION
Dummy load	50 Ω , rated for at least twice the maximum continuous carrier power level (250 W and 500 W), VSWR 1.1	Provides precise load for 'off-air' testing (calibration and troubleshooting).
Digital multimeter	3-1/2 digit, ac and dc volts (10 M Ω input), ohms and amps, \pm 0.5% accuracy, Beckman 3010	Testing and maintenance
Ac Voltmeter	HP400E	Precise measurement of RF voltage across dummy load during calibration procedures
Frequency counter	5 ppm up to 10 MHz Fluke model 1900A	Measure carrier frequency
Oscilloscope	Tektronix model T922	Testing and maintenance
RF Signal Generator	Capable of operating in frequency range of 190 – 550 kHz with an adjustable output capable of supplying 0.5 V pp – 4 V pp into 50 Ω	Simulate external RF drive source during testing and troubleshooting.
Dc power supply (variable)	0 – 50 V, 1A	Testing and maintenance
Torque wrench	Capable of providing five inch-pounds (0.665 Newton-Meters) of torque.	Installing power MOSFETs
Serial null modem adapter	9-pin null modem	Programming firmware
Current probe		Calibrate reflected power
Clip-on dc current meter		Calibrate battery current



Table 1-3: Glossary of Terms

TERM	DESCRIPTION
ac	Alternating current
AM	Amplitude modulation
Bit	Basic timing increment derived from master clock in keying unit. Length is dependent on frame length and number of characters used. An 8-bit frame is nominally 125 ms long.
Character	Letter or number in the beacon identification signal
dBm	Decibel reference 1 mW
dc	Direct current
Element	Smallest divisible part of a character. May be either a dot or a dash
Frame	Selected, fixed interval of time that is sufficiently long to accommodate the beacon identification signal and an interval of continuous tone. Normally set to 80 bits (10 seconds)
GUI	Graphic user interface. Referred to as diagnostic display throughout the manual
Hz	Hertz
Modular Redundancy	Identical modules operating in an overall system design such that failure of one module does not affect the output of the system
PDM	Pulse duration modulation
PSTN	Public Switched Telephone Network
PWB	Printed wiring board (also known as printed circuit board)
RF	Radio frequency
SPI	Serial Peripheral Interface
V ac	Volts ac
VSWR	Voltage standing wave ratio



Vector-LP Radio Beacon Transmitter

TECHNICAL INSTRUCTION MANUAL

Section 2 PREPARATION FOR USE AND INSTALLATION

2.1 INTRODUCTION

This section contains pre-installation and installation information for the transmitter. Nautel recommends that you incorporate all requirements to ensure optimum reliability and performance.

NOTE

Failure to comply with these recommendations and instructions could void the manufacturer's warranty. Please review Nautel's warranty terms for more information.

2.2 PREPARATION FOR USE

Prepare the transmitter site to receive the transmitter prior to its delivery and installation. Use the following information to prepare new sites and as evaluating criteria at existing sites.

NOTE

Frequent reference is made to connectors and terminal blocks on the remote interface PWB. This PWB is located on the back of the front panel.

2.2.1 Transmitter Room

Requirements

The following criteria must be addressed when finalizing the transmitter site.

2.2.1.1 Transmitter Dimensions

Refer to Table 1-1 or Figure MD-1 for transmitter dimensions. Dimensions identify room entry and floor space requirements and will assist in determining cable lengths and routing.

2.2.1.2 Transmitter Weights

Refer to Table 1-1 for transmitter weights. Sufficient manpower or lifting apparatus is required to move the transmitter.

2.2.1.3 Transmitter Clearances

Refer to Figure 2-1 for recommended transmitter clearances.

2.2.1.4 Air Flushing

Fans below each RF power module draw cooling air through filters in the bottom of the transmitter and exhaust it through ventilation holes in the top of the RF power modules. For VR250 transmitters, the air exchange rate required to achieve an acceptable intake/exhaust temperature rise is 110 CFM. Standard VR125 transmitters are convection cooled, but can be equipped with optional cooling fans for each RF power module.

2.2.1.5 Cooling and Heating

Refer to Figure 2-1 for transmitter room ambient air temperature limitations. If necessary, ensure adequate cooling and/or heating systems are in place to maintain appropriate ambient air temperature.

2.2.1.6 Work Area

Nautel recommends that a suitable work area with an adequate table surface be provided adjacent to the transmitter to permit bench adjustment and repair of modules. Static precautions must be observed.

2.2.1.7 Power Source Switch

The **AC INPUT** switch on the back of the transmitter controls the application of the ac power source. If an optional dc power source is being used, Nautel recommends installing a switching assembly for the dc power source in close proximity to the transmitter.



2.2.2 Lightning Protection

Extremely high voltage and current transients are produced when a lightning strike occurs. These transients, which are usually the most significant hazard to any solid state transmitter, may be passed to the transmitter through the wiring connecting the transmitter to the power source and the antenna system. All practical precautions should be taken to protect the transmitter from this phenomenon. Refer to the *Lightning Protection* section of Nautel's *Recommendations for Transmitter Site Preparation* booklet for specific protection techniques. Installing Nautel's interface protection unit is highly recommended. The following requirements are considered to be essential and failure to follow the site layout requirements may void the transmitter warranty.

NOTE

The following paragraphs discuss customer required connections to the transmitter. Figure 2-2 is provided as an aid for various customer interface connections and should be referenced while planning and installing these connections.

2.2.3 Station Reference Ground

The site must contain a station reference ground, as defined in Nautel's *Recommendations for Transmitter Site Preparation* booklet. This ground must provide a continuous, low impedance path to the earth. The transmitter cabinet's designated station reference ground point, the shield of the coaxial feed cable, and the ground connection of the power source's surge protection devices must be connected directly to the station reference ground using, as a minimum, 100 mm (4 inch) copper strap.

2.2.4 Ac Power Source

If an ac power source is used, all conductors should be protected by bi-directional surge protection devices that are connected between each conductor and the station reference ground. In addition, the conductors, as a group, should pass through a ferrite toroid. The inductance formed by this toroid is transparent to ac voltages, but presents impedance to transients originating in the power source. A surge protector panel, containing suitably rated varistors, is available from Nautel for this purpose. If used, the surge protector panel should be installed in close proximity to the station reference ground.

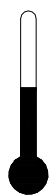
2.2.4.1 Ac Wiring

The ac wiring for the transmitter should not be smaller than 18 AWG, based on an average ac input voltage of 200 V ac.

NOTE

Local electrical codes must be observed when sizing cables. The ac power source usually presents the lowest impedance path to ground potential for a lightning strike and will normally carry most of the lightning induced current away from the transmitter. When lightning hits the power source, a significant amount of induced current may flow towards the transmitter. In this instance, the objective is to route the current around the transmitter, instead of through it, to the best ground available.





TEMPERATURE

-30°C (-22°F) TO +55°C (131°F)

0% TO 95% RELATIVE HUMIDITY

ALTITUDE:

3,048m (UP TO 10,000ft)

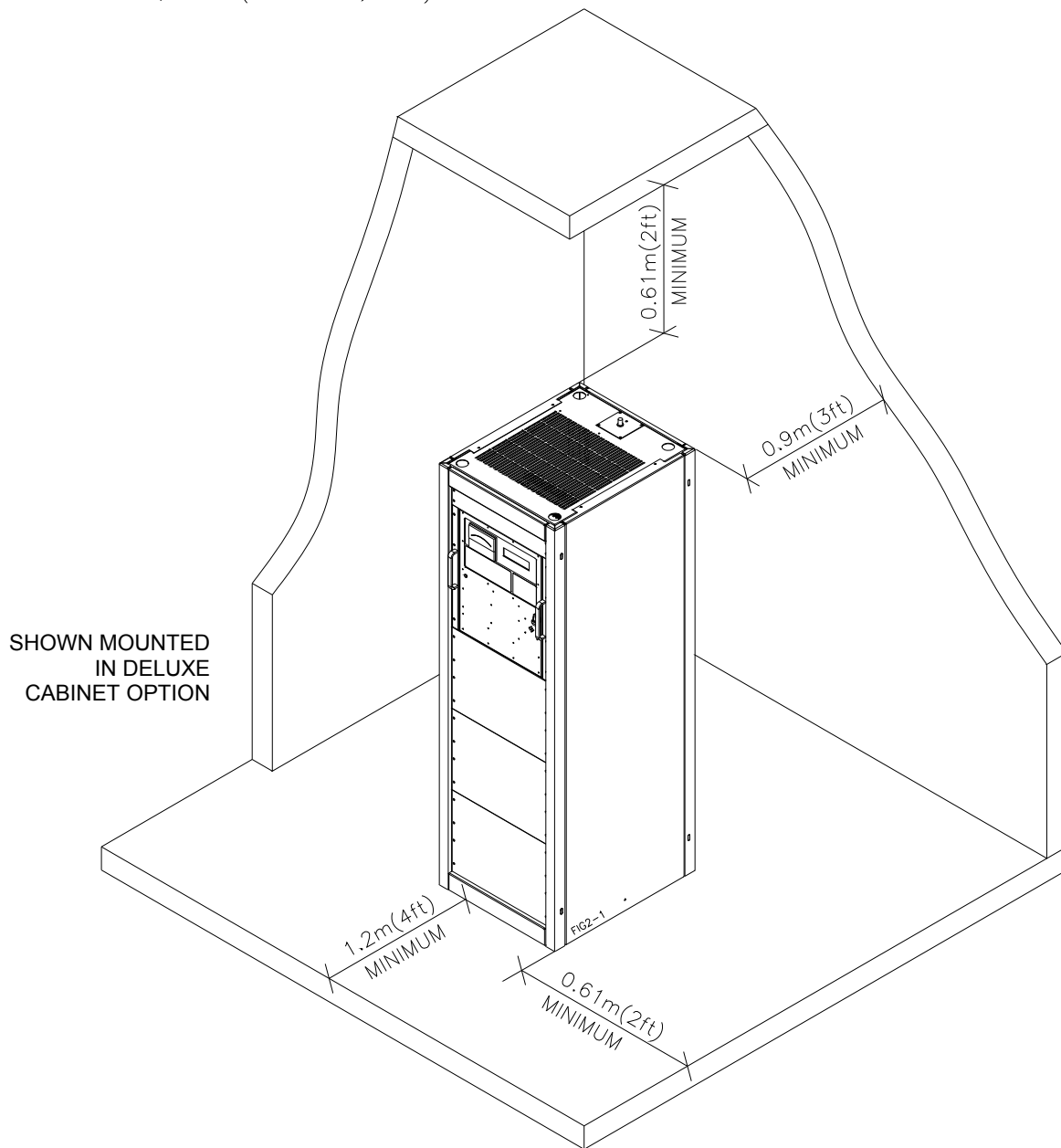
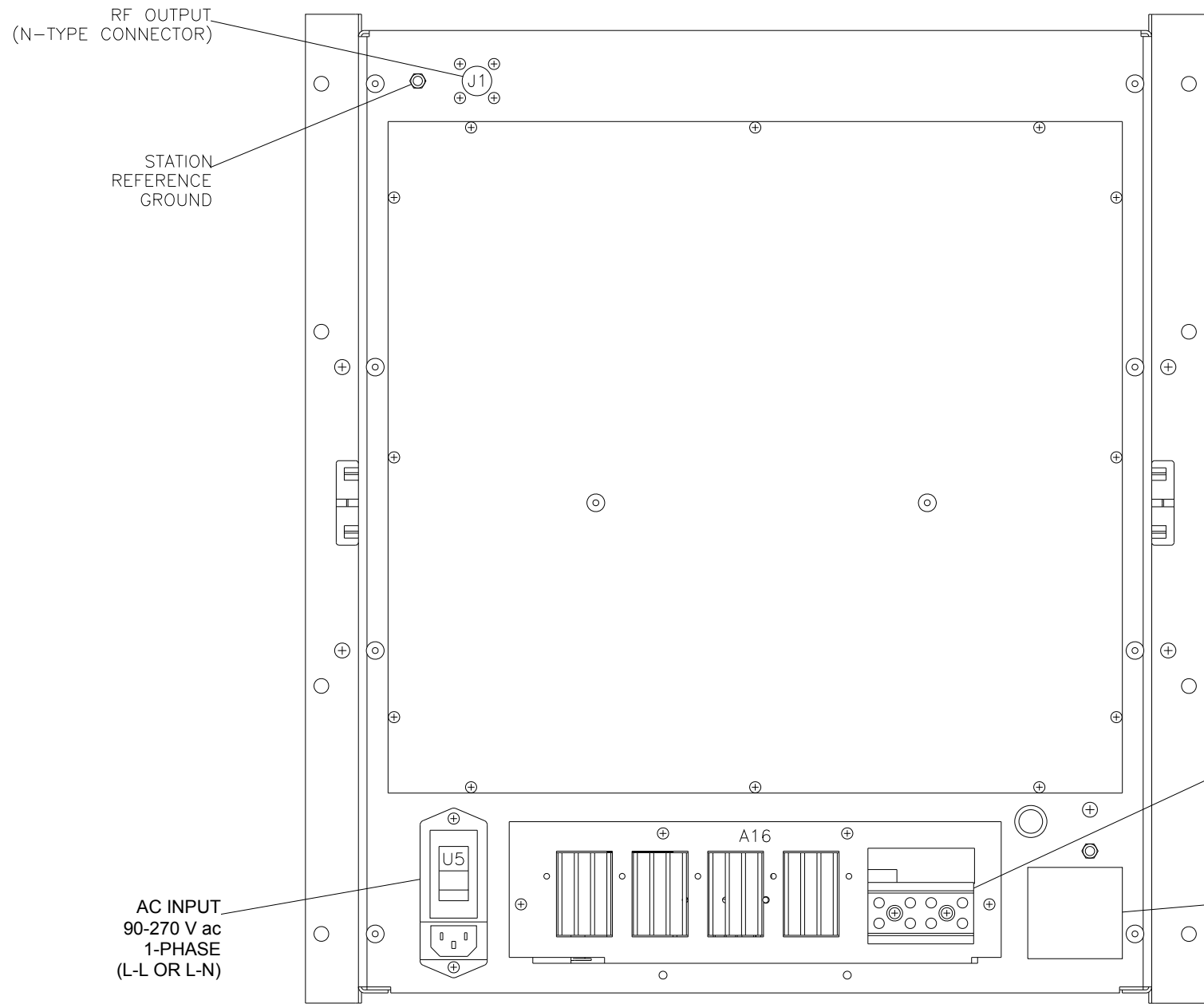
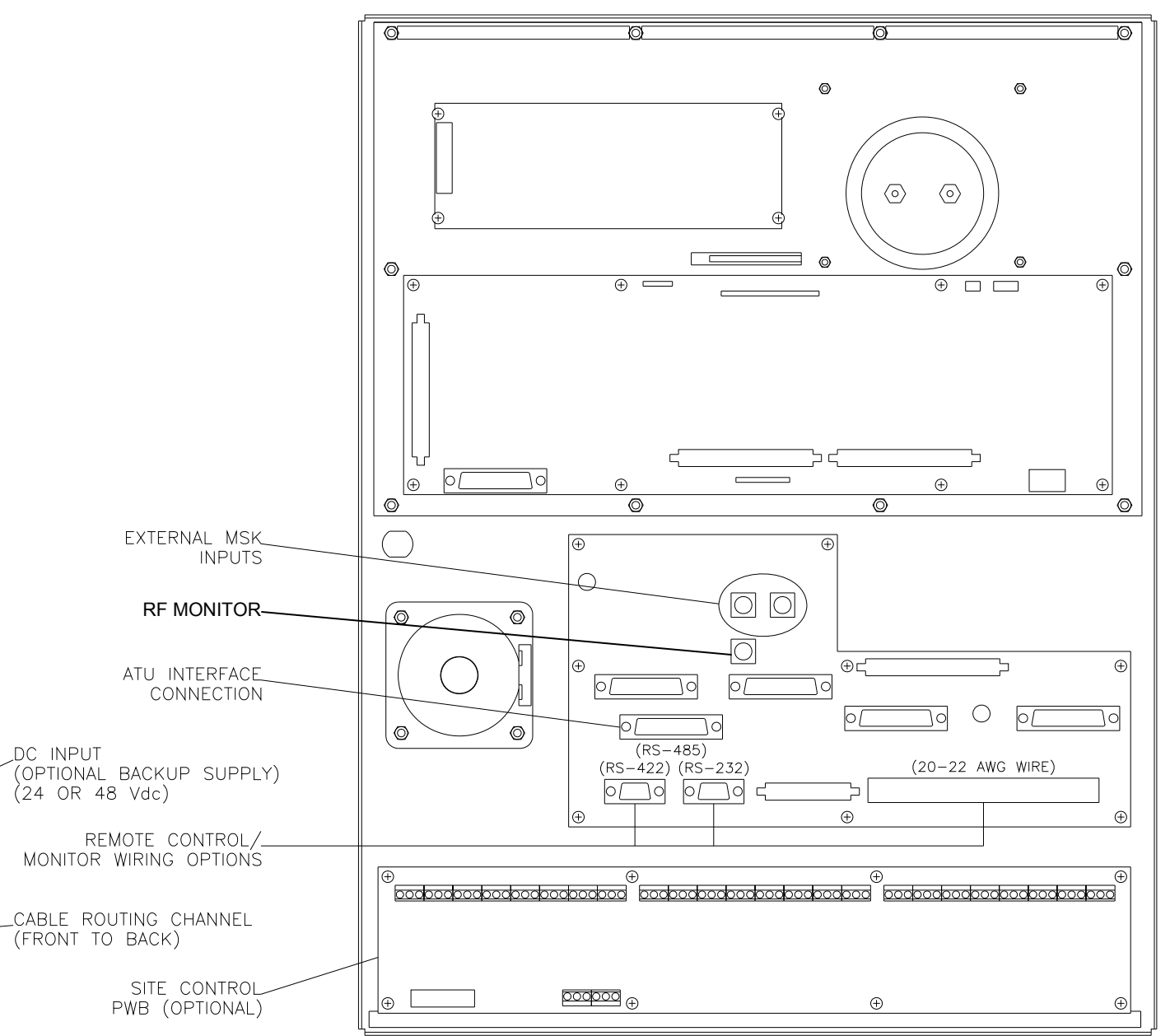


Figure 2-1 Vector-LP Transmitter Environment Considerations



BACK OF TRANSMITTER



BACK OF FRONT PANEL

Dimensions = mm (inches)



Customer Interface to Vector-LP Transmitter			
Issue 1.8.1	Not to Scale	Figure 2-2	Page 2-5 (2-6 Blank)

2.2.5 Antenna Feed Cable

The shield of the antenna feed coaxial cable should be connected directly to the station reference ground where it enters the building. In addition, the centre conductor and the shield of the feed cable should pass through a ferrite toroid positioned between the shield ground at the building entrance and the shield termination at the transmitter reference ground. This toroid is transparent to the RF signal, but presents impedance to transients originating in the antenna. When Nautel's interface protection unit is installed, the RF feed cable is connected directly to it. It contains the necessary ferrite for the ac wiring and RF feeder cable.

2.2.6 Antenna Tower

The antenna tower is the most likely target for lightning strikes. It is imperative that it contain lightning protection devices as the first line of defense against lightning strikes.

2.2.7 External Control/Monitor Wiring

All external control/monitor wiring that may be subject to lightning induced transients should be interfaced to the station reference ground by surge protection devices at the building entry. All conductors and shields should pass through a ferrite toroid that is positioned between its surge protection device and the transmitter. This toroid is transparent to control/monitor signals, but presents impedance to lightning induced transients. Connect shields to the ground stud at the back of the transmitter, above the cable routing channel (see Figure 2-2).

2.2.8 Electrical Power

The transmitter is configured during manufacture to operate from an ac or dc power source. The power source and associated switching components and wiring must meet the following requirements:

2.2.8.1 Ac Voltage Source

The VR250 can operate from a 170 to 270 V ac, 50 Hz, (line-to-neutral) or 60 Hz (line-to-line) ac power source. The VR125 can operate from a 90 to 270 V ac, 50/60 Hz,

(line-to-neutral) or 60 Hz (line-to-line) ac power source. The voltage must be maintained within the specified voltage range under all loading conditions. The transmitter contains circuitry that maintains the RF output at the pre-set carrier level for voltage variations within this range. Power consumption and line current depends on the transmitter's maximum rated power level (see Table 2-1). Nautel recommends the ac power source have a 20% over-capacity to ensure adequate regulation.

Table 2-1: Ac Power Consumption

Vector Product	Max. Power Consumption	Max. Line Current
VR125	500 VA	*5 A RMS
VR250	1000 VA	*5 A RMS

based on worst-case parameters (maximum RF output power, minimum ac voltage and efficiency)

* maximum line current cannot exceed 5 A (ac power entrance uses a 5 A breaker)

2.2.8.2 External Ac Switching

All current carrying conductors from the ac power source should be controlled by an external switching box located in close proximity to the transmitter. This switch box should be clearly marked **TRANSMITTER EMERGENCY ON/OFF SWITCH**. Refer to Table 2-1 for current ratings that should be observed when selecting a circuit breaker and associated input wiring.

2.2.8.3 Dc Voltage Source

As an option, the transmitter may operate from a dc power source (battery bank).

- The dc source must provide a nominal 24 V (VR125 only) or 48 V. When a 24 V battery is used in VR125 transmitters, a 24-48 V power supply (A16) is used to boost the dc voltage. The no-load voltage must be in excess of 44.0 V (or 22.0 V for 24 V sources, limit is adjustable) for the transmitter to turn on initially.
- Line current depends on the transmitter's maximum rated power level (see Table 2-2).



Table 2-2: Dc Power Consumption

Transmitter	Max. Line Current
VR125	6.3 A (48 V); 12.6 A (24 V)
VR250	12.4 A (for 48 V)
based on worst-case parameters (maximum RF output power, minimum dc voltage and efficiency)	

- The capacity of the dc battery bank and the *Low Battery Voltage Threshold* setting, dictates the length of time the transmitter will operate. When the battery bank voltage falls below the low battery voltage threshold (factory set for 42 V dc for 48 V sources or 21 V for 24 V sources; limit is adjustable), the transmitter turns off and prevents the battery from fully discharging.
- Use an external circuit breaker for the dc power source. There is an internal fuse for the dc supply.

2.2.9 Antenna System

The antenna system must present $50 \pm j0 \Omega$ impedance at the carrier frequency. The transmitter will function while operating into a maximum VSWR of 1.5:1, but overall system performance will be degraded. Circuitry within the transmitter will prevent damage to the transmitter from high VSWR loads. Refer to the associated antenna tuning unit's manual for further information.

2.2.9.1 RF Feed Cable

The RF feed cable must be a 50Ω coaxial cable that is terminated by a type N coaxial connector. The RF output connector of the transmitter is located at the back of the transmitter. If the transmitter is installed in the deluxe, short or tall cabinet mounting option, the RF output connector is located on top of the cabinet. If the transmitter is installed in the IP66 cabinet mounting option, the RF output connector is located on the side of the cabinet.

2.2.9.2 Interface Protection Unit

An interface protection unit (SPU1) is available from Nautel. It prevents lightning induced transients from flowing through the transmitter. Isolation of the transmitter and the desired lightning protection is accomplished by:

- Inserting a 1:1 isolation transformer in the RF feed cable to ensure there is no dc connection between the transmitter's RF output and the antenna system.
- Passing all wires through ferrite toroids. A toroid is an inductance transparent to normal signals but presents impedance to lightning induced transients.
- Connecting suitably rated varistors between the ac line and the station reference ground.
- Connecting the shield of the coaxial cable from the antenna/phaser directly to the reference ground.

When used, the antenna feed cable is connected directly to the interface protection unit. Fifty feet of coaxial cable is provided for the connection between the interface unit and the transmitter.

2.2.10 Internal DDS Source

The integral numerically controlled oscillator is the RF drive source. Configure the shorting posts on RF synthesizer PWBs (A5 and, if used, A8) as follows:

- E1 in **INT** position (pins 2 and 3 shorted)
- E2 in **INT** position (pins 2 and 3 shorted)
- E4 in **INT** position (pins 2 and 3 shorted)



2.2.11 External Interlocks

The external electrical interlock circuit connects between **INTERLOCK** terminals TB1-19 and TB1-20 of the remote interface PWB. When it is safe to produce an RF output, the circuit must be closed and the transmitter must be applying +24 V to TB1-20. When it is not safe to produce RF output (one or more of the external interlock switches activated), the circuit must provide an open circuit to TB1-20. You can install any number of serial interlock switches, provided +24 V is removed from TB1-20 if any interlock switch is activated.

NOTE

Transients may be induced on the 24 V source if the external wiring is lengthy. To prevent this, install a relay controlled by external interlock switches near the remote interface PWB. Connect it as a fail-safe relay (energized when the interlock circuit is closed, de-energized when it is opened) with its normally open contacts interconnecting TB1-19 and TB1-20.

2.2.12 Remote Control Circuits

You can control and monitor transmitter functions by connecting to the remote interface PWB using a conventional remote interface or using an RS232 or RS422 serial port (see 2.2.15 for a description of the serial port features). You can control the on/off status, standby code 1, and standby code 2 using switching circuits that are either a single ended input or a differential input. The charger alarm can also be monitored remotely.

NOTE

*External control circuits connect to the transmitter circuits through opto-couplers on the remote interface PWB. The opto-couplers buffer/isolate the external circuits and prevent any transients from affecting transmitter operation. These opto-couplers only have influence when **Remote control** is selected at the transmitter. The remote interface PWB contains selection circuits that allow the user to select an internal (single ended input) or external (differential*

input) dc power supply as the current source for the opto-coupler associated with each controlled function.

The switching circuit for each remotely controlled function must be the equivalent of a normally open/held closed spring-loaded (momentary) switch. Each must be configured to operate as a single ended input using the transmitter's unregulated +24 V as the dc volts source (see Figure 2-3) or as a differential input using an external dc power supply (24 V to 30 V) as the dc volts source (see Figure 2-4). Each control function has positive and negative input terminals on the remote interface PWB to accommodate the selected configuration.

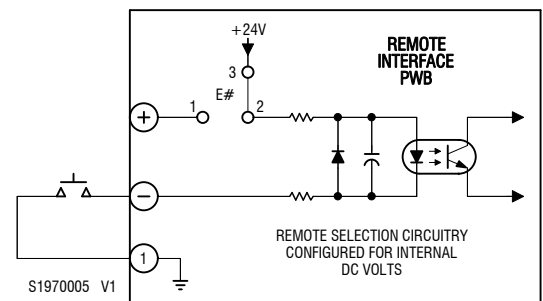


Figure 2-3 Single Ended Input Selected

Single Ended Input (Internal V dc)

When using the transmitter's +24 V as the current source for a control function's opto-coupler, configure the remote interface PWB circuit for a single ended input. Configure the 2-socket shunt post on the 3-pin header associated with the control function as shown in Figure 2-3. Apply a negative logic command (current-sink-to-ground is active) to the control's negative (-) input terminal. The ground must come from TB1-24.



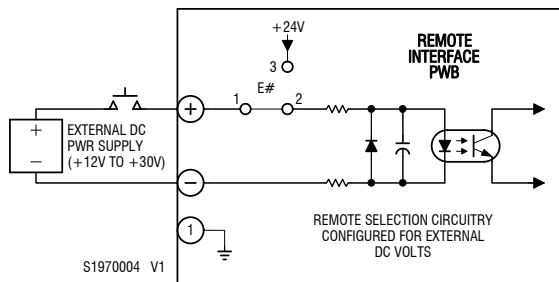


Figure 2-4 Differential Input Selected

Differential Input (External V dc)

When using an external dc voltage (24 V to 30 V) as the current source for a control function's opto-coupler, configure the control function's external switching circuit and the remote interface PWB's selection circuitry for a differential input. Configure the 2-socket shunt post on the 3-pin header associated with the control function as shown in Figure 2-4. The normally open/hold closed switch may be located between the dc voltage's negative output and the negative (-) input terminal (negative logic), or between its positive output and the positive (+) input terminal (positive logic).

2.2.12.1 On/Off Control

The remote on/off circuitry (TB1-5/6) controls the on/off status of the RF power stage. Activation of this circuit toggles the status between on and off.

2.2.12.2 Charger Alarm

If an external battery charger is used, its charger alarm output may be connected to the transmitter (TB1-3/4) for fault monitoring.

2.2.12.3 Standby Code 1

The standby code 1 circuit (TB1-9/10) controls the on/off status of standby code 1 generation.

2.2.12.4 Standby Code 2

The standby code 2 circuit (TB1-7/8) controls the on/off status of standby code 2 generation.

2.2.13 Press-To-Talk Input

The press-to-talk circuit should be a normally open, single pole switch. When closed (press-to-talk), it should apply a ground to TB1-12. If the press-to-talk information is phantom fed on the audio shield (TB1-15), the switching circuit is not required (see jumper E4 in Table 3-4 and on Figure SD-11). In phantom feed operation, -15 V must be applied to the shield of the audio input when press-to-talk is to be asserted.

2.2.14 User Assigned Information

Determine the final configuration of the transmitter according to user requirements and applications. Obtain the following user assigned information prior to final assembly and installation of the transmitter.

2.2.14.1 Carrier Frequency

Determine the transmitter's assigned carrier frequency.

2.2.14.2 Keyed Tone Frequency

Determine which keyed tone frequency (400 Hz, 1020 Hz or external) is to be used.

2.2.14.3 Identification Code

Determine the identification code that has been assigned to the transmitter. Determine if the programmable filler space after the last character of the identification code is to be no tone (CW) (ICAO) or continuous tone (MCW) (NAVCAN).

2.2.14.4 Standby Codes

Determine the code variation to be transmitted as standby '1', noting that options consist of increasing one or more of the no-tone intervals, between characters of the identification code from 3 bits to 5 bits. When the programmable filler space after the last character is continuous tone, the no-tone interval between the last character and the continuous tone may be increased a similar amount.



2.2.15 Serial Port Features

The Vector transmitter has several serial port features which allow interfacing to the remote control/monitor center and the ATU.

2.2.15.1 Remote Control and Monitoring Interface

Remote control and monitoring is optionally available over a serial connection. This connection can be RS-232, RS-422 or optionally via modem, USB or TCP/IP. Serial connections are made to the remote interface PWB on the back of the front panel. The modem, USB to serial adapter, and TCP/IP to serial adapter plug into the RS-232 connection on the rear of the exciter.

If purchased, the NAPI80 Site Interface PWB provides 16 optically isolated monitor points and 16 form C relay contact control points. Using the front panel GUI, monitor points can be configured to indicate alarms in a high or low logic state and control points can be configured to automatically toggle on any status change in the transmitter.

2.2.15.2 ATU Interface

For transmitter systems that use a Nautel ATU-LP or ATU500 (NAT39B only) antenna tuning unit, a serial interface can be established by connecting to the **ATU RS-485** 25-pin D-sub connector (J3) on the remote interface PWB on the back of the front panel (see Figure 2-2).

2.2.16 RF Monitoring Sample

A true sample of the RF output voltage waveform is provided on the **RF MONITOR** BNC connector (J8) on the remote interface PWB on the back of the front panel. The **RF MONITOR** output should be applied to a station modulation monitor with a 50 Ω input impedance. It may also be monitored by an oscilloscope during maintenance procedures. The **RF MONITOR** output will be a nominal 1 V RMS, into a 50 Ω load, when the RF output power level is at rated power.

2.2.17 Parts Supplied by Nautel

An ancillary parts kit is provided with the transmitter. These parts ensure installation is not delayed due to lost or damaged parts, and allow you to maintain the equipment until a full maintenance spares kit is obtained. These parts are not intended to be long-term maintenance spares. The contents of the ancillary parts kit are itemized in the packing list. Connectors for remote control/monitor wiring are included in the ancillary kit. Detailed information about these parts is not included in this manual.

2.2.18 Parts Not Supplied by Nautel

Some parts required to complete installation are not supplied with the transmitter, or are not provided by Nautel. Each installation dictates the parts required, but users will normally need to supply the following:

- A suitable 50 Ω RF output coaxial cable, terminated by the appropriate RF connector.
- All external control/monitor wiring, including the associated terminating devices and conduit clamps.
- All electrical power cables, including conduit, clamps and terminating devices.
- Appropriate batteries when the dc option is purchased.
- Appropriate ac breaker and dc fusing

2.2.19 Test Equipment and Special Tools

The test equipment and special tools required to install and maintain the transmitter are listed in Table 1-2.

2.2.20 Available Options

There are several options available for the Vector-LP transmitter. Each option is described below to assist the user in selecting the final configuration.



2.2.20.1 Standby Side

The Vector-LP transmitter can be upgraded to accept a standby RF power module and a set of standby exciter assemblies, including:

- RF synthesizer PWB (A8)
- Interphase PDM driver PWB (A9)
- Exciter monitor/generator PWB (A10)
- RF power module (A13)
- Universal input ac/dc power supply (U3)

When the standby side components are installed, the transmitter must be placed in **NORMAL** changeover mode to enable the standby switching feature.

2.2.20.2 Spares Kit

A comprehensive maintenance spares kit is available. The kit includes a quantity of each through-hole semiconductor, LED, and fuse used in the equipment as well as important repair items such as semiconductor insulators, fan filters, etc.

2.2.20.3 Interface Protection Unit

A surge protector panel rated for the ac power source being applied to the transmitter is available from Nautel. The surge protector panel will help protect the transmitter against lightning-induced voltage transients on the ac power source and/or the antenna system.

NOTE

Figure 2-5 shows the recommended system installation for a transmitter system. This drawing emphasizes the interconnections to the interface protection unit.

2.2.20.4 Battery Backup

If purchased, the battery boost assembly (A16) will distribute appropriate voltages to the exciter assemblies and power modules. When purchased, the battery boost PWB is used in conjunction with a bank of user supplied batteries attached in such a manner as to provide 24 V dc (VR125 only) or 48 V dc and suitable current to allow the system to operate in battery backup mode.

2.2.20.5 Site Interface

The optional site interface PWB (A4) mounts below the remote interface PWB on the back of the front panel (see Figure 2-2). It can be used to provide 16 control points and 16 monitor points from a remote location via terminal block connectors. The active status of these control and monitor points can be configured using the front panel GUI.

2.2.20.6 Modem Kit

An optional modem kit (Nautel Part # 195-3032) is available. The kit includes a Multi-Tech Systems MT5634 modem (Nautel Part # UW66) and cabling. The transmitter can be set up for modem operation in the RCMS section of the front panel GUI.

2.2.20.7 Deluxe Cabinet Mounting

A deluxe cabinet (Nautel Part # 205-8075, see Figures SD-26 and MD-1B) is available. This cabinet supports the Vector-LP on slides and also contains:

- terminal block TB1 to accept the external ac power source
- ac line cord (P3, Nautel Part # JN50) to connect between TB1 and the Vector-LP
- RF output connector on the side of the cabinet, and coaxial cable (P2) for connection to the Vector-LP's RF output
- interconnect cabling (see Table 8-6)
- optional battery charger (U1), which receives its ac input via TB1

2.2.20.8 IP66 Cabinet Mounting

An IP66 cabinet (Nautel Part # 205-8080-01, see Figures SD-27 and MD-1C) is available. This cabinet supports the Vector-LP in a weather-proof cabinet with accessible weather-proof connectors and also contains:

- terminal block TB1 to accept the external ac power source
- terminal block TB2 accepts the optional battery charger connections
- ac line cord (P1, Nautel Part # JN50) to connect between TB1 and the Vector-LP
- RF output connector (N-type, J1) and coaxial cable (P2) for connection to the Vector-LP's RF output



2.2.20.9 Short Cabinet Mounting

A short cabinet (Nautel Part # 205-8120 or -01, see Figures SD-28 and MD-1D) is available. This cabinet supports the Vector-LP on slides and also contains:

- terminal block TB1 to accept the external ac power source and ac line cord P1 (Nautel Part # JN50) to connect between TB1 and the Vector-LP
- terminal block TB2 to accept the optional battery charger connections
- RF output connector at the top of the cabinet, and coaxial cable (W1) for connection to the Vector-LP's RF output
- interconnect cabling (see Tables 8-7a and 8-7b)
- optional battery (205-8120 only) and charger (U1), which receives its ac input via TB1, and dc circuit breaker (CB1), which provides on/off control of the dc voltage

2.2.20.10 Tall Cabinet Mounting

A tall cabinet (Nautel Part # 205-8200, see Figures SD-29 and MD-1E) is available. This cabinet supports the Vector-LP on slides and also contains:

- terminal block TB1 to accept the external ac power source and ac line cord P1 (Nautel Part # JN50) to connect between TB1 and the Vector-LP
- terminal block TB2 to accept the optional battery charger connections
- RF output connector at the top of the cabinet, and coaxial cable (W1) for connection to the Vector-LP's RF output
- interconnect cabling (see Table 8-8)
- internal battery
- optional battery charger (U1), which receives its ac input via TB1, and dc circuit breaker (CB1), which provides on/off control of the dc voltage
- optional VR-Link unit, which facilitates remote control/monitoring of the Vector-LP



2.3 INSTALLATION

All assemblies (listed below) are installed in the transmitter cabinet for shipping.

NOTE

Figure 2-5 shows the recommended installation for a transmitter system. This drawing emphasizes the interconnections to the interface protection unit.

Refer to Figure MD-1 for the transmitter's assembly detail and dimensions.

NOTE

Metric, stainless steel attaching hardware is used in this transmitter. Unless otherwise specified, use metric wrenches/sockets, except where an imperial measure is specifically identified. When required, replacement hardware should be identical to the items being replaced.

2.3.1 Acceptance of Shipment

Inspect all shipments for transmitter damage prior to acceptance.

2.3.2 Unpacking Instructions

Instructions for unpacking are dictated by the method of packaging for shipment and whether the transmitter has been installed in one of the optional cabinets available from Nautel. Transmitters not shipped by electronic equipment moving specialists may be packed in wooden crates. Instructions accompany any crate that requires special unpacking information. Remove all items from packing and place on a suitable work area. Verify shipped contents with packing lists, which provide detailed listings of shipment contents.

2.3.3 Visual Inspection

A visual inspection should be performed on the transmitter, its removable modules/assemblies, and printed wiring boards. The inspection should cover the following:

- (a) Verify the LCD screen on the front panel is not damaged.
- (b) Remove any packing materials (tape, tyrap) used to secure wiring that was disconnected for shipment.
- (c) Check for obvious damage and missing parts.
- (d) Check electrical wiring/cabling for broken or frayed insulation, loose or improper connections, and broken, shorted or pinched conductors.
- (e) Verify all hardware is firmly tightened.
- (f) Remove any unwanted foreign objects from the interior of the transmitter/assemblies, paying particular attention for floating conductive materials such as wire strands, metal slivers/filing, and loose hardware.

2.3.4 Cabinet Mounting

If the user is supplying the 19-inch mounting cabinet, install the transmitter in the cabinet, ensuring the drawer slides on each side of the transmitter are mated/locked together. If you purchased a Nautel cabinet option (deluxe, short, tall or IP66), the transmitter is shipped in the cabinet.

If the transmitter was shipped in a deluxe, short or tall cabinet, temporarily remove both of the cabinet's side panels [two screws at the top of the cabinet and one at the bottom (for the deluxe and tall cabinets) or two screws on the lower, front and rear (for the short cabinet)] and then remove four shipping screws (M8, two on each side) from the transmitter (see Figure MD-1B, MD-1D or MD-1E).

2.3.5 Determining Control/Monitoring Requirements

There are several remote control and monitoring options to consider before installing external wiring. The pre-installation information in paragraph 2.2 identifies the remote controls and alarm/status outputs available. It is assumed the user has already reviewed this information and has determined which to use. It is also assumed the options available for the control inputs and the monitoring outputs have been reviewed and the user has determined which options are required to interface with the external equipment.

2.3.6 Installing External Control/Monitor Wiring

Connect the wiring from the remote control/monitoring devices to the remote interface PWB (A3) as follows:

NOTE

Remote control and monitor wiring terminate on the remote interface PWB (A3), which is accessible from the back of the front panel (see Figure 2-2). The connectors, included in the ancillary kit, are solder-cup type and the terminal blocks accept wires sizes (AWG) # 14 through # 24.

A cable routing channel (see Figure 2-2) allows wiring to pass between the front and back of the transmitter. Remote control/monitor wiring should enter and exit at the back of the transmitter.

Table 2-3: ATU Serial Interface
(for **INTERNAL RS-485** connector J3)

Description	Pin
+5V (ISOL)	1
GND (ISOL)	2, 6, 25
INT BUS (+)	3
INT BUS (-)	4
DE/RE	5



Table 2-4: RS-422 Remote Interface
(for **RS-422** connector J4)

Description	Pin
TX	1
TX	2
GND	5
RX	7
RX	8

Table 2-5: RS-232 Remote Interface
(for **RS-232** connector J5)

Description	Pin
DCD	1
RXD	2
TXD	3
DTR	4
GND	5
DSR	6
RTS	7
CTS	8

- (a) Route wires from the back of the transmitter through the cable routing channel hole to the remote interface PWB (A3) on the back of the front panel. Using Tables 2-3 through 2-5 (note the applicable serial interface options), determine the specific destination of each wire.
- (b) Pass all control/monitor wires, including their shields, through a ferrite toroid supplied in the ancillary kit. If practical, pass the wires through each toroid a minimum of two times (two turns).
- (c) Determine which remote control inputs are being applied and then determine, if applicable, whether they are differential or single-ended input. See section 2.2.12 (Remote Control Circuits), for more information on the type of input.
- (d) Cut each wire to the required length and, if the wire is being terminated at a terminal block, remove 3/8" (9.5 mm) of insulation from the end of each conductor; if the wire is being terminated in one of the connectors,

remove 1/8" (3.2 mm) of insulation from the end of each conductor.

- (e) Insert the control/monitor wiring into the applicable terminals of the remote interface PWB (A3). Ensure the terminal block securing screws are firmly tightened and the adjacent wires do not touch (short).
- (f) If the optional modem kit (Nautel Part # 195-3032) is being used, verify connectors P7 and P8 are connected to the modem and connect the phone line to the modem.
- (g) If a Nautel ATU-LP or ATU500 is being used, complete the serial connection to the ATU (transmitter connections detailed in Table 2-3) as detailed in the ATU-LP or ATU500 Technical Instructions Manual. Also, provide the ATU's dc input source by connecting a separate cable between the transmitter's 24 V source [TB1-1 (+) and TB1-3 (ground)], see Figure MD-1] and the associated ATU's dc input (see ATU manual).

2.3.7 Installing Ac Power Wiring

NOTE

The following procedures assume the ac power is supplied from a single-phase, 50/60 Hz ac power source between 170 and 270 V ac (for VR250) or between 90 and 270 V ac (for VR125).

- (a) If an interface protection unit was purchased, route the ac power wiring from the ac power source (service entrance) to the interface protection unit, noting that it should be located close to the building's ac entrance. If an interface protection unit was not purchased, Nautel recommends that all ac power wiring pass through one or more ferrite toroids positioned near the transmitter's power connection.



Table 2-6a: RF Filter PWB Tap Settings vs. Frequency (Standard Frequency Band) (Connect E12 to E11)

Frequency (kHz)	E20 to	E21 to	E33 to	E36 to	E15 to	E17 to
190.0 -209.0	E1	E22	E31	E34	E16	E18
209.1 - 229.9	E2	E23	E31	E34	E16	E18
230.0 - 252.9	E4	E25	E31	E34	E16	E18
253.0 - 278.2	E3	E24	E31	E35	E14	E18
278.3 - 306.0	E5	E26	E31	E35	E14	E18
306.1 - 336.6	E6	E27	E31	E35	E14	E18
336.7 -370.3	E7	E28	E31	E35	E14	E18
370.4 - 407.3	E6	E27	E32	E35	E14	E16
407.4 -447.9	E7	E28	E32	E35	E14	E16
448.0 - 492.9	E8	E29	E32	E35	E14	E16
493.0 - 535.0	E9	E30	E32	E35	E14	E16

Table 2-6b: RF Filter PWB Tap Settings vs. Frequency (Extended Frequency Band, 125 W only) (Connect Input to E1)

Frequency (kHz)	E5 to	E18 to	E22 to	E35 to	Jumper 1	Jumper 2	Jumper 3	Jumper 4	Jumper 5	Jumper 6	Jumper 7
535.1 -592.0	E3	E17	E19	E23	E16 to E14	E15 to E12	E13 to E6	E24 to E25	E26 to E27	E28 to E29	E30 to E31
592.1 - 655.0	E3	E17	E19	E23	E16 to E10	E11 to E8	-	E24 to E25	E26 to E27	E28 to E31	-
655.1 - 725.0	E3	E15	E19	E23	E14 to E12	E13 to E10	-	E24 to E27	E28 to E29	E30 to E33	-
725.1 - 802.0	E3	E17	E19	E27	E16 to E6	-	-	E28 to E29	E30 to E31	E32 to E33	-
802.1 - 887.0	E4	E15	E20	E27	E14 to E12	E13 to E10	-	E28 to E29	E25 to E34	E30 to E33	-
887.1 - 981.0	E4	E17	E20	E27	E16 to E6	-	-	E28 to E29	E30 to E31	E32 to E33	-
981.1 - 1086.0	E4	E15	E20	E27	E14 to E10	-	-	E28 to E26	-	-	-
1086.1 - 1201.0	E4	E13	E20	E23	E12 to E8	-	-	E24 to E31	-	-	-
1201.1 - 1329.0	E2	E15	E21	E23	E14 to E10	-	-	E24 to E27	-	-	-
1600.0 - 1800.0	E2	E15	E21	E23	-	-	-	-	-	-	-

(b) Connect the transmitter’s ac input (U5, see Figure 2-2) to the interface protection unit, if purchased, or to ac power source. An ac line cord (Nautel Part # JN50) is included in the ancillary kit or cabinet kit. If a Nautel cabinet was purchased, connect the ac source to TB1 (see Figure MD-1B, MD-1C, MD-1D or MD-1E).

(a) Disable the dc power source.
 (b) Connect the dc power source to TB1 of the transmitter as shown in Table 2-7. Ensure wiring is securely tightened. If the short, tall or IP66 cabinet was purchased, disregard Table 2-7 and connect dc power source wiring to TB2-1 (+) and TB2-2 (-) of the cabinet.

2.3.8 Installing Dc Power Source Wiring (optional)

Connect the wiring from the dc power source to the transmitter as follows:

NOTE

Batteries are typically provided by the user and must be installed at the site.

Table 2-7: Dc Power Connection

TERMINAL	CONNECTION
TB1-1	Battery (+)
TB1-2	Battery (-)
TB1-3	Charger In
TB1-4	Charger Out



- (c) Apply dc power. Verify the voltage between TB1-1 and TB1-2 is the battery's nominal voltage [24 V dc (VR125 only) or 48 V dc].

2.4 COMMISSIONING

The following procedures are in a step-by-step format. They permit a person who is not familiar with the transmitter to perform required checks. Complete the procedures in sequence. The transmitter is calibrated and burned-in during manufacture. Unless otherwise specified you should not need to make any adjustment. If the tests associated with a procedure indicate the pre-set adjustments are not optimum, perform the appropriate adjustment procedure detailed in *Section 4, Testing and Adjustment* prior to proceeding with additional tests.

2.4.1 Precautions

The transmitter contains many solid state devices that can be damaged by excessive heat or high voltage transients. Read and observe the precautionary information in Section 3 - Operating Instructions prior to applying power.

2.4.2 Turn-On Prerequisites

Complete the following steps to verify the transmitter is ready to turn on:

- (a) Ensure that the RF filter PWB (A14) is tuned for the desired frequency:
- see Table 2-6a for standard frequencies between 190 and 535 kHz.
 - see Table 2-6b for 125 W transmitters operating at extended frequencies between 536 and 1250 kHz or between 1600 and 1800 kHz.

NOTE

250 W transmitters that operate in the extended band of 1600 to 1800 kHz do not require any jumper adjustments.

WARNING

If there is a jumper between TB1-19 and TB1-20 on remote interface PWB A3, safety features controlled by the external interlocks will be disabled. Implement a fail-safe method to alert personnel to this fact. Dangerous voltages are present on RF output stages and the antenna system if the transmitter is on.

- (b) Close all external interlocks or connect a temporary jumper wire between TB1-19 and TB1-20 of the remote interface PWB (A3).

2.4.3 Initial Turn-On

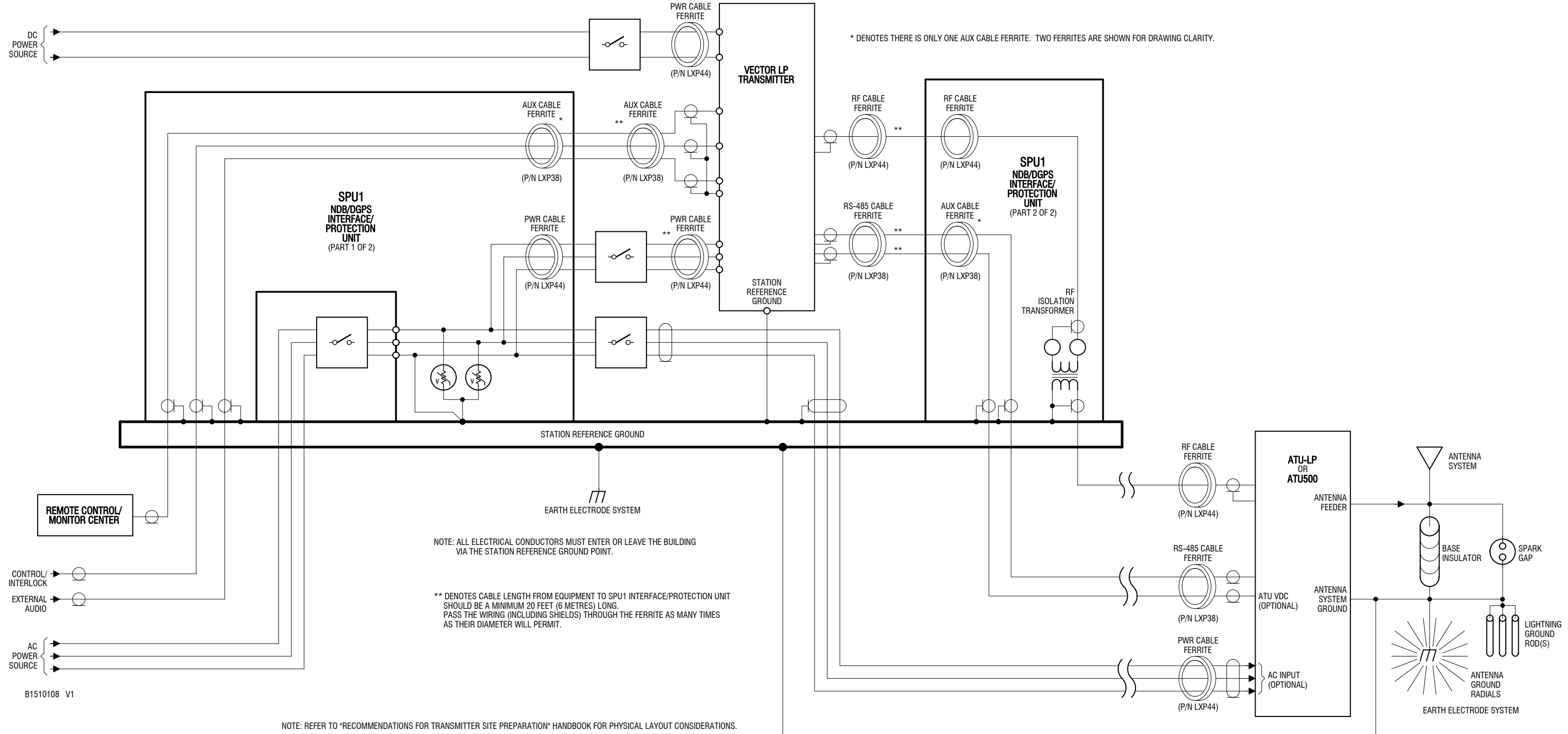
Ensure that all connectors on the back of the transmitter and the back of the front panel are securely fastened. If there are any loose connectors, ensure they are mated according to the connector's labeled tag.

- (a) Switch the ac power switch on the back of the transmitter to **ON**.
- (b) Verify that the GUI on the front panel is on and displays legible text.
- (c) Select local control by pressing the **Control – Local** button.
- (d) Confirm that the System Diagram's **Control - RF Off** and **Local** lamps are on. Confirm that the amber LEDs in the RF power modules are all flashing.
- (e) Set the **Requested Power Source** to **AC** (see 3.6.9).
- (f) Clear the **Events Log** (see 3.6.5).



- (g) For dual side transmitters only, ensure the transmitter's main side is set to **B** or and the monitor mode is set to **BYPASS** (see 3.6.4).
- (h) Reset the alarm status (see 3.6.3). The pre-existing alarms should clear.
- (i) There should be no alarms indicated on the System Diagram or GUI.
- (j) Connect the transmitter's RF output to a 50 Ω dummy load rated for twice the transmitter's maximum output power.
- (k) In the Test Standby Side menu (see 3.6.13.4), select **Run All Tests**. Each test should take about 20 s. **OK** should be displayed.
- (l) For dual side transmitters only, set the transmitter's operating side to **A** (see 3.6.4). For single side transmitters, skip to step (n).
- (m) For dual side transmitters only, in the Test Standby Side menu, select **Run All Tests**. Each test should take about 20 s. **OK** should be displayed.
- (n) Press **RF On** and set the power level to 0 W (simultaneously press the **Power - Increase** and **Decrease** buttons). Set modulation to 0% (off).
- (o) Set the analog meter to display reflected power on the 0 to 100 W scale (see 3.6.8.2).
- (p) In the Meters menu, use the **▲** or **▼** buttons to display the average PA volts for side A.
- (q) Slowly increase the RF output until the PA voltage is 65 V dc while ensuring the reflected power does not exceed the reflected power limit of 80 W. The output power from the A side RF power module should be 100 ± 20 W.
- (r) Increase the RF output to rated power. If a dual side system was not purchased, proceed to step (y).
- (s) Set power to 0 W. Press **RF Off**. Set the active side to B.
- (t) There should be no alarms indicated on the System Diagram or the GUI.
- (u) In the Meters menu, use the **▲** or **▼** buttons to display the average PA volts for side B.
- (v) Increase the RF output until the PA voltage is 65 V dc while ensuring the reflected power does not exceed the reflected power limit of 80 W. The output from the B side RF power module should be 100 ± 20 W.
- (w) Increase the RF output to rated power.
- (x) Set the active side to A. The transmitter should resume operating at full power.
- (y) If the dc power source option was not purchased, proceed to step (cc).
- (z) Apply dc power. In the GUI set the **Requested Power Source** to **BOTH** (see 3.6.9).
- (aa) Switch the ac power switch on the back of the transmitter to **OFF**. The transmitter should continue to run at full power on the dc source (battery).
- (bb) Switch the ac power switch on the back of the transmitter to **ON**. The transmitter should return to operating in ac mode.
- (cc) Complete the Standard Adjustments in Section 4 of this manual.
- (dd) Set the RF output power to 0 W. Press **Control - RF Off**.



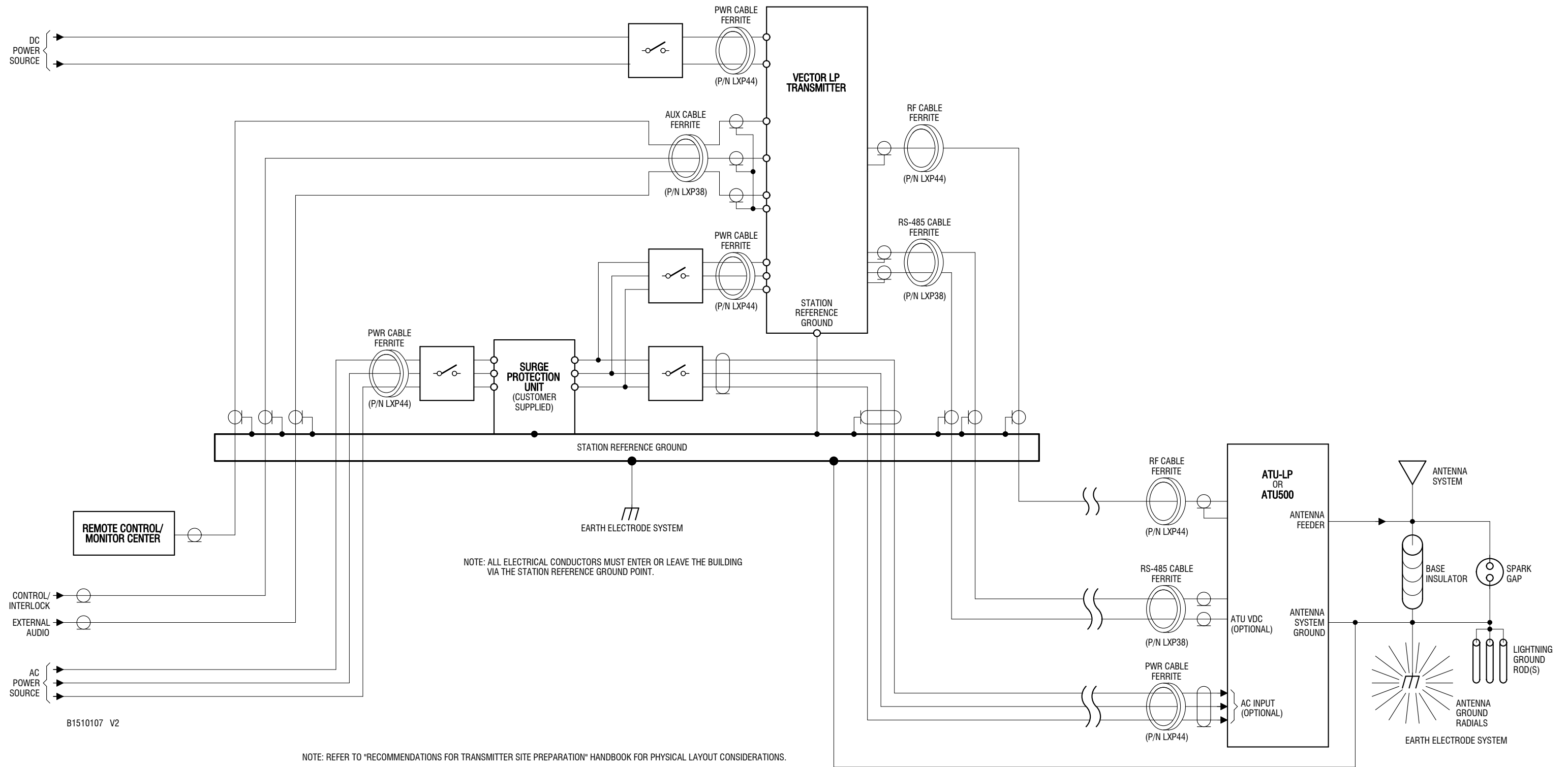


B1510108 V1

NOTE: REFER TO "RECOMMENDATIONS FOR TRANSMITTER SITE PREPARATION" HANDBOOK FOR PHYSICAL LAYOUT CONSIDERATIONS.

Dimensions = mm (inches)





Dimensions = mm (inches)

Block Diagram - Recommended Transmitter System Installation (without SPU1)



Vector-LP Radio Beacon Transmitter

TECHNICAL INSTRUCTION MANUAL

Section 3 OPERATING INSTRUCTIONS

3.1 INTRODUCTION

The following instructions are intended primarily for persons involved in testing or maintenance of the equipment.

3.1.1 Precautions

The Vector-LP transmitter contains many solid state devices that can be damaged if they are subjected to excessive heat or high voltage transients. Ensure the circuits are not overdriven and are not disconnected from their loads while turned on.

3.2 EMERGENCY SHUTDOWN

If an emergency shutdown is necessary, no special precautions are required. However, the type of shutdown is dictated by the reason for the shutdown. There are two types of shutdown. The first turns off the RF output by inhibiting the power stage. The second turns off the RF output and disables all of the internal power supplies by disconnecting the ac and dc power sources.

3.2.1 Turn Off RF Output

When the cause of the emergency shutdown is external to the transmitter or is in the RF output portion of the transmitter, the following will turn off the power produced by the RF power module:

WARNING

The following will not remove the ac or dc power source voltage from the transmitter or inhibit any of the internal low voltage dc supplies or the B+ power supply. If the reason for the shutdown requires all voltages be turned off, proceed directly to paragraph 3.2.2

- If in local or remote control, press the **RF Off** switch on the transmitter's front panel.
- If in remote control, select **RF Off** at the remote control site.
- Open any external interlock switch.

3.2.2 Complete Shutdown

When the cause of the emergency shutdown dictates the need for a complete shutdown of the transmitter, do the following:

- Switch the ac power switch on the back of the transmitter to **OFF**.
- If applicable, disconnect the dc power source (battery).

3.3 EXTERNAL SAFETY INTERLOCK

The external electrical interlock circuit is a protection circuit controlled by user determined, serially connected, normally open/held closed interlock switches. It inhibits the RF output when it is not safe to produce RF output.

When all of the external interlock switches are closed and it is safe to produce an RF output, the front panel's system diagram **External Alarm** lamp will be off. The operator will have full control of transmitter functions.

When any external interlock switch is open, the RF output stage will automatically turn off. The front panel's system diagram **External Alarm** lamp will turn on (alarm state). It is not possible to enable the RF power stages until all of the external interlock switches are closed.



3.4 ELECTROSTATIC DISCHARGE PROTECTION

The transmitter's assemblies contain semiconductor devices that are susceptible to damage from electrostatic discharge (ESD). Observe the following precautions when handling an assembly that contains these devices:

NOTE

Electrostatic energy is produced when two insulating materials are rubbed together. A person wearing rubber-soled shoes, walking across a nylon carpet or a waxed floor can generate an extremely large electrostatic charge. This effect is magnified during periods of low humidity.

This high voltage may damage semiconductor devices such as integrated circuits, field-effect transistors, thyristors and Schottky diodes unless adequate precautions are taken.

3.4.1 Discharging of Personnel
Maintainers must be electrically discharged by a suitable ground system (anti-static mats, grounding straps) when removing an assembly from the transmitter and while handling the assembly for maintenance procedures.

3.4.2 Handling/Storage
Place the assembly in an anti-static bag when it is not installed in a host transmitter or when it is not being subjected to maintenance procedures. Electronic components should be stored in anti-static materials.

3.4.3 Tools/Test Equipment
Testing and maintenance equipment, including soldering and unsoldering tools, should be suitable for contact with static sensitive semiconductor devices.

3.4.4 Stress Current Protection
Always ensure the static sensitive semiconductor devices are protected from unnecessary stress current. This is achieved by ensuring:

- Current is not flowing when an electrical connection is broken.
- Voltages are not present on external control/monitoring circuits when they are connected.

3.5 CONTROLS AND INDICATORS
Nautel recommends the operator/maintainer is familiar with the transmitter's controls and indicators before operating the transmitter and/or attempting to perform fault diagnostics. In most cases, controls and indicators are presented in an assembly-by assembly format. A mechanical drawing and an associated table are provided as aids to locating and understanding the assembly's controls and indicators.

NOTE

On some mechanical drawings, numbered callouts are provided to cross-reference the control/indicator to the description table.

*The names used in the **PANEL MARKING** column of the controls and indicators tables are intended to be the closest possible representation to the item's label/silkscreen.*



3.5.1 Front Panel

The front panel is the primary local user interface for the transmitter. Control and indicators are grouped into four sections of the panel (see Figure 3-1) as follows:

- **System Diagram** - a simple block diagram of the transmitter complete with alarm lamps. Refer to Figure 3-2 and Table 3-1 for a description of the controls and indicators.
- **Control** - push-button switches that allow convenient control of the transmitter's RF status (on or off and increase or decrease) and its operator control source (local or remote). The **RF Off** switch is functional regardless of local or remote selection. Refer to Figure 3-3 and Table 3-2 for a description of the controls and indicators.
- **Diagnostic Display** - a menu-driven user interface screen - with five associated push-buttons - which allows control and monitoring of the transmitter's critical parameters and modes of operation. Refer to paragraph 3.6 for a full description of the diagnostic display.
- **Analog Meter** - the front panel meter displays a user selected analog sample on a user selected scale. Scale selection and meter enabling is done using the diagnostic display (refer to paragraph 3.6.8).

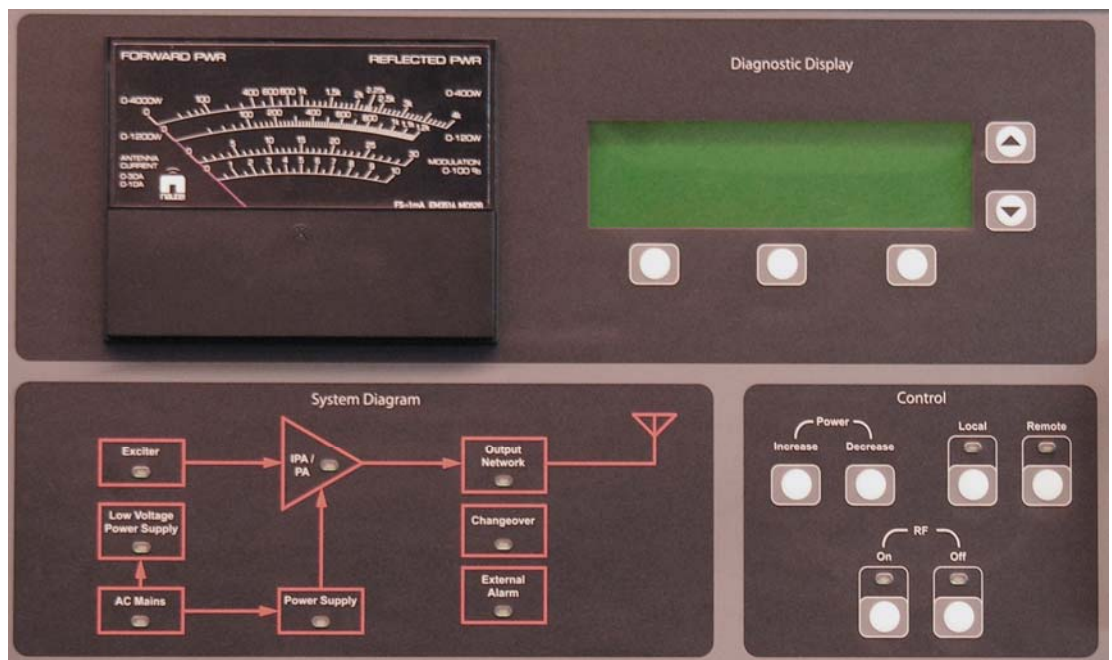


Figure 3-1 Vector Transmitter Front Panel (Primary User Interface)



3.5.2 Exciter Interface PWB Controls and Indicators

Figure 3-4 and Table 3-3 identify and describe the controls and indicators on the exciter interface PWB (A2).

3.5.3 Remote Interface PWB Controls and Indicators

Figure 3-5 and Table 3-4 identify and describe the controls and indicators on the remote interface PWB (A3).

3.5.4 RF Synthesizer PWB Controls and Indicators

Figure 3-6 and Table 3-5 identify and describe the controls and indicators on the RF synthesizer PWBs (A5 and, if installed, A8).

3.5.5 Miscellaneous Control and Exciter Controls and Indicators

Table 3-6 describes the miscellaneous controls and indicators of the control/display PWB and exciter assemblies that were not covered in previous paragraphs. Refer to the mechanical drawings section to locate a referenced item.

3.5.6 Miscellaneous RF Power Stage Controls and Indicators

Table 3-7 describes the miscellaneous controls and indicators of the RF power modules (A12 and, if installed, A13). Refer to the mechanical drawings section to locate a referenced item.

3.5.7 Battery Boost PWB Controls and Indicators

Figure 3-7 and Table 3-8 identify and describe the controls on the optional battery boost PWB (A16A1).

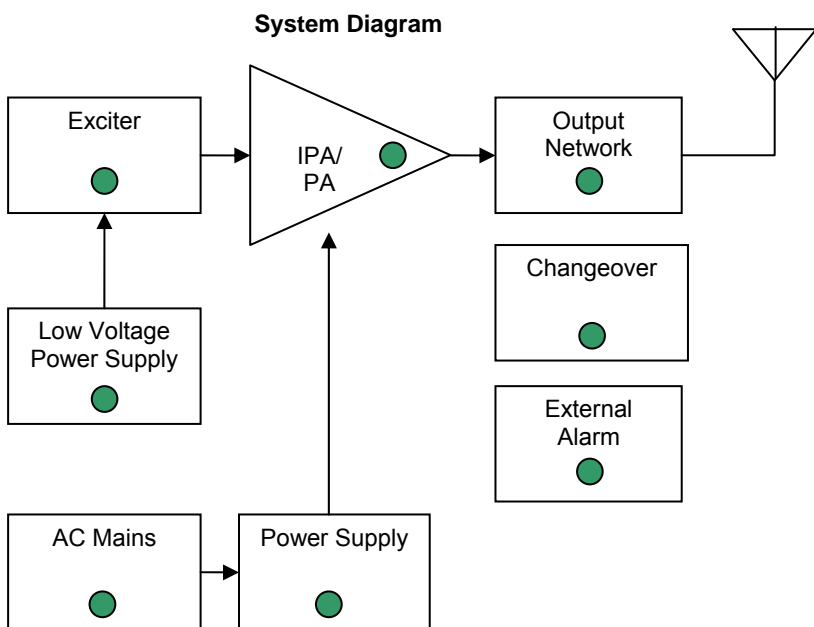


Figure 3-2 Vector-LP Transmitter Front Panel - System Diagram Section



Table 3-1: Front Panel - System Diagram Controls and Indicators

PANEL MARKING	DESCRIPTION
Exciter	When turned on (red), typically indicates a failure has occurred in the active exciter (side A or B). This alarm will initiate a changeover in dual transmitters; the side of the transmitter designated as standby will be operating as the active side.
Low Voltage Power Supply	When turned on (red), indicates a failure has occurred in one of the LVPS modules (U2 or, if installed, U3).
AC Mains	When turned on (red), indicates the ac voltage applied to the transmitter has fallen below an acceptable level. If the battery backup option is installed, the power source switches to battery mode. If no battery is available, the transmitter's RF output is inhibited.
Power Supply	When turned on (red), indicates a fault has occurred in one or more of the switching power supplies that supply the RF power modules. This alarm will initiate a changeover in dual transmitters; the side of the transmitter designated as standby will be operating as the active side.
External Alarm	When turned on (red), indicates the external interlock circuit is not presenting a closed circuit (inhibiting RF power) OR the ATU (optional) or site interface PWB (optional) are not responding OR the battery voltage is below the user established threshold.
Changeover	When turned on (red), indicates a changeover to the standby side has been enabled due to a fault in the main side.
IPA/PA	When turned on (red), indicates a fault has occurred in one of the RF power modules (A12 or, if installed, A13). This alarm will initiate a changeover in dual transmitters; the side of the transmitter designated as standby will be operating as the active side.
Output Network	When turned on (red), indicates the transmitter's RF power is being cut back or shut back due to an impedance mismatch (high VSWR) at the transmitter's output.

NOTE

*In each case, root-cause details of the fault are displayed in the diagnostic display's **Events Logs** (see paragraph 3.6.5)*



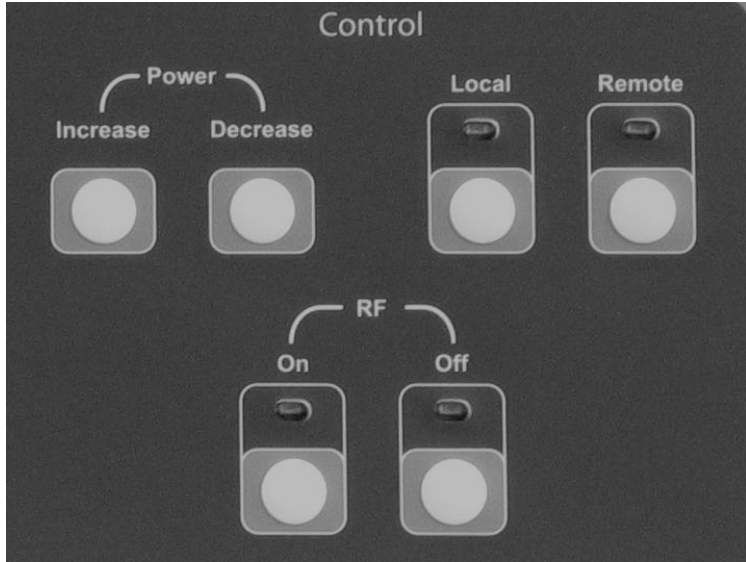


Figure 3-3 Vector-LP Transmitter Front Panel – Control Section



Table 3-2: Front Panel - Control Section Controls and Indicators

PANEL MARKING	DESCRIPTION
Power Increase	Pushbutton switch that increases the RF output power level of the transmitter. RF power is increased from minimum power to maximum power in approximately 200 steps. Each step will increase the output voltage of the switch mode power supplies to the RF power modules linearly – the RF output power increase will follow a square law. Pressing and holding the switch increases the rate of change.
Power Decrease	Pushbutton switch that decreases the RF output power level of the transmitter. RF power is decreased from maximum power to minimum power in approximately 200 steps. Each step will decrease the output voltage of the switch mode power supplies to the RF power modules linearly – the RF output power decrease will follow a square law. Pressing and holding the switch increases the rate of change.
Local	<p>Pushbutton switch that sets control of transmitter functions to switches on the front panel. When its integral lamp is on (amber) (by pressing the switch), Local control has been selected.</p> <p>When Local control is selected, all of the remote control circuits (except the external interlock and RF off function) are disabled.</p>
Remote	<p>Pushbutton switch that sets control of transmitter functions to remote control circuits. When its integral lamp is on (amber) (by pressing the switch), Remote control has been selected.</p> <p>When Remote control is selected, all pushbutton switches on the exciter's front panel that execute control functions, except the RF Off switch, are disabled and have no influence. The RF Off switch is still enabled to ensure the RF power stage can be turned off locally in the event of an emergency.</p>
RF On	Push button switch that turns on the transmitter's RF power stage and, for VR250 transmitters, its cooling fans when it is pressed. Its integral lamp will be on when the RF power stage is turned on. Transmitter will operate at the level stored in the selected power pre-set.
RF Off	Push button switch that turns off the transmitter's RF power stage when it is pressed. Its integral lamp will be on when the RF power stage is turned off.



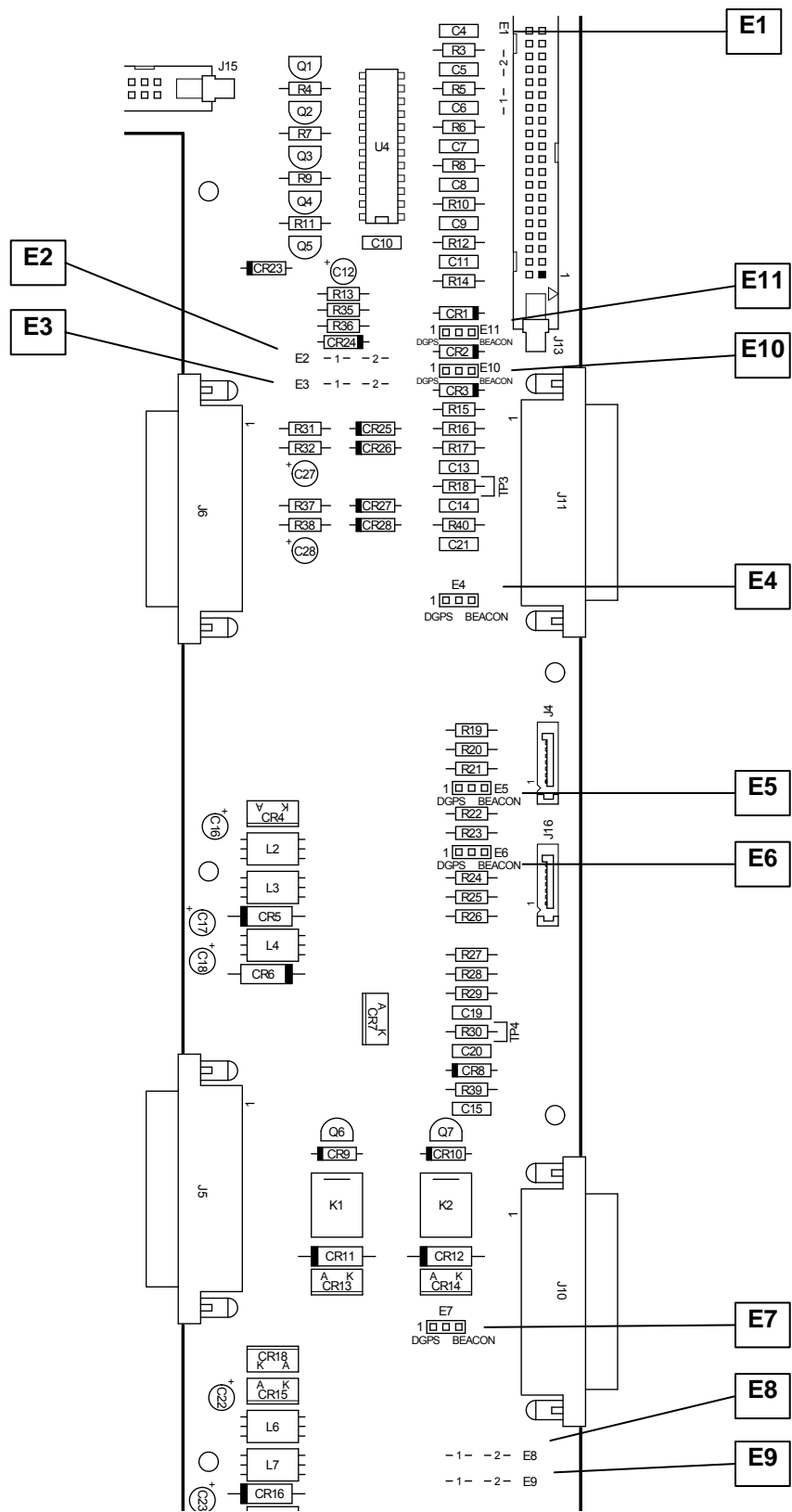


Figure 3-4 Part of NAPI76A/02 Exciter Interface PWB A2



Table 3-3: Exciter Interface PWB Controls and Indicators

REF DES	PANEL MARKING	DESCRIPTION
E1, E2, E3, E8, E9	Key CW Jumpers	Shorting jumpers that are installed in positions determined by the type of transmitter. In NDB transmitters, the jumpers are factory installed in position 1. No user adjustment is required.
E4, E5, E6, E7, E10, E11	DGPS/BEACON Jumpers	Bi-position selection jumpers that are installed in positions determined by the type of transmitter. In NDB transmitters, the jumpers are factory installed to short pins 2 and 3. No user adjustment is required.



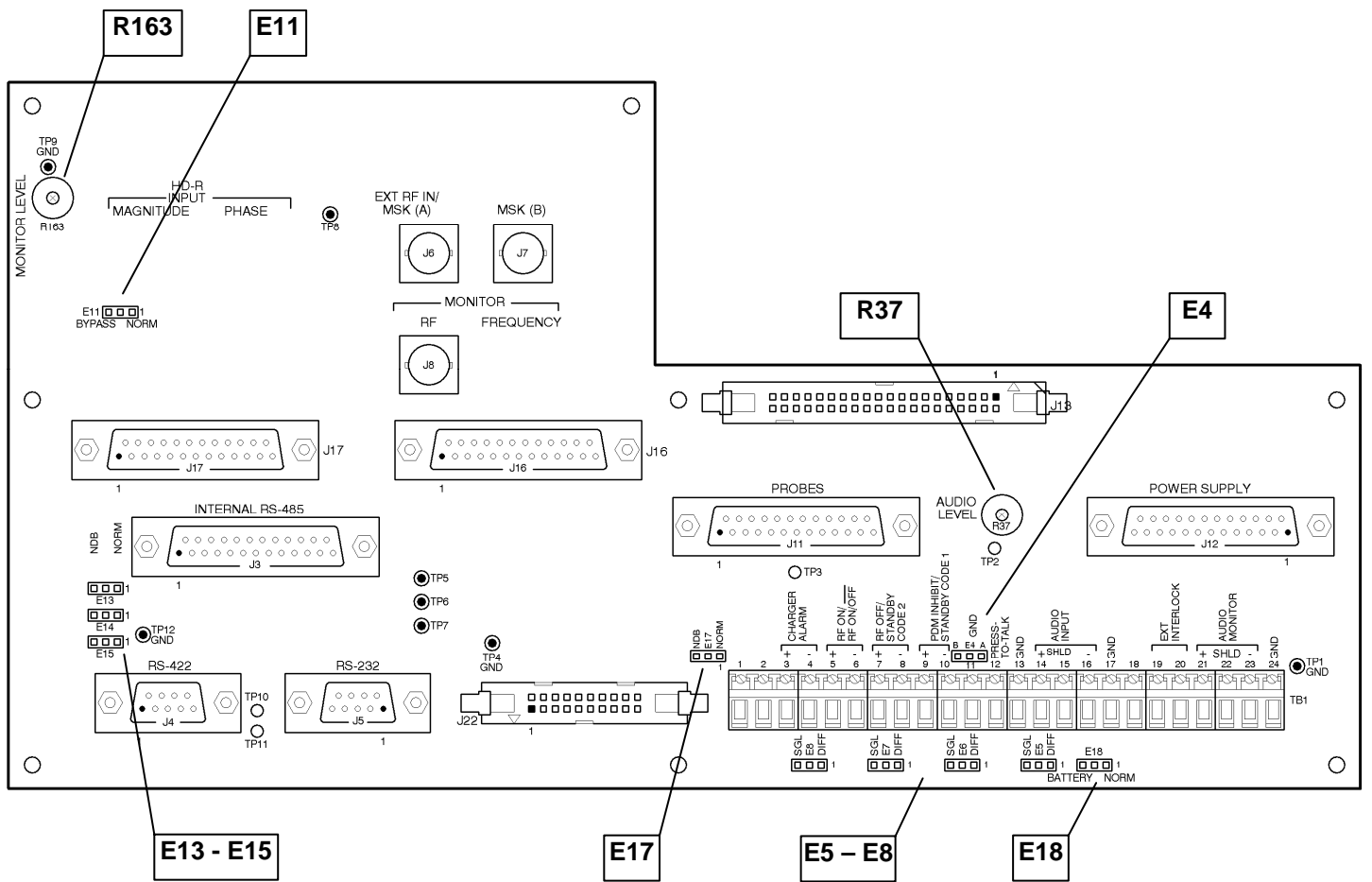


Figure 3-5 Part of NAPI78D/02 Remote Interface PWB A3



Table 3-4: Remote Interface PWB Controls and Indicators

REF DES	PANEL MARKING	DESCRIPTION
E4	Press-To-Talk/Phantom Feed	Bi-position selection jumper that is installed based on the type of mode to enable voice operation. The jumper is factory installed for 'press-to-talk' mode, position A (shorting pins 1 and 2). For 'phantom feed' mode, install the jumper in position B (shorting pins 2 and 3). In 'press-to-talk' mode a ground is applied to TB1-12 to enable voice. In 'phantom feed' mode, -15 V is applied to the shield of the audio to enable voice.
E5 – E8	Single/Differential	Bi-position selection jumpers that configure the remote interface PWB to accept either single-ended or differential remote control inputs. <ul style="list-style-type: none"> • A differential input is selected when the jumper shorts pins 1 and 2 of its associated 3-pin header. • A single-ended input is selected when the jumper shorts pins 2 and 3 of its associated 3-pin header.
E11	NORMAL/BYPASS	Factory default is shorting pins 1 and 2. No user adjustment is required.
E13 – E15 E17	NORM/NDB	Bi-position selection jumpers that are installed in positions determined by the type of transmitter. In NDB transmitters, the jumpers are factory installed in the NDB position (shorting pins 2 and 3). No user adjustment is required.
E18	NORM/BATTERY	Bi-position selection jumper that should always be installed in the NORM position (shorting pins 1 and 2).
R37	AUDIO LEVEL	Adjusted for 100% modulation when the modulating audio is between -20 dBm and +10 dBm and its amplitude is the level that is expected to produce 100% modulation.
R163	MONITOR LEVEL	Adjusted to set the level of the RF MONITOR output, which is a sample of the RF output. This output is located on BNC connector J8 on the remote interface PWB).



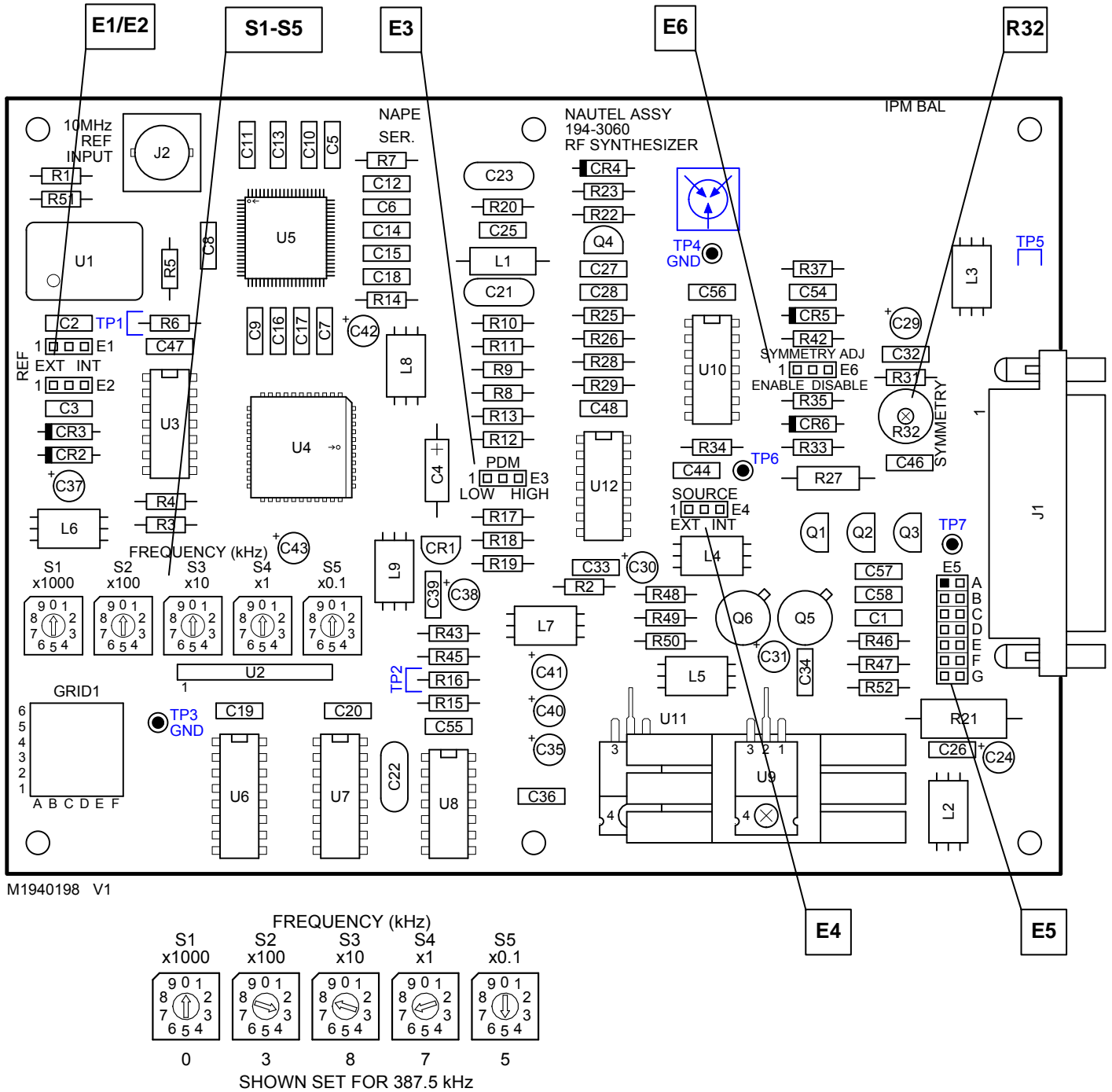


Figure 3-6 Assembly Detail - NAPE70C/01 RF Synthesizer PWB A5 and A8



Table 3-5: RF Synthesizer PWB Controls and Indicators

ITEM (Ref)	PANEL MARKING	DESCRIPTION
E1, E2	REF (10 MHz)	Bi-position selection jumpers used to configure the RF synthesizer PWB to use either an internal or external 10 MHz reference generator. Jumpers are always set to INT (internal, shorting pins 2 and 3) for Vector-LP transmitters.
E3	PDM High/Low	Bi-position selection jumper used to configure the RF synthesizer PWB for high PDM (nominal 130 kHz) or low PDM (nominal 65 kHz). Always set to HIGH PDM (shorting pins 2 and 3) for Vector-LP transmitters.
E4	RF Drive Source	Bi-position selection jumper used to configure the RF synthesizer PWB to use either the output of an integral crystal controlled oscillator or an external RF generator as the RF drive source. Always set for INT (internal <i>f_c</i> , shorting pins 2 and 3) for Vector-LP transmitters.
E5	Drive Matching	Seven selection jumper (A-G) used to configure the RF drive circuit for its host transmitter. The jumper is installed in the D position (shorting pins 7 and 8) for Vector-LP transmitters.
E6	Symmetry Adjust Enable/Disable	Bi-position selection jumper used to enable or disable the RF drive symmetry adjustment circuitry. Always set to ENABLE (E6 installed between pins 1 and 2 of its 3-pin header) for Vector-LP transmitters.
R32	RF DRIVE SYMMETRY	Adjusted to obtain an RF oscillator drive waveform that is a symmetrical square wave.
R41	IPM BAL	Not applicable to Vector-LP transmitters.
S1-S5	X1000 X100 X10 X1 X0.1	Adjusts the carrier frequency in 1000 kHz steps. Adjusts the carrier frequency in 100 kHz steps. Adjusts the carrier frequency in 10 kHz steps. Adjusts the carrier frequency in 1000 Hz steps. Adjusts the carrier frequency in 100 Hz steps.
S6:1/2/3	Correction Selection	Not applicable to Vector-LP transmitters.
S6:4	Enable/Disable	Always closed for Vector-LP transmitters.



Table 3-6: Miscellaneous Control and Exciter Controls and Indicators

REF DES	PANEL MARKING	DESCRIPTION
A1E1 A1E2	A/B	No user adjustment should be required. Always installed in position B .
A1E3	A/B	No user adjustment required. A link is soldered between pins 1 and 3 for Vector-LP transmitters.
A1LS1	SPEAKER	Provides an audible signal for local monitoring of the demodulated keyed tone (identification code).
A6E1 or A9E1	A/B	No user adjustment should be required. Always installed in position A .
A6R31 or A9R31	GAIN TRIM	Adjusted, when interphase PDM driver PWB is enabled (the associated exciter is the active exciter). Compensates for tolerance differences between side 'A' and side 'B' in dual side transmitters. One or both must be adjusted to set the PDM pulse train to produce identical RF output levels when either side is selected (see 4.3.6.10).
A6R59 or A9R59	DUMP	Not applicable to Vector-LP transmitters.
A7E1 A7E3 or A10E1 A10E3	A/B	No user adjustment should be required. Always installed in position B .
A7E2 or A10E2	KEYED CW/ NORMAL	Bi-position selection jumpers that are installed in positions determined by the type of transmitter. In Vector-LP transmitters, the jumpers are factory installed in the NORMAL position (shorting pins 2 and 3). No user adjustment is required.

NOTE: Prefix all items with A2 to obtain complete reference designation.



Table 3-7: Miscellaneous RF Power Stage Controls and Indicators

REF DES	PANEL MARKING	DESCRIPTION
A12A1DS1 or A13A1DS1	MODULE INSTALLED	When turned on (amber), indicates that RF power module A or B is installed in the transmitter.
A12A1DS2 or A13A1DS2	MODULE ON	When turned on (green), indicates that RF power module A or B is on and is contributing to the transmitter's RF output.
A12A1DS3 or A13A1DS3	MODULE FAULT	When turned on (red), indicates that a fault has occurred in RF power module A or B and it is not contributing to the transmitter's RF output.
A12A2DS1 or A13A2DS1	AC IND	When turned on (amber), indicates the ac input voltage is being applied to RF power module A or B.
A12A2DS2 or A13A2DS2	+18V	When turned on (green), indicates the +24 V power supply voltage is being applied to RF power module A or B and that the +18 V regulator is functioning.
A12A3F1 or A13A3F1	+15V	Fuses the +15 V applied from the power module control/ interface PWB to the power amplifier at 1 A.
A12A5DS1 or A13A5DS1	B+ ON	When turned on (green), indicates that the B+ voltage is being applied from the switch mode power supply PWB (or optional battery) to the modulator.
A14E1 through A14E36	RF Filter Jumpers	Frequency dependent jumpers that are factory installed for the customer operating frequency. If a frequency change is required, change the position of these jumpers (see Figure MD-16 A or MD-16B).



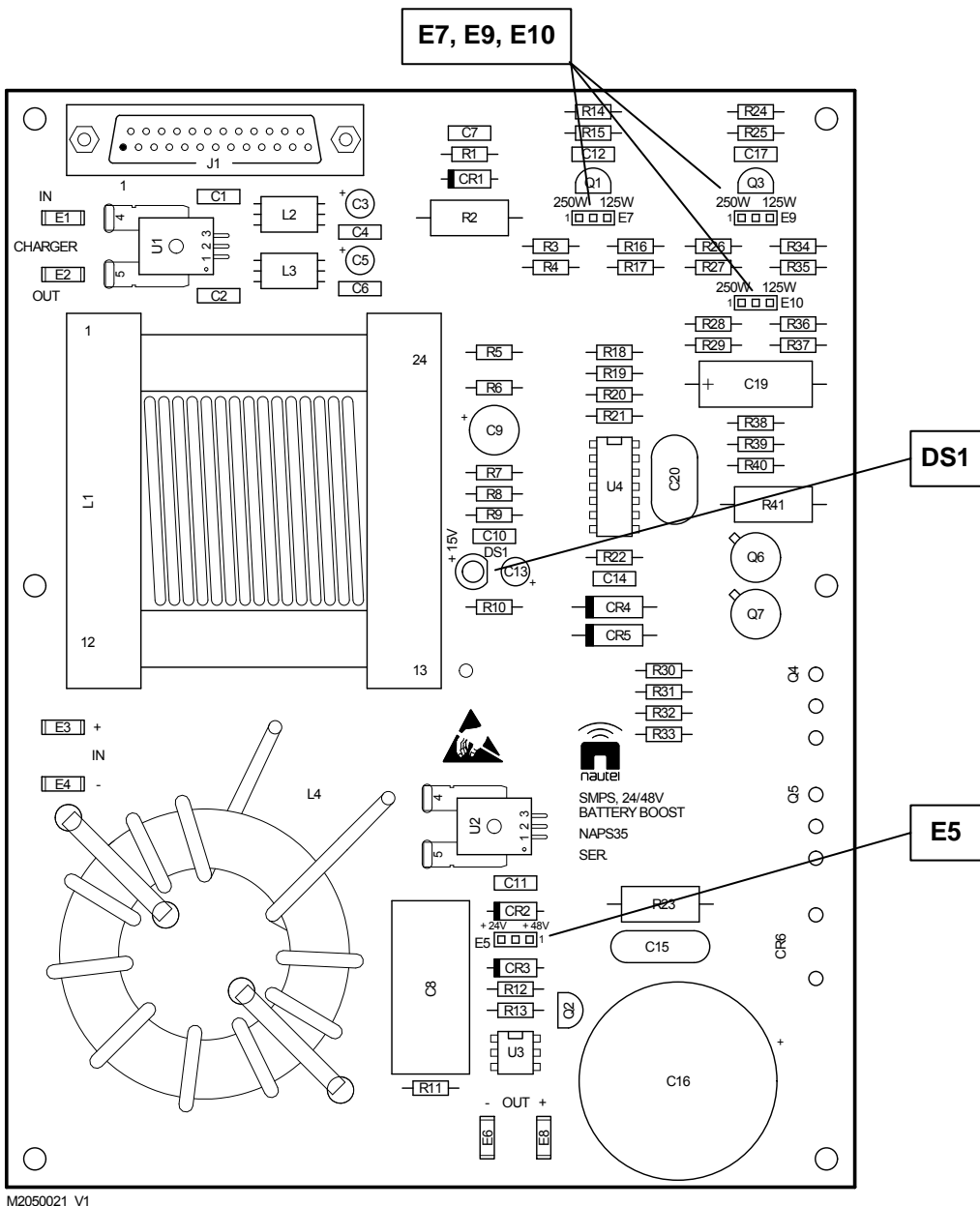


Figure 3-7 NAPS35 Battery Boost PWB A16A1 (Optional)



Table 3-8: Battery Boost PWB Controls and Indicators

REF DES	PANEL MARKING	DESCRIPTION
A16A1DS1	+15V	When turned on (green), indicates the +15 V power supply voltage is being applied to the battery boost PWB and its switch mode PWM IC U4.
A16A1E5	+24V/+48V	Bi-position selection jumper that is installed in the position determined by the backup battery voltage. The jumper is installed in the +48V position (shorting pins 1 and 2) if a 48 V battery is used. The jumper is installed in the +24V position (shorting pins 2 and 3) if a 24 V battery is used.
A16A1E7 A16A1E9 A16A1E10	250W/125W	Bi-position selection jumpers that are installed in positions determined by the rated power level of the transmitter. The jumper is installed in the 250W position (shorting pins 1 and 2) for a VR250. The jumper is installed in the 125W position (shorting pins 2 and 3) for a VR125.



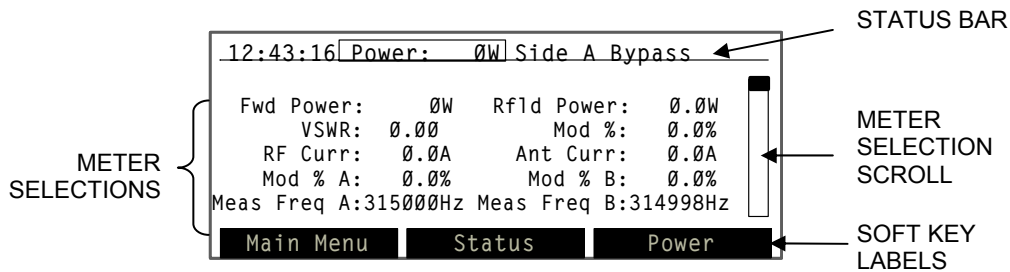


Figure 3-8 Diagnostic Display – Meters Screen

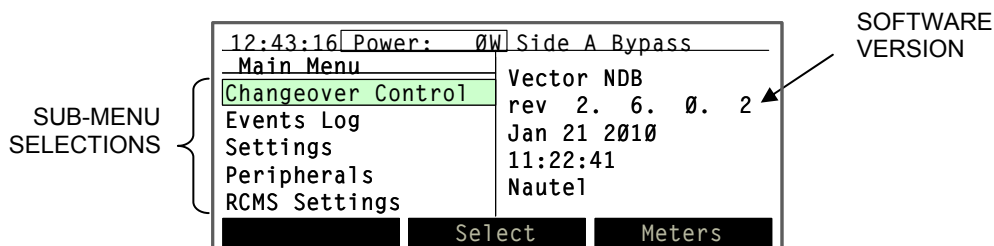


Figure 3-9 Diagnostic Display – Main Menu

3.6 DIAGNOSTIC DISPLAY

The diagnostic display (see Figure 3-9), in the centre of the transmitter’s front panel, is a 240 x 64 graphic LCD display and is the primary local user interface for the transmitter. With the exception of RF on/off, power increase/decrease and local/remote control, all transmitter functions can be controlled and indicated by this display. All critical parameters and events are monitored from this display. The following paragraphs describe how to use the diagnostic display.

3.6.1 Pushbutton Switches

Navigating the diagnostic display is done using the five pushbutton switches adjacent the display. The up (▲) and down (▼) pushbuttons, to the right of the display, are used to move up and down through displayed selections and to increase or decrease the value of a selected parameter. Pressing and holding the ▲ or ▼ pushbutton will increase the rate of change, where applicable. There are also three ● soft-key pushbuttons whose functions are defined by the text displayed directly above them for a given menu.

3.6.2 Main Screens

The high level screens of the diagnostic display (Figures 3-8 and 3-9) display:

- Transmitter status bar
- Three user-definable meter selections
- Meter selection scroll (controlled by ▲ and ▼ pushbuttons)
- Sub-menu selections
- Software version

3.6.2.1 Transmitter Status Bar

The transmitter status bar is the information displayed along the top of the diagnostic display. This information is present at all times and indicates the following (from left to right):

- Current time (24-hour clock)
- Current output power
- Active side (A or B)
- Monitor mode (blank for normal or Bypass) – bypass indicates that automatic changeover is inhibited.

For quick reference, locate the desired function in the flow diagram depicted in Figure 3-10, then refer to the referenced paragraph for further information.



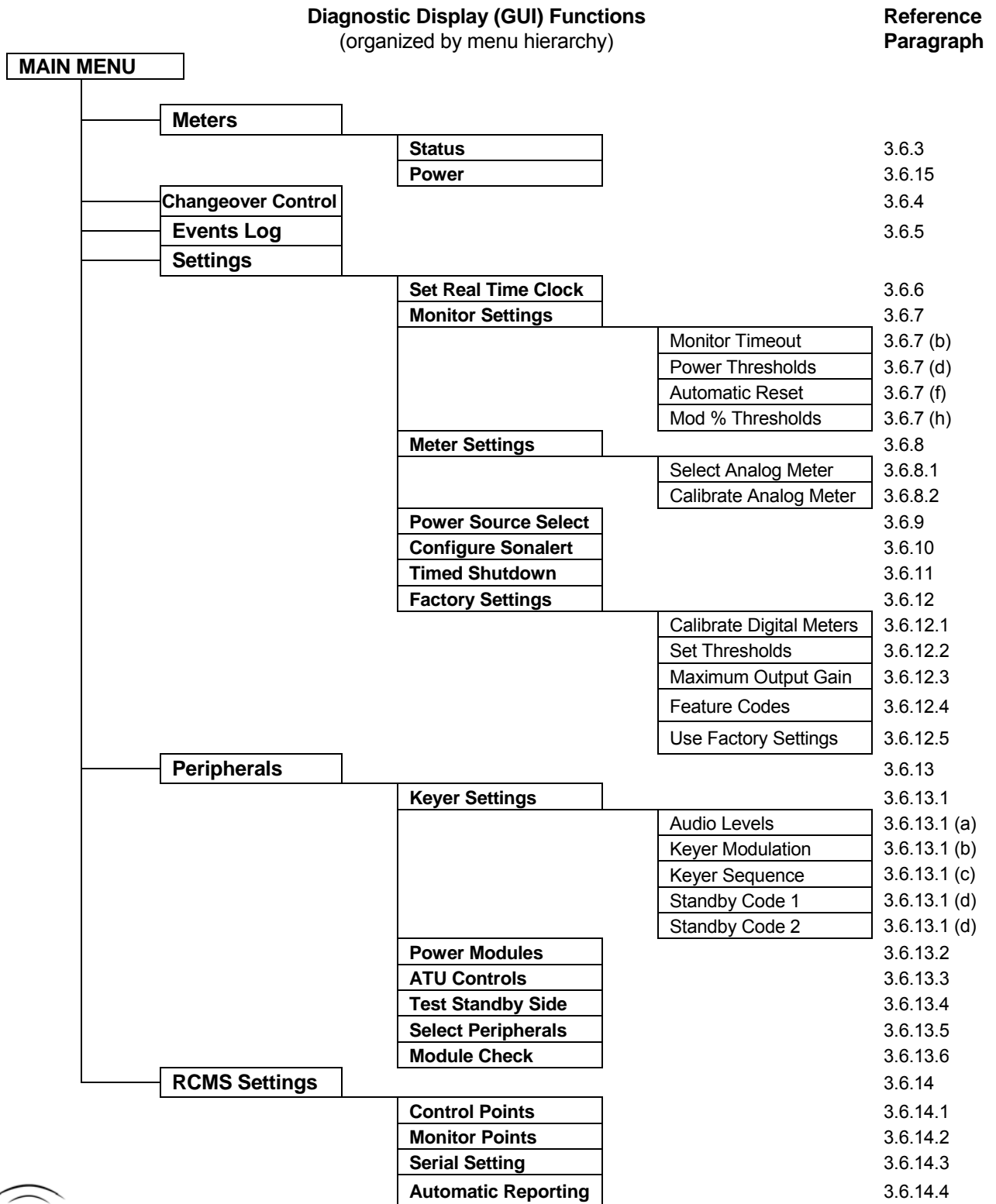
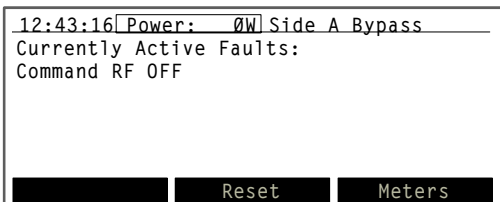
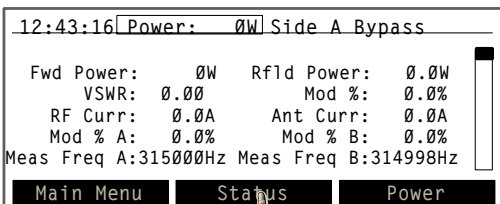


Figure 3-10 – Flow Diagram - Diagnostic Display Functions

3.6.3 Viewing Faults

In addition to the system diagram's fault indicators, a list of current faults can be viewed on the diagnostic display. View the list of faults as follows:



- (a) From the meter screen, press **Status**. A list of current faults is displayed. If **Status** is not displayed.

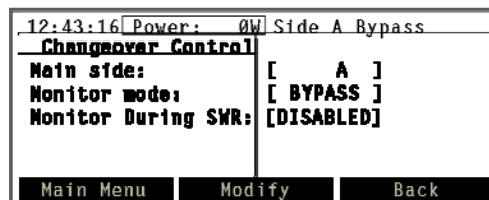
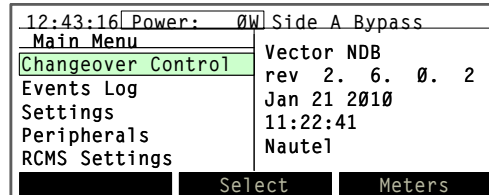
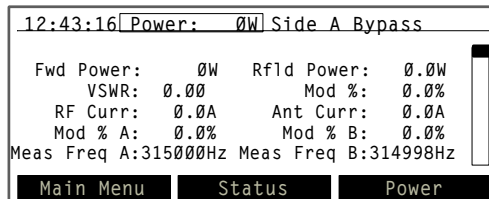
NOTE

Use the **Events Log** (see paragraph 3.6.5) to view alarm history.

- (b) If necessary, press ▲ or ▼ to scroll through the faults.
- (c) Press **Reset** to attempt to clear the alarm.
- (d) Press **Meters** to return to the meters screen.

3.6.4 Changeover Control

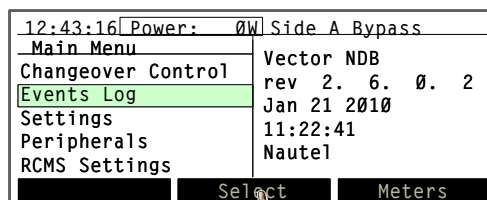
The transmitter may optionally contain two fully redundant exciter and RF power paths (sides A and B). The active side and the monitor mode can be controlled using the diagnostic display. View and, if necessary, edit the changeover control settings as follows:

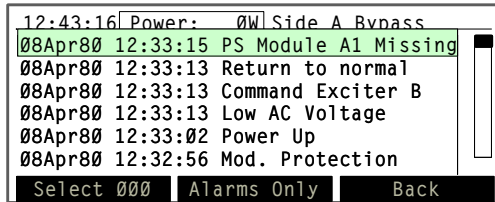


- (a) Set the main side to either **A** or **B**.
- (b) Set the monitor mode to either **BYPASS** or **NORMAL**. Bypass mode inhibits automatic changeover from the main side to the standby side.
- (c) Set Monitor During SWR to **ENABLED** to allow the transmitter to change over during an SWR alarm. Monitor mode must be set to **NORMAL**.

3.6.5 Viewing Events Log

The most recent 256 transmitter events (alarms, operational changes, etc.) are stored in memory. View the events log as follows:





- (a) From the main menu, highlight **Events Log** (using ▲ and ▼) and press **Select**. The center soft-key permits viewing the **Events Log** in two different modes – **All Events** or **Alarms Only**. For either mode, a list of events is displayed, sorted chronologically, with a root-cause description of the event.

NOTE

Refer to Table 3-9 for a list of non-alarm events that can be displayed on the **Events Log** and a brief description of each. A list of alarm events is available in Table 5-1.

- (b) Press ▲ or ▼ to scroll through the events.
- (d) Press **Select ###** on a highlighted event to display the transmitter status when the highlighted event occurred. Use the **Next event** button to check the status of subsequent numbered events.

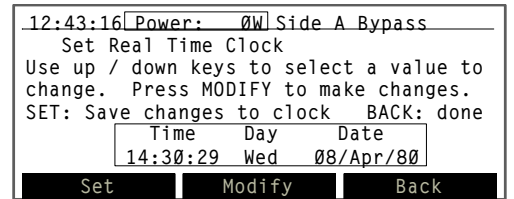
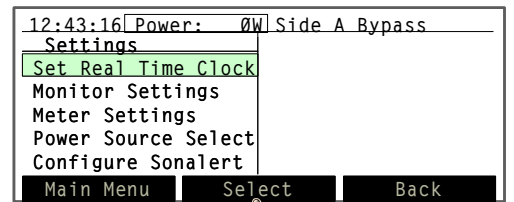
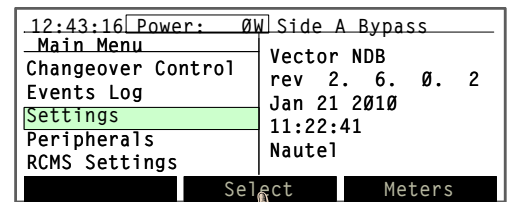
NOTE

The 3-digit number shown in the **Select ###** display is the number allocated to the highlighted event. Event **000** is the most recent occurrence.

- (e) To clear the history stored in the events log, press the ▲ and ▼ buttons simultaneously.
- (f) Press **Back** to return to the main menu.

3.6.6 Setting Real Time Clock

Set the real-time clock as follows:



NOTE

The real-time clock does not automatically update for Daylight Savings Time (DST).

Table 3-9: Events Log Displays – Non-Alarm Events

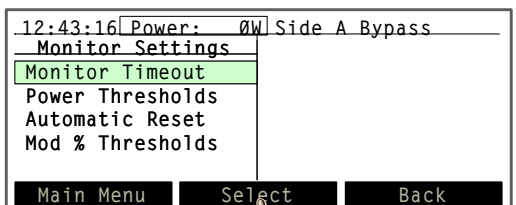
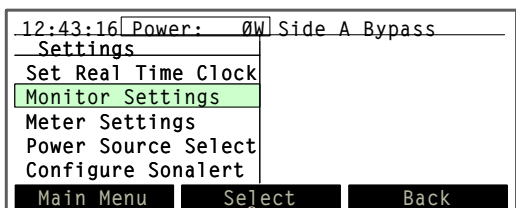
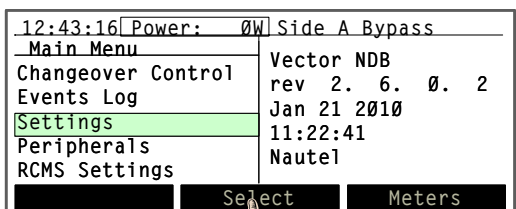
NON-ALARM EVENTS (as displayed)	DESCRIPTION
Return to normal	Transmitter alarms have cleared.
Power up	Transmitter has completed power up.



3.6.7 Setting RF Monitor Limits
 High and low power thresholds, low modulation threshold and loss of keying can be set to ensure the transmitter is operating within acceptable limits. If the RF carrier is outside these limits for a pre-defined delay period, the transmitter initiates a changeover to the standby side (in normal operation) or continues to operate (in bypass mode). Set the transmitter's RF monitor limits as follows:

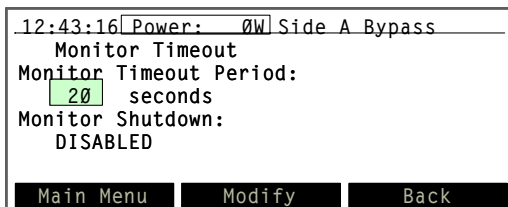
NOTE

International Civil Aviation Organization (ICAO) standards dictate the transmitter be turned off or a warning alarm be generated when the RF output decreases by 3.0 dB or increases by 2.0 dB from the intended carrier level. The user can alter the monitor settings provided these criteria are still met.



(a) From the main menu, highlight **Settings** and press **Select**. Highlight **Monitor Settings** and press **Select**.

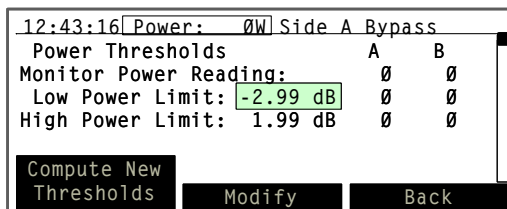
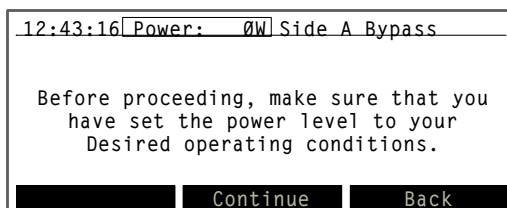
(b) Highlight **Monitor Timeout** and press **Select**. See step (d) for **Power Thresholds**.



(c) Use **▲** and **▼** to highlight the desired monitor timeout field and press **Modify**:

- The monitor timeout period can be set (using **▲** and **▼**) between 4 and 82 s (factory set for 20 s).
- The monitor shutdown can be set (using **▲** and **▼**) for **ENABLED** or **DISABLED**.

(d) Press **Back**, highlight **Power Thresholds** and press **Select**. The following message is displayed. Press **Continue** to proceed.



NOTE

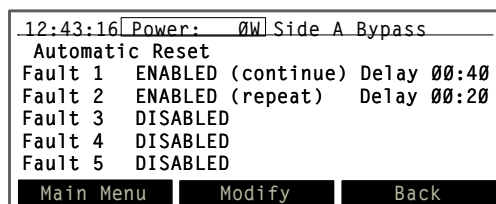
As the warning message indicates, ensure that the transmitter is operating at the desired power level before computing the new thresholds. If the power level of the transmitter changes after computing the thresholds, re-establish the thresholds.



(e) Use ▲ and ▼ to highlight the desired monitor timeout field and press **Modify**:

- The low limit is factory set for 3.00 dB. Adjust using ▲ and ▼.
- The high limit is factory set for 2.00 dB. Adjust using ▲ and ▼.

(f) Press **Back**, highlight **Automatic Reset** and press **Select**.



(g) Use ▲ and ▼ to highlight the desired **Fault 1 -5** field and press **Modify**. Set the Automatic Reset schedule as follows:

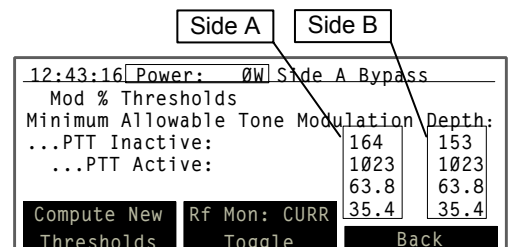
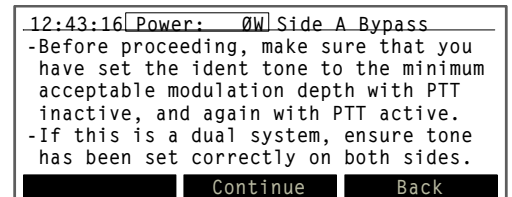
NOTE

The Automatic Reset allows the user to define a reset schedule for the transmitter after a shutdown condition. The schedule can have up to five sequential levels, each with their own user definable delay period (up to 24 hours) and subsequent instruction.

- **ENABLED (continue)**: attempts a reset the denoted delay time after a shutdown and then, if no reset occurs, continues to the next item in the Fault schedule.
- **ENABLED (repeat)**: attempt a reset the denoted delay time after a shutdown and continues attempting (as necessary) after each delay time. All subsequent items in the Fault schedule default to **DISABLED**.
- **ENABLED (halt)**: attempts a reset the denoted delay time after a shutdown and then, if no reset occurs, stops attempting. All subsequent items in the Fault schedule default to **DISABLED**.
- **DISABLED**: no attempt to reset.

- Waits the Fault 1 delay period (40 min)
- Attempts to reset transmitter. If successful, Automatic Reset schedule will begin on Fault 1 next shutdown. If unsuccessful, reset sequence continues to Fault 2 item.
- Waits the Fault 2 delay period (20 min)
- Attempts to reset transmitter. If successful, Automatic Reset schedule will begin on Fault 1 next shutdown. If unsuccessful, repeats Fault 2 item.

(h) Press **Back**, highlight **Mod% Thresholds** and press **Select**. The following message is displayed. Press **Continue** to proceed.



NOTE

As the warning message indicates, ensure that the transmitter is operating at the minimum allowable modulation depth before computing the thresholds. If the transmitter is to operate in both PTT and Normal modes, set up both thresholds, otherwise, set up only the applicable threshold.

- (i) The screen shows the minimum allowable modulation for **PTT Inactive** (no voice) and **PTT Active** (voice).
- The left column has side A values and the right column has side B values.

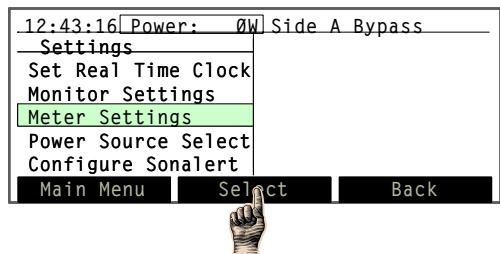
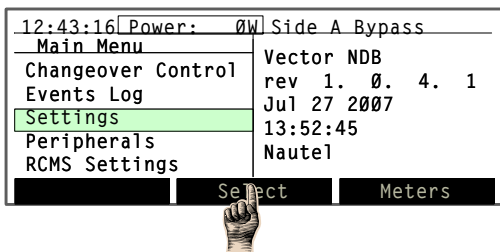


- The first two values in each column are internal tone generator reference values.
 - The third and fourth values are the modulation depth (in %) for PTT Inactive and PTT Active respectively.
 - Press **Toggle** to switch between **RF Mon: CURR** and **Rf Mon: VOLT**, if desired.
- (j) Press **Compute New Thresholds** to establish new monitor modulation % thresholds.
- (k) If a modification is made, a screen appears which prompts you to save changes to EEPROM. Select **Yes** or **No**.

3.6.8 Meter Settings

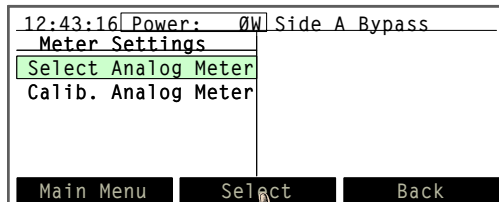
Determine the parameter to be displayed on the front panel analog meter as follows:

- (a) From the main menu, highlight **Settings** (using **▲** and **▼**) and press **Select**. Highlight **Meter Settings** and press **Select**. Use **▲** and **▼** to highlight **Select Analog Meter** or **Calib. Analog Meter** and press **Select**. Refer to the appropriate paragraph (3.6.8.1 or 3.6.8.2 for further details).

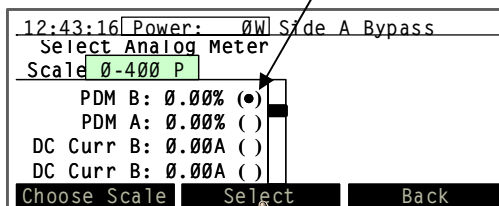


3.6.8.1 Selecting Analog Meter

Select the parameter to be displayed on the front panel analog meter as follows:



Selected Parameter

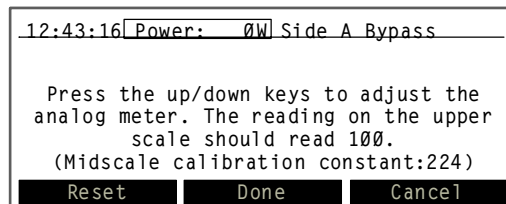
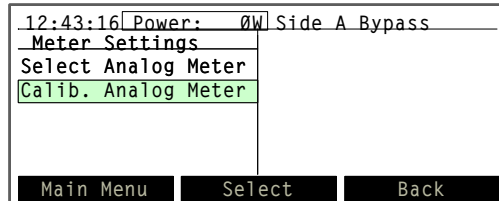


- (a) Use **▲** or **▼** to select the desired meter parameter and press **Select**. Press **Choose Scale** to select from various scale options to view the parameter on the front panel analog meter. Note that scales with a **P** suffix are power (square law) scales whereas scales with an **L** suffix are linear scales.
- (b) Press **Back** to return to the Meter Settings screen. A message appears to confirm saving changes to the EEPROM. Press **Yes** or **No**.



3.6.8.2 Calibrating Analog Meter

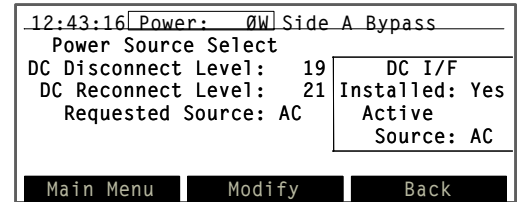
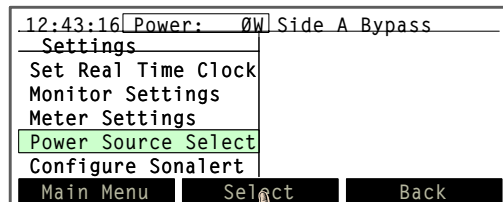
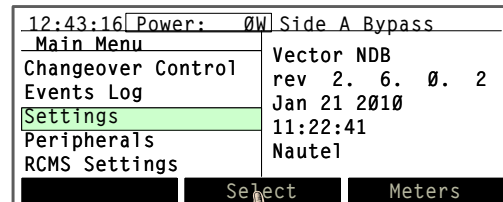
Calibrate the analog meter as follows:



- (a) When the analog meter is calibrated, press **Done**.

3.6.9 Selecting Power Source

Select the transmitter's power source and view power source related parameters as follows:



- (a) From the main menu, highlight **Settings** (using **▲** and **▼**) and press **Select**. Highlight **Power Source Select** and press **Select**.

- (b) The parameters that can be modified (press **Modify** and use **▲** or **▼**) are:

- DC Disconnect Level (**DC** power source operation): if the dc power source is below this voltage, the transmitter will discontinue operation
- DC Reconnect Level (**DC** power source operation): when the dc power source recovers to this voltage, the transmitter will attempt to restore operation.
- Requested Power Source: **AC**, **DC**, **BOTH** (if both ac and dc power sources are installed) or **NONE**.

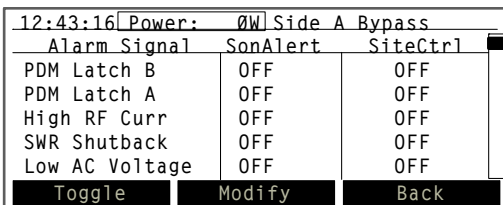
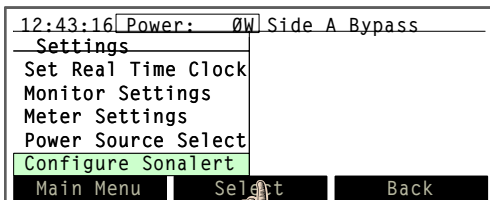
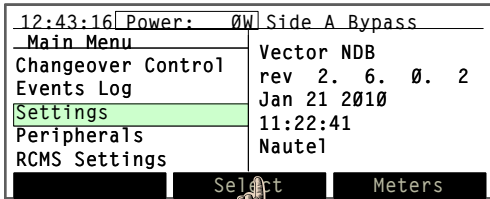
- (c) Press **Done** to activate. A message appears to confirm saving changes to the EEPROM. Press **Yes** or **No**.

- (d) The remaining parameters are for monitoring only.

- DC I/F InstId: Yes or No (indicates if battery boost assembly A16 is installed).
- Active Power Source: indicates the power source configuration for the transmitter (**AC**, **DC**, **BOTH** or **NONE**)



3.6.10 Configuring the Sonalert
Configure the status of the audible alarm (sonalert) for all transmitter alarms as follows:



- (a) From the main menu, highlight **Settings** (using ▲ and ▼) and press **Select**. Highlight **Configure Sonalert** and press **Select**.

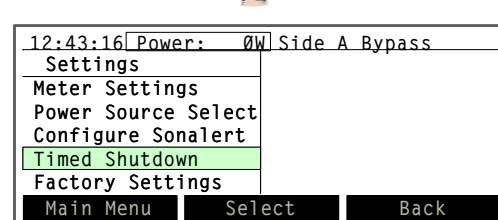
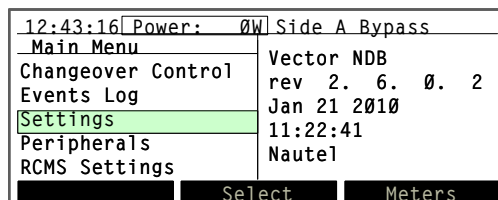
NOTE

The Sonalert peripheral must be activated (see 3.6.13.5) before settings in this section can take effect.

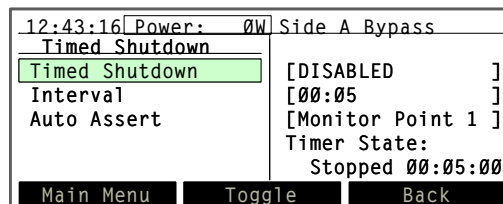
- (b) A list of transmitter alarms and their current SonAlert (audible) and Site Ctrl (remote outputs) status is displayed.
- To configure an alarm for the sonalert, use ▲ and ▼ to select the desired alarm; press **Toggle** to change the status to **ON**.

- Press **Modify** to configure an alarm for use with site interface PWB A4 (if installed). Use ▲ and ▼ to select the desired alarm and press **Toggle** to change the status from OFF to the appropriate remote control output (1 through 16).

3.6.11 Setting a Timed Shutdown
Modify timed shutdown parameters as follows:



- (a) From the main menu, highlight **Settings** (using ▲ and ▼) and press **Select**. Highlight **Timed Shutdown** and press **Select**.



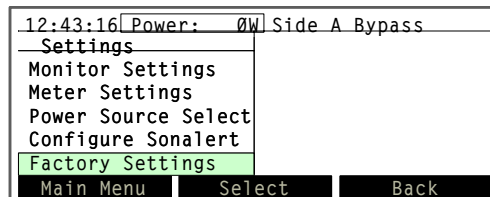
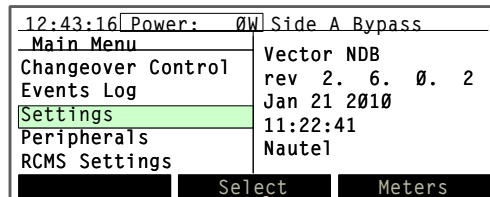
- (b) Use ▲ and ▼ to highlight **Timed Shutdown**, **Interval** or **Auto Assert**, noting:



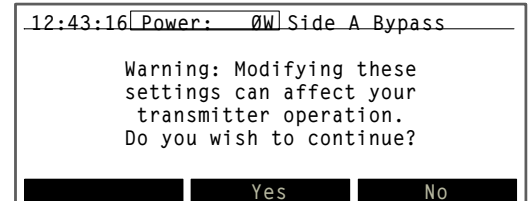
- For **Timed Shutdown**, press **Toggle** to change between **ENABLED** and **DISABLED**. When **Timed Shutdown** is **ENABLED**, the transmitter will shut down the **Interval** period (in hours:minutes) after **RF On** is asserted.
- For **Interval**, press **Modify** to enable editing of the interval time. Use **▲** and **▼** to change the interval between 5 minutes and 24 hours (in 5 minute increments). Press **Done** to store the change.
- For **Auto Assert**, press **Modify** to enable editing of the asserting monitor point. Use **▲** and **▼** to change the monitor point between 1 and 40 (or Disabled). Press **Done** to store the change. Monitor points can only enable the timed shutdown timer. Set **Timed Shutdown** to **DISABLED** when using **Auto Assert**.

3.6.12 Changing Factory Calibrated Settings

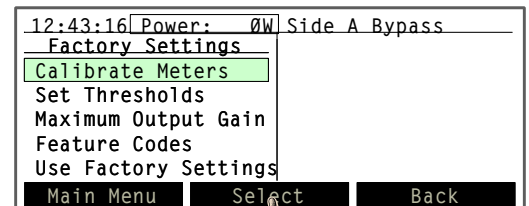
Certain parameters, calibrated during factory testing, can be changed, in local control only, if an out-of-tolerance condition occurs.



- (a) From the main menu, highlight **Settings** (using **▲** and **▼**) and press **Select**. Highlight **Factory Settings** and press the **▲** and left soft-key simultaneously.



Press **Yes** to display the following options:

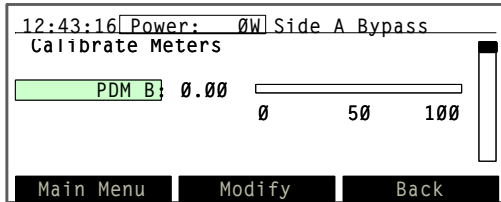


- (b) Press **▲** or **▼** to scroll through the options and press **Select** to enter the appropriate sub-menu (see appropriate paragraph 3.6.12.1 through 3.6.12.5):



3.6.12.1 CALIBRATING DIAGNOSTIC DISPLAY METERS

Re-align an out-of-tolerance meter reading for a displayed parameter as follows:



NOTE

All meter readings displayed on the meters screen can be adjusted. It is imperative that reliable, calibrated test equipment be used to verify the actual value of the out-of-tolerance parameter.

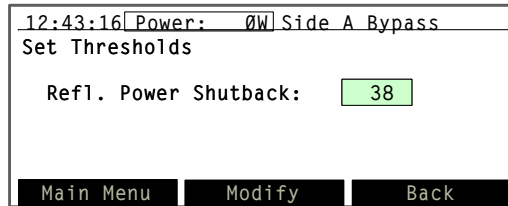
- (a) Press ▲ or ▼ until the desired out-of-tolerance parameter and its current metered level is displayed.
- (b) To calibrate a meter, press **Modify** and then ▲ or ▼ to adjust the level of the out-of-tolerance parameter. When complete, press **Done**.
- (c) Continue calibration of other metered parameters or return to previous menu by pressing **Back**. A message prompt appears to confirm saving all modifications to the EEPROM. Press **Yes** or **No**.

3.6.12.2 SETTING PROTECTION THRESHOLD LEVELS

Adjustments can be made to the critical transmitter shutback thresholds, such as RF current, low ac voltage, and high reflected power cutback levels. Less critical settings, such as diagnostic display contrast and speaker volume (audio) can also be adjusted. Set these thresholds as follows:

CAUTION

Protection threshold levels are factory set and do not normally require adjustment. Contact Nautel prior to attempting to alter these settings. Failure to comply could result in equipment damage.



- (a) Press ▲ or ▼ until the desired threshold and its current value is displayed. The following thresholds may be displayed and edited:

- Refl. Power Shutback
- Low AC Voltage
- RF Current Shutback
- Chrgr. Current DC Offset
- Audio
- LCD Contrast
- Bttry. Current DC Offset
- Slowback Pwr (Per Block)
- Max. PS Temperature (°C)
- Max. ATU Temperature (°C)
- Minimum Logged Cutback
- Ac Meter Zero Offset
- Carrier Frequency (kHz) **

** - available only when the Frequency Monitor feature code is turned on

- (b) To edit a threshold value, press **Modify** and then ▲ or ▼ to adjust the value. When complete, press **Done**. Press **Reset** to restore the value to its pre-modified setting.

NOTE

The Minimum Logged Cutback threshold can be set between 1 (least severe) and 18 (most severe). Only cutback occurrences of the set value and higher (more severe) will be logged.

NOTE

If the Frequency Monitor feature code is enabled (see 3.6.12.4), you can adjust the Carrier Frequency (kHz) to the operational carrier frequency.

- (c) When complete, return to previous menu by pressing **Back**. A prompt appears to confirm saving modifications to the EEPROM. Press **Yes** or **No**.



3.6.12.3 SETTING MAXIMUM OUTPUT LIMITATIONS

The maximum allowable output gain can be adjusted in terms of carrier reference.

12:43:16	Power: 0W	Side A Bypass
Maximum Output Gain		
Set Duty Cycle:		0.00
Set Forward Power:		0
Maximum Carrier Reference: 154		
PDM A: 7.97%	Carr. Ref: 8	
B+ Volt A: 75.0V	PA Volt A: 6.4V	
Main Menu	Modify	Back

NOTE

The **Set Duty Cycle** and **Set Forward Power** values represent actual transmitter levels. The **Maximum Carrier Reference** represents the maximum carrier reference value and can be used to limit output power.

The bottom two rows display current levels for the active side (A or B).

CAUTION

Do not adjust the **Maximum Carrier Reference** to a value that causes the transmitter to exceed its rated power level. Failure to observe this may void the equipment warranty.

- Press ▲ or ▼ until the desired parameter (**Set Duty Cycle** and **Set Forward Power** are grouped together) is displayed.
- To edit a parameter, press **Modify** and then ▲ or ▼ to adjust the value. If the **Set Duty Cycle** and **Set Forward Power** group is selected to Modify, use the **Next** button to toggle between the two items.
- When complete, press **Done**. Press **Reset** to restore the value to its pre-modified setting.
- When complete, return to previous menu by pressing **Back**. A prompt appears to confirm saving modifications to the EEPROM. Press **Yes** or **No**.



3.6.12.4 USING FEATURE CODES (OPTIONAL)

Eight-digit codes can be entered to enable various features that are available in software for display on the GUI. Features are application specific and are not all required. Typically these features and their associated codes are entered during factory testing.

NOTE

Feature codes are entered at the factory and should not require user adjustment. Contact Nautel if one of your GUI's features is not being displayed.

12:43:16	Power: 0W	Side A Bypass
Feature Codes		
Frequency Monitor		
Enter Feature Code: 00000000		
Main Menu	Modify	Back

3.6.12.5 USING FACTORY SETTINGS

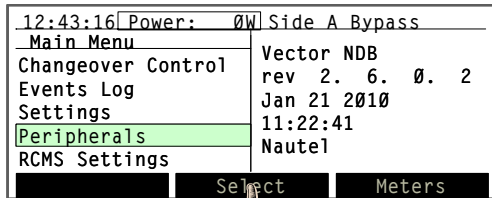
The functions described in paragraphs 3.6.12.1 through 3.6.12.4 can be restored to factory settings as follows:

12:43:16	Power: 0W	Side A Bypass
Do you want to restore Factory Defaults? All current settings will be lost.		
	Yes	No

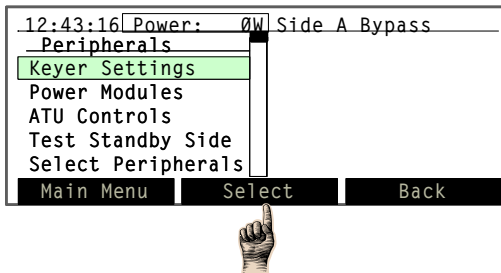
- Pressing **Yes** will restore all setup and calibration values and thresholds to factory settings. All other saved information, including changes to presets, is also restored to factory settings.

3.6.13 Viewing and Setting Peripherals

View and set parameters related to auxiliary items, such as the keyer, the ATU or the transmitter's inactive (standby) side, as follows:



- (a) From the main menu, highlight **Peripherals** (using ▲ and ▼) and press **Select**.

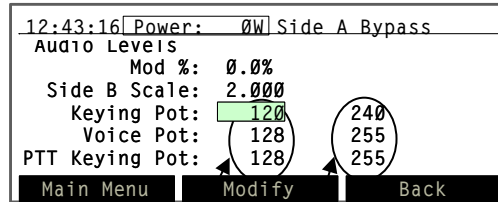
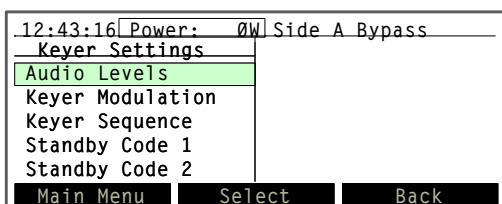


- (b) Press ▲ or ▼ to scroll through the options and press **Select** to enter the appropriate sub-menu (see 3.6.13.1 through 3.6.13.6).

- Keyer Settings (para. 3.6.13.1)
- Power Modules (para. 3.6.13.2)
- ATU Controls (para. 3.6.13.3)
- Test Standby Side (para. 3.6.13.4)
- Select Peripherals (para. 3.6.13.5)
- Module Check (para. 3.6.13.6)

3.6.13.1 SETTING THE KEYER

Set up the keyer as follows:



- (a) **Audio Levels:** Select the desired parameter, using ▲ or ▼. To edit, press **Modify** and then use ▲ or ▼ to adjust the **Side B Scale** factor, **Keying Pot** (for tone modulation level in beacon mode), **PTT Keying Pot** (for tone modulation level in PTT, or press-to-talk mode) or **Voice Pot** (for voice modulation level in PTT mode) value. Press **Done** and **Back** when complete.

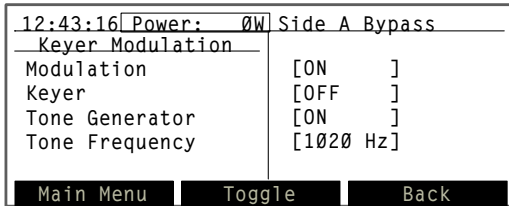
NOTE

The **Side B Scale** factor is factory set and should not require user adjustment. If the modulation depth on side B does not match the modulation depth on side A, adjust the **Side B Scale** factor up or down until they agree.

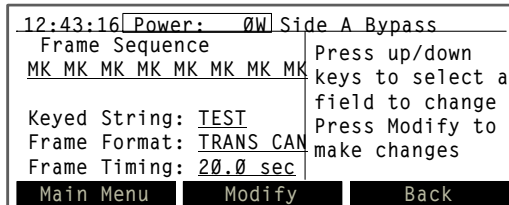
After adjusting the **Side B Scale** factor, adjust a **Pot** value (press ▲ and ▼) to enable the new scaling factor.

- The **Side B Scale** factor is used to scale pot values for side B to allow for an adjustment so the modulation depth on side B can be calibrated to match side A.
- There are two values displayed for each **Pot**. The left-hand value is for side A. The right-hand value is for side B. The side B **Pot** value should be the side A **Pot** value multiplied by the **Side B Scale** factor.
- If a **Pot** value (side A or B) is adjusted, the other side's value will automatically change according to the **Side B Scale** factor.



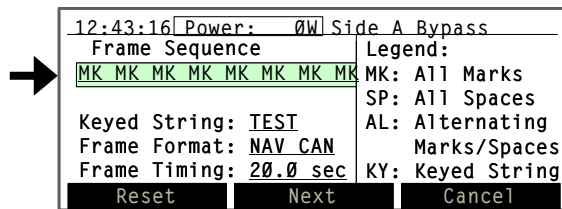


- (b) **Keyer Modulation:** Select the desired parameter, using ▲ or ▼. Press **Toggle** to change the status or value and then press **Back**:
- **Modulation, Keyer and Tone Generator** can be set to ON or OFF.
- **Tone Frequency** can be set to 400 Hz or 1020 Hz.

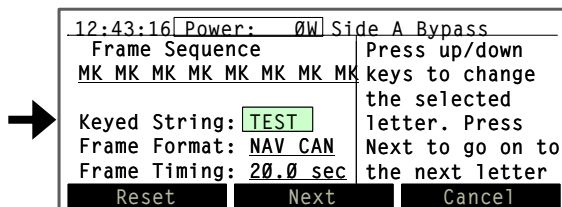


- (c) **Keyer Sequence:** Select the desired parameter, **Frame Sequence, Keyed String, Frame Format or Frame Timing**, using ▲ or ▼. Press **Modify** and follow the instructions on the right-hand side of the GUI display.

Frame Sequence

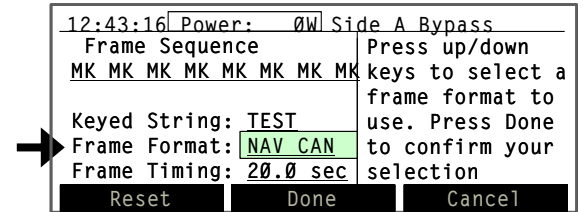


Keyed String



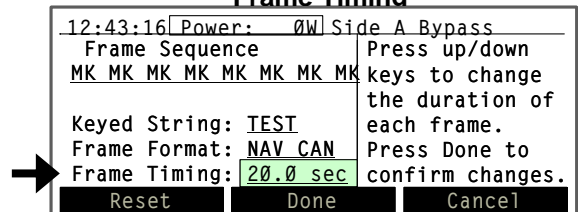
(set to either NAV CAN or ICAO)

Frame Format

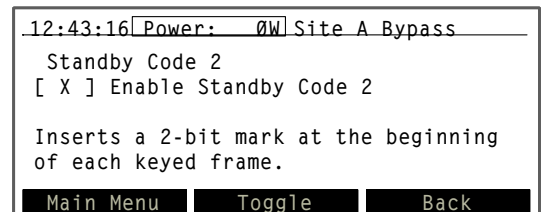
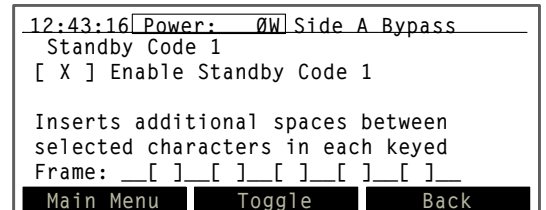


- **ICAO:** International Civil Aviation Organization
- **NAV CAN:** uses a 10 s frame and 0.125 ms bits to key out 3 symbols. (set between 4.0 s and 20.0 s)

Frame Timing



- (d) **Standby Codes 1 and 2:** Press **Toggle** to enable [X] or disable [] the standby code 1 or 2. For Standby Code 1, use the ▲ and ▼ buttons to move between field. Continue using **Toggle** to select or de-select the location of additional inserted spaces.

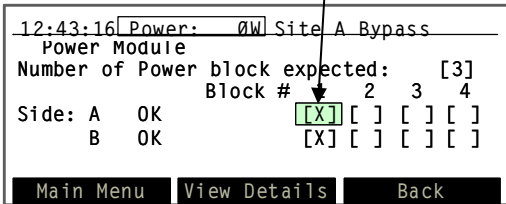


3.6.13.2 VIEWING POWER MODULE STATUS

Configure the transmitter's software for the number of power blocks and view the status of individual power modules as follows:



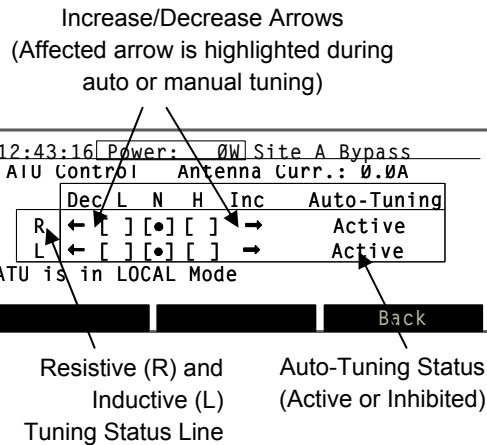
X = installed



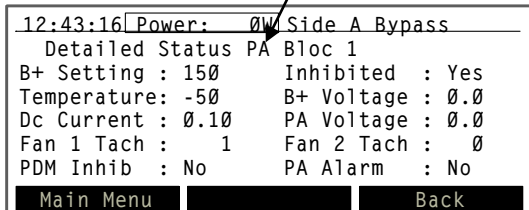
- (a) The screen below appears if the ATU is in local mode of operation and auto-tuning is active and is tuned. This screen allows viewing of ATU status only. No adjustments are possible while the ATU is in local mode.

(a) Press ▲ or ▼ until the desired parameter is highlighted.

- If the **Number of Power block expected** value is highlighted, the **Modify** option is displayed. If necessary, press **Modify** and use ▲ or ▼ to select 1 (for Vector-LP). Press **Done** when complete.
- If one of the power module fields (**Block # 1, Side A and B** for Vector-LP) is highlighted, the **View Details** option is displayed. Press **View Details** to view the following RF power module details:

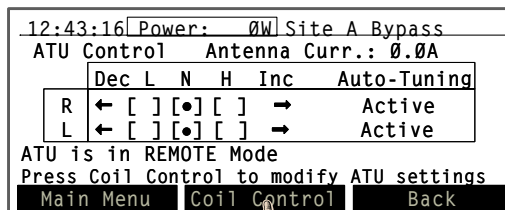


PA = Side A



- (b) If the ATU is set to the remote mode of operation, the screen is as shown below. This screen allows ATU tuning to be controlled from the transmitter GUI. Press **Coil Control**.

(b) Return to the previous menu by pressing **Back**.



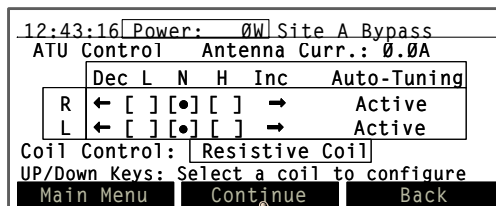
3.6.13.3 ATU CONTROLS

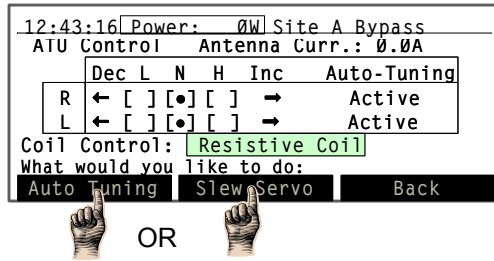
If a Nautel antenna tuning unit (ATU) is being used, view and edit its control parameters as follows:

NOTE

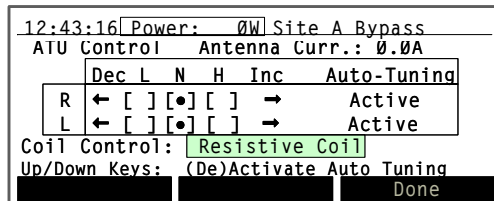
A serial interface allows communication between the transmitter and the ATU. This interface connects to the transmitter via the **INTERNAL RS-485** connector (25-pin D-sub) on the rear of the exciter/control assembly.

- (c) In the coil control screen shown below, use ▲ and ▼ to select the desired coil to control - **Resistive Coil** or **Inductive Coil**. Press **Continue**.

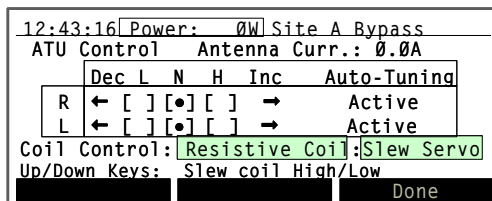




- (d) If **Auto Tuning** is selected, the following screen appears which allows the selected coil to be auto tuned (active) or inhibited. Use ▲ and ▼ to highlight **Active** or **Inhibited**, then press **Done** to select.



- (e) If **Slew Servo** is selected, the following screen appears which allows the selected coil to be manually tuned. Use ▲ and ▼ to slew the coil high or low. Press **Done** when complete.



3.6.13.4 TESTING THE STANDBY SIDE

Test the operation of the transmitter's inactive (standby) side as follows:

- (a) Use ▲ and ▼ to highlight the desired test (**Turn Standby Side Off, Test Power Supply, Test Modulators, Test RF Drive, or Run All Tests**). Press **Select** to activate.
- (b) If you select a test, the display will initially indicate **Running**. When the test is complete, a pass (**OK**) or fail indication is displayed. If the item

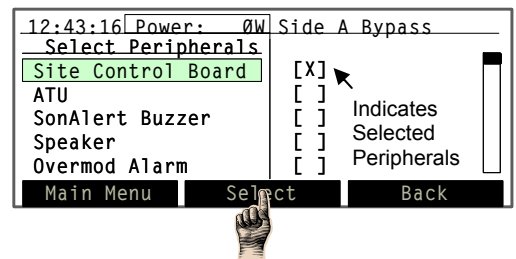
under test fails, a root cause message (e.g., PS Ovr Cur) is displayed.

NOTE

The root cause text is identical to that displayed in the Status menu (see 3.6.3).

3.6.13.5 SELECTING PERIPHERALS

Configure the transmitter's software for peripheral equipment, such as an ATU or site interface PWB as follows:



- (a) Use ▲ and ▼ to highlight the desired peripheral. Press **Select** to activate.

- If the site interface PWB (A2A4) is installed, select **Site Control Board**.
- If a Nautel ATU is used and a serial interface is connected to the **INTERNAL RS-485** connector on the rear of the exciter/control assembly, select **ATU**.
- To hear the sonalert buzzer for a fault defined in the sonalert setup menu, select **SonAlert**.
- To hear the transmitter output, select **Speaker**.
- To enable the GUI to display Audio Limit alarm occurrences, select **Overmod Alarm**.
- If module fans are installed (VR250 only), select **Module Fan Tachs**.

- (b) Return to previous menu by pressing **Back** or press **Main Menu**.



3.6.13.6 CHECKING MODULES:

Check the software revision of various modules that contain microcontrollers as follows:

12:43:16 Power: 0W Side A Bypass			
Module Check			
7			
8	NAPE76u	rev 0. 0. 0.	2
9	NAPE76u	rev 0. 0. 0.	2
10			
11	NAPI80u	rev 0. 1. 0.	34

(a) Use ▲ and ▼ to scroll through rows 1 to 12, noting:

- Rows 0 through 7 are assigned to RF power modules.
- Rows 8 and 9 are assigned to the exciter/monitor generator PWBs (side A and, if applicable, side B).
- Row 10 is assigned to the associated ATUs control/monitor PWB.
- Row 11 is assigned to the site control PWB, if installed.

NOTE

If text is not displayed for a particular row, the associated module or PWB is not installed.

3.6.14 Remote Control Monitor System Settings

If the NDB site interface PWB (A4) is installed, configure the active logic states of the control and monitor points as follows:

12:43:16 Power: 0W Side A Bypass	
Main Menu	Vector NDB
Changeover Control	rev 2. 6. 0. 2
Events Log	Jan 21 2010
Settings	11:22:41
Peripherals	Nautel
RCMS Settings	



12:43:16 Power: 0W Side A Bypass	
RCMS Settings	
Control Points	
Monitor Points	
Serial Setting	
Automatic Reporting	

(a) From the main menu, highlight **RCMS Settings** and press **Select**.

(b) Set the transmitter to **Local** mode.

(c) Press ▲ or ▼ to scroll through the options and press **Select** to enter the appropriate sub-menu (see paragraphs 3.6.14.1 through 3.6.14.3).

- Control Points (see 3.6.14.1)
- Monitor Points (see 3.6.14.2)
- Serial Settings (see 3.6.14.3)
- Automatic Reporting (see 3.6.14.4)

3.6.14.1 SETTING CONTROL POINTS

Set the site interface PWBs control points as follows:

12:43:16 Power: 0W Side A Bypass	
Control Points	Set Value
Control Point 1	0
Control Point 2	0
Control Point 3	0
Control Point 4	0
Control Point 5	0

(a) Use ▲ and ▼ to highlight the desired control point (1 through 16). Press **Toggle** to change the logic level (0 or 1) of the **Set Value**. The logic level determines the active state for the control point's remote input.

NOTE

Control points 1 through 16 correspond to inputs connected to **CONTROL POINT 1** through **16** on TB3 of the remote control/monitor interface PWB.

(b) Return to previous menu by pressing **Back**.



3.6.14.2 SETTING MONITOR POINTS

Set the site interface PWB's monitor points as follows:

Monitor Points	Default	Current
Monitor Point 1	0	0
Monitor Point 2	0	0
Monitor Point 3	0	0
Monitor Point 4	0	0
Monitor Point 5	0	0

Buttons: Set Current, Toggle, Back

- (a) Use ▲ and ▼ to highlight the desired monitor point (1 through 16). Press **Toggle** to change the logic level (0 or 1) of the **Default** value. The logic level determines the active (for status outputs) or normal (for alarm outputs) state for the monitor point's remote output.

NOTE

Monitor points 1 through 16 correspond to outputs connected to **MONITOR POINT 1** through **16** on TB1 and TB2 of the site interface PWB.

- (b) The values in the **Current** column represent the existing state of the monitor point. Press **Set Current** to set the **Current** values to match the **Default** values.
- (c) Return to previous menu by pressing **Back**.

3.6.14.3 SERIAL SETTINGS

Set up the serial connection as follows:

Serial Settings	
Tx Address	ABCD
Connection Mode	[DIRECT]

Buttons: Main Menu, Modify, Back

- (a) Use ▲ and ▼ to highlight the desired serial setting. Press **Modify** or **Toggle** to change the setting. Press **Next** or **Done** when complete.

- To modify Tx Address, use ▲ and ▼.
- Press **Toggle** to set Connection Mode to **DIRECT** or **MODEM**. When **MODEM** is selected, the following screen appears, which enables three further settings:

Serial Settings	
Tx Address	ABCD
Connection Mode	[MODEM]
Modem Line	[DIAL UP]
Passkey	0000
Dial-up Number	

Buttons: Main Menu, Toggle, Back

- Press **Toggle** to set Modem Line to **DIAL UP** or **LEASED**. The Dial-up number option disappears when **LEASED** is selected.
 - Press ▲, ▼ and **Next** to set the Passkey and the Dial-up Number.
- (b) Return to the previous menu by pressing **Back**.

3.6.14.4 AUTOMATIC REPORTING

Configure the serial connection to automatically report transmitter alarms (without needing to poll the status) as follows:

Fault	Automatic Reporting
PDM Latch B	OFF
PDM Latch A	OFF
High RF Current	OFF
SWR Shutback	OFF
Low AC Volts	OFF

Buttons: Main Menu, Select, Back

- (a) A list of transmitter alarms and their current Automatic Reporting status is displayed.
- To configure an alarm for automatic reporting, use ▲ and ▼ to select the desired alarm and press **Select** to change the status to **ON**.

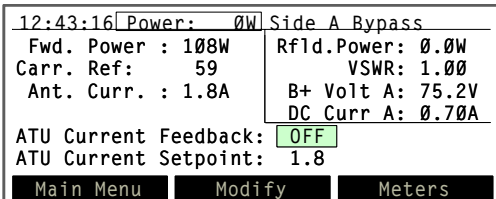
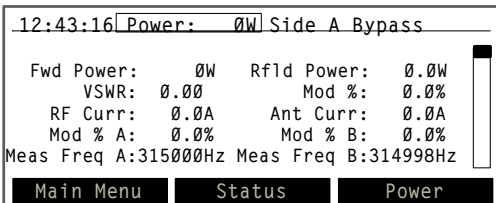


3.6.15 Viewing Power Related Parameters and Setting ATU Current Feedback

View the transmitter's power menu and, if necessary, set the status of the ATU current feedback circuit as follows:

NOTE

The ATU current feedback circuit attempts to regulate the antenna current over a range of RF output power. The two ATU options in the power menu are only available when the transmitter is attached (using a RS485 serial link) to an ATU-LP or ATU500.



- (a) From the meter screen, press **Power**. The current forward power, reflected power, carrier reference, VSWR, antenna current, B+ voltage (for the active side's power supply) and dc current (for the active side's power supply).
- (b) To edit the **Fwd. Power** or **ATU Current Feedback** field, press **Modify** and then use **▲** and **▼** to edit:
 - **Fwd. Power** changes in 1 W steps
 - **ATU Current Feedback** toggles between **ON** and **OFF**. (Not used for ATU500)
- (c) Press **Done** when complete.

NOTE

The transmitter regulates the antenna current to the **ATU Current Setpoint** value displayed on the GUI. Ensure the transmitter's RF output is set to the desired level before setting the **ATU Current Feedback** field to **ON**.



Vector-LP Radio Beacon Transmitter

TECHNICAL INSTRUCTION MANUAL

Section 4 **TESTING AND ADJUSTMENT**

4.1 INTRODUCTION

This section contains step-by-step functional test procedures using integral meters and precision test/monitoring equipment. The test procedures contain routine adjustment instructions to bring the parameter being tested within defined limits, where appropriate.

NOTE

Nautel recommends all instructions be followed in the order presented, particularly by personnel who are not familiar with detailed circuit theory and may not realize the impact a specific adjustment can have on other steps. These adjustments should be performed during initial turn-on and after major repairs or a frequency change.

4.2 OPERATING PRECAUTIONS

The transmitter contains protection circuits that monitor critical parameters. When the defined limits of any of these parameters are exceeded, one of the operational lamps on the exciter panel's system diagram will turn red. If the alarm condition could result in excessive power amplifier stress current, the control voltage applied to the power amplifiers will effectively be reduced or turned off until the out-of-tolerance condition no longer exists. Maintainers should read and fully understand the Section 3 - Operating Instructions, and in particular the section on controls and indicators.

NOTE

The diagnostic display's meters screen displays three pre-determined parameters (e.g., forward power, total dc current, +15 V power supply, etc.). All transmitter parameters may be displayed on this screen. See paragraph 3.6.8.1.

4.3 FUNCTIONAL TESTS

To verify the transmitter circuits are within factory specifications, complete the tests in this section. In cases where a routine adjustment will correct an out-of-tolerance condition, the adjustment procedure is included.

NOTE

If an in-tolerance condition cannot be attained with the specified routine adjustment, discontinue testing until the cause of the out-of-tolerance condition is corrected.

4.3.1 General

Functional tests should be performed as a routine part of scheduled maintenance checks, and as the first step in troubleshooting procedures. The results should be recorded for comparison with past and future test results.

4.3.1.1 The functional test procedures are provided in a step-by-step format. This method of presentation will permit a person who is unfamiliar with the transmitter to perform the functional tests in a logical sequence. The procedures should be completed in sequence, as each procedure establishes switch settings and contains prerequisites for subsequent procedures.

4.3.1.2 The following assumes the initial turn-on procedure detailed in Section 2 has been completed during initial installation, and after major repairs that warrant the initial start-up procedure be repeated.



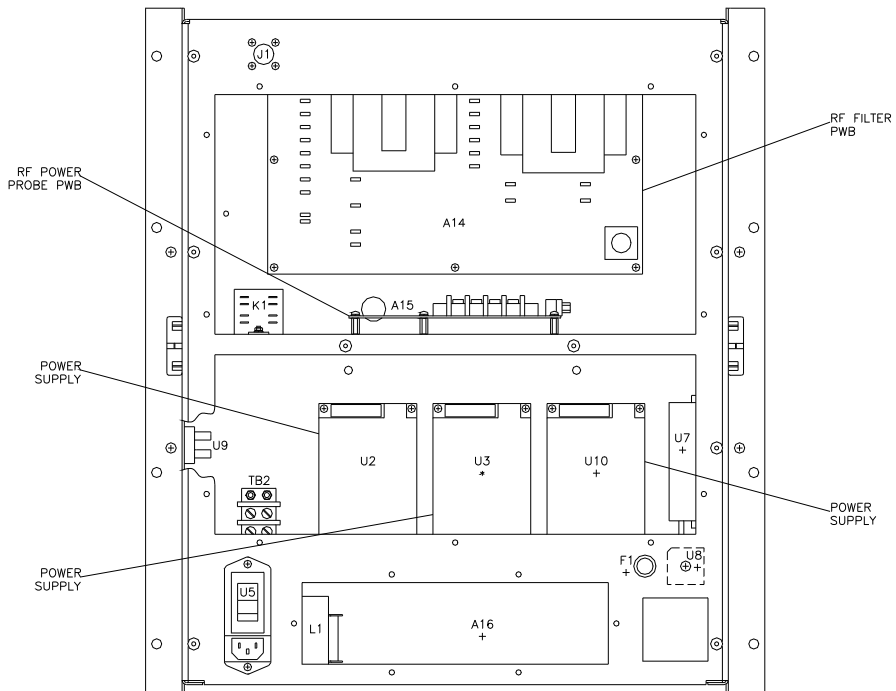
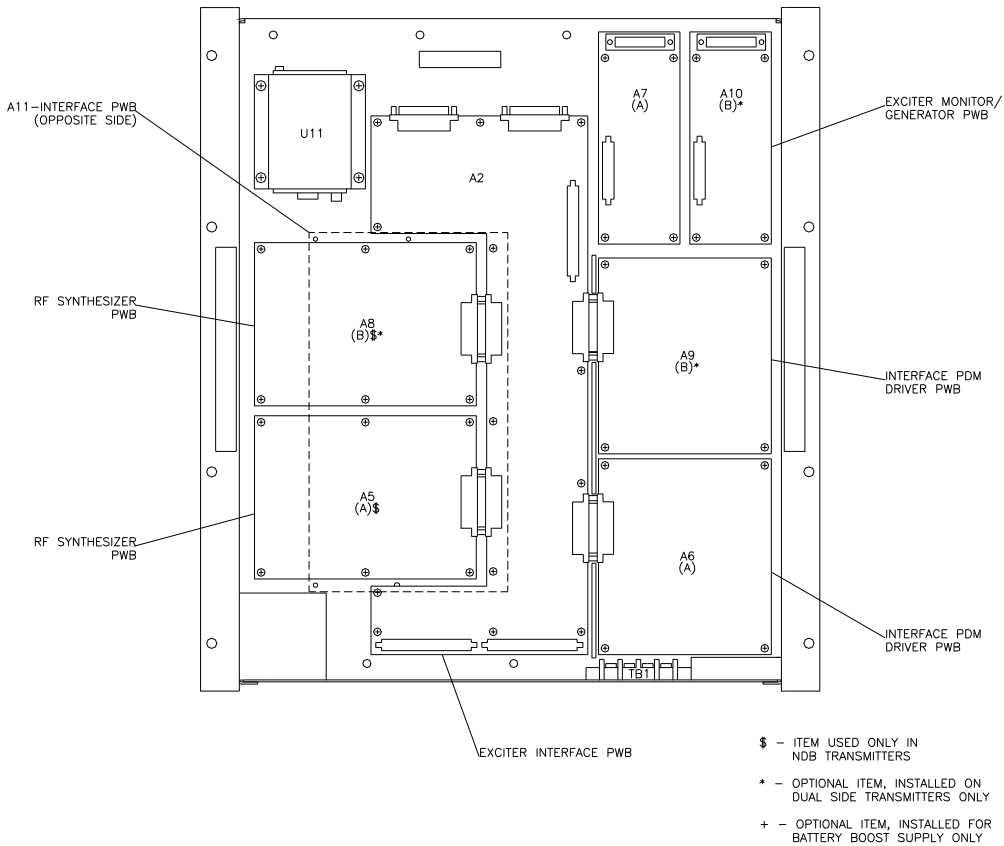


Figure 4-1 Exciter Panel and Rear View



4.3.1.3 Some of the transmitter's PWBs may be duplicated and connected as active (main) and reserve (standby). The front panel diagnostic display provides selection of the active side (A or B). The following list identifies the duplicated PWBs/assemblies and which are active for a specific selection. Refer to Figure 4-1 to locate these assemblies. To locate an assembly's adjustment or test point, refer to the controls and indicators portion of Section 3.

Side A Assemblies

RF Synthesizer PWB	A5
Interphase PDM Driver PWB	A6
Exciter Monitor/Generator PWB	A7
RF Power Module	A12
LVPS Module	U2

Side B Assemblies (optional)

RF Synthesizer PWB	A8
Interphase PDM Driver PWB	A9
Exciter Monitor/Generator PWB	A10
RF Power Module	A13
LVPS Module	U3

4.3.2 Test Equipment Required
A dummy load rated for twice the maximum power capability of the transmitter, an oscilloscope and a digital multimeter are required to perform the functional test procedures. Refer to Table 1-2 for recommended test equipment.

4.3.3 Test Prerequisites
The following steps must be completed prior to performing any of the functional test procedures:

- (a) Verify that nothing affecting the RF power stage has been changed or altered since the initial start-up procedure (described in Section 2 of this manual) was completed.
- (b) Ensure the ac or dc power source is turned off or disconnected.
- (c) Terminate the transmitter's RF output into a suitably rated, precision 50 Ω, load that is able to accurately display the RF power being applied to it.

WARNING

If there is a jumper between TB1-19 and TB1-20 on the remote interface PWB, safety features provided by the external interlocks are disabled. Implement a fail-safe method to alert personnel to this fact. Dangerous voltages will be present near the RF output and the antenna system if the transmitter is turned on under these conditions.

- (d) Close all external interlocks or connect a jumper between TB1-19 and TB1-20 of the remote interface PWB.

NOTE

Remote interface PWB A3 is located on the back of the front panel.

NOTE

This section makes frequent reference to Section 3 - Operating Instructions. You should be familiar with the transmitter's operating instructions, specifically the front panel GUI, before testing or adjusting the transmitter's circuits.

4.3.4 Initial Turn-On

Enable the ac or dc power source, turn on the transmitter, and observe its alarm and status indicators as follows:

- (a) Verify the requirements of paragraph 4.3.3 have been completed.
- (b) Turn on (enable) the ac or dc power for the transmitter. The **AC IND** lamp on each RF power module (viewed from transmitter top) will be on. The presence and value of ac voltage can also be viewed on the front panel GUI. Ensure the transmitter's RF power stage is disabled by pressing the **Control - RF OFF** switch.
- (c) Select local control by pressing the **Control - Local** switch.



NOTE

During initial turn-on and adjustment of transmitter power, the diagnostic display's meters screen should be monitored.

Various input parameters, such as **Forward Power**, **Average B+ Voltage**, and **Total Dc Current** should be displayed while the transmitter RF output power is being increased.

If the diagnostic display indicates an alarm, discontinue adjustment of the transmitter and press the **Status** button to determine the nature of the fault.

4.3.5 Standard Adjustments

The following standard adjustments are described in this section. Verify them after transmitter commissioning.

- 4.3.5.1 Setting Sonalert Remote Control States
- 4.3.5.2 Setting Low Battery Threshold
- 4.3.5.3 Setting Default Monitor States
- 4.3.5.4 Adjusting Audio Limiter
- 4.3.5.5 Setting Changeover Mode and RF Monitor Thresholds
- 4.3.5.6 Verifying Exciter Changeover Thresholds
- 4.3.5.7 Setting Mod Depth in Beacon Mode
- 4.3.5.8 Setting Mod Depth in Beacon and Voice Mode
- 4.3.5.9 Setting Standby Codes
- 4.3.5.10 Setting the Keyer
- 4.3.5.11 Setting the Antenna Current Level

4.3.5.1 SETTING SONALERT REMOTE CONTROL STATES

Use the sonalert menu to allow a transmitter alarm to generate a change in a control points state. See *Configuring the Sonalert* (3.6.10).

4.3.5.2 SETTING LOW BATTERY THRESHOLD

If a dc power source (battery) is used, see *Selecting Power Source* (3.6.9) to set the DC disconnect and reconnect levels.

4.3.5.3 SETTING DEFAULT MONITOR STATES

If the optional NDB site interface PWB (A4) is installed, see 3.6.14.1 and 3.6.14.2 to set default monitor states.

4.3.5.4 ADJUSTING AUDIO LIMITER

Adjust the audio limit threshold as follows:

- (a) Adjust the remote interface PWB (A3) **AUDIO LEVEL** potentiometer (R37) fully clockwise.
- (b) Connect an audio signal at the desired level (between -20 dBm and +10 dBm, in a 600 Ω load) to the **AUDIO INPUT (+)** (TB1-14) and **(-)** (TB1-16) terminals of the remote interface PWB.
- (c) The system diagram's **External Alarm** LED should turn on.
- (d) In the Configure Sonalert menu (see 3.6.10), set the Mod Protection alarm signal to **ON**.
- (e) In the Select Peripherals menu (3.6.13.5), select Sonalert Buzzer. The sonalert will sound an alarm.
- (f) Adjust the **AUDIO LEVEL** potentiometer counter-clockwise until the alarm stops, noting there is a five second delay between the adjustment and the alarm reaction. The **External Alarm** LED should also turn off.
- (g) Sweep the test signal's frequency across the desired frequency band. Adjust the **AUDIO LEVEL** potentiometer when an audible alarm occurs so that the level is as high as possible without generating an alarm.
- (h) In the Configure Sonalert menu (see 3.6.10), set the Mod Protection alarm signal to **OFF**, if desired.



4.3.5.5 SETTING CHANGEOVER MODE AND RF MONITOR THRESHOLDS

If a standby side is being used, adjust the transmitter's high and low RF power limits, low modulation and tone levels, and the monitor delay period, as follows:

NOTE

International Civil Aviation Organization (ICAO) standards dictate the transmitter be turned off or a warning alarm be generated when the RF output decreases by at least 3.0 dB or increases by at least 2.0 dB from the intended carrier level. The user can alter the monitor settings provided these criteria are still met.

- (a) Disable changeover. Set changeover control to bypass mode (see 3.6.4).
- (b) Set the transmitter to the desired RF output level.
- (c) Set the transmitter for desired modulation depth in 'beacon' (PTT inactive) and 'beacon and voice' (PTT active) modes (see 3.6.7).

NOTE

If the NDB is to be used only in 'beacon' or 'beacon and voice' mode, you only need to set up the NDB for the appropriate mode.

- (d) Calculate the desired low modulation depth for each mode. Set the transmitter to modulate at these levels.
- (e) In the Monitor Timeout screen (see 3.6.7), set the monitor timeout period (in seconds) and decide whether shutdown will be enabled or disabled.
- (f) In the Power Thresholds screen (see 3.6.7), set the high and low power limits and press **Compute New Thresholds**.
- (g) In the Mod % Thresholds screen (see 3.6.7), press **Compute New Thresholds** in 'beacon' (PTT inactive) and 'beacon and voice' (PTT active)



modes (see 3.6.7). The thresholds should be updated with the desired values.

NOTE

At this point the system has automatically determined to use either a current or voltage sample to control the modulation detection and protection circuitry.

- (h) Set the transmitter for desired modulation depth in 'beacon' (PTT inactive) and 'beacon and voice' (PTT active) modes (see 3.6.7).
- (i) Enable changeover. Set changeover control to normal mode (see 3.6.4).

NOTE

Changeover is inhibited when a VSWR of 1.4:1 or greater is present.

- (j) Check each threshold to ensure that it functions properly by adjusting the transmitter beyond the desired limit and observing that the transmitter reacts as expected. For detailed testing information see 4.3.5.6.

NOTE

If you manually decrease the modulation depth, the transmitter will inhibit output power when the tone level is below the desired threshold. The Keying Gate Monitor Fail A or B fault will be displayed. To restore power, increase the modulation level and reset the fault status.

- (k) When complete, restore the transmitter to the desired power level and press reset to clear all alarms (see 3.6.3). Normal operation should resume.

4.3.5.6 VERIFYING EXCITER CHANGEOVER THRESHOLDS

Verify the exciter changeover thresholds as follows:

- (a) Set the exciter control mode to **NORMAL** (see 3.6.4). Set Keyer Modulation to **ON** (see 3.6.13.1)

Ensure that antenna current feedback is **OFF** (disabled, see 3.6.15) before proceeding.

- (b) Select the exciter (A or B) that will be operational for the next year as the Main Side (see 3.6.4) and note the forward power level on the screen.

NOTE

For clarity of description this procedure uses factory default values for changeover thresholds (3 dB for low RF power, 60% for low modulation) and timeout values (20 seconds). These thresholds and values are user adjustable.

- (c) From the diagnostic display, select Main Menu / Settings / Monitor Settings. The timeout counter should read 20 sec. (default value; can be user adjusted).
- (d) Decrease the RF power until the counter begins to count down. The RF power should be 3 dB (default value, can be user adjusted) below the power noted in step (b).

- (e) A changeover should occur after the timeout counter value in step (c). If not, adjust the RF power to the original level noted in step (b). Select Main Menu/Settings/Monitor Settings/Power Thresholds. Press **Continue** to proceed. Press **Compute New Thresholds** to establish new power thresholds. If a modification is made, a screen appears which prompts you to save changes to EEPROM. Select **Yes**. Return to step (d).

- (f) Increase the RF power to the desired power level noted in step (b). Press **Reset** in the **Status** menu. The transmitter should switch back to the main side and the **Changeover** LED should no longer be on.

- (g) Select Main Menu/Peripherals/Keyer Settings/Audio Levels.
- (h) Note the modulation level. Decrease the Keying Pot level (see 3.6.13.1). Power should be inhibited when $60 \pm 2\%$ modulation is reached. A changeover should occur 20 seconds later. Power should still be inhibited on the standby side. If not, continue to decrease the Keying Pot until power is inhibited on the standby side (this should also occur at $60 \pm 2\%$ modulation). Press **Cancel**. Press **Reset** in the **Status** menu. The transmitter should switch back to the main side and the **Changeover** LED should no longer be on.
- (i) Select Main Menu/Settings/Monitor Settings/Mod % Thresholds. Press **Continue** to proceed.

	Side A	Side B
12:43:16 Power: 0W Side A Bypass		
Mod % Thresholds		
Minimum Allowable Tone Modulation Depth:		
...PTT Inactive:	164	153
...PTT Active:	1023	1023
	63.8	63.8
	35.4	35.4
Compute New Thresholds	Rf Mon: CURR Toggle	Back

The third row in the Side A column (63.8 in the example above) should read $60 \pm 2\%$. The third row in the Side B column (also 63.8 in the example above) should read $60 \pm 2\%$.



- (j) If the requirements of step (i) are not met, set the transmitter to operate in **BYPASS** mode. Press **Reset** in the **Status** menu. The transmitter should switch back to the main side and the **Changeover** LED should no longer be on.
- (k) Decrease the modulation depth (Keying Pot level) to 60%. Select Main Menu/Settings/Monitor Settings/Mod % Thresholds. Press **Continue** to proceed. Press **Compute New Thresholds** to establish new monitor modulation % thresholds. If a modification is made, a screen appears which prompts you to save changes to EEPROM. Select **Yes**. Increase the modulation depth to the desired level. Set changeover mode to **NORMAL**. Return to step (g).
- (l) Select Main Menu/Peripherals/Keyer Settings/Audio Levels.
- (m) The modulation levels should be as close to desired modulation without distortion.

4.3.5.7 SETTING MOD DEPTH IN BEACON MODE

Set the modulation depth in beacon (no voice) mode as follows:

- (a) Ensure there is no link between the **PRESS-TO-TALK** terminal (TB1-12) and **GND** (TB1-13) on the remote interface PWB (A3).
- (b) In the Keyer Modulation menu (see 3.6.13.1), set Modulation and Tone Generator to ON and set Keyer to OFF. Set the Tone Frequency to 400 Hz or 1020 Hz.
- (c) In the Audio Levels menu (see 3.6.13.1), set Keying Pot to 0.
- (d) Press **RF On**. Increase the transmitter's output to desired power.

- (e) In the Audio Levels menu, while monitoring the Mod %, increase the Keying Pot value until the Mod % is as desired. If the modulating signal begins to distort, stop increasing mod depth.
- (f) In the Keyer Modulation menu, set Keyer to ON.

4.3.5.8 SETTING MOD DEPTH IN BEACON AND VOICE MODE

Set the modulation depth in PTT (beacon and voice) mode as follows:

- (a) Adjust the audio limiter as described in 4.3.5.4. The audio generator should remain connected.
- (b) Assert **Press-To-Talk**. The status screen should indicate press to talk.

NOTE

*If the system is in normal mode, connect a link between the **PRESS-TO-TALK** terminal (TB1-12) and **GND** (TB1-13) on the remote interface PWB (A3). If the system is being used in phantom feed mode, apply -15 V down the shield of the audio signal (see 2.2.13).*

- (c) In the Keyer Modulation menu (see 3.6.13.1), set Modulation to ON and set Keyer and Tone Generator to OFF.
- (d) In the Audio Levels menu (see 3.6.13.1), set Voice Pot and Keying Pot to 0.
- (e) Press **RF On**. Increase the transmitter's output to rated power.
- (f) In the Audio Levels menu, while monitoring the Mod %, increase the Voice Pot value until the Mod % is at the desired depth. If the modulating signal begins to distort, stop increasing the modulation depth.
- (g) Turn off the audio generator.



- (h) In the Keyer Modulation menu, set Modulation and Tone Generator to ON. Set the Tone Frequency to 400 Hz or 1020 Hz.
- (i) In the Audio Levels menu, while monitoring the Mod %, increase the PTT Keying Pot value until the Mod % is at the desired depth. If the modulating signal begins to distort, stop increasing the modulation depth. The total modulation depth cannot exceed 95%.
- (j) In the Keyer Modulation menu, set Keyer to ON.

4.3.5.9 SETTING STANDBY CODES

See 3.6.13.1, *Setting the Keyer*.

4.3.5.10 SETTING THE KEYS

See *Setting the Keyer* (3.6.13.1).

4.3.5.11 SETTING THE ANTENNA CURRENT LEVEL

Adjust the antenna current to the desired level and set the antenna current feedback feature as follows:

- (a) Ensure the serial interface cable is installed between the transmitter (at the **INTERNAL RS-485** connector on remote interface PWB A3) and the ATU.
- (b) Apply power to the ATU.
- (c) In the Power menu (see 3.6.15), set the antenna current feedback to **OFF**.
- (d) Adjust the transmitter for the desired antenna current by adjusting the output power level.
- (e) Ensure that the changeover mode and monitor thresholds have been set (see 4.3.5.5)
- (f) In the Power menu, set the antenna current feedback to **ON**.

NOTE

When antenna current feedback is enabled, the transmitter will adjust the output power to ensure that antenna current remains constant. With each power adjustment, a new high and low forward power threshold is calculated. In this case the low and high power thresholds have essentially become low and high antenna current thresholds.

4.3.6 Non-Standard Adjustments

The following non-standard adjustments are described in this section. They have been factory set prior to shipping and do not require verification or re-calibration unless an unintentional adjustment has been made or a fault has occurred.

- 4.3.6.1 Changing Frequency
- 4.3.6.2 Changing RF Filter Tap Settings
- 4.3.6.3 Calibrating Transmitter Output Power
- 4.3.6.4 Calibrating Exciter Dc Voltages and Ambient Temperature
- 4.3.6.5 Calibrating PDM
- 4.3.6.6 Calibrating Reflected Power Threshold and Output Network Alarm
- 4.3.6.7 Setting the RF Monitor Level
- 4.3.6.8 Calibrating the Ac Failure Alarm
- 4.3.6.9 Adjusting for RF Drive Symmetry
- 4.3.6.10 Equalizing Exciter Gain (Dual Exciter Transmitters Only)
- 4.3.6.11 Calibrating Battery Voltage, Current and Charger Current(Optional)
- 4.3.6.12 Setting Display Contrast
- 4.3.6.13 Adjusting Speaker Volume
- 4.3.6.14 Reading Modulation Level

- (a) Verify the initial turn-on requirements of paragraph 4.3.4 have been completed and are being met.

4.3.6.1 CHANGING FREQUENCY

To perform a frequency change, perform the following steps in order:

- (a) Press **RF Off**.



- (b) On the RF synthesizer PWB(s), change the carrier frequency using BCD switches S1 through S5. Each switch represents one of the five most significant digits in the carrier frequency expressed in kHz:

- S1 is thousands digit (**x1000**)
- S2 is hundreds digit (**x100**)
- S3 is tens digit (**x10**)
- S4 is units digit (**x1**)
- S5 is the tenths digit (**x0.1**)

- (c) If the Frequency Monitor feature is enabled, adjust the Carrier Frequency (kHz) (in the Set Thresholds menu; see 3.6.12.2) to the operational carrier frequency.

- (d) Perform RF drive symmetry testing and adjustment procedures (see 4.3.6.9).

- (e) Change the RF filter tap settings (see 4.3.6.2).

- (f) Calibrate the transmitter's output power (see 4.3.6.3).

4.3.6.2 CHANGING RF FILTER TAP SETTINGS

For a frequency change, change the tap settings on the RF filter PWB as follows:

NOTE

If your frequency is changing between the standard frequency band (190 - 535 kHz) and the extended frequency band (535 – 1800 kHz), you will need to change the RF filter PWB (A14). Contact Nautel.

- (a) Turn off the RF power and the ac and dc circuit breakers.
- (b) Remove the rear cover from the transmitter to gain access to the RF filter PWB (A14).

- (c) Enter the frequency into Table 2-6a (standard frequencies) or 2-6b (high frequencies, VR125 only) to determine the tap settings for the six jumpers. Connect the jumpers to the appropriate taps.

- (d) Turn on the ac and dc circuit breakers.

- (e) Install the rear cover on the transmitter and perform the calibration in 4.3.6.3.

4.3.6.3 CALIBRATING TRANSMITTER OUTPUT POWER

Calibrate the transmitter's forward power and related parameters as follows:

- (a) Select reflected power to be monitored on the exciter/control assembly's front panel analog meter (see 3.6.8.2).

- (b) Select side A in the Changeover Control menu. Go to the Power Module menu.

- (c) Monitor TP17 of interphase PDM driver PWB A (A6) with an oscilloscope.

- (d) Set the RF output to 0 W by pressing the **Power Increase** and **Power Decrease** buttons at the same time.

- (e) Press **RF On**. Ensure all side A RF power module fans turn on (VR250 only). Set modulation to 0%.

- (f) While monitoring the PA voltage for the side A RF power module (see 3.6.13.2), slowly increase the RF output power until the PA voltage is 65 V. Stop increasing power if at any time:

- the PA voltage between RF power modules varies by more than 5%, or
- the reflected power on the analog meter increases above 10 W

- (g) Use an external current probe to verify that the output power is 100 ± 20 W.



- (h) Increase power to rated or maximum, whichever is lower. Use an external current probe and the following formula to determine the output power:

$$Power = Current^2 \times R_{load}$$

- (i) In the Maximum Output Gain menu (see 3.6.12.3), calibrate the duty cycle and forward power as follows:
- Highlight the value for **Set Duty Cycle**. Press **Modify**.
 - Change the value to match the positive duty cycle measured at TP17 in step (c). Press **Next**.
 - Change the value for **Set Forward Power** to match the power calculated in step (h).
- (j) If the transmitter is operating at full power, go to step (l). If not:
- Highlight the value for **Maximum Carrier Reference**. Press **Modify**.
 - Increase the value by 5. Press **Done**.
- (k) Return to step (h).
- (l) Set the maximum carrier reference:
- Record the current duty cycle and forward power values.
 - Record the power according to the external current probe.
 - Highlight the value for **Maximum Carrier Reference**. Press **Modify**.
 - Adjust the value to 1 higher than the current **Carr. Ref** value. Press **Done**.
- (m) The initial Forward Power measurement should be within 20 % of the actual value. In the Calibrate Meters menu (see 3.6.12 and 3.6.12.1) calibrate the Forward Power.

- Scroll through the parameters until **Forward Power** is highlighted. Press **Modify**.
 - Adjust the reading to the same value calculated in step (h). Record this level. Press **Done**.
- (n) Increase the power until maximum power is reached. Record the power level on the top line (status bar) of the GUI display.
- (o) Press **Power Increase** and **Power Decrease** at the same time to set the RF power to 0 W. Press **RF Off**.

4.3.6.4 CALIBRATING EXCITER DC VOLTAGES AND AMBIENT TEMPERATURE

- (a) Measure and record the following dc voltages on the control/display PWB (A1):
- TP18 (approx. 24 V)
 - TP12 (approx. 15 V)
 - TP20 (approx. -15 V)
 - TP9 (approx. 5 V)
- (b) In the Calibrate Meters menu (see 3.6.12 and 3.6.12.1) scroll through the parameters until **+24 Volt P/S** is highlighted. Press **Modify**.
- (c) Adjust the value to match the TP18 voltage measured in step (a). Press **Done**.
- (d) Repeat step (c) to calibrate the other parameters:
- **+15 Volt P/S** (measured on TP12)
 - **-15 Volt P/S** (measured on TP20)
 - **+5 Volt P/S** (measured on TP9)
 - **AC Voltage**
 - **Temperature** (use a thermometer to measure the ambient room temperature)



NOTE

When you exit the Calibrate Meters menu a message is displayed indicating that you have made changes. You will be prompted to save the changes to EEPROM so that they can be restored in the event of a power failure. Press **Yes** each time this prompt is displayed during the setup procedure.

During initial turn-on and adjustment of transmitter power, the diagnostic display's meters screen should be monitored.

4.3.6.5 CALIBRATING PDM

- (a) Use an oscilloscope to monitor TP17 of the active interphase PDM driver PWB (A6 for side A or A9 for side B).
- (b) Press **RF On**. Set modulation to 0%.
- (c) In the Calibrate Meters menu (see 3.6.12 and 3.6.12.1) scroll through the parameters until **PDM A** (or **PDM B**, depending on the transmitter's active side) is highlighted. Press **Modify**.
- (d) Adjust the value to match the positive duty cycle measured on TP17 in step (a). Press **Done**.

4.3.6.6 CALIBRATING REFLECTED POWER THRESHOLD AND OUTPUT NETWORK ALARM

- (a) Turn off the transmitter and disconnect the dummy load from the transmitter's RF output. Short the transmitter's RF output to ground near the RF output. Install the external current probe on the shorting jumper.
- (b) In the Set Thresholds menu (see 3.6.12 and 3.6.12.2) set the **Slowback Pwr (Per Block)** value to 100 W.

- (c) Set RF output power to 0 W. Press **RF On**. Monitor the external current while slowly increasing the power to half of the reflected power limit. Try to achieve a current of 1.8 A (should occur at approximately 40 W).

- (d) Calculate the actual reflected power using the following equation:

$$\text{Refld Pwr} = (I_{\text{short circuit}} / 2)^2 \times 50 \Omega$$

- (e) In the Calibrate Meters menu (see 3.6.12 and 3.6.12.1) scroll through the parameters until **Reflec. Power** is highlighted. The **Reflec. Power** value should be within 20% of the value determined in step (d).

- Press **Modify**.
- Adjust the value to match the level calculated in step (d). Press **Done**.

- (f) Press **Back** and select **Set Thresholds**.

- (g) Press **▲**, **▼** or **Next** until **Refl. Power Shutback** is displayed.

- Monitor the external current while slowly increasing the power to the reflected power limit. Try to achieve a current of 2.5 A (should occur at approximately 80 W).

- (h) If an **Output Network** alarm occurs before reaching the reflected power limit, increase the **Refl. Power Shutback** threshold level and press **Done** and return to step (h). Otherwise continue to step (j).

- (i) Decrease the **Refl. Power Shutback** threshold level until the **Output Network** alarm occurs. Press **Done**.

- (j) In the Set Thresholds menu, set the **Slowback Pwr** to 30 W (for VR250) or 15 W (for VR125).



- (k) Verify the reflected power cutback is below 30 W (for VR250) or 15 W (for VR125). Press **RF Off**.
- (l) Remove the shorting jumper from the transmitter's RF output. Reconnect the dummy load to the transmitter's RF output.

4.3.6.7 SETTING THE RF MONITOR LEVEL

- (a) Increase the transmitter's RF output to full power.
- (b) Connect a 50 Ω load to the **RF MONITOR** BNC connector (J8 of remote interface PWB A3, accessible at the back of the front panel. Monitor the voltage with an oscilloscope.
- (c) Adjust the remote interface PWB's **MONITOR LEVEL** potentiometer (R163) until the voltage is 1.0 V RMS.

4.3.6.8 CALIBRATING THE AC FAILURE ALARM

- (a) With the transmitter connected to a suitably rated dummy load, press **RF On** and increase to rated power.
- (b) Measure the dc voltage at TP13 on the control/display PWB (A1). Calculate and record the low ac voltage reference:

For VR250:
 $Low\ AC\ ref = 170 \times TP13/Ac\ Voltage$

For VR125:
 $Low\ AC\ ref = 90 \times TP13/Ac\ Voltage$

- (c) Monitor the dc voltage at TP19 on the control/display PWB.
- (d) In the Set Thresholds menu (see 3.6.12 and 3.6.12.2), scroll to the **Low AC Voltage** threshold. Press **Modify**.

- (e) Adjust the **Low AC Voltage** value until the voltage at TP19 matches the low ac voltage reference calculated in step (b). Press **Done**.
- (f) Turn off the transmitter's ac power. If testing is required, connect a variac between the ac power source and the transmitter. Turn on the ac power.
- (g) Use the variac to decrease the ac voltage until the System Diagram's **AC Mains** LED. The Diagnostic Display should display both Shutback A and Low AC. Record the ac voltage.
- (h) Press **RF Off**.
- (i) Turn off the ac power and disconnect the variac. Reconnect ac to the transmitter.

4.3.6.9 ADJUSTING FOR RF DRIVE SYMMETRY

Measure the symmetry of the RF drive applied from the active RF synthesizer PWB to the RF power modules as follows:

- (a) Select the side for the symmetry adjustment.
- (b) Press **RF On** and set the transmitter's RF output power to 0 W.
- (c) Connect an oscilloscope between TP2 (TP1 for side B) and ground on the exciter interface PWB (A2).
- (d) The oscilloscope should indicate a symmetrical (50% duty cycle) square wave with a nominal amplitude of 5 V peak-to-peak.
- (e) Adjust the appropriate RF synthesizer PWB's **SYMMETRY** potentiometer (R32) to obtain a $50 \pm 1\%$ duty cycle.



NOTE

If an external RF generator is producing the RF drive, verify its output waveform is symmetrical.

4.3.6.10 EQUALIZING EXCITER GAIN (Dual Side Transmitters Only)

If the RF output of the transmitter varies between side A and B, you may need to equalize the exciter gain. Equalize the PDM pulse train between sides A and B so that no change in RF output level occurs during exciter changeover, as follows:

- (a) Go to the Power Module Status menu (see 3.6.13.2).
- (b) Use an oscilloscope to monitor TP17 of interphase PDM driver PWB A (A6).
- (c) On interphase PDM driver PWB A (A6), adjust the **GAIN TRIM** potentiometer (R31) four turns counter clockwise and one and a half turns clockwise. On interphase PDM driver PWB B (A9), adjust the **GAIN TRIM** potentiometer (R31) four turns counter clockwise.
- (d) Press **RF On**. Increase the transmitter's RF output to full rated or maximum power, whichever is lower.
- (e) Use an external current probe to measure RF output power:

$$Power = Current^2 \times R_{load}$$

- (f) In the Maximum Output Gain menu (see 3.6.12.3), calibrate the duty cycle and forward power as follows:
 - Highlight the value for **Set Duty Cycle**. Press **Modify**.
 - Change the value to match the positive duty cycle measured at TP17 in step (c). Press **Next**.

- Change the value for **Set Forward Power** to match the power calculated in step (e). Press **Done**.
- (g) If the transmitter is operating at full power, go to step (o). If not:
 - Highlight the value for **Maximum Carrier Reference**. Press **Modify**.
 - Increase the value by 5. Press **Done**.
 - (h) Repeat step (e).
 - (i) Set the maximum carrier reference:
 - Record the current duty cycle and forward power values.
 - Record the power according to the external current probe.
 - Highlight the value for **Maximum Carrier Reference**. Press **Modify**.
 - Adjust the value to 1 higher than the current **Carr. Ref** value. Press **Done**.
 - (j) Increase the power until maximum power is reached. Record the power level on the top line (status bar) of the GUI display.
 - (k) Press **Power Increase** and **Power Decrease** at the same time to set the RF power to 0 W. Press **RF Off**.
 - (l) Select side B in the Changeover Control menu.
 - (m) Press **RF On**. Ensure all side B RF power module fans are on.
 - (n) Press **Power Increase** until you reach maximum power. Adjust **GAIN TRIM** potentiometer R31 on interphase PDM driver PWB B (A9) to ensure that the output power matches the output power recorded in step (j).



4.3.6.11 CALIBRATING BATTERY VOLTAGE, BATTERY CURRENT AND CHARGER CURRENT (Optional)

NOTE

This procedure applies to transmitters that use a dc power source and the battery boost PWB (A16).

- (a) Press **RF Off**.
- (b) Open the dc breaker and remove ac power from the transmitter. Disconnect the positive lead of the battery from the terminal block (TB1) on the battery boost PWB (A16). Reconnect the positive lead of the battery to TB1-3 on the battery boost PWB.
- (c) Connect a link, using 14 AWG wire, between TB1-4 and TB1-1 on the battery boost PWB. Close the dc breaker.
- (d) Measure and record the dc voltage between TB1-1 and TB1-2 on the battery boost PWB.
- (e) In the Calibrate Meters menu (see 3.6.12 and 3.6.12.1) scroll through the parameters until **Battery Voltage** is highlighted. Press **Modify**.
- (f) Adjust the value to match the voltage measured in step (a). Press **Done**.

NOTE

*When you exit the Calibrate Meters menu a message is displayed indicating that you have made changes. You will be prompted to save the changes to EEPROM so that they can be restored in the event of a power failure. Press **Yes** each time this prompt is displayed during the setup procedure.*

- (g) In the Power Source Select menu, change the transmitter's **Requested Power Source** to **DC** (see 3.6.9).

- (h) Press **RF On** and increase the RF output to rated power.
- (i) Use a clip-on dc current meter to measure the current between the battery and TB1-3 of the battery boost PWB.
- (j) In the Calibrate Meters menu scroll through the parameters until **Battery Current** is highlighted. Press **Modify**.
- (k) Adjust the value to match the current measured in step (i). Press **Done**.
- (l) In the Calibrate Meters menu scroll through the parameters until **Charger Current** is highlighted. Press **Modify**.
- (m) Adjust the value to match the current measured in step (i). Press **Done**.
- (n) Press **RF Off**.
- (o) Open the dc breaker. Remove the link, between TB1-4 and TB1-1 on the battery boost PWB. Disconnect the positive lead of the battery from TB1-3 on the battery boost PWB and reconnect it to TB1-1.
- (p) Close the dc breaker and reapply ac power to the transmitter.
- (q) In the Power Source Select menu, change the transmitter's **Requested Power Source** to **AC** (see 3.6.9).

4.3.6.12 SETTING DISPLAY CONTRAST

Set the contrast of the diagnostic display's GUI as follows:

- (a) In the Set Thresholds menu (see 3.6.12 and 3.6.12.2), scroll to the **LCD Display Contrast** threshold. Press **Modify**.
- (b) Adjust the contrast to the desired level. Press **Done**.



4.3.6.13 ADJUSTING SPEAKER VOLUME

See *Setting Protection Thresholds* (3.6.12.2). Adjust the Audio parameter as desired.

4.3.6.14 READING MODULATION LEVEL

Read the modulation level as follows:

- Connect an oscilloscope to the **RF MONITOR** connector (J8) on the remote interface PWB (A3).
- Set the exciter in CW mode: use ▲ and ▼ to scroll the display and set Modulation to **OFF** using the **Toggle** switch.
- Adjust the oscilloscope's timescale to 500 μs per division (for 400 Hz modulation). Adjust the amplitude level of the oscilloscope to just cover all eight divisions of the display with the RF signal (see Figure 4-2).

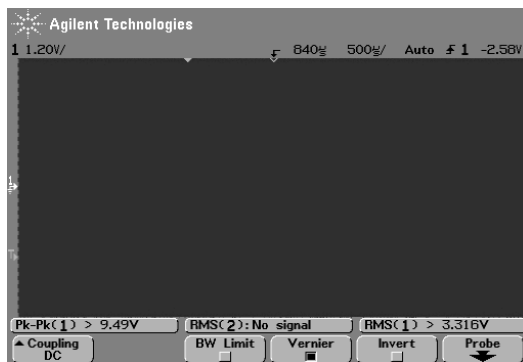


Figure 4-2: CW signal set to fill display

- Adjust the position of the oscilloscope signal so that the bottom of the CW waveform is at the mid-point of the display (see Figure 4-3).

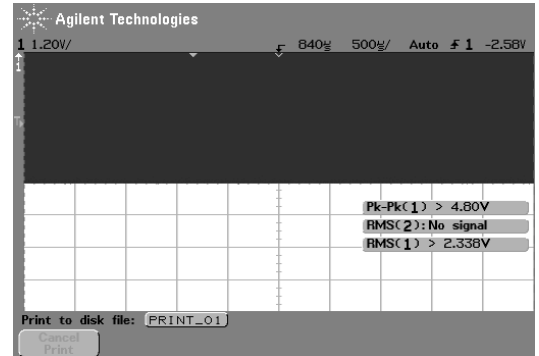


Figure 4-3: CW signal with position adjusted to mid-point of display

- Set the exciter in MCW mode: use ▲ and ▼ to scroll the display and set Modulation to **ON** and the Keyer to **OFF** using the **Toggle** switch.
- Measure the bottom of the waveform. Each sub-division should correspond to 5% in modulation. The bottom of the waveform should be one sub-division above the bottom of the display when the modulation is at 95% (see Figure 4-4).

NOTE

There may be some distortion in the trough. This is an effect of class D amplification called pinch off and can be ignored as it does not produce significant total harmonic distortion (THD).

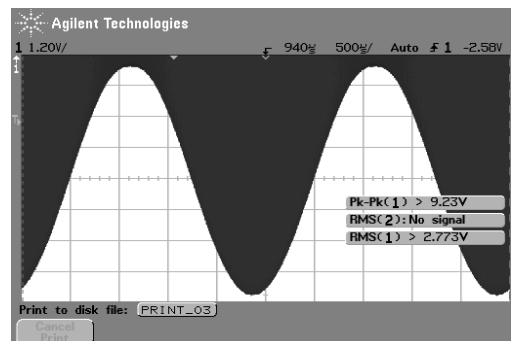


Figure 4-4: MCW signal, 95% modulation



- (g) If the modulation level requires adjustment select Main Menu/Peripherals/Keyer Settings/Audio Levels.
- (h) Adjust the Keying Pot (in Press-to-talk mode adjust the PTT Keying Pot) to get the desired level of modulation. This adjustment will affect both exciters.
- (i) Check if the reading on the diagnostic display agrees with the oscilloscope measurement. If necessary calibrate the meter as described in 3.6.12.1.



Vector-LP Radio Beacon Transmitter

TECHNICAL INSTRUCTION MANUAL

Section 5 MAINTENANCE AND TROUBLESHOOTING

5.1 GENERAL

This section contains scheduled and corrective maintenance information for the Vector-LP transmitter. Fault symptoms should be analyzed to determine the corrective action required. Troubleshooting information (see paragraph 5.5) is presented based on the exciter panel's diagnostic information.

CAUTION

The Vector-LP transmitter contains many solid state devices that may be damaged if subjected to excessive heat or high voltage transients. Ensure circuits are not overdriven or disconnected from their loads while turned on.

5.2 SCHEDULED MAINTENANCE

Scheduled maintenance consists of performing a visual inspection of the transmitter at scheduled intervals. The recommended minimum time between scheduled maintenance visits is one year. Local operating and environmental conditions may dictate more frequent visits and in remote sites, less frequent visits may be acceptable. Experience and system reliability will determine the most practical schedule for a specific installation.

5.2.1 Cleaning the Transmitter

As a minimum, perform the following cleaning procedures:

NOTE

A site located in a dirty area using open-air cooling requires more extensive cleaning than a site located in a clean area using closed-air cooling.

- Once a year, clean the transmitter using a vacuum cleaner and a soft-bristle brush to remove loose dirt. Use clean, damp rags to remove dirt that cannot be vacuumed. NEVER use compressed air to clean the transmitter.
- For VR250 transmitters only: Once a year, inspect and clean air filters using soap and warm water. If the air filters are damaged, replace them as soon as possible.

5.2.2 Checking Hardware

All hardware MUST be checked at least once a year. Thermal cycling from turning the transmitter on and off will require more frequent checks.

- Ensure the proper sized tools are used to prevent damaging the hardware. In most cases, hardware is metric.
- A mounting surface or terminal that has changed colour indicates a loose hardware connection.
- Multi-stranded cables installed on terminal strips MUST be re-torqued.

5.2.3 Battery Replacement

The transmitter's control/display PWB contains a battery backup circuit that provides a memory of alarm occurrences during ac power failure. The battery should be replaced at least once a year or whenever the diagnostic display on the exciter/control assembly's front panel indicates a 'low NVRM battery' message.



5.3 CORRECTIVE MAINTENANCE

Corrective maintenance procedures consist of identifying and correcting defects or deficiencies that arise during operation of the transmitter. Local/remote alarm signals are generated when a malfunction occurs. The nature of the fault and station policy dictates whether immediate maintenance response is necessary. Fault analysis and rectification may be conducted from three different levels with a different technical competence level required for each.

5.3.1 On-Air Troubleshooting

On-air troubleshooting can be performed from a remote location or locally at the transmitter site.

5.3.1.1 Remote Troubleshooting

Remote on-air troubleshooting consists of monitoring the transmitter's RF output using an on-air monitor and polling the status of the transmitter using the optional remote control and monitoring software. This information enables you to decide if a response is deferred to a more convenient time, if immediate corrective action is taken, and whether a standby transmitter is enabled (if available). Nautel recommends you incorporate the significance of remote indications and the appropriate responses into the station's standard operating procedures. Refer to paragraph 5.5 to determine the troubleshooting action required for a given fault.

5.3.1.2 Local Troubleshooting

Local on-air troubleshooting consists of monitoring the transmitter's diagnostic display and fault alarm indicators. Analysis of their status normally identifies the type of fault and in most cases determines what corrective action must be taken. Refer to paragraph 5.5 to determine the troubleshooting action required for a given fault.

5.3.2 Off-Air and Standby Side Troubleshooting

Off-air troubleshooting is performed when proper operation cannot be restored. In dual side (A and B) transmitters, if an active side PWB or assembly is defective, the transmitter automatically changes over allowing safe replacement of the defective PWB or assembly. You can remove the RF power module from the active side, but a changeover (for dual side applications) or inhibit (for single side applications) will occur. Troubleshooting for a majority of standby side faults can be performed using the test standby side troubleshooting menu (paragraph 3.6.13.4).

For off-air troubleshooting procedures, Nautel recommends you connect the output to a precision 50 Ω , resistive dummy load (rated for twice the transmitter's maximum carrier power). If a suitable dummy load is not available, the transmitter may remain connected to its antenna for these procedures. When it is necessary to troubleshoot faults in the power amplifier stage, reduce the RF output level to a minimal value when the RF output is connected to the antenna.

5.4 ELECTROSTATIC PROTECTION

The transmitter's assemblies contain semiconductor devices that may be damaged by electrostatic discharge. Before removing an assembly from the transmitter, and while servicing an assembly, observe the following precautions:

NOTE

Electrostatic energy is produced when two insulating materials are rubbed together. A person wearing rubber-soled shoes, walking across a nylon carpet or a waxed floor can generate an extremely large electrostatic charge. This effect is magnified during periods of low humidity. This high voltage may damage components such as integrated circuits, field-effect transistors, thyristors, and Schottky diodes unless adequate precautions are taken.



5.4.1 Discharging of Personnel
Maintainers should be electrically discharged by a suitable grounding system (anti-static mats, grounding straps) during removal of an assembly from the exciter and while handling the assembly for maintenance procedures.

5.4.2 Handling/Storage
A sub-assembly should be placed in an anti-static bag when it is not installed in the exciter or when it is not being subjected to maintenance procedures. Electronic components should be stored in anti-static materials.

5.4.3 Tools/Test Equipment
Testing and maintenance equipment, including soldering (for example: Irons with grounded tips) and unsoldering tools, should be suitable for contact with static sensitive semiconductor devices.

5.4.4 Stress Current Protection
Protect static sensitive semiconductor devices from unnecessary stress current as follows:

- Ensure electrical connections are not broken while current is flowing in the circuit.
- Ensure voltages are not present on external control/monitoring circuits when they are connected.

5.5 TROUBLESHOOTING FRONT PANEL ALARMS
Front panel fault analysis can be performed from the exciter panel. There are several ways to use the front panel to determine the occurrence and origin of a fault:

- The system diagram is a flow diagram that indicates the operational status of various sections of the transmitter. If a lamp is on (red), a fault is occurring in the associated section of the transmitter.

- The diagnostic display's meter screen has real-time meter indications (e.g., forward power) to assist in fault analysis.
- The diagnostic display's main screen will indicate when a fault is occurring. Press the **Status** soft key to display all active faults.
- The diagnostic display's **Events Log** (see paragraph 3.6.5) provides a chronological list of faults/events as well as root cause information to assist in fault diagnosis.

NOTE

*It is important to consider both the real-time and the logged information when troubleshooting. Displayed active faults may or may not be the root cause of the problem. The **Events Log** displays the root cause of an event (i.e., the first fault detected), which may have been transient, but resulted in other faults that remain active. It also displays the status of certain parameters at the time of the event.*

- (a) Determine the origin of the fault by noting which of the system diagram's lamps has turned on. If no system diagram lamp is on, proceed to step (b) for non-alarm troubleshooting tips.

NOTE

*In dual side (A and B) transmitters, some faults will also initiate a **Changeover** alarm. In this case, the transmitter will continue to operate using the standby side. This may allow troubleshooting (and subsequent repair) to be deferred to a more convenient time.*

NOTE

The troubleshooting procedures in this manual are limited to module level checks and sub-assembly replacement.



(b) From the diagnostic display's main screen, press the **Status** button. Note the alarm indication(s) and refer to Table 5-1 for troubleshooting tips, which may also reference replacement and subsequent re-calibration procedures.

(c) The diagnostic display will indicate the current active faults and more specifically identify the nature of the fault.

e.g., PDM Drive A Fail

(d) Attempt to clear the alarm by pressing the reset button. If the alarm persists, it will not be cleared from the display.

(e) In the example given in step (c), a PDM Drive A Fail has occurred indicating a problem with exciter A's interphase PDM driver PWB. The suspect PWB should be replaced as detailed in paragraph 5.8.1.2.

NOTE

For dual side transmitters, a changeover to the standby side should also occur. Determine which side caused the fault, noting it is the opposite side to that displayed on the transmitter status bar at the top of the diagnostic display.

*Viewing the diagnostic display's **Events Log** (see paragraph 3.6.5) can also assist in diagnosing a fault.*

(f) Other fault indications may prompt the troubleshooter to replace other PWBs/assemblies or an RF power module (e.g., PA Alarm A indicates a fault has occurred on the side A RF power module).

NOTE

Replacement procedures (paragraphs 5.6, 5.8 and 5.9) are provided for RF power modules and PWBs/assemblies that require specific removal/installation or adjustment instructions. Instructions have not been included for assemblies that are straightforward to replace and require no re-calibration.

(g) If replacement of a suspect PWB or assembly does not remove the fault condition, contact Nautel.



Table 5-1: Troubleshooting and Replacement Tips

Front Panel LED	Status Message	Action	See Troubleshooting/ Replacement Paragraph	See Re-calibration Paragraph
AC Mains	Low AC Voltage	The ac voltage is less than 170 V ac (or 90 V ac for VR125 transmitters). If the ac source voltage is present, check the ac breaker at the back of the transmitter. If the breaker is OK, replace the interface PWB (A11).	5.8.3	N/A
Low Voltage Power Supply	LVPS Fault A or B	Replace associated ac/dc universal input power supply [side A (U2) or side B (U3)].	N/A	N/A
Power Supply	Over Voltage PS A or B	Replace switch mode power supply PWB (A2 of associated RF power module).	5.6.1	3.6.13.4 (ensure the replaced/repared module is on the standby side)
Power Supply	Over Current PS A or B	Replace switch mode power supply PWB (A2 of associated RF power module). If the transmitter is running in dc mode (optional), and this alarm is indicated on the active side, replace battery boost assembly A16. Otherwise, check cabling between A7 and A3 through A6.	5.6.1 5.9	3.6.13.4 (ensure the replaced/repared module is on the standby side)
Power Supply	High Temp PS A or B	Check fans. Ensure they are spinning at an adequate speed (a minimum of 3000 RPM, see 3.6.13.2). If necessary, replace the appropriate fan.	N/A	N/A
Power Supply	PS A or B Missing Module	An RF power module has been removed from the associated side.	N/A	N/A
PA	Modulator Fail A or B	Check/replace FET on modulator assembly (A5 of associated RF power module).	5.6.1 5.7	3.6.13.4 (ensure the replaced/repared module is on the standby side)
PA	PA Alarm A or B	Check/replace FETs on power amplifier (A3 of associated RF power module).	5.6.1 5.7	3.6.13.4 (ensure the replaced/repared module is on the standby side)
PA	PDM Inhibit A or B	A module has been removed from the transmitter. A PS Missing Module message will indicate which module has been removed.	N/A	N/A
Exciter	Low NVRAM Bty	Replace battery BT1 on the control/display PWB (A1).	N/A	N/A
Exciter	RF Fail A or B	Replace the RF synthesizer PWB [side A (A5) or side B (A8)].	5.8.1.1	4.3.6.1 4.3.6.9
Exciter	PDM Latch A or B	Change the active side of the exciter and run a standby side test on the power supply (see 3.6.13.4). If a fault is detected, replace switch mode power supply PWB of faulty power module. If no fault is detected, replace interphase PDM driver PWB [side A (A6) or exciter B (A9)].	5.8.1.2	4.3.6.3 (single side) or 4.3.6.10 (dual side) 3.6.13.4 (ensure the replaced/repared module is on the standby side)



Table 5-1: Troubleshooting and Replacement Tips (Continued)

Front Panel LED	Status Message	Action	See Troubleshooting/ Replacement Paragraph	See Re-calibration Paragraph
Exciter	Monitor Fault A or B	Indicates a fault in a monitor PWB. The Monitor Fault will be accompanied by an indication of the fault. If it is not accompanied by a specific fault, replace the exciter monitor/generator PWB [side A (A7) or side B (A10)].	5.8.2	4.3.5.5 (if applicable) 4.3.5.6 (if applicable) 4.3.5.7 (if applicable) 4.3.5.8 (if applicable) 4.3.5.9 (if applicable) 4.3.5.10
Exciter	E/G not responding A or B	Indicates that an exciter monitor/generator PWB is not responding. Replace the exciter monitor/generator PWB [side A (A7) or side B (A10)].	5.8.2	4.3.5.5 (if applicable) 4.3.5.6 (if applicable) 4.3.5.7 (if applicable) 4.3.5.8 (if applicable) 4.3.5.9 (if applicable) 4.3.5.10
Exciter	Mon PGM Fault A or B	Indicates that an exciter monitor/generator PWB has an EEPROM or Flash memory error. Replace the exciter monitor/generator PWB [side A (A7) or side B (A10)].	5.8.2	4.3.5.5 (if applicable) 4.3.5.6 (if applicable) 4.3.5.7 (if applicable) 4.3.5.8 (if applicable) 4.3.5.9 (if applicable) 4.3.5.10
Exciter	Keying Gate Monitor Fail A or B	Indicates that the tone level is not at the correct level. Ensure that the thresholds have been set up correctly. If they have been, and the tone is at an adequate level, replace the exciter monitor/generator PWB [side A (A7) or side B (A10)]. As long as this fault persists, output power is inhibited.	5.8.2	4.3.5.5 (if applicable) 4.3.5.6 (if applicable) 4.3.5.7 (if applicable) 4.3.5.8 (if applicable) 4.3.5.9 (if applicable) 4.3.5.10
Exciter	Pwr. Monitor Fail A or B	Indicates that the transmitter's output power is outside of the desired thresholds. If there is no accompanying error message, a power amplifier (A3) in an RF power block may be damaged. Try operating the transmitter at rated power. If the problem persists, check/replace FETs on the associated power amplifier.	5.6	3.6.13.4 (ensure the replaced/repared module is on the standby side)
Exciter	Mod Depth Fault A or B	Indicates that the transmitter's modulation depth is below the desired low limit. Ensure that the thresholds have been set up correctly. If they have been, and the mod depth is at an adequate level, replace the exciter monitor/generator PWB [side A (A7) or side B (A10)].	5.8.2	4.3.5.5 (if applicable) 4.3.5.6 (if applicable) 4.3.5.7 (if applicable) 4.3.5.8 (if applicable) 4.3.5.9 (if applicable) 4.3.5.10
Exciter	Monitor Fail	Indicates that one, not both, of the exciter monitor/generator PWBs [side A (A7) or side B (A10)] requested a changeover. It is typical for a brief monitor fail event to occur after a changeover. If the problem persists and the transmitter is not operating near an alarm threshold, replace the faulty exciter monitor/generator PWB [side A (A7) or side B (A10)].	5.8.2	4.3.5.5 (if applicable) 4.3.5.6 (if applicable) 4.3.5.7 (if applicable) 4.3.5.8 (if applicable) 4.3.5.9 (if applicable) 4.3.5.10



Table 5-1: Troubleshooting and Replacement Tips (Continued)

Front Panel LED	Status Message	Action	See Troubleshooting/ Replacement Paragraph	See Re-calibration Paragraph
Output Network	SWR Shutback	RF power has been inhibited due to high reflected power. Check the RF path between the transmitter's RF output and the antenna system. If the instantaneous reflected power exceeds 80 W, the RF output is shut back. The power level will automatically recover to its previous level. If two consecutive SWR shutbacks occur within a two second period, the RF output is cut back (see SWR Cutback).	N/A	N/A
Output Network	Cutback Level 1-18	There are 18 steps (or cutback levels) available. The transmitter will continue decreasing or increasing the RF output power until normal operating power is achieved, at which point the SWR alarm will disappear. If two consecutive SWR shutbacks occur within a two second period, the transmitter enters the next highest cutback level (1-18). If the average peak reflected power exceeds 30 W (VR250) or 15 W (VR125), the transmitter enters the next highest cutback level (1-18). When the reflected power level falls below 30 W (VR250) or 15 W (VR125), the transmitter will enter the next lowest cutback level (1-18). During a cutback, the System Diagram's Output Network alarm lamp blinks and the Diagnostic Display indicates the cutback level (1-18).	N/A	N/A
Changeover	Monitor Changeover	Check the accompanying error message to determine the cause of the changeover.	N/A	N/A
Changeover	Monitor Shutdown	Check the accompanying error message to determine the cause of the shutdown.	N/A	N/A
Changeover	Frequency Monitor A or B	The carrier frequency of the associated RF synthesizer PWB is outside the acceptable tolerance (typically $\pm 0.01\%$, or $\pm 0.005\%$ if operating at frequencies ≥ 1606.5 kHz and power levels > 200 W). If only one alarm occurs, suspect the monitoring circuitry on the associated exciter/monitor/generator PWB. If both A and B alarms occur, suspect a fault with the RF synthesizer PWB that was active prior to the changeover.	N/A	N/A
External Alarm	Ext Interlock Open	An external interlock circuit is open. Check the integrity of the circuitry connected between terminals TB1-19 and TB1-20 of the remote interface PWB (A3).	N/A	N/A
External Alarm	Charger Alarm	Check for battery charger failure.	N/A	N/A
External Alarm	Low Battery Voltage	The battery voltage is below the low voltage threshold. Check battery.	N/A	N/A
External Alarm	ATU Not Responding	The associated ATU is not responding. Check connection between transmitter and ATU.	N/A	N/A
External Alarm	RCMI Not Responding	The NDB site interface PWB is not responding. Replace the NDB site interface PWB.	N/A	4.3.5.1 4.3.5.3



Table 5-1: Troubleshooting and Replacement Tips (Continued)

Front Panel LED	Status Message	Action	See Troubleshooting/ Replacement Paragraph	See Re-calibration Paragraph
-	-	Replace the RF power probe (A15).	N/A	4.3.6.3
-	-	Replace the optional battery boost assembly (A16).	5.9	4.3.6.11 (if applicable)
-	-	Replace the modulator filter PWB (A4) of the applicable RF power module (A12 or A13).	5.6	3.6.13.4 (ensure the replaced/repared module is on the standby side)
-	-	Replace the RF filter PWB (A14).	Tables 2-7a and 2-7b	4.3.6.2
-	-	Replace the control/display PWB (A1). Verify all jumper settings on the replacement PWB are the same as the replaced PWB.	N/A	4.3.5.1 4.3.5.2 4.3.5.3 (if applicable) 4.3.5.5 (if applicable) 4.3.5.11 4.3.6.3 (single side) or 4.3.6.10 (dual side) 4.3.6.4 4.3.6.5 4.3.6.8 4.3.6.11 (if applicable) 4.3.6.12
-	-	Replace the remote interface PWB (A3). Verify all jumper settings on the replacement PWB are the same as the replaced PWB.	N/A	4.3.5.4 4.3.5.9 (if applicable) 4.3.5.10 (if applicable) 4.3.5.11 (if applicable) 4.3.6.7

NOTE: PWBs and assemblies that are not referenced in this table do not require special replacement or re-calibration procedures.



5.6 REPLACING AN RF POWER MODULE

The diagnostic display status messages indicate which RF power module caused an alarm. In dual side applications (A and B), the transmitter should change over to operate on the standby side.

NOTE

A defective RF power module can be removed for repair as described below. After removing the RF power module (in dual side applications), the transmitter can resume operation on its standby side.

CAUTION

RF power modules contain solid-state devices that can be damaged if subjected to excessive heat or high voltage transients. Ensure circuits are not overdriven or disconnected from their loads while turned on.

5.6.1 RF Power Module Removal See Figure 5-1.

- (a) Remove the top cover from the applicable RF power module by removing five M4 screws. RF power module A is nearer the front of the transmitter. For some transmitters, it will also be necessary to remove the support brackets on either side of the RF power module. To do this, you will need to remove the two screws from the other RF power module's cover.
- (b) If they were not removed during installation, remove four M4 shipping screws (for each RF power module) from the bottom of the transmitter. These screws are no longer required.
- (c) Remove the cable connected near the top of the RF power module by releasing the spring latches on either side of the connector, then unplugging the connector.

- (d) Grip the flanged edge at the top of the RF power module and carefully lift the module out of the transmitter cabinet.
- (e) Replace a defective FET (see 5.7) or an entire PWB or assembly (see Figure MD-10) as necessary.

NOTE

If an operational RF power module is available, you can install it in the transmitter while you repair the defective module. Refer to paragraph 5.6.2 to install an RF power module.

5.6.2 RF Power Module Installation

CAUTION

Ensure proper orientation of an RF power module before installing it in the transmitter. The mating connector at the bottom of the module (see Figure MD-10) should face the back of the transmitter.

- (a) Carefully insert the operational RF power module in the appropriate slot in the top of the transmitter. Align the module with the guides on each side of the transmitter. Slide the module down into the transmitter and push firmly into place.
- (b) Replace the top cover for the applicable RF power module and secure using five M4 screws. Three of these screws fasten to the holes in the flanged edge at the top of the module.
- (c) Press **Reset** in the status menu. Verify the **PA** or **Power Supply** lamp on the front panel's system diagram turns off. In single side applications, the transmitter should resume operation at the desired operating level.



**Battery Boost Assembly A16
Replacement: Remove two M3**

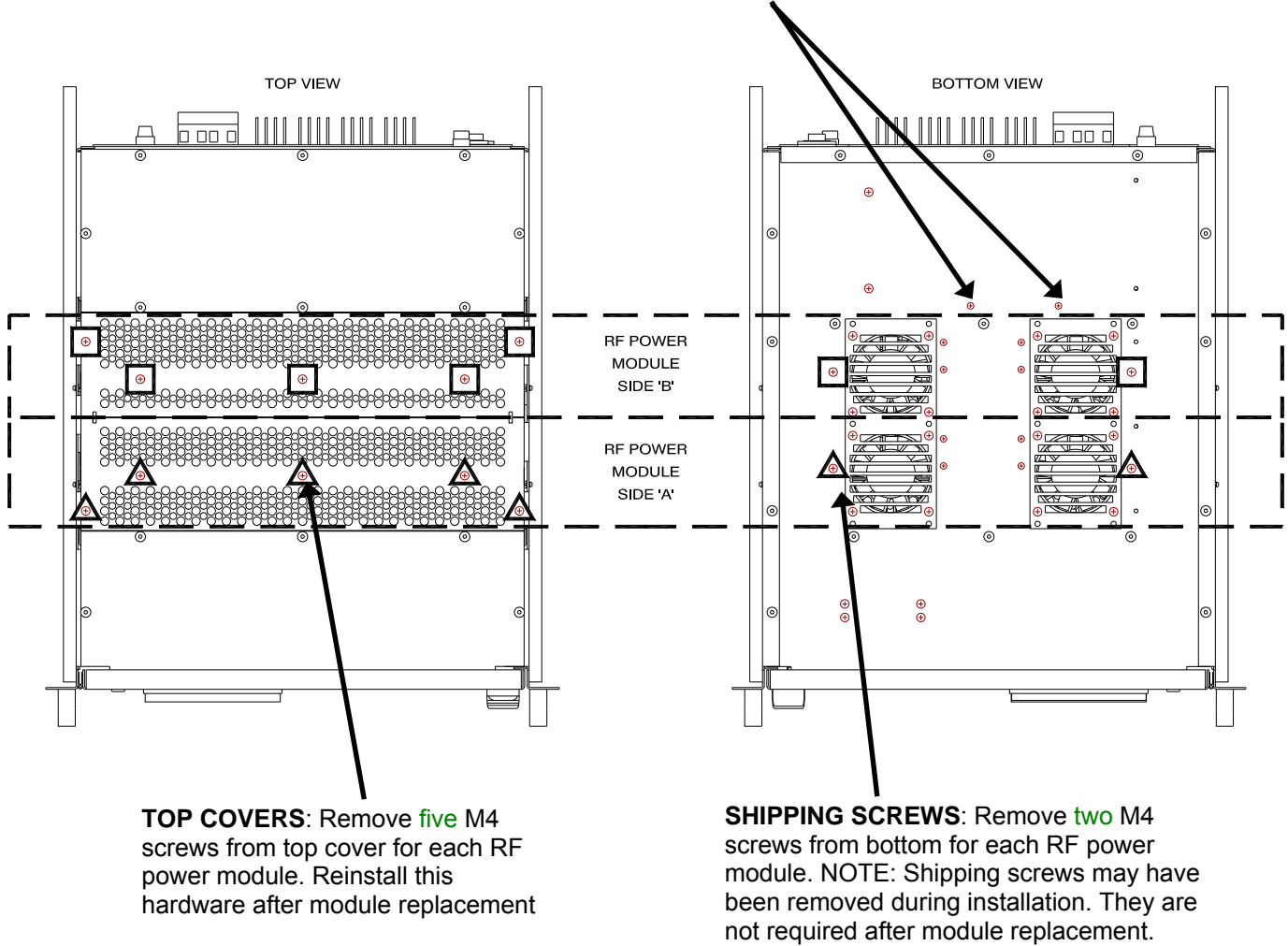


Figure 5-1: RF Power Module Securing Hardware



5.7 FET CHECKING/ REPLACEMENT

The transmitter contains many FETs. The FETs most likely to fail are in RF power modules A and B. For failures caused in an RF power module, remove the module (see 5.6.1), check the devices listed below and, if necessary, replace them.

NOTE

The station spares kit, if purchased, contains Nautel parts referenced below.

- FETs Q1 and Q2 (Nautel Part # QR54) of switch mode power supply PWB A2 (see Figures MD-10 and MD-12)
 - power MOSFETs Q1 through Q4 (Nautel Part # QAP49) of power amplifier A3 (see Figures MD-10 and MD-13)
 - power MOSFET Q1 (Nautel Part # QAP49) of modulator A5 (see Figures MD-10 and MD-15; same device as in power amplifier A3)
- (a) Unsolder the gate pins of the FET under test and all parallel devices. Refer to the assembly's electrical schematic in Section 9 to determine the parallel devices, if applicable. Refer to the assembly's detail drawing in Section 10 to verify pin-out.

NOTE

To turn on a FET under test, apply a dc voltage between its gate and source terminals. Some digital multimeters have enough dc voltage (9 V battery recommended) on their test leads when set to the 'diode' or 'resistance' positions. If not, obtain another dc voltage source.

- (b) Turn off the FET by shorting the gate and source. Using a digital multimeter, momentarily place the negative lead on the gate pin and positive lead on the source pin for each FET in the circuit.

- (c) Measure the drain-source resistance with the positive lead on the drain and the negative lead on the source. The digital multimeter should indicate an open circuit.
- (d) Measure the drain-source resistance with the negative lead on the drain and the positive lead on the source. The digital multimeter should indicate a diode pedestal.
- (e) If the requirements of steps (c) and (d) are not met, replace the device as detailed in steps (i) through (m).
- (f) Turn on the device under test by placing the positive lead on the gate and the negative lead on the source.
- (g) Measure the drain-source resistance with the positive lead on the drain and the negative lead on the source. The digital multimeter reading should indicate a short circuit.
- (h) If the requirement of step (g) is met, the FET is operational. Turn it off as detailed in step (b) and proceed to the next suspect device. If the requirement of step (g) is not met, replace the device as detailed in steps (i) through (m).
- (i) Unsolder the drain and source pins of the defective device.
- (j) Remove the hardware securing the device in place and remove the defective device. Clean the associated heat sink surface near the input PWB.
- (k) Apply a thin, even coat of thermal compound on the bottom of the new device.

NOTE

FETs are static sensitive. Handle replacement devices in a manner that protects the FETs from static.



- (l) Reinstall the device on its cleaned heat sink using the hardware removed in step (j). Replace the Belleville (cupped) washer with a new washer (Nautel Part # HZ48, located in ancillary kit). Apply a thin, even coat of thermal compound to both sides of the insulator (if replaced). Refer to the assembly's detail drawing in Section 10 to verify the hardware orientation for the device being replaced.
- (m) Using a torque screwdriver, tighten the mounting hardware to the value (typically 3 to 4 inch-pounds) specified on the assembly's detail drawing in Section 10, ensuring that the pins of the device are aligned with their corresponding solder terminals. Solder the pins to their associated terminals.

5.8 EXCITER PANEL PWB REPLACEMENT

Replace defective printed wiring boards (PWBs) on the exciter panel and perform necessary adjustments as follows:

NOTE

The exciter panel is located directly behind the transmitter's front panel (see Figure 2-2). It contains all the PWBs referenced in the following replacement procedures.

- (a) Press the **Control - RF OFF** switch. Switch off the ac power and disconnect the dc supply, if applicable.
- (b) Gain access to the exciter panel by opening the hinged front panel.
- (c) Replace the appropriate assembly or PWB (see 5.8.1, 5.8.2 or 5.8.3).

5.8.1 Exciter Interface PWB and Interconnecting PWB Replacement
See 5.8 first. The exciter interface PWB (A2) physically interconnects with the RF synthesizer PWBs (A5 and A8) and the interphase PDM driver PWBs (A6 and A9). Removing the exciter interface PWB involves removing its interconnecting PWBs first. Complete the instructions in the sub-paragraphs (5.8.1.1, 5.8.1.2, and/or 5.8.1.3) to replace the appropriate PWB. Complete all three paragraphs if replacing the exciter interface PWB.

5.8.1.1 RF SYNTHESIZER PWB REMOVAL/REPLACEMENT

(See 5.8 and 5.8.1 first)

- (a) Remove six sets of mounting hardware from the RF synthesizer PWB being replaced (A5 or A8). If the exciter interface PWB is to be removed (see 5.8.1.3), remove both RF synthesizer PWBs, if applicable, and go to 5.8.1.2.
- (b) Pull the PWB(s) away from the exciter interface PWB (A2A2). It may be helpful to gently pry the connector loose with a screwdriver.
- (c) Install the new RF synthesizer PWB by reversing the steps above.
- (d) Install all shorting jumpers on the replacement PWB in the same position as the replaced PWB.
- (e) Verify the carrier frequency is set using BCD switches S1 through S5. Each switch represents one of the five most significant digits in the carrier frequency expressed in kHz:
 - S1 is thousands digit (**x1000**)
 - S2 is hundreds digit (**x100**)
 - S3 is tens digit (**x10**)
 - S4 is units digit (**x1**)
 - S5 is the tenths digit (**x0.1**)



NOTE

When an RF synthesizer PWB configured to operate from an external RF drive source is installed in a transmitter, its frequency synthesizer must be operational and its BCD switches must be set to produce the assigned carrier frequency. The synthesizer's output is used to obtain the $2(f_{PDM})$ output which ultimately determines the host transmitter's pulse duration modulation frequency (f_{PDM}).

- (f) Perform RF drive symmetry testing and adjustment procedures (see 4.3.6.9).

5.8.1.2 INTERPHASE PDM DRIVER PWB REMOVAL/REPLACEMENT

(See 5.8 and 5.8.1 first)

- (a) Remove the protective cover over the interphase PDM driver PWB being replaced (A6 or A9). The cover is secured using seven sets of M3 mounting hardware.
- (b) Remove and retain four sets of mounting hardware for the interphase PDM driver PWB being replaced (A6 or A9). If the exciter interface PWB is to be removed (see 5.8.1.3, remove both interphase PDM driver PWBs, if applicable, and go to 5.8.1.3.
- (c) Pull the PWB(s) away from the exciter interface PWB (A2). It may be helpful to gently pry the connector loose with a screwdriver.
- (d) Install the new interphase PDM driver PWB by reversing the steps above.
- (e) Verify that shorting jumper E1 is installed in the D position.
- (f) For dual side transmitters, perform the *Equalizing Exciter Gain* adjustment procedure (see 4.3.6.10). For a single side transmitter perform the *Calibrating Transmitter Output Power* adjustment procedure (see 4.3.6.3).

5.8.1.3 EXCITER INTERFACE PWB REMOVAL/REPLACEMENT

(See 5.8 and 5.8.1 first)

- (a) Remove all connections to the top and bottom of the exciter interface PWB.
- (b) Remove and retain 13 sets of mounting hardware for the exciter interface PWB. Remove the PWB.
- (c) Install the new exciter interface PWB. Re-install connections to the top and bottom sides. Use the connector tag labels or the connector mating information after Table 8-2 to determine proper connections.
- (d) Set all shorting jumpers as per the original exciter interface PWB.
- (e) Re-install the RF synthesizer PWB(s) removed in paragraph 5.8.1.1 and the interphase PDM driver PWB(s) removed in paragraph 5.8.1.2.
- (f) Re-install the exciter/control assembly in the transmitter by reversing the steps in paragraph 5.8.

5.8.2 Exciter Monitor/Generator PWB Replacement

See 5.8 first. Remove the exciter/monitor generator PWB (A7 and, for dual side transmitters, A10) as follows.

- (a) Remove and retain four sets of mounting hardware for the exciter monitor/generator PWB being replaced.
- (b) Remove all connections to the exciter monitor/generator PWB.
- (c) Install the new exciter monitor/generator PWB. Re-install connections. Use the connector tag labels or the connector mating information in Section 8 to determine proper connections.
- (d) Perform the following calibration procedures: 4.3.5.5, 4.3.5.6, 4.3.5.7, 4.3.5.8, 4.3.5.9 and 4.3.5.10.



5.8.3 Interface PWB Replacement
See 5.8 first. Remove the interface PWB (A11) as follows.

NOTE

The interface PWB is located on the back of the exciter panel (see Figure 4-1).

- (a) Remove the RF power module(s) from the transmitter (see 5.6.1) to gain access to the interface PWB.
- (b) Remove all connections (ribbon cables, D-sub and quick-disconnects) to the interface PWB.
- (c) Using a short Philips screwdriver, remove and retain ten sets of M3 mounting hardware.
- (d) Install the new interface PWB. Re-install connections. Use the connector tag labels or the connector mating information in Section 8 to determine proper connections.
- (e) Reinstall the RF power module(s) in the transmitter (see 5.6.2).

5.9 BATTERY BOOST ASSEMBLY REPLACEMENT

Replace a defective battery boost assembly (A16) as follows:

NOTE

The battery boost PWB (A16A1) is not provided as a spare part on its own. If a spare is purchased, it is provided as part of the entire battery boost assembly (A16). For ease of maintenance it should be replaced as an assembly, as described in this paragraph.

- (a) Press the **Control - RF OFF** switch. Switch off the ac power and disconnect the dc supply, if applicable.
- (b) Disconnect the dc input wiring from in terminal block A16TB1
- (c) Remove the access panel at the back of the transmitter (see Figure 2-2), noting it is secured by 12 M3 screws.
- (d) Remove all connections (D-sub and quick-disconnects) to the battery boost assembly.
- (e) Remove and retain four sets of M3 mounting hardware for the battery boost assembly at the back of the transmitter (see Figure 2-2) and two sets of M3 mounting hardware on the bottom of the transmitter (see Figure 5-1). Remove the battery boost assembly.
- (f) On the replacement assembly, ensure that shorting jumpers A1E5 and A1E7 through A1E10 are installed in the same position as the replaced assembly (see Table 3-8).
- (g) Install the new battery boost assembly using retained hardware for the back and the bottom. Re-install dc input wiring and mating connectors. Use the connector tag labels or the connector mating information in Section 8 to determine proper connections.
- (h) Reinstall the access panel removed in step (c).



Vector-LP Radio Beacon Transmitter

TECHNICAL INSTRUCTION MANUAL

Section 6 THEORY OF OPERATION

6.1 INTRODUCTION

The theory of operation for the Vector-LP Radio Beacon transmitter is presented in this section. Frequent reference is made to electrical schematics (e.g., Figure SD-1). They are located in Section 9 of this manual. Circuits that are shown on electrical schematics, but not described in this section are either beyond the scope of this manual or are not used for NDB applications.

6.2 TRANSMITTER OVERVIEW

The transmitter operates at one fixed frequency in the LF/MF band (190 kHz to 535 kHz) or in the MF band (536 kHz to 1200 kHz and 1600 kHz to 1800 kHz). It provides up to 125 W (VR125) or 250 W (VR250) of continuous carrier power. It automatically transmits specific beacon identification signals at pre-selected repetition rates. Special codes may also be transmitted when commanded from an external source. Provision is made for local or remote operation of the transmitter as well as antenna fine-tuning through controls on the transmitter's front panel. If the standby option is purchased, provision is made for automatic changeover from the selected main side of the transmitter to the standby side when the selected main side's critical parameters are not met. The transmitter operates from a single phase, 47 Hz to 63 Hz ac power supply (170 V to 270 V ac for VR250; 90 V to 270 V for VR125), using switch mode power supplies. A 48 V dc input option (and 24 V dc for VR125 only) can also be purchased. Emission is continuous carrier (NON) beacon keyed identification tone (A2A) and beacon with voice (A2A/A3A).

Local control/monitoring is done using front panel membrane switches and a graphic liquid crystal display. Critical parameters such as forward power, reflected power and antenna current can also be displayed on an analog meter on the front of the transmitter.

Remote control and monitoring can be provided over several optional interfaces. The transmitter also has provision to interface with a Nautel antenna tuning unit (ATU), using an isolated RS485 serial link. This ATU link allows the transmitter to regulate antenna current, and therefore maintain constant field strength, by auto-adjusting its output power in accordance with the ATUs antenna current sample.

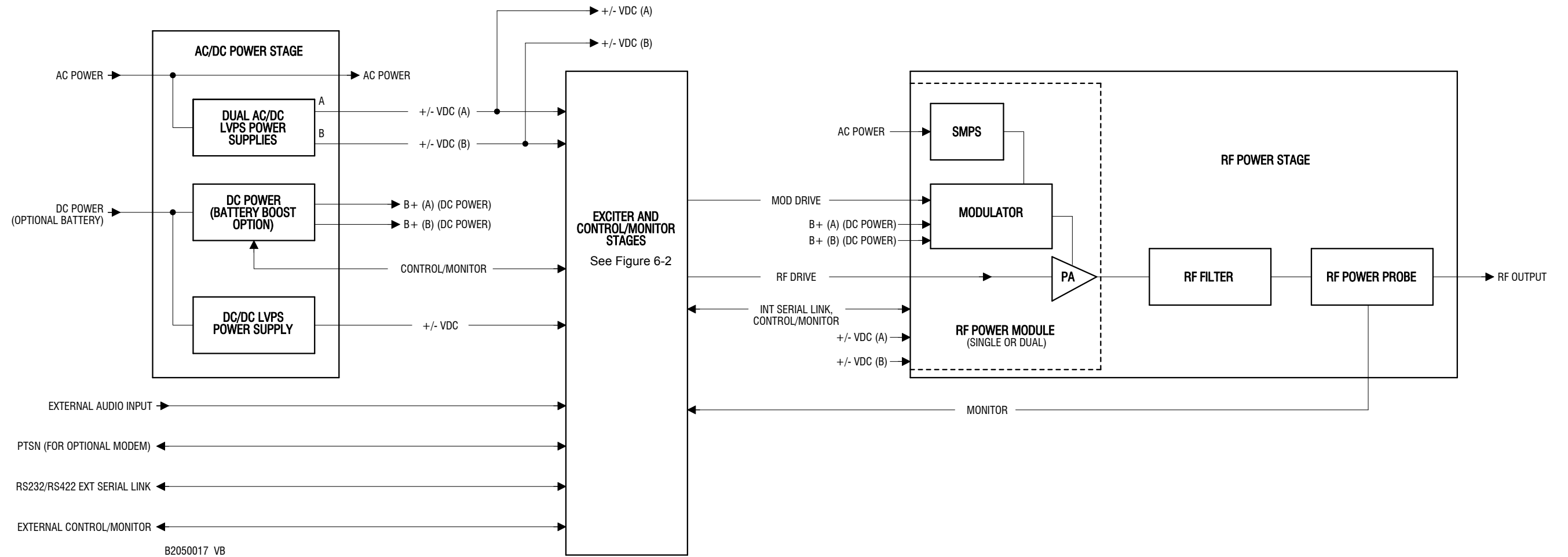
The transmitter circuitry can be represented using four functional stages (see Figure 6-1):

- Ac-Dc Power Stage
- Exciter Stage
- Control/Monitor Stage
- RF Power Stage

6.3 AC-DC POWER STAGE

See Figures 6-1 and SD-1. The ac-dc power stage accepts the ac power source or optional dc power source and converts it to the necessary low level dc voltages required throughout the transmitter. The ac input voltage is also applied directly to the RF power stage. The ac-dc power stage's primary components are the ac-dc universal input power supplies (U2 and U3, if used) and the interface PWB (A11). If the dc input option is purchased, the transmitter also includes the dc-dc universal input power supply (U10) and the battery boost PWB (A16A1).





Dimensions = mm (inches)

Block Diagram - Vector-LP Radio Beacon Transmitter

Issue 1.8.1

Not to Scale

Figure 6-1

Page 6-3 (6-4 Blank)



The ac input is applied through 10 A circuit breaker U5 and line filter U6. The ac voltage for the RF power stage (RF power modules A12 and A13) passes through thermistor RT1 and choke L1. Thermistor RT1 limits the inrush current to the RF power modules. Choke L1 improves the power factor on the ac lines applied to the RF power modules. The ac input is also applied to ac-dc universal power supplies U2 and U3 (U3 optional, for dual side transmitters), which convert the ac voltage to low level dc voltages. The ac input voltage is also applied to the interface PWB (A11) for sampling by the control/monitor stage.

Dc voltage is applied from an external 24 V or 48 V battery connected to A16TB1. The dc voltage is fused by F1 and applied to rectifier U8 and line filter U7 before being distributed to dc-dc universal power supply U10 and battery boost PWB A16A1. The battery boost PWB boosts the dc voltage and applies it to the RF power stage via rectifier U9.

6.3.1 Interface PWB

See Figures SD-1 and SD-21. The interface PWB (A11) provides an interface between the ac-dc power stage and the rest of the transmitter. It also contains voltage regulators (U1 and U2) that provide 9 V for the optional modem (via E5 and E6) and 24 V (limited to 1A) for the ATU (via E3 and E4). It also provides a dc sample of the ac input voltage to the control/display PWB as an aid in determining if the ac input source is at an acceptable level.

6.3.2 Ac/Dc Universal Input Power Supplies

See Figure SD-1. The ac/dc universal input power supplies [U2 (side A) and U3 (side B, if used)] are 110 W, universal ac input, multiple dc output power supplies. The transmitter's ac input is applied to U2 and U3 and the regulated 24.5 V, 15.6 V, 5.6 V and -15.5 V supplies are provided on the output. The outputs are applied through the interface PWB to the remaining functional blocks of the transmitter.



6.3.3 Battery Boost PWB (optional)

See Figures SD-1 and SD-25. The battery boost PWB is a boost type switching power supplies that provide a regulated B+ supply voltage to the transmitter when a 24 V or 48 V battery is acting as the power source.

A 24 V or 48 V supply is applied to the drain of switching FETs Q4 and Q5 through inductors L1 and L4. The gate of FETs Q4 and Q5 is driven with square wave pulses from pulse width modulation switching power supply controller U4 through push-pull buffer stage Q6/Q7. U4 is a fixed-frequency, pulse width modulation control circuit, incorporating the functions required for the control of a switching power supply. The device contains an internal sawtooth oscillator that is set to a nominal frequency of 100 kHz by external components R22 and C14. The output pulse width modulated control pulses to the gate of FETs Q4 and Q5 are generated by the comparison of this sawtooth waveform with a feed-back voltage sample from the output (CR6-cathode) and the bias voltage created from the in-circuit resistors selected by the *Battery Select 1* (J1-18) and 2 (J1-19) inputs.

The resultant variable pulse width, 100 kHz square wave at U4-8 (E) is applied to the gate of FETs Q4 and Q5 (through Q6/Q7) and turns it on and off with the appropriate pulses to maintain the desired set dc output voltage.

The *Battery Select 1* and 2 inputs, applied from the control/monitor stage, change the level of *Battery Boost (B+)* voltage based on the transmitter's power level. See Table 6-1 for the logic levels.

Table 6-1: Battery Select Logic

B+ Voltage		Battery Select 1	Battery Select 2
VR250	VR125		
79 V	55 V	0	0
136 V	97 V	0	1
236 V	167 V	1	1
Invalid	Invalid	1	0

6.4 EXCITER STAGE

See Figures 6-2 and SD-2. In dual configuration the exciter stage contains two independent exciter sections (A and B) which can be supplied in a single or a main/standby configuration. In a main/standby configuration, the exciter can be selected automatically or manually by local or remote control. Each exciter section consists of an RF synthesizer PWB, interphase PDM driver PWB and exciter monitor/generator PWB.

6.4.1 Exciter Interface PWB

See Figures SD-9 and SD-10. The exciter interface PWB (A2) provides signal distribution, as well as the interconnection for all the PWBs and assemblies in the exciter control/monitor stage. The RF drive failure detection, changeover/shutdown and monitor fail logic circuits are located on the exciter interface PWB.

6.4.1.1 RF Drive Circuitry and Failure Detection

U3:A, U3:B, U2:A, U2:B, and U2C and their associated components drive the RF signal to the RF power blocks for side A. Q9 and its associated components provide a low when the RF drive is present and a high when it is not present.

U3:C, U3:D, U1:A, U1:B, and U1C and their associated components drive the RF signal to the power blocks for side B. Q8 and its associated components provide a low when the RF drive is present and a high when it is not present.

6.4.1.2 Changeover/Shutdown

U4, Q1 through Q7, K1 and K2 along with their associated components allows for the selection of the main side of the transmitter. If the NDB A/B input is held low, the main side will be B, otherwise it will be A. If no changeover or shutdown is indicated (U4 inputs 3, 4, 6, and 7 are all high level), the relay for the main side will be energized, closing the contact and providing voltages to the main PDM driver and RF synthesizer. The relay for the standby side will be open. The RF relay control FET (Q5) selects the main

position for RF relay K1. If a changeover is indicated by a low on either U4:3 or U4:4, the relay for the main side will open and the relay for the standby side will close. The RF relay control FET (Q5), will select the standby position for RF relay K1. U4:17, U4:21, U4:22, and U4:15 drive transistors Q1 through Q4 to indicate to the control board information about the active side of the transmitter and the changeover/ shutdown state. If a shutdown is indicated, both K2 and K1 are opened so that neither PDM driver or RF synthesizer has power.

6.4.2 RF Synthesizer PWBs

See Figures SD-16 and SD-17. The RF synthesizer PWBs (A5 and, if installed, A8) use direct digital synthesis (DDS) to generate carrier frequencies within the LF/MF broadcast band (190 kHz to 1800 kHz). The output of a digital synthesizer integrated circuit with internal high-speed 12-bit digital-to-analog converter is low-pass filtered to provide a sinusoidal continuous output. The sine wave is digitized and divided by a factor of four to obtain the carrier frequency. The digitized sine wave is also divided by a factor of N to obtain a $2f_{PDM}$ frequency that ultimately determines the transmitter's pulse duration modulation (PDM) frequency. The RF synthesizer PWB consists of a microprocessor, direct digital synthesizer, low pass filter, digitizer, IPM correction, balanced drive, and N divider.

6.4.2.1 MICROPROCESSOR

The microprocessor consists of an 87C51 integrated circuit (U4), which is clocked at the system oscillator frequency (10.0000 MHz). Firmware resides in U4's internal four kilobytes of EPROM memory. The microprocessor generates control information for the DDS circuit and generates control information for the N divider circuit.



6.4.2.1.1 DDS Control Information

The RF carrier frequency is set using five binary coded decimal (BCD) switches (S1 through S5). When a current-sink-to-ground is applied at the *Reset DDS* input, or during turn on, the *microprocessor* monitors these switches and outputs the appropriate 48-bit value to the DDS Frequency Tuning Word #1 register. The 48-bit value is written in six consecutive bytes to the DDS's six internal registers. The *clk* signal is enabled on each write cycle.

6.4.2.1.2 N Divider Control Information

The $4f_C/B$ frequency is divided by an 'N' factor to provide $2f_{PDM}$ output frequency between 126 kHz and 134 kHz (when E3 is set in **LOW PDM** mode) or between 245 kHz and 276 kHz (when E3 is set in **HIGH PDM** mode) (see formula below). The microprocessor determines the value of N and outputs the information at pins 2, 3, 4, 5, 6 and 7. The N divider circuit uses this information as the N dividing factor.

- for $f_{PDM} = 130$ kHz (HIGH PDM position):

f_C and f_{PDM} are expressed in kHz

$$2f_{PDM} = \frac{4f_C}{\text{int}\left[\frac{2f_C + 65}{130}\right]}$$

6.4.2.2 DIRECT DIGITAL SYNTHESIZER

The direct digital synthesizer consists of integrated circuit U5 (AD98525Q) and associated components. It generates a frequency of $4f_C$ based on information provided by microprocessor U4 (refer to paragraph 6.5.2.1). Integrated circuit U5 is a CMOS, numerically controlled oscillator with a 48-bit phase accumulator and 12-bit digital-to-analog converter (DAC). The phase accumulator, which is responsible for generating an output frequency, is presented with a 48-bit value from the Frequency Tuning Word 1 registers, whose contents determine the FTW as follows:

$$FTW = \frac{(\text{DesiredOutputFrequency} \times 2^{48})}{SYSCLK}$$

The 10 MHz clock input is coupled with U5's internal programmable reference clock multiplier. This results in a system clock of 50 MHz (i.e., $SYSCLK = 50$ MHz).

The 12-bit output from the phase accumulator is input to the DAC, which outputs a stepped sine wave at $4f_C$. The $4f_C$ output is then low-pass filtered to remove high frequency components.

6.4.2.3 LOW PASS FILTER

A low-pass filter consisting of C21, L1, and C23 removes the high frequency images present in the DDS output signal. The output is a sine wave at a frequency of $4f_C$.

6.4.2.4 DIGITIZER

The output of the low-pass filter is connected to a digitizer circuit consisting of transistor Q4, inverter U10:B, and associated components. Inverter U10:B outputs an approximate square wave at a frequency of $4f_C$, which is applied to a $\div 4$ circuit and to the N divider circuit.

6.4.2.5 IPM CORRECTION

Not applicable to Vector transmitters.

6.4.2.6 WAVEFORM SYMMETRY

RF DRIVE SYMMETRY potentiometer R32 is adjusted for an RF drive output waveform, which is a symmetrical square wave (50% duty cycle). The position of **SYMMETRY ADJ** shorting jumper E6 determines when the RF drive symmetry circuit is enabled or disabled. E6 should be installed in the **ENABLE** position (shorting pins 1 and 2) when used in a Vector transmitter.



6.4.2.7 BALANCED DRIVE

The balanced drive buffer is a switching circuit that ensures the rise and fall times of its output square wave are minimal. The f_c signal is a 15 V peak-to-peak square wave that is the low level RF drive signal for the RF power stage of the transmitter.

6.4.2.7.1 Balanced Drive Matching

Different values are possible on the balanced drive output, depending on the transmitter's requirements. The position of shorting shunt post E5 on 7-position header XE5 can be changed to choose between different capacitor and resistor values. E5 is factory installed in the **D** position (shorting pins 7 and 8) for Vector transmitters.

6.4.2.8 N DIVIDER

The N divider circuit is a cascade counter made up of U6, U7, and inverters U8:A and U8:F. The $4f_c/B$ signal is divided by N to provide a $2f_{PDM}$ frequency, which is between 126 kHz and 134 kHz (when E3 is set in **LOW PDM** mode) or between 245 kHz and 276 kHz (when E3 is set in **HIGH PDM** mode). The value of N is supplied by microprocessor U4 (see 6.5.2.1.2). The $2f_{PDM}$ output, which is nominal 5 V pk-to-pk pulses, is applied to the transmitter's PDM generation circuit, and ultimately determines the PDM frequency.

6.4.2.9 RF DRIVE SOURCE SELECTION

The RF drive (f_c) source is provided by the integral numerically controlled oscillator or an external RF generator. The position of shorting shunt posts E1, E2 and E4 determine which source is selected. Vector transmitters use the internal source.

6.4.2.9.1 Internal f_c Source

To use the integral numerically controlled oscillator's output as the RF drive source, set the shorting shunt posts as follows:

- E1 in **INT** position (pins 2 and 3 shorted)
- E2 in **INT** position (pins 2 and 3 shorted)
- E4 in **INT** position (pins 2 and 3 shorted)

6.4.3 Interphase PDM Driver PWBs

See Figure SD-18. The interphase PDM driver PWBs (A6 and, if installed, A9) produce a pulse train of variable width as their PDM output. The PDM repetition rate (f_{PDM}) is a fixed frequency normally between 130 kHz and 133 kHz. The frequency is determined by the $2f_{PDM}$ input, which is produced by the active exciter monitor/generator PWB. The PDM drive signal, which determines the transmitter output power level, is applied to the modulator assemblies in RF power modules A or B (see Figure SD-22).

6.4.3.1 CARRIER LEVEL CONTROL

The carrier level control circuit consists of U6, U7, U2A, U2D, U3B, U3D, U13A and their associated components. U6 and U7 are analog multipliers connected as a variable gain, wide-band, linear amplifier. The modulation reference (U6-X1) is multiplied by a factor determined by the *carrier ref* (U6-Y1) and *B+ sample* (U7-X1) signals to determine the gain and, in turn, the status of U7-Y1.

When there is no *Unbalanced Audio* input at P1-15, U2D's output (TP3), which is the modulation reference, will be a nominal 1.4 V. This voltage is applied as U6's X1 input.

The *Carrier Ref* input at P1-2 is a dc voltage directly proportional to the square of the expected RF carrier level. This voltage is applied to U6-Y1.



The *B+ Sample* input at P1-3 is a dc voltage directly proportional to the B+ voltage being applied to the transmitter's RF power stage. When the B+ voltage is 236 V (for VR250) or 167 V (for VR125), the *B+ Sample* input and, in turn, the output of buffer U3D (TP4), are a nominal 4.0 V (for VR250) or 2.8 V (for VR125). This voltage is applied to U7-X1.

The gain of U6 and U7 and, in turn, the voltage at U7-Y1 is determined by the following formula:

$$\text{Unbalanced Audio} * \text{Carrier Ref} / \text{B+ Ref}$$

When the *Carrier Ref* input (U6-Y1) is 4.7 V and the *B+ Sample* input (U7-X1) is 4.0 V (for VR250) or 2.8 V (for VR125), the gain of U6 is 1.18 (for VR250) or 1.68 (for VR125) for the dc reference applied to U6-X1. The U7-Y1 current is 1.18 (for VR250) or 1.68 (for VR125) times the U6-X1 current. U3B is connected as a less than unity amplifier and its gain is summed with U7's gain. The end result is the total voltage gain of the circuit, relative to the voltage at the output of U2D (1.4 V), is a nominal 1.11 (for VR250) or 1.58 (for VR125) when **GAIN TRIM** potentiometer R31 is set to the centre of its range. The output of U3B (TP8) is 1.55 (for VR250; 1.4 V x 1.11) or 2.21 (for VR125; 1.4 V x 1.58).

The gain of U7 will change in direct proportion to changes in the *Carrier Ref* voltage. If the *Carrier Ref* voltage is set to 0 V, or it is clamped to ground because Q1 is turned on, U7's gain is minimum (zero). In turn, the dc reference's multiplication factor is minimum (zero). The transmitter's RF output is turned off.

The gain of U7 will change in inverse proportion to changes in the *B+ Sample* input. This feature eliminates the need for sophisticated filtering of the transmitter's B+ power supply and maintains the transmitter's RF output at the original level for B+ voltage variations of $\pm 10\%$.

GAIN TRIM potentiometer R31 provides a nominal 10% adjustment in the *carrier level ref* output of U3B. In dual exciter applications, it is adjusted to compensate for tolerance differences in the PDM generators of exciters A and B. When it is set properly, the transmitter's RF output is the same when either exciter is selected, provided the same *Carrier Ref* is being applied.

6.4.3.2 PDM DIVIDER

The PDM divider circuit divides the $2f_{\text{PDM}}$ input frequency (P1-7) by two. The resulting f_{PDM} output (P1-10) is a 0 V to 15 V square wave. Unless otherwise established during the transmitter's manufacture, it should be a fixed frequency, nominally 130 kHz.

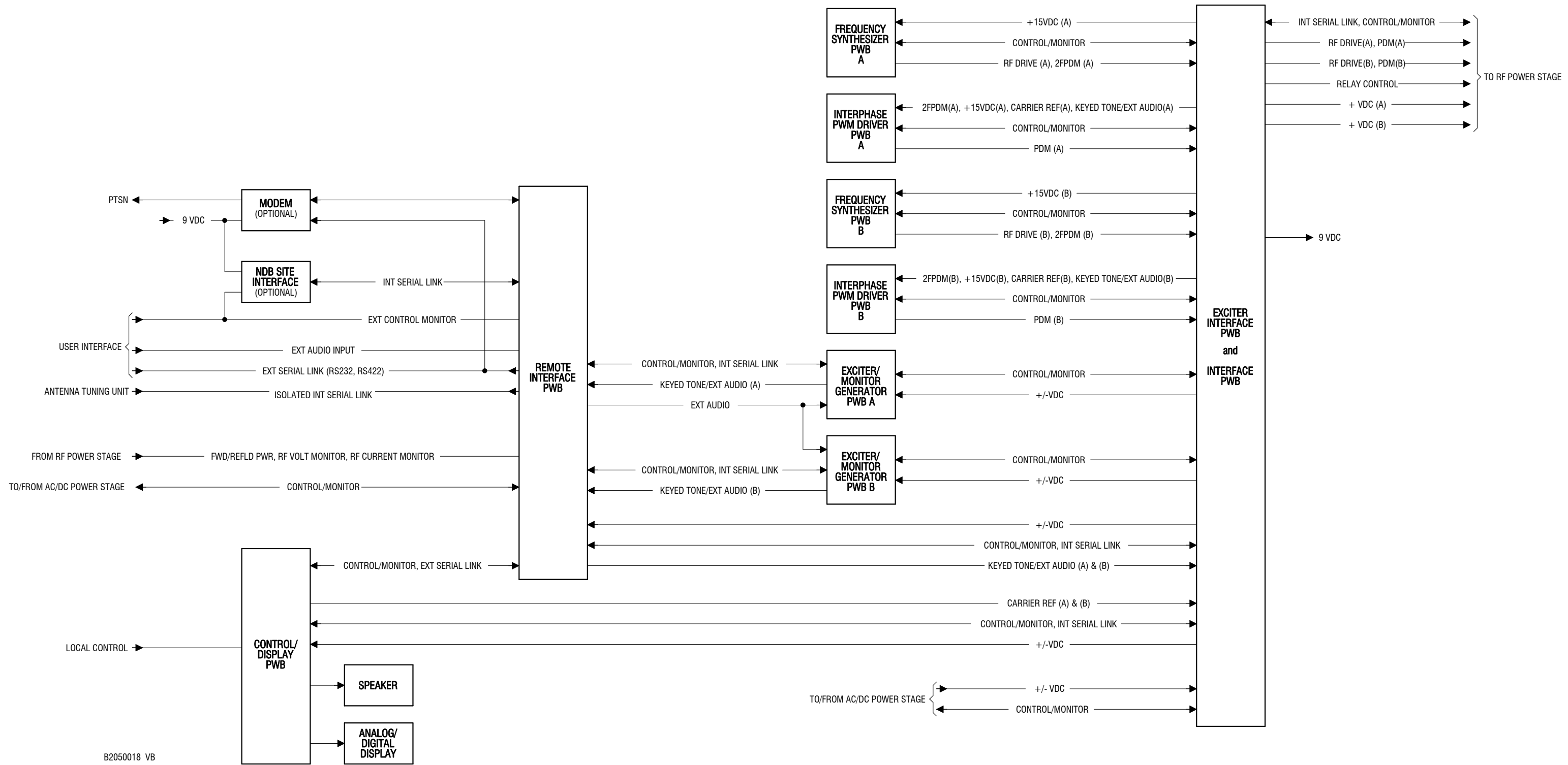
6.4.3.3 LINEAR INTEGRATOR

The linear integrator circuit converts the f_{PDM} square wave input to a triangular waveform. The triangular waveform has negative and positive voltage excursions of equal amplitude and duration. The long R/C time constant formed by C26/R10 ensures a linear rise and fall time. Since the R/C time constant is fixed, the waveform amplitude varies over the frequency range of f_{PDM} . The charge/discharge time and waveform amplitude are maximum at the lowest frequency.

6.4.3.4 INTEGRATOR PEAK DETECTOR

The integrator peak detector circuit detects the positive going parts of the linear integrator's triangular waveform. A portion of the resulting positive dc voltage (nominally 1.8 V) at U2C's output, is applied to the inverting input of differential amplifier U3A. The *carrier level ref* output of U3A is offset by this voltage, which is proportional to the triangular waveform voltage peaks. This offset effectively sets the *carrier level ref*'s zero power reference to the triangular waveform's peak voltage. This ensures no RF output is produced when the *Carrier Ref* input (P1-2) is 0 V.





B2050018 VB

Dimensions = mm (inches)

Block Diagram - Exciter/Control/Monitor Stage
 Issue 1.8.1 Not to Scale Figure 6-2 Page 6-11 (6-12 Blank)



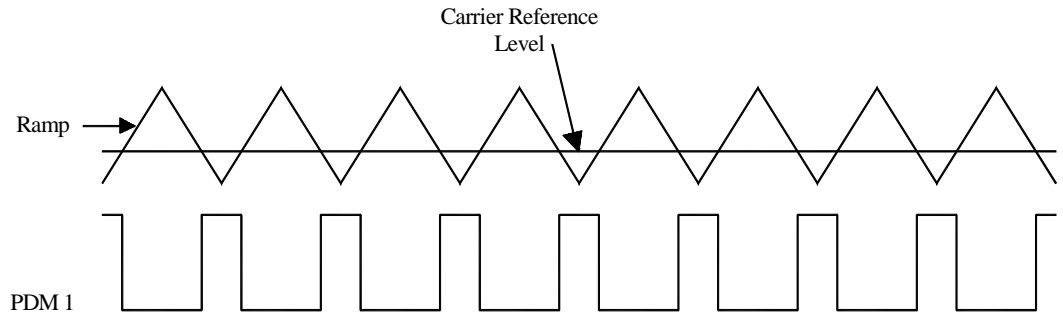


Figure 6-3 Timing Diagram for PDM Differential Amplifier

6.4.3.5 INTERPHASE PDM GENERATOR

The interphase PDM generator consists of two identical variable pulse duration generators (PDM1 and PDM2; PDM1 circuitry is described). The PDM1 generator produces a 0 V to 15 V rectangular waveform at the f_{PDM} repetition rate. The waveform on/off ratio (duty cycle) is directly proportional to the carrier level. The transmitter uses three B+ voltage levels to maximize performance. As the RF output power is increased from 0 W (B+ voltage is 55 V for VR125; 79 V for VR250), the PDM duty cycle increases proportionally. When the RF output is increased so that the PDM duty cycle reaches 45 %, the control/ display PWB initiates a B+ voltage increase (to 97 V for VR125; 136 V for VR250) and a PDM duty cycle decrease (to 27%). When the RF output is increased to a level where the PDM duty cycle again reaches 45%, the control/ display PWB initiates a B+ voltage increase (to 167 V for VR125; 236 V for VR250) and a PDM duty cycle decrease (to 32%).

6.4.3.5.1 PDM1 Generator

The PDM1 generator consists of U10B, transistors Q4, Q5, and associated components. The compensated *carrier level ref* input from the integrator peak detector circuit is applied to differential amplifier U10B's non-inverting input, where it is compared to the triangular waveform from the linear integrator circuit. When the compensated *carrier level ref* is more positive than the triangular waveform, U10B's output is open collector. +15 V is applied through R60 and R62 to the balanced drive formed by Q4/Q5. Q4 turns on and applies +15 V to K1-3 as the PDM1 output (Q5 is off). For the rest of the triangular waveform's period, the compensated *carrier level ref* is less positive than the triangular waveform. U10B's output is a current-sink-to -15 V and Q4 turns off. Q5 turns on and clamps the PDM1 output to ground. The minimum 'on time' (zero RF power) occurs at the negative peaks of the triangular waveform. See Figure 6-3 for a timing diagram.



6.4.3.6 PDM FAULT DETECTOR

The PDM fault detector circuit contains a voltage controlled switch that controls the 'set/reset' status of the shutback latch circuit and, in turn, controls the on/off status of relay K1.

The PDM1 fault detector circuit consists of U12A and its associated components. R67/C58 form an integrator with a long time constant, relative to the PDM frequency. C58's charge voltage is applied to U12A's inverting input and compared to the 5 V reference voltage applied to its non-inverting input from voltage divider R70/R71/R72. U12A's output is an open collector and has no influence when C58's charge voltage is less positive than the reference voltage. U12A's output will switch to a current-sink-to-ground when C58's charge voltage goes more positive than the reference voltage.

During normal operation, C58 will charge through R67 towards 15 V when the PDM1 output is 15 V ('on time') and CR3 is reversed biased. It will instantly discharge to 0 V, through CR3, when the PDM1 output switches to 0 V ('off time'). The repetition rate of the PDM1 on/off periods ensures the charge on C58 will not exceed 5 V, provided each PDM1 cycle contains an 'off time'. If a PDM failure occurs such that it produces a continuous 'on time', C58 will charge more positively than 5 V. U12A's output will switch to a current-sink-to-ground and toggle the shutback latch circuit to its 'set' state.

6.4.3.7 SHUTBACK LATCH

The shutback latch circuit inhibits the 'on time' of the PDM output and, in turn, the RF output of the transmitter whenever a transmitter originated *Inhibit PDM* (P1-16) command is applied. This circuit provides additional protection to the transmitter's RF power stages when faults are detected or actions are initiated that may cause RF stress current thresholds to be exceeded. Its function is to de-energize K1 and

disconnect the *PDM 1* output from the transmitter circuits when the PDM fault detector output is a current-sink-to-ground (logic low). It also inhibits the PDM generator when relay K1 is de-energized or when a logic true *inhibit PDM* command is applied to P1-16.

U9A/U9B form a bistable flip/flop. The flip-flop's output (U9-3) will be 15 V (logic high) in its 'reset' state, and a current-sink-to-ground (logic low) in its 'set' state.

Normally the *inhibit PDM* input and the output of the PDM fault detector circuit, which are the flip-flop's controlling inputs, are open collector. 5 V (logic high) is applied to U9-1 and U9-5 through their pull-up resistors and the flip-flop is latched in its 'reset' state. Relay K1 is held energized and the PDM output is applied to the transmitter circuits.

If a PDM fault is sensed, the PDM fault detector circuit applies a current-sink-to-ground (logic low) to U9-5 and causes the flip-flop to switch to and latch in its 'set' state. Relay K1 de-energizes and disconnects the PDM output from the transmitter circuits. The *PDM latch* output (J1-11) is activated (5 V). This condition is maintained until the flip-flop is reset by the removal of the logic low from U9-5 (no PDM fault) and the application of logic low to U9-1 (a logic true current-sink-to-ground *reset PDM* command is applied to J1-1).

6.4.3.8 PDM INHIBIT

The PDM inhibit circuit consists of U9D, transistor Q2, and their associated circuits. Its function is to instantly clamp the output of the PDM generator to ground (zero carrier level) when a logic true (current-sink-to-ground) *inhibit PDM* input is applied to P1-16, or when the PDM fault detector circuit senses a PDM fault and the shutback latch circuit's flip-flop is latched in its 'set' state. When neither of these conditions are true, the PDM inhibit circuit has no influence.



6.4.4 Exciter Monitor/Generator PWBs

See Figures SD-19 and SD-20. The exciter/monitor/generator PWBs [A7 (exciter A) and A10 (exciter B, if used)] perform the following functions:

- Use the press-to-talk input to select between beacon and voice modes.
- Monitor and control modulation depth
- Selects the parameter, RF current or RF voltage, to be applied to the remote interface PWB for external monitoring.
- Generate the appropriate tone frequency
- Monitors tone and keyer operation
- Monitors the forward power and controls changeover and inhibit functions.

6.4.4.1 MICROCONTROLLER

Microcontroller U11 uses the SPI bus to communicate with shift register U16 which shifts out digital data used to control various signals including changeover, shutdown, RF off, and alarm. Watchdog timer IC U2 and associated components generate a *Keying/Misc Alarm* (J1-4) if the microcontroller falls into an unknown state.

The clock for the microcontroller and the tone oscillator is generated using Y1, U4:E and the associated components.

The microcontroller (U11) continually monitors its internal Flash and EEPROM memory using checksums. If for some reason, the checksum returns as invalid, the microcontroller will detect the error and raise a flag, resulting in the output power being inhibited. U2 acts as a watchdog timer, if the watchdog times out, the monitor fault will also be raised, causing the output power to be inhibited (via the control/display PWB). This will guarantee that the U11 is always operating as intended.



6.4.4.2 PRESS-TO-TALK

The input to U11:11 indicates to the exciter monitor/generator PWB which mode of operation it should be operating in. It will react by adjusting the U16:1 that controls the MUX U1:X.

6.4.4.3 MODULATION DEPTH FUNCTIONS

Modulation depth of the beacon, voice and beacon, and voice are controlled using the digital pots 1, 2 and 3 of U10 respectively. The levels of the pots in U10 are adjusted by the microcontroller U11 over the SPI bus.

A selection between RF Monitor Voltage and RF Monitor Current samples is made using the MUX U14:C. CR9, U9:B and their associated components RF detect the selected RF monitor signal. The RF monitor signal is then used to calculate the modulation depth. The microcontroller (U11) compares the average and peak levels of the RF signal. The average value is detected using U9:A and its associated components. The peak level is detected using U9:C, CR7, and their associated components.

6.4.4.4 TONE GENERATION

The keyer tone is generated using the DDS IC U5. The microcontroller U11 sends an SPI signal to U5 indicating the frequency of the tone to generate. The tone is then amplified using U8:C and its associated components. The microcontroller (U11) then controls keying by toggling the MUX U1:Z.

Correct operation of the keyer is monitored by U8:A, U8:B, CR11, and CR12 and their associated components. The analog samples at U11:27 and U11:28 are compared to the low threshold levels (set up using the GUI) to determine if the keying gate is opened or closed. If at any time the keying gate is opened when it should be closed or closed when it should be opened, and alarm is flagged and output power is inhibited (via the control/display PWB).

6.4.4.5 FORWARD POWER MONITOR

A dc voltage, proportional to the transmitter's forward power, is applied to the *Forward Power Sample* input (P1-1). This voltage is filtered by operational amplifier U9 and associated components and applied to U11's internal ADC. If the forward power sample is above or below user-defined limits for a user-defined time period, the *Changeover* output (J4-15) becomes active (logic low). If a changeover had already occurred prior to this occurrence, a *Shutdown* output (J4-16) will also be generated. All user-defined parameters are established using the front panel GUI and applied to the exciter monitor/generator PWB via the internal serial bus.

6.4.4.6 RF MONITOR PARAMETER SELECTION

Multiplexer U14 and associated components allows the user to select the parameter (RF voltage or RF current) to be applied to the **RF MONITOR** output at the rear of the exciter.

6.5 CONTROL/MONITOR STAGE

See Figures 6-2 and SD-3. The control/monitor stage contains the control/display PWB, which contains the transmitter's embedded microcontroller. The remote interface PWB, graphic user interface (GUI), analog/digital displays and audio speaker are also contained here. The NDB site interface PWB (A4) and a modem (U11) are optional items that can also be part of the control/monitor stage.

6.5.1 Control/Display PWB

See Figures SD-5 through SD-8. The control/display PWB (A1) performs the following functions:

- Produces dc voltage *Carrier Ref (A)* and *(B)* outputs that ultimately determine the forward power (RF carrier) level of the RF output. These voltages are the reference voltages for the variable pulse duration modulation (PDM) generator in each exciter (A and B).

- Monitors critical parameters and turns off (shuts back) or reduces (cuts back) the *Carrier Ref* voltage when defined fault threshold limits are exceeded.
- Identifies out-of-tolerance parameters when the carrier level is shut back or cut back by providing a visual indication for local monitoring or an electrical status output for remote monitoring.
- Selects the main exciter (A or B) that will provide the RF drive and PDM drive to the RF power stage's RF amplifiers, if no changeover has occurred.
- Determines on/off status of RF power stage.
- Interfaces with the diagnostic display.

6.5.1.1 CARRIER REFERENCE VOLTAGE

The *Carrier Ref (A)* (J7-38) and *(B)* (J7-40) outputs are applied to the interphase PDM driver PWB of each exciter to generate the PDM drive pulse that ultimately controls the RF output of the transmitter. DACs U31 and U32, in conjunction with microcontroller U22, establish a dc reference voltage for the *Carrier Ref* outputs. The voltage is buffered through operational amplifiers U27B, U28B and associated components.

6.5.1.2 ALARM THRESHOLD CIRCUITS

Certain parameters that are monitored by the control/display PWB can initiate an alarm indication and appropriate transmitter control if an out of tolerance condition occurs.



6.5.1.2.1 Ac Supply Voltage

The *Ac Power* input (J4-21) is an unregulated dc voltage that is proportional to the ac source. The input is filtered and compared to the *low ac ref* fault threshold on operational amplifier U4C. If the *Ac Power* voltage is below this threshold, the *ac low* signals switch to 0 V. The *Carrier Ref (A)* and *(B)* outputs clamp to 0 V and the *Shutback (A)* (J7 1) and *(B)* (J7-2) outputs switch to 0 V and inhibit the exciter's modulator drive. The transmitter's RF output turns off (shuts back) and remains off until the ac power returns to an acceptable voltage. The system diagram's **AC Mains** lamp displays a fault condition. An *Ac Sample* signal is applied to ADC U9 for application to the diagnostic display.

6.5.1.2.2 Reflected Power Monitor

The *Refl'd Pwr Sample* input (J1-5) is a dc voltage that is proportional to the reflected power at the transmitter's output. The input is filtered and buffered by operational amplifier U1B and associated components, and then applied to the remote interface PWB via the external serial interface (microcontroller U22). The signal is also compared to a pre-determined *refld pwr shtbk ref* fault threshold on operational amplifier U4A. When the reflected power indicates a VSWR of greater than 2:1, relative to rated forward power, the *refld pwr sample* input exceeds the fault threshold and the *refld_pwr_shutback* signal switches to 5 V. The *Carrier Ref (A)* and *(B)* outputs clamp to 0 V and the *Shutback (A)* (J7-1) and *(B)* (J7-2) outputs switch to 0 V and inhibit the exciter's modulator drive. A clock pulse is also applied to an alarm count/cutback circuit in complex programmable logic device (CPLD) U18. The RF output is instantly shut back (turn off). The system diagram's **Output Network** lamp displays a fault condition. A *Refl'd Pwr Sample* signal is applied to ADC U9 for application to the front panel's diagnostic display.

Turning off the RF output reduces the *refld pwr sample* input to 0 V. The *Carrier Ref (A)* and *(B)* outputs are restored to their pre-shutback levels, the *Shutback A* and *B* outputs return to open collector, and the RF output is restored at an exponential rate. If the fault threshold is exceeded before the pre-set power level is reached, the shutback cycle is repeated. If two or more shutback cycle clock pulses are applied within any two second period, the *Carrier Ref* outputs are cut back (reduced) until the carrier level is cut back to a level that results in an acceptable reflected power. When the transmitter enters cutback mode, the system diagram's **Output Network** lamp flashes on and off. When the *refld pwr sample* input returns to or is maintained at a level which is less than the fault threshold, the *Shutback* outputs returns to open collector but the system diagram's **Output Network** lamp continues to display a fault as a maintenance aid. The lamp remains on until reset by the diagnostic display menu.

6.5.1.3 SAMPLE MONITORING CIRCUITS

In addition to the parameters described in paragraph 6.5.6.2, various parameters are applied to the control/display PWB for local (via the front panel's diagnostic display) and external (via the remote interface PWB) monitoring. In some cases, these parameters have associated alarm detection circuitry, but it is not resident on the control/display PWB.

6.5.1.3.1 PDM Drive

The *PDM (A)* (J4-9) and *PDM (B)* (J4-7) inputs are pulses which represent the PDM signal applied to RF power modules A and B. The inputs are filtered through operational amplifiers U7B and U11B and associated components. *PDM (A) Sample* and *PDM (B) Sample* signals are applied to ADC U9 for application to the front panel's diagnostic display.



6.5.1.3.2 Forward Power

The *Fwd Pwr Sample* input (J1-3) is a dc voltage which represents the forward power at the transmitter's RF output. The input is filtered through operational amplifier U2D and associated components. A *fwd_pwr_sample* signal is applied to ADC U9 for application to the front panel's diagnostic display. The *fwd_pwr_sample* input is also applied to the remote interface PWB via the external serial interface (microcontroller U22). The *Fwd Pwr Sample* input is also low-pass filtered through operational amplifier U2C and associated components. A *speaker_ref_level* signal is applied through DAC U32. The analog output (pin 12) is filtered through operational amplifier U28D and associated components and applied to the *Audio (Speaker)* output (J11-1), then applied to speaker LS1 for audio monitoring.

6.5.1.3.3 Battery Voltage

The *Battery Voltage* input (J1-27) is a dc voltage which represents the voltage applied from the transmitter's optional battery supply. The input is filtered through operational amplifier U3B and associated components. The *bat_volt_sample* signal is applied to ADC U12 for application to the front panel's diagnostic display.

6.5.1.3.4 Battery Current

The *Battery Current* input (J1-25) is a dc voltage which represents the current drawn by the transmitter's optional battery supply. The input is filtered through operational amplifier U3A and associated components. The *bat_cur_sample* signal is applied to ADC U12 for application to the front panel's diagnostic display.

6.5.1.3.5 Low Voltage Power Supplies

Attenuated, buffered samples of all low voltage dc power supplies (+24 V, ± 15 V and + 5 V) are applied to ADCs U9 and U12 for application to the front panel's diagnostic display.

6.5.1.3.6 Cabinet Temperature

Low voltage temperature sensor U5 provides a dc voltage (between 0 and 5 V) which represents the ambient cabinet temperature. This voltage is buffered by operational amplifier U8A and associated components and applied to ADC U12 for application to the front panel's diagnostic display.

6.5.1.4 MICROCONTROLLER

Microcontroller IC U22 interfaces between the diagnostic display and its associated soft-keys. It controls the level of the *Carrier Ref* signals (see paragraph 6.5.1.1), which ultimately determines the forward power level of the transmitter. It also acts as an internal and external serial interface for transmitter alarm and status signals.

6.5.1.5 CPLD

Complex programmable logic device (CPLD) U18 continuously reads digital inputs for all transmitter alarm events. It is programmed to perform root cause detection of a fault as well as high-speed fault protection. Depending on the nature of the fault, the CPLD generates transmitter *Shutback* outputs (J7-1 and J7-2) or various digital control/inhibit signals via a parallel data bus.



6.5.2 Remote Interface PWB

See Figures SD-11 through SD-13. The remote interface PWB (A2A2) performs the following functions:

- Buffers all external transmitter remote control inputs and provides the connection for the system's external interlock circuit
- Provides RF filtering for RF power probe samples (forward power, reflected power, and RF current)
- Provides an isolated ATU serial interface
- Converts external serial levels from TTL to RS232 and RS422
- RF monitor conditioning
- Press-to-talk input
- Audio conditioning
- Audio monitoring
- Provides distribution and interface point between the ac/dc distribution stages and exciter control/monitor stage

6.5.2.1 Remote Inputs/Outputs

U7:A and associated components form the circuitry to allow control of RF on/off when in remote mode. U21:C and associated components form the circuitry to control the external interlock. If the link between TB1-19 and TB2-20 is open, U21:C will output a high (external interlock), causing the transmitter to inhibit RF power.

6.5.2.2 Isolated ATU Serial Interface

U9, U11, U13, U14, U15, and U17 provide isolation to the internal serial bus (RS485) to allow for ATU control. The ATU provides 5 V to opto-isolators U13 and U14, which provide isolation between differential transceivers U11 and U17. The ATU controls the DE/ \overline{RE} signal (J3-5), allowing the ATU to specify direction of transmission through the isolated link preventing collisions over the serial bus.

6.5.2.3 RS232 and RS422 Interface

U19, U18, U12, convert the TTL levels produced by the control/display PWB to RS232 and RS422 levels for external control/monitoring of the transmitter.

6.5.2.4 RF Monitor Conditioning

U16 and associated components allow the user to specify the RF monitor level from the GUI. U23 and R163 form an adjustable gain amplifier for the RF monitor signal that is able to drive a 50 Ω load.

6.5.2.5 Press-To-Talk Input

Link E4 allows for the selection of phantom feed or normal press-to-talk operation. When in position A, normal operation is selected and grounding TB1-12 indicates press-to-talk mode. When in position B, phantom feed mode is selected and applying -15 V to the shield (TB1-15) will indicate press-to-talk mode.

6.5.2.6 Audio Conditioning

The audio conditioning circuitry on the remote interface board consists of 3 parts, balanced conditioning, audio filtering, and the audio limiting.

6.5.2.6.1 Balanced Conditioning

U3:A and its associated components convert the balance audio signal between TB1-14 and TB1-16 to an unbalanced signal. The level of the audio signal is adjusted using **AUDIO LEVEL** potentiometer R37.

6.5.2.6.2 Audio Filtering

U8:B, U8:C, U8:D and their associated components forms the audio input filter. This filter, along with the poles located on the Exciter Interface PWB and the Modulator Filter, is a band pass filter passing signals from 300 to 3000 Hz.



6.5.2.6.3 Audio Limiting

U10:B, U10:C, U10:D, Q7, and their associated components form the audio limiter. The limiter will raise an alarm at U10:13 when the audio signal goes above a pre-defined threshold. It will then compress the audio signal by adjusting the resistance across the JFET Q7. This is accomplished by adjusting the JFET's base voltage at the output of the comparators U10:B and U10:C.

6.5.2.7 Audio Monitor

U1:B and T1 condition the forward power sample signal to produce an audio monitor signal that can be used to view the modulated signal being output by the transmitter.

6.5.3 Front Panel Metering

The front panel of the exciter control/monitor assembly provides local controls and a graphic user interface to display operating status, root cause fault detection, RF power, and critical dc voltage/current levels. The controller/display PWB is mounted on the rear of the panel. The front panel is divided into three sections – system diagram, diagnostic display and control.

6.5.3.1 SYSTEM DIAGRAM

The system diagram is a functional flow diagram of the transmitter. Each section of the flow diagram contains an alarm lamp, which turns on when a fault occurs in that section. If a lamp is flashing, the transmitter has entered a cutback (reduced power) mode of operation. The lamp that is flashing is likely the cause for the cutback.

6.5.3.2 DIAGNOSTIC DISPLAY

The diagnostic display is a graphic user interface (GUI) screen that is navigated using five associated soft-keys. The majority of the transmitter's local control (exciter selection, power level, etc.) and monitoring (critical parameter levels, alarm events, etc.) may be performed from menus on this display. An analog meter is provided, which can display forward power, reflected power, modulation percentage or antenna current.

6.5.3.3 CONTROL SWITCHES

The control switches determine the transmitter's control location (local or remote) and its RF status (on or off).

6.5.3.3.1 Local/Remote Selection

When **Local** is selected, all remote control functions, except RF off, are disabled and have no influence on the transmitter's operating status or pre-set RF power levels. When **Remote** is selected, all front panel control functions, except **RF Off**, are disabled and have no influence on the transmitter's operating status or pre-set RF power levels.

6.5.3.3.2 RF On/RF Off Selection

When **RF On** is selected (enabled in **Local** mode only), the transmitter's RF power stage is enabled to provide an RF output. When **RF Off** is selected (enabled in **Local** and **Remote** modes), the transmitter's RF power stage is inhibited.

6.5.3.3.3 Power Increase/Decrease

When **Power Increase** is pressed (enabled in **Local** mode only), the transmitter's RF output power is increased. When **Power Decrease** is pressed (enabled in **Local** mode only), the transmitter's RF output power is decreased. Additionally, if both the **Power Increase** and **Power Decrease** switches are depressed simultaneously, the transmitter's RF output power will be reduced to 0 W.



6.5.4 NDB Site Interface PWB (Optional)

See Figures SD-14 and 15. The NDB site interface PWB (A4), if purchased, provides:

- 16 optically isolated monitor inputs.
- 16 form C contact relay closure control points.

6.5.4.1 Site Monitor Points

RFI filtering is provided on all control input lines to ensure transmitter operation is not interrupted due to RF pick-up on control lines. Opto-couplers buffer/isolate the external circuits and prevent unwanted transients from affecting transmitter operation. All isolated inputs are driven by isolated dc to dc converter U1 to prevent unwanted transients from affecting the transmitter's dc supplies. The monitor inputs are shifted in through shift registers U6 and U9. These values are then relayed to the control/display PWB over the internal serial bus using RS485 transceiver U12.

6.5.4.2 Site Control Points

Shift registers U17 and U19, controlled by microcontroller U13 over the SPI bus will control relays K1 to K16. Control point logic levels are determined by the control/display PWB and are communicated to the NDB site interface PWB over the internal serial bus.

6.5.5 Modem (Optional)

See Figure SD-3. An optional modem (U11) can be provided to interface the transmitter's RS232 Ext Serial Link to a PTSN. The link provides remote monitoring and status for the transmitter.



6.6 RF POWER STAGE

See Figures 6-5 and SD-4. The RF power stage produces the transmitter's final RF output. It contains the RF power modules (A12 and A13, if used), the RF filter PWB (A14) and the RF power probe (A15).

6.6.1 RF Power Module(s)

See Figure SD-22. Each RF power module (A12 and, if purchased, A13) produces up to 250 W (for VR250) or 125 W (for VR125) RF carrier power to the transmitter's RF output and contains a wideband power amplifier, a modulator, and a modulator filter. A switch mode power supply PWB is provided to convert the ac input voltage to the high level B+ voltage used by the modulator assembly. Each module's RF output is applied to the RF filter PWB (A14) via RF relay K1 (see SD-4), which determines the 'on-air' module'. A power module interface PWB is provided to interface control/monitor signals between the RF power modules and the exciter and control/monitor stages as required. For VR250 transmitters, cooling air for the RF power modules is provided by fans B1 and B2.

6.6.1.1 SWITCH MODE POWER SUPPLY PWB

See Figure SD-24. The switch mode power supply PWB (A2) converts the transmitter's ac input voltage to the B+ voltage used by the modulator. In the VR250, the ac input voltage range is 170 – 270 V ac and the B+ voltages used by the modulator are 79 V, 136 V and 236 V. In the VR125, the ac input voltage range is 90 – 270 V ac and the B+ voltages used by the modulator are 55 V, 97 V and 167 V.

6.6.1.1.1 Rectifier

The ac input voltage is rectified by diodes U1 and U2, providing a dc voltage across capacitors C12 through C17. Varistors RV1 through RV3 provide protection from high voltage transients. **AC IND** lamp DS1 provides a status indication of the ac voltage on the RF power module.

6.6.1.1.2 Switching Signal

IC U3 is a high current FET driver that provides a switching PWM signal (0-18 V) to the primary of transformer T2. The secondaries of T2 control the on/off status of FETs Q1 and Q2, which in turn switch the rectified ac voltage to the primary of step-up transformer T1/T4.

6.6.1.1.3 B+ Voltage

The secondaries of step-up transformer T1 are rectified by diodes CR9, CR10, CR11, CR13, CR14, and CR15 and combine, through chokes L4, L5 and L6, to form the high level B+ voltage. This voltage is applied to the *Dc Output* (J2-1). Samples of the B+ voltage and current are applied to inputs of current mode PWM controller U8, which provides PWM switching information to regulate the B+ voltage. FETs Q4, Q5 and resistors R10, R11, R24 and R25, in conjunction with opto-couplers U4 and U6, provide a means to adjust the attenuated voltage applied to U8, thereby adjusting the level of the B+ voltage.

6.6.1.1.4 Inhibit PWM

When an RF power module fault occurs, an *Inhibit* signal is provided to J1-7. Opto-coupler U7 will turn on and apply a signal to current mode PWM controller U8 to inhibit the switching signal output of FET driver U3.

6.6.1.2 POWER MODULE CONTROL/ INTERFACE PWB

See Figure SD-23. With the exception of the ac input for the switching power supply and the RF output of the module, the power module control/interface PWB (A1) provides the input and output connections for the RF power module. It performs the following functions:

6.6.1.2.1 Module Status

Module status such as B+ and PA voltage, dc current, and temperature are measured using ADC inputs on microcontroller U7. The *Fan Tach 1* and *2* inputs are also captured using interrupt 0 and interrupt 1 on U7. All information is transmitted to the control/display PWB using the internal serial bus.



6.6.1.2.2 Gate Bias Drive Signal

U7, Q2 and associated components generate a 15 V square wave at 263 kHz to drive the gate bias drive in the modulator.

6.6.1.2.3 Switch Mode Supply Control

Decodes the serial control (B+ settings) from the control/display PWB and outputs the settings using darlington transistor U1.

6.6.1.3 MODULATOR

See Figure SD-22. The modulator (A5) is a logic level converter that converts the low level (0 to 15 V) logic of the *PDM* input to a high level (0-B+) logic *PDM (B+)* output.

6.6.1.3.1 13 V Power Supply

The 15 V *LO* output (pin 1) of FET driver U1 is full-wave rectified by bridge rectifier CR1 through CR4, at the *PDM* frequency. The resultant dc voltage is filtered by capacitor C7 and limited to 13 V by zener diode CR5. The power supply's less positive output is referenced to the source terminal of power FET Q1 via resistor R7. Therefore, the positive output is always 13 V higher than the voltage on the FET source terminal. The 13 V output is applied to U1's V_B (+) and V_S (-) inputs as the switched gate drive for the FETs. Transformer T1 provides isolation between the high and low level signals.

6.6.1.3.2 FET Driver

FET driver U1 is an integrated circuit configured to produce outputs as follows:

- When the *PDM* signal applied to the H_{IN} input is high (15 V), the H_O output is the dc voltage applied to the V_B input.
- When the *PDM* signal applied to the H_{IN} input is low (0 V), the H_O output is the reference voltage applied to the V_S input.

The H_O output, which contains the *PDM* data, is applied to the gate of power MOSFET Q1 as its on/off control.

6.6.1.3.3 B+ Switching MOSFET

Power MOSFET Q1 is connected to switch the B+ voltage at the on/off ratio of the *PDM* data on U1's H_O output, which is applied to its gate. The resultant *PDM (B+)* output contains the *PDM* data applied to J2-7 at a high (0-B+) logic level. Free-wheeling diode CR6 prevents negative overshoot by providing current flow when MOSFET Q1 is off.

6.6.1.4 MODULATOR FILTER PWB

See Figure SD-22. The modulator filter PWB (A4) consists of inductors L1 and L2 and capacitors C1 and C3 as well as C2 of the power amplifier (A3). These components form a low pass filter that passes the audio components but rejects the *PDM* frequency. When no modulating audio information is present, the *PA Volts* output will be a dc voltage equal to the modulator input voltage multiplied by the duty cycle of the *PDM (B+)* signal. Capacitor C3 in conjunction with L2 is resonant at a frequency to provide optimal rejection of the *PDM* frequency.

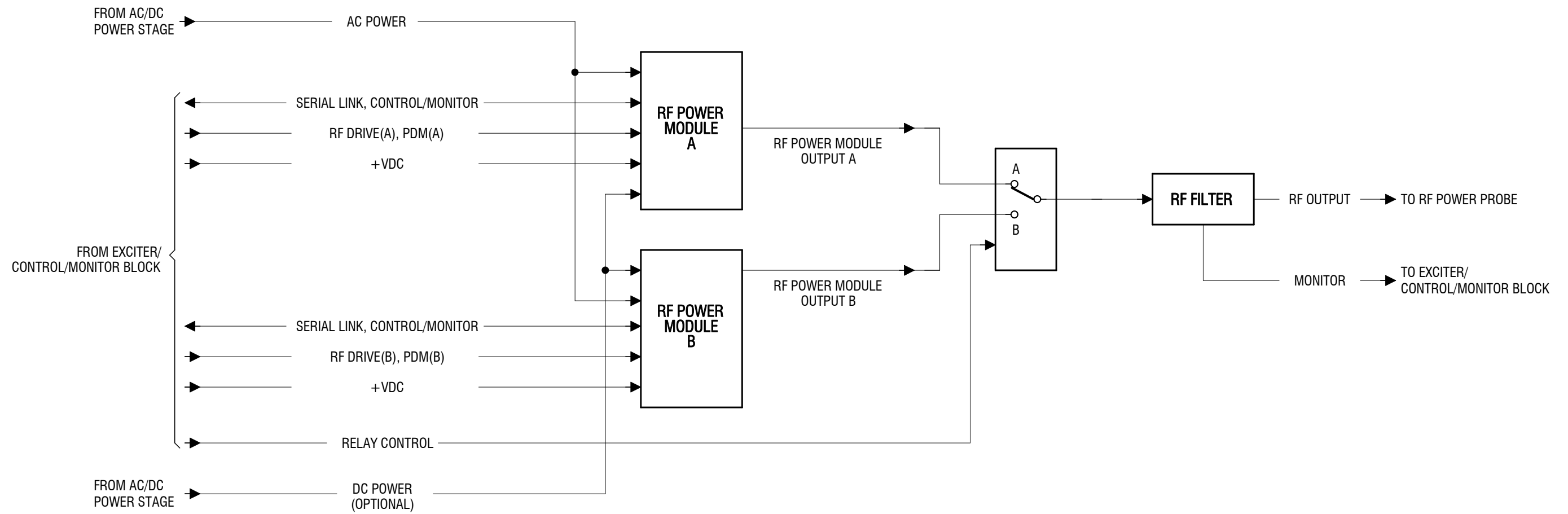
6.6.1.5 POWER AMPLIFIER

See Figure SD-22. The power amplifier (A3) uses two parallel pairs of MOSFETs to produce an unfiltered, modulated RF output. Q1 through Q4 are connected as cascode or 'H' bridge class 'D' amplifiers, which switch the *PA volts* at the RF drive frequency (see Figure 6-6 for a description of class D operation). Transformer T1 splits the *RF drive* signal and applies it, through buffer amplifier U1 (fused by F1) to the MOSFETs with the required phase relationship. Diodes CR1 through CR4 prevent the output of the RF amplifier from going negative. Transistor Q5 and associated components detect the RF drive level and provide an alarm signal to the control/display PWB. Resistors R5 through R7 provide a *PA Volts Sample* for front panel monitoring.

6.6.1.6 RF TRANSFORMER

RF transformer T1 provides impedance matching between the power amplifier output and the RF filter PWB.



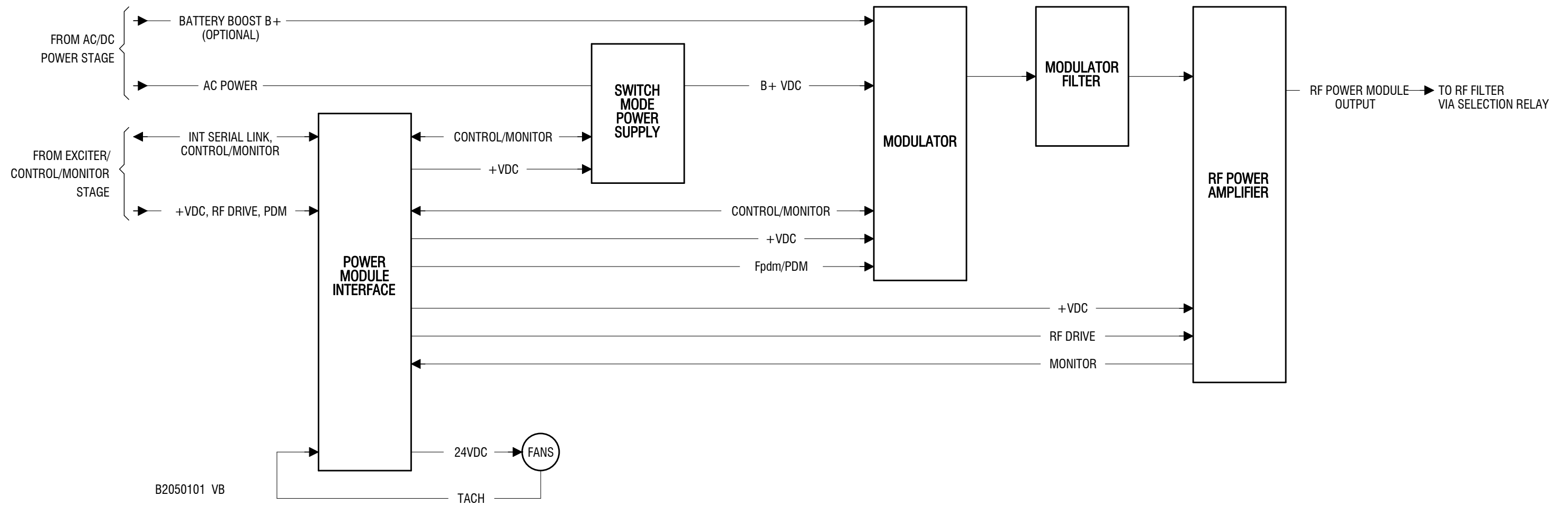


B2050103 VA

Dimensions = mm (inches)



Block Diagram - RF Power Stage			
Issue 1.8.1	Not to Scale	Figure 6-4	Page 6-25 (6-26 Blank)



Dimensions = mm (inches)

Block Diagram - RF Power Module			
Issue 1.8.1	Not to Scale	Figure 6-5	Page 6-27 (6-28 Blank)

6.6.2 RF Filter PWB

See Figure SD-4. The RF filter PWB (A14) is a band pass filter that attenuates the harmonics of the square wave output applied from the selected RF power module before it is applied to the RF combiner/probe. The filter has a flat response characteristic over the operating bandwidth [three PWB options; standard frequency band (190 - 535 kHz), extended frequency band for 125 W transmitters (536 - 1250 kHz and 1600 – 1800 kHz), and extended frequency band for 250 W transmitters (1600 – 1800 kHz)]. It has a nominal input and output impedance of $50\ \Omega$ and a loaded Q of 2. The band-pass is selected using frequency dependent link connections (E1 through E36; see Tables 2-7a and 2-7b).

6.6.3 RF Power Probe PWB

See Figure SD-4. The RF power probe PWB (A15) contains various circuits that monitor the RF output and provide RF voltage, RF current, forward power and reflected power monitoring samples to the control/monitor stage.

6.6.3.1 FORWARD/REFLECTED POWER PROBE

The forward/reflected power probe circuit consists of 40:1 RF current transformer T1, 80:4 RF voltage transformer T3 and associated components. These transformers form the current and voltage arms of a forward/reflected power bridge, which samples the RF output.

The current flowing into the RF output passes through transformer T1's primary. The current in T1's secondary develops a voltage across resistors R33, R34, R41, R42, R43 that is proportional to the RF output current. The anti-phase voltage across the secondary of RF voltage transformer T3 is applied (summed) to the centre-tap of T1's secondary. When the RF output impedance is precisely $50\ \Omega$, the RF current waveform is in-phase and of equal amplitude to the RF voltage waveform on one half of T1's center-tapped secondary and equal amplitude, but 180° out-of-phase on the other half.



The in-phase voltages are summed, rectified by CR35, low-pass filtered by L9/C53/L11, resulting in a dc voltage being applied to the *Fwd Pwr Sample* output (J1-1). This voltage is proportional to the RF output's forward power level.

The out-of-phase voltages are summed, rectified by CR36, low-pass filtered by L8/C54/L10, resulting in a dc voltage being applied to the *Refld Pwr Sample* output (J1-5). This voltage is proportional to the RF output's reflected power level.

T3's secondary voltage, which is a true sample of the RF output's voltage waveform, is also applied to the *RF Volts Monitor* output (J1-9). This output is intended for monitoring by a modulation monitor and for test equipment during maintenance.

6.6.3.2 RF CURRENT PROBE

The RF current probe circuit consists of 40:1 RF current transformer T2 and associated components. The current flowing into the RF output passes through the primary of transformer T2. The current in T2's secondary winding develops a voltage across resistors R37 and R40 that is proportional to the primary (RF output) current. This voltage is applied to the *RF Current Sample* output (J1-17), which is used by the control/display PWB's high RF current detector and metering circuit. This high RF current detector produces a high RF current alarm and – via the control/display PWB - causes the transmitter's RF output to shut back (turn off) when the RF current exceeds a threshold that represents the maximum stress current for the RF power modules. The current sample voltage is also applied to the *RF Current Monitor* output (J1-13), which is used for external monitoring purposes.

6.7 MODULATION DEPTH WHEN USING A HIGH 'Q' ANTENNA

When the transmitter's output is connected to a high 'Q' antenna system, the modulation envelope observed on the RF current waveform may differ from that on the RF voltage waveform. This difference is caused by antenna impedance mismatch at the sideband frequencies, which results in reflected power standing waves on the feed cable. Depending upon feed cable length, the sideband impedance may be more or less than $50\ \Omega$. When the sideband impedance is less than $50\ \Omega$, the sideband current will increase and may place undesirable stress on the solid state devices in modulator/power amplifier.

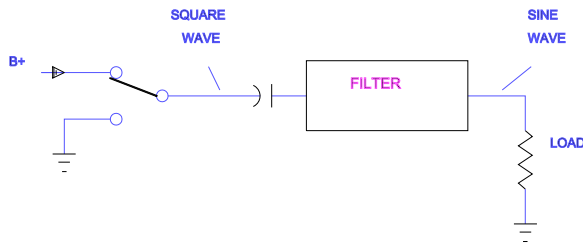
When calibrating the modulation limits for the monitor (see 3.6.7), the system automatically tests using both current and voltage samples and selects the sample that places most stress on the transmitter (i.e., the highest modulation depth).

The following explanation should assist in understanding this phenomenon.

A typical radiobeacon antenna is relatively inefficient, since it is very short when compared with the wavelength of the carrier frequency. The high capacitive reactance of a typical antenna is tuned to the carrier frequency, by an antenna tuning unit's (ATU) loading coils, to produce a series resonant circuit. The resulting net antenna system resistance is then transformed to $50\ \Omega$ by a matching transformer. When the antenna is very short compared with the wavelength of the carrier frequency, the series resonant circuit has an extremely high 'Q'. Under these conditions, the antenna system may present a $50\ \Omega$ load to the transmitter at the carrier frequency but different impedance at the sideband frequencies.

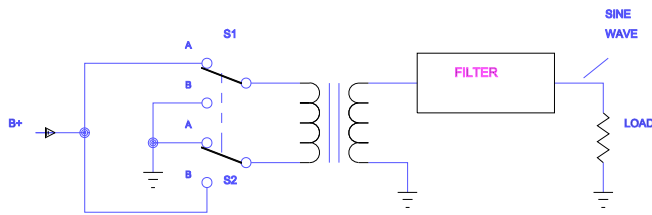
The mismatch at the sideband frequencies will cause a standing wave on the feed cable. Depending upon the length of the feed cable, the sideband impedance of the antenna system will appear to be more or less than $50\ \Omega$. When the transmitter is connected to a high 'Q' antenna system, the difference between the carrier impedance and the sideband impedance may cause RF stress current limits to be exceeded. When this occurs, remedial action must be taken instantly.





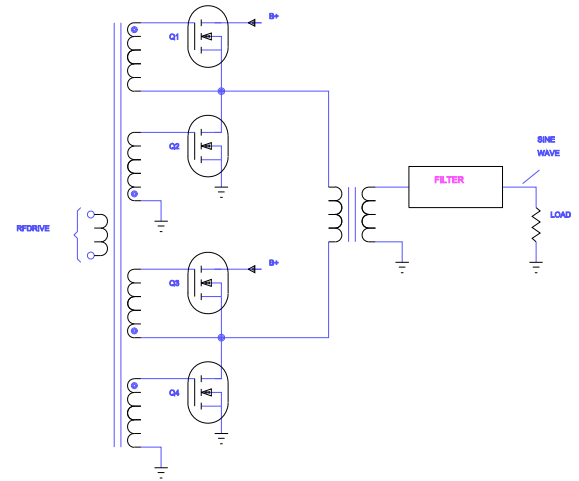
SIMPLE CLASS 'D' OPERATION

If the switch is opened and closed with a 50% duty cycle, a square wave at the switching frequency will result at the filter input. If the filter is designed to pass the switching frequency, but attenuate its harmonics, a sine wave is applied to the load.



PUSH-PULL CLASS 'D' OPERATION

If S1 and S2 are opened and closed with a 50% duty cycle, a square wave of current, at the switching frequency, is passed through the primary of the transformer and transformed to its secondary. If the filter is designed to pass the switching frequency, but attenuate its harmonics, a sine wave is applied to the load.



POWER MOSFET CLASS 'D' OPERATION

Power MOSFETs can be used to replace the switches as depicted in the simple class 'D' operation and push-pull class 'D' operation examples. Note that the switch contacts are replaced by the phase-oriented secondaries of an RF drive transformer. Q1 corresponds to S1-A, Q2 to S1-B, Q3 to S2-B and Q4 to S2-A, as depicted in the push-pull class 'D' operation example. Q1 and Q4 turn on/off together and Q2 and Q3 turn on/off together.

Figure 6-6 Simplified Principles of Class 'D' Operation



Vector-LP Radio Beacon Transmitter

TECHNICAL INSTRUCTION MANUAL

Section 7 PARTS INFORMATION

7.1 INTRODUCTION

This section contains parts lists that provide descriptive and provisioning information for all electrical and mechanical parts that have been assigned a reference designation and form a part of the subject equipment.

7.2 FAMILY TREE

Figure 7-1 depicts the family tree for the subject equipment. It is based on the descending order of the reference designation hierarchy and identifies all assemblies that have an assigned Nautel configuration control number.

7.3 HOW TO LOCATE INFORMATION FOR A SPECIFIC PART

To locate the information for a specific part, the assigned reference designation for the part must be known. In addition, the Nautel configuration control number (e.g., NAPC147D) assigned to the assembly containing the part or the full reference designation, including the reference designation of all higher assemblies, must be known.

7.3.1 When Nautel Configuration Control Number Is Known

When the Nautel configuration control number (e.g., NAPC147D) is known, the information for a specific part can be located in the alphanumerically sorted reference designation lists.

7.3.2 When Ref Des Is Known

When the full reference designation is known, the information for a part can be located as follows:

- Refer to the family tree depicted in Figure 7-1 with the full reference designation.

- Follow the family tree branches to the block that represents the lowest level assembly assigned a Nautel configuration control number. Then locate the reference designation table for that Nautel configuration control number.

- Locate the part's reference designation in the specified table.

7.4 REFERENCE DESIGNATION LISTS

Individual reference designation lists are provided for:

- Assemblies assigned an alpha-prefixed Nautel nomenclature (e.g., NAPC147D)
- Cable harnesses that are assigned a numbered Nautel part (e.g., 205-8001)
- Optional kits that are assigned a numbered Nautel part (e.g., 205-8045)

The reference designation lists, which are titled and presented in alphanumeric order, are divided into columns to aid in locating specific information.

7.5 COLUMN CONTENT EXPLANATION

The following paragraphs explain the purpose and contents of each column in the reference designation lists.

7.5.1 Ref Des Column

The 'ref des' column contains the reference designation for a specific part. These designations are assigned in accordance with the requirements of American National Standard Specification ANSI Y32.16. Reference designations are listed alphanumerically in this column.



7.5.2 Description Column

This column contains the name and descriptive information for each part. The key word or noun is presented first, followed by the adjective identifiers. When the description is 'See Family Tree for Assembly Nomenclature', the associated part is subject to its own reference designation list or is contained in an optional kit's list. If a family tree is not provided in this section, assume the latter to be true.

7.5.3 Nautel # Column

This column contains the Nautel part number assigned to each part. This number is Nautel's drawing number for Nautel manufactured parts, Nautel's configuration control number for assemblies that are under configuration control management or Nautel's inventory management number for purchased parts. When a Nautel configuration control number (e.g. NAPC*) is referenced in this column, the associated ref des item is subject to its own reference designation table.

7.5.4 Vendor # Column:

This column contains an original equipment manufacturer's part number for a part. A single part number is listed for each part, even if there is more than one known manufacturer. The listed number is Nautel's usual or preferred choice. The use of this number does not restrict Nautel from selecting and using commercial equivalents, where their use will not degrade circuit operation or reliability, during manufacture.

7.5.5 OEM Code Column

This column typically contains a five digit coded group as the original equipment manufacturer's (OEM) identifier. The code was extracted from Cataloging Handbook H4/H8 - Commercial and Government Entity (Cage) Code. Manufacturers that were not listed in the catalog when this listing was compiled have been assigned a unique five-letter code. This code is assigned arbitrarily and has no other significance. The manufacturers identified for parts that have JAN or MIL part numbers are Nautel's normal supply source for that part.

NOTE

OEM code 37338 is listed for parts manufactured by Nautel or to a Nautel control drawing. United States of America customers should refer all replacement part orders to Nautel Maine Incorporated (OEM code 57655).

7.6 OEM CODE TO MANUFACTURER CROSS-REFERENCE

The OEM (CAGE) codes listed in the reference designation lists are representative of the original equipment manufacturers of those parts. To determine a specific part's manufacturer contact information, enter the five-character OEM (CAGE) code for that part in the following website:

https://www.bpn.gov/bin/cs/begin_search.asp

Upon entering the OEM (CAGE) code number, manufacturer pertinent information (address, telephone number, fax number, etc.) shall be displayed. Please contact Nautel if a part cannot be obtained (see also ON-LINE PART QUOTES in this manual's *Warranty* section).

7.6.1 Manufacturer's Index

For users without internet access, Table 7-1 provides a cross-reference from the original equipment manufacturer's (OEM) codes to the manufacturer's name. The listing is sorted alphanumerically by the OEM code.



7.7 COMMON ABBREVIATIONS/ ACRONYMS

The following abbreviations/acronyms may appear in **Description** column:

DIP - Dual In-line Package

IDC - Denotes item is an Insulation
Displacement connector for ribbon
cable.

MTA - Denotes item is a Mass Termination
Assembly connector.

SIP - Single In-line Package

SMT - Denotes item is designed to be
installed using Surface Mount
Technology.



Table 7-1: Manufacturer's Index

00779	CTS Company Incorporated	61529	Airmat Corporation
01295	Texas Instruments Incorporated	62959	Multi-Tech Systems, Inc.
01961	Pulse Engineering Inc.	63590	Premier Industrial Corp SPC Technology Div
021P3	Ametherm Inc.	64155	Linear Technology Corporation
02660	Amphenol Corp Spectra-Strip/Ltd.	65786	Cypress Semiconductor Corp.
04713	Motorola Incorporated	68994	XILINX Incorporated
06090	Raychem Corporation	69669	Hammond Power Solutions Inc
07263	Fairchild Camera and Instrument Corp	74199	Quam Nichols Co.
08779	Signal Transformer Company Inc	75042	TRW Incorporated
09482	Amp of Canada Limited	75915	Littelfuse Tracor Incorporated
0A5K5	IXYS Corporation	7D893	Fairchild Semiconductor Corporation
0B0A9	Dallas Semiconductor Corporation	80294	Bourns Instruments Incorporated
0CVK3	Allegro Microsystems Inc.	81073	Grayhill Incorporated
0G343	Huffman Mfg. Co.	81483	International Rectifier
0GP12	Radiall Incorporated	83330	Dialight Corporation, DBA Dialight
12969	Micro USPD Incorporated	90201	Mallory Sonalert Products Inc.
13150	Axsys Technologies Incorporated	91833	Keystone Electronics Corporation
14655	Cornell Dubilier Electronics	91929	Honeywell Incorporated
16704	Cramer Coil and Transformer Co. Inc.	96095	AVX Ceramics Div of AVX Corp.
17856	Vishay Siliconix	97525	Transico Inc.
19647	Caddock Electronics Incorporated	AGILENT	See 50434
1EM90	Lumex Opto/Components Incorporated	ATC-FROS	ATC-Frost
1FN41	Atmel Corporation	BIVAR	Bivar Inc.
1JRT7	Epson Electronics American, Inc	C3057	Conec Elektronische Bauelemente GMBH
1K126	C & D Technologies	COILCRA	Coilcraft
1MQ07	ZRG Incorporated	COMP-C	Components Corporation
1UX99	Molex Connector Corporation	DEARBO	Dearborn Electronics Incorporated
1W344	United Chemi-Con	EPCOS	Epcos
22421	Thomas and Betts Limited	ER737	Texas Instruments
23875	M-Tron Industries Incorporated	IPD	Integrated Power Designs
24355	Analog Devices Inc.	IR	See 81483
25706	Daburn Electronics & Cable Corporation	ITT CANN	ITT Cannon
27014	National Semiconductor Corp	IXYS	See 0A5K5
31433	Kemet Electronics Corporation	LITEON	Liteon Inc.
31781	Edac Incorporated	MAGNE	MagneTek Triad
33062	Ferronics Incorporated	MICREL	Micrel Incorporated
35005	Dale Electronics Limited	MURATA	Murata
37338	Nautel Limited	ONSEMI	ON Semiconductors
36AB3	Pacific Display Devices	PANAS	Panasonic
3DX59	Citizen America Corporation	QT	QT Optoelectronics
3N087	Mill-Max Manufacturing Corporation	RALTRON	Ralton Electroincs Corp.
45496	Digital Systems	ROHM	ROHM
50434	Agilent Technologies Incorporated	SBE	SB Electronics Incorporated
54583	TDK Electronics Corporation	Shurter	Schurter Inc.
56289	Sprague Electric Company	SOSH	Soshin Electric Company, Limited
56699	BC Components	TYCO	Tyco Electronics
56845	Vishay Dale Electronics Incorporated	U3040	ST Microelectronics Ltd.
57655	Nautel Incorporated	UNITED	United Chemi-Con, Inc.
59124	KOA Speer Electronics Incorporated		
5Y407	Phoenix Contact Incorporated		



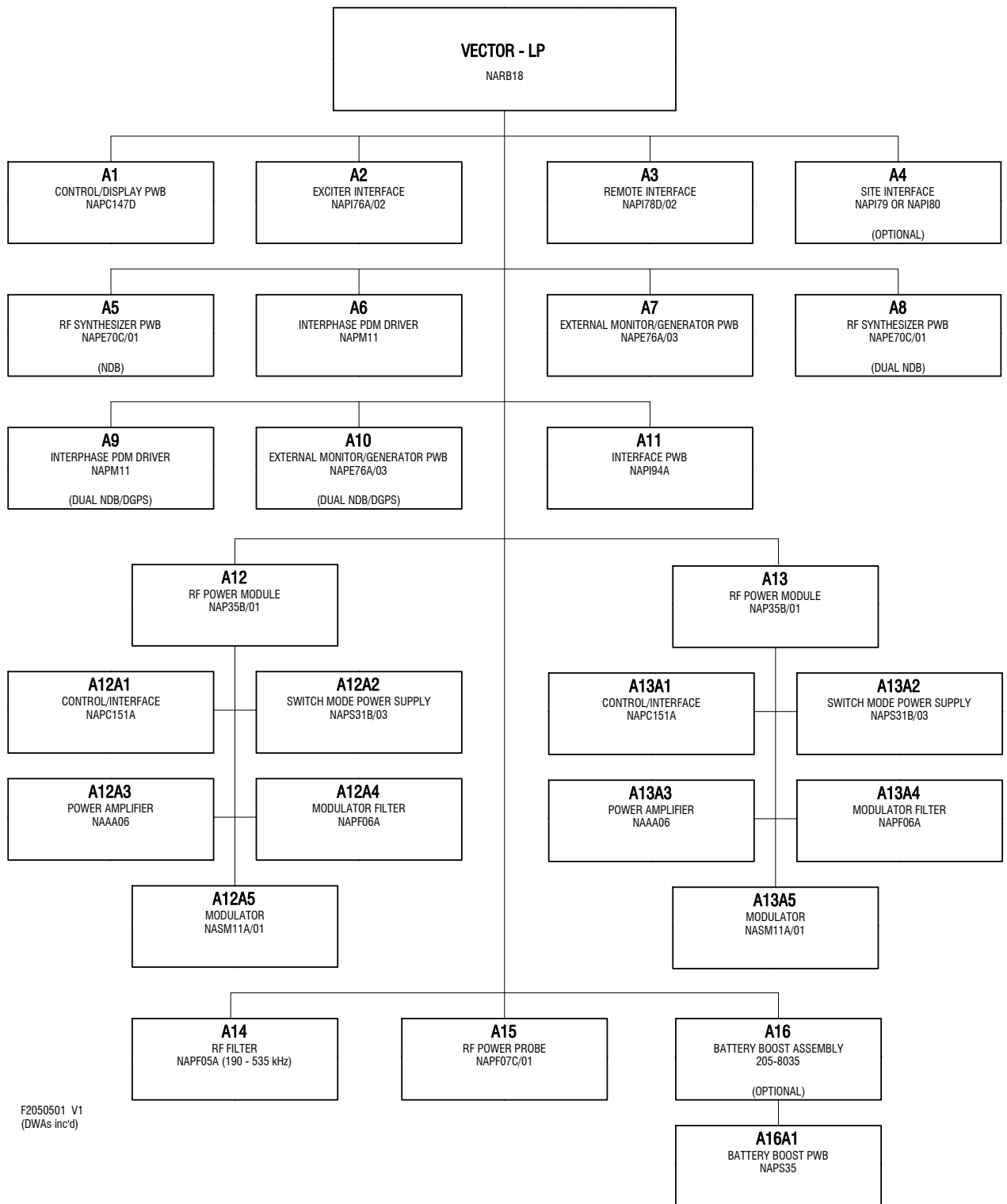


Figure 7-1: Family Tree – Vector-LP Radio Beacon Transmitter



195-3019

Display Mod

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
J01	Conn, Header, Ribbon Cbl, 20Pin	JQ55	103308-5	00779
U01	Display,LCD,240x60 Graphic,Ext Temp	UT81	C10815(STATIC) PACIFIC DISPLAY DEVICES	36AB3

195-3023

Ribbon Cable Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
W16P01	Conn, Recept, Ribbon Cable, 20 pin	JP45	746288-4	00779
W16P02	Conn, Recept, Ribbon Cable, 20 pin	JP45	746288-4	00779

195-3032

Modem Kit

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
U04	Modem, Industrial, V.92 Data/Fax	UW66	MT5634IND-NAM	62959

205-1016

Cableform Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
P01	Conn,Rcpt Housing,12 Pin,Metrimate	JP65	211759-1	09482
P02	Conn, Plug, 3-Pin, Mate-N-Lok	JT50	350766-1	00779
P03	Conn, Plug, 3-Pin, Mate-N-Lok	JT50	350766-1	00779
P04	Conn, Plug, 3-Pin, Mate-N-Lok	JT50	350766-1	00779

205-1018

Ribbon Cable Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
W1P1	Conn, Recept, Ribbon Cable, 10 pin	JP50	746285-1	00779
W1P2	Conn, Recept, Ribbon Cable, 10 pin	JP50	746285-1	00779
W2P1	Conn, Recept, Ribbon Cable, 10 pin	JP50	746285-1	00779
W2P2	Conn, Recept, Ribbon Cable, 10 pin	JP50	746285-1	00779
W3P1	Conn, Recept, Ribbon Cable, 20 pin	JP45	746288-4	00779
W3P2	Conn, Recept, Ribbon Cable, 20 pin	JP45	746288-4	00779



205-5050

RF Transformer Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
E01	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E02	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E03	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E04	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
T01	RF Transformer Assy	195-6055	195-6055	37338



REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
P01	MTA, Standard Dust Cover, 8 pin	JU07	640551-8	09482
P01	MTA, Keyed Closed End Housing,8 pin,22AWG	JU28	644463-8	00779
P02	MTA, Standard Dust Cover, 8 pin	JU07	640551-8	09482
P02	MTA, Keyed Closed End Housing,8 pin,22AWG	JU28	644463-8	00779
P03	MTA, Keyed Closed End Housing,10 Pin, 22 AWG	JU37	1-644463-0	00779
P03	MTA, Standard Dust Cover,10 Pin	JU38	1-640551-0	00779
P04	MTA, Keyed Closed End Housing,10 Pin, 22 AWG	JU37	1-644463-0	00779
P04	MTA, Standard Dust Cover,10 Pin	JU38	1-640551-0	00779
P05	MTA,Closed End Housing,3 pin,22 AWG	JU46	3-640433-3(ROHS)	TYCO
P05	MTA,Standard Dust Cover,3 pin	JU47	640551-3(ROHS)	TYCO
P06	MTA,Closed End Housing,3 pin,22 AWG	JU46	3-640433-3(ROHS)	TYCO
P06	MTA,Standard Dust Cover,3 pin	JU47	640551-3(ROHS)	TYCO
P07	Conn, Plug, D-Sub, 25 pin, HDP-20	JR39	205208-1	09482
P07	Conn, Lock Screw, D-Sub, Male	JT16	205980-1	09482
P08	Conn, Socket, D-Sub, HDP-20, 25 pin	JR38	205207-1	09482
P08	Conn, Lock Screw, D-Sub, Male	JT16	205980-1	09482
P09	Conn, Plug, D-Sub, 25 pin, HDP-20	JR39	205208-1	09482
P09	Conn, Lock Screw, D-Sub, Male	JT16	205980-1	09482
P10	Conn, Socket, D-Sub, HDP-20, 25 pin	JR38	205207-1	09482
P10	Conn, Lock Screw, D-Sub, Male	JT16	205980-1	09482
P11	Conn, Socket, D-Sub, HDP-20, 25 pin	JR38	205207-1	09482
P12	Conn, Socket, D-Sub, HDP-20, 25 pin	JR38	205207-1	09482
P12	Conn, Lock Screw, D-Sub, Male	JT16	205980-1	09482
P13	Conn, Plug, D-Sub, 25 pin, HDP-20	JR39	205208-1	09482
P14	Conn, Plug, D-Sub, 25 pin, HDP-20	JR39	205208-1	09482
P14	Conn, Lock Screw, D-Sub, Male	JT16	205980-1	09482
P15	Conn, Coax, N, Plug, 50ohm, Crimp, RG58	JDP22	82-5375	02660
P16	Conn, Plug, D-Sub, 25 pin, HDP-20	JR39	205208-1	09482
P17	Conn, Socket, D-Sub, HDP-20, 25 pin	JR38	205207-1	09482
P18	Conn, Spring Latch, D-sub Plate	JS65	D110278(ROHS)	ITT CANNO
P18	Conn, Shell, D-sub, 25 pin, 90 deg	JS66	DB51213(ROHS)	ITT CANNO
P18	Conn, IDC, D-Sub, S, HDE-20, 25-Pos	JT30	745495-3	09482
P19	Conn, Spring Latch, D-sub Plate	JS65	D110278(ROHS)	ITT CANNO
P19	Conn, Shell, D-sub, 25 pin, 90 deg	JS66	DB51213(ROHS)	ITT CANNO
P19	Conn, IDC, D-Sub, S, HDE-20, 25-Pos	JT30	745495-3	09482
P20	Conn, Plug, D-Sub, 25 pin, HDP-20	JR39	205208-1	09482
P21	Conn, Plug, D-Sub, 25 pin, HDP-20	JR39	205208-1	09482
P21	Conn, Lock Screw, D-Sub, Male	JT16	205980-1	09482
P22	MTA, Standard Dust Cover, 4 pin	JU02	640551-4	09482

205-8001

Cableform, Vector-LP

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
P22	MTA, Keyed Closed End Housing,4 pin,22AWG	JU27	3-644463-4(ROHS) AMP	00779
P23	Conn, Socket, D-Sub, HDP-20, 25 pin	JR38	205207-1	09482
P24	Conn, Plug, D-Sub, 25 pin, HDP-20	JR39	205208-1	09482
P24	Conn, Lock Screw, D-Sub, Male	JT16	205980-1	09482
P25	MTA, Keyed Closed End Housing,10 Pin, 22 AWG	JU37	1-644463-0	00779
P25	MTA, Standard Dust Cover,10 Pin	JU38	1-640551-0	00779
P26	MTA, Standard Dust Cover, 12 pin	JU04	1-640551-2	09482
P26	MTA, Keyed Closed End Housing,12pin,22AWG	JU26	1-644463-2	00779
P27	Conn, Socket, D-Sub, HDP-20, 25 pin	JR38	205207-1	09482
P27	Conn, Lock Screw, D-Sub, Male	JT16	205980-1	09482
P28	Conn, Recept, Mate-N-Lok, 3 pin, Mini	JT40	172234-1	09482
P29	Conn, Recept, Mate-N-Lok, 3 pin, Mini	JT40	172234-1	09482
P30	Conn, Recept, Mate-N-Lok, 3 pin, Mini	JT40	172234-1	09482
P31	Conn, Recept, Mate-N-Lok, 3 pin, Mini	JT40	172234-1	09482
P32	MTA, Standard Dust Cover, 4 pin	JU02	640551-4	09482
P32	MTA, Keyed Closed End Housing,4 pin,22AWG	JU27	3-644463-4(ROHS) AMP	00779
XA12P1	Conn,Sckt Housing,12 Socket,Metrimate	JP66	211758-1	09482
XA13P1	Conn,Sckt Housing,12 Socket,Metrimate	JP66	211758-1	09482



205-8019

Ribbon Cable Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
W01P1	Conn, Recept, Ribbon Cable, 40 pin	JP51	746288-9	00779
W01P2	Conn, Recept, Ribbon Cable, 40 pin	JP51	746288-9	00779
W02P1	Conn, Recept, Ribbon Cable, 40 pin	JP51	746288-9	00779
W02P2	Conn, Recept, Ribbon Cable, 40 pin	JP51	746288-9	00779
W03P1	Conn, Recept, Ribbon Cable, 40 pin	JP51	746288-9	00779
W03P2	Conn, Recept, Ribbon Cable, 40 pin	JP51	746288-9	00779
W04P1	Conn, Recept, Ribbon Cable, 40 pin	JP51	746288-9	00779
W04P2	Conn, Recept, Ribbon Cable, 40 pin	JP51	746288-9	00779
W05P1	Conn, Recept, Ribbon Cable, 40 pin	JP51	746288-9	00779
W05P2	Conn, Recept, Ribbon Cable, 40 pin	JP51	746288-9	00779
W06P1	Conn, Recept, Ribbon Cable, 20 pin	JP45	746288-4	00779
W06P2	Conn, Recept, Ribbon Cable, 20 pin	JP45	746288-4	00779
W06P3	Conn, Recept, Ribbon Cable, 40 pin	JP51	746288-9	00779
W07P1	Conn, Recept, Ribbon Cable, 20 pin	JP45	746288-4	00779
W07P2	Conn, Recept, Ribbon Cable, 20 pin	JP45	746288-4	00779
W10P1	Conn, Recept, Ribbon Cable, 40 pin	JP51	746288-9	00779
W10P2	Conn, Recept, Ribbon Cable, 40 pin	JP51	746288-9	00779

205-8035

Battery Boost Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
A01	SMPS, 24/48V Battery Boost PWB Assy	NAPS35	205-7020	37338
C01	Capacitor, Plastic, 1.0uF 10PC 250V	CS11	B32232A3105K	EPCOS
C02	Capacitor, Metal, Polyprop, 5uF +/-10% 100V	CS22	5MP12D505K	50558
CR06	Diode, Fast Recovery, 600V, 60A	QH43	DSEI60-06A	0A5K5
Q04	Transistor, FET, N, 500V, 0.1 Ohm	QR56	STW26NM50(STATIC)	0G343
Q05	Transistor, FET, N, 500V, 0.1 Ohm	QR56	STW26NM50(STATIC)	0G343
TB01	Terminal Block, 4-Pos, Double, 61A	JF27	G10/4	5Y407

205-8073

Wire Assy Cabinet Vector-LP

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
J1	Conn, Coax, Jack, N, Crimp for RG303	JT52	24-N-50-3-11C/133	0GZ58
P2	Conn, Coax, N, Plug, 50ohm, Crimp, RG58	JDP22	82-5375	02660

205-8075

Cabinet-Vector-LP (Tall Rack)

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
P3	Cord, Line Assy, SJT, 250V,10A	JN50	17569	VOLEX
TB01	Terminal Block, 4-Pos, Double, 61A	JF27	G10/4	5Y407
W1	Wire Assy Cabinet Vector-LP	205-8073	205-8073	37338

205-8080

IP66 Cabinet w/Vector-LP Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
J01	Conn, Coax, N, Bulkhead,Receptacle	JA54	UG-680/U	00795
P01	Cord, Line Assy, SJT, 250V,10A	JN50	17569	VOLEX
P02	Conn, Coax, N, Plug, 50ohm, Crimp, RG58	JDP22	82-5375	02660
TB01	Terminal Block, 4-Pos, Double, 61A	JF27	G10/4	5Y407
TB02	Terminal Block, 4-Pos, Double, 61A	JF27	G10/4	5Y407

205-8120

Cabinet-Vector-LP (Short Rack)w/ Internal Battery

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
CB01	Circuit Breaker, 1-pole, 65Vdc20A	SB46	W91-X152-20	U5588
P01	Cord, Line Assy, SJT, 250V,10A	JN50	17569	VOLEX
TB01	Terminal Block, 4-Pos, Double, 61A	JF27	G10/4	5Y407
TB02	Terminal Block, 4-Pos, Double, 61A	JF27	G10/4	5Y407
W01	Wire Assy Cabinet Vector-LP	205-8073	205-8073	37338

205-8120-01

Cabinet-Vector-LP (Short Rack)

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
P01	Cord, Line Assy, SJT, 250V,10A	JN50	17569	VOLEX
TB01	Terminal Block, 4-Pos, Double, 61A	JF27	G10/4	5Y407
TB02	Terminal Block, 4-Pos, Double, 61A	JF27	G10/4	5Y407
W01	Wire Assy Cabinet Vector-LP	205-8073	205-8073	37338



205-8200

Cabinet-Vector-LP (Tall Rack)w/ Internal Battery

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
CB01	Circuit Breaker, 1-pole, 65Vdc20A	SB46	W91-X152-20	U5588
P01	Cord, Line Assy, SJT, 250V,10A	JN50	17569	VOLEX
P03	See Sales Order	%	% SEE SALES ORDER	37338
TB01	Terminal Block, 4-Pos, Double, 61A	JF27	G10/4	5Y407
TB02	Terminal Block, 4-Pos, Double, 61A	JF27	G10/4	5Y407
U01	See Sales Order	%	% SEE SALES ORDER	37338
U02	See Sales Order	%	% SEE SALES ORDER	37338
W01	Wire Assy Cabinet Vector-LP	205-8073	205-8073	37338
W02	See Sales Order	%	% SEE SALES ORDER	37338
W03	See Sales Order	%	% SEE SALES ORDER	37338



REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C01	Capacitor, Ceramic, 1.0uF 100V	CAP16	RPE114Z5U105M100V	91929
C02	Capacitor, Polyprop, 0.056uF, 10%, 600V	CP30	716P56396L	SBE
C03	Capacitor, Ceramic, 0.47uF 10% 50V	CCG09	CKR06BX474KRV	56289
C04	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C05	Capacitor, Ceramic, 1.0uF 100V	CAP16	RPE114Z5U105M100V	91929
C06	Capacitor, Ceramic, 1.0uF 100V	CAP16	RPE114Z5U105M100V	91929
C07	Capacitor, Ceramic, 0.1uF 10% 100V	CCG07	CKR06BX104KRV	56289
CR01	Diode, Power Rectifier, 4A, Ultra Fast	QM22	MUR460	04713
CR02	Diode, Power Rectifier, 4A, Ultra Fast	QM22	MUR460	04713
CR03	Diode, Power Rectifier, 4A, Ultra Fast	QM22	MUR460	04713
CR04	Diode, Power Rectifier, 4A, Ultra Fast	QM22	MUR460	04713
CR05	Diode, General Purpose, 200V, 0.1A	QAP29	1N4938	07263
E01	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E02	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E03	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
F01	Fuse, 1A, 250V, Slow, 3AG	FA08	313001	75915
J01	Conn, Header, Ribbon Cbl, 10 pin	JA49	499910-1	00779
Q01	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
Q02	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
Q03	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
Q04	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
Q05	Transistor, NPN, Switch/Amplifier	QA45	2N4401	04713
R01	Resistor, Film, 100 Ohms, 5% 2W	RBP07	GS-3, 100 OHMS	75042
R02	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
R03	Resistor, MF, 15.0K Ohms, 1PC 1/4W	RAB39	MF1/4DL1502F	59124
R04	Resistor, MF, 8.25K Ohms, 1PC 1/4W	RAB36	MF1/4DL8251F	59124
R05	Resistor, Film, 33K Ohms, 5%, 2W	RBP22	GS-3, 33K OHMS	75042
R06	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R07	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
T01	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
U01	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XF01	Fuseholder, PWB Mount, Type 3AG	FA31	4245	91833

NAP356

RF Power Module Assy,Vector-LP250/D375

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
A01	Power Module Control/InterfacePWB Assy	NAPC151A	205-4110-01	37338
A02	SPS, Forward Converter PWBAssy	NAPS31B/02	197-7022-10	37338
A03	Power Amplifier Assy	NAAA06	195-1055	37338
A04	Modulator Filter PWB Assy	NAPF06A	195-1090-01	37338
A05	Modulator (Vector) Assy	NASM11A/01	195-1077-02	37338
A3Q01	Transistor, FET, N Channel	QAP49	STW14NM50(STATIC)	OG343
A3Q02	Transistor, FET, N Channel	QAP49	STW14NM50(STATIC)	OG343
A3Q03	Transistor, FET, N Channel	QAP49	STW14NM50(STATIC)	OG343
A3Q04	Transistor, FET, N Channel	QAP49	STW14NM50(STATIC)	OG343
A3R02	Resistor, 2.5 Ohm/15W, TO-126	RAB51	MP915-2.5-1	19647
A3T01	RF Drive Transformer Assy	197-1020	197-1020	37338
A3U01	IC, Mosfet Driver, T0220-5-12A	UD54	MIC4452CT(STATIC)	MICRELL
A5CR08	Diode, Ultrafast, Soft Recovery, 600V, 8A	QR24	HFA08TB60(STATIC)	81483
A5L01	Bead, Ferrite, 3.5mm, B Mtl	LXP20	21-030-B	33062
A5Q01	Transistor, FET, N Channel	QAP49	STW14NM50(STATIC)	OG343
T01	RF Transformer Assy	205-5050	205-5050-P	37338

NAP356/01

RF Power Module Assy,Vector-LP125/D200

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
A01	Power Module Control/InterfacePWB Assy	NAPC151A	205-4110-01	37338
A02	SPS, Fwd Conv PWB Assy	NAPS31B/03	197-7022-11	37338
A03	Power Amplifier Assy	NAAA06	195-1055	37338
A04	Modulator Filter PWB Assy	NAPF06A	195-1090-01	37338
A05	Modulator (Vector) Assy	NASM11A/01	195-1077-02	37338
A3Q01	Transistor, FET, N Channel	QAP49	STW14NM50(STATIC)	OG343
A3Q02	Transistor, FET, N Channel	QAP49	STW14NM50(STATIC)	OG343
A3Q03	Transistor, FET, N Channel	QAP49	STW14NM50(STATIC)	OG343
A3Q04	Transistor, FET, N Channel	QAP49	STW14NM50(STATIC)	OG343
A3R02	Resistor, 2.5 Ohm/15W, TO-126	RAB51	MP915-2.5-1	19647
A3T01	RF Drive Transformer Assy	197-1020	197-1020	37338
A3U01	IC, Mosfet Driver, T0220-5-12A	UD54	MIC4452CT(STATIC)	MICRELL
A5CR08	Diode, Ultrafast, Soft Recovery, 600V, 8A	QR24	HFA08TB60(STATIC)	81483
A5L01	Bead, Ferrite, 3.5mm, B Mtl	LXP20	21-030-B	33062
A5Q01	Transistor, FET, N Channel	QAP49	STW14NM50(STATIC)	OG343
T01	RF Transformer Assy	205-5050	205-5050-P	37338



REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
BT01	Battery, Lithium, 3V,20mm Coin Cell	BBLT01	CR2032	PANAS
C001	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C002	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C003	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C004	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C005	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C006	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C007	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C008	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C009	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C010	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C011	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C012	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C013	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C014	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C015	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C016	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C017	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C018	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C019	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C020	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C021	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C022	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C023	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C024	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C025	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C026	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C027	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C028	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C029	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C030	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C031	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C032	Cap,SMT,Ceramic,0.0022uF,10%,50V,X7R,0603	CCFS02	C0603C222K5RAC	31433
C033	Cap,SMT,Ceramic,0.0047uF,10%,50V,X7R,0603	CCFS03	C0603C472K5RAC	31433
C034	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C035	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C036	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C037	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C038	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433

NAPC147B Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C039	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C040	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C041	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C042	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C043	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C044	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C045	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C046	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C047	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C048	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C049	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C050	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C051	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C052	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C053	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C054	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C055	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C056	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C057	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C058	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C059	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C060	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C061	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C062	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C063	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C064	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C065	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C066	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C067	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C068	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C069	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C070	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C071	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C072	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C073	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C074	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C075	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C076	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C077	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433

NAPC147B Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C078	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C079	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C080	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C081	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C082	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C083	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C084	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C085	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C086	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C087	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C088	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C089	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C090	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C091	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C092	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C093	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C094	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C095	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C096	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C097	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C098	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C099	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C100	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C101	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C102	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C103	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C104	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C105	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C106	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C107	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C108	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C109	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C110	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C111	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C112	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C113	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C114	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C115	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C116	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433

NAPC147B Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C117	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C118	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C119	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C120	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C121	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C122	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C123	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C124	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C125	Cap,SMT,Ceramic,18pF,2%,50V,C0G,0603	CCFS23	C0603C180G5GAC	31433
C126	Cap,SMT,Ceramic,18pF,2%,50V,C0G,0603	CCFS23	C0603C180G5GAC	31433
C127	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C128	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C129	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C130	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C131	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C132	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C133	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C134	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C135	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C136	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C137	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C138	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C139	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C140	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C141	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C142	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C143	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C144	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C145	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C146	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C147	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C148	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C149	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C150	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C151	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C152	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C153	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C154	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C155	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433

NAPC147B Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C156	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C157	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C158	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C159	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C160	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C161	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C162	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C163	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C164	Cap,SMT,Ceramic,0.47uF,10%,25V,X7R,0805	CCFS09	C0805C474K3RAC	31433
C165	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C166	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
CR01	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR02	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR03	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR04	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR05	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR06	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR07	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR08	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR09	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR10	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR11	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR12	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR13	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR14	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR15	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR16	Diode,SMT,Zener,39V,5%,3W,SMB	QDZS04	1SMB5939BT3	04713
E01	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E02	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E03	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
J01	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J02	Conn, Plug, D-Sub, 25 pin, PWB Mt	JS12	K22-B25P-NJ	63590
J03	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
J04	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J05	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
J06	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
J07	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J08	Conn, Header,Square Post,Gold,Dual,40-pin	JF47	4-102973-0	09482
J09	Conn, Header, Ribbon Cbl, 20Pin	JQ55	103308-5	00779

NAPC147B Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
J10	Conn, Header,Square Post,Gold,Dual,40-pin	JF47	4-102973-0	09482
J11	MTA, Keyed Square Post HeaderAssy, 4 pin	JU25	647123-4	00779
L01	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L02	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L03	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L04	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L05	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L06	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L07	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L08	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L09	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L10	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L11	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L12	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L13	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L14	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L15	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
LS01	Alarm, Audio Piezoelectric,Sonalert	LP30	MSR516N	90201
Q01	Transistor,SMT,NPN,Switch/Amp,SOT-23	QBNS01	MMBT4401LT1(STATI C)	04713
Q02	Transistor,SMT,NPN,Switch/Amp,SOT-23	QBNS01	MMBT4401LT1(STATI C)	04713
Q03	Transistor,SMT,NPN,Switch/Amp,SOT-23	QBNS01	MMBT4401LT1(STATI C)	04713
Q04	Transistor,SMT,NPN,Switch/Amp,SOT-23	QBNS01	MMBT4401LT1(STATI C)	04713
Q05	Transistor,SMT,MOSFET,N-Channel,60V,115mA,SOT-23	QN53	2N7002LT1G(STATIC) (ROHS)	1MQ07
R001	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R002	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R003	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R004	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R005	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R006	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R007	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R008	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R009	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R010	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R011	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R012	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R013	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R014	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124

NAPC147B Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R015	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R016	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R017	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R018	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R019	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R020	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R021	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R022	Resistor,SMT,MF,8250ohms,1%,1/10W,0603	RFFS49	RK73H1JLTD8251F	59124
R023	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R024	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R025	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R026	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R027	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R028	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R029	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R030	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R031	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R032	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R033	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R034	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R035	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R036	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R037	Resistor,SMT,MF,39.2Kohms,1%,1/10W,0603	RFFS57	RK73H1JLTD3922F	59124
R038	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R039	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R040	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R041	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R042	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R043	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R044	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R045	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R046	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R047	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R048	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R049	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R050	Not Used	-	NOT USED	37338
R051	Resistor,SMT,MF,0.0ohms,Jumper,0603	RFFS01	RK73Z1JLTD	59124
R052	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R053	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124

NAPC147B Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R054	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R055	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R056	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R057	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R058	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R059	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R060	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R061	Resistor,SMT,MF,5620ohms,1%,1/10W,0603	RFFS47	RK73H1JLTD5621F	59124
R062	Resistor,SMT,MF,8250ohms,1%,1/10W,0603	RFFS49	RK73H1JLTD8251F	59124
R063	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R064	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R065	Resistor,SMT,MF,1500ohms,1%,1/10W,0603	RFFS40	RK73H1JLTD1501F	59124
R066	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R067	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R068	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R069	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R070	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R071	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R072	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R073	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R074	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R075	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R076	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R077	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R078	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R079	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R080	Resistor,SMT,MF,1500ohms,1%,1/10W,0603	RFFS40	RK73H1JLTD1501F	59124
R081	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R082	Resistor,SMT,MF,15.0Kohms,1%,1/10W,0603	RFFS52	RK73H1JLTD1502F	59124
R083	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R084	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R085	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R086	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R087	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R088	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R089	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R090	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R091	Resistor, SMT, MF, 221 Ohms,1% 1/4W	RAD17	RK73H2BL2210F	59124
R092	Resistor, SMT, MF, 221 Ohms,1% 1/4W	RAD17	RK73H2BL2210F	59124

NAPC147B Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R093	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R094	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R095	Resistor,SMT,MF,68.1Kohms,1%,1/10W,0603	RFFS60	RK73H1JLTD6812F	59124
R096	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R097	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R098	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R099	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R100	Resistor,SMT,MF,681ohms,1%,1/10W,0603	RFFS36	RK73H1JLTD6810F	59124
R101	Resistor,SMT,MF,681ohms,1%,1/10W,0603	RFFS36	RK73H1JLTD6810F	59124
R102	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R103	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R104	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R105	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R106	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R107	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R108	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R109	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R110	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R111	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R112	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R113	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R114	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R115	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R116	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R117	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R118	Resistor,SMT,MF,47.5Kohms,1%,1/10W,0603	RFFS58	RK73H1JLTD4752F	59124
R119	Resistor,SMT,MF,1210ohms,1%,1/10W,0603	RFFS39	RK73H1JLTD1211F	59124
R120	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R121	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R122	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R123	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R124	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R125	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R126	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R127	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R128	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R129	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R130	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R131	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124



NAPC147B Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R132	Resistor,SMT,MF,22.1Kohms,1%,1/10W,0603	RFFS54	RK73H1JLTD2212F	59124
R133	Resistor,SMT,MF,1820ohms,1%,1/10W,0603	RFFS41	RK73H1JLTD1821F	59124
R134	Resistor,SMT,MF,12.1Kohms,1%,1/10W,0603	RFFS51	RK73H1JLTD1212F	59124
R135	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R136	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R137	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R138	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R139	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R140	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R141	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R142	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R143	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R144	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R145	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R146	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R147	Not Used	-	NOT USED	37338
R148	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R149	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R150	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R151	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R152	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R153	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R154	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R155	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R156	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R157	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R158	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R159	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R160	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R161	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R162	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R163	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R164	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R165	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R166	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R167	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R168	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R169	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R170	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124

NAPC147B Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R171	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R172	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R173	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R174	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R175	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R176	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R177	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R178	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R179	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R180	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R181	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R182	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R183	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R184	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R185	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R186	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R187	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R188	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R189	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R190	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R191	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R192	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R193	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R194	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R195	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R196	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R197	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R198	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R199	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R200	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R201	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R202	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R203	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R204	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R205	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R206	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R207	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R208	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R209	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124

NAPC147B Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R210	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R211	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R212	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R213	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R214	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R215	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R216	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R217	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R218	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R219	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R220	Resistor, Film, 4.75 Ohms, 1PC 1/2W	RC09	MF1/2DL4R75F	59124
R221	Resistor, Film, 4.75 Ohms, 1PC 1/2W	RC09	MF1/2DL4R75F	59124
R222	Resistor,SMT,MF,0.0ohms,Jumper,0603	RFFS01	RK73Z1JLTD	59124
R223	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R224	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R225	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R226	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R227	Resistor,SMT,MF,1500ohms,1%,1/10W,0603	RFFS40	RK73H1JLTD1501F	59124
R228	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R229	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R230	Resistor,SMT,MF,15.0Kohms,1%,1/10W,0603	RFFS52	RK73H1JLTD1502F	59124
R231	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R232	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R233	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R234	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R235	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R236	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R237	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R238	Resistor,SMT,MF,0.0ohms,Jumper,0603	RFFS01	RK73Z1JLTD	59124
R239	Resistor,SMT,MF,2740ohms,1%,1/10W,0603	RFFS43	RK73H1JLTD2741F	59124
R240	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R241	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R242	Resistor,SMT,MF,33.2Kohms,1%,1/10W,0603	RFFS56	RK73H1JLTD3322F	59124
R243	Resistor, Film, 3.92 Ohms, 1PC 1/2W	RC08	MF1/2DL3R92F	59124
R244	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R245	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R246	Resistor, Film, 3.92 Ohms, 1PC 1/2W	RC08	MF1/2DL3R92F	59124
R247	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R248	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124

NAPC147B Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R249	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R250	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R251	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R252	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R253	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R254	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R255	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
U01	IC,SMT,Opamp,Quad,Rail-To-Rail,SOIC-14	ULAS02	TLV2374ID(STATIC)	01295
U02	IC,SMT,Opamp,Quad,Rail-To-Rail,SOIC-14	ULAS02	TLV2374ID(STATIC)	01295
U03	IC,SMT,Opamp,Quad,Rail-To-Rail,SOIC-14	ULAS02	TLV2374ID(STATIC)	01295
U04	IC,SMT,Comparator,Quad,SOIC-14	ULCS01	MC3302D(STATIC)	04713
U05	IC,Low Voltage Temp Sensor,+/-3 Deg,TO-92	UC58	TMP36GT9(STATIC)	45496
U06	IC,SMT,RS-485 Transceiver,Sgl,SOIC-8	UDTS03	DS36C278TM(STATIC)	27014
U07	IC,SMT,Opamp,Quad,Rail-To-Rail,SOIC-14	ULAS02	TLV2374ID(STATIC)	01295
U08	IC,SMT,Opamp,Quad,Rail-To-Rail,SOIC-14	ULAS02	TLV2374ID(STATIC)	01295
U09	IC,SMT,ADC,10-Bit,11-ch,SPI,SOIC-20	UMAS01	TLC1543IDW(STATIC)	01295
U10	IC,SMT,4.096V Reference,0.1%,SOT-23-6	ULRS02	LT1790BIS6-4.096(STATIC)	64155
U11	IC,SMT,Opamp,Quad,Rail-To-Rail,SOIC-14	ULAS02	TLV2374ID(STATIC)	01295
U12	IC,SMT,ADC,10-Bit,11-ch,SPI,SOIC-20	UMAS01	TLC1543IDW(STATIC)	01295
U13	IC,CMOS,Hex Schmitt,Trigger Inverter,SOIC-14	UG35	MM74HC14M(STATIC)	07263
U14	IC,CMOS,Hex Schmitt,Trigger Inverter,SOIC-14	UG35	MM74HC14M(STATIC)	07263
U15	IC,CMOS,Hex Schmitt,Trigger Inverter,SOIC-14	UG35	MM74HC14M(STATIC)	07263
U16	IC,CMOS,Hex Schmitt,Trigger Inverter,SOIC-14	UG35	MM74HC14M(STATIC)	07263
U17	IC,CMOS,Hex Schmitt,Trigger Inverter,SOIC-14	UG35	MM74HC14M(STATIC)	07263
U18	IC,SMT,Complex Prog Logic Dev,PLCC-84	UX74	XC9572-15PC84I(STATIC)	68994
U19	Not Used	-	NOT USED	37338
U20	IC, SMT, SRAM, 32Kx8, SOIC-28(Wide)	UDMS01	CY62256NLL-55SNXI(STATIC)(RoHS)	65786
U21	IC,SMT,Non-Volatile RAM Ctrlr,SOIC-8	UDSS01	DS1312S-2(STATIC)	0B0A9
U22	IC, SMT, Micro, ADC, PWM,Flash, TQFP-64	UDMS02	ATMEGA128-16AI(STATIC)	1FN41
U23	IC, SMT, CMOS, Octal Latch,SOIC-20	UDLS02	SN74AHC573DW(STATIC)	01295
U24	IC,CMOS,Hex Schmitt,Trigger Inverter,SOIC-14	UG35	MM74HC14M(STATIC)	07263
U25	IC,SMT,Real-Time Clock,SPI,SOIC-16	UDTS01	M41T94MQ6(STATIC)	U3040

NAPC147B Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
U26	IC,SMT,2.5V Reference,0.1%,SOT-23-6	UX83	LT1790BIS6-2.5(STATIC)	64155
U27	IC,SMT,Opamp,Quad,Single Supply,SOIC-14	ULAS01	MC33074AD(STATIC)	04713
U28	IC,SMT,Opamp,Quad,Single Supply,SOIC-14	ULAS01	MC33074AD(STATIC)	04713
U29	IC,SMT,CMOS,Octal Flip Flop,SOIC-20	UDLS01	SN74AHC574DW(STA TIC)	01295
U30	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713
U31	IC,SMT,DAC,8-Bit,4-ch,SPI,SOIC-14	UMDS01	TLV5620ID(STATIC)	64155
U32	IC,SMT,DAC,8-Bit,4-ch,SPI,SOIC-14	UMDS01	TLV5620ID(STATIC)	64155
U33	IC,SMT,CMOS,Octal Flip Flop,SOIC-20	UDLS01	SN74AHC574DW(STA TIC)	01295
U34	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713
U35	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713
U36	IC,SMT,CMOS,Octal Flip Flop,SOIC-20	UDLS01	SN74AHC574DW(STA TIC)	01295
U37	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713
U38	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713
XBT01	Holder, 20mm Coin Cell, PWB Mt	BBHT01	1065	91833
XE01	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE02	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE03	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XJ08	Conn, Header,Square Post,Gold,Dual,40-pin	JF47	4-102973-0	09482
Y01	Crystal,SMT,Fund,Par Res,11.0592MHz	XFPS01	CMR309T11.0592MAB JTR	3DX59
Y02	Crystal,SMT,Fund,Par Res,32.768kHz	XFPS02	MC20632.7680KA-A0	1JRT7

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
BT01	Battery, Lithium, 3V,20mm Coin Cell	BBLT01	CR2032	PANAS
C001	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C002	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C003	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C004	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C005	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C006	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C007	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C008	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C009	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C010	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C011	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C012	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C013	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C014	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C015	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C016	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C017	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C018	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C019	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C020	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C021	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C022	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C023	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C024	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C025	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C026	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C027	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C028	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C029	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C030	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C031	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C032	Cap,SMT,Ceramic,0.0022uF,10%,50V,X7R,0603	CCFS02	C0603C222K5RAC	31433
C033	Cap,SMT,Ceramic,0.0047uF,10%,50V,X7R,0603	CCFS03	C0603C472K5RAC	31433
C034	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C035	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C036	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C037	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C038	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433

NAPC147D

Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C039	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C040	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C041	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C042	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C043	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C044	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C045	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C046	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C047	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C048	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C049	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C050	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C051	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C052	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C053	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C054	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C055	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C056	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C057	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C058	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C059	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C060	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C061	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C062	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C063	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C064	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C065	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C066	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C067	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C068	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C069	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C070	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C071	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C072	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C073	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C074	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C075	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C076	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C077	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433

NAPC147D

Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C078	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C079	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C080	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C081	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C082	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C083	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C084	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C085	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C086	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C087	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C088	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C089	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C090	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C091	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C092	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C093	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C094	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C095	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C096	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C097	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C098	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C099	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C100	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C101	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C102	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C103	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C104	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C105	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C106	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C107	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C108	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C109	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C110	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C111	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C112	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C113	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C114	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C115	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C116	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433

NAPC147D Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C117	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C118	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C119	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C120	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C121	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C122	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C123	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C124	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C125	Cap,SMT,Ceramic,18pF,2%,50V,C0G,0603	CCFS23	C0603C180G5GAC	31433
C126	Cap,SMT,Ceramic,18pF,2%,50V,C0G,0603	CCFS23	C0603C180G5GAC	31433
C127	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C128	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C129	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C130	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C131	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C132	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C133	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C134	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C135	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C136	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C137	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C138	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C139	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C140	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C141	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C142	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C143	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C144	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C145	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C146	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C147	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C148	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C149	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C150	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C151	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C152	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C153	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C154	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C155	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433

NAPC147D Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C156	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C157	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C158	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C159	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C160	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C161	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C162	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C163	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C164	Cap,SMT,Ceramic,0.47uF,10%,25V,X7R,0805	CCFS09	C0805C474K3RAC	31433
C165	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C166	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
CR01	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR02	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR03	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR04	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR05	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR06	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR07	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR08	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR09	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR10	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR11	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR12	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR13	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR14	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR15	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR16	Diode,SMT,Zener,39V,5%,3W,SMB	QDZS04	1SMB5939BT3	04713
E01	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E02	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E03	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
J01	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J02	Conn, Plug, D-Sub, 25 pin, PWB Mt	JS12	K22-B25P-NJ	63590
J03	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
J04	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J05	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
J06	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
J07	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J08	Conn, Header,Square Post,Gold,Dual,40-pin	JF47	4-102973-0	09482
J09	Conn, Header, Ribbon Cbl, 20Pin	JQ55	103308-5	00779

NAPC147D Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
J10	Conn, Header,Square Post,Gold,Dual,40-pin	JF47	4-102973-0	09482
J11	MTA, Keyed Square Post HeaderAssy, 4 pin	JU25	647123-4	00779
L01	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L02	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L03	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L04	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L05	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L06	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L07	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L08	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L09	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L10	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L11	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L12	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L13	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L14	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L15	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
LS01	Alarm, Audio Piezoelectric,Sonalert	LP30	MSR516N	90201
Q01	Transistor,SMT,NPN,Switch/Amp,SOT-23	QBNS01	MMBT4401LT1(STATI C)	04713
Q02	Transistor,SMT,NPN,Switch/Amp,SOT-23	QBNS01	MMBT4401LT1(STATI C)	04713
Q03	Transistor,SMT,NPN,Switch/Amp,SOT-23	QBNS01	MMBT4401LT1(STATI C)	04713
Q04	Transistor,SMT,NPN,Switch/Amp,SOT-23	QBNS01	MMBT4401LT1(STATI C)	04713
Q05	Transistor,SMT,MOSFET,N-Channel,60V,115mA,SOT-23	QN53	2N7002LT1G(STATIC) (ROHS)	1MQ07
R001	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R002	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R003	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R004	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R005	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R006	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R007	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R008	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R009	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R010	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R011	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R012	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R013	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R014	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124

NAPC147D Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R015	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R016	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R017	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R018	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R019	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R020	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R021	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R022	Resistor,SMT,MF,8250ohms,1%,1/10W,0603	RFFS49	RK73H1JLTD8251F	59124
R023	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R024	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R025	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R026	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R027	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R028	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R029	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R030	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R031	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R032	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R033	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R034	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R035	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R036	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R037	Resistor,SMT,MF,39.2Kohms,1%,1/10W,0603	RFFS57	RK73H1JLTD3922F	59124
R038	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R039	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R040	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R041	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R042	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R043	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R044	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R045	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R046	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R047	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R048	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R049	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R050	Not Used	-	NOT USED	37338
R051	Resistor,SMT,MF,0.0ohms,Jumper,0603	RFFS01	RK73Z1JLTD	59124
R052	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R053	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124

NAPC147D Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R054	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R055	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R056	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R057	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R058	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R059	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R060	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R061	Resistor,SMT,MF,5620ohms,1%,1/10W,0603	RFFS47	RK73H1JLTD5621F	59124
R062	Resistor,SMT,MF,8250ohms,1%,1/10W,0603	RFFS49	RK73H1JLTD8251F	59124
R063	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R064	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R065	Resistor,SMT,MF,1500ohms,1%,1/10W,0603	RFFS40	RK73H1JLTD1501F	59124
R066	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R067	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R068	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R069	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R070	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R071	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R072	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R073	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R074	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R075	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R076	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R077	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R078	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R079	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R080	Resistor,SMT,MF,1500ohms,1%,1/10W,0603	RFFS40	RK73H1JLTD1501F	59124
R081	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R082	Resistor,SMT,MF,15.0Kohms,1%,1/10W,0603	RFFS52	RK73H1JLTD1502F	59124
R083	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R084	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R085	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R086	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R087	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R088	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R089	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R090	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R091	Resistor, SMT, MF, 221 Ohms,1% 1/4W	RAD17	RK73H2BL2210F	59124
R092	Resistor, SMT, MF, 221 Ohms,1% 1/4W	RAD17	RK73H2BL2210F	59124

NAPC147D

Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R093	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R094	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R095	Resistor,SMT,MF,68.1Kohms,1%,1/10W,0603	RFFS60	RK73H1JLTD6812F	59124
R096	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R097	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R098	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R099	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R100	Resistor,SMT,MF,681ohms,1%,1/10W,0603	RFFS36	RK73H1JLTD6810F	59124
R101	Resistor,SMT,MF,681ohms,1%,1/10W,0603	RFFS36	RK73H1JLTD6810F	59124
R102	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R103	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R104	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R105	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R106	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R107	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R108	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R109	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R110	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R111	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R112	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R113	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R114	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R115	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R116	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R117	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R118	Resistor,SMT,MF,47.5Kohms,1%,1/10W,0603	RFFS58	RK73H1JLTD4752F	59124
R119	Resistor,SMT,MF,1210ohms,1%,1/10W,0603	RFFS39	RK73H1JLTD1211F	59124
R120	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R121	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R122	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R123	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R124	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R125	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R126	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R127	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R128	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R129	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R130	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R131	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124

NAPC147D Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R132	Resistor,SMT,MF,22.1Kohms,1%,1/10W,0603	RFFS54	RK73H1JLTD2212F	59124
R133	Resistor,SMT,MF,1820ohms,1%,1/10W,0603	RFFS41	RK73H1JLTD1821F	59124
R134	Resistor,SMT,MF,12.1Kohms,1%,1/10W,0603	RFFS51	RK73H1JLTD1212F	59124
R135	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R136	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R137	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R138	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R139	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R140	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R141	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R142	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R143	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R144	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R145	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R146	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R147	Not Used	-	NOT USED	37338
R148	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R149	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R150	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R151	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R152	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R153	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R154	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R155	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R156	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R157	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R158	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R159	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R160	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R161	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R162	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R163	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R164	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R165	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R166	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R167	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R168	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R169	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R170	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124

NAPC147D Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R171	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R172	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R173	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R174	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R175	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R176	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R177	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R178	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R179	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R180	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R181	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R182	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R183	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R184	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R185	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R186	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R187	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R188	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R189	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R190	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R191	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R192	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R193	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R194	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R195	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R196	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R197	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R198	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R199	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R200	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R201	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R202	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R203	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R204	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R205	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R206	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R207	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R208	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R209	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124



NAPC147D Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R210	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R211	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R212	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R213	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R214	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R215	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R216	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R217	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R218	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R219	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R220	Resistor, Film, 4.75 Ohms, 1PC 1/2W	RC09	MF1/2DL4R75F	59124
R221	Resistor, Film, 4.75 Ohms, 1PC 1/2W	RC09	MF1/2DL4R75F	59124
R222	Resistor,SMT,MF,0.0ohms,Jumper,0603	RFFS01	RK73Z1JLTD	59124
R223	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R224	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R225	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R226	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R227	Resistor,SMT,MF,1500ohms,1%,1/10W,0603	RFFS40	RK73H1JLTD1501F	59124
R228	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R229	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R230	Resistor,SMT,MF,15.0Kohms,1%,1/10W,0603	RFFS52	RK73H1JLTD1502F	59124
R231	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R232	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R233	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R234	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R235	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R236	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R237	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R238	Resistor,SMT,MF,0.0ohms,Jumper,0603	RFFS01	RK73Z1JLTD	59124
R239	Resistor,SMT,MF,2740ohms,1%,1/10W,0603	RFFS43	RK73H1JLTD2741F	59124
R240	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R241	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R242	Resistor,SMT,MF,33.2Kohms,1%,1/10W,0603	RFFS56	RK73H1JLTD3322F	59124
R243	Resistor, Film, 3.92 Ohms, 1PC 1/2W	RC08	MF1/2DL3R92F	59124
R244	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R245	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R246	Resistor, Film, 3.92 Ohms, 1PC 1/2W	RC08	MF1/2DL3R92F	59124
R247	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R248	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124

NAPC147D Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R249	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R250	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R251	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R252	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R253	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R254	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R255	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
U01	IC,SMT,Opamp,Quad,Rail-To-Rail,SOIC-14	ULAS02	TLV2374ID(STATIC)	01295
U02	IC,SMT,Opamp,Quad,Rail-To-Rail,SOIC-14	ULAS02	TLV2374ID(STATIC)	01295
U03	IC,SMT,Opamp,Quad,Rail-To-Rail,SOIC-14	ULAS02	TLV2374ID(STATIC)	01295
U04	IC,SMT,Comparator,Quad,SOIC-14	ULCS01	MC3302D(STATIC)	04713
U05	IC,Low Voltage Temp Sensor,+/-3 Deg,TO-92	UC58	TMP36GT9(STATIC)	45496
U06	IC,SMT,RS-485 Transceiver,Sgl,SOIC-8	UDTS03	DS36C278TM(STATIC)	27014
U07	IC,SMT,Opamp,Quad,Rail-To-Rail,SOIC-14	ULAS02	TLV2374ID(STATIC)	01295
U08	IC,SMT,Opamp,Quad,Rail-To-Rail,SOIC-14	ULAS02	TLV2374ID(STATIC)	01295
U09	IC,SMT,ADC,10-Bit,11-ch,SPI,SOIC-20	UMAS01	TLC1543IDW(STATIC)	01295
U10	IC,SMT,4.096V Reference,0.1%,SOT-23-6	ULRS02	LT1790BIS6-4.096(STATIC)	64155
U11	IC,SMT,Opamp,Quad,Rail-To-Rail,SOIC-14	ULAS02	TLV2374ID(STATIC)	01295
U12	IC,SMT,ADC,10-Bit,11-ch,SPI,SOIC-20	UMAS01	TLC1543IDW(STATIC)	01295
U13	IC,CMOS,Hex Schmitt,Trigger Inverter,SOIC-14	UG35	MM74HC14M(STATIC)	07263
U14	IC,CMOS,Hex Schmitt,Trigger Inverter,SOIC-14	UG35	MM74HC14M(STATIC)	07263
U15	IC,CMOS,Hex Schmitt,Trigger Inverter,SOIC-14	UG35	MM74HC14M(STATIC)	07263
U16	IC,CMOS,Hex Schmitt,Trigger Inverter,SOIC-14	UG35	MM74HC14M(STATIC)	07263
U17	IC,CMOS,Hex Schmitt,Trigger Inverter,SOIC-14	UG35	MM74HC14M(STATIC)	07263
U18	IC,SMT,Complex Prog Logic Dev,PLCC-84	UX74	XC9572-15PC84I(STATIC)	68994
U19	Not Used	-	NOT USED	37338
U20	IC, SMT, SRAM, 32Kx8, SOIC-28(Wide)	UDMS01	CY62256NLL-55SNXI(STATIC)(RoHS)	65786
U21	IC,SMT,Non-Volatile RAM Ctrlr,SOIC-8	UDSS01	DS1312S-2(STATIC)	0B0A9
U22	IC, SMT, Micro, ADC, PWM,Flash, TQFP-64	UDMS02	ATMEGA128-16AI(STATIC)	1FN41
U23	IC, SMT, CMOS, Octal Latch,SOIC-20	UDLS02	SN74AHC573DW(STATIC)	01295
U24	IC,CMOS,Hex Schmitt,Trigger Inverter,SOIC-14	UG35	MM74HC14M(STATIC)	07263
U25	IC,SMT,Real-Time Clock,SPI,SOIC-16	UDTS01	M41T94MQ6(STATIC)	U3040



NAPC147D Control Display PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
U26	IC,SMT,2.5V Reference,0.1%,SOT-23-6	UX83	LT1790BIS6-2.5(STATIC)	64155
U27	IC,SMT,Opamp,Quad,Single Supply,SOIC-14	ULAS01	MC33074AD(STATIC)	04713
U28	IC,SMT,Opamp,Quad,Single Supply,SOIC-14	ULAS01	MC33074AD(STATIC)	04713
U29	IC,SMT,CMOS,Octal Flip Flop,SOIC-20	UDLS01	SN74AHC574DW(STA TIC)	01295
U30	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713
U31	IC,SMT,DAC,8-Bit,4-ch,SPI,SOIC-14	UMDS01	TLV5620ID(STATIC)	64155
U32	IC,SMT,DAC,8-Bit,4-ch,SPI,SOIC-14	UMDS01	TLV5620ID(STATIC)	64155
U33	IC,SMT,CMOS,Octal Flip Flop,SOIC-20	UDLS01	SN74AHC574DW(STA TIC)	01295
U34	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713
U35	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713
U36	IC,SMT,CMOS,Octal Flip Flop,SOIC-20	UDLS01	SN74AHC574DW(STA TIC)	01295
U37	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713
U38	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713
XBT01	Holder, 20mm Coin Cell, PWB Mt	BBHT01	1065	91833
XE01	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE02	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE03	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XJ08	Conn, Header,Square Post,Gold,Dual,40-pin	JF47	4-102973-0	09482
Y01	Crystal,SMT,Fund,Par Res,11.0592MHz	XFPS01	CMR309T11.0592MAB JTR	3DX59
Y02	Crystal,SMT,Fund,Par Res,32.768kHz	XFPS02	MC20632.7680KA-A0	1JRT7

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C01	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C02	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C03	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433
C04	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433
C05	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C06	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C07	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C08	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C09	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C10	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C11	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C12	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C13	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C14	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C15	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C16	Cap,SMT,Ceramic,18pF,2%,50V,C0G,0603	CCFS23	C0603C180G5GAC	31433
C17	Cap,SMT,Ceramic,18pF,2%,50V,C0G,0603	CCFS23	C0603C180G5GAC	31433
C18	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C19	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C20	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C21	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C22	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C23	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C24	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C25	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C26	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C27	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C28	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C29	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433
C30	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C31	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C32	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C33	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C34	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C35	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C36	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C37	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
CR01	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR02	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713

NAPC151A

Power Module Control/InterfacePWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
CR03	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
DS01	Diode, LED, Amber	QK14	HLMP-3451	50434
DS02	Diode, LED, Green	QK12	HLMP-3554	50434
DS03	Diode, LED, Red	QK13	HLMP-3351	50434
J01	Conn, Header,Square Post,Gold,Dual,40-pin	JF47	4-102973-0	09482
J02	Conn, Header, Ribbon Cbl, 10 pin	JA49	499910-1	00779
J04	Conn, Header, Ribbon Cbl, 10 pin	JA49	499910-1	00779
J06	Conn, Header, Ribbon Cbl, 20Pin	JQ55	103308-5	00779
J07	Conn, Plug, D-Sub, 25 pin, Vert PWB	JS43	627 025 220 017	31781
L01	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L02	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
Q01	Transistor, FET, N Channel, 100V, 8A	QR13	IRF520(STATIC)	81483
Q02	Transistor,SMT,MOSFET,N-Channel,60V,115mA,SOT-23	QN53	2N7002LT1G(STATIC) (ROHS)	1MQ07
Q03	Transistor,SMT,MOSFET,N-Channel,60V,115mA,SOT-23	QN53	2N7002LT1G(STATIC) (ROHS)	1MQ07
R01	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R02	Resistor,SMT,MF,681ohms,1%,1/10W,0603	RFFS36	RK73H1JLTD6810F	59124
R03	Resistor,SMT,MF,681ohms,1%,1/10W,0603	RFFS36	RK73H1JLTD6810F	59124
R04	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R05	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R06	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R07	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R08	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R09	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R10	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R11	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R12	Resistor,SMT,MF,121Kohms,1%,1/10W,0603	RFFS63	RK73H1JLTD1213F	59124
R13	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R14	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R15	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R16	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R17	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R18	Resistor,SMT,MF,6810ohms,1%,1/10W,0603	RFFS48	RK73H1JLTD6811F	59124
R19	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R20	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R21	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R22	Not Used	-	NOT USED	37338
R23	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R24	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124

NAPC151A

Power Module Control/InterfacePWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R25	Not Used	-	NOT USED	37338
R26	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R27	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R28	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R29	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R30	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R31	Resistor,SMT,MF,22.1ohms,1%,1/10W,0603	RFFS18	RK73H1JLTD22R1F	59124
R32	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R33	Resistor,SMT,MF,1500ohms,1%,1/10W,0603	RFFS40	RK73H1JLTD1501F	59124
R34	Resistor,SMT,MF,10.0ohms,1%,1/10W,0603	RFFS14	RK73H1JLTD10R0F	59124
R35	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R36	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
TP01	Terminal, SMT, Test Point, PWB	H AJ66	TP-107-02-1-T(RoHS) COMPONENTS CORP	
TP02	Terminal, SMT, Test Point, PWB	H AJ66	TP-107-02-1-T(RoHS) COMPONENTS CORP	
TP03	Terminal, SMT, Test Point, PWB	H AJ66	TP-107-02-1-T(RoHS) COMPONENTS CORP	
TP04	Terminal, SMT, Test Point, PWB	H AJ66	TP-107-02-1-T(RoHS) COMPONENTS CORP	
TP05	Terminal, SMT, Test Point, PWB	H AJ66	TP-107-02-1-T(RoHS) COMPONENTS CORP	
TP06	Terminal, SMT, Test Point, PWB	H AJ66	TP-107-02-1-T(RoHS) COMPONENTS CORP	
U01	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713
U02	IC,SMT,RS-485 Transceiver,Sgl,SOIC-8	UDTS03	DS36C278TM(STATIC)	27014
U03	IC,SMT,Microprocessor Supervisor, SC70	UDSS02	ADM803- MAKS(STATIC)	24355
U04	IC, CMOS, Hex Inverter	UG03	MC74AC04N(STATIC)	04713
U05	IC,SMT,CMOS,8-Bit Shft Reg,Par I/P, SOIC-16	UDLS04	MC74HC165AD(STATI C)	04713
U06	IC,SMT,CMOS,Quad Tri-State Buffer, SOIC-14	UDLS06	MC74HC125AD(STATI C)	04713
U07	IC, SMT, Micro, ADC, PWM,Flash, TQFP-32	UDMS03	ATMEGA8- 16AI(STATIC)	1FN41
U08	IC,SMT,4.096V Reference,0.1%,SOT-23-6	ULRS02	LT1790BIS6- 4.096(STATIC)	64155
XJ01	Conn, Header,Square Post,Gold,Dual,40-pin	JF47	4-102973-0	09482
Y01	Crystal,SMT,Fund,Par Res,3.6864MHz,Comm	XFPS03	ATSM49-3.6864MHz	23875

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C01	Not Used	-	NOT USED	37338
C02	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C03	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C04	Capacitor, Tantalum, 2.2uF 10PC 20V	CCP16	CSR13E225KM	56289
C05	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C06	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C07	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C08	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C09	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C10	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C11	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C12	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C13	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C14	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C15	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C16	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C17	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C18	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C19	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C20	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C21	Capacitor, Mica, Dipped, 390pF 2% 500V	CB32	CM05FD391G03	14655
C22	Capacitor, Mica, Dipped, 100pF 2% 500V	CB25	CM05FD101G03	SOSH
C23	Capacitor, Mica, Dipped, 390pF 2% 500V	CB32	CM05FD391G03	14655
C24	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C25	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C26	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C27	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C28	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C29	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C30	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C31	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C32	Capacitor, Ceramic, 0.22uF 10% 50V	CCG08	CKR06BX224KRV	56289
C33	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C34	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C35	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C36	Capacitor, Ceramic, 0.47uF 10% 50V	CCG09	CKR06BX474KRV	56289

NAPE70C/01 RF Synthesizer PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C37	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C38	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C39	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C40	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C41	Capacitor, Tantalum, 47uF 10%20V	CM01	T356K476K020AT(Ro HS) KEMET	96095
C42	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C43	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C44	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C45	Not Used	-	NOT USED	37338
C46	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C47	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C48	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C49	Not Used	-	NOT USED	37338
C50	Not Used	-	NOT USED	37338
C51	Not Used	-	NOT USED	37338
C52	Not Used	-	NOT USED	37338
C53	Not Used	-	NOT USED	37338
C54	Capacitor, Ceramic, 0.001uF 10% 200V	CCG01	CKR05BX102KRV SPRAGUE	91929
C55	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C56	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C57	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C58	Capacitor, Ceramic, 0.47uF 10% 50V	CCG09	CKR06BX474KRV	56289
CR01	Diode, Schottky	QR15	MBD301(STATIC)	04713
CR02	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR03	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR04	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR05	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR06	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
E01	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E02	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E03	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E04	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E05	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E06	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
J01	Conn, Socket, D-Sub, 25 pin, PWB Mt	JS13	K22-B25S-NJ	22421
J02	Conn, BNC, Recept, PWB Mt	JF35	R141426161	0GP12

NAPE70C/01 RF Synthesizer PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
L01	Inductor, Moulded, Shielded, 1.8uH	LAP28	IMS-5-1.8UH+/-10%	35005
L02	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L03	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L04	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L05	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L06	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L07	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L08	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L09	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L10	Not Used	-	NOT USED	37338
Q01	Transistor, NPN, Switch/Amplifier	QA15	2N3904	04713
Q02	Transistor, NPN, Switch/Amplifier	QA15	2N3904	04713
Q03	Transistor, NPN, Switch/Amplifier	QA15	2N3904	04713
Q04	Transistor, NPN, Switch/Amplifier	QA15	2N3904	04713
Q05	Transistor, NPN, General Purpose	QAP04	2N2219A	04713
Q06	Transistor, PNP, Switch/Amplifier	QA23	2N2905A	04713
R01	Resistor, MF, 100 Ohms, 1PC 1/4W	RAB13	MF1/4DL1000F	59124
R02	Resistor, MF, 4.75K Ohms, 1PC1/4W	RAB33	MF1/4DL4751F	59124
R03	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R04	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R05	Resistor, MF, 274 Ohms, 1PC 1/4W	RAB18	MF1/4DL2740F	59124
R06	Resistor, MF, 100 Ohms, 1PC 1/4W	RAB13	MF1/4DL1000F	59124
R07	Resistor, MF, 1.21K Ohms, 1PC1/4W	RAB26	MF1/4DL1211F	59124
R08	Resistor, MF, 100 Ohms, 1PC 1/4W	RAB13	MF1/4DL1000F	59124
R09	Resistor, MF, 100 Ohms, 1PC 1/4W	RAB13	MF1/4DL1000F	59124
R10	Resistor, MF, 47.5 Ohms, 1PC 1/4W	RAB09	MF1/4DL47R5F	59124
R11	Resistor, MF, 47.5 Ohms, 1PC 1/4W	RAB09	MF1/4DL47R5F	59124
R12	Resistor, MF, 47.5 Ohms, 1PC 1/4W	RAB09	MF1/4DL47R5F	59124
R13	Resistor, MF, 3.92K Ohms, 1PC1/4W	RAB32	MF1/4DL3921F	59124
R14	Resistor, MF, 47.5 Ohms, 1PC 1/4W	RAB09	MF1/4DL47R5F	59124
R15	Resistor, MF, 100 Ohms, 1PC 1/4W	RAB13	MF1/4DL1000F	59124
R16	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R17	Resistor, MF, 10.0 Ohms, 1PC 1/4W	RAB01	MF1/4DL10R0F	59124
R18	Resistor, MF, 10.0 Ohms, 1PC 1/4W	RAB01	MF1/4DL10R0F	59124
R19	Resistor, MF, 10.0 Ohms, 1PC 1/4W	RAB01	MF1/4DL10R0F	59124
R20	Resistor, MF, 82.5 Ohms, 1PC 1/4W	RAB12	MF1/4DL82R5F	59124
R21	Resistor, Film, 22 Ohms, 5% 2W	RBP03	GS-3, 22 OHMS	75042
R22	Resistor, MF, 27.4K Ohms, 1PC1/4W	RAB42	MF1/4DL2742F	59124
R23	Resistor, MF, 1.82K Ohms, 1PC1/4W	RAB28	MF1/4DL1821F	59124



NAPE70C/01 RF Synthesizer PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R24	Not Used	-	NOT USED	37338
R25	Resistor, MF, 1.50K Ohms, 1PC1/4W	RAB27	MF1/4DL1501F	59124
R26	Resistor, MF, 100 Ohms, 1PC 1/4W	RAB13	MF1/4DL1000F	59124
R27	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R28	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R29	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R30	Not Used	-	NOT USED	37338
R31	Resistor, MF, 562 Ohms, 1PC 1/4W	RAB22	MF1/4DL5620F	59124
R32	Resistor, Variable, Film, 1000 Ohms, 1/2W	RV06	3339P-1-102	80294
R33	Resistor, MF, 562 Ohms, 1PC 1/4W	RAB22	MF1/4DL5620F	59124
R34	Resistor, MF, 2.21K Ohms, 1PC1/4W	RAB29	MF1/4DL2211F	59124
R35	Resistor, MF, 4.75K Ohms, 1PC1/4W	RAB33	MF1/4DL4751F	59124
R36	Not Used	-	NOT USED	37338
R37	Resistor, MF, 3.32K Ohms, 1PC1/4W	RAB31	MF1/4DL3321F	59124
R39	Not Used	-	NOT USED	37338
R40	Not Used	-	NOT USED	37338
R41	Not Used	-	NOT USED	37338
R42	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R43	Resistor, MF, 2.74K Ohms, 1PC1/4W	RAB30	MF1/4DL2741F	59124
R44	Not Used	-	NOT USED	37338
R45	Resistor, MF, 1.21K Ohms, 1PC1/4W	RAB26	MF1/4DL1211F	59124
R46	Resistor, MF, 47.5 Ohms, 1PC 1/4W	RAB09	MF1/4DL47R5F	59124
R47	Resistor, MF, 27.4 Ohms, 1PC 1/4W	RAB06	MF1/4DL27R4F	59124
R48	Resistor, MF, 4.75K Ohms, 1PC1/4W	RAB33	MF1/4DL4751F	59124
R49	Resistor, MF, 4.75K Ohms, 1PC1/4W	RAB33	MF1/4DL4751F	59124
R50	Resistor, MF, 4.75K Ohms, 1PC1/4W	RAB33	MF1/4DL4751F	59124
R51	Resistor, MF, 100 Ohms, 1PC 1/4W	RAB13	MF1/4DL1000F	59124
R52	Not Used	-	NOT USED	37338
S01	Switch, DIP, Rotary, 10-pos, BCD	SB40	230002G	97525
S02	Switch, DIP, Rotary, 10-pos, BCD	SB40	230002G	97525
S03	Switch, DIP, Rotary, 10-pos, BCD	SB40	230002G	97525
S04	Switch, DIP, Rotary, 10-pos, BCD	SB40	230002G	97525
S05	Switch, DIP, Rotary, 10-pos, BCD	SB40	230002G	97525
S06	Not Used	-	NOT USED	37338
U01	Oscillator, TCXO, 10.000MHz,2ppm	UT55	RTXT-781DJZ5-C-10.000(STATIC)	RALTRON
U02	Res, Network, SIP, 9 x 4700 Ohms, 2% Bus	RT07	4610X-101-472	80294
U03	IC, CMOS, Hex Inverter	UG03	MC74AC04N(STATIC)	04713
U04	IC, Programmed MicrocontrollerDDS	190-5043-02	190-5043-02	37338
U05	IC, CMOS, 48-bit DDS	UT58	AD9852ASQ(STATIC)	45496



NAPE70C/01 RF Synthesizer PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
U06	IC, CMOS, Synchronous Counter	UT56Z	74ACT163PC(STATIC)	07263
U07	IC, CMOS, Synchronous Counter	UT56Z	74ACT163PC(STATIC)	07263
U08	IC, CMOS, Hex Inverter	UX11	MC74HC04AN(STATIC)	01295
U09	IC, Voltage Regulator, +5V, 1A, Plastic	UX17	MC7805ACT	04713
U10	IC, CMOS, Hex Schmitt Trigger	UM23	MC14584BCP(STATIC)	04713
U11	IC, Voltage Regulator, +3.3V,1A	UT59	LM3940IT-3.3/NOPB	27014
U12	IC, CMOS, Dual, Type D, Flip Flop	UB15	MC14013BCP(STATIC)	04713
U13	Not Used	-	NOT USED	37338
XE01	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE02	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE03	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE04	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE06	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE5A	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE5B	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XS01	Socket, IC, 6-pin	UD43	390261-1	00779
XS02	Socket, IC, 6-pin	UD43	390261-1	00779
XS03	Socket, IC, 6-pin	UD43	390261-1	00779
XS04	Socket, IC, 6-pin	UD43	390261-1	00779
XS05	Socket, IC, 6-pin	UD43	390261-1	00779
XU01	Not Used	-	NOT USED	37338
XU02	Not Used	-	NOT USED	37338
XU03	Socket, IC, 14-pin	UC02	2-641261-1	00779
XU04	Not Used	-	NOT USED	37338
XU05	Not Used	-	NOT USED	37338
XU06	Socket, IC, 16-pin	UC03	2-641262-1	00779
XU07	Socket, IC, 16-pin	UC03	2-641262-1	00779
XU08	Socket, IC, 14-pin	UC02	2-641261-1	00779
XU09	Not Used	-	NOT USED	37338
XU10	Socket, IC, 14-pin	UC02	2-641261-1	00779
XU11	Not Used	-	NOT USED	37338
XU12	Socket, IC, 14-pin	UC02	2-641261-1	00779
XU13	Not Used	-	NOT USED	37338

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C01	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C02	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C03	Cap,SMT,Ceramic,0.047uF,10%,50V,X7R,0603	CCFS06	C0603C473K5RAC	31433
C04	Cap,SMT,Ceramic,10uF,20%,6.3V,X5R,0805	CCFS57	C2012X5R0J106M	54583
C05	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C06	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C07	Cap,SMT,Tantalum,10uF,10%,16V,1411	CTFS01	T494B106K016AS	31433
C08	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C09	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C10	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C11	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C12	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C13	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C14	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C15	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C16	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C17	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C18	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433
C19	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C20	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C21	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C22	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C23	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C24	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C25	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433
C26	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C27	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C28	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C29	Cap,SMT,Ceramic,0.47uF,10%,25V,X7R,0805	CCFS09	C0805C474K3RAC	31433
C30	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C31	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C32	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C33	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C34	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C35	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C36	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C37	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C38	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C39	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433

NAPE76A/00 Exciter Monitor/GeneratorPWB Assy, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C40	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C41	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C42	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C43	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C44	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C45	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C46	Cap,SMT,Ceramic,18pF,2%,50V,C0G,0603	CCFS23	C0603C180G5GAC	31433
C47	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C48	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C49	Cap,SMT,Ceramic,10uF,20%,6.3V,X5R,0805	CCFS57	C2012X5R0J106M	54583
C50	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C51	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C52	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C53	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C54	Cap,SMT,Ceramic,10uF,20%,6.3V,X5R,0805	CCFS57	C2012X5R0J106M	54583
C55	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C56	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C57	Cap,SMT,Ceramic,18pF,2%,50V,C0G,0603	CCFS23	C0603C180G5GAC	31433
C58	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C59	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C60	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C61	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C62	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C63	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C64	Cap,SMT,Tantalum,10uF,10%,16V,1411	CTFS01	T494B106K016AS	31433
C65	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C66	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C67	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C68	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C69	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C70	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C71	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C72	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C73	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C74	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C75	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C76	Cap,SMT,Ceramic,10uF,20%,6.3V,X5R,0805	CCFS57	C2012X5R0J106M	54583
C77	Cap,SMT,Ceramic,0.47uF,10%,25V,X7R,0805	CCFS09	C0805C474K3RAC	31433
C78	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433

NAPE76A/00 Exciter Monitor/GeneratorPWB Assy, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C79	Cap,SMT,Ceramic,10uF,20%,6.3V,X5R,0805	CCFS57	C2012X5R0J106M	54583
C80	Cap,SMT,Ceramic,0.47uF,10%,25V,X7R,0805	CCFS09	C0805C474K3RAC	31433
C81	Cap,SMT,Ceramic,0.47uF,10%,25V,X7R,0805	CCFS09	C0805C474K3RAC	31433
C82	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C83	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C85	Cap,SMT,Ceramic,10uF,20%,6.3V,X5R,0805	CCFS57	C2012X5R0J106M	54583
CR01	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR02	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR03	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR04	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR05	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR06	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR07	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR08	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR09	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR10	Diode,SMT,Zener,5.1V,5%,3W,SMB	QDZS01	1SMB5918BT3	04713
CR11	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR12	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR13	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
DS01	Diode, SMT, LED, Green,(560nm), 0603	QDLS01	597-5312-402F(STATIC)(RoHS)	83330
E01	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E02	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E03	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J01	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J02	Conn, Header,Square Post,Gold,Dual,40-pin	JF47	4-102973-0	09482
J03	Conn,SMT,Plug,SATA,Signal,Vert PWB	JQ57	67491-0031	1UX99
J04	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
L01	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L02	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L03	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
Q01	Transistor,SMT,NPN,Switch/Amp,SOT-23	QBNS01	MMBT4401LT1(STATI C)	04713
R01	Resistor,SMT,MF,56.2ohms,1%,1/10W,0603	RFFS23	RK73H1JLTD56R2F	59124
R02	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R03	Resistor,SMT,MF,18.2Kohms,1%,1/10W,0603	RFFS53	RK73H1JLTD1822F	59124
R04	Resistor,SMT,MF,18.2Kohms,1%,1/10W,0603	RFFS53	RK73H1JLTD1822F	59124
R05	Resistor,SMT,MF,12.1Kohms,1%,1/10W,0603	RFFS51	RK73H1JLTD1212F	59124

NAPE76A/00 Exciter Monitor/GeneratorPWB Assy, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R06	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R07	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R08	Resistor,SMT,MF,825ohms,1%,1/10W,0603	RFFS37	RK73H1JLTD8250F	59124
R09	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R10	Resistor,SMT,MF,8250ohms,1%,1/10W,0603	RFFS49	RK73H1JLTD8251F	59124
R11	Resistor, SMT, MF, 100 Ohms,1% 1/4W	RAD13	RK73H2BL1000F	59124
R12	Resistor, SMT, MF, 100 Ohms,1% 1/4W	RAD13	RK73H2BL1000F	59124
R13	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R14	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R15	Resistor,SMT,MF,22.1Kohms,1%,1/10W,0603	RFFS54	RK73H1JLTD2212F	59124
R16	Resistor,SMT,MF,33.2Kohms,1%,1/10W,0603	RFFS56	RK73H1JLTD3322F	59124
R17	Resistor,SMT,MF,27.4Kohms,1%,1/10W,0603	RFFS55	RK73H1JLTD2742F	59124
R18	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R19	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R20	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R21	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R22	Resistor,SMT,MF,3.32Mohms,1%,1/10W,0603	RFFS80	RK73H1JLTD3324F	59124
R23	Resistor,SMT,MF,3.32Mohms,1%,1/10W,0603	RFFS80	RK73H1JLTD3324F	59124
R24	Resistor,SMT,MF,18.2Kohms,1%,1/10W,0603	RFFS53	RK73H1JLTD1822F	59124
R25	Resistor,SMT,MF,1.00Mohms,1%,1/10W,0603	RFFS74	RK73H1JLTD1004F	59124
R26	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R27	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R28	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R29	Resistor,SMT,MF,68.1Kohms,1%,1/10W,0603	RFFS60	RK73H1JLTD6812F	59124
R30	Resistor,SMT,MF,182Kohms,1%,1/10W,0603	RFFS65	RK73H1JLTD1823F	59124
R31	Resistor,SMT,MF,182Kohms,1%,1/10W,0603	RFFS65	RK73H1JLTD1823F	59124
R32	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R33	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R34	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R35	Resistor,SMT,MF,681ohms,1%,1/10W,0603	RFFS36	RK73H1JLTD6810F	59124
R36	Resistor,SMT,MF,8250ohms,1%,1/10W,0603	RFFS49	RK73H1JLTD8251F	59124
R37	Resistor,SMT,MF,56.2Kohms,1%,1/10W,0603	RFFS59	RK73H1JLTD5622F	59124
R38	Resistor,SMT,MF,18.2Kohms,1%,1/10W,0603	RFFS53	RK73H1JLTD1822F	59124
R39	Resistor,SMT,MF,18.2Kohms,1%,1/10W,0603	RFFS53	RK73H1JLTD1822F	59124
R40	Resistor,SMT,MF,18.2Kohms,1%,1/10W,0603	RFFS53	RK73H1JLTD1822F	59124
R41	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R42	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R43	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R44	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124

NAPE76A/00 Exciter Monitor/GeneratorPWB Assy, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R45	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R46	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R47	Resistor,SMT,MF,5620ohms,1%,1/10W,0603	RFFS47	RK73H1JLTD5621F	59124
R48	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R49	Resistor,SMT,MF,18.2Kohms,1%,1/10W,0603	RFFS53	RK73H1JLTD1822F	59124
R50	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R51	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R52	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R53	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R54	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R55	Resistor,SMT,MF,0.0ohms,Jumper,0603	RFFS01	RK73Z1JLTD	59124
R56	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R57	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R58	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R59	Resistor,SMT,MF,681ohms,1%,1/10W,0603	RFFS36	RK73H1JLTD6810F	59124
R60	Resistor,SMT,MF,332Kohms,1%,1/10W,0603	RFFS68	RK73H1JLTD3323F	59124
R61	Resistor,SMT,MF,15.0Kohms,1%,1/10W,0603	RFFS52	RK73H1JLTD1502F	59124
R62	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R64	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R65	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R66	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R67	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R68	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R69	Resistor,SMT,MF,681ohms,1%,1/10W,0603	RFFS36	RK73H1JLTD6810F	59124
R71	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R72	Resistor,SMT,MF,0.0ohms,Jumper,0603	RFFS01	RK73Z1JLTD	59124
R73	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R74	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R75	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R76	Resistor,SMT,MF,22.1Kohms,1%,1/10W,0603	RFFS54	RK73H1JLTD2212F	59124
R77	Resistor, SMT, MF, 1000 Ohms,1% 1/4W	RAD25	RK73H2BL1001F	59124
R78	Resistor, SMT, MF, 1000 Ohms,1% 1/4W	RAD25	RK73H2BL1001F	59124
R79	Resistor,SMT,MF,47.5Kohms,1%,1/10W,0603	RFFS58	RK73H1JLTD4752F	59124
R80	Resistor,SMT,MF,825ohms,1%,1/10W,0603	RFFS37	RK73H1JLTD8250F	59124
R81	Resistor,SMT,MF,22.1Kohms,1%,1/10W,0603	RFFS54	RK73H1JLTD2212F	59124
R82	Resistor,SMT,MF,1.00Mohms,1%,1/10W,0603	RFFS74	RK73H1JLTD1004F	59124
R83	Resistor,SMT,MF,1.00Mohms,1%,1/10W,0603	RFFS74	RK73H1JLTD1004F	59124
R84	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R85	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124

NAPE76A/00 Exciter Monitor/GeneratorPWB Assy, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R86	Resistor,SMT,MF,562Kohms,1%,1/10W,0603	RFFS71	RK73H1JLTD5623F	59124
R87	Resistor,SMT,MF,562Kohms,1%,1/10W,0603	RFFS71	RK73H1JLTD5623F	59124
U01	IC,SMT,CMOS,Analog Multiplexer,SOIC-16	UX86	MC74HC4053AD(STA TIC)	04713
U02	IC,SMT,Micro Supervisor,Watchdog,SO-8	UX85	ADM705AR(STATIC)	45496
U03	IC,SMT,Opamp,Quad,Rail-To-Rail,SOIC-14	ULAS02	TLV2374ID(STATIC)	01295
U04	IC,SMT,CMOS,Hex Inverter,Unbuff,SO-14	UDLS09	MM74HCU04M(STATI C)	07263
U05	IC,SMT,Prog Wave Gen,28 bit,MSOP-10	UX89	AD9833BRM(STATIC)	45496
U06	IC,SMT,Comparator,Quad,SOIC-14	ULCS01	MC3302D(STATIC)	04713
U07	IC,SMT,4.096V Reference,0.1%,SOT-23-6	ULRS02	LT1790BIS6- 4.096(STATIC)	64155
U08	IC,SMT,Opamp,Quad,Single Supply,SOIC-14	ULAS01	MC33074AD(STATIC)	04713
U09	IC,SMT,Opamp,Quad,Rail-To-Rail,SOIC-14	ULAS02	TLV2374ID(STATIC)	01295
U10	IC,SMT,Digital Pot,Quad,20K,TSSOP-24	UX87	AD5263BRU20(STATI C)	45496
U11	IC,SMT,Micro, ADC,PWM,TQFP-32,16k Flash	UX95	ATMEGA 168- 20AI(STATIC)	1FN41
U12	IC,SMT,RS-485 Transceiver,Sgl,SOIC-8	UDTS03	DS36C278TM(STATIC)	27014
U13	IC,SMT,Microprocessor Supervisor, SC70	UDSS02	ADM803- MAKS(STATIC)	24355
U14	IC,SMT,CMOS,Analog Multiplexer,SOIC-16	UX86	MC74HC4053AD(STA TIC)	04713
U15	IC,SMT,CMOS,Hex Inverter,Unbuff,SO-14	UDLS09	MM74HCU04M(STATI C)	07263
U16	IC,SMT,CMOS,8-Bit Shft Reg,Par O/P, SOIC-16	UDLS05	MC74HC595AD(STATI C)	04713
U17	IC,SMT,CMOS,Hex Inv,SOIC	UX88	CD74ACT04M(STATIC)	01295
U18	IC,SMT,CMOS,Hex Schm,Trig,Inv,SOIC-14	UDLS03	SN74AHCT14D(STATI C)	01295
U19	IC,SMT,Opamp,Quad,Rail-To-Rail,SOIC-14	ULAS02	TLV2374ID(STATIC)	01295
U20	IC,SMT,CMOS,Hex Inv,SOIC	UX88	CD74ACT04M(STATIC)	01295
XE01	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE02	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE03	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
Y01	Crystal,SMT,Fund,Par Res,3.6864MHz,Comm	XFPS03	ATSM49-3.6864MHz	23875

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
E01	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E02	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E03	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
J01	Conn, Plug, D-Sub, 25 pin, Vert PWB	JS43	627 025 220 017	31781
J04	Conn, Header, Ribbon Cbl, 20 pin	JP46	499910-4	00779
R63	Resistor, SMT, MF, 681 Ohms,1% 1/4W	RAD23	MCR18EZHf6810(RO HS)	ROHM
R70	Resistor, SMT, MF, 681 Ohms,1% 1/4W	RAD23	MCR18EZHf6810(RO HS)	ROHM
XE01	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE02	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE03	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482

NAPF05A

RF Filter PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C01	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
C02	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
C03	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
C04	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
C05	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
C06	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
C07	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
C08	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
C09	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
C10	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
C11	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
C12	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
C13	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
C14	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
C15	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
C16	Capacitor,Polyprop,0.0036uF,3%,900VAC	CP29	715P3623900L-1138	SBE
E01	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E02	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E03	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E04	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E05	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E06	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E07	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E08	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E09	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E10	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E11	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E13	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E14	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E16	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E18	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E19	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E22	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E23	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E24	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E25	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E26	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E27	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E28	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833



NAPF05A RF Filter PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
E29	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E30	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E31	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E32	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E34	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
E35	Connector, Quick-Dis, M, 1/4 Tab, PWB	HR26	1287	91833
J01	Conn, Coax, N, Recept, Panel, 50ohm	JDP21	UG58A/U	02660
L01	Tapped Inductor Assy	195-6056-01	195-6056-01	37338
L02	Tapped Inductor Assy	195-6057-01	195-6057-01	37338

NAPF065 Modulator Filter PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C01	Capacitor, Metal, Polyprop, 0.22uF, 5%, 630V	CAP50	2222-378-64224	BC COMP
C02	Not Used	-	NOT USED	37338
C03	Capacitor, Metal, Polyprop, 0.22uF, 5%, 630V	CAP50	2222-378-64224	BC COMP
C04	Not Used	-	NOT USED	37338
CR01	Diode, Power Rectifier, 1000V, 8A	QM45	MUR8100E(STATIC)	1MQ07
L01	Clip, Spring, Mounting Clamp for LY50	HX63	00C353517(ROHS)	MAGNETIC
L01	Pot Core (halves), 35mm, PC44 Gapped	LY41	PC44PQ35/35G2.27-22SG+/- 0.022mm(ROHS) TDK	54583
L01	Bobbin for 35mm Pot Core	LY42	BPQ35/35 - OD	54583
L01	Wire, Litz, 170/40 SNSN, Nylon 18 AWG	WB45	NELC170/40SNSN	25706
L02	Clip, Spring, Mounting Clamp for LY50	HX63	00C353517(ROHS)	MAGNETIC
L02	Pot Core (halves), 35mm, PC44 Gapped	LY41	PC44PQ35/35G2.27-22SG+/- 0.022mm(ROHS) TDK	54583
L02	Bobbin for 35mm Pot Core	LY42	BPQ35/35 - OD	54583
L02	Wire, Litz, 170/40 SNSN, Nylon 18 AWG	WB45	NELC170/40SNSN	25706



REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C01	Capacitor, Mica, Dipped, 1800pF 2% 500V	CB40	CM06FD182G03	14655
C02	Capacitor, Mica, Dipped, 1800pF 2% 500V	CB40	CM06FD182G03	14655
C03	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
C04	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
C05	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
C06	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR01	Diode, Power Rectifier, 1A, UltraFast	QN33	MUR160	04713
CR02	Diode, Power Rectifier, 1A, UltraFast	QN33	MUR160	04713
CR03	Diode, Power Rectifier, 1A, UltraFast	QN33	MUR160	04713
CR04	Diode, Power Rectifier, 1A, UltraFast	QN33	MUR160	04713
CR05	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR06	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR07	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR08	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR09	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E01	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E02	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E03	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E04	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J01	Conn, Socket, D-Sub, 25 pin, PWB Mt	JS13	K22-B25S-NJ	22421
J02	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
L01	Inductor, Moulded, Shielded, 10000uH	LAP41	IMS-5-10000UH+/- 10%	35005
L02	Inductor, Moulded, Shielded, 10000uH	LAP41	IMS-5-10000UH+/- 10%	35005
L03	Inductor, Moulded, Shielded, 10000uH	LAP41	IMS-5-10000UH+/- 10%	35005
L04	Inductor, Moulded, Shielded, 10000uH	LAP41	IMS-5-10000UH+/- 10%	35005
R01	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
R02	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
R03	Resistor, Film, 1000 Ohms, 5%, 2W	RBP13	GS-3, 1000 OHMS	75042
R04	Resistor, Film, 1000 Ohms, 5%, 2W	RBP13	GS-3, 1000 OHMS	75042

NAPF07C/00 RF Power Probe PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R05	Resistor, Film, 1000 Ohms, 5%, 2W	RBP13	GS-3, 1000 OHMS	75042
R06	Resistor, Film, 1000 Ohms, 5%, 2W	RBP13	GS-3, 1000 OHMS	75042
R07	Resistor, Film, 1000 Ohms, 5%, 2W	RBP13	GS-3, 1000 OHMS	75042
R08	Resistor, Film, 4700 Ohms, 2PC 1/2W	RD03	RL20S472G	35005
R09	Resistor, Film, 100 Ohms, 5%2W	RBP07	GS-3, 100 OHMS	75042
R10	Resistor, Film, 100 Ohms, 5%2W	RBP07	GS-3, 100 OHMS	75042
R11	Resistor, Film, 4700 Ohms, 2PC 1/2W	RD03	RL20S472G	35005
T01	Transformer Assy	195-9065	195-9065	37338
T02	RF Current Transformer	195-9064	195-9064	37338
T03	Voltage Transformer	195-9060	195-9060	37338
TB01	Terminal Block, 4-pos, Double, 30A	JB33	382100104	13150

NAPF07C/01 RF Power Probe (VECTOR) PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C03	Not Used	-	NOT USED	37338
C04	Not Used	-	NOT USED	37338
C05	Not Used	-	NOT USED	37338
C06	Not Used	-	NOT USED	37338
CR05	Not Used	-	NOT USED	37338
CR06	Not Used	-	NOT USED	37338
CR07	Not Used	-	NOT USED	37338
CR08	Not Used	-	NOT USED	37338
CR09	Not Used	-	NOT USED	37338
E01	Not Used	-	NOT USED	37338
E02	Not Used	-	NOT USED	37338
E03	Not Used	-	NOT USED	37338
E04	Not Used	-	NOT USED	37338
E05	Not Used	-	NOT USED	37338
E06	Not Used	-	NOT USED	37338
J02	Not Used	-	NOT USED	37338
R01	Resistor, Film, 100 Ohms, 5%2W	RBP07	GS-3, 100 OHMS	75042
R02	Resistor, Film, 100 Ohms, 5%2W	RBP07	GS-3, 100 OHMS	75042



REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C01	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C02	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C03	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C04	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C05	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C06	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C07	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C08	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C09	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C10	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C11	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C12	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C13	Capacitor, Ceramic, 0.0022uF 10% 100V	CCG02	CKR05BX222KRV	56289
C14	Capacitor, Ceramic, 0.0022uF 10% 100V	CCG02	CKR05BX222KRV	56289
C15	Capacitor, Mica, Dipped, 2200pF 2% 500V	CB41	CM06FD222G03	14655
C16	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C17	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C18	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C19	Capacitor, Ceramic, 0.0022uF 10% 100V	CCG02	CKR05BX222KRV	56289
C20	Capacitor, Ceramic, 0.0022uF 10% 100V	CCG02	CKR05BX222KRV	56289
C21	Capacitor, Mica, Dipped, 2200pF 2% 500V	CB41	CM06FD222G03	14655
C22	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C23	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C24	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C25	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C26	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C27	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C28	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
CR01	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR02	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR03	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR04	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR05	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338

NAPI76A/00 Exciter Interface PWB AssyBasic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
CR06	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR07	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR08	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR09	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR10	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR11	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR12	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR13	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR14	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR15	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR16	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR17	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR18	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR19	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR20	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR21	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR22	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR23	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR24	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR25	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR26	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR27	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR28	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
E01	Not Used	-	NOT USED	37338
E02	Not Used	-	NOT USED	37338
E03	Not Used	-	NOT USED	37338
E04	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E05	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E06	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E07	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E08	Not Used	-	NOT USED	37338
E09	Not Used	-	NOT USED	37338
E10	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482



NAPI76A/00 Exciter Interface PWB AssyBasic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
E11	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
J01	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J02	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J03	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J04	Conn,SMT,Plug,SATA,Signal,Vert PWB	JQ57	67491-0031	1UX99
J05	Conn, Plug, D-Sub, 25 pin, PWB Mt	JS12	K22-B25P-NJ	63590
J06	Conn, Plug, D-Sub, 25 pin, PWB Mt	JS12	K22-B25P-NJ	63590
J07	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J08	Conn, Plug, D-Sub, 25 pin, PWB Mt	JS12	K22-B25P-NJ	63590
J09	Conn, Socket, D-Sub, 25 pin, PWB Mt	JS13	K22-B25S-NJ	22421
J10	Conn, Socket, D-Sub, 25 pin, PWB Mt	JS13	K22-B25S-NJ	22421
J11	Conn, Socket, D-Sub, 25 pin, PWB Mt	JS13	K22-B25S-NJ	22421
J12	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J13	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J14	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J15	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J16	Conn,SMT,Plug,SATA,Signal,Vert PWB	JQ57	67491-0031	1UX99
K01	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K02	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
L02	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L03	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L04	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L06	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L07	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L08	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
Q01	Transistor, NPN, Switch/Amplifier	QA45	2N4401	04713
Q02	Transistor, NPN, Switch/Amplifier	QA45	2N4401	04713
Q03	Transistor, NPN, Switch/Amplifier	QA45	2N4401	04713
Q04	Transistor, NPN, Switch/Amplifier	QA45	2N4401	04713
Q05	Transistor, FET, N Channel	QN54	2N7000(STATIC)	04713
Q06	Transistor, FET, N Channel	QN54	2N7000(STATIC)	04713
Q07	Transistor, FET, N Channel	QN54	2N7000(STATIC)	04713
Q08	Transistor, NPN, Switch/Amplifier	QA45	2N4401	04713
Q09	Transistor, NPN, Switch/Amplifier	QA45	2N4401	04713
R01	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R02	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R03	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124

NAPI76A/00 Exciter Interface PWB AssyBasic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R04	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R05	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R06	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R07	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R08	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R09	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R10	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R11	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R12	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R13	Resistor, MF, 22.1K Ohms, 1PC1/4W	RAB41	MF1/4DL2212F	59124
R14	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R15	Resistor, MF, 82.5K Ohms, 1PC1/4W	RAB48	MF1/4DL8252F	59124
R16	Resistor, MF, 8.25K Ohms, 1PC1/4W	RAB36	MF1/4DL8251F	59124
R17	Resistor, MF, 3.32K Ohms, 1PC1/4W	RAB31	MF1/4DL3321F	59124
R18	Resistor, MF, 3.32K Ohms, 1PC1/4W	RAB31	MF1/4DL3321F	59124
R19	Resistor, MF, 332 Ohms, 1PC 1/4W	RAB19	MF1/4DL3320F	59124
R20	Resistor, MF, 332 Ohms, 1PC 1/4W	RAB19	MF1/4DL3320F	59124
R21	Resistor, MF, 332 Ohms, 1PC 1/4W	RAB19	MF1/4DL3320F	59124
R22	Resistor, MF, 100 Ohms, 1PC 1/4W	RAB13	MF1/4DL1000F	59124
R23	Resistor, MF, 100 Ohms, 1PC 1/4W	RAB13	MF1/4DL1000F	59124
R24	Resistor, MF, 332 Ohms, 1PC 1/4W	RAB19	MF1/4DL3320F	59124
R25	Resistor, MF, 332 Ohms, 1PC 1/4W	RAB19	MF1/4DL3320F	59124
R26	Resistor, MF, 332 Ohms, 1PC 1/4W	RAB19	MF1/4DL3320F	59124
R27	Resistor, MF, 82.5K Ohms, 1PC1/4W	RAB48	MF1/4DL8252F	59124
R28	Resistor, MF, 8.25K Ohms, 1PC1/4W	RAB36	MF1/4DL8251F	59124
R29	Resistor, MF, 3.32K Ohms, 1PC1/4W	RAB31	MF1/4DL3321F	59124
R30	Resistor, MF, 3.32K Ohms, 1PC1/4W	RAB31	MF1/4DL3321F	59124
R31	Resistor, MF, 56.2K Ohms, 1PC1/4W	RAB46	MF1/4DL5622F	59124
R32	Resistor, MF, 100 Ohms, 1PC 1/4W	RAB13	MF1/4DL1000F	59124
R33	Resistor, MF, 33.2K Ohms, 1PC1/4W	RAB43	MF1/4DL3322F	59124
R34	Resistor, MF, 33.2K Ohms, 1PC1/4W	RAB43	MF1/4DL3322F	59124
R35	Resistor, MF, 22.1K Ohms, 1PC1/4W	RAB41	MF1/4DL2212F	59124
R36	Resistor, MF, 22.1K Ohms, 1PC1/4W	RAB41	MF1/4DL2212F	59124
R37	Resistor, MF, 56.2K Ohms, 1PC1/4W	RAB46	MF1/4DL5622F	59124
R38	Resistor, MF, 100 Ohms, 1PC 1/4W	RAB13	MF1/4DL1000F	59124
R39	Resistor, MF, 68.1K Ohms, 1PC1/4W	RAB47	MF1/4DL6812F	59124
R40	Resistor, MF, 68.1K Ohms, 1PC1/4W	RAB47	MF1/4DL6812F	59124
U01	IC, CMOS, Hex Inverter	UG03	MC74AC04N(STATIC)	04713
U02	IC, CMOS, Hex Inverter	UG03	MC74AC04N(STATIC)	04713



NAPI76A/00 Exciter Interface PWB AssyBasic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
U03	IC, CMOS, Quad, 2-input NAND Gate	UM15	MC74HC00N(STATIC)	04713
U04	IC, Programmed, GAL	190-5077	190-5077	37338
XE04	Conn, Header, SIP, 12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE05	Conn, Header, SIP, 12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE06	Conn, Header, SIP, 12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE07	Conn, Header, SIP, 12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE10	Conn, Header, SIP, 12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE11	Conn, Header, SIP, 12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XK01	Socket, IC, 10 Pin	UW43	110-93-310-41-001	3N087
XK02	Socket, IC, 10 Pin	UW43	110-93-310-41-001	3N087
XU01	Not Used	-	NOT USED	37338
XU02	Not Used	-	NOT USED	37338
XU03	Not Used	-	NOT USED	37338
XU04	Socket, IC, 24-Pin, 0.3"W	UD44	390261-8	00779



REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
CR04	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR05	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR06	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR07	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR11	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR12	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR13	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR14	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR15	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR16	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR17	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR18	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR19	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR20	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
J12	Not Used	-	NOT USED	37338
J13	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J14	Not Used	-	NOT USED	37338
J15	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C001	Cap,SMT,Ceramic,0.0022uF,10%,50V,X7R,0603	CCFS02	C0603C222K5RAC	31433
C002	Cap,SMT,Ceramic,0.0047uF,10%,50V,X7R,0603	CCFS03	C0603C472K5RAC	31433
C003	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C004	Cap,SMT,Ceramic,1000pF,2%,50V,C0G,0805	CCFS42	C0805C102G5GAC	31433
C005	Not Used	-	NOT USED	37338
C006	Cap,SMT,Ceramic,1000pF,2%,50V,C0G,0805	CCFS42	C0805C102G5GAC	31433
C007	Cap,SMT,Ceramic,1000pF,2%,50V,C0G,0805	CCFS42	C0805C102G5GAC	31433
C008	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C009	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C010	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C011	Not Used	-	NOT USED	37338
C012	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C013	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C014	Not Used	-	NOT USED	37338
C015	Cap,SMT,Ceramic,150pF,1%,50V,C0G,0603	CCFS33	06035A151FAT2A	56289
C016	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C017	Capacitor, Ceramic, 1.0uF 10%50V	CCG10	CKR06BX105KRV	56289
C018	Not Used	-	NOT USED	37338
C019	Not Used	-	NOT USED	37338
C020	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C021	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C022	Cap,SMT,Ceramic,150pF,1%,50V,C0G,0603	CCFS33	06035A151FAT2A	56289
C023	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C024	Not Used	-	NOT USED	37338
C025	Not Used	-	NOT USED	37338
C026	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C027	Not Used	-	NOT USED	37338
C028	Not Used	-	NOT USED	37338
C029	Cap,SMT,Tantalum,10uF,10%,16V,1411	CTFS01	T494B106K016AS	31433
C030	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C031	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C032	Not Used	-	NOT USED	37338
C033	Not Used	-	NOT USED	37338
C034	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C035	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C036	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C037	Not Used	-	NOT USED	37338
C038	Not Used	-	NOT USED	37338
C039	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433

NAPI78B/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C040	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C041	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C042	Cap,SMT,Ceramic,0.47uF,10%,25V,X7R,0805	CCFS09	C0805C474K3RAC	31433
C043	Not Used	-	NOT USED	37338
C044	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C045	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C046	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C047	Cap,SMT,Ceramic,0.47uF,10%,25V,X7R,0805	CCFS09	C0805C474K3RAC	31433
C049	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C050	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C051	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C052	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C053	Not Used	-	NOT USED	37338
C054	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C055	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C056	Cap,SMT,Ceramic,0.0047uF,10%,50V,X7R,0603	CCFS03	C0603C472K5RAC	31433
C057	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C058	Cap,SMT,Ceramic,3300pF,2%,50V,C0G,1206	CCFS46	C1206C332G5GAC	31433
C059	Cap,SMT,Ceramic,3300pF,2%,50V,C0G,1206	CCFS46	C1206C332G5GAC	31433
C060	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C061	Cap,SMT,Ceramic,3300pF,2%,50V,C0G,1206	CCFS46	C1206C332G5GAC	31433
C062	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C063	Not Used	-	NOT USED	37338
C064	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C065	Cap,SMT,Ceramic,390pF,2%,50V,C0G,0603	CCFS37	C0603C391G5GAC	31433
C066	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C067	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C068	Cap,SMT,Tantalum,10uF,10%,16V,1411	CTFS01	T494B106K016AS	31433
C069	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C070	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C071	Cap,SMT,Ceramic,0.047uF,10%,50V,X7R,0603	CCFS06	C0603C473K5RAC	31433
C072	Cap,SMT,Ceramic,100pF,2%,50V,C0G,0603	CCFS32	C0603C101G5GAC	31433
C073	Cap,SMT,Ceramic,390pF,2%,50V,C0G,0603	CCFS37	C0603C391G5GAC	31433
C074	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C075	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C076	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C077	Cap,SMT,Tantalum,10uF,10%,16V,1411	CTFS01	T494B106K016AS	31433
C078	Cap,SMT,Ceramic,0.0022uF,10%,50V,X7R,0603	CCFS02	C0603C222K5RAC	31433
C079	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433

NAPI78B/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C080	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C081	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C082	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C083	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433
C084	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433
C085	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433
C086	Not Used	-	NOT USED	37338
C087	Not Used	-	NOT USED	37338
C088	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C089	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C091	Not Used	-	NOT USED	37338
C092	Not Used	-	NOT USED	37338
C094	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433
C095	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C098	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C100	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C102	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C103	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C105	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C106	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C107	Cap,SMT,Ceramic,10uF,20%,6.3V,X5R,0805	CCFS57	C2012X5R0J106M	54583
C108	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C109	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C112	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C113	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C115	Not Used	-	NOT USED	37338
C118	Cap,SMT,Tantalum,10uF,10%,16V,1411	CTFS01	T494B106K016AS	31433
C119	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C120	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C121	Not Used	-	NOT USED	37338
C122	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C123	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C124	Capacitor, Ceramic, 1.0uF 100V	CAP16	RPE114Z5U105M100V	91929
C125	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C126	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C127	Capacitor, Ceramic, 1.0uF 100V	CAP16	RPE114Z5U105M100V	91929
CR01	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR02	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713



NAPI78B/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
CR03	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR04	Not Used	-	NOT USED	37338
CR05	Not Used	-	NOT USED	37338
CR06	Not Used	-	NOT USED	37338
CR07	Not Used	-	NOT USED	37338
CR08	Not Used	-	NOT USED	37338
CR09	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR10	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR11	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR12	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR13	Not Used	-	NOT USED	37338
CR14	Not Used	-	NOT USED	37338
CR15	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR16	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR17	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR18	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR19	Not Used	-	NOT USED	37338
CR20	Diode,SMT,Zener,39V,5%,3W,SMB	QDZS04	1SMB5939BT3	04713
CR21	Diode,SMT,Zener,5.1V,5%,3W,SMB	QDZS01	1SMB5918BT3	04713
CR22	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR23	Not Used	-	NOT USED	37338
CR24	Not Used	-	NOT USED	37338
E01	Not Used	-	NOT USED	37338
E02	Not Used	-	NOT USED	37338
E03	Not Used	-	NOT USED	37338
E04	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E05	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E06	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E07	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E08	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E09	Not Used	-	NOT USED	37338
E11	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E12	Not Used	-	NOT USED	37338
E13	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E14	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338



NAPI78B/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
E15	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E16	Not Used	-	NOT USED	37338
E17	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E18	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J01	Not Used	-	NOT USED	37338
J02	Not Used	-	NOT USED	37338
J03	Conn,Socket,D-Sub,25 pin,VertPWB	JS53	628-025-220-017	31781
J04	Conn, Socket, D-Sub, 9-Pin,Vertical PWB	JS50	164A16669X	C3057
J05	Connector,Plug,D-Sub,9-Pin,Vert., PWB	JPDT01	163 A 16259 X	C3057
J06	Conn, BNC, Recept, PWB Mt	JF35	R141426161	0GP12
J07	Conn, BNC, Recept, PWB Mt	JF35	R141426161	0GP12
J08	Conn, BNC, Recept, PWB Mt	JF35	R141426161	0GP12
J09	Not Used	-	NOT USED	37338
J10	Conn, Header, Ribbon Cbl, 20 pin	JP46	499910-4	00779
J11	Conn,Socket,D-Sub,25 pin,VertPWB	JS53	628-025-220-017	31781
J12	Conn, Plug, D-Sub, 25 pin, Vert PWB	JS43	627 025 220 017	31781
J13	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J14	Not Used	-	NOT USED	37338
J15	Not Used	-	NOT USED	37338
J16	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J17	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J18	Conn, Header, Ribbon Cbl, 40-Pin	JQ53	103308-8	00779
L01	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L02	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L03	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L04	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L06	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L07	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L08	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L09	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L10	Not Used	-	NOT USED	37338
L11	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L12	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
Q01	Not Used	-	NOT USED	37338
Q02	Not Used	-	NOT USED	37338
Q03	Not Used	-	NOT USED	37338



NAPI78B/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
Q04	Not Used	-	NOT USED	37338
Q05	Not Used	-	NOT USED	37338
Q06	Not Used	-	NOT USED	37338
Q07	Transistor, FET, P ChannelSTATIC	QM21	2N5116(STATIC)	17856
Q08	Not Used	-	NOT USED	37338
Q11	Not Used	-	NOT USED	37338
R001	Resistor,SMT,MF,5620ohms,1%,1/10W,0603	RFFS47	RK73H1JLTD5621F	59124
R002	Not Used	-	NOT USED	37338
R003	Not Used	-	NOT USED	37338
R004	Resistor,SMT,MF,15.0Kohms,1%,1/10W,0603	RFFS52	RK73H1JLTD1502F	59124
R005	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R006	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R007	Not Used	-	NOT USED	37338
R008	Not Used	-	NOT USED	37338
R009	Resistor,SMT,MF,68.1Kohms,1%,1/10W,0603	RFFS60	RK73H1JLTD6812F	59124
R010	Not Used	-	NOT USED	37338
R011	Not Used	-	NOT USED	37338
R012	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R013	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R014	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R015	Resistor, SMT, MF, 3320 Ohms,1% 1/4W	RAD31	RK73H2BL3321F	59124
R016	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R017	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R018	Resistor,SMT,MF,68.1Kohms,1%,1/10W,0603	RFFS60	RK73H1JLTD6812F	59124
R019	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R020	Not Used	-	NOT USED	37338
R021	Not Used	-	NOT USED	37338
R022	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R023	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R024	Not Used	-	NOT USED	37338
R025	Not Used	-	NOT USED	37338
R026	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R027	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R028	Resistor, MF, 301 Ohms, 1%1/4W	RAC23	MF1/4DL3010F	59124
R029	Resistor, MF, 301 Ohms, 1%1/4W	RAC23	MF1/4DL3010F	59124
R030	Resistor,SMT,MF,1.82Mohms,1%,1/10W,0603	RFFS77	RK73H1JLTD1824F	59124
R031	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R032	Resistor,SMT,MF,22.1Kohms,1%,1/10W,0603	RFFS54	RK73H1JLTD2212F	59124
R033	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124



NAPI78B/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R034	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R035	Not Used	-	NOT USED	37338
R036	Not Used	-	NOT USED	37338
R037	Resistor, Variable, Film, 5000 Ohms, 1/2W	RV10	3339P-1-502	80294
R038	Resistor,SMT,MF,22.1Kohms,1%,1/10W,0603	RFFS54	RK73H1JLTD2212F	59124
R039	Not Used	-	NOT USED	37338
R040	Not Used	-	NOT USED	37338
R041	Not Used	-	NOT USED	37338
R042	Not Used	-	NOT USED	37338
R043	Not Used	-	NOT USED	37338
R044	Not Used	-	NOT USED	37338
R045	Not Used	-	NOT USED	37338
R046	Not Used	-	NOT USED	37338
R047	Not Used	-	NOT USED	37338
R048	Resistor,SMT,MF,0.0ohms,Jumper,0603	RFFS01	RK73Z1JLTD	59124
R049	Not Used	-	NOT USED	37338
R050	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R051	Resistor, SMT, MF, 4750 Ohms,1%, 1/4W	RAD33	RK73H2BL4751F	59124
R052	Not Used	-	NOT USED	37338
R053	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R054	Resistor, SMT, MF, 4750 Ohms,1%, 1/4W	RAD33	RK73H2BL4751F	59124
R055	Resistor,SMT,MF,8250ohms,1%,1/10W,0603	RFFS49	RK73H1JLTD8251F	59124
R056	Not Used	-	NOT USED	37338
R057	Not Used	-	NOT USED	37338
R058	Not Used	-	NOT USED	37338
R059	Not Used	-	NOT USED	37338
R060	Not Used	-	NOT USED	37338
R061	Not Used	-	NOT USED	37338
R062	Not Used	-	NOT USED	37338
R063	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R064	Not Used	-	NOT USED	37338
R065	Not Used	-	NOT USED	37338
R066	Not Used	-	NOT USED	37338
R067	Not Used	-	NOT USED	37338
R068	Not Used	-	NOT USED	37338
R069	Not Used	-	NOT USED	37338
R070	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R071	Resistor, SMT, MF, 4750 Ohms,1%, 1/4W	RAD33	RK73H2BL4751F	59124
R072	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124



NAPI78B/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R073	Resistor,SMT,MF,6810ohms,1%,1/10W,0603	RFFS48	RK73H1JLTD6811F	59124
R074	Resistor,SMT,MF,1820ohms,1%,1/10W,0603	RFFS41	RK73H1JLTD1821F	59124
R075	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R076	Resistor, SMT, MF, 4750 Ohms,1%, 1/4W	RAD33	RK73H2BL4751F	59124
R077	Resistor,SMT,MF,6810ohms,1%,1/10W,0603	RFFS48	RK73H1JLTD6811F	59124
R078	Resistor,SMT,MF,1820ohms,1%,1/10W,0603	RFFS41	RK73H1JLTD1821F	59124
R079	Not Used	-	NOT USED	37338
R081	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R082	Resistor,SMT,MF,681Kohms,1%,1/10W,0603	RFFS72	RK73H1JLTD6813F	59124
R083	Resistor,SMT,MF,150Kohms,1%,1/10W,0603	RFFS64	RK73H1JLTD1503F	59124
R084	Resistor,SMT,MF,150Kohms,1%,1/10W,0603	RFFS64	RK73H1JLTD1503F	59124
R085	Resistor,SMT,MF,6810ohms,1%,1/10W,0603	RFFS48	RK73H1JLTD6811F	59124
R086	Resistor,SMT,MF,150Kohms,1%,1/10W,0603	RFFS64	RK73H1JLTD1503F	59124
R087	Resistor,SMT,MF,1.82Mohms,1%,1/10W,0603	RFFS77	RK73H1JLTD1824F	59124
R088	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R089	Resistor,SMT,MF,150Kohms,1%,1/10W,0603	RFFS64	RK73H1JLTD1503F	59124
R090	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R091	Resistor,SMT,MF,1.82Mohms,1%,1/10W,0603	RFFS77	RK73H1JLTD1824F	59124
R092	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R093	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R094	Resistor,SMT,MF,1820ohms,1%,1/10W,0603	RFFS41	RK73H1JLTD1821F	59124
R095	Not Used	-	NOT USED	37338
R096	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R097	Resistor,SMT,MF,562Kohms,1%,1/10W,0603	RFFS71	RK73H1JLTD5623F	59124
R098	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R099	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R100	Resistor,SMT,MF,1.00Mohms,1%,1/10W,0603	RFFS74	RK73H1JLTD1004F	59124
R101	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R102	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R103	Resistor,SMT,MF,1.00Mohms,1%,1/10W,0603	RFFS74	RK73H1JLTD1004F	59124
R104	Not Used	-	NOT USED	37338
R105	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R106	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R107	Not Used	-	NOT USED	37338
R108	Not Used	-	NOT USED	37338
R109	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R110	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R114	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R116	Not Used	-	NOT USED	37338

NAPI78B/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R117	Not Used	-	NOT USED	37338
R123	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R127	Not Used	-	NOT USED	37338
R130	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R131	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R132	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R133	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R134	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R135	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R136	Resistor,SMT,MF,121Kohms,1%,1/10W,0603	RFFS63	RK73H1JLTD1213F	59124
R137	Resistor,SMT,MF,121Kohms,1%,1/10W,0603	RFFS63	RK73H1JLTD1213F	59124
R138	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R139	Resistor, SMT, MF, 121K Ohms,1% 1/4W	RAE02	RK73H2BL1213F	59124
R140	Not Used	-	NOT USED	37338
R141	Not Used	-	NOT USED	37338
R142	Resistor,SMT,MF,221ohms,1%,1/10W,0603	RFFS30	RK73H1JLTD2210F	59124
R143	Resistor,SMT,MF,221ohms,1%,1/10W,0603	RFFS30	RK73H1JLTD2210F	59124
R144	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R145	Resistor, SMT, MF, 121K Ohms,1% 1/4W	RAE02	RK73H2BL1213F	59124
R147	Not Used	-	NOT USED	37338
R149	Not Used	-	NOT USED	37338
R150	Not Used	-	NOT USED	37338
R152	Resistor, SMT, MF, 1000 Ohms,1% 1/4W	RAD25	RK73H2BL1001F	59124
R153	Resistor, SMT, MF, 1000 Ohms,1% 1/4W	RAD25	RK73H2BL1001F	59124
R154	Not Used	-	NOT USED	37338
R155	Not Used	-	NOT USED	37338
R156	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R157	Not Used	-	NOT USED	37338
R158	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R159	Resistor, SMT, MF, 121K Ohms,1% 1/4W	RAE02	RK73H2BL1213F	59124
R160	Resistor, SMT, MF, 121K Ohms,1% 1/4W	RAE02	RK73H2BL1213F	59124
R161	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R162	Resistor, MF, 3.92K Ohms, 1PC1/4W	RAB32	MF1/4DL3921F	59124
R163	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
R164	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R165	Resistor, Film, 150 Ohms, 2PC1/2W	RC27	RL20S151G	35005
R166	Resistor, Film, 1500 Ohms, 2PC 1/2W	RC39	RL20S152G	35005
R167	Resistor, Film, 150 Ohms, 5%,2W	RBP08	GS-3, 150 OHMS	75042



NAPI78B/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R168	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
S01	Not Used	-	NOT USED	37338
T01	Transformer, Audio,600CT/600CT, PWB	TTAT01	101F	69669
T02	Not Used	-	NOT USED	37338
TB01	Terminal Block,5mm,3-pos,PWBMt,Angled,Blue	JR49	796688-3	5Y407
U01	IC,SMT,Opamp,Quad,Single Supply,SOIC-14	ULAS01	MC33074AD(STATIC)	04713
U02	Not Used	-	NOT USED	37338
U03	IC,SMT,Instrumentation Amp,SOIC-8	UP98	AD620AR(STATIC)	45496
U04	Not Used	-	NOT USED	37338
U05	Not Used	-	NOT USED	37338
U06	IC,SMT,Dual Optocoupler,SOIC-8	UDOS01	MOCD223-M(STATIC)	7D893
U07	IC,SMT,Dual Optocoupler,SOIC-8	UDOS01	MOCD223-M(STATIC)	7D893
U08	IC,SMT,Opamp,Quad,Single Supply,SOIC-14	ULAS01	MC33074AD(STATIC)	04713
U09	IC,SMT,CMOS,Hex Schm,Trig,Inv,SOIC-14	UDLS03	SN74AHCT14D(STATI C)	01295
U10	IC,SMT,Comparator,Quad,SOIC-14	ULCS01	MC3302D(STATIC)	04713
U11	IC,SMT,RS-485 Transceiver,Sgl,SOIC-8	UDTS03	DS36C278TM(STATIC)	27014
U12	IC,SMT,RS-232 Transceiver,3.3V,SO-16	UDTS05	ADM3202ARN(STATIC)	45496
U13	IC,SMT,Dual,Optocoupler,SOIC-8	UX81	HCPL-0731(STATIC)	AGILENT
U14	IC,SMT,Dual,Optocoupler,SOIC-8	UX81	HCPL-0731(STATIC)	AGILENT
U15	IC,SMT,CMOS,Hex Schm,Trig,Inv,SOIC-14	UDLS03	SN74AHCT14D(STATI C)	01295
U16	IC,SMT,CMOS,Analog Multiplexer,SOIC-16	UX86	MC74HC4053AD(STA TIC)	04713
U17	IC,SMT,RS-485 Transceiver,Sgl,SOIC-8	UDTS03	DS36C278TM(STATIC)	27014
U18	IC,SMT,RS-485 Transceiver,Sgl,SOIC-8	UDTS03	DS36C278TM(STATIC)	27014
U19	IC,SMT,RS-485 Transceiver,Sgl,SOIC-8	UDTS03	DS36C278TM(STATIC)	27014
U21	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713
U23	IC,SMT,Amp,35MHz,CurrentFeedback 1.1A,TO263-7	UT90	LT1210CR(STATIC)	64155
XE04	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE05	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE06	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE07	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE08	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE11	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338

NAPI78B/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
XE13	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE14	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE15	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE17	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE18	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338



REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
E04	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E05	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E06	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E07	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E08	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E11	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E13	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E14	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E15	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E17	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E18	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
J13	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J16	Conn,Socket,D-Sub,25 pin,VertPWB	JS53	628-025-220-017	31781
J17	Conn,Socket,D-Sub,25 pin,VertPWB	JS53	628-025-220-017	31781
R163	Resistor, Variable, Film, 100K Ohms, 1/2W	RW01	3339P-1-104	80294
R168	Not Used	-	NOT USED	37338
XE04	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE05	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE06	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE07	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE08	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE11	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE13	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE14	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE15	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE17	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE18	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C001	Cap,SMT,Ceramic,0.0022uF,10%,50V,X7R,0603	CCFS02	C0603C222K5RAC	31433
C002	Cap,SMT,Ceramic,0.0047uF,10%,50V,X7R,0603	CCFS03	C0603C472K5RAC	31433
C003	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C004	Cap,SMT,Ceramic,1000pF,2%,50V,C0G,0805	CCFS42	C0805C102G5GAC	31433
C005	Not Used	-	NOT USED	37338
C006	Cap,SMT,Ceramic,1000pF,2%,50V,C0G,0805	CCFS42	C0805C102G5GAC	31433
C007	Cap,SMT,Ceramic,1000pF,2%,50V,C0G,0805	CCFS42	C0805C102G5GAC	31433
C008	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C009	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C010	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C011	Not Used	-	NOT USED	37338
C012	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C013	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C014	Not Used	-	NOT USED	37338
C015	Cap,SMT,Ceramic,150pF,1%,50V,C0G,0603	CCFS33	06035A151FAT2A	56289
C016	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C017	Capacitor, Ceramic, 1.0uF 10%50V	CCG10	CKR06BX105KRV	56289
C018	Not Used	-	NOT USED	37338
C019	Not Used	-	NOT USED	37338
C020	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C021	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C022	Cap,SMT,Ceramic,150pF,1%,50V,C0G,0603	CCFS33	06035A151FAT2A	56289
C023	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C024	Not Used	-	NOT USED	37338
C025	Not Used	-	NOT USED	37338
C026	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C027	Not Used	-	NOT USED	37338
C028	Not Used	-	NOT USED	37338
C029	Cap,SMT,Tantalum,10uF,10%,16V,1411	CTFS01	T494B106K016AS	31433
C030	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C031	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C032	Not Used	-	NOT USED	37338
C033	Not Used	-	NOT USED	37338
C034	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C035	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C036	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C037	Not Used	-	NOT USED	37338
C038	Not Used	-	NOT USED	37338
C039	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433

NAPI78D/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C040	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C041	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C042	Cap,SMT,Ceramic,0.47uF,10%,25V,X7R,0805	CCFS09	C0805C474K3RAC	31433
C043	Not Used	-	NOT USED	37338
C044	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C045	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C046	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C047	Cap,SMT,Ceramic,0.47uF,10%,25V,X7R,0805	CCFS09	C0805C474K3RAC	31433
C049	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C050	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C051	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C052	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C053	Not Used	-	NOT USED	37338
C054	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C055	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C056	Cap,SMT,Ceramic,0.0047uF,10%,50V,X7R,0603	CCFS03	C0603C472K5RAC	31433
C057	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C058	Cap,SMT,Ceramic,3300pF,2%,50V,C0G,1206	CCFS46	C1206C332G5GAC	31433
C059	Cap,SMT,Ceramic,3300pF,2%,50V,C0G,1206	CCFS46	C1206C332G5GAC	31433
C060	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C061	Cap,SMT,Ceramic,3300pF,2%,50V,C0G,1206	CCFS46	C1206C332G5GAC	31433
C062	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C063	Not Used	-	NOT USED	37338
C064	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C065	Cap,SMT,Ceramic,390pF,2%,50V,C0G,0603	CCFS37	C0603C391G5GAC	31433
C066	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C067	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C068	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433
C069	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C070	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C071	Cap,SMT,Ceramic,0.047uF,10%,50V,X7R,0603	CCFS06	C0603C473K5RAC	31433
C072	Cap,SMT,Ceramic,100pF,2%,50V,C0G,0603	CCFS32	C0603C101G5GAC	31433
C073	Cap,SMT,Ceramic,390pF,2%,50V,C0G,0603	CCFS37	C0603C391G5GAC	31433
C074	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C075	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C076	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C077	Cap,SMT,Tantalum,10uF,10%,16V,1411	CTFS01	T494B106K016AS	31433
C078	Cap,SMT,Ceramic,0.0022uF,10%,50V,X7R,0603	CCFS02	C0603C222K5RAC	31433
C079	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433

NAPI78D/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C080	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C081	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C082	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C083	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433
C084	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433
C085	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433
C086	Not Used	-	NOT USED	37338
C087	Not Used	-	NOT USED	37338
C088	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C089	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C091	Not Used	-	NOT USED	37338
C092	Not Used	-	NOT USED	37338
C094	Cap,SMT,Tantalum,1uF,10%,35V,1411	CTFS02	T494B105K035AS	31433
C095	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C098	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C100	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C102	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C103	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C105	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C106	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C107	Cap,SMT,Ceramic,10uF,20%,6.3V,X5R,0805	CCFS57	C2012X5R0J106M	54583
C108	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C109	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C112	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C113	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C115	Not Used	-	NOT USED	37338
C118	Cap,SMT,Tantalum,10uF,10%,16V,1411	CTFS01	T494B106K016AS	31433
C119	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C120	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C121	Not Used	-	NOT USED	37338
C122	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C123	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C124	Capacitor, Ceramic, 1.0uF 100V	CAP16	RPE114Z5U105M100V	91929
C125	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C126	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C127	Capacitor, Ceramic, 1.0uF 100V	CAP16	RPE114Z5U105M100V	91929
CR01	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR02	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713



NAPI78D/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
CR03	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR04	Not Used	-	NOT USED	37338
CR05	Not Used	-	NOT USED	37338
CR06	Not Used	-	NOT USED	37338
CR07	Not Used	-	NOT USED	37338
CR08	Not Used	-	NOT USED	37338
CR09	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR10	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR11	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR12	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR13	Not Used	-	NOT USED	37338
CR14	Not Used	-	NOT USED	37338
CR15	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR16	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR17	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR18	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR19	Not Used	-	NOT USED	37338
CR20	Diode,SMT,Zener,39V,5%,3W,SMB	QDZS04	1SMB5939BT3	04713
CR21	Diode,SMT,Zener,5.1V,5%,3W,SMB	QDZS01	1SMB5918BT3	04713
CR22	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR23	Not Used	-	NOT USED	37338
CR24	Not Used	-	NOT USED	37338
CR25	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
CR26	Diode,SMT,Schottky,30V,0.2A,SOD-323	QDSS01	BAT54HT1(STATIC)	04713
E01	Not Used	-	NOT USED	37338
E02	Not Used	-	NOT USED	37338
E03	Not Used	-	NOT USED	37338
E04	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E05	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E06	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E07	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E08	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E09	Not Used	-	NOT USED	37338
E11	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E12	Not Used	-	NOT USED	37338
E13	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338

NAPI78D/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
E14	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E15	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E16	Not Used	-	NOT USED	37338
E17	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E18	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J01	Not Used	-	NOT USED	37338
J02	Not Used	-	NOT USED	37338
J03	Conn,Socket,D-Sub,25 pin,VertPWB	JS53	628-025-220-017	31781
J04	Conn, Socket, D-Sub, 9-Pin,Vertical PWB	JS50	164A16669X	C3057
J05	Connector,Plug,D-Sub,9-Pin,Vert., PWB	JPDT01	163 A 16259 X	C3057
J06	Conn, BNC, Recept, PWB Mt	JF35	R141426161	0GP12
J07	Conn, BNC, Recept, PWB Mt	JF35	R141426161	0GP12
J08	Conn, BNC, Recept, PWB Mt	JF35	R141426161	0GP12
J09	Not Used	-	NOT USED	37338
J10	Conn, Header, Ribbon Cbl, 20 pin	JP46	499910-4	00779
J11	Conn,Socket,D-Sub,25 pin,VertPWB	JS53	628-025-220-017	31781
J12	Conn, Plug, D-Sub, 25 pin, Vert PWB	JS43	627 025 220 017	31781
J13	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J14	Not Used	-	NOT USED	37338
J15	Not Used	-	NOT USED	37338
J16	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J17	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J18	Conn, Header, Ribbon Cbl, 40-Pin	JQ53	103308-8	00779
L01	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L02	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L03	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L04	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L06	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L07	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L08	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L09	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L10	Not Used	-	NOT USED	37338
L11	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L12	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
Q01	Not Used	-	NOT USED	37338
Q02	Not Used	-	NOT USED	37338



NAPI78D/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
Q03	Not Used	-	NOT USED	37338
Q04	Not Used	-	NOT USED	37338
Q05	Not Used	-	NOT USED	37338
Q06	Not Used	-	NOT USED	37338
Q07	Transistor, FET, P ChannelSTATIC	QM21	2N5116(STATIC)	17856
Q08	Not Used	-	NOT USED	37338
Q11	Not Used	-	NOT USED	37338
R001	Resistor,SMT,MF,5620ohms,1%,1/10W,0603	RFFS47	RK73H1JLTD5621F	59124
R002	Not Used	-	NOT USED	37338
R003	Not Used	-	NOT USED	37338
R004	Resistor,SMT,MF,15.0Kohms,1%,1/10W,0603	RFFS52	RK73H1JLTD1502F	59124
R005	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R006	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R007	Not Used	-	NOT USED	37338
R008	Not Used	-	NOT USED	37338
R009	Resistor,SMT,MF,68.1Kohms,1%,1/10W,0603	RFFS60	RK73H1JLTD6812F	59124
R010	Not Used	-	NOT USED	37338
R011	Not Used	-	NOT USED	37338
R012	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R013	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R014	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R015	Resistor, SMT, MF, 3320 Ohms,1% 1/4W	RAD31	RK73H2BL3321F	59124
R016	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R017	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R018	Resistor,SMT,MF,68.1Kohms,1%,1/10W,0603	RFFS60	RK73H1JLTD6812F	59124
R019	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R020	Not Used	-	NOT USED	37338
R021	Not Used	-	NOT USED	37338
R022	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R023	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R024	Not Used	-	NOT USED	37338
R025	Not Used	-	NOT USED	37338
R026	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R027	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R028	Resistor, MF, 301 Ohms, 1%1/4W	RAC23	MF1/4DL3010F	59124
R029	Resistor, MF, 301 Ohms, 1%1/4W	RAC23	MF1/4DL3010F	59124
R030	Resistor,SMT,MF,1.82Mohms,1%,1/10W,0603	RFFS77	RK73H1JLTD1824F	59124
R031	Resistor,SMT,MF,475Kohms,1%,1/10W,0603	RFFS70	RK73H1JLTD4753F	59124
R032	Resistor,SMT,MF,22.1Kohms,1%,1/10W,0603	RFFS54	RK73H1JLTD2212F	59124

NAPI78D/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R033	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R034	Resistor,SMT,MF,475ohms,1%,1/10W,0603	RFFS34	RK73H1JLTD4750F	59124
R035	Not Used	-	NOT USED	37338
R036	Not Used	-	NOT USED	37338
R037	Resistor, Variable, Film, 5000 Ohms, 1/2W	RV10	3339P-1-502	80294
R038	Resistor,SMT,MF,22.1Kohms,1%,1/10W,0603	RFFS54	RK73H1JLTD2212F	59124
R039	Not Used	-	NOT USED	37338
R040	Not Used	-	NOT USED	37338
R041	Not Used	-	NOT USED	37338
R042	Not Used	-	NOT USED	37338
R043	Not Used	-	NOT USED	37338
R044	Not Used	-	NOT USED	37338
R045	Not Used	-	NOT USED	37338
R046	Not Used	-	NOT USED	37338
R047	Not Used	-	NOT USED	37338
R048	Resistor,SMT,MF,0.0ohms,Jumper,0603	RFFS01	RK73Z1JLTD	59124
R049	Not Used	-	NOT USED	37338
R050	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R051	Resistor, SMT, MF, 4750 Ohms,1%, 1/4W	RAD33	RK73H2BL4751F	59124
R052	Not Used	-	NOT USED	37338
R053	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R054	Resistor, SMT, MF, 4750 Ohms,1%, 1/4W	RAD33	RK73H2BL4751F	59124
R055	Resistor,SMT,MF,8250ohms,1%,1/10W,0603	RFFS49	RK73H1JLTD8251F	59124
R056	Not Used	-	NOT USED	37338
R057	Not Used	-	NOT USED	37338
R058	Not Used	-	NOT USED	37338
R059	Not Used	-	NOT USED	37338
R060	Not Used	-	NOT USED	37338
R061	Not Used	-	NOT USED	37338
R062	Not Used	-	NOT USED	37338
R063	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R064	Not Used	-	NOT USED	37338
R065	Not Used	-	NOT USED	37338
R066	Not Used	-	NOT USED	37338
R067	Not Used	-	NOT USED	37338
R068	Not Used	-	NOT USED	37338
R069	Not Used	-	NOT USED	37338
R070	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R071	Resistor, SMT, MF, 4750 Ohms,1%, 1/4W	RAD33	RK73H2BL4751F	59124

NAPI78D/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R072	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R073	Resistor,SMT,MF,6810ohms,1%,1/10W,0603	RFFS48	RK73H1JLTD6811F	59124
R074	Resistor,SMT,MF,1820ohms,1%,1/10W,0603	RFFS41	RK73H1JLTD1821F	59124
R075	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R076	Resistor, SMT, MF, 4750 Ohms,1%, 1/4W	RAD33	RK73H2BL4751F	59124
R077	Resistor,SMT,MF,6810ohms,1%,1/10W,0603	RFFS48	RK73H1JLTD6811F	59124
R078	Resistor,SMT,MF,1820ohms,1%,1/10W,0603	RFFS41	RK73H1JLTD1821F	59124
R079	Not Used	-	NOT USED	37338
R081	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R082	Resistor,SMT,MF,681Kohms,1%,1/10W,0603	RFFS72	RK73H1JLTD6813F	59124
R083	Resistor,SMT,MF,150Kohms,1%,1/10W,0603	RFFS64	RK73H1JLTD1503F	59124
R084	Resistor,SMT,MF,150Kohms,1%,1/10W,0603	RFFS64	RK73H1JLTD1503F	59124
R085	Resistor,SMT,MF,6810ohms,1%,1/10W,0603	RFFS48	RK73H1JLTD6811F	59124
R086	Resistor,SMT,MF,150Kohms,1%,1/10W,0603	RFFS64	RK73H1JLTD1503F	59124
R087	Resistor,SMT,MF,1.82Mohms,1%,1/10W,0603	RFFS77	RK73H1JLTD1824F	59124
R088	Resistor,SMT,MF,100Kohms,1%,1/10W,0603	RFFS62	RK73H1JLTD1003F	59124
R089	Resistor,SMT,MF,150Kohms,1%,1/10W,0603	RFFS64	RK73H1JLTD1503F	59124
R090	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R091	Resistor,SMT,MF,1.82Mohms,1%,1/10W,0603	RFFS77	RK73H1JLTD1824F	59124
R092	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R093	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R094	Resistor,SMT,MF,1820ohms,1%,1/10W,0603	RFFS41	RK73H1JLTD1821F	59124
R095	Not Used	-	NOT USED	37338
R096	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R097	Resistor,SMT,MF,562Kohms,1%,1/10W,0603	RFFS71	RK73H1JLTD5623F	59124
R098	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R099	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R100	Resistor,SMT,MF,1.00Mohms,1%,1/10W,0603	RFFS74	RK73H1JLTD1004F	59124
R101	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R102	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R103	Resistor,SMT,MF,1.00Mohms,1%,1/10W,0603	RFFS74	RK73H1JLTD1004F	59124
R104	Not Used	-	NOT USED	37338
R105	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R106	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R107	Not Used	-	NOT USED	37338
R108	Not Used	-	NOT USED	37338
R109	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R110	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R114	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124

NAPI78D/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R116	Not Used	-	NOT USED	37338
R117	Not Used	-	NOT USED	37338
R123	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R127	Not Used	-	NOT USED	37338
R130	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R131	Resistor,SMT,MF,100ohms,1%,1/10W,0603	RFFS26	RK73H1JLTD1000F	59124
R132	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R133	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R134	Resistor,SMT,MF,1000ohms,1%,1/10W,0603	RFFS38	RK73H1JLTD1001F	59124
R135	Resistor,SMT,MF,2210ohms,1%,1/10W,0603	RFFS42	RK73H1JLTD2211F	59124
R136	Resistor,SMT,MF,121Kohms,1%,1/10W,0603	RFFS63	RK73H1JLTD1213F	59124
R137	Resistor,SMT,MF,121Kohms,1%,1/10W,0603	RFFS63	RK73H1JLTD1213F	59124
R138	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R139	Resistor, SMT, MF, 121K Ohms,1% 1/4W	RAE02	RK73H2BL1213F	59124
R140	Not Used	-	NOT USED	37338
R141	Not Used	-	NOT USED	37338
R142	Resistor,SMT,MF,221ohms,1%,1/10W,0603	RFFS30	RK73H1JLTD2210F	59124
R143	Resistor,SMT,MF,221ohms,1%,1/10W,0603	RFFS30	RK73H1JLTD2210F	59124
R144	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R145	Resistor, SMT, MF, 121K Ohms,1% 1/4W	RAE02	RK73H2BL1213F	59124
R147	Not Used	-	NOT USED	37338
R149	Not Used	-	NOT USED	37338
R150	Not Used	-	NOT USED	37338
R152	Resistor, SMT, MF, 1000 Ohms,1% 1/4W	RAD25	RK73H2BL1001F	59124
R153	Resistor, SMT, MF, 1000 Ohms,1% 1/4W	RAD25	RK73H2BL1001F	59124
R154	Not Used	-	NOT USED	37338
R155	Not Used	-	NOT USED	37338
R156	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R157	Not Used	-	NOT USED	37338
R158	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R159	Resistor, SMT, MF, 121K Ohms,1% 1/4W	RAE02	RK73H2BL1213F	59124
R160	Resistor, SMT, MF, 121K Ohms,1% 1/4W	RAE02	RK73H2BL1213F	59124
R161	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R162	Resistor, MF, 3.92K Ohms, 1PC1/4W	RAB32	MF1/4DL3921F	59124
R163	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
R164	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
R165	Resistor, Film, 150 Ohms, 2PC1/2W	RC27	RL20S151G	35005
R166	Resistor, Film, 1500 Ohms, 2PC 1/2W	RC39	RL20S152G	35005

NAPI78D/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R167	Resistor, Film, 150 Ohms, 5%,2W	RBP08	GS-3, 150 OHMS	75042
R168	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
R169	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R170	Resistor, SMT, MF, 681 Ohms,1% 1/4W	RAD23	MCR18EZHf6810(RO HS)	ROHM
R171	Resistor, SMT, MF, 681 Ohms,1% 1/4W	RAD23	MCR18EZHf6810(RO HS)	ROHM
S01	Not Used	-	NOT USED	37338
T01	Transformer, Audio,600CT/600CT, PWB	TTAT01	101F	69669
T02	Not Used	-	NOT USED	37338
TB01	Terminal Block,5mm,3-pos,PWBMt,Angled,Blue	JR49	796688-3	5Y407
U01	IC,SMT,Opamp,Quad,Single Supply,SOIC-14	ULAS01	MC33074AD(STATIC)	04713
U02	Not Used	-	NOT USED	37338
U03	IC,SMT,Instrumentation Amp,SOIC-8	UP98	AD620AR(STATIC)	45496
U04	Not Used	-	NOT USED	37338
U05	Not Used	-	NOT USED	37338
U06	IC,SMT,Dual Optocoupler,SOIC-8	UDOS01	MOCD223-M(STATIC)	7D893
U07	IC,SMT,Dual Optocoupler,SOIC-8	UDOS01	MOCD223-M(STATIC)	7D893
U08	IC,SMT,Opamp,Quad,Single Supply,SOIC-14	ULAS01	MC33074AD(STATIC)	04713
U09	IC,SMT,CMOS,Hex Schm,Trig,Inv,SOIC-14	UDLS03	SN74AHCT14D(STATI C)	01295
U10	IC,SMT,Comparator,Quad,SOIC-14	ULCS01	MC3302D(STATIC)	04713
U11	IC,SMT,RS-485 Transceiver,Sgl,SOIC-8	UDTS03	DS36C278TM(STATIC)	27014
U12	IC,SMT,RS-232 Transceiver,3.3V,SO-16	UDTS05	ADM3202ARN(STATIC)	45496
U13	IC,SMT,Dual,Optocoupler,SOIC-8	UX81	HCPL-0731(STATIC)	AGILENT
U14	IC,SMT,Dual,Optocoupler,SOIC-8	UX81	HCPL-0731(STATIC)	AGILENT
U15	IC,SMT,CMOS,Hex Schm,Trig,Inv,SOIC-14	UDLS03	SN74AHCT14D(STATI C)	01295
U16	IC,SMT,CMOS,Analog Multiplexer,SOIC-16	UX86	MC74HC4053AD(STA TIC)	04713
U17	IC,SMT,RS-485 Transceiver,Sgl,SOIC-8	UDTS03	DS36C278TM(STATIC)	27014
U18	IC,SMT,RS-485 Transceiver,Sgl,SOIC-8	UDTS03	DS36C278TM(STATIC)	27014
U19	IC,SMT,RS-485 Transceiver,Sgl,SOIC-8	UDTS03	DS36C278TM(STATIC)	27014
U21	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713
U23	IC,SMT,Amp,35MHz,CurrentFeedback 1.1A,TO263-7	UT90	LT1210CR(STATIC)	64155
XE04	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE05	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338

NAPI78D/00 Remote Interface, Basic

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
XE06	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE07	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE08	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE11	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE13	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE14	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE15	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE17	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
XE18	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338



REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
E04	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E05	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E06	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E07	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E08	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E11	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E13	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E14	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E15	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E17	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E18	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
J13	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J16	Conn,Socket,D-Sub,25 pin,VertPWB	JS53	628-025-220-017	31781
J17	Conn,Socket,D-Sub,25 pin,VertPWB	JS53	628-025-220-017	31781
R163	Resistor, Variable, Film, 100K Ohms, 1/2W	RW01	3339P-1-104	80294
R164	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R168	Not Used	-	NOT USED	37338
XE04	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE05	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE06	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE07	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE08	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE11	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE13	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE14	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE15	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE17	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE18	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C01	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C02	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C03	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C04	Capacitor, Elect, 100uF 20% 25V	CAP42	KME25VB101M6X11L L	1W344
C05	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C06	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C07	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C08	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C09	Cap,SMT,Tantalum,10uF,10%,35V,2917	CTFS03	T494D106K035AS	31433
C10	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C11	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C12	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C13	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C14	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C15	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C16	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C17	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C18	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C19	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C20	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C21	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C22	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C23	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C24	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C25	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C26	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C27	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C28	Cap,SMT,Ceramic,18pF,2%,50V,C0G,0603	CCFS23	C0603C180G5GAC	31433
C29	Cap,SMT,Ceramic,18pF,2%,50V,C0G,0603	CCFS23	C0603C180G5GAC	31433
C30	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C31	Cap,SMT,Ceramic,0.001uF,10%,50V,X7R,0603	CCFS01	C0603C102K5RAC	31433
C32	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	CCFS04	C0603C103K5RAC	31433
C33	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C34	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C35	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C36	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C37	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
C38	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	CCFS07	C0805C104K5RAC	31433
CR01	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713

NAPI80

NDB Site Interface PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
CR02	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR03	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR04	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR05	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR06	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR07	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR08	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR09	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR10	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR11	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR12	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR13	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR14	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR15	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
CR16	Diode,SMT,Switching,250V,0.2A,SOD-323	QDRS01	BAS21HT1(STATIC)	04713
J01	Conn, Header, Ribbon Cbl, 20Pin	JQ55	103308-5	00779
J02	Conn, Header,Square Post,Gold,Dual,40-pin	JF47	4-102973-0	09482
K01	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K02	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K03	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K04	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K05	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K06	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K07	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K08	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K09	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K10	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K11	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K12	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K13	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K14	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K15	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
K16	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
L01	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L02	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L03	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L04	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L05	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845
L06	Inductor, SMT, Choke, 600ohms,2A, 0805	LCFS01	ILHB0805RK601V	56845

NAPI80

NDB Site Interface PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R01	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R02	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R03	Resistor, Film, 150 Ohms, 5%,2W	RBP08	GS-3, 150 OHMS	75042
R04	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R05	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R06	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R07	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R08	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R09	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R10	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R11	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R12	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R13	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R14	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R15	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R16	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R17	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R18	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R19	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R20	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R21	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R22	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R23	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R24	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R25	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R26	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R27	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R28	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R29	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R30	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R31	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R32	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R33	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R34	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R35	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R36	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R37	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R38	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R39	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124



NAPI80

NDB Site Interface PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R40	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R41	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R42	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R43	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R44	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R45	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R46	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R47	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R48	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R49	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R50	Resistor,SMT,MF,4750ohms,1%,1/10W,0603	RFFS46	RK73H1JLTD4751F	59124
R51	Resistor,SMT,MF,3920ohms,1%,1/10W,0603	RFFS45	RK73H1JLTD3921F	59124
R52	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R53	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
R54	Resistor,SMT,MF,10.0Kohms,1%,1/10W,0603	RFFS50	RK73H1JLTD1002F	59124
TB01	Terminal Block,5mm,3-pos,PWBMT,Green	JR50	282836-3	5Y407
TB02	Terminal Block,5mm,3-pos,PWBMT,Green	JR50	282836-3	5Y407
TB03	Terminal Block,5mm,3-pos,PWBMT,Green	JR50	282836-3	5Y407
U01	IC,DC-DC Converter,12V-12V,Isolated,3W	UT80	NDY1212(STATIC)	1K126
U02	IC,SMT,Dual Optocoupler,SOIC-8	UDOS01	MOCD223-M(STATIC)	7D893
U03	IC,SMT,Dual Optocoupler,SOIC-8	UDOS01	MOCD223-M(STATIC)	7D893
U04	IC,SMT,Dual Optocoupler,SOIC-8	UDOS01	MOCD223-M(STATIC)	7D893
U05	IC,SMT,Dual Optocoupler,SOIC-8	UDOS01	MOCD223-M(STATIC)	7D893
U06	IC,SMT,CMOS,8-Bit Shft Reg,Par I/P, SOIC-16	UDLS04	MC74HC165AD(STATI C)	04713
U07	IC,SMT,Dual Optocoupler,SOIC-8	UDOS01	MOCD223-M(STATIC)	7D893
U08	IC,SMT,Dual Optocoupler,SOIC-8	UDOS01	MOCD223-M(STATIC)	7D893
U09	IC,SMT,CMOS,8-Bit Shft Reg,Par I/P, SOIC-16	UDLS04	MC74HC165AD(STATI C)	04713
U10	IC,SMT,Dual Optocoupler,SOIC-8	UDOS01	MOCD223-M(STATIC)	7D893
U11	IC,SMT,Dual Optocoupler,SOIC-8	UDOS01	MOCD223-M(STATIC)	7D893
U12	IC,SMT,RS-485 Transceiver,Sgl,SOIC-8	UDTS03	DS36C278TM(STATIC)	27014
U13	IC, SMT, Micro, ADC, PWM,Flash, TQFP-32	UDMS03	ATMEGA8- 16AI(STATIC)	1FN41
U14	IC,SMT,Microprocessor Supervisor, SC70	UDSS02	ADM803- MAKS(STATIC)	24355
U15	IC,SMT,CMOS,Quad Tri-State Buffer, SOIC-14	UDLS06	MC74HC125AD(STATI C)	04713
U16	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713
U17	IC,SMT,CMOS,8-Bit Shft Reg,Par O/P, SOIC-16	UDLS05	MC74HC595AD(STATI C)	04713
U18	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713

NAPI80

NDB Site Interface PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
U19	IC,SMT,CMOS,8-Bit Shft Reg,Par O/P, SOIC-16	UDLS05	MC74HC595AD(STATI C)	04713
U20	IC,SMT,Trans Array, 7 Darl.,SOIC-16	UDAS01	MC1413BD(STATIC)	04713
Y01	Crystal,SMT,Fund,Par Res,3.6864MHz,Comm	XFPS03	ATSM49-3.6864MHz	23875



REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C01	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C02	Capacitor, Ceramic, 1.0uF 10%50V	CCG10	CKR06BX105KRV	56289
C03	Capacitor, Ceramic, 1.0uF 10%50V	CCG10	CKR06BX105KRV	56289
C04	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C05	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C06	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C07	Capacitor, Elect, 33uF, 63V,+/-20%	CBP16	KME63VB33RM6X11L	UNITED L
CR01	Diode, Zener Transient Supressor, 30V	QM12	P6KE30CA	04713
CR02	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR03	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR04	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR05	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR06	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR07	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR08	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR09	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR10	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR11	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR12	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR13	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR14	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR15	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR16	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR17	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR18	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR19	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR20	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR21	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR22	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR23	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR24	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713

NAPI94

Interface PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
CR25	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR26	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
E01	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E02	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E03	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E04	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E05	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E06	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
J01	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J02	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J03	Conn, Plug, D-Sub, 25 pin, PWB Mt	JS12	K22-B25P-NJ	63590
J04	MTA, Keyed Square Post HeaderAssy, 8 pin	JU24	647123-8	00779
J05	MTA, Keyed Square Post HeaderAssy, 8 pin	JU24	647123-8	00779
J06	MTA, Keyed Square Post HeaderAssy,12 Pin	JU23	1-647123-2	00779
J07	Conn, Plug, D-Sub, 25 pin, PWB Mt	JS12	K22-B25P-NJ	63590
J08	Conn, Socket, D-Sub, 25 pin, PWB Mt	JS13	K22-B25S-NJ	22421
J09	Conn, Socket, D-Sub, 25 pin, PWB Mt	JS13	K22-B25S-NJ	22421
J10	Conn, Plug, D-Sub, 25 pin, PWB Mt	JS12	K22-B25P-NJ	63590
L01	Transformer Assy, Servo Probe	195-9535	195-9535	37338
R01	Resistor, Wirewound, 1 Ohms, 1%, 2.5W, NH	RS44	NS-2C-1 OHM-1%	35005
R02	Resistor, MF, 121 Ohms, 1%, 1/4W	RAB14	MF1/4DL1210F	59124
R03	Resistor, MF, 562 Ohms, 1PC 1/4W	RAB22	MF1/4DL5620F	59124
R04	Resistor, MF, 182 Ohms, 1PC 1/4W	RAB16	MF1/4DL1820F	59124
R05	Resistor, MF, 15.0K Ohms, 1PC1/4W	RAB39	MF1/4DL1502F	59124
R06	Resistor, MF, 2.21K Ohms, 1PC1/4W	RAB29	MF1/4DL2211F	59124
R07	Resistor, MF, 22.1K Ohms, 1PC1/4W	RAB41	MF1/4DL2212F	59124
T01	Signal Transformer, 1.1VA230V/36V	TD46	DST-2-36	08779
TP01	Terminal, Test Point, PWB, Yellow	HR10	TP-106-01-04	COMP-C
U01	Voltage Regulator, Adj Voltage, 3A	UT36	LM350T	27014
U02	Voltage Regulator, Adj Voltage, 3A	UT36	LM350T	27014

NAPI94A

Interface PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C01	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C02	Capacitor, Ceramic, 1.0uF 10%50V	CCG10	CKR06BX105KRV	56289
C03	Capacitor, Ceramic, 1.0uF 10%50V	CCG10	CKR06BX105KRV	56289
C04	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C05	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C06	Capacitor, Elect, 4.7uF, 100V, +/-20%	CD48	KME100VB4R7M5X11 LL	
C07	Capacitor, Elect, 4.7uF, 100V, +/-20%	CD48	KME100VB4R7M5X11 LL	
CR01	Diode, Zener Transient Supressor, 30V	QM12	P6KE30CA	04713
CR02	Not Used	-	NOT USED	37338
CR03	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR04	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR05	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR06	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR07	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR08	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR09	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR10	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR11	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR12	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR13	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR14	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR15	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR16	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR17	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR18	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR19	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR20	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR21	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR22	Diode, Schottky Rectifier, 45V, 16A	QM43	MBR1645(STATIC)	ONSEMI
CR23	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR24	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713

NAPI94A Interface PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
CR25	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR26	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
E01	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E02	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E03	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E04	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E05	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E06	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
J01	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J02	Conn, Header, Ribbon Cbl, 40 pin	JP52	499910-9	00779
J03	Conn, Plug, D-Sub, 25 pin, PWB Mt	JS12	K22-B25P-NJ	63590
J04	MTA, Keyed Square Post HeaderAssy, 8 pin	JU24	647123-8	00779
J05	MTA, Keyed Square Post HeaderAssy, 8 pin	JU24	647123-8	00779
J06	MTA, Keyed Square Post HeaderAssy,12 Pin	JU23	1-647123-2	00779
J07	Conn, Plug, D-Sub, 25 pin, PWB Mt	JS12	K22-B25P-NJ	63590
J08	Conn, Socket, D-Sub, 25 pin, PWB Mt	JS13	K22-B25S-NJ	22421
J09	Conn, Socket, D-Sub, 25 pin, PWB Mt	JS13	K22-B25S-NJ	22421
J10	Conn, Plug, D-Sub, 25 pin, PWB Mt	JS12	K22-B25P-NJ	63590
L01	Transformer Assy, Servo Probe	195-9535	195-9535	37338
R01	Resistor, Wirewound, 1 Ohms, 1%, 2.5W, NH	RS44	NS-2C-1 OHM-1%	35005
R02	Not Used	-	NOT USED	37338
R03	Not Used	-	NOT USED	37338
R04	Not Used	-	NOT USED	37338
R05	Resistor, MF, 15.0K Ohms, 1PC1/4W	RAB39	MF1/4DL1502F	59124
R06	Resistor, MF, 2.21K Ohms, 1PC1/4W	RAB29	MF1/4DL2211F	59124
R07	Resistor, MF, 22.1K Ohms, 1PC1/4W	RAB41	MF1/4DL2212F	59124
T01	Signal Transformer, 1.1VA230V/36V	TD46	DST-2-36	08779
TP01	Terminal, Test Point, PWB, Yellow	HR10	TP-106-01-04	COMP-C
U01	Voltage Regulator, Adj Voltage, 3A	UT36	LM350T	27014
U02	Not Used	-	NOT USED	37338

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C01	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C02	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C03	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C04	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C05	Capacitor, Ceramic, 0.22uF 10% 50V	CCG08	CKR06BX224KRV	56289
C06	Capacitor, Mica, Dipped, 470pF 2% 500V	CB33	CD15FD471G03	14655
C07	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C08	Capacitor, Ceramic, 0.47uF 10% 50V	CCG09	CKR06BX474KRV	56289
C09	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C10	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C11	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C12	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C13	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C14	Capacitor, Mica, Dipped, 100pF 2% 500V	CB25	CM05FD101G03	SOSH
C15	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C16	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C17	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C18	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C19	Capacitor, Mica, Dipped, 470pF 2% 500V	CB33	CD15FD471G03	14655
C20	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C21	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C22	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C23	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C24	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C25	Capacitor, Mica, Dipped, 100pF 2% 500V	CB25	CM05FD101G03	SOSH
C26	Capacitor, Ceramic, 0.047uF 10% 100V	CCG06	CKR06BX473KRV	56289
C27	Capacitor, Mica, Dipped, 330pF 2% 500V	CB31	CM05FD331G03	14655
C28	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C29	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C30	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C31	Not Used	-	NOT USED	37338
C32	Not Used	-	NOT USED	37338
C33	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C34	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C35	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289

NAPM11

Interphase PDM Driver PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C36	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C37	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C38	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C39	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C40	Not Used	-	NOT USED	37338
C41	Capacitor, Ceramic, 0.22uF 10% 50V	CCG08	CKR06BX224KRV	56289
C42	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C43	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C44	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C45	Capacitor, Ceramic, 0.001uF 10% 200V	CCG01	CKR05BX102KRV SPRAGUE	91929
C46	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C47	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C48	Capacitor, Ceramic, 0.001uF 10% 200V	CCG01	CKR05BX102KRV SPRAGUE	91929
C49	Capacitor, Mica, Dipped, 100pF 2% 500V	CB25	CM05FD101G03	SOSH
C50	Capacitor, Mica, Dipped, 100pF 2% 500V	CB25	CM05FD101G03	SOSH
C51	Capacitor, Ceramic, 0.001uF 10% 200V	CCG01	CKR05BX102KRV SPRAGUE	91929
C52	Capacitor, Ceramic, 0.001uF 10% 200V	CCG01	CKR05BX102KRV SPRAGUE	91929
C53	Capacitor, Ceramic, 0.001uF 10% 200V	CCG01	CKR05BX102KRV SPRAGUE	91929
C54	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C55	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C56	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C57	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C58	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C59	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C60	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C61	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C62	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C63	Capacitor, Ceramic, 0.001uF 10% 200V	CCG01	CKR05BX102KRV SPRAGUE	91929
C64	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C65	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C66	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C71	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
CR01	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263

NAPM11

Interphase PDM Driver PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
CR02	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR03	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR04	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR05	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
E01	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
J01	Conn, Plug, D-Sub, 25 pin, PWB Mt	JS12	K22-B25P-NJ	63590
K01	Relay, 5V Coil, 2PDT, 1A	KC18	TQ2-5V	61529
L01	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L02	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L03	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L04	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L05	Not Used	-	NOT USED	37338
L06	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L07	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L08	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
Q01	Transistor, NPN, Switch/Amplifier	QA45	2N4401	04713
Q02	Transistor, NPN, Switch/Amplifier	QA45	2N4401	04713
Q03	Transistor, NPN, Switch/Amplifier	QA45	2N4401	04713
Q04	Transistor, NPN, Switch/Amplifier	QA45	2N4401	04713
Q05	Transistor, PNP, Switch/Amplifier	QA44	2N4403	04713
Q06	Transistor, NPN, Switch/Amplifier	QA45	2N4401	04713
Q07	Transistor, PNP, Switch/Amplifier	QA44	2N4403	04713
Q08	Not Used	-	NOT USED	37338
Q09	Not Used	-	NOT USED	37338
Q10	Transistor, NPN, Switch/Amplifier	QA45	2N4401	04713
R01	Resistor, MF, 100K Ohms, 1PC 1/4W	RAC01	MF1/4DL1003F	59124
R02	Resistor, MF, 22.1K Ohms, 1PC1/4W	RAB41	MF1/4DL2212F	59124
R03	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R04	Resistor, MF, 681K Ohms, 1%1/4W	RAC11	MF1/4DL6813F	59124
R05	Resistor, MF, 562 Ohms, 1PC 1/4W	RAB22	MF1/4DL5620F	59124
R06	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R07	Resistor, MF, 100K Ohms, 1PC 1/4W	RAC01	MF1/4DL1003F	59124
R08	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R09	Resistor, MF, 15.0K Ohms, 1PC1/4W	RAB39	MF1/4DL1502F	59124
R10	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R11	Resistor, MF, 2.21M Ohms, 1%1/4W	RAC17	MF1/4DL2214F	59124
R12	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R13	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R14	Resistor, MF, 4.75K Ohms, 1PC1/4W	RAB33	MF1/4DL4751F	59124



NAPM11

Interphase PDM Driver PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R15	Resistor, MF, 2.74K Ohms, 1PC1/4W	RAB30	MF1/4DL2741F	59124
R16	Resistor, MF, 681K Ohms, 1%1/4W	RAC11	MF1/4DL6813F	59124
R17	Not Used	-	NOT USED	37338
R18	Not Used	-	NOT USED	37338
R19	Not Used	-	NOT USED	37338
R20	Not Used	-	NOT USED	37338
R21	Not Used	-	NOT USED	37338
R22	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R23	Not Used	-	NOT USED	37338
R24	Not Used	-	NOT USED	37338
R25	Resistor, MF, 1.21K Ohms, 1PC1/4W	RAB26	MF1/4DL1211F	59124
R26	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R27	Resistor, MF, 18.2K Ohms, 1PC1/4W	RAB40	MF1/4DL1822F	59124
R28	Not Used	-	NOT USED	37338
R29	Resistor, MF, 2.21M Ohms, 1%1/4W	RAC17	MF1/4DL2214F	59124
R30	Resistor, MF, 2.21M Ohms, 1%1/4W	RAC17	MF1/4DL2214F	59124
R31	Resistor, Variable, Film, 5000 Ohms, 1/2W	RV10	3339P-1-502	80294
R32	Not Used	-	NOT USED	37338
R33	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R34	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R35	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R36	Resistor, MF, 100K Ohms, 1PC 1/4W	RAC01	MF1/4DL1003F	59124
R37	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R38	Resistor, MF, 10K Ohms, 0.1%,1/4W	RAC28	MF55E1002B	59124
R39	Resistor, MF, 10K Ohms, 0.1%,1/4W	RAC28	MF55E1002B	59124
R40	Not Used	-	NOT USED	37338
R41	Not Used	-	NOT USED	37338
R42	Resistor, MF, 10K Ohms, 0.1%,1/4W	RAC28	MF55E1002B	59124
R43	Not Used	-	NOT USED	37338
R44	Resistor, MF, 10K Ohms, 0.1%,1/4W	RAC28	MF55E1002B	59124
R45	Not Used	-	NOT USED	37338
R46	Resistor, MF, 10K Ohms, 0.1%,1/4W	RAC28	MF55E1002B	59124
R47	Resistor, MF, 4990 Ohms, 1%1/4W	RAC32	MF1/4DL4991F	59124
R48	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R49	Resistor, MF, 10K Ohms, 0.1%,1/4W	RAC28	MF55E1002B	59124
R50	Resistor, MF, 562 Ohms, 1PC 1/4W	RAB22	MF1/4DL5620F	59124
R51	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R52	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R53	Resistor, MF, 562 Ohms, 1PC 1/4W	RAB22	MF1/4DL5620F	59124



NAPM11

Interphase PDM Driver PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R54	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R55	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R56	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R57	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R58	Resistor, MF, 15.0K Ohms, 1PC1/4W	RAB39	MF1/4DL1502F	59124
R59	Resistor, Variable, Film, 1000 Ohms, 1/2W	RV06	3339P-1-102	80294
R60	Resistor, MF, 1.21K Ohms, 1PC1/4W	RAB26	MF1/4DL1211F	59124
R61	Resistor, MF, 1.21K Ohms, 1PC1/4W	RAB26	MF1/4DL1211F	59124
R62	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R63	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R64	Not Used	-	NOT USED	37338
R64	Resistor, MF, 33.2K Ohms, 1PC1/4W	RAB43	MF1/4DL3322F	59124
R65	Resistor, MF, 56.2K Ohms, 1PC1/4W	RAB46	MF1/4DL5622F	59124
R66	Resistor, MF, 56.2K Ohms, 1PC1/4W	RAB46	MF1/4DL5622F	59124
R67	Resistor, MF, 1.00M Ohms, 1%1/4W	RAC13	MF1/4DL1004F	59124
R68	Resistor, MF, 1.00M Ohms, 1%1/4W	RAC13	MF1/4DL1004F	59124
R69	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R70	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R71	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R72	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R73	Resistor, MF, 3.32K Ohms, 1PC1/4W	RAB31	MF1/4DL3321F	59124
R74	Resistor, MF, 10.0 Ohms, 1PC 1/4W	RAB01	MF1/4DL10R0F	59124
R75	Resistor, MF, 10.0 Ohms, 1PC 1/4W	RAB01	MF1/4DL10R0F	59124
R76	Resistor, MF, 10.0 Ohms, 1PC 1/4W	RAB01	MF1/4DL10R0F	59124
R77	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R78	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R79	Not Used	-	NOT USED	37338
R80	Not Used	-	NOT USED	37338
U01	IC, CMOS, Dual, Type D, Flip-Flop	UX13	MC74HC74N(STATIC)	04713
U02	IC, Op Amp, Quad, Single Supply	UR42	MC34074AP(STATIC)	04713
U03	IC, Op Amp, Quad, Single Supply	UR42	MC34074AP(STATIC)	04713
U04	IC, Voltage Regulator, +5V, 1A, Plastic	UX17	MC7805ACT	04713
U05	IC, Comparator, Dual, High Speed	UD07	LM319J(STATIC)	27014
U06	IC, Analog Multiplier, 8 PDIP	UN44	AD633AN(STATIC)	45496
U07	IC, Analog Multiplier, 8 PDIP	UN44	AD633AN(STATIC)	45496
U08	IC, Op Amp, Quad, Single Supply	UR42	MC34074AP(STATIC)	04713
U09	IC, CMOS, Quad, 2-input NAND Gate	UM15	MC74HC00N(STATIC)	04713
U10	IC, Comparator, Dual, High Speed	UD07	LM319J(STATIC)	27014
U11	IC, Comparator, Dual, High Speed	UD07	LM319J(STATIC)	27014



NAPM11

Interphase PDM Driver PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
U12	IC, Comparator, Quad	UL02	MC3302L(STATIC)	04713
U13	IC, Op Amp, Quad, Single Supply	UR42	MC34074AP(STATIC)	04713
XE01	Conn, Header, SIP, 12 Pin Breakaway, .10 Ctr	JQ16	1-103185-2	09482
XK01	Socket, IC, 10 Pin	UW43	110-93-310-41-001	3N087



REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C01	Capacitor, Ceramic, 0.001uF 10% 200V	CCG01	CKR05BX102KRV SPRAGUE	91929
C02	Capacitor, Ceramic, 1.0uF 100V	CAP16	RPE114Z5U105M100V	91929
C03	Not Used	-	NOT USED	37338
C04	Capacitor, Polypro, 0.015uF 800Vac	CT39	715P1535800L	SBE
C05	Capacitor, Ceramic, 0.1uF 10% 100V	CCG07	CKR06BX104KRV	56289
C06	Capacitor, Ceramic, 0.1uF 10% 100V	CCG07	CKR06BX104KRV	56289
C07	Capacitor, Ceramic, 0.1uF 10% 100V	CCG07	CKR06BX104KRV	56289
C08	Capacitor, Ceramic, Coated, 2.2uF 20% 50V	CCG45	C340C225M5R5CA	91929
C09	Capacitor, Ceramic, Y, 0.01uF 250VAC	CCG44	DE1607F103M-KH	MURATA
C10	Capacitor, Ceramic, 1.0uF 100V	CAP16	RPE114Z5U105M100V	91929
C11	Capacitor, Ceramic, Y, 0.01uF 250VAC	CCG44	DE1607F103M-KH	MURATA
C12	Capacitor, Electrolytic, 470uF 450V	CBP15	381LR471M450A052 CORNELL	14655
C13	Capacitor, Electrolytic, 470uF 450V	CBP15	381LR471M450A052 CORNELL	14655
C14	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C15	Capacitor, Electrolytic, 470uF 450V	CBP15	381LR471M450A052 CORNELL	14655
C16	Capacitor, Ceramic, 0.001uF 10% 200V	CCG01	CKR05BX102KRV SPRAGUE	91929
C17	Capacitor, Metal, Polyprop, 5uF +/-20% 600V	CT40	734G505X0600	DEARBO
C18	Capacitor, Ceramic, 1.0uF 100V	CAP16	RPE114Z5U105M100V	91929
C19	Capacitor, Mica, Dipped, 470pF 2% 500V	CB33	CD15FD471G03	14655
C20	Capacitor, Dipped Mica, 220pF 5% 1000V	CT16	CDV18FF221J03	14655
C21	Capacitor, Dipped Mica, 220pF 5% 1000V	CT16	CDV18FF221J03	14655
C22	Capacitor, Ceramic, 0.001uF 10% 200V	CCG01	CKR05BX102KRV SPRAGUE	91929
C23	Capacitor, Dipped Mica, 220pF 5% 1000V	CT16	CDV18FF221J03	14655
C24	Capacitor, Ceramic, 0.1uF 10% 100V	CCG07	CKR06BX104KRV	56289
C25	Capacitor, Ceramic, 0.1uF 10% 100V	CCG07	CKR06BX104KRV	56289
C26	Capacitor, Mica, Dipped, 1000pF 2% 500V	CB37	CM06FD102G03	14655
C27	Capacitor, Metal, Polyprop, 5uF +/-20% 600V	CT40	734G505X0600	DEARBO
C28	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C29	Capacitor, Ceramic, 1.0uF 100V	CAP16	RPE114Z5U105M100V	91929
C30	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C31	Capacitor, Ceramic, 2700pF, 1%, 100V	CAP47	C052C272F1G5CA	91929
C32	Capacitor, Ceramic, 0.47uF 10% 50V	CCG09	CKR06BX474KRV	56289
C33	Capacitor, Ceramic, 0.1uF 10% 100V	CCG07	CKR06BX104KRV	56289
C34	Capacitor, Ceramic, 0.001uF 10% 200V	CCG01	CKR05BX102KRV SPRAGUE	91929

NAPS31B/00 SPS, Fwd Converter PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C35	Capacitor, Mica, Dipped, 100pF 2% 500V	CB25	CM05FD101G03	SOSH
C36	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C37	Capacitor, Ceramic, 0.001uF 10% 200V	CCG01	CKR05BX102KRV SPRAGUE	91929
C38	Capacitor, Ceramic, 0.001uF 10% 200V	CCG01	CKR05BX102KRV SPRAGUE	91929
C39	Not Used	-	NOT USED	37338
C40	Not Used	-	NOT USED	37338
C41	Capacitor, Ceramic, 0.47uF 10% 50V	CCG09	CKR06BX474KRV	56289
C42	Not Used	-	NOT USED	37338
C43	Capacitor, Metal, Polyprop, 3.3uF, 10%, 250V	CD47	725M33592LA3	SBE
C44	Capacitor, Metal, Polyprop, 3.3uF, 10%, 250V	CD47	725M33592LA3	SBE
C45	Capacitor, Metal, Polyprop, 3.3uF, 10%, 250V	CD47	725M33592LA3	SBE
CR01	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR02	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR03	Diode, General Purpose, 200V, 0.1A	QAP29	1N4938	07263
CR04	Diode, Zener Transient Suppressor, 20V	QI29	P6KE20CA	07263
CR05	Diode, General Purpose, 200V, 0.1A	QAP29	1N4938	07263
CR06	Diode, Rect, 1200V, 8 Amp Ultrafast, Soft Recovery	QM52	HFA08TB120(STATIC)	IR
CR07	Diode, Rect, 1200V, 8 Amp Ultrafast, Soft Recovery	QM52	HFA08TB120(STATIC)	IR
CR08	Not Used	-	NOT USED	37338
CR09	Diode, Rect, 1200V, 8 Amp Ultrafast, Soft Recovery	QM52	HFA08TB120(STATIC)	IR
CR10	Diode, Rect, 1200V, 8 Amp Ultrafast, Soft Recovery	QM52	HFA08TB120(STATIC)	IR
CR11	Diode, Rect, 1200V, 8 Amp Ultrafast, Soft Recovery	QM52	HFA08TB120(STATIC)	IR
CR12	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR13	Diode, Rect, 1200V, 8 Amp Ultrafast, Soft Recovery	QM52	HFA08TB120(STATIC)	IR
CR14	Diode, Rect, 1200V, 8 Amp Ultrafast, Soft Recovery	QM52	HFA08TB120(STATIC)	IR
CR15	Diode, Rect, 1200V, 8 Amp Ultrafast, Soft Recovery	QM52	HFA08TB120(STATIC)	IR
CR16	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR17	Diode, Zener, 5.1V, 1W, 5%	QM07	1N4733A	04713
CR18	Diode, Zener, 16V, 1.5W, 2%	QL23	1N5930C	91929
CR19	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR20	Diode, Rect, 1200V, 8 Amp Ultrafast, Soft Recovery	QM52	HFA08TB120(STATIC)	IR

NAPS31B/00 SPS, Fwd Converter PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
CR21	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
DS01	Diode, LED, Amber	QK14	HLMP-3451	50434
DS02	Diode, LED, Green	QK12	HLMP-3554	50434
E01	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E02	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E03	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E04	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
E05	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J01	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J02	Conn, Pin Header,3-Pin,Mate-N-Lok, Vert	JT65	641966-1	09482
J03	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
L01	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L02	Not Used	-	NOT USED	37338
L03	Choke, Common Mode High L, .58mH, 13Amps	TG48	P3224-A	COILCRA
L04	Inductor Assy	197-1105	197-1105	37338
L05	Inductor Assy	197-1105	197-1105	37338
L06	Inductor Assy	197-1105	197-1105	37338
Q01	Transistor, FET, 600V, 44A,TO264	QR54	IXFK44N60	IXYS
Q02	Transistor, FET, 600V, 44A,TO264	QR54	IXFK44N60	IXYS
Q03	Not Used	-	NOT USED	37338
Q04	Transistor, FET, N Channel	QN54	2N7000(STATIC)	04713
Q05	Transistor, FET, N Channel	QN54	2N7000(STATIC)	04713
Q06	Not Used	-	NOT USED	37338
Q07	Transistor, FET, N Channel, 100V, 8A	QR13	IRF520(STATIC)	81483
Q08	Transistor, FET, N Channel	QN54	2N7000(STATIC)	04713
R01	Resistor, Film, 100K Ohms, 5%, 2W	RBP25	GS-3, 100K OHMS	75042
R02	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R03	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R04	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R05	Resistor, MF, 3.32M Ohms, 1%1/4W	RAC19	MF1/4DL3324F	59124
R07	Resistor, Film, 100K Ohms, 5%, 2W	RBP25	GS-3, 100K OHMS	75042
R08	Not Used	-	NOT USED	37338
R09	Resistor, Film, 1M Ohms, 2PC 1/2W	RD31	RL20S105G	14655
R10	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338

NAPS31B/00 SPS, Fwd Converter PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R11	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
R12	Resistor, MF, 332 Ohms, 1PC 1/4W	RAB19	MF1/4DL3320F	59124
R13	Resistor, Film, 390 Ohms, 5%,2W	RBP33	GS-3, 390 OHMS	75042
R14	Resistor, Film, 390 Ohms, 5%,2W	RBP33	GS-3, 390 OHMS	75042
R15	Resistor, Film, 390 Ohms, 5%,2W	RBP33	GS-3, 390 OHMS	75042
R16	Resistor, Film, 390 Ohms, 5%,2W	RBP33	GS-3, 390 OHMS	75042
R17	Resistor, Film, 390 Ohms, 5%,2W	RBP33	GS-3, 390 OHMS	75042
R18	Resistor, Film, 390 Ohms, 5%,2W	RBP33	GS-3, 390 OHMS	75042
R19	Resistor, Film, 390 Ohms, 5%,2W	RBP33	GS-3, 390 OHMS	75042
R20	Resistor, Film, 390 Ohms, 5%,2W	RBP33	GS-3, 390 OHMS	75042
R21	Resistor, Film, 390 Ohms, 5%,2W	RBP33	GS-3, 390 OHMS	75042
R22	Resistor, MF, 68.1 Ohms, 1PC 1/4W	RAB11	MF1/4DL68R1F	59124
R23	Resistor, MF, 392 Ohms, 1PC 1/4W	RAB20	MF1/4DL3920F	59124
R24	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
R25	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
R26	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
R27	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
R28	Resistor, MF, 2.21K Ohms, 1PC1/4W	RAB29	MF1/4DL2211F	59124
R29	Resistor, MF, 681 Ohms, 1PC 1/4W	RAB23	MF1/4DL6810F	59124
R30	Resistor, MF, 6.81K Ohms, 1PC1/4W	RAB35	MF1/4DL6811F	59124
R31	Not Used	-	NOT USED	37338
R32	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R33	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R34	Not Used	-	NOT USED	37338
R35	Resistor, MF, 332 Ohms, 1PC 1/4W	RAB19	MF1/4DL3320F	59124
R36	Not Used	-	NOT USED	37338
R37	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R38	Not Used	-	NOT USED	37338
R39	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R40	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R41	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R42	Not Used	-	NOT USED	37338
R43	Resistor, Wirewound, 33K ohms, 1PC5W	RN13	RS5-33K OHMS-1%	35005
R44	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R45	Not Used	-	NOT USED	37338
R46	Resistor, MF, 182 Ohms, 1PC 1/4W	RAB16	MF1/4DL1820F	59124
R47	Resistor, MF, 825 Ohms, 1PC 1/4W	RAB24	MF1/4DL8250F	59124



NAPS31B/00 SPS, Fwd Converter PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R48	Not Used	-	NOT USED	37338
R49	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R50	Resistor, Wirewound, 0.2 ohms, 1%, 3W	RT12	RS-2B	35005
R51	Resistor, MF, 10.0 Ohms, 1PC 1/4W	RAB01	MF1/4DL10R0F	59124
R52	Resistor, MF, 39.2 Ohms, 1PC 1/4W	RAB08	MF1/4DL39R2F	59124
R53	Resistor, MF, 1.50K Ohms, 1PC1/4W	RAB27	MF1/4DL1501F	59124
R54	Resistor, MF, 100 Ohms, 1PC 1/4W	RAB13	MF1/4DL1000F	59124
R55	Resistor, MF, 121 Ohms, 1%, 1/4W	RAB14	MF1/4DL1210F	59124
R56	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R57	Resistor, Film, 3.32 Ohms, 1PC 1/2W	RZ04	MF1/2DL3R32F	59124
R58	Resistor, Film, 15 Ohms, 2PC 1/2W	RC15	RL20S150G	35005
R59	Not Used	-	NOT USED	37338
R60	Not Used	-	NOT USED	37338
R61	Resistor, MF, 5.62K Ohms, 1PC1/4W	RAB34	MF1/4DL5621F	59124
R62	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R63	Resistor, MF, 39.2 Ohms, 1PC 1/4W	RAB08	MF1/4DL39R2F	59124
R64	Resistor, MF, 681 Ohms, 1PC 1/4W	RAB23	MF1/4DL6810F	59124
R65	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
R66	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R67	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R68	Resistor, MF, 10.0 Ohms, 1PC 1/4W	RAB01	MF1/4DL10R0F	59124
R69	Resistor, MF, 1K Ohms, 1PC 1/4W	RAB25	MF1/4DL1001F	59124
RT01	Thermistor, PTC, .50-.77 Ohms, 0.5A Hold	RT16	RXE050	06090
RV01	Varistor, 300VAC, 173J, Clamp775V	QI46	SIOV-S14K300	EPCOS
RV02	Varistor, 300VAC, 173J, Clamp775V	QI46	SIOV-S14K300	EPCOS
RV03	Varistor, 300VAC, 173J, Clamp775V	QI46	SIOV-S14K300	EPCOS
T01	Transformer, Double Ended, Forward Converter	TA44D	CSM 5521-074 CRAMER	16704
T02	Transformer, Gate Drive, HighFreq	TZ74	P0584	01961
T03	Transformer, Current Sense, High Freq	TZ51	CST306-3A	MAGNE
U01	Diode, Power Rectifier, 1600VDual 2x28A	UR68	DSP25-16A(STATIC)	0A5K5
U02	Diode, Power Rectifier, 1600VDual 2x28A	UR68	DSP25-16A(STATIC)	0A5K5
U03	IC, FET Driver, High Current, 8-Pin	UT45	UC3710N(STATIC)	12969
U04	Optocoupler/Optoisolator, 6-Pin DIP	UM53	MOC8104(STATIC)	QT
U05	IC, Op Amp, Quad, Single Supply	UR42	MC34074AP(STATIC)	04713
U06	Optocoupler/Optoisolator, 6-Pin DIP	UM53	MOC8104(STATIC)	QT
U07	Optocoupler/Optoisolator, 6-Pin DIP	UM53	MOC8104(STATIC)	QT
U08	IC, Current Mode PWMController	UR72	UC1844AJ (STATIC)	ER737
U09	Optocoupler/Optoisolator, 6-Pin DIP	UM53	MOC8104(STATIC)	QT
U10	Voltage Regulator, Adj Voltage, 3A	UT36	LM350T	27014



NAPS31B/00 SPS, Fwd Converter PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
U11	IC,Low Voltage Temp Sensor,+/-3 Deg,TO-92	UC58	TMP36GT9(STATIC)	45496

NAPS31B/02 SPS, Forward Converter PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
E01	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E02	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
J01	Conn, Header, Ribbon Cbl, 20 pin	JP46	499910-4	00779
J03	Conn, Pin Header,3-Pin,Mate-N-Lok, Vert	JT65	641966-1	09482
R10	Resistor, MF, 68.1K Ohms, 1PC1/4W	RAB47	MF1/4DL6812F	59124
R11	Resistor, MF, 39.2K Ohms, 1PC1/4W	RAB44	MF1/4DL3922F	59124
R24	Resistor, MF, 39.2K Ohms, 1PC1/4W	RAB44	MF1/4DL3922F	59124
R25	Resistor, MF, 4.75K Ohms, 1PC1/4W	RAB33	MF1/4DL4751F	59124
R26	Resistor, MF, 15.0K Ohms, 1PC1/4W	RAB39	MF1/4DL1502F	59124
R27	Resistor, MF, 18.2K Ohms, 1PC1/4W	RAB40	MF1/4DL1822F	59124

NAPS31B/03 SPS, Fwd Conv PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
E01	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E02	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
J01	Conn, Header, Ribbon Cbl, 20 pin	JP46	499910-4	00779
J03	Conn, Pin Header,3-Pin,Mate-N-Lok, Vert	JT65	641966-1	09482
R10	Resistor, MF, 392K Ohms, 1%1/4W	RAC08	MF1/4DL3923F	59124
R11	Resistor, MF, 39.2K Ohms, 1PC1/4W	RAB44	MF1/4DL3922F	59124
R24	Resistor, MF, 56.2K Ohms, 1PC1/4W	RAB46	MF1/4DL5622F	59124
R25	Resistor, MF, 4.75K Ohms, 1PC1/4W	RAB33	MF1/4DL4751F	59124
R26	Resistor, MF, 6.81K Ohms, 1PC1/4W	RAB35	MF1/4DL6811F	59124
R27	Resistor, MF, 39.2K Ohms, 1PC1/4W	RAB44	MF1/4DL3922F	59124

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C01	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C02	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C03	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C04	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C05	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C06	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C07	Capacitor, Ceramic, 0.01uF 10% 100V	CCG04	CKR05BX103KRV	56289
C08	Capacitor, Metal,Polyprop, 3.3uF, 10%, 250V	CD47	725M33592LA3	SBE
C09	Capacitor, Tantalum, 22uF 10%35V	CCF05	T356K226K035AT(Ro HS) KEMET	56289
C10	Capacitor, Ceramic, 0.0047uF10% 100V	CCG03	CKR05BX472KRV	56289
C11	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C12	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C13	Capacitor, Tantalum, Dipped, 10uF, 35V	CCP36	T351G106K035AT(Ro HS) KEMET	96095
C14	Capacitor, Ceramic, 0.001uF 10% 200V	CCG01	CKR05BX102KRV SPRAGUE	91929
C15	Capacitor, Mica, Dipped, 560pF 2% 500V	CB34	CM06FD561G03	14655
C16	Capacitor, Electrolytic, 470uF450V	CBP15	381LR471M450A052 CORNELL	14655
C17	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C19	Capacitor, Elect, 47uF 100V	CD13	TVX2A47OMAA	55680
C20	Capacitor, Ceramic, Y, 0.01uF250VAC	CCG44	DE1607F103M-KH	MURATA
CR01	Diode, Zener, 16V, 1W, 5%	QE32	1N4745A	04713
CR02	Diode, Zener, 18V, 1.5W, 10%	QK37	1N5931A	04713
CR03	Diode, Zener, 20V, 1W, 5%	QK46	1N4747A(STATIC)	04713
CR04	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR05	Diode, Schottky, 1A 40V	QS13	1N5819(STATIC) MOTO	04713
CR06	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
DS01	Diode, LED, Green	QK12	HLMP-3554	50434
E01	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E02	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E03	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E04	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E05	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E06	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E07	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
E08	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E09	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482

NAPS35

SMPS, 24/48V Battery Boost PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
E10	Conn, Post Shunt, 2 Pos, .10 Centreline	JQ15	390088-2	09482
J01	Conn,Socket,D-Sub,25 pin,VertPWB	JS53	628-025-220-017	31781
L01	LVPS Distribution Board ChokeAssy	205-8037	205-8037	37338
L02	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L03	Inductor, Choke, 2.5 Turns, JMtl	LA16	82-152-J	33062
L04	Inductor Assy	205-7026	205-7026	37338
Q01	Transistor, FET, N Channel	QN54	2N7000(STATIC)	04713
Q02	Transistor, NPN, Switch/Amplifier	QA45	2N4401	04713
Q03	Transistor, FET, N Channel	QN54	2N7000(STATIC)	04713
Q04	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
Q05	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
Q06	Transistor, NPN, General Purpose	QAP04	2N2219A	04713
Q07	Transistor, PNP, Switch/Amplifier	QA23	2N2905A	04713
R01	Resistor, MF, 4.75K Ohms, 1PC1/4W	RAB33	MF1/4DL4751F	59124
R02	Resistor, Film, 68K Ohms, 5%,2W	RBP24	GS-3, 68K OHMS	75042
R03	Resistor, MF, 5.62K Ohms, 1PC1/4W	RAB34	MF1/4DL5621F	59124
R04	Resistor, MF, 182 Ohms, 1PC 1/4W	RAB16	MF1/4DL1820F	59124
R05	Resistor, MF, 475K Ohms, 1%1/4W	RAC09	MF1/4DL4753F	59124
R06	Resistor, MF, 475K Ohms, 1%1/4W	RAC09	MF1/4DL4753F	59124
R07	Resistor, MF, 10.0 Ohms, 1PC 1/4W	RAB01	MF1/4DL10R0F	59124
R08	Resistor, MF, 1.00M Ohms, 1%1/4W	RAC13	MF1/4DL1004F	59124
R09	Resistor, MF, 15.0K Ohms, 1PC1/4W	RAB39	MF1/4DL1502F	59124
R10	Resistor, MF, 1.21K Ohms, 1PC1/4W	RAB26	MF1/4DL1211F	59124
R11	Resistor, MF, 4.75K Ohms, 1PC1/4W	RAB33	MF1/4DL4751F	59124
R12	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R13	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R14	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R15	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R16	Resistor, MF, 3.92K Ohms, 1PC1/4W	RAB32	MF1/4DL3921F	59124
R17	Resistor, MF, 182 Ohms, 1PC 1/4W	RAB16	MF1/4DL1820F	59124
R18	Resistor, MF, 3.32K Ohms, 1PC1/4W	RAB31	MF1/4DL3321F	59124
R19	Resistor, MF, 3.32K Ohms, 1PC1/4W	RAB31	MF1/4DL3321F	59124
R20	Resistor, MF, 39.2K Ohms, 1PC1/4W	RAB44	MF1/4DL3922F	59124
R21	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R22	Resistor, MF, 12.1K Ohms, 1PC1/4W	RAB38	MF1/4DL1212F	59124
R23	Resistor, Film, 10 Ohms, 5%, 2W	RBP01	GS-3, 10 OHMS	75042
R24	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R25	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124

NAPS35

SMPS, 24/48V Battery Boost PWB Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R26	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R27	Resistor, MF, 56.2 Ohms, 1PC 1/4W	RAB10	MF1/4DL56R2F	59124
R28	Resistor, MF, 332 Ohms, 1PC 1/4W	RAB19	MF1/4DL3320F	59124
R29	Resistor, MF, 27.4K Ohms, 1PC1/4W	RAB42	MF1/4DL2742F	59124
R30	Resistor, MF, 10.0 Ohms, 1PC 1/4W	RAB01	MF1/4DL10R0F	59124
R31	Resistor, MF, 10.0 Ohms, 1PC 1/4W	RAB01	MF1/4DL10R0F	59124
R32	Resistor, MF, 10.0 Ohms, 1PC 1/4W	RAB01	MF1/4DL10R0F	59124
R33	Resistor, MF, 10.0 Ohms, 1PC 1/4W	RAB01	MF1/4DL10R0F	59124
R34	Resistor, MF, 6.81K Ohms, 1PC1/4W	RAB35	MF1/4DL6811F	59124
R35	Resistor, MF, 274 Ohms, 1PC 1/4W	RAB18	MF1/4DL2740F	59124
R36	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R37	Resistor, MF, 825 Ohms, 1PC 1/4W	RAB24	MF1/4DL8250F	59124
R38	Resistor, MF, 4.75K Ohms, 1PC1/4W	RAB33	MF1/4DL4751F	59124
R39	Resistor, MF, 2.74K Ohms, 1PC1/4W	RAB30	MF1/4DL2741F	59124
R40	Resistor, MF, 10.0K Ohms, 1PC1/4W	RAB37	MF1/4DL1002F	59124
R41	Resistor, Film, 100 Ohms, 5%2W	RBP07	GS-3, 100 OHMS	75042
U01	Current sensor,Hall,50A,5VDCUniDirect	UP102	ACS755LCB-050- PFF(STATIC)(ROHS) AMI	OCVK3
U02	Current sensor,Hall,50A,5VDCUniDirect	UP102	ACS755LCB-050- PFF(STATIC)(ROHS) AMI	OCVK3
U03	Optocoupler/Optoisolator, 6-Pin DIP	UM53	MOC8104(STATIC)	QT
U04	IC, Switchmode PWM Control Circuits	UM39	MC33060AP(STATIC) MOTO	04713
XE05	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE07	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE09	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482
XE10	Conn, Header, SIP,12 Pin Breakaway,.10 Ctr	JQ16	1-103185-2	09482

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
A01	Control Display PWB Assy	NAPC147D	195-2050-04	37338
A02	Exciter Interface PWB AssyVector-LP	NAPI76A/02	195-3020-03	37338
A03	Remote Interface PWB	NAPI78D/02	195-2060-10	37338
A04	See Sales Order	%	% SEE SALES ORDER	37338
A05	See Master Work Order	*	* SEE MASTER WORK ORDER	37338
A06	Interphase PDM Driver PWB Assy	NAPM11	197-3060	37338
A07	Exciter Monitor/GeneratorPWB Assy	NAPE76A/03	195-3030-06	37338
A08	See Master Work Order	*	* SEE MASTER WORK ORDER	37338
A09	See Master Work Order	*	* SEE MASTER WORK ORDER	37338
A10	See Master Work Order	*	* SEE MASTER WORK ORDER	37338
A11	Interface PWB Assy	NAPI94A	205-4044-01	37338
A12	See Master Work Order	*	* SEE MASTER WORK ORDER	37338
A13	See Master Work Order	*	* SEE MASTER WORK ORDER	37338
A14	See Master Work Order	*	* SEE MASTER WORK ORDER	37338
A15	RF Power Probe (VECTOR) PWBAssy	NAPF07C/01	195-6020-08	37338
A16	See Sales Order	%	% SEE SALES ORDER	37338
B01	See Master Work Order	*	* SEE MASTER WORK ORDER	37338
B02	See Master Work Order	*	* SEE MASTER WORK ORDER	37338
B03	See Master Work Order	*	* SEE MASTER WORK ORDER	37338
B04	See Master Work Order	*	* SEE MASTER WORK ORDER	37338
F01	See Sales Order	%	% SEE SALES ORDER	37338
J01	Conn, Coax, N, Recept, Panel,50ohm	JDP21	UG58A/U	02660
K01	Relay,24Vdc,DPDT,25A	KA55	W389CX-8(RoHS) MAGN	ECR
L01	Choke, 2.5mH, 10A	TC46	CHC159ZL-N	ATC-FROS
LS01	Speaker, 45 Ohm, 2W	LP07	30A05Z45	74199
M01	Meter,0-400W/100W,0-12/4A,mod%,142ohm,1mA FSD	MD53	195-9020-01	37338
RT01	Thermistor, Mega Surge, 10 Ohm, 15 A	RX54	MS32 10015	021P3
S01	Switch, Miniature, SPDT, Actuated	SD47	V-15G4-1C25-K	34361
S02	Switch, Miniature, SPDT, Actuated	SD47	V-15G4-1C25-K	34361
TB01	Terminal Block, 4-pos, Double, 30A	JB33	382100104	13150
TB02	Terminal Block, 4-pos, Double, 30A	JB33	382100104	13150
U01	Display Mod	195-3019	195-3019	37338

NARB18

Final Assy, Vector-LP

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
U02	Pwr Sply,85-264Vac,80W,5.6,15.6,24.5,-15.5V	UG50	REL-110-4007-5.6-WT(STATIC)(ROHS) INTEGRATED	IPD
U03	See Master Work Order	*	* SEE MASTER WORK ORDER	37338
U05	AC Power Entrance,c/w 5A Circuit Brkr	UC56	6145.3431.001	61935
U06	Filter, AC Line, 20A, 250Vac,50/60Hz	UC54	20VP6	05245
U07	See Sales Order	%	% SEE SALES ORDER	37338
U08	See Sales Order	%	% SEE SALES ORDER	37338
U09	Rect/Assy, Bridge, 800V, 35A	UF28	GBPC3508	LITEON
U10	See Sales Order	%	% SEE SALES ORDER	37338
U11	See Sales Order	%	% SEE SALES ORDER	37338
U12	See Sales Order	%	% SEE SALES ORDER	37338
U13	See Sales Order	%	% SEE SALES ORDER	37338
U14	See Sales Order	%	% SEE SALES ORDER	37338
XF01	See Sales Order	%	% SEE SALES ORDER	37338



NASM11A/00 Modulator Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C01	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C02	Capacitor, Tantalum, 6.8uF 10PC 35V	CCP19	CSR13F685KM	56289
C03	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C04	Capacitor, Electrolytic, 470uF450V	CBP15	381LR471M450A052 CORNELL	14655
C05	Capacitor, Electrolytic, 470uF450V	CBP15	381LR471M450A052 CORNELL	14655
C06	Capacitor, Electrolytic, 470uF450V	CBP15	381LR471M450A052 CORNELL	14655
C07	Capacitor, Tantalum, 6.8uF 10PC 35V	CCP19	CSR13F685KM	56289
C08	Capacitor, Polyprop, 0.12uF,5%, 600V	CT44	715P12456MA3	SBE
C09	Capacitor, Ceramic, 0.1uF 10%100V	CCG07	CKR06BX104KRV	56289
C10	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR01	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR02	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR03	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR04	Diode, General Purpose, 200V,0.1A	QAP29	1N4938	07263
CR05	Diode, Zener, 13V, 1W, 10%	QK19	1N4743	04713
CR06	Diode, Power Rectifier, 4A, Ultra Fast	QM22	MUR460	04713
CR07	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR08	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR09	Diode, Zener Transient Supressor, 20V	QI29	P6KE20CA	07263
CR10	Diode, Zener Transient Supressor, 20V	QI29	P6KE20CA	07263
CR11	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR12	Diode, General Purpose, 400V,1A	QE28	1N4004	04713
CR13	Diode, Zener Transient Supressor, 20V	QI29	P6KE20CA	07263
DS01	Diode, LED, Yellow, 8.6mm Lg	QM19	SSL-LX5093YD	1EM90
E01	Connector, Quick-Dis, M,1/4 Tab, PWB	HR26	1287	91833
E02	Connector, Quick-Dis, M,3/16 Tab PWB	HAM52	1212	91833
J01	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
J02	Conn, Header, Ribbon Cbl, 10 pin	JA49	499910-1	00779
L01	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
Q01	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
Q02	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
R01	Resistor, MF, 33.2 Ohms, 1PC 1/4W	RAB07	MF1/4DL33R2F	59124
R02	Resistor, Film, 68K Ohms, 5%,2W	RBP24	GS-3, 68K OHMS	75042
R03	Resistor, Film, 68K Ohms, 5%,2W	RBP24	GS-3, 68K OHMS	75042



NASM11A/00 Modulator Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
R04	Resistor, MF, 10.0 Ohms, 1PC 1/4W	RAB01	MF1/4DL10R0F	59124
R05	Resistor, MF, 1.82K Ohms, 1PC1/4W	RAB28	MF1/4DL1821F	59124
R06	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
R07	Resistor, Film, 2.21 Ohms, 1%, 1/2W	RC05	MF1/2DL2R21F	59124
R08	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
R09	Resistor, Film, 33K Ohms, 5%,2W	RBP22	GS-3, 33K OHMS	75042
R10	Resistor, MF, 15.0K Ohms, 1PC1/4W	RAB39	MF1/4DL1502F	59124
R11	Resistor, MF, 15.0K Ohms, 1PC1/4W	RAB39	MF1/4DL1502F	59124
R12	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
T01	Transformer Assy	197-1019	197-1019	37338
U01	IC, MOS Gate Driver, High Voltage	UN18	IR2110(STATIC)	81483
XU01	Socket, IC, 14-pin	UC02	2-641261-1	00779

NASM11A/01 Modulator (Vector) Assy

REFDES	DESCRIPTION	NAUTEL #	VENDOR #	OEM CODE
C10	Not Used	-	NOT USED	37338
CR07	Not Used	-	NOT USED	37338
CR08	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
CR11	Not Used	-	NOT USED	37338
J01	Conn, Pin Header,3-Pin,Mate-N-Lok, Vert	JT65	641966-1	09482
L01	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
Q01	Installed at Next Higher Assy	+	INSTALLED AT NEXT HIGHER ASSY	37338
Q02	Not Used	-	NOT USED	37338
R06	Not Used	-	NOT USED	37338
R08	Not Used	-	NOT USED	37338
R12	Not Used	-	NOT USED	37338

Vector-LP Radio Beacon Transmitter

TECHNICAL INSTRUCTION MANUAL

Section 8 **WIRING INFORMATION**

8.1 INTRODUCTION

This section contains wiring information for hard-wired assemblies of the subject unit. Refer to Table 8-1 for an itemized listing of assemblies that have wiring lists.

8.2 WIRING LISTS NOT PROVIDED

Separate wiring lists are not provided for some assemblies, including:

- Assemblies that have separate maintenance manuals. Refer to the associated maintenance manual for detailed wiring information of these assemblies.
- Assemblies that have their wiring information adequately depicted/ tabulated on their assembly detail drawings. Refer to the associated assembly detail drawing for detailed wiring information of these assemblies.

8.3 PRINTED WIRING PATTERNS

Printed wiring pattern information is beyond the scope of this manual. Therefore, detailed printed wiring patterns for printed circuit boards are not included.

8.4 WIRE COLOURS

Every effort is made to manufacture the assemblies using wire that is the colour tabulated in the 'Code' column of the wiring list tables. In some instances, a white wire will be substituted. In this case identification must be determined by locating the assigned identification number.

8.5 WIRING LIST PROVIDED

Wiring lists are provided in table format. A list of the table numbers and the associated wiring list are shown in Table 8-1. These lists provide non-printed wiring pattern, point-to-point (source/destination) inter-connecting information.

8.5.1 Connector Mating Information

Where applicable, connector mating information is provided at the bottom of an associated wiring list. These tables identify the mating connectors for the referenced assembly.

Table 8-1: Wiring Lists Provided

Table #	Description
8-2	Wiring List – NARB18 Transmitter
8-3	Wiring List – NAP35B/01 RF Power Module
8-4	Wiring List – Optional Battery Boost Assembly (205-8035)
8-5	Wiring List – Optional Modem Kit (195-3032) Interface
8-6	Wiring List – Optional Deluxe Cabinet (205-8075)
8-7a	Wiring List – Optional Short Cabinet, with battery (205-8120)
8-7b	Wiring List – Optional Short Cabinet, without battery (205-8120-01)
8-8	Wiring List – Optional Tall Cabinet (205-8200)



Table 8-2: Wiring List – NARB18 Transmitter

Source	Destination	Wire #	Color	Size	Remarks
TB2-03	TB2-04	-	-		RT1
TB2-01	TB2-02	-	-		L1
U5-04	U6-1 (line)	-	Grey	18	Jumper
U5-03	U6-1 (line)	-	Grey	18	Jumper
U5-G	SFTY GND	-	Grn/Yel	14	Jumper
TB2-01	P5-03	1	Grey	22	
TB2-01	P6-03	2	Grey	22	
TB2-01	A11E2	3	Grey	22	
-	-	4	Not Used		
TB2-03	P5-01	5	Grey	22	
TB2-03	P6-01	6	Grey	22	
TB2-03	A11E1	7	Grey	22	
-	-	8	Not Used		
TB2-2	XA12P1-01	9	Grey	14	
TB2-2	XA13P1-01	10	Grey	14	
TB2-04	XA12P1-02	11	Grey	14	
TB2-04	XA13P1-02	12	Grey	14	
XA12P1-12	K1-01	13	Yellow	14	Teflon
XA13P1-12	K1-04	14	Yellow	14	Teflon
XA12P1-11	GND	15	Yellow	14	Teflon
XA13P1-11	GND	16	Yellow	14	Teflon
K1-07	A14E13	-	Yellow	14	Teflon
P15	A15TB1-01	-	Core	RG58A/U	Jumper
P15	A15TB1-02	-	Shield		
-	-	18	Not Used		
P1-01	P3-06	19	White	22	
P1-02	P3-05	20	Black	22	
P1-03	P3-01	21	White	22	
P1-04	P3-02	22	Black	22	
P1-05	P3-04	23	White	22	
P1-06	P3-03	24	Black	22	
P1-07	P3-10	25	White	22	
P1-08	P3-07	26	Black	22	
P2-01	P4-06	27	White	22	
P2-02	P4-05	28	Black	22	
P2-03	P4-01	29	White	22	
P2-04	P4-02	30	Black	22	
P2-05	P4-04	31	White	22	
P2-06	P4-03	32	Black	22	
P2-07	P4-10	33	White	22	
P2-08	P4-07	34	Black	22	
P7-02	P8-02	35	White	22	1 conductor shielded
P7-01	P8-01	35	Shield		
P7-03	P8-03	36	White	22	
P7-04	P8-04	37	White	22	



Table 8-2: Wiring List – NARB18 Transmitter (Continued)

Source	Destination	Wire #	Color	Size	Remarks
P7-05	P8-05	38	White	22	
P7-08	P8-08	39	White	22	2 conductor shielded
P7-07	P8-07	39	Black	22	
P7-06	P8-06	39	Shield		
P7-10	P8-10	40	White	22	1 conductor shielded
P7-09	P8-09	40	Shield		
P7-11	P8-11	41	White	22	
P7-13	P8-13	42	White	22	1 conductor shielded
P7-12	P8-12	42	Shield		
P7-15	P8-15	43	White	22	1 conductor shielded
P7-14	P8-14	43	Shield		
P7-18	P8-18	44	White	22	1 conductor shielded
P7-17	P8-17	44	Shield		
P7-21	P8-21	45	White	22	1 conductor shielded
P7-20	P8-20	45	Shield		
P7-23	P8-23	46	White	22	1 conductor shielded
P7-22	P8-22	46	Shield		
P7-24	P8-24	47	White	22	
P7-25	P8-25	48	White	22	
P9-02	P10-02	49	White	22	1 conductor shielded
P9-01	P10-01	49	Shield		
P9-03	P10-03	50	White	22	
P9-04	P10-04	51	White	22	
P9-05	P10-05	52	White	22	
P9-08	P10-08	53	White	22	2 conductor shielded
P9-07	P10-07	53	Black	22	
P9-06	P10-06	53	Shield	22	
P9-10	P10-10	54	White	22	1 conductor shielded
P9-09	P10-09	54	Shield		
P9-11	P10-11	55	White	22	
P9-13	P10-13	56	White	22	1 conductor shielded
P9-12	P10-12	56	Shield		
P9-15	P10-15	57	White	22	1 conductor shielded
P9-14	P10-14	57	Shield		
P9-18	P10-18	58	White	22	1 conductor shielded
P9-17	P10-17	58	Shield		
P9-21	P10-21	59	White	22	1 conductor shielded
P9-20	P10-20	59	Shield		
P9-23	P10-23	60	White	22	1 conductor shielded
P9-22	P10-22	60	Shield		
P9-24	P10-24	61	White	22	
P9-25	P10-25	62	White	22	
P11-01	P12-01	63	White	22	
P11-02	P12-02	64	Black	22	
P11-10	P12-10	65	White	22	1 conductor shielded
P11-11	P12-11	65	Shield		



Table 8-2: Wiring List – NARB18 Transmitter (Continued)

Source	Destination	Wire #	Color	Size	Remarks
P11-12	P12-12	66	White	22	1 conductor shielded
P11-13	P12-13	66	Shield		
P11-14	P12-14	67	White	22	1 conductor shielded
P11-15	P12-15	67	Shield		
P11-20	P12-20	68	White	22	1 conductor shielded
P11-21	P12-21	68	Shield		
P11-22	P12-22	69	White	22	2 conductor shielded
P11-23	P12-23	69	Black	22	
P11-24	P12-24	69	Shield		
P11-25	P12-25	70	Black	22	
P13-10	P14-04	71	White	22	1 conductor shielded
P13-11	P14-03	71	Shield		
P13-12	P14-02	72	White	22	1 conductor shielded
P13-13	P14-01	72	Shield		
P13-14	P14-25	73	White	22	1 conductor shielded
P13-15	P14-24	73	Shield		
P13-20	P14-19	74	White	22	1 conductor shielded
P13-21	P14-18	74	Shield		
P13-22	P14-17	75	White	22	
P13-23	P14-16	76	White	22	
P13-24	P14-15	77	White	22	
P13-25	P14-14	78	Black	22	
P16-13	P18-01	79	White	22	
P16-12	P18-02	80	Black	22	
P16-11	P18-03	81	White	22	
P16-10	P18-04	82	Black	22	
P16-09	P18-05	83	White	22	
P16-08	P18-06	84	Black	22	
P16-07	P18-20	85	White	22	
P16-06	P18-09	86	White	22	1 conductor shielded
P16-05	P18-10	86	Shield		
P16-04	P18-11	87	White	22	1 conductor shielded
P16-03	P18-12	87	Shield		
P16-02	P18-13	88	White	22	1 conductor shielded
P16-01	P18-14	88	Shield		
P16-24	K1-A	89	White	22	
P16-23	K1-B	90	Black	22	
P16-19	P18-15	91	White	22	1 conductor shielded
P16-18	P18-16	91	Shield		
P16-17	P18-17	92	White	22	2 conductor shielded
P16-16	P18-18	92	Black	22	
P16-15	P18-19	92	Shield		
P17-01	P19-01	93	White	22	
P17-02	P19-02	94	Black	22	
P17-03	P19-03	95	White	22	
P17-04	P19-04	96	Black	22	



Table 8-2: Wiring List – NARB18 Transmitter (Continued)

Source	Destination	Wire #	Color	Size	Remarks
P17-05	P19-05	97	White	22	
P17-06	P19-06	98	Black	22	
P17-07	P19-20	99	White	22	
P17-08	P19-09	100	White	22	1 conductor shielded
P17-09	P19-10	100	Shield		
P17-10	P19-11	101	White	22	1 conductor shielded
P17-11	P19-12	101	Shield		
P17-12	P19-13	102	White	22	1 conductor shielded
P17-13	P19-14	102	Shield		
P17-20	P19-15	103	White	22	1 conductor shielded
P17-21	P19-16	103	Shield		
P17-22	P19-17	104	White	22	2 conductor shielded
P17-23	P19-18	104	Black	22	
P17-24	P19-19	104	Shield		
P18-21	S1-02	105	White	22	
P19-21	S2-02	106	White	22	
-	-	107	Not Used		
-	-	108	Not Used		
TB1-01	A11E3	109	White	22	
TB1-03	A11E4	110	Black	22	
P20-01	P21-01	111	White	22	1 conductor shielded
P20-02	P21-02	111	Shield		
P20-05	P21-05	112	White	22	1 conductor shielded
P20-06	P21-06	112	Shield		
P20-09	P21-09	113	White	22	1 conductor shielded
P20-10	P21-10	113	Shield		
P20-13	P21-13	114	White	22	1 conductor shielded
P20-14	P21-14	114	Shield		
P20-17	P21-17	115	White	22	1 conductor shielded
P20-18	P21-18	115	Shield		
P18-07	P28-02	116	White	22	
P18-08	P29-02	117	White	22	
P18-22	P28-03	118	Black	22	
P18-23	P29-03	119	Black	22	
P18-24	P28-01	120	White	22	
P18-25	P29-01	121	White	22	
P19-07	P30-02	122	White	22	
P19-08	P31-02	123	White	22	
P19-22	P30-03	124	Black	22	
P19-23	P31-03	125	Black	22	
P19-24	P30-01	126	White	22	
P19-25	P31-01	127	White	22	
P22-01	LS1-(+)	128	White	22	
P22-02	LS1-(-)	129	Black	22	
P22-03	M1-(+)	130	White	22	
P22-04	M1-(-)	131	Black	22	



Table 8-2: Wiring List – NARB18 Transmitter (Continued)

Source	Destination	Wire #	Color	Size	Remarks
P23-01	P24-01	132	White	22	
P23-02	P24-02	133	Black	22	
P23-03	P24-03	134	White	22	
P23-04	P24-04	135	Black	22	
P23-18	P24-18	136	White	22	
P23-19	P24-19	137	White	22	
P25-01	P26-03	138	White	22	
P25-02	P26-04	139	Black	22	
P25-03	P26-06	140	Black	22	
P25-04	P26-05	141	White	22	
P25-05	P26-02	142	Black	22	
P25-06	P26-01	143	White	22	
P25-08	P26-08	144	Black	22	
P25-10	P26-07	145	White	22	
P24-07	P27-07	146	White	22	
P24-10	P27-10	147	White	22	
P24-11	P27-11	148	Black	22	
P24-21	P27-21	149	White	22	
P24-22	P27-22	150	White	22	
P24-23	P27-23	151	Black	22	
P24-24	P27-24	152	White	22	
P24-25	P27-25	153	Black	22	
U9-AC1	XA12P1-05	154	White	14	
U9-AC2	XA13P1-05	155	White	14	
XA12P1-06	GND	156	Black	14	
XA13P1-06	GND	157	Black	14	
XA12P1-03	SFTY GND	160	Grn/Yel	14	Jumper
XA13P1-03	SFTY GND	161	Grn/Yel	14	Jumper
S1-01	GND	-	Black	22	Jumper
S2-01	GND	-	Black	22	Jumper
A15TB1-04	J1-Centre	-	Yellow	14	Jumper
A15TB1-02	J1-GND	-	Yellow	14	Jumper
TB1-01	XF1-01	162	Grey	18	Jumper
TB1-02	U7-N (LINE)	163	Grey	18	Jumper
TB1-03	A16E01	164	Grey	18	Jumper
TB1-04	A16E02	165	Grey	18	Jumper
XF1-02	U8(-)	166	Grey	18	Jumper
U8-AC1	U7-L (LINE)	167	Grey	18	Jumper
U8-AC2	U7-L (LINE)	168	Grey	18	Jumper
U7-L (LOAD)	A16E03	169	Grey	18	Jumper
U7-N (LOAD)	A16E04	170	Grey	18	Jumper
U7-L (LOAD)	P32-04	171	White	22	
U7-N (LOAD)	P32-01	172	Black	22	
A16E08	U9(-)	173	White	14	Jumper
A16E06	GND	174	Black	14	Jumper



Table 8-2: Wiring List – NARB18 Transmitter (Continued)

Source	Destination	Wire #	Color	Size	Remarks
U6-3	TB2-01	-	Grey	14	
U6-4	TB2-03	-	Grey	14	
U6-GND	SFTY GND	-	Grn/Yel	14	

Connector Mating Information

Connector	Mate	Connector	Mate
P1	A11J4	W1P1	A2J7
P2	A11J5	W1P2	A1J7
P3	U2-OUTPUT	W2P1	A2J3
P4	U3-OUTPUT	W2P2	A1J4
P5	U2-INPUT	W3P1	A3J18
P6	U3-INPUT	W3P2	A1J1
P7	A3J17	W4P1	A11J1
P8	A7J1	W4P2	A2J1
P9	A3J16	W5P1	A3J13
P10	A10J1	W5P2	A2J15
P11	A2J8	W6P1	A7J4
P12	A11J7	W6P2	A10J4
P13	A2J9	W6P3	A2J13
P14	A11J8	W7P1	A1J9
P15	A14J1	W7P2	U1J1
P16	A11J9	W8P1	A1J5
P17	A11J10	W9P1	A1J6
P18	A12A1J7	W10P1	A11J2
P19	A13A1J7	W10P2	A2J2
P20	A15J1		
P21	A3J11		
P22	A1J11		
P23	A11J3		
P24	A16J1		
P25	U10P2		
P26	A11J6		
P27	A3J12		
P28	B1P1		
P29	B2P1		
P30	B3P1		
P31	B4P1		
P32	U10P1		



Table 8-3: Wiring List – NAP35B/01 RF Power Module

Source	Destination	Wire #	Color	Size	Remarks
P1-01	P2-01	1	White	14	
P1-02	P2-02	2	White	14	
P1-03	P2-03	3	Grn/Yel	14	
P1-05	P3-01	4	White	18	
P1-06	P3-03	5	Black	18	
P3-01	P4-01	6	White	18	
P3-03	P4-03	7	Black	18	
P1-11	T1E3	8	Yellow	14	Teflon Twisted
P1-12	T1E4	9	Yellow	14	Teflon Twisted
A4-(A)	A5E2	-	Yellow	18	Teflon/Jumper
A4-(B)	A5E1	-	Yellow	14	Teflon/Jumper
A4-(C)	A3E1	-	Yellow	14	Teflon/Jumper
A3T1	A3(+)	-	Orange		A3T1 Lead
A3T1	A3(+)	-	Yellow		A3T1 Lead
A3T1	A3(-)	-	Org/Blk		A3T1 Lead
A3T1	A3(-)	-	Yel/Blk		A3T1 Lead
A3T1	A3Q1-Gate	-	Brown		A3T1 Lead
A3T1	A3Q1-Source	-	Brn/Blk		A3T1 Lead
A3T1	A3Q2-Source	-	Red		A3T1 Lead
A3T1	A3Q2-Gate	-	Red/Blk		A3T1 Lead
A3T1	A3Q3-Source	-	Green		A3T1 Lead
A3T1	A3Q3-Gate	-	Grn/Blk		A3T1 Lead
A3T1	A3Q4-Gate	-	Blue		A3T1 Lead
A3T1	A3Q4-Source	-	Blue/Blk		A3T1 Lead
A3E2	T1E2	-	Yellow	14	Teflon/Jumper
A3E3	T1E1	-	Yellow	14	Teflon/Jumper

Connector Mating Information

Connector	Mate
P2	A2J3
P3	A2J2
P4	A5J1
W1P1	A1J2
W1P2	A5J2
W2P1	A1J4
W2P2	A3J1
W3P1	A1J6
W3P2	A2J1



Table 8-4: Wiring List – Optional Battery Boost Assembly (205-8035)

Source	Destination	Wire #	Color	Size	Remarks
A16TB1-01	XF1-01	162	White	14	
A16TB1-02	U7-N (LINE)	163	Black	14	
A16TB1-03	A16E01	164	White	14	
A16TB1-04	A16E02	165	Black	14	
XF1-02	U8-(-)	166	White	14	
U8-AC1	U7-L (LINE)	167	White	14	
U8-AC2	U7-L (LINE)	168	White	14	
U7-L (LOAD)	A16E03	169	White	14	
U7-N (LOAD)	A16E04	170	Black	14	
U7-L (LOAD)	P32-04	171	White	22	
U7-N (LOAD)	P32-01	172	Black	22	
A16E08	U9-(-)	173	White	14	
A16E06	GND	174	Black	14	

Connector Mating Information

Connector	Mate
P32	U10P1



Table 8-5: Wiring List – Optional Modem Kit (195-3032) Interface

Source	Destination	Wire #	Color	Size	Remarks
P7	A13-A	-	Black		Modem DC cable, Without ribbing
P7	A13-B	-	Black		Modem DC cable, With ribbing
P8 (male)	P9 (female)	-	-		Modem 9-pin D-sub

Connector Mating Information

Connector	Mate
P7	Modem-DC
P8	Modem-DB9
P9	Remote Interface PWB - EXTERNAL RS-232

Table 8-6: Wiring List – Optional Deluxe Cabinet (205-8075)

Source	Destination	Wire #	Color	Size	Remarks
W1J1-Center	W1P2-Center	-	Core	RG58A/U	Coaxial Cable W1
W1J1-Bodt	W1P2-Body	-	Shield		
Station Ref Gnd	Ground Bolt	-	Grn/Yel	14	
Station Ref Gnd	Ground Bolt	-	Grn/Yel	14	
TB1-1	Ground Bolt	-	Grn/Yel	14	
TB1-1	Ground Bolt	-	Grn/Yel	14	
TB1-1	P3-Ground	-	Grn/Yel	18	Ac line cord
TB1-2	P3-Neutral	-	Blue	18	Ac line cord
TB1-3	P3-Line	-	Brown	18	Ac line cord
1-Ref Gnd	Ground Bolt	-	Grn/Yel	14	
1-Ref Gnd	Ground Bolt	-	Grn/Yel	14	
*TB1-1	U1-G (Input)	-	Grn/Yel		
*TB1-2	U1-N (Input)	-	Blue		
*TB1-3	U1-PH (Input)	-	Brown		
*U1- B+	1A16TB1-3	1	White	14	
*U1- B-	1A16TB1-2	2	Black	14	
*1A16TB1-4	1A16TB1-1	-	White	14	
*U1-RFA (NC)	1A3TB1-3	3	White	22	
*U1-RFA (COM)	1A3TB1-4	4	Black	22	
*U1-BTC	U1-Battery Sensor	-	White	22	Battery Sensor Assy
*U1-BTC	U1-Battery Sensor	-	White	22	Battery Sensor Assy

Items prefixed with 1 are part of Vector-LP transmitter

* - Denotes used only if optional battery charger kit is installed

Connector Mating Information

Connector	Mate
W1P2	1J1 (RF Output)
P3	1U5



Table 8-7a: Wiring List – Optional Short Cabinet, with battery (205-8120)

Source	Destination	Wire #	Color	Size	Remarks
*U1-B+	1A16TB1-3	1	White	14	
*U1-B-	1A16TB1-2	2	Black	14	
*U1-RFA (NC)	1A3TB1-4	3	White	22	
*U1-RFA (COM)	1A3TB1-11	4	Black	22	
*U1-BTC	Temp Sensor	-			
*U1-BTC	Temp Sensor	-			
*1A16TB1-2	TB2-2	8	Black	14	
*CB1-Load	1A16TB1-1	9	Black	8	
*CB1-Line	TB2-1	10	Black	8	
W1J1-Center	W1P2-Center	-	Core	RG58A/U	W1
W1J1-Body	W1P2-Body	-	Shield		
TB1-1	Gnd Bolt	-	Grn/Yel	14	
TB1-1	Gnd Bolt	-	Grn/Yel	14	
TB1-1	P1-Ground	-	Grn/Yel	18	Line Cord
TB1-2	P1-Neutral	-	Blue	18	Line Cord
TB1-3	P1-Line	-	Brown	18	Line Cord
1-Ref Gnd	Gnd Bolt	-	Grn/Yel	14	
1-Ref Gnd	Gnd Bolt	-	Grn/Yel	14	
TB1-1	*U1-G (Input)	-	Grn/Yel	14	
TB1-2	*U1-N (Input)	-	Blue	14	
TB1-3	*U1-PH (Input)	-	Brown	14	
1A16TB1-4	*1A16TB1-1	-	White	14	
GND	GND	-	Grn/Yel	14	
GND bolt	Station Ref GND	-	Grn/Yel	14	
GND bolt	Station Ref GND	-	Grn/Yel	14	
Battery (-)	TB2-2	-	Black	8	Jumper
Battery (+)	TB2-1	-	Black	8	Jumper

Items prefixed with 1 are part of Vector-LP transmitter

* - Denotes used only if optional battery charger kit is installed

Connector Mating Information

Connector	Mate
W1P2	1J1 (RF Output)
P3	1U5



Table 8-7b: Wiring List – Optional Short Cabinet, without battery (205-8120-01)

Source	Destination	Wire #	Color	Size	Remarks
*U1-B+	1A16TB1-3	1	White	14	
*U1-B-	1A16TB1-2	2	Black	14	
*U1-RFA (NC)	1A3TB1-4	3	White	22	
*U1-RFA (COM)	1A3TB1-11	4	Black	22	
*U1-BTC	Temp Sensor	-			
*U1-BTC	Temp Sensor	-			
1A16TB1-2	TB2-2	8	Black	14	
TB2-1	1A16TB1-1	9	White	14	
W1J1-Center	W1P2-Center	-	Core	RG58A/U	W1
W1J1 - Body	W1P2-Body	-	Shield		
TB1-1	Gnd Bolt	-	Grn/Yel	14	
TB1-1	Gnd Bolt	-	Grn/Yel	14	
TB1-1	P1-Ground	-	Grn/Yel	18	Line Cord
TB1-2	P1-Neutral	-	Blue	18	Line Cord
TB1-3	P1-line	-	Brown	18	Line Cord
1 Ref Gnd	Gnd Bolt	-	Grn/Yel	14	
1 Ref Gnd	Gnd Bolt	-	Grn/Yel	14	
TB1-1	*U1-G (Input)	-	Grn/Yel	14	
TB1-2	*U1-N (Input)	-	Blue	14	
TB1-3	*U1-PH (Input)	-	Brown	14	
1A16TB1-4	*1A16TB1-1	-	White	14	
GND	GND	-	Grn/Yel	14	
GND bolt	Station Ref GND	-	Grn/Yel	14	
GND bolt	Station Ref GND	-	Grn/Yel	14	

Items prefixed with 1 are part of Vector-LP transmitter

* - Denotes used only if optional battery charger kit is installed

Connector Mating Information

Connector	Mate
W1P2	1J1 (RF Output)
P3	1U5



Table 8-8: Wiring List – Optional Tall Cabinet (205-8200)

Source	Destination	Wire #	Color	Size	Remarks
*U1-B+	1A16TB1-3	1	White	14	
*U1-B-	1A16TB1-2	2	Black	14	
*U1-RFA (NC)	1A3TB1-4	3	White	22	
*U1-RFA (COM)	1A3TB1-11	4	Black	22	
*U1-BTC	Temp Sensor	-			
*U1-BTC	Temp Sensor	-			
*1A16TB1-2	TB2-2	8	Black	14	
CB1-Load	1A16TB1-1	9	Black	8	
CB1-Line	TB2-1	10	Black	8	
W1P1-Center	W1P2-Center	-	Core	RG58A/U	W01
W1P1-Body	W1P2-Body	-	Shield		
TB1-1	GND Bolt	-	Grn/Yel	14	
TB1-1	GND Bolt	-	Grn/Yel	14	
TB1-1	P1-Ground	-	Grn/Yel	18	Line Cord
TB1-2	P1-Neutral	-	Blue	18	Line Cord
TB1-3	P1-line	-	Brown	18	Line Cord
1 Ref Gnd	GND Bolt	-	Grn/Yel	14	
1 Ref Gnd	GND Bolt	-	Grn/Yel	14	
TB1-1	*U1-G (Input)	-	Grn/Yel	14	
TB1-2	*U1-N (Input)	-	Blue	14	
TB1-3	*U1-PH (Input)	-	Brown	14	
1A16TB1-4	*1A16TB1-1	-	White	14	
GND	GND	-	Grn/Yel	14	
GND bolt	Station Ref GND	-	Grn/Yel	14	
GND bolt	Station Ref GND	-	Grn/Yel	14	
*Battery (-)	TB2-2	-	Black	8	Jumper
*Battery (+)	TB2-1	-	Black	8	Jumper
TB1-1	P3-Ground	-	Grn/Yel	18	Line Cord
TB1-2	P3-Neutral	-	Blue	18	Line Cord
TB1-3	P3-Line	-	Brown	18	Line Cord
W3P1	W3P2	-			Serial Cable
W2P1-1	W2P2	-	White	14	
W2P1-4	W2P3	-	Black	14	

Items prefixed with 1 are part of Vector-LP transmitter
 * - Denotes used only if optional battery charger kit is installed

Connector Mating Information

Connector	Mate
W1P1	J1{RF OUT}
W1P2	1J1{RF OUT}
W2P1*	U2J1{DC}
W2P2*	1A16TB1-3
W2P3*	1A16TB1-2
W3P1*	U2A1J1{RS232}
W3P2*	1A3J5{RS232}
P1	1U5{AC}
P3*	U2U2{AC}



Vector-LP Radio Beacon Transmitter

TECHNICAL INSTRUCTION MANUAL

Section 9 **ELECTRICAL SCHEMATICS**

9.1 INTRODUCTION

This section contains electrical schematics/ logic diagrams for the subject equipment. Block diagrams, simplified electrical schematics, and/or logic diagrams may be included. Refer to Table 9-1 for an itemized listing.

9.2 COMPONENT VALUES

Unless otherwise specified on the logic/ schematic diagram, the following applies:

- Resistor values are shown in ohms. (K = 1000 and M = 1 000 000).
- Resistor power ratings are not shown when less than 0.5 W.
- Capacitor values are shown in microfarads (μF).
- Unidentified diodes are part number 1N4938.

9.3 GRAPHIC SYMBOLS

The graphic symbols used on electrical schematics are in accordance with American National Standard ANSI Y32.2-1975 - Graphic Symbols for Electrical and Electronic Diagrams.

9.4 LOGIC SYMBOLS

The logic symbols used on electrical schematics and logic diagrams are in accordance with American National Standard ANSI Y32.14-1975 - Graphic Symbols for Logic Diagrams.

9.5 REFERENCE DESIGNATIONS

Reference designations were assigned in accordance with American National Standard ANSI Y32.16-1975 - Reference Designations for Electrical and Electronic Parts and Equipment. Each electrical symbol is identified with its basic reference designation. To obtain the full reference designation for a specific part, this basic identifier must be

prefixed with the reference designation assigned to all higher assemblies.

9.6 UNIQUE SYMBOLOGY

Nautel utilizes unique symbology on electrical schematics to describe two-state (logic) inputs/outputs that differ from those inputs/ outputs having only one distinct state or multiple states (analog).

9.6.1 Type of Inputs/Outputs

On electrical schematics, names used to describe two-state (logic) inputs/outputs are prefixed by a '#'. Those inputs/outputs representing a one-state or analog signal will have no prefix.

9.6.2 Logic Level/Convention

The '#' prefix identifies an input/output that has two distinct states - 'high' and 'low'. A suffix, '+' or '-', identifies the active (true) state of the input/output. The 'high' (+) is the more positive of the two levels used to represent the logic states. The 'low' (-) is the less positive of the two levels used to represent the logic states. Two types of logic, positive and negative, may be represented on a particular schematic. In positive logic, 'high' represents the active (true) state and 'low' represents the inactive (false) state. In negative logic, 'low' represents the active state and 'high' represents the inactive state.

9.7 TROUBLESHOOTING AIDS

Waveforms and/or voltage levels are provided on some electrical schematics to aid in troubleshooting. Where applicable, accompanying text is included to establish conditional operating parameters that apply to the corresponding waveforms or voltages.



9.8 IDENTIFICATION OF SCHEMATIC DIAGRAMS

A number that is both the figure number and the page number identifies each illustration in this section. The numbers are assigned sequentially and are prefixed by the letters 'SD-'. The electrical schematics/logic diagrams included in this section are listed in Table 9-1.

9.9 STRUCTURE OF SCHEMATICS

The electrical schematics are structured in a hierarchical format that is based on function and signal flow. Wherever practical, the signal flow is from left to right. Inputs normally originate on the left-hand side and outputs will extend to the right-hand side. Exceptions are shown by an arrow indicating the direction of signal flow.

NOTE

The physical location of a part/assembly was not necessarily a factor when a schematic was drawn. The full reference designation assigned to a part/assembly, in conjunction with the family tree in Figure 7-1 and the assembly detail drawings in section 10 will identify its location.

Figure SD-1 identifies each major stage and its detailed interconnection. Each stage contains cross-references that identify which block is the signal source for inputs or the destination for outputs.

When a sub-function is treated as a block in Figure SD-1, its detailed circuit information is included in its own schematic drawing(s), also included in this section.

9.10 LOCATING THE SCHEMATIC DIAGRAM(S) FOR A FUNCTIONAL BLOCK

The text inside a functional block provides the key to locating its schematic diagram(s). When a functional block is assigned a reference designation, refer to Table 9-1 with the Nautel nomenclature number and/or the description to identify the appropriate figure number(s), if applicable.

9.11 LOCATING A PART/ ASSEMBLY IDENTIFIED ON A SCHEMATIC

The full reference designation assigned to a part/assembly is the key to physically locating that part/assembly.

NOTE

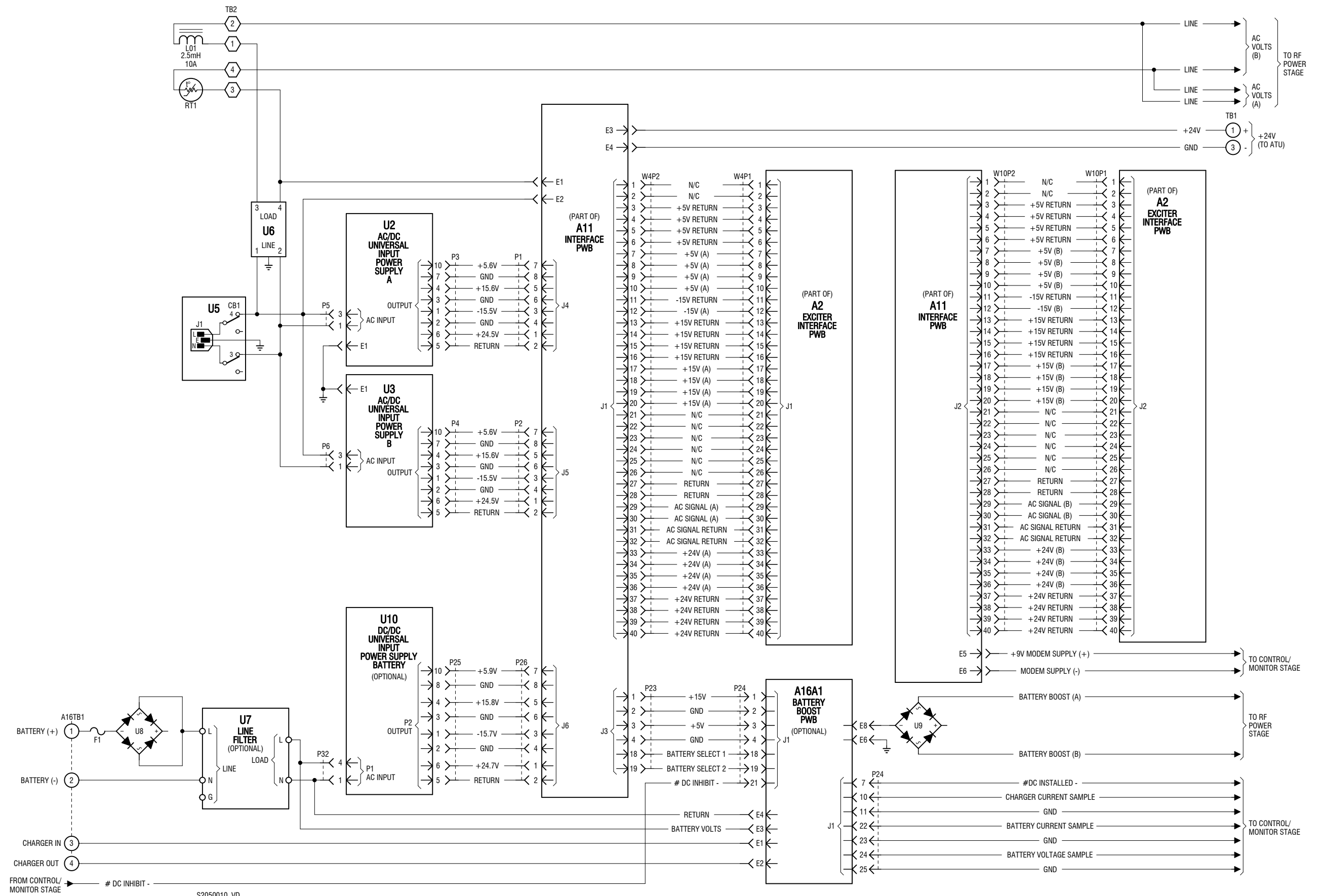
Full reference designations contain the assembly hierarchical coding. When the end item is divided into units (cabinets), the first coding is a unit number (1, 2, 3, etc). When the end item is divided into assemblies, the first coding is an assembly number (A1, A2, A3, etc). If a unit or an assembly is divided into sub-assemblies, assembly coding that identifies assembly relationship (1A1, A2A1, A2A1A1, etc) is added.



Table 9-1: Electrical Schematics

Figure #	Description
SD-1	Electrical Schematic – Vector-LP Transmitter: Ac/Dc Power Stage
SD-2	Electrical Schematic – Vector-LP Transmitter: Exciter Stage
SD-3	Electrical Schematic – Vector-LP Transmitter: Control/Monitor Stage
SD-4	Electrical Schematic – Vector-LP Transmitter: RF Power Stage
SD-5	Electrical Schematic – Control/Display PWB (NAPC147D) (Sheet 1 of 4)
SD-6	Electrical Schematic – Control/Display PWB (NAPC147D) (Sheet 2 of 4)
SD-7	Electrical Schematic – Control/Display PWB (NAPC147D) (Sheet 3 of 4)
SD-8	Electrical Schematic – Control/Display PWB (NAPC147D) (Sheet 4 of 4)
SD-9	Electrical Schematic – Exciter Interface PWB (NAPI76A/02) (Sheet 1 of 2)
SD-10	Electrical Schematic – Exciter Interface PWB (NAPI76A/02) (Sheet 2 of 2)
SD-11	Electrical Schematic – Remote Interface PWB (NAPI78D/02) (Sheet 1 of 3)
SD-12	Electrical Schematic – Remote Interface PWB (NAPI78D/02) (Sheet 2 of 3)
SD-13	Electrical Schematic – Remote Interface PWB (NAPI78D/02) (Sheet 3 of 3)
SD-14	Electrical Schematic – Site Interface PWB (NAPI80, Optional) (Sheet 1 of 2)
SD-15	Electrical Schematic – Site Interface PWB (NAPI80, Optional) (Sheet 1 of 2)
SD-16	Electrical Schematic – RF Synthesizer PWB (NAPE70C/01) (Sheet 1 of 2)
SD-17	Electrical Schematic – RF Synthesizer PWB (NAPE70C/01) (Sheet 2 of 2)
SD-18	Electrical Schematic – Interphase PDM Driver PWB (NAPM11)
SD-19	Electrical Schematic – Exciter Monitor/Generator PWB (NAPE76A/03) (Sheet 1 of 2)
SD-20	Electrical Schematic – Exciter Monitor/Generator PWB (NAPE76A/03) (Sheet 2 of 2)
SD-21	Electrical Schematic – Interface PWB (NAPI94A)
SD-22	Electrical Schematic – RF Power Module (NAP35B/01)
SD-23	Electrical Schematic – Power Module Control/Interface PWB (NAPC151A)
SD-24	Electrical Schematic – Switch Mode Power Supply PWB (NAPS31B/03)
SD-25	Electrical Schematic – Battery Boost PWB (NAPS35, Optional)
SD-26	Electrical Schematic – Vector-LP in Deluxe Cabinet (205-8075, Optional)
SD-27	Electrical Schematic – Vector-LP in IP66 Cabinet (205-8080, Optional)
SD-28	Electrical Schematic – Vector-LP in Short Cabinet [205-8120 (with battery) & 205-8120-01 (no battery), Optional]
SD-29	Electrical Schematic – Vector-LP in Tall Cabinet (205-8200, Optional)





S2050010 VD

Dimensions = mm (inches)

Electrical Schematic - Vector-LP Transmitter: Ac/Dc Power Stage

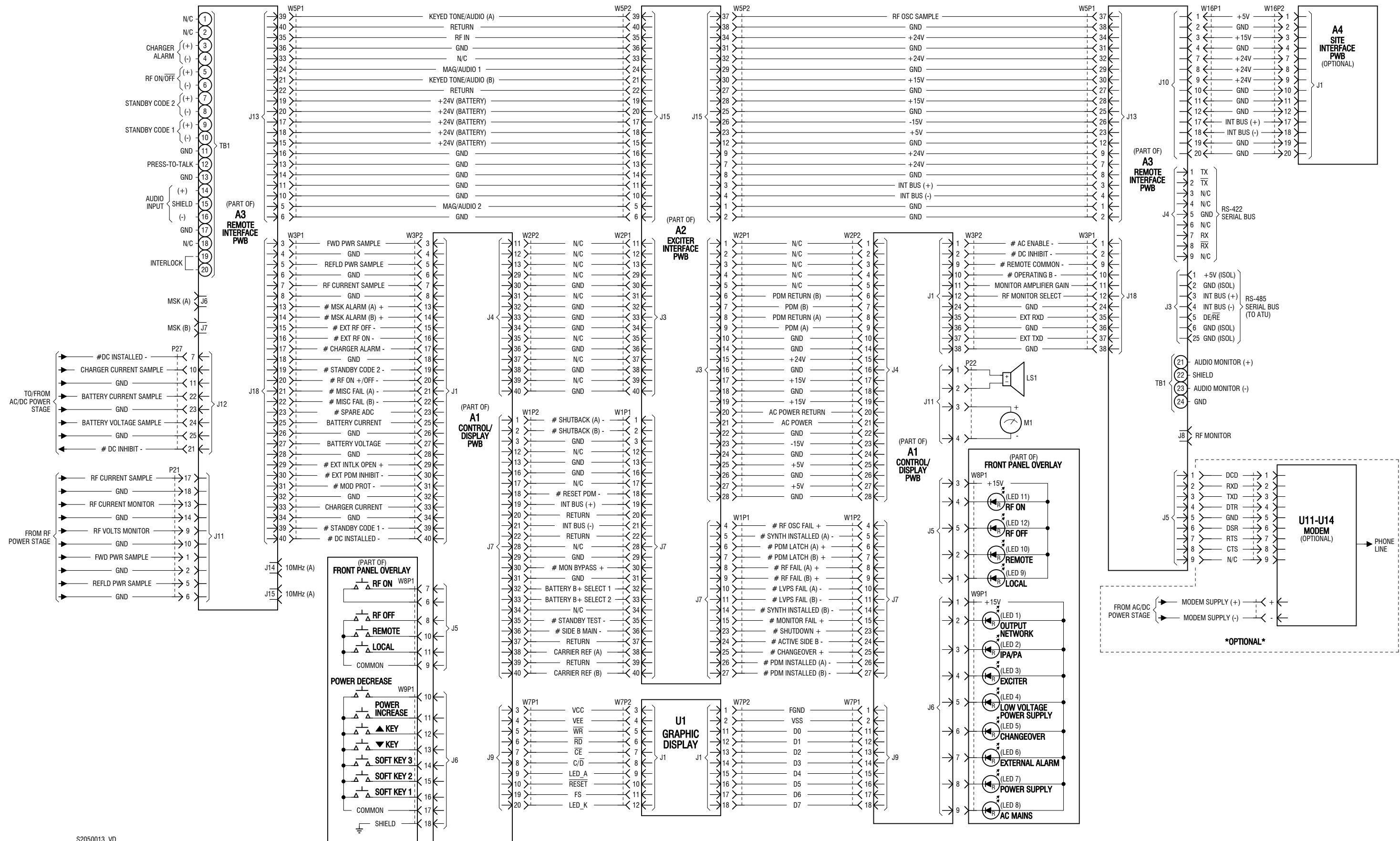
Issue 1.8.1

Not to Scale

Figure SD-1

Sheet 1 of 1





S2050013 VD

Dimensions = mm (inches)

Electrical Schematic - Vector-LP Transmitter: Control/Monitor Stage

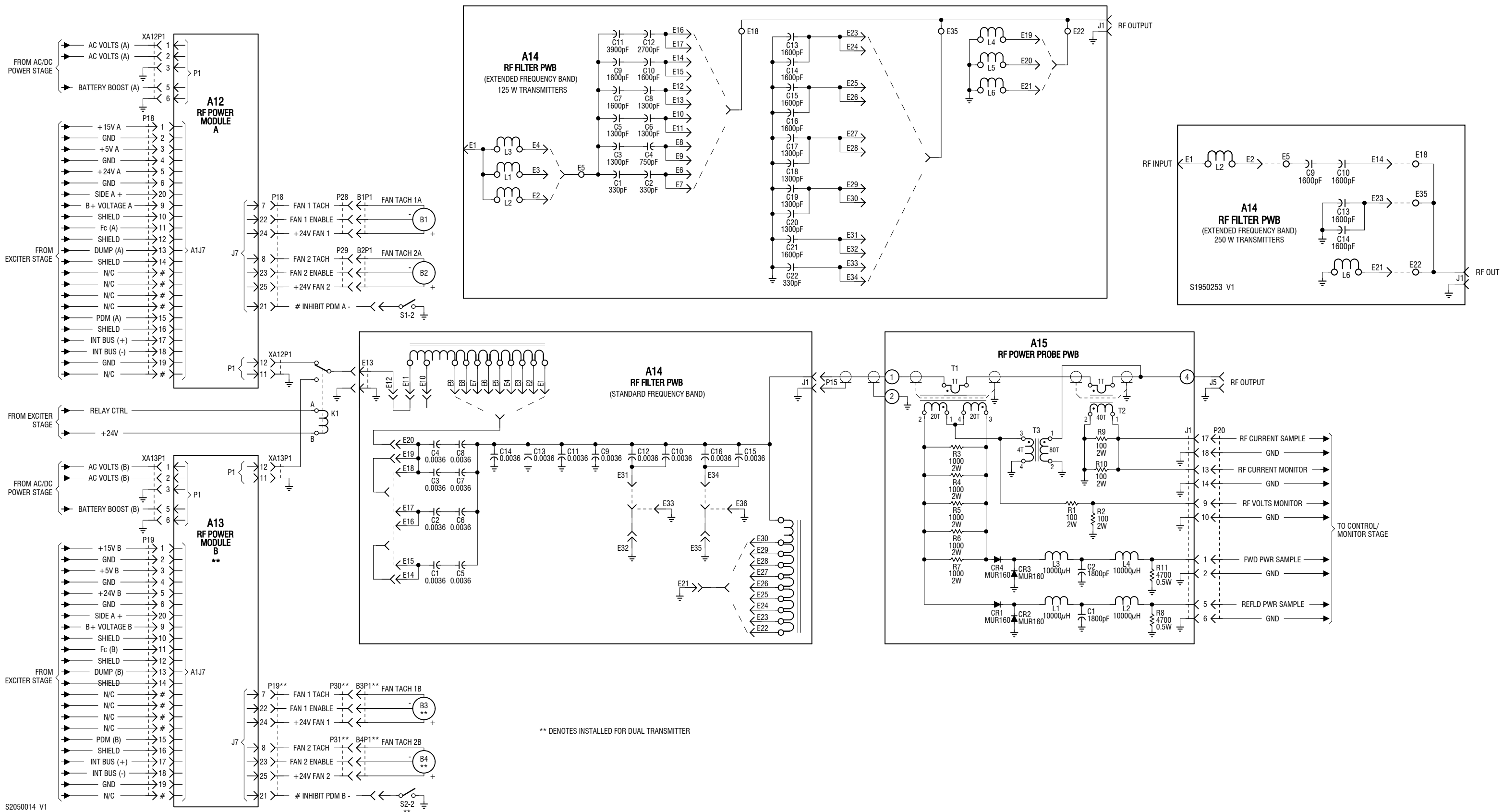
Issue 1.8.1

Not to Scale

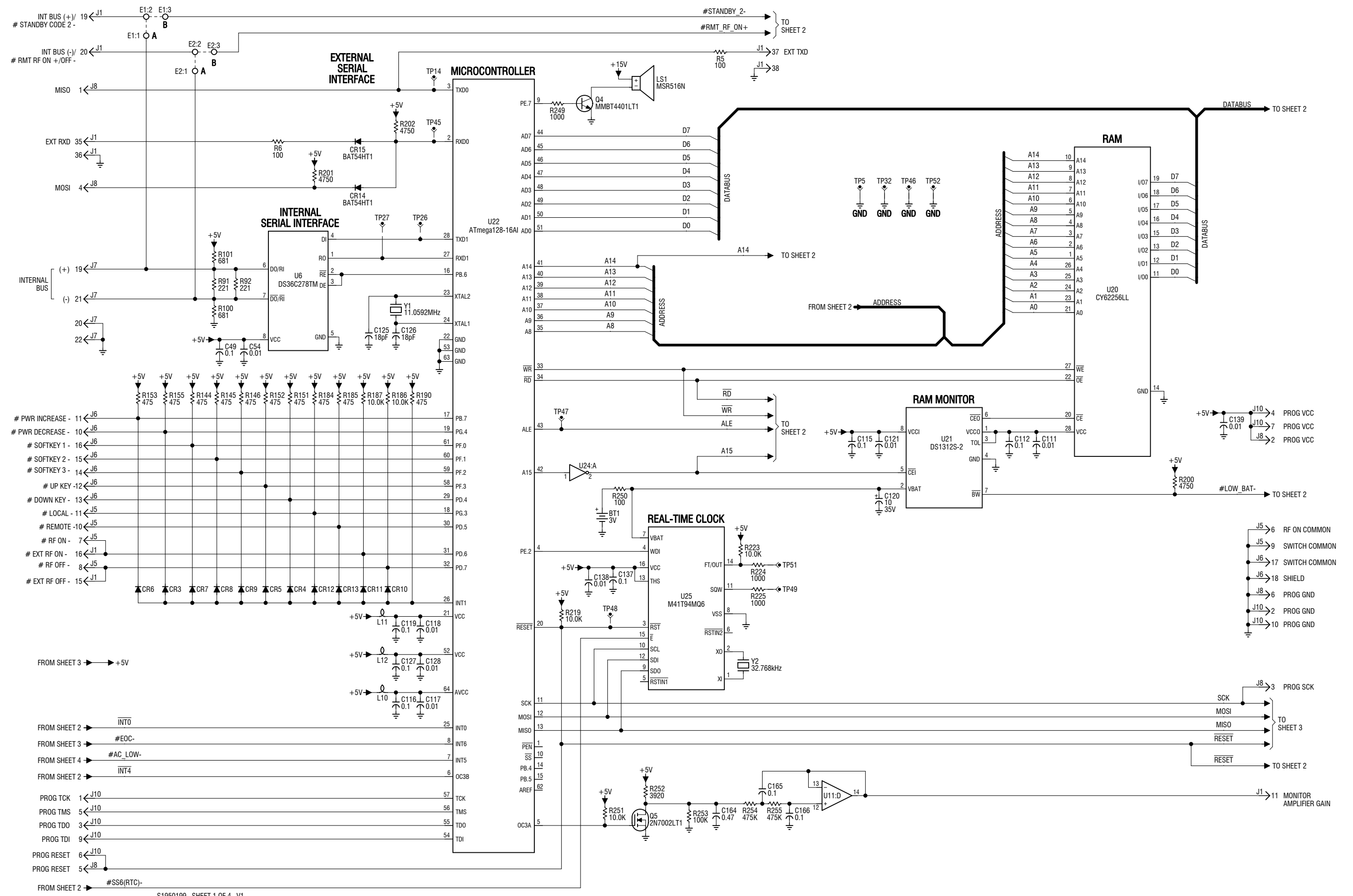
Figure SD-3

Sheet 1 of 1





Dimensions = mm (inches)

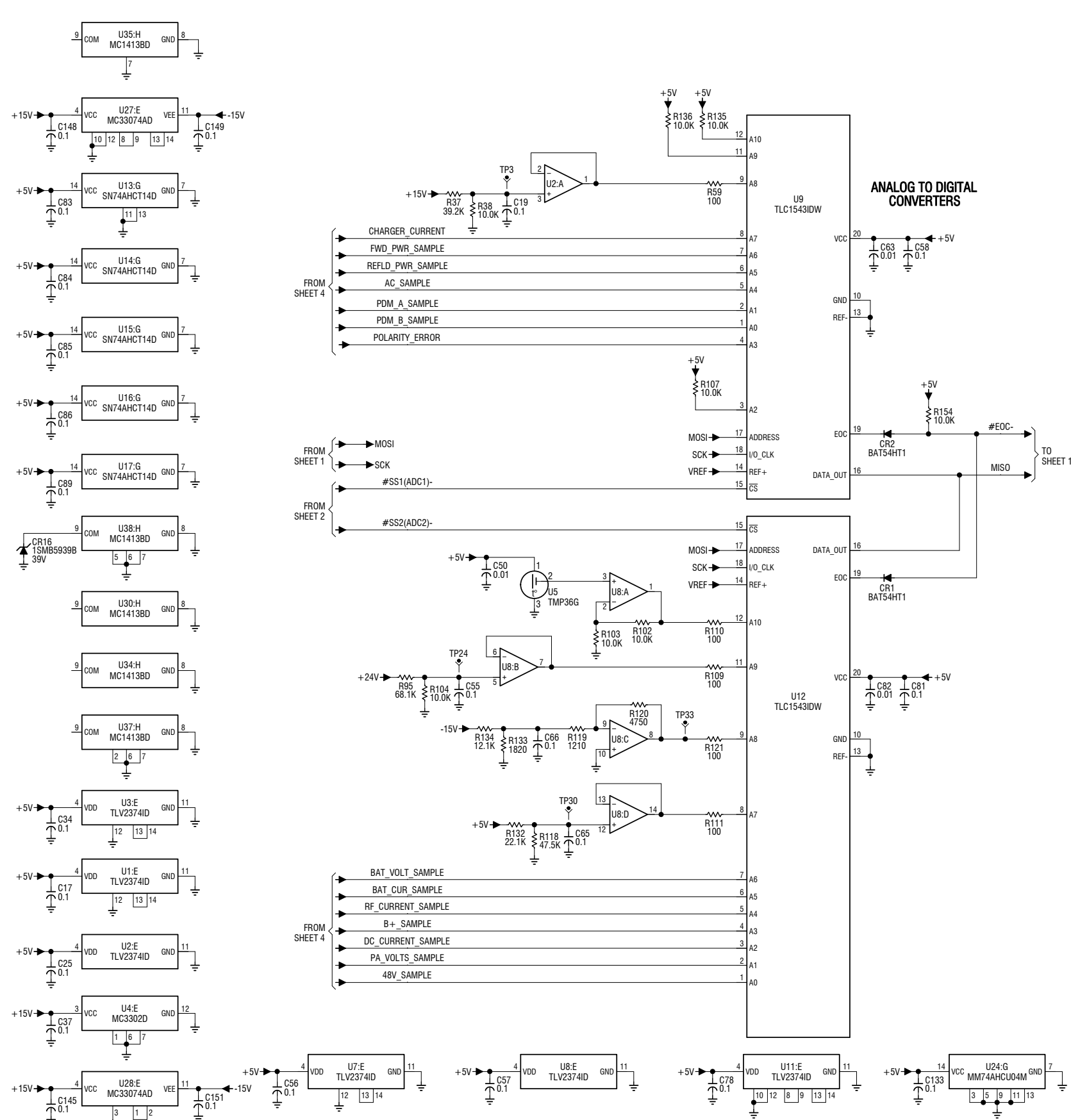


S1950199 SHEET 1 OF 4 V1

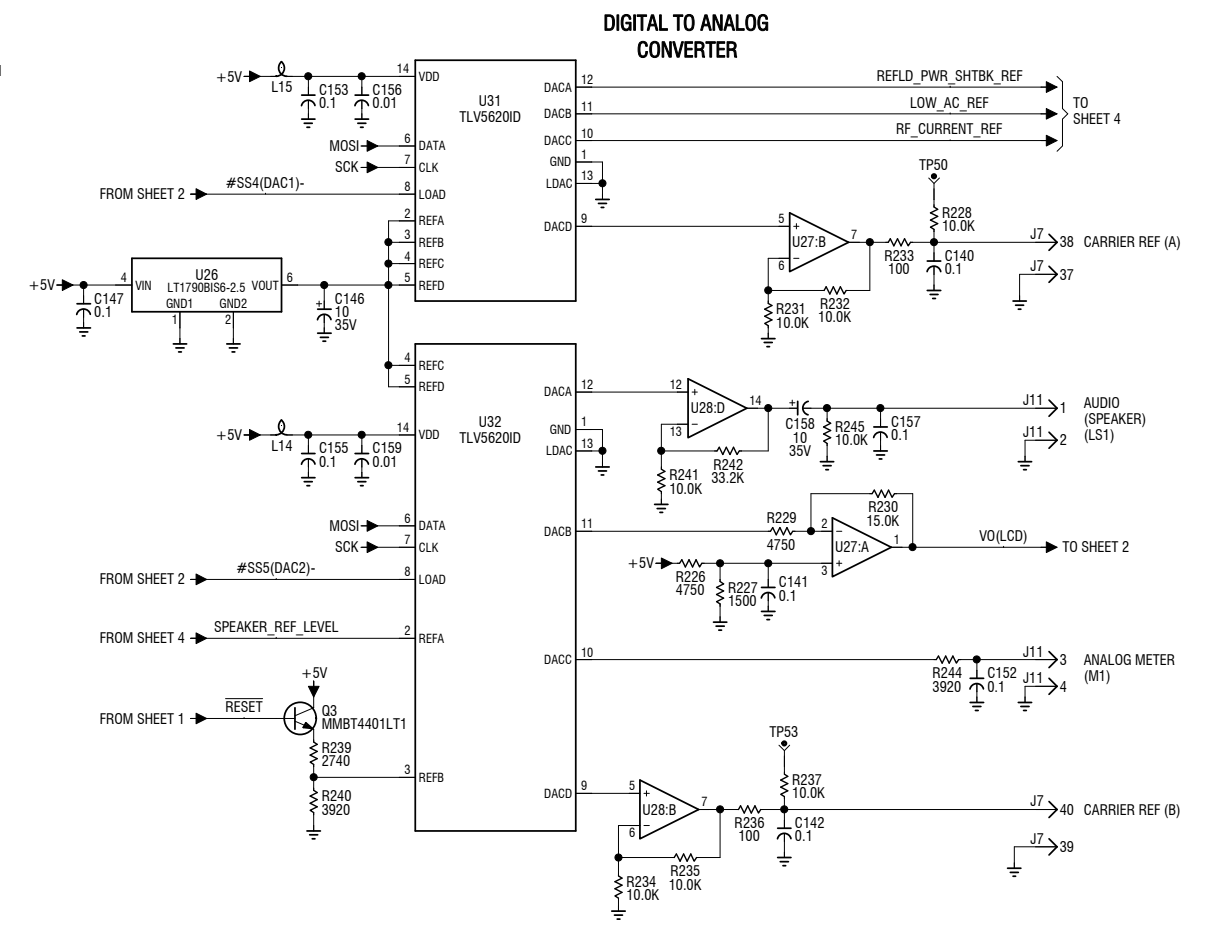
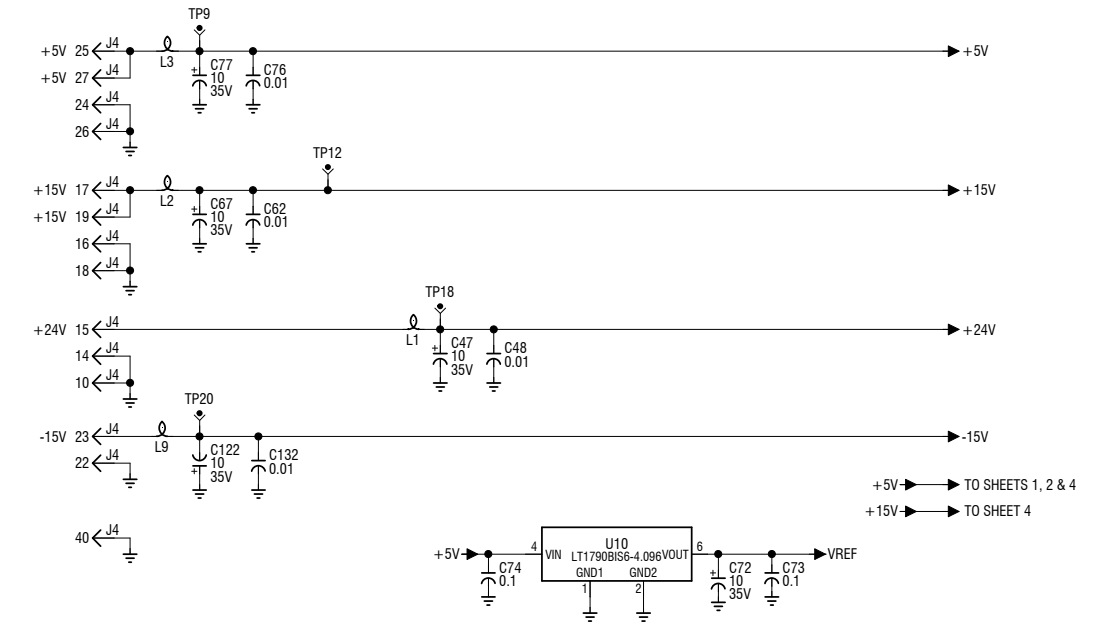
Dimensions = mm (inches)

Electrical Schematic - Control/Display PWB (NAPC147D)			
Issue 1.8.1	Not to Scale	Figure SD-5	Sheet 1 of 4



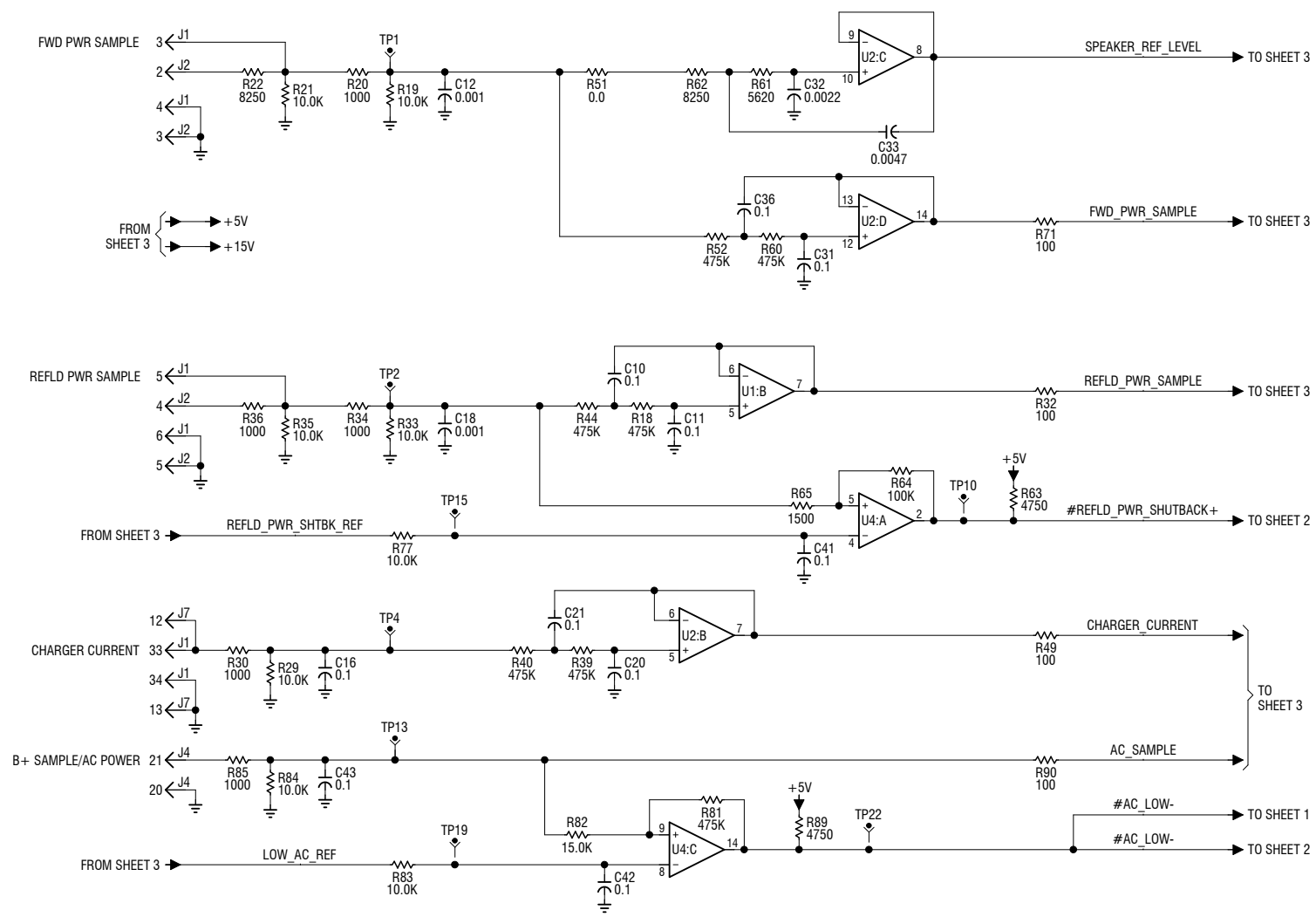


S1950199 SHEET 3 OF 4 V1

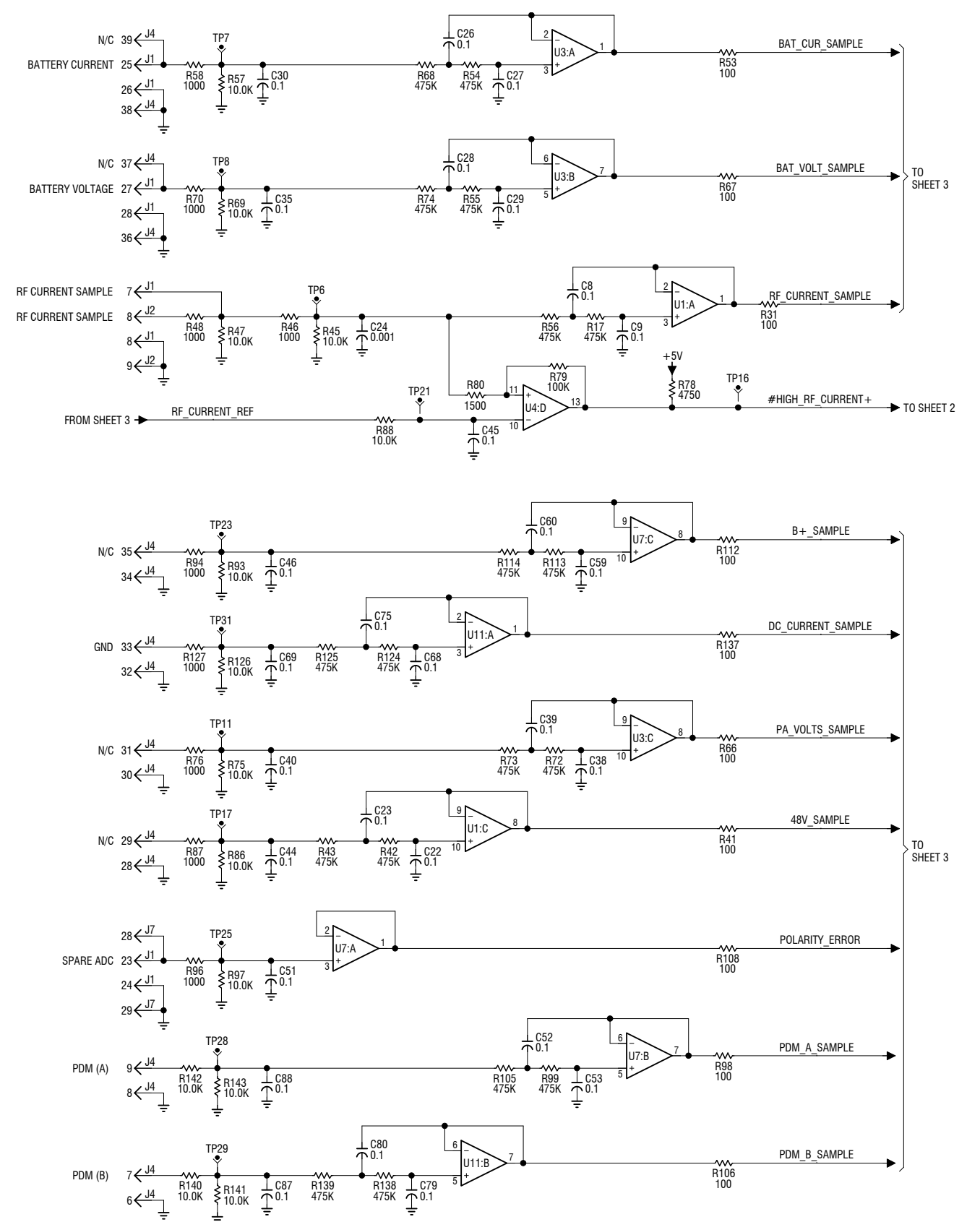


Dimensions = mm (inches)





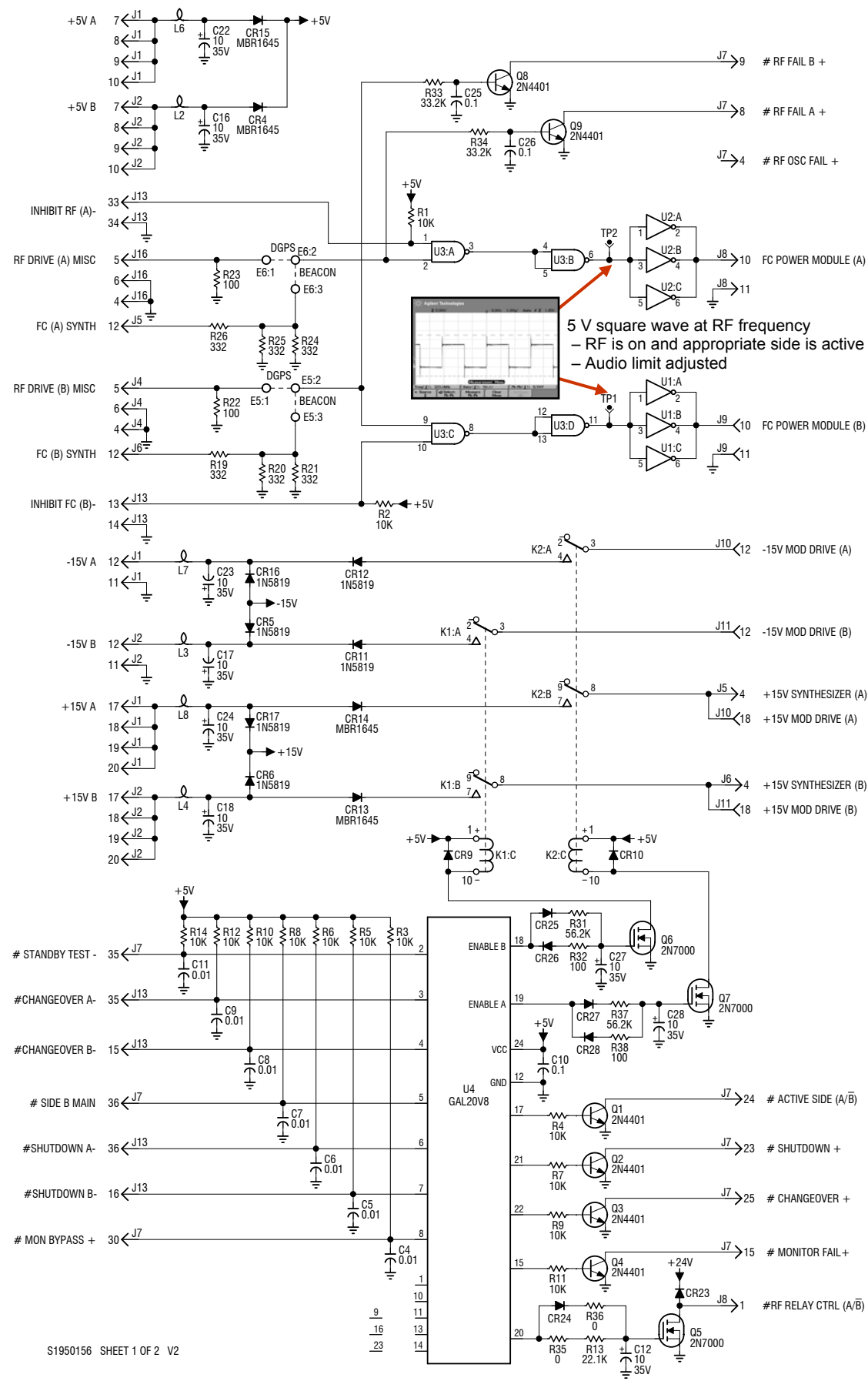
S1950199 SHEET 4 OF 4 V1



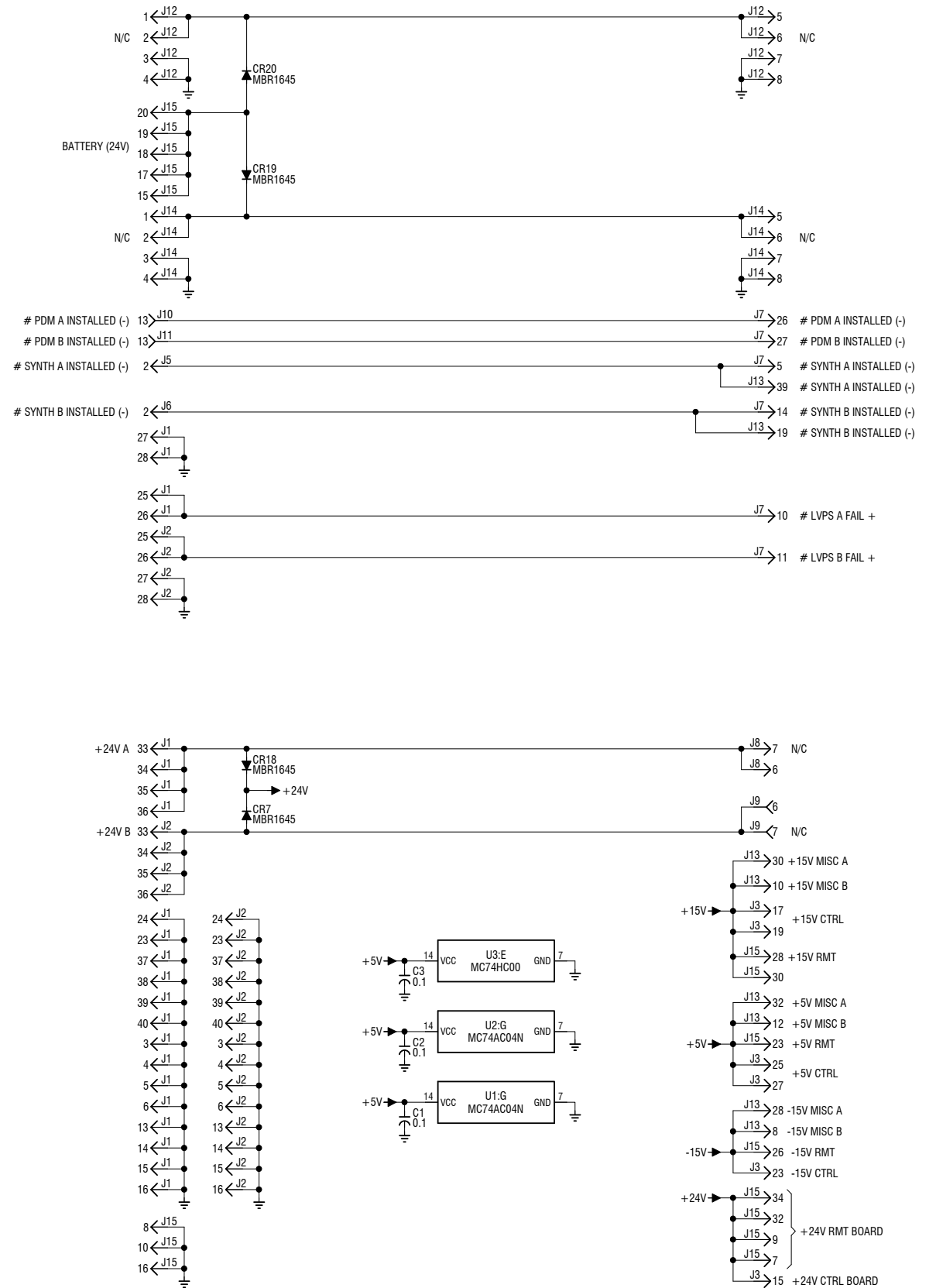
Dimensions = mm (inches)



Electrical Schematic - Control/Display PWB (NAPC147D)			
Issue 1.8.1	Not to Scale	Figure SD-8	Sheet 4 of 4



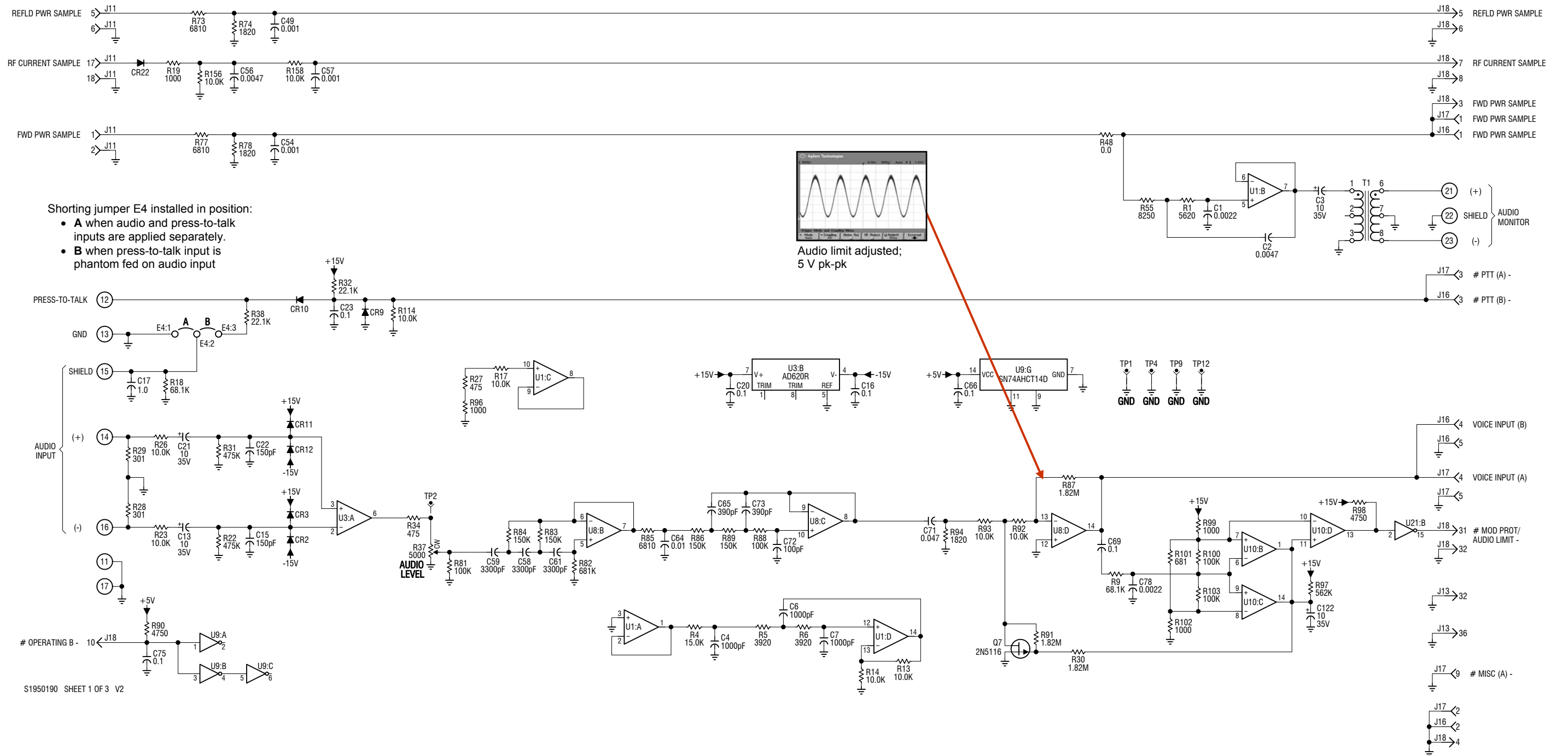
S1950156 SHEET 1 OF 2 V2

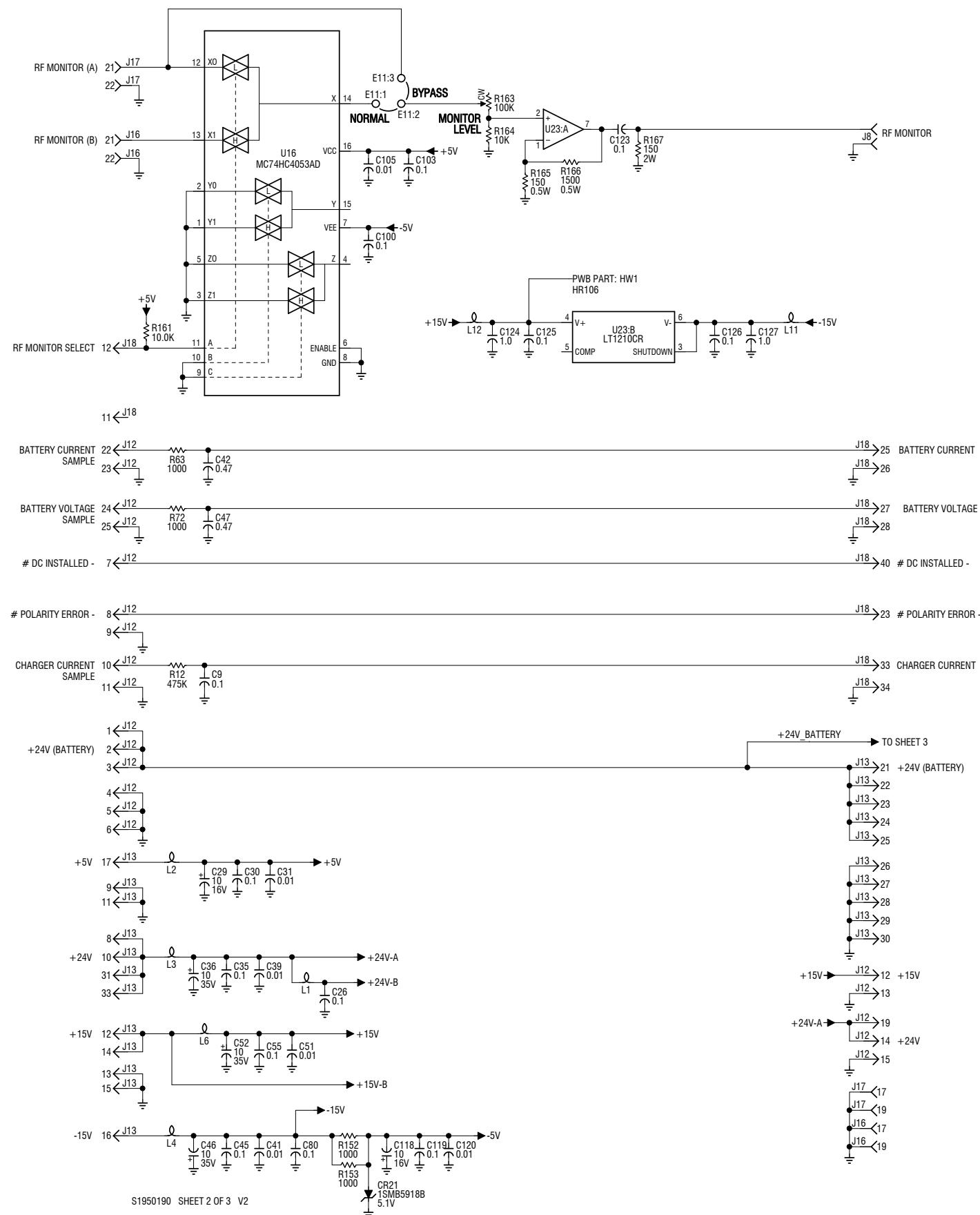


Dimensions = mm (inches)

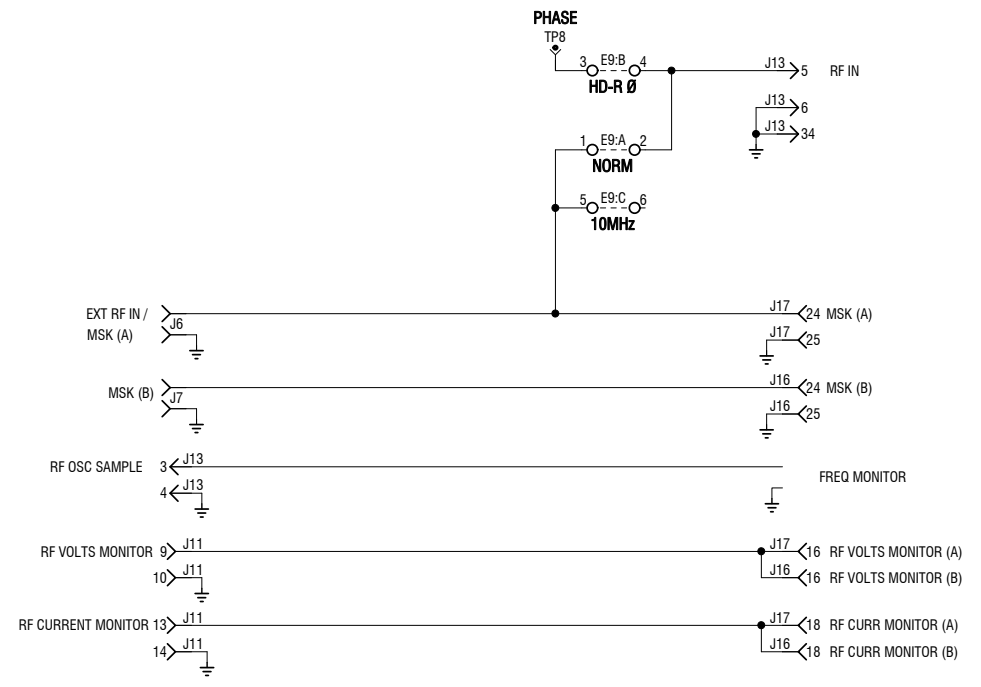
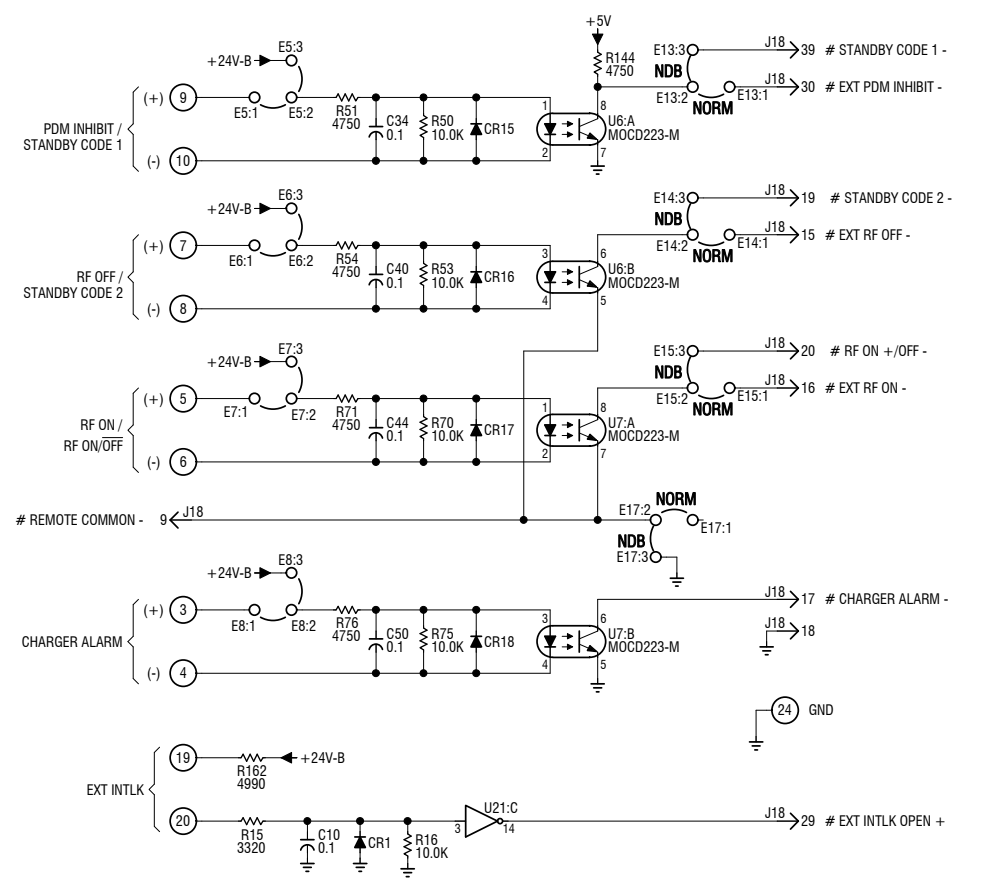
Electrical Schematic - Exciter Interface PWB (NAPI76A/02)			
Issue 1.8.1	Not to Scale	Figure SD-9	Sheet 1 of 2







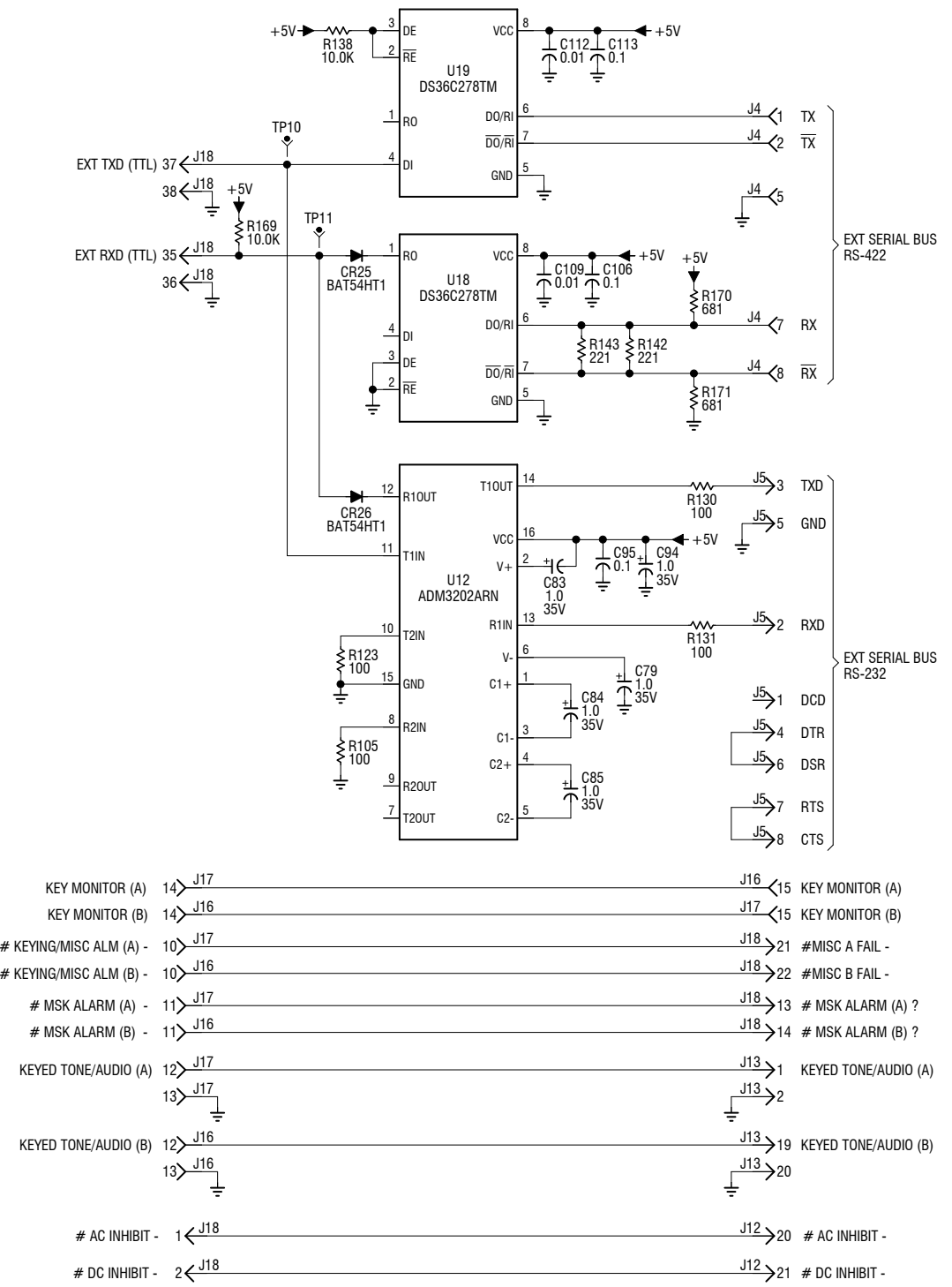
S1950190 SHEET 2 OF 3 V2



Dimensions = mm (inches)

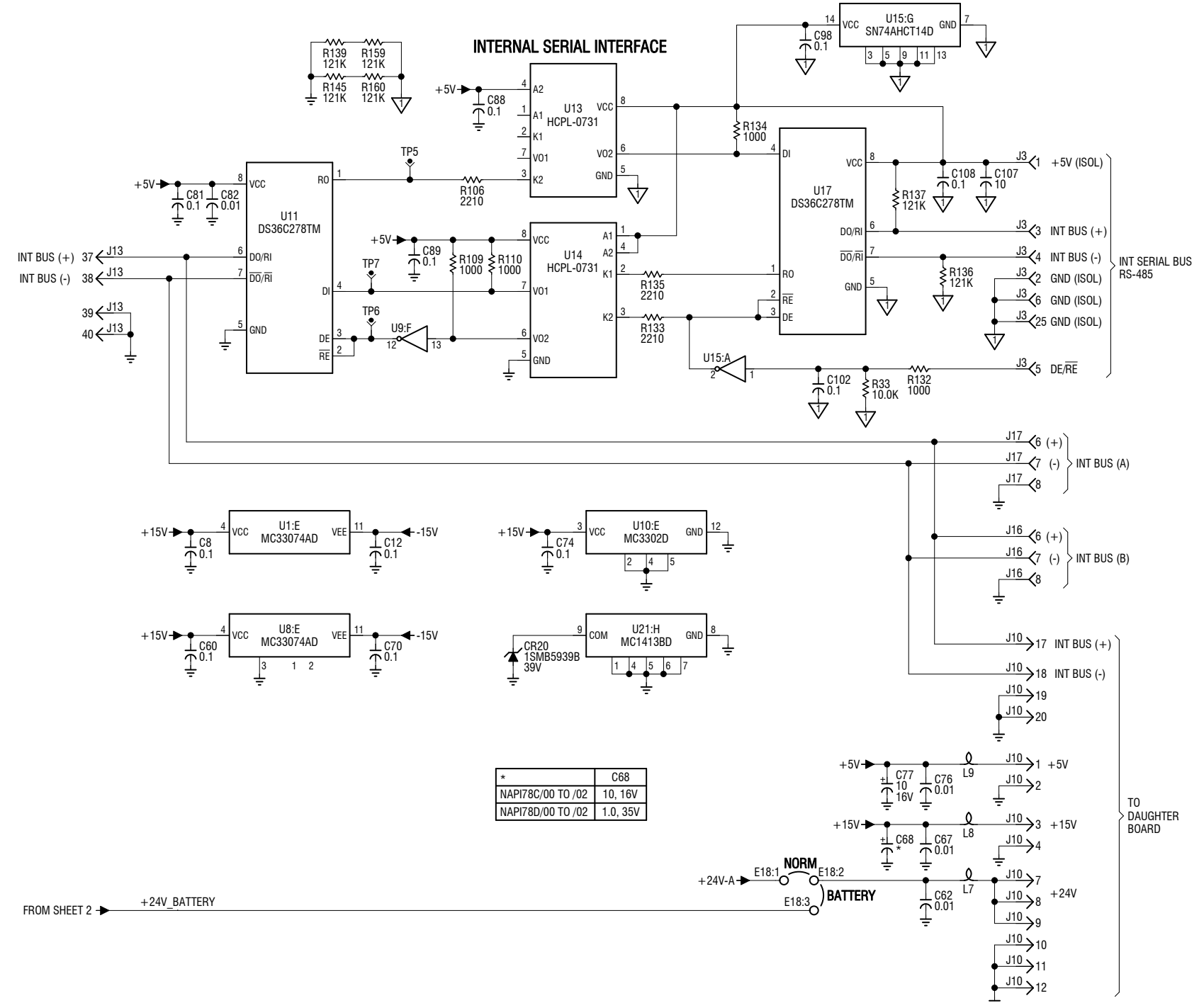


EXTERNAL SERIAL INTERFACE



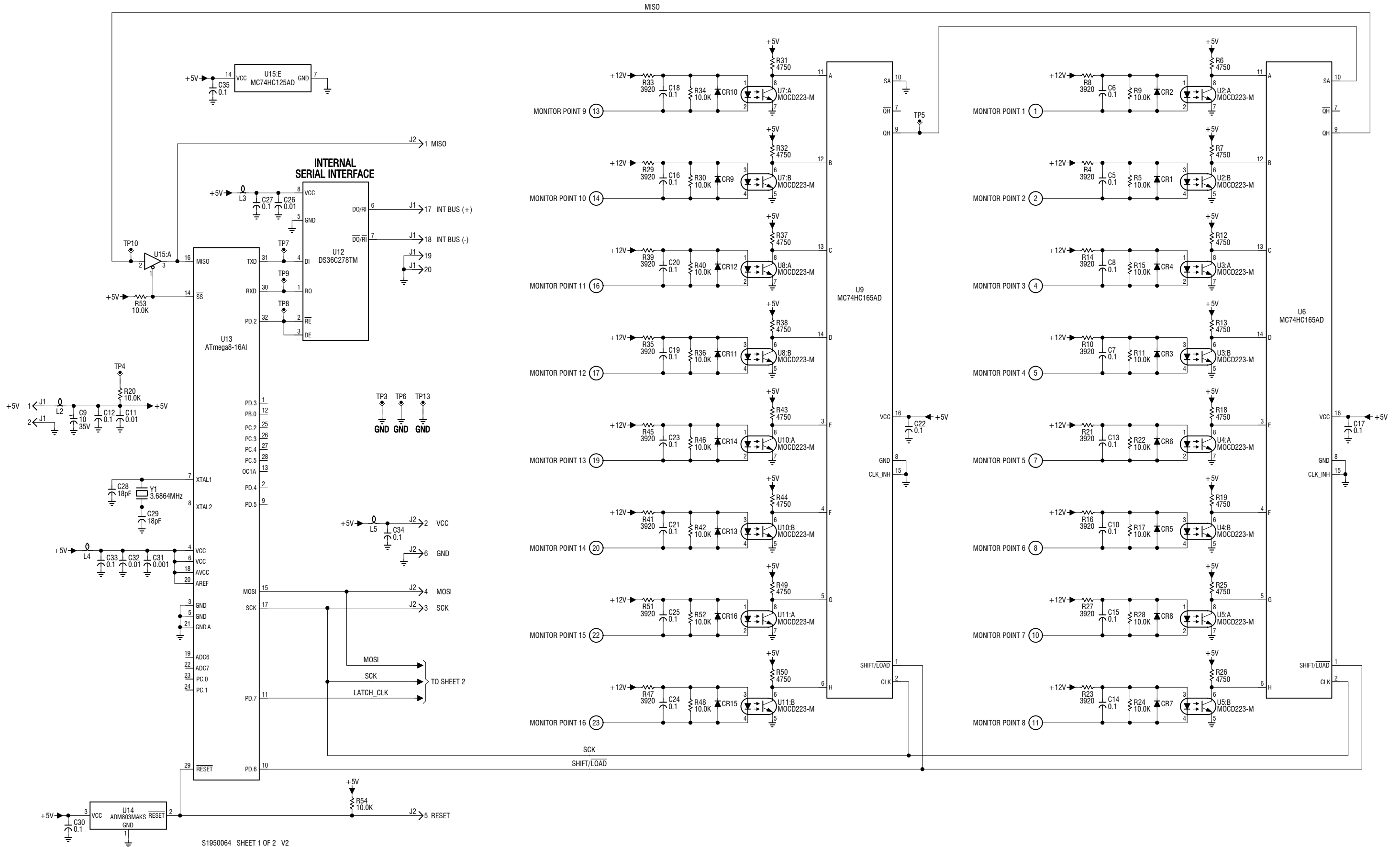
S1950190 SHEET 3 OF 3 V2

INTERNAL SERIAL INTERFACE



Dimensions = mm (inches)



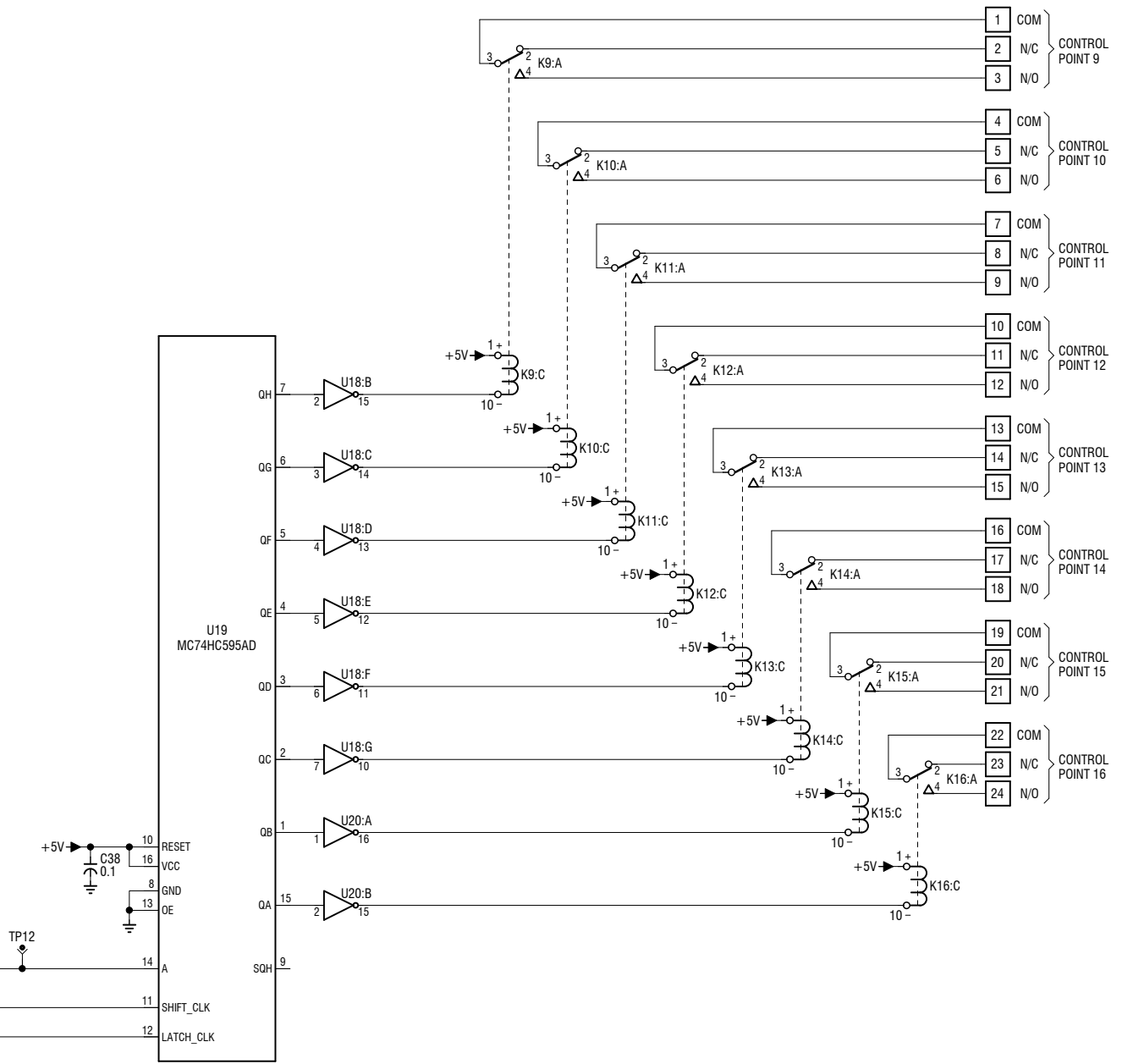
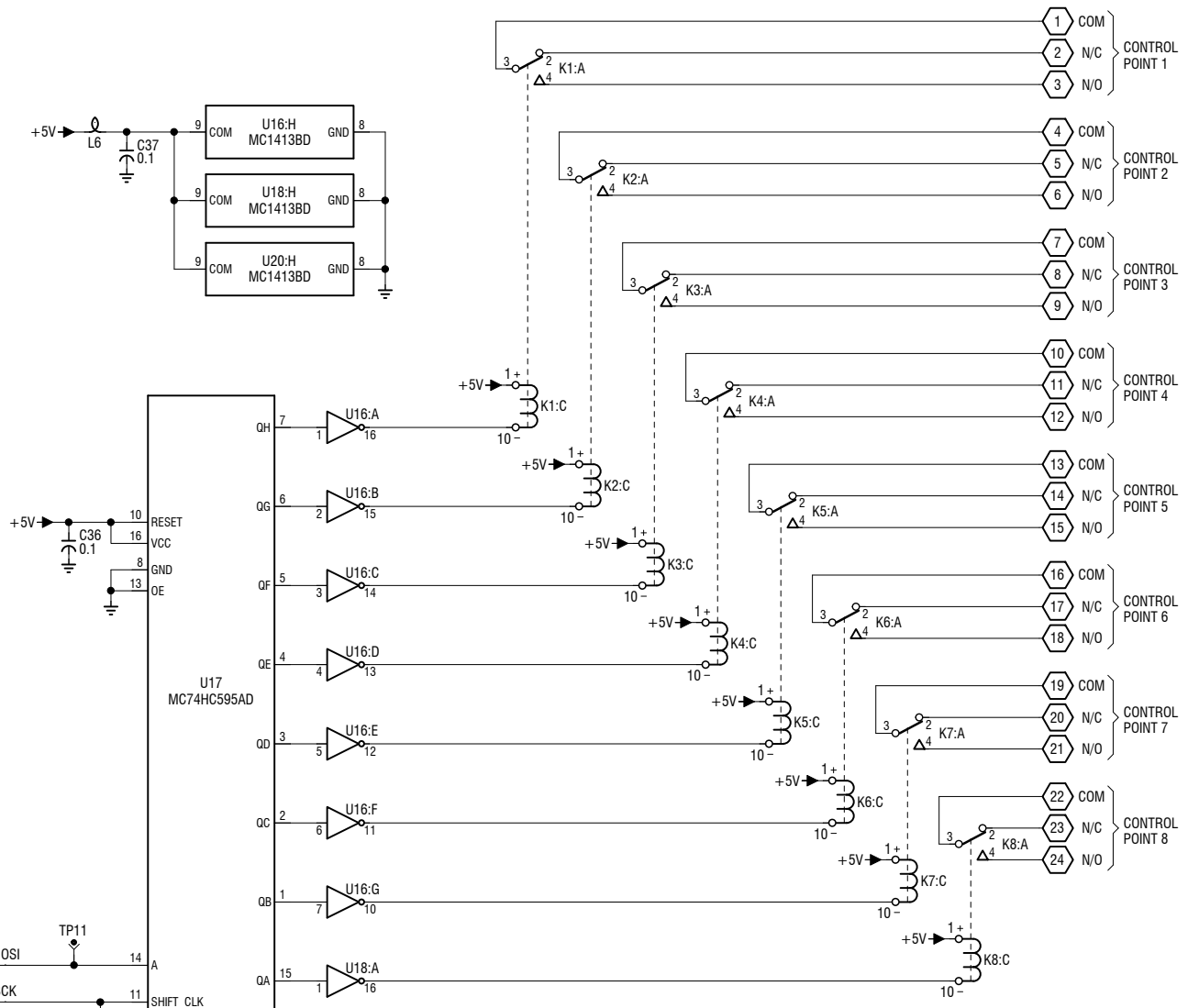
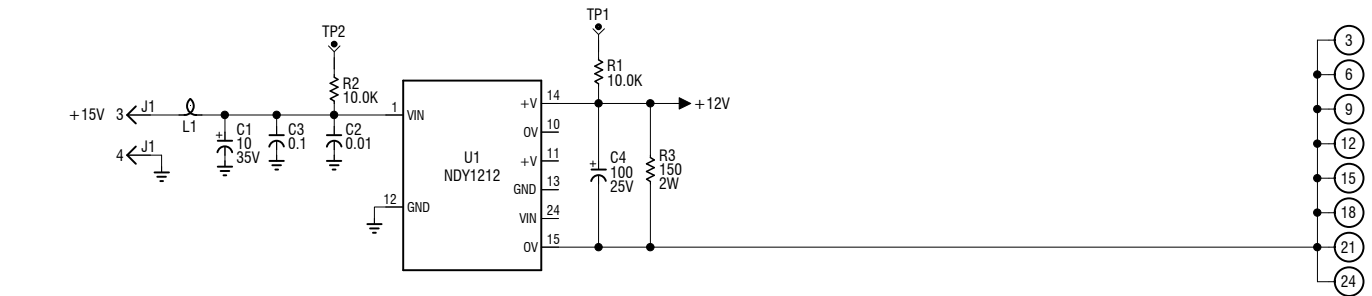


S1950064 SHEET 1 OF 2 V2

Dimensions = mm (inches)

Electrical Schematic - Site Interface PWB (NAPI80), Optional			
Issue 1.8.1	Not to Scale	Figure SD-14	Sheet 1 of 2

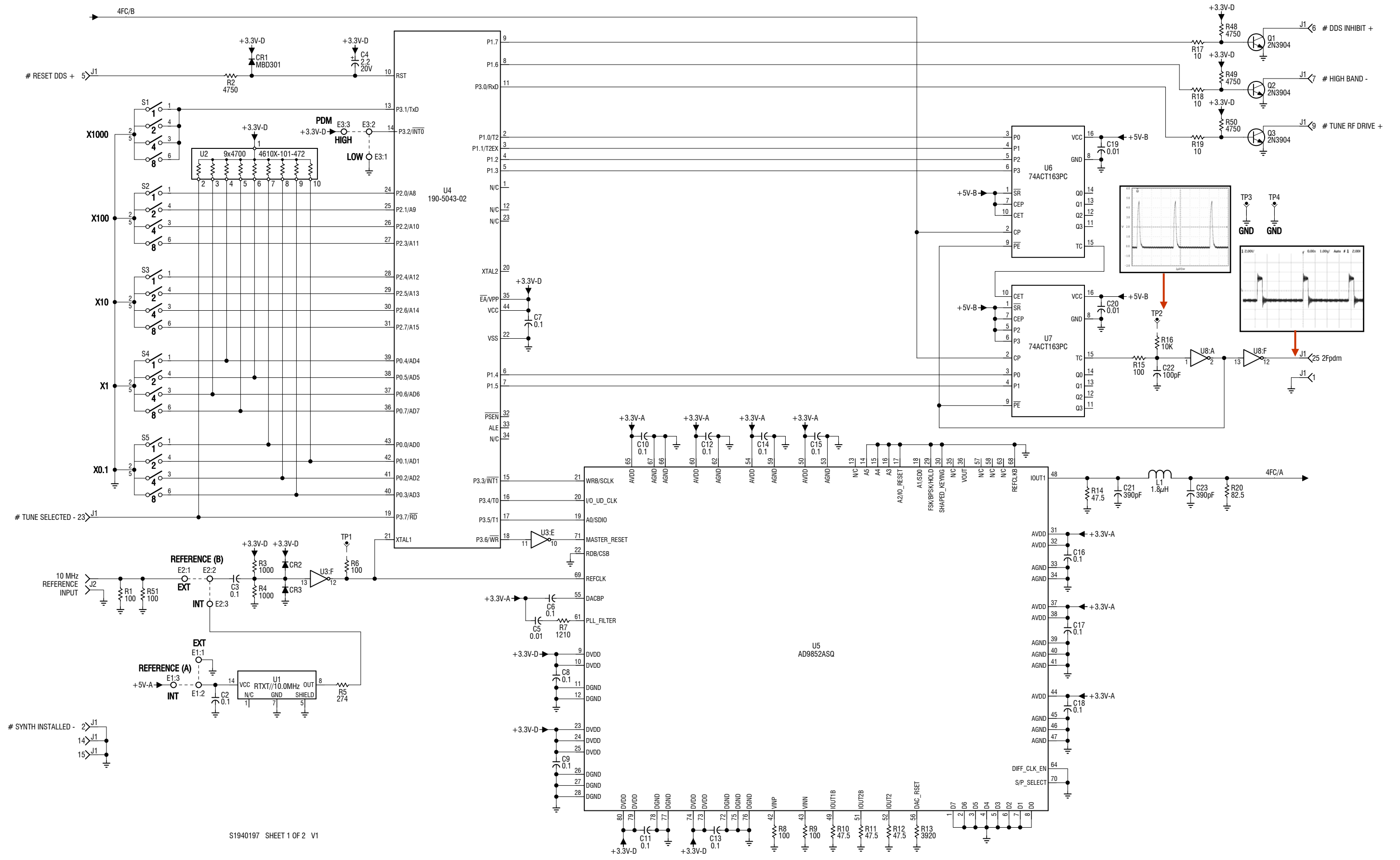




S1950064 SHEET 2 OF 2 V2

Dimensions = mm (inches)



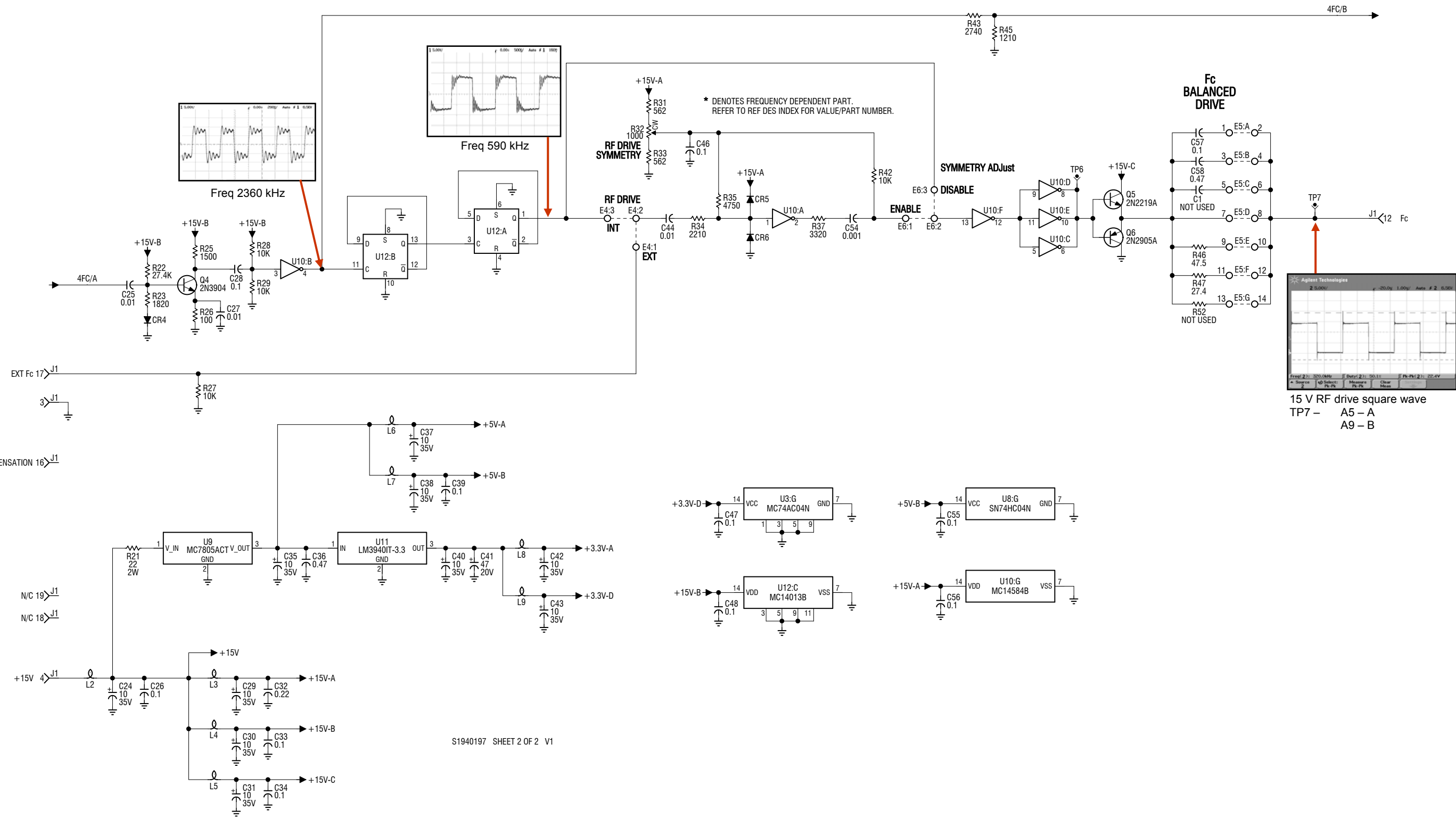


S1940197 SHEET 1 OF 2 V1

Dimensions = mm (inches)

Electrical Schematic - RF Synthesizer PWB (NAPE70C/01)			
Issue 1.8.1	Not to Scale	Figure SD-16	Sheet 1 of 2



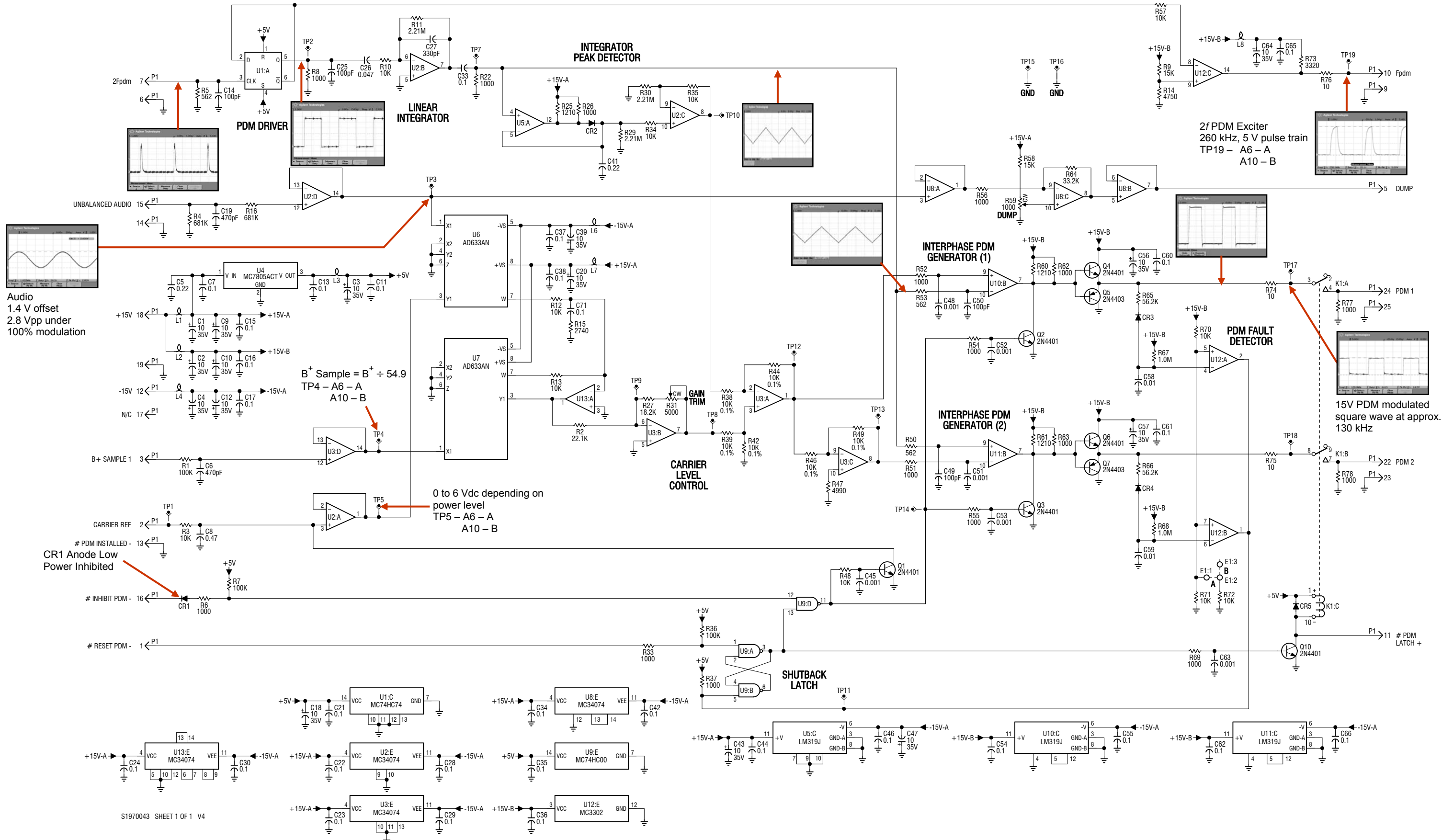


S1940197 SHEET 2 OF 2 V1

Dimensions = mm (inches)

Electrical Schematic - RF Synthesizer PWB (NAPE70C/01)			
Issue 1.8.1	Not to Scale	Figure SD-17	Sheet 2 of 2





Audio
1.4 V offset
2.8 Vpp under
100% modulation

$B^+ \text{ Sample} = B^+ \div 54.9$
TP4 - A6 - A
A10 - B

0 to 6 Vdc depending on
power level
TP5 - A6 - A
A10 - B

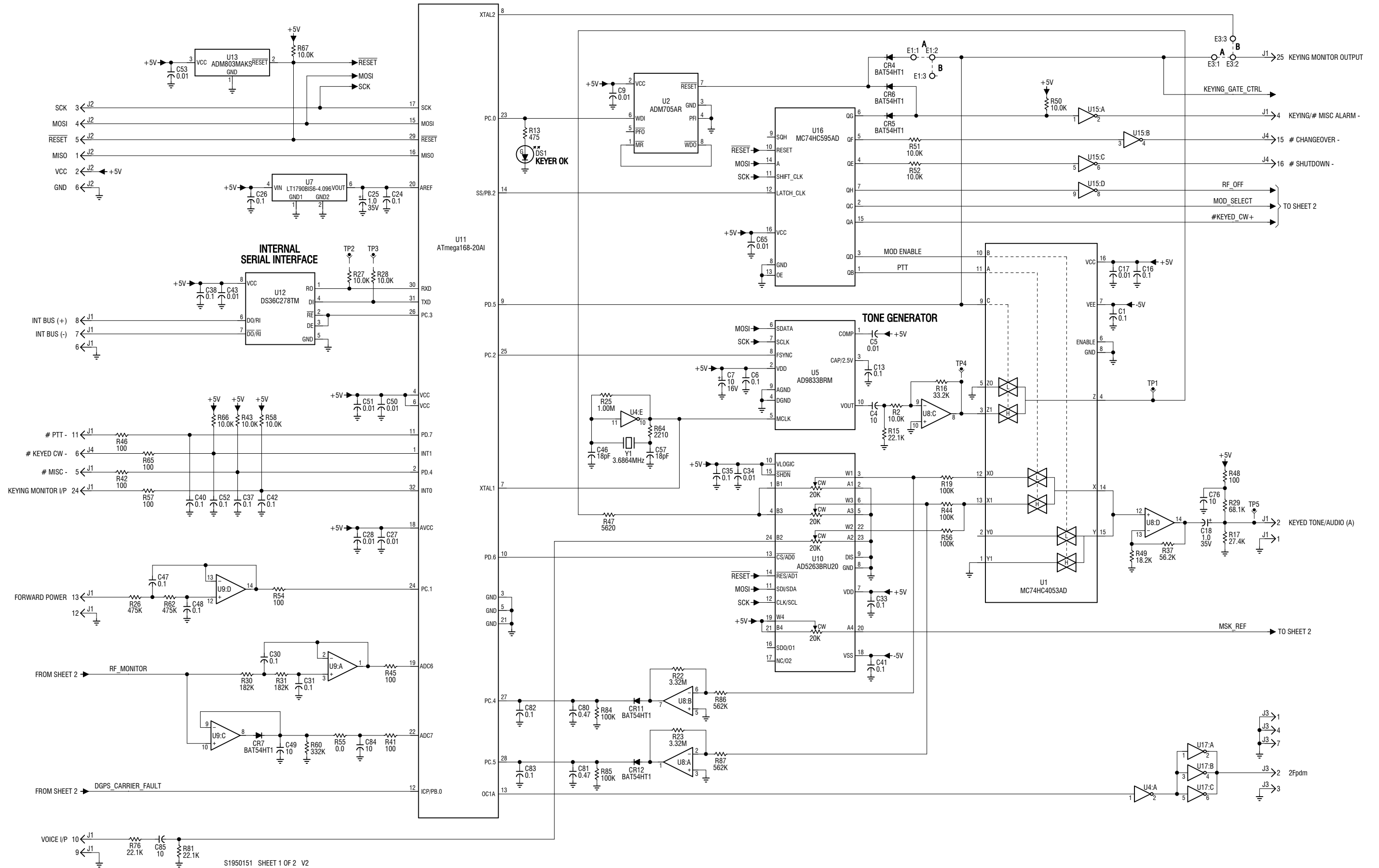
CR1 Anode Low
Power Inhibited

S1970043 SHEET 1 OF 1 V4

Dimensions = mm (inches)

Electrical Schematic - Interphase PDM Driver PWB (NAPM11)			
Issue 1.8.1	Not to Scale	Figure SD-18	Sheet 1 of 1



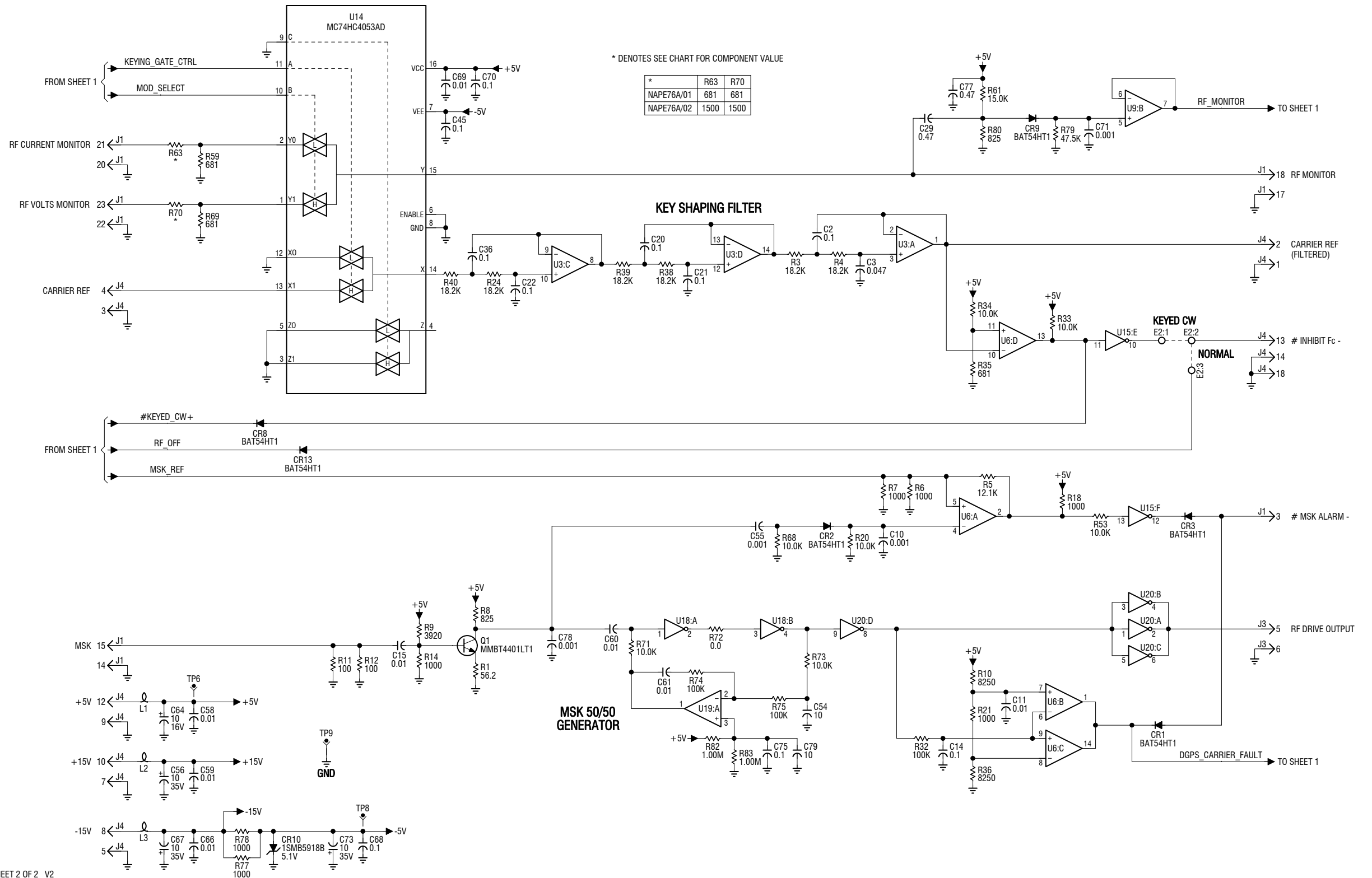


S1950151 SHEET 1 OF 2 V2

Dimensions = mm (inches)

Electrical Schematic - Exciter Monitor/Generator PWB (NAPE76A/03)			
Issue 1.8.1	Not to Scale	Figure SD-19	Sheet 1 of 2

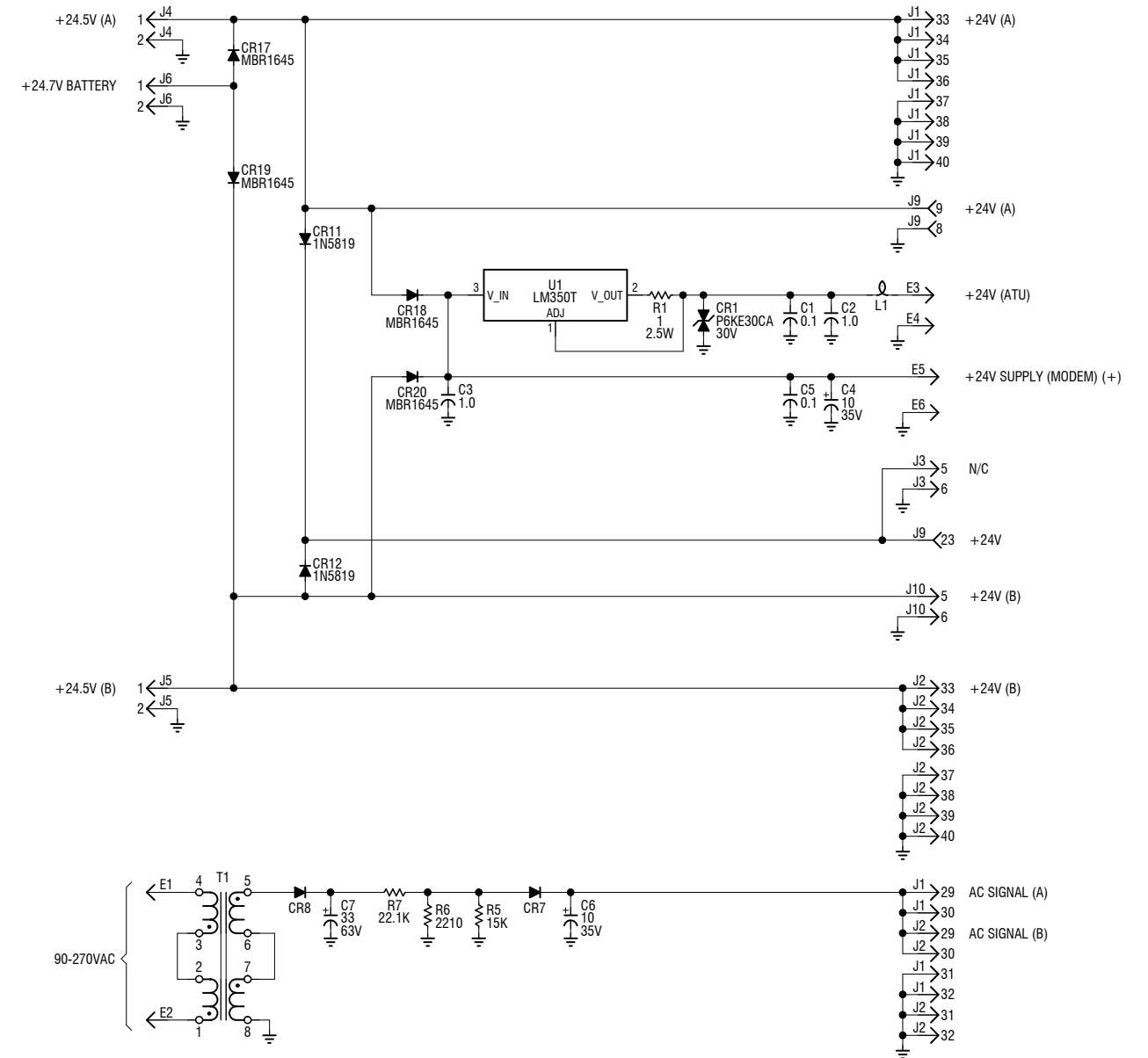
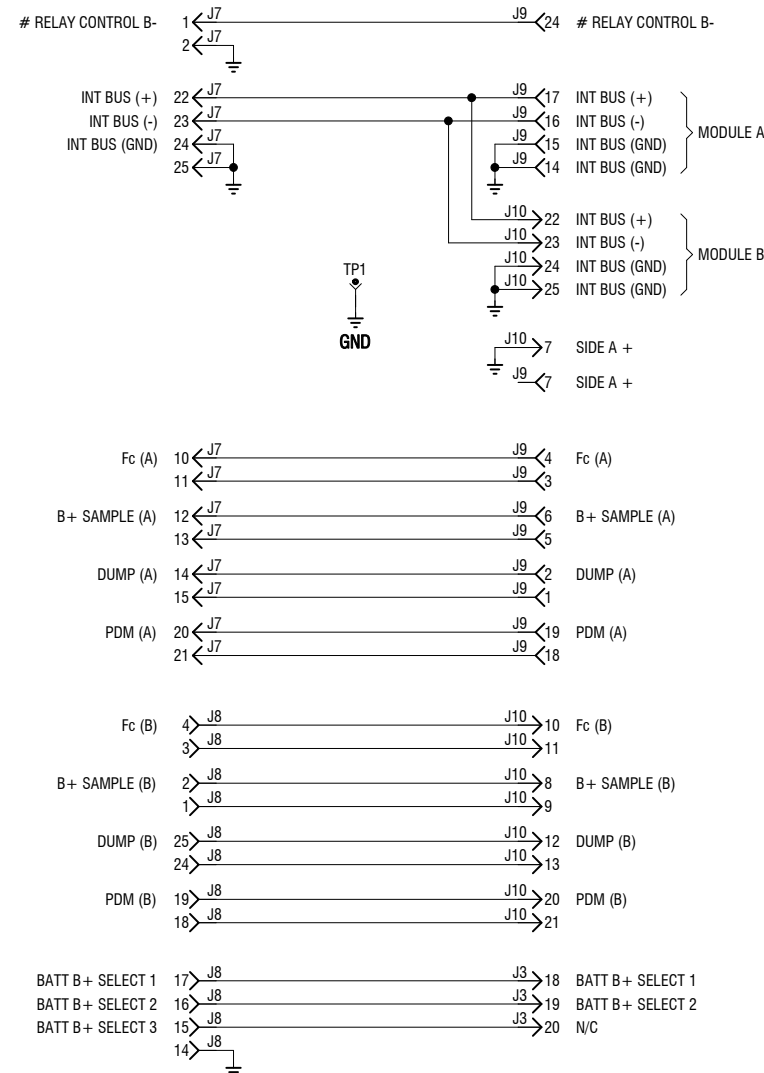
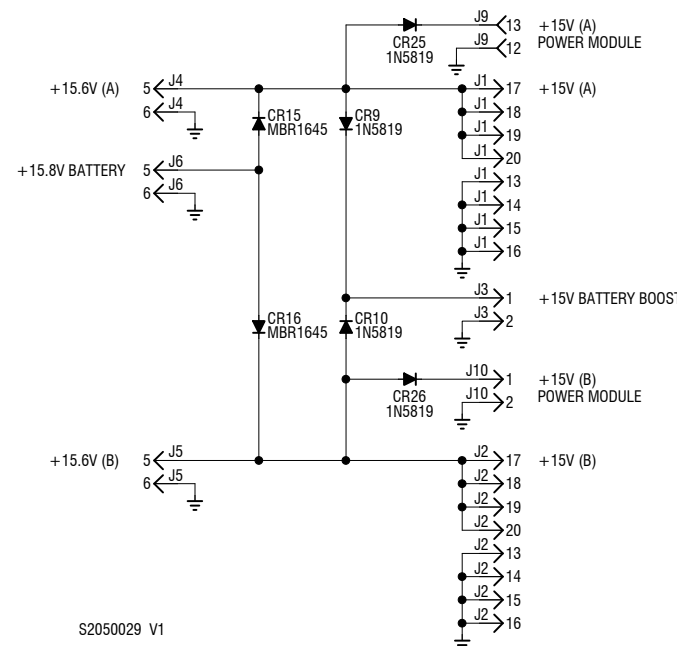
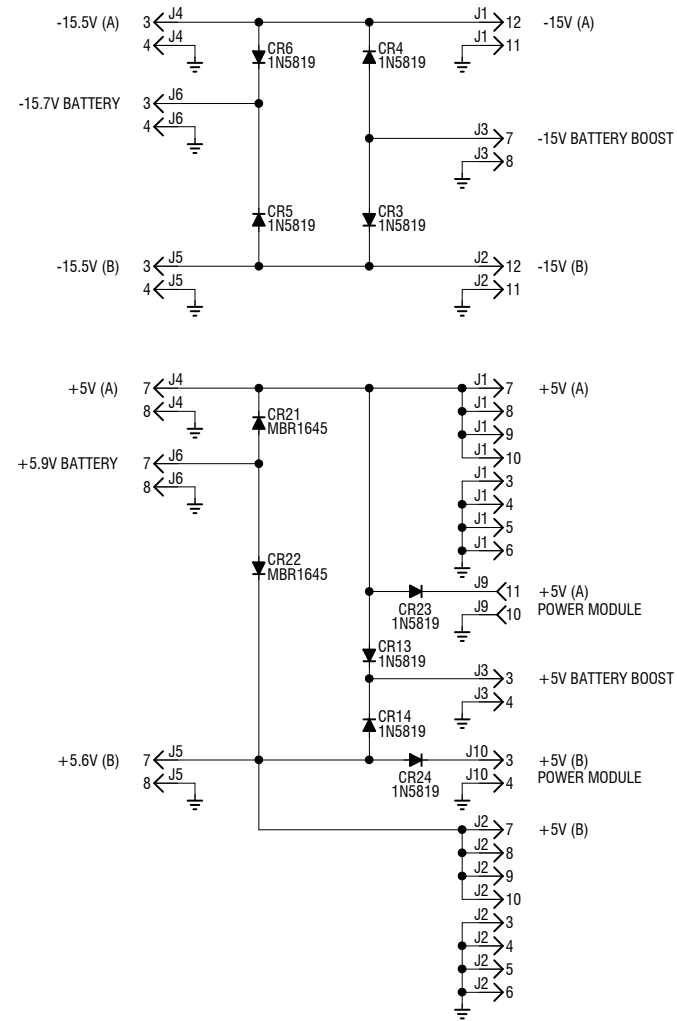




S1950151 SHEET 2 OF 2 V2

Dimensions = mm (inches)

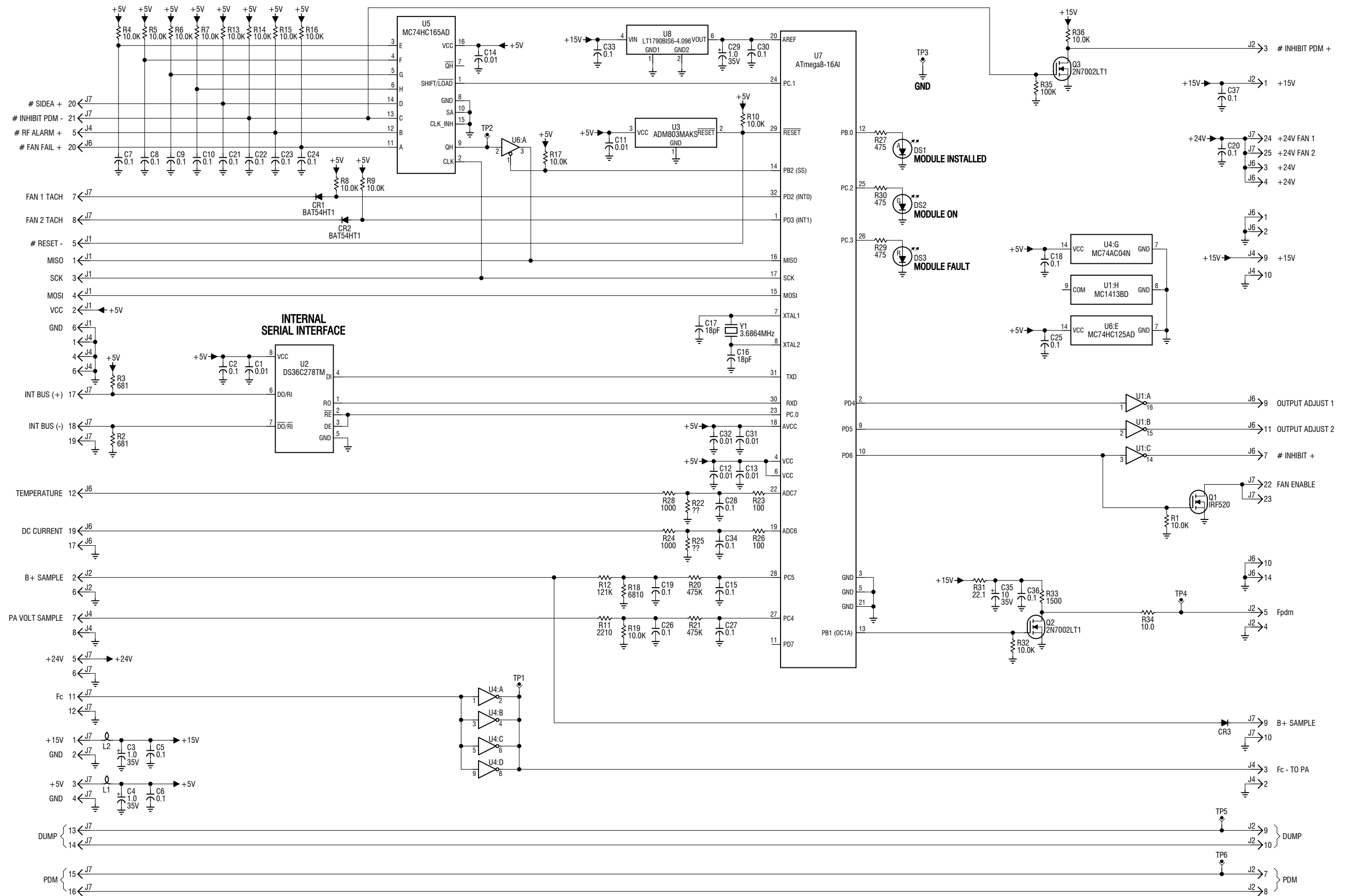




S2050029 V1

Dimensions = mm (inches)



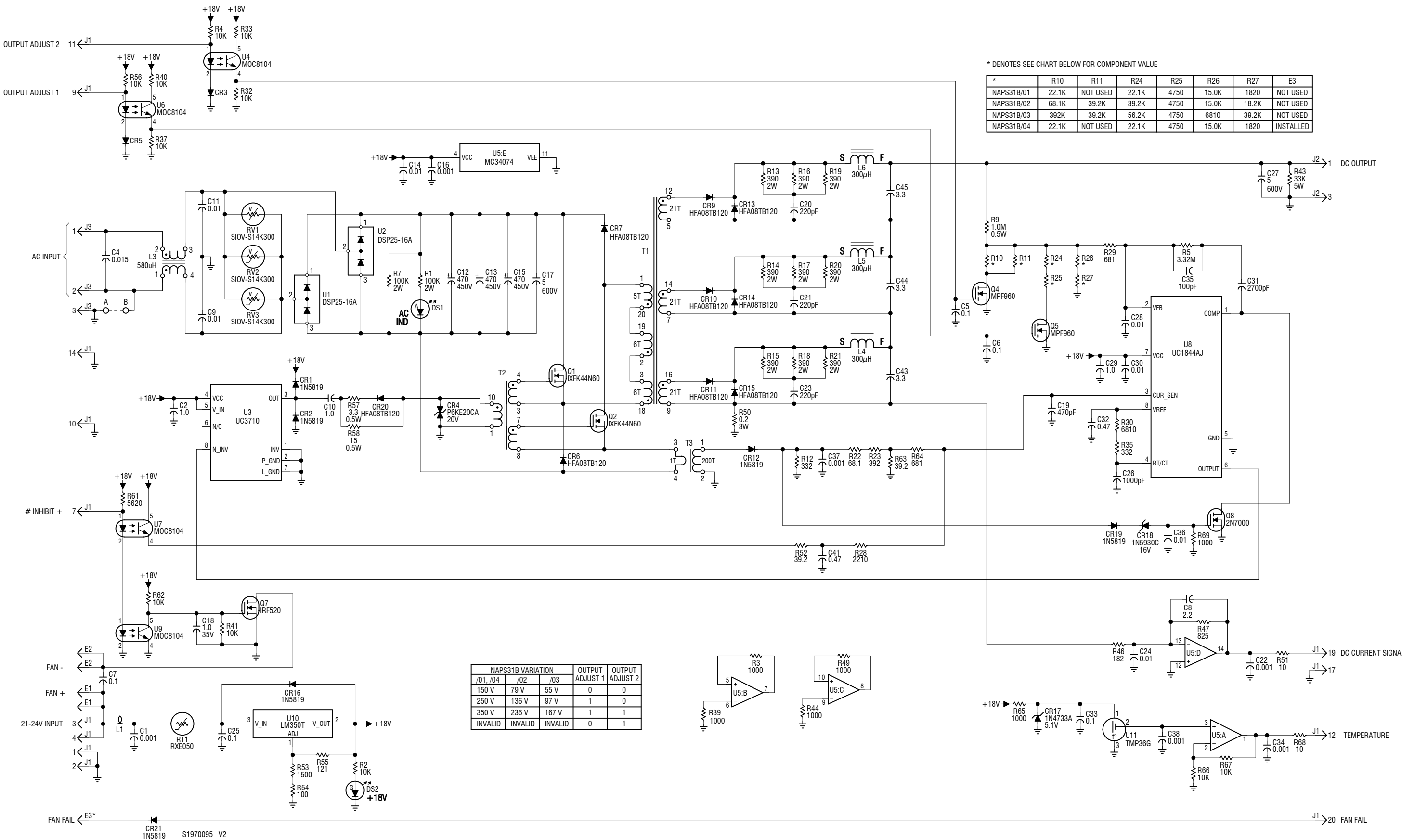


S2050004 V3

Dimensions = mm (inches)



Electrical Schematic - Power Module Control/Interface (NAPC151A)			
Issue 1.8.1	Not to Scale	Figure SD-23	Sheet 1 of 1



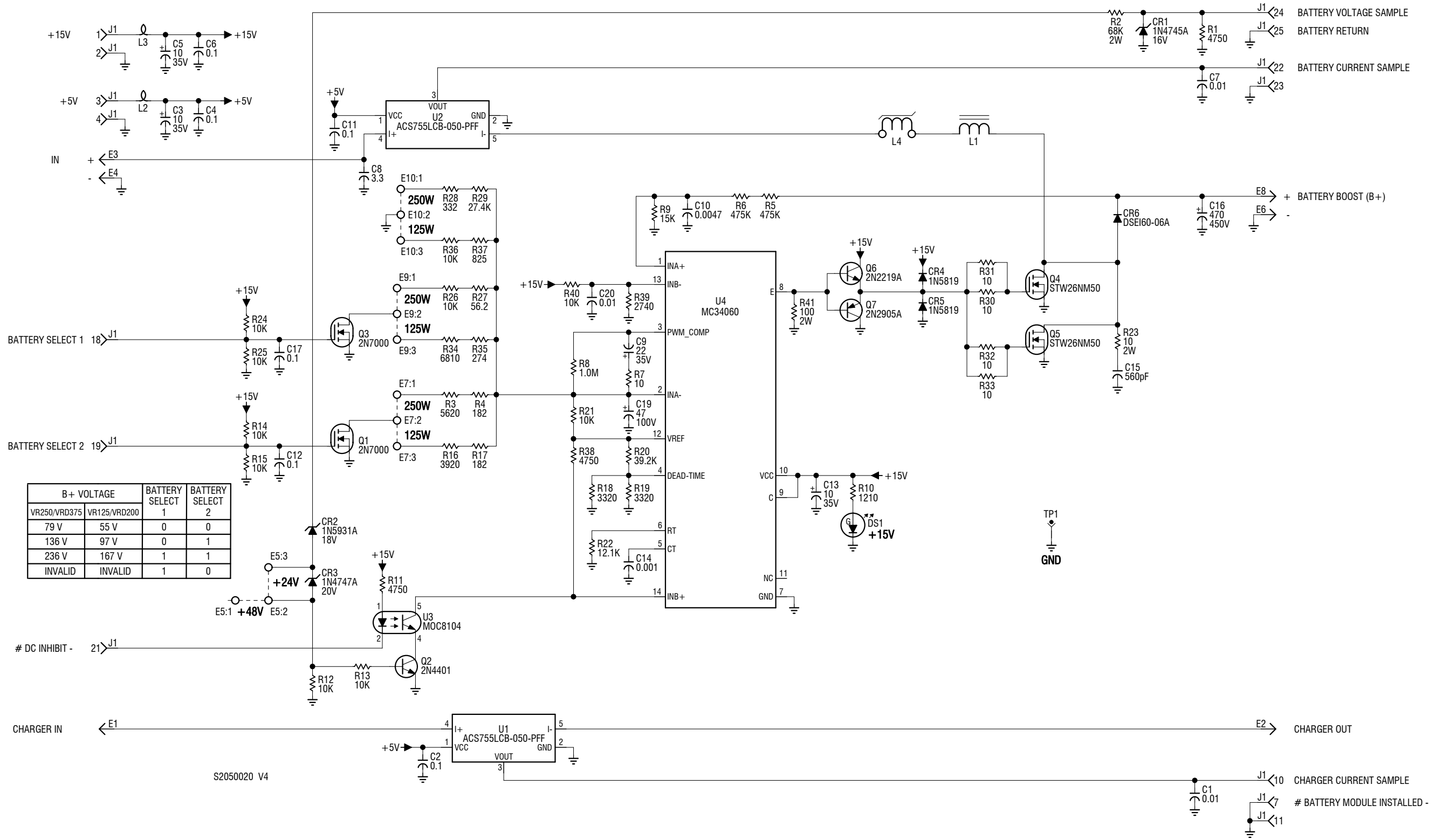
* DENOTES SEE CHART BELOW FOR COMPONENT VALUE

*	R10	R11	R24	R25	R26	R27	E3
NAPS31B/01	22.1K	NOT USED	22.1K	4750	15.0K	1820	NOT USED
NAPS31B/02	68.1K	39.2K	39.2K	4750	15.0K	18.2K	NOT USED
NAPS31B/03	39.2K	39.2K	56.2K	4750	6810	39.2K	NOT USED
NAPS31B/04	22.1K	NOT USED	22.1K	4750	15.0K	1820	INSTALLED

NAPS31B VARIATION			OUTPUT ADJUST 1	OUTPUT ADJUST 2
/01, /04	/02	/03		
150 V	79 V	55 V	0	0
250 V	136 V	97 V	1	0
350 V	236 V	167 V	1	1
INVALID	INVALID	INVALID	0	1

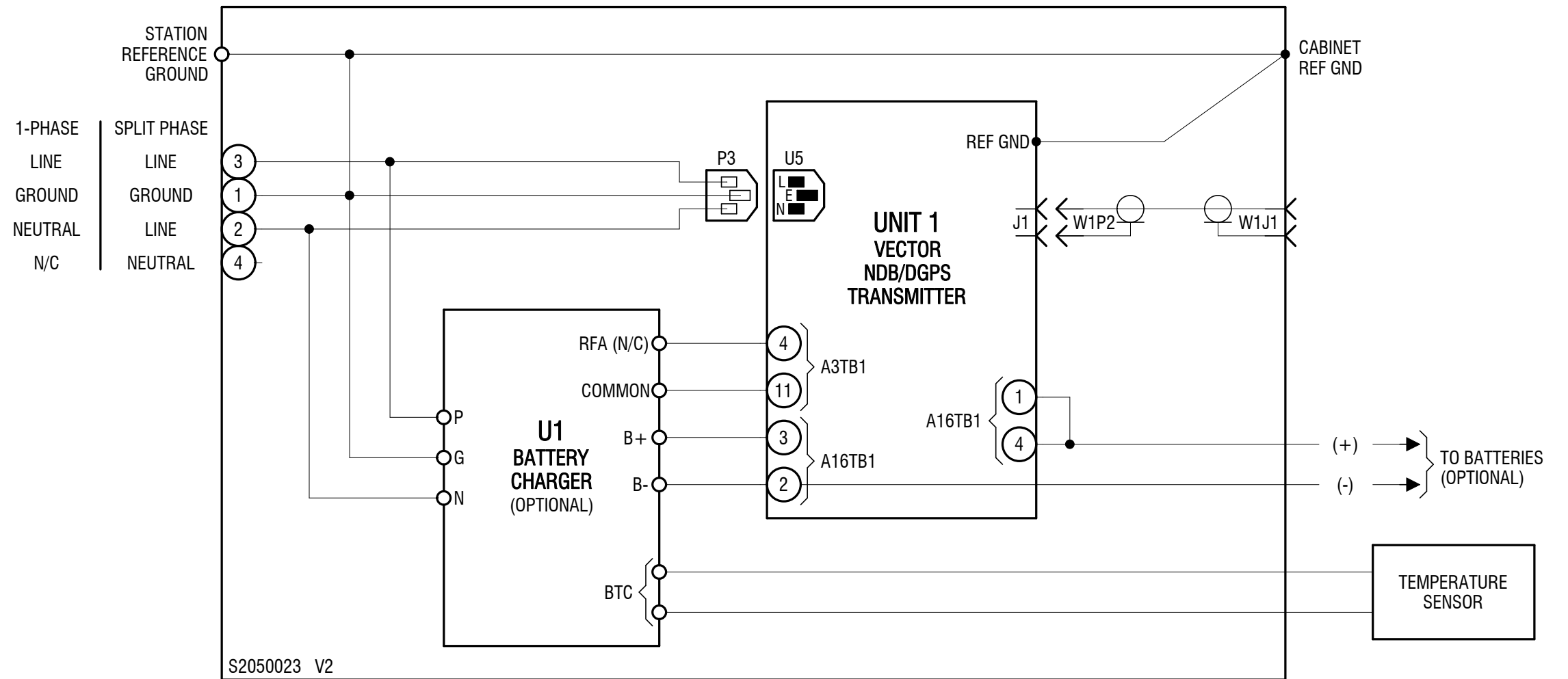
Dimensions = mm (inches)





Dimensions = mm (inches)





Dimensions = mm (inches)

Electrical Schematic - Vector-LP in Deluxe Cabinet (205-8075, Optional)

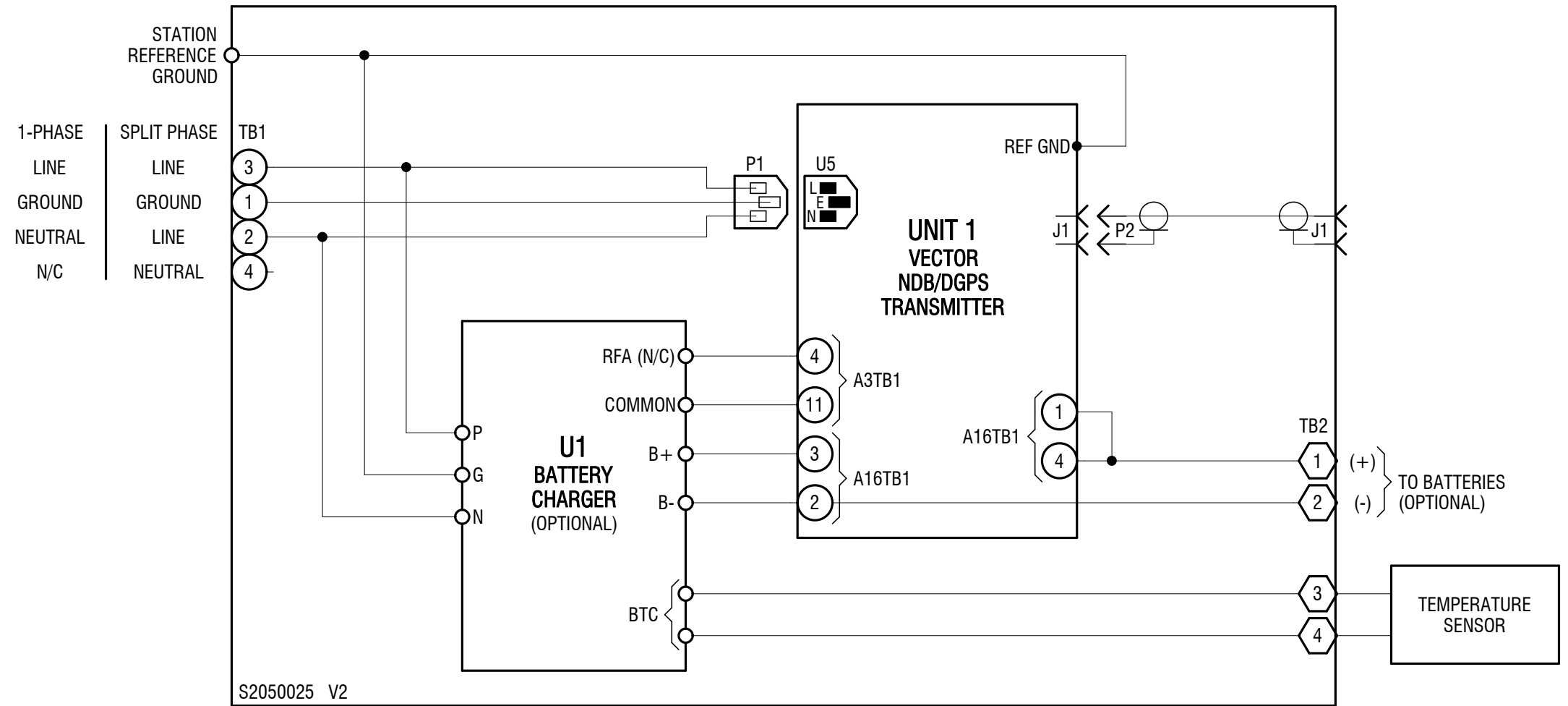
Issue 1.8.1

Not to Scale

Figure SD-26

Sheet 1 of 1

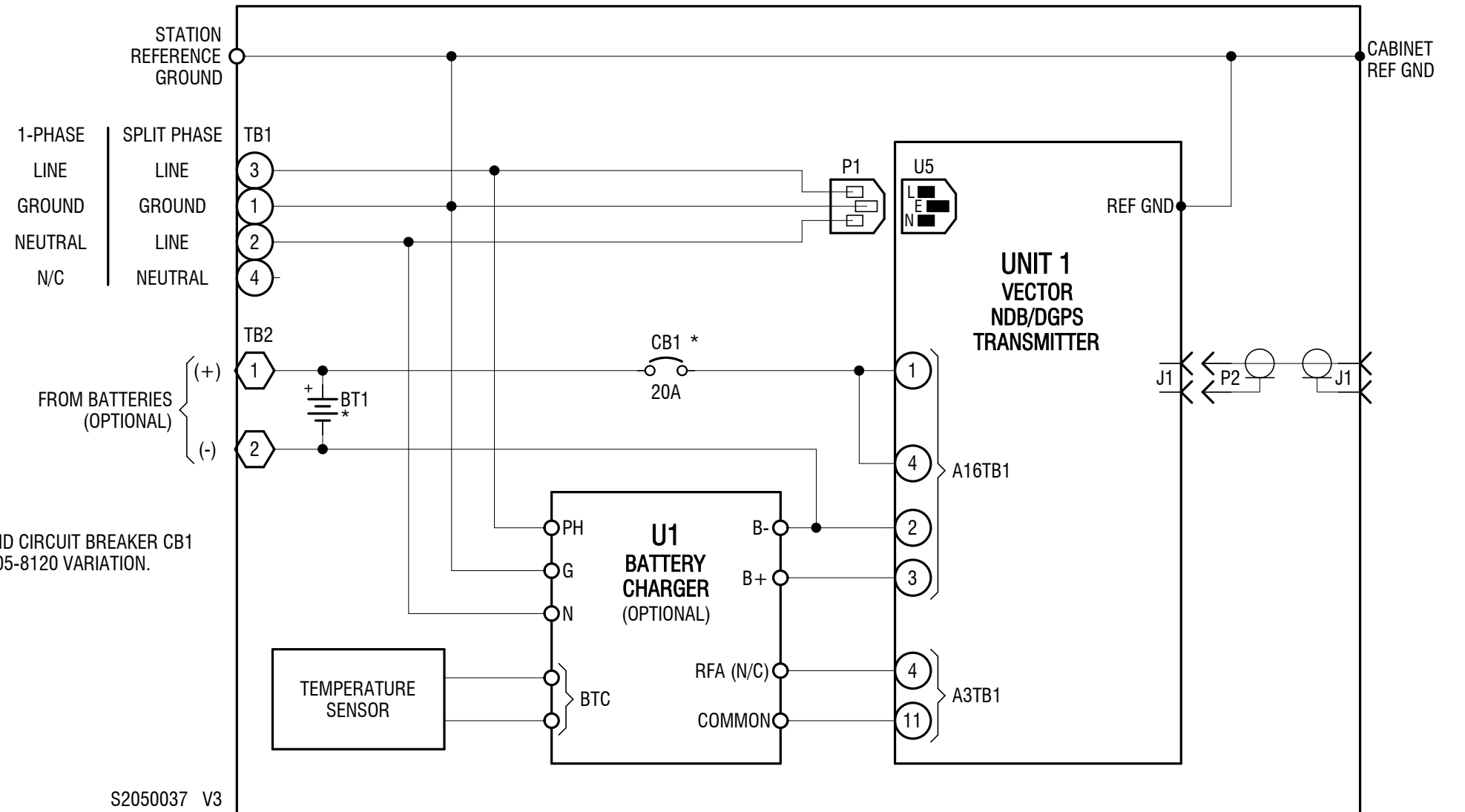




Dimensions = mm (inches)

Electrical Schematic - Vector-LP in IP66 Cabinet (205-8080, Optional)			
Issue 1.8.1	Not to Scale	Figure SD-27	Sheet 1 of 1





* DENOTES BATTERY AND CIRCUIT BREAKER CB1 INSTALLED ONLY IN 205-8120 VARIATION.

Dimensions = mm (inches)

Electrical Schematic - Vector-LP in Short Cabinet [205-8120 (with battery) or 205-8120-01 (no battery), Optional]

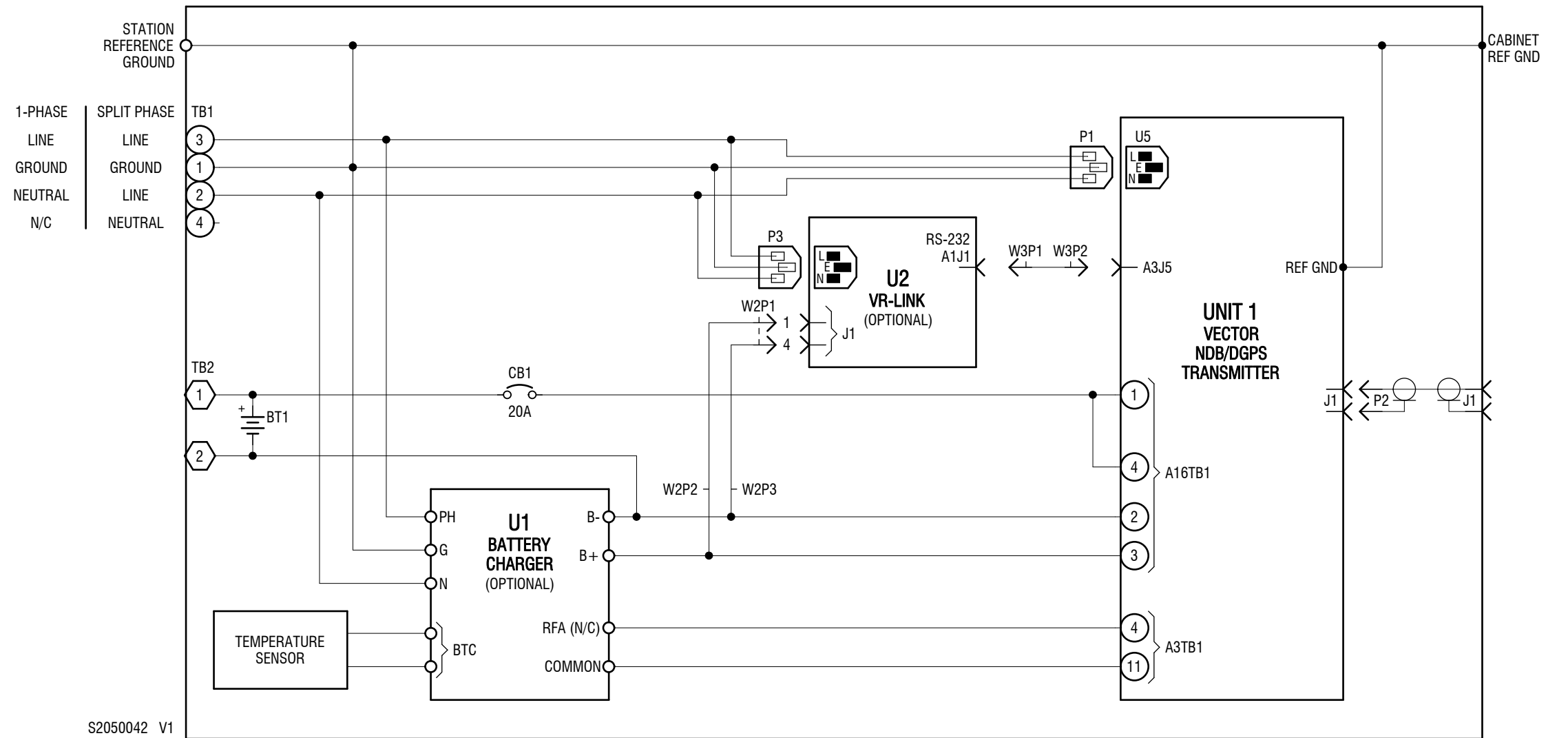
Issue 1.8.1

Not to Scale

Figure SD-28

Sheet 1 of 1





S2050042 V1

Dimensions = mm (inches)

Electrical Schematic - Vector-LP in Tall Cabinet (205-8200), Optional]			
Issue 1.8.1	Not to Scale	Figure SD-29	Sheet 1 of 1



Vector-LP Radio Beacon Transmitter

TECHNICAL INSTRUCTION MANUAL

Section 10 **MECHANICAL DRAWINGS**

10.1 INTRODUCTION

This section contains mechanical drawings for assemblies of the subject equipment. Dimensional drawings may be included. Refer to Table 10-1 for an itemized list. Assembly detail drawings for assemblies/modules that have separate maintenance manuals are not included. Refer to the appropriate maintenance manual for the assembly detail of these assemblies.

10.2 LOCATING ASSEMBLY DETAIL DRAWINGS

Each illustration in this section is identified by a number that is both the figure number and the page number. The numbers are assigned sequentially and are prefixed by the letters 'MD-'. Drawings in this section are listed in Table 10-1.

10.3 CONTENT OF MECHANICAL DRAWINGS

Mechanical drawings are illustrations that depict the location of electrical components and show assembly outline detail. Dimensional information is included, where appropriate.

When a module/assembly is the subject of its own assembly detail drawing and it is also shown in a higher level assembly, the detail depicted in the higher level assembly may have minor differences from the module/assembly actually installed. In this case, always refer to the assembly detail drawing of the module/assembly for detailed information.

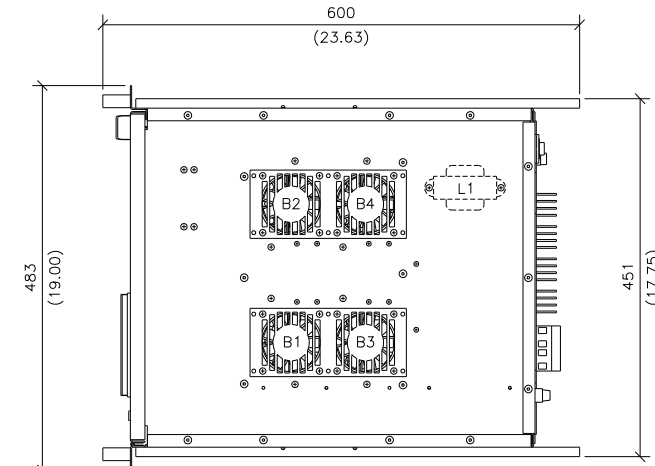
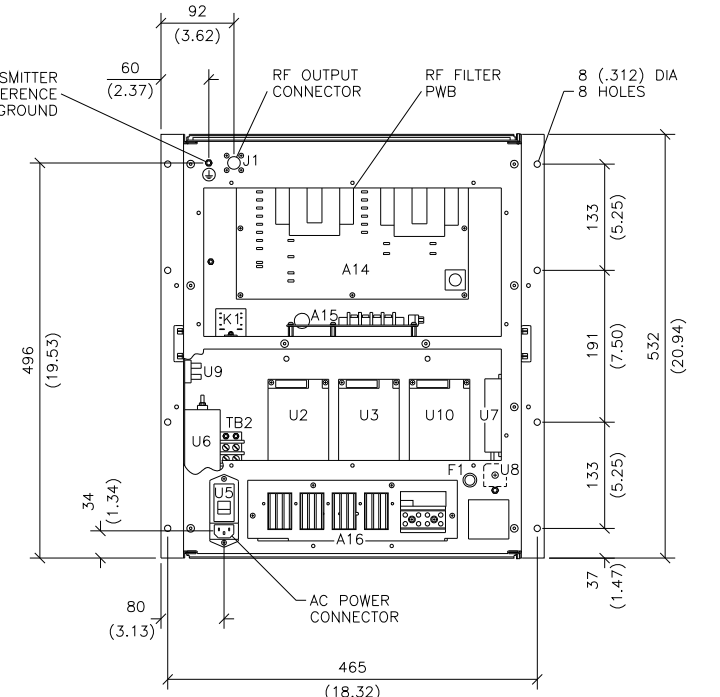
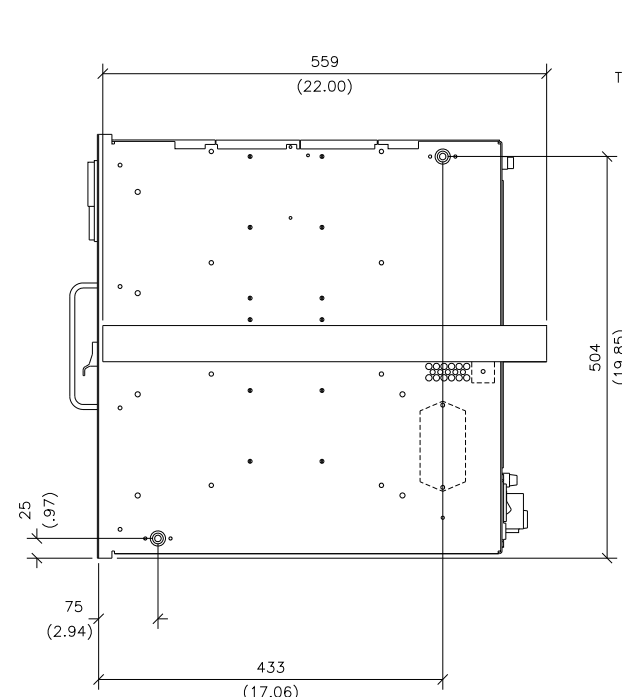
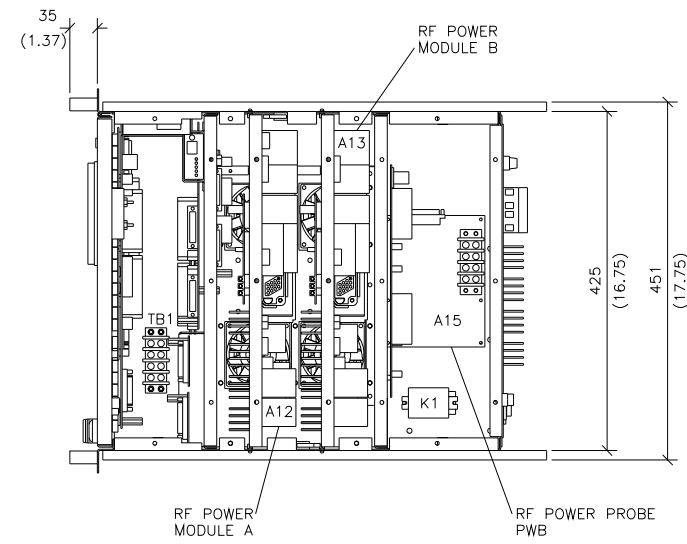
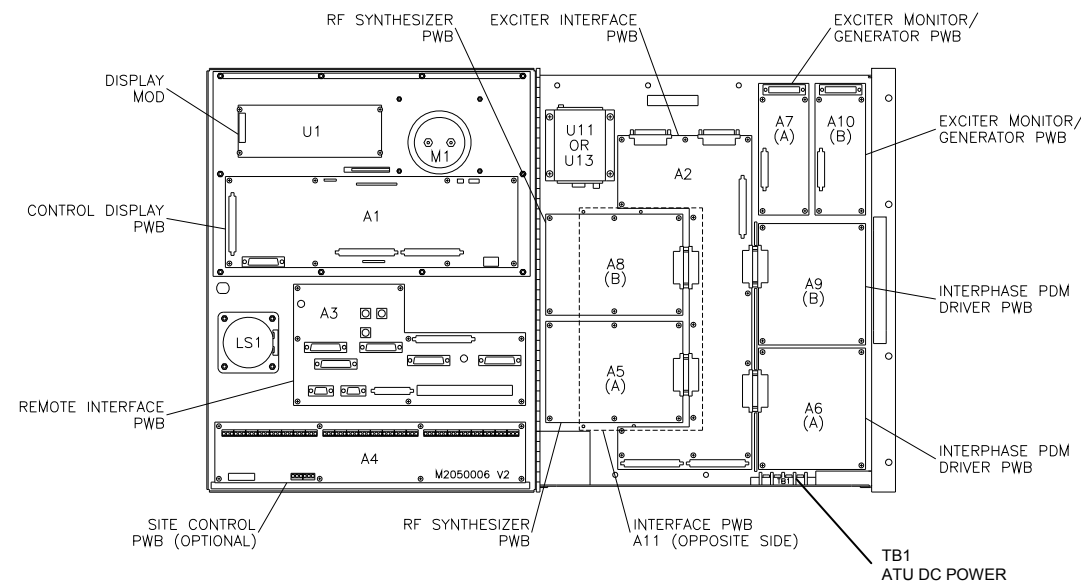


Table 10-1: Mechanical Drawings

Figure #	Description
MD-1A	Assembly Detail and Dimensional Information – Vector-LP Transmitter
MD-1B	Assembly Detail and Dimensional Information – Vector-LP Transmitter (Installed in a Deluxe Cabinet)
MD-1C	Assembly Detail and Dimensional Information – Vector-LP Transmitter (Installed in an IP66 Cabinet)
MD-1D	Assembly Detail and Dimensional Information – Vector-LP Transmitter (Installed in a Short Cabinet)
MD-1E	Assembly Detail and Dimensional Information – Vector-LP Transmitter (Installed in a Tall Cabinet)
MD-2	Assembly Detail – NAPC147D Control/Display PWB
MD-3	Assembly Detail – NAPI76A/02 Exciter Interface PWB
MD-4	Assembly Detail – NAPI78D/02 Remote Interface PWB
MD-5	Assembly Detail – NAPI80 Site Interface PWB (Optional)
MD-6	Assembly Detail – NAPE70C/01 RF Synthesizer PWB
MD-7	Assembly Detail – NAPM11 Interphase PDM Driver PWB
MD-8	Assembly Detail – NAPE76A/03 Exciter Monitor/Generator PWB
MD-9	Assembly Detail – NAPI94A Interface PWB
MD-10	Assembly Detail – NAP35B/01 RF Power Module
MD-11	Assembly Detail – NAPC151A Control/Interface PWB
MD-12	Assembly Detail – NAPS31B/03 Switch Mode Power Supply PWB
MD-13	Assembly Detail – NAAA06 Power Amplifier
MD-14	Assembly Detail – NAPF06A Modulator Filter PWB
MD-15	Assembly Detail – NASM11A/01 Modulator Assembly
MD-16	Assembly Detail – NAPF05A RF Filter PWB (Standard Frequency Band)
MD-17	Assembly Detail – NAPF07C/01 RF Power Probe
MD-18	Assembly Detail – 205-8035 Battery Boost Assembly (Optional)
MD-19	Assembly Detail – NAPS35 Battery Boost PWB (Optional)



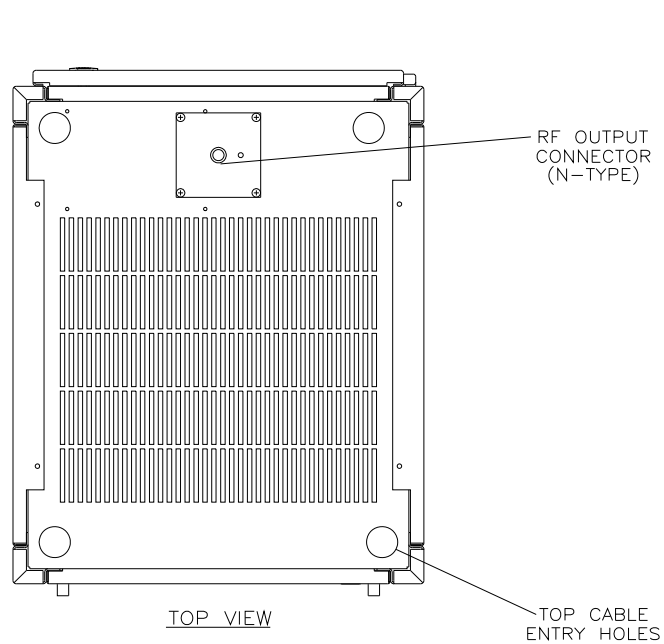
ALL DIMENSIONS ARE IN mm
(inches)



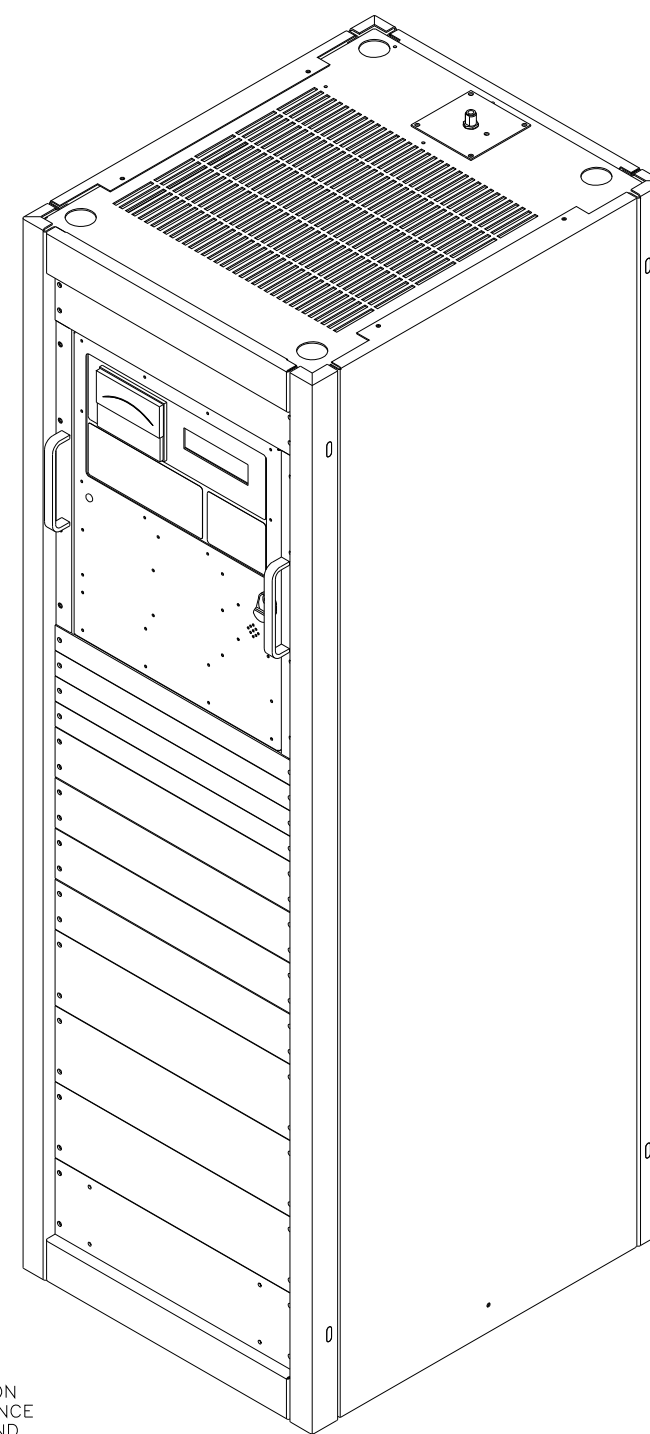
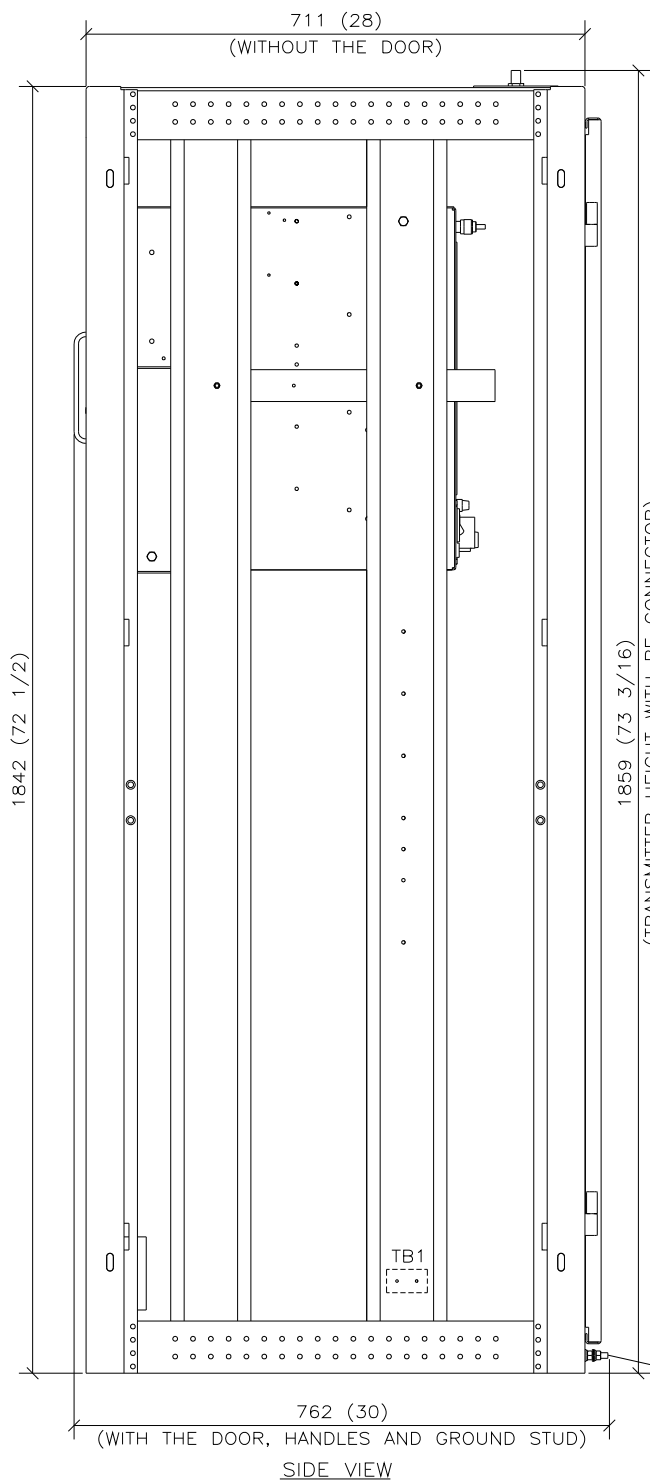
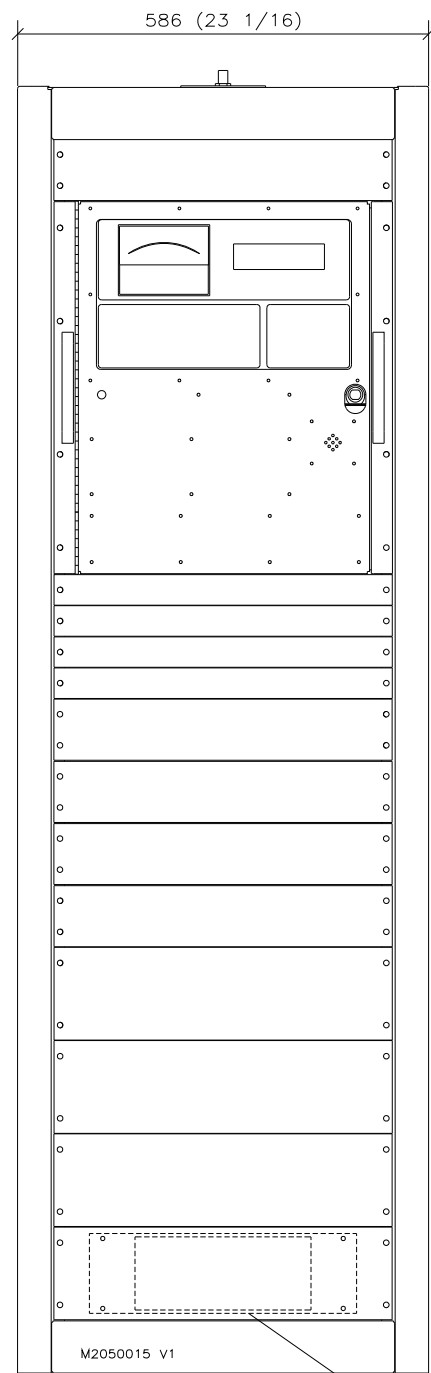
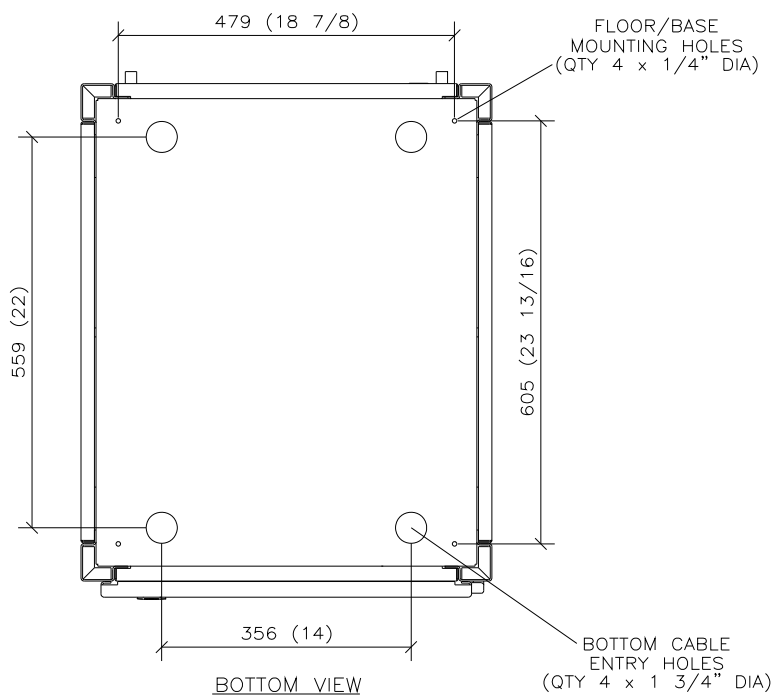
Dimensions = mm (inches)

Assembly Detail and Dimensional Information- Vector-LP Transmitter			
Issue 1.8.1	Not to Scale	Figure MD-1A	Sheet 1 of 1





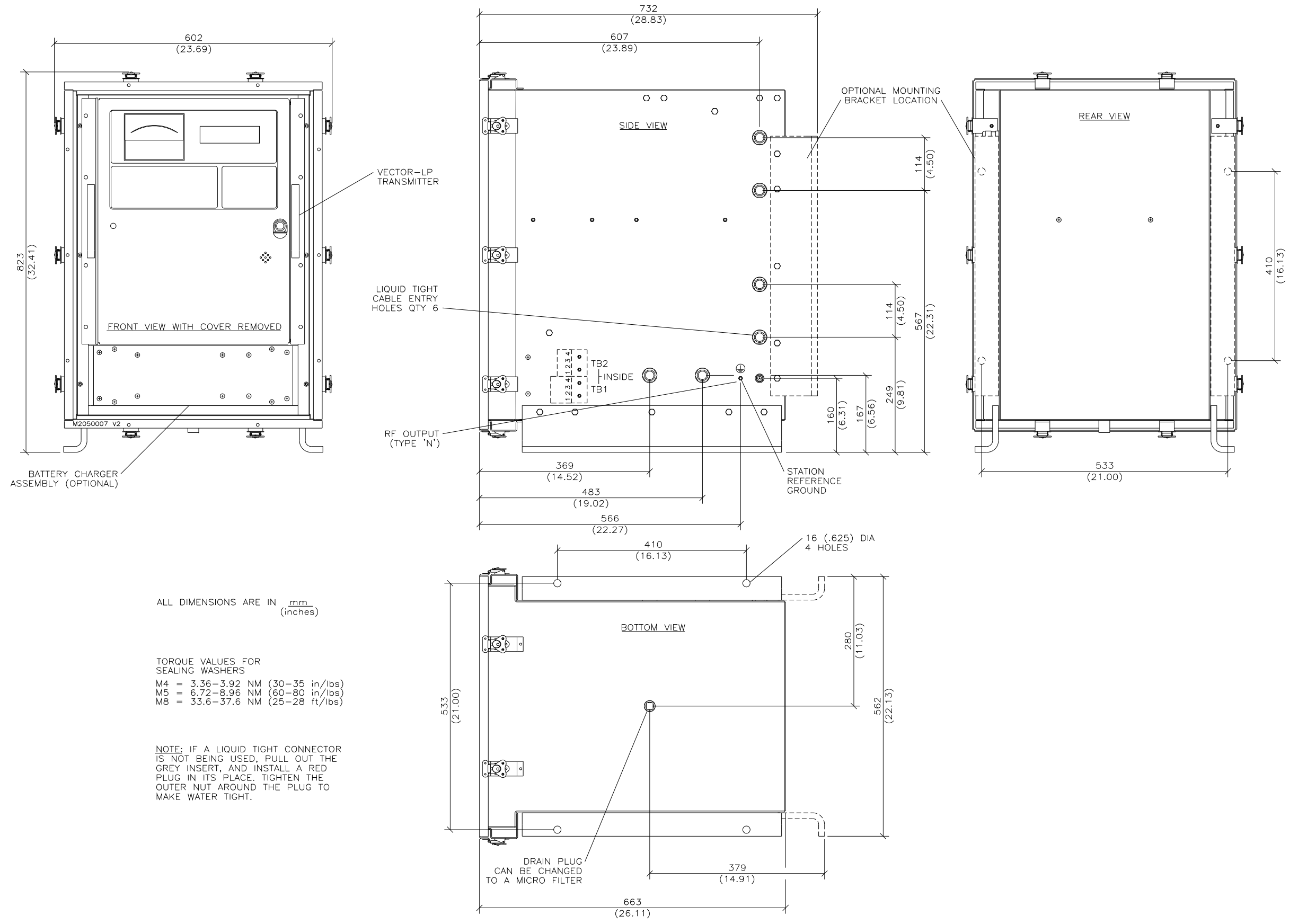
ALL DIMENSIONS ARE IN MM (INCHES)



Dimensions = mm (inches)

Assembly Detail and Dimensional Information- Vector-LP Transmitter (Installed in a Deluxe Cabinet)			
Issue 1.8.1	Not to Scale	Figure MD-1B	Sheet 1 of 1





ALL DIMENSIONS ARE IN $\frac{\text{mm}}{\text{(inches)}}$

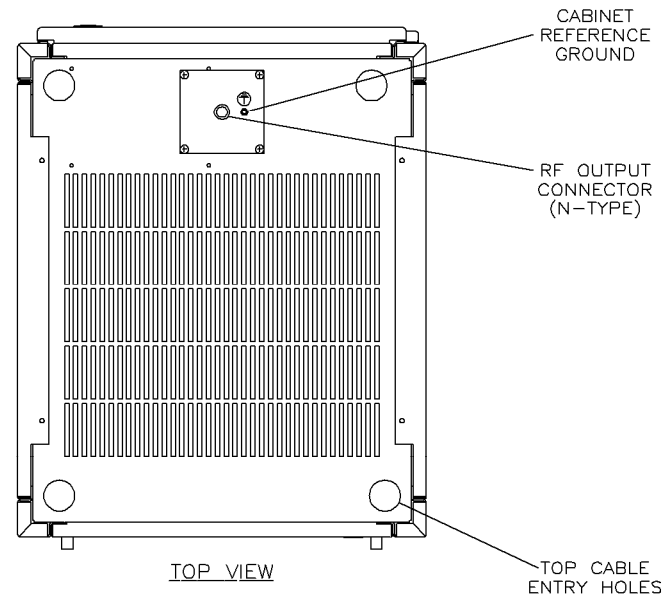
TORQUE VALUES FOR SEALING WASHERS
M4 = 3.36-3.92 NM (30-35 in/lbs)
M5 = 6.72-8.96 NM (60-80 in/lbs)
M8 = 33.6-37.6 NM (25-28 ft/lbs)

NOTE: IF A LIQUID TIGHT CONNECTOR IS NOT BEING USED, PULL OUT THE GREY INSERT, AND INSTALL A RED PLUG IN ITS PLACE. TIGHTEN THE OUTER NUT AROUND THE PLUG TO MAKE WATER TIGHT.

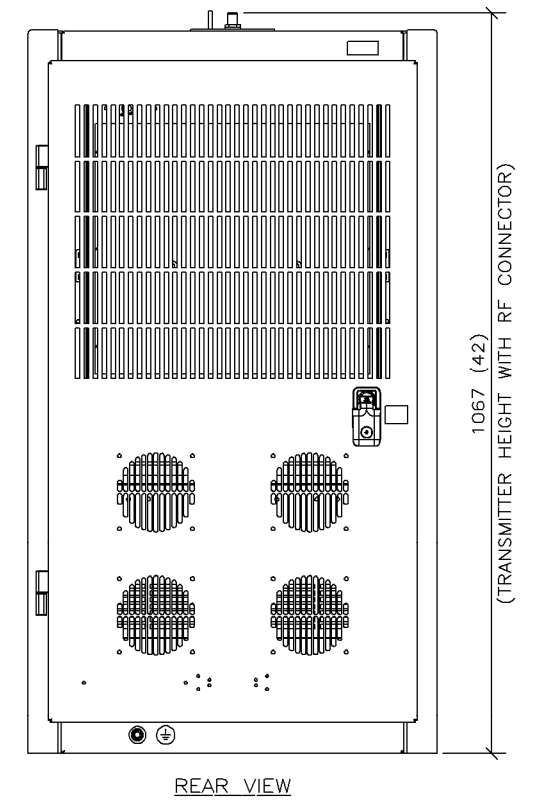
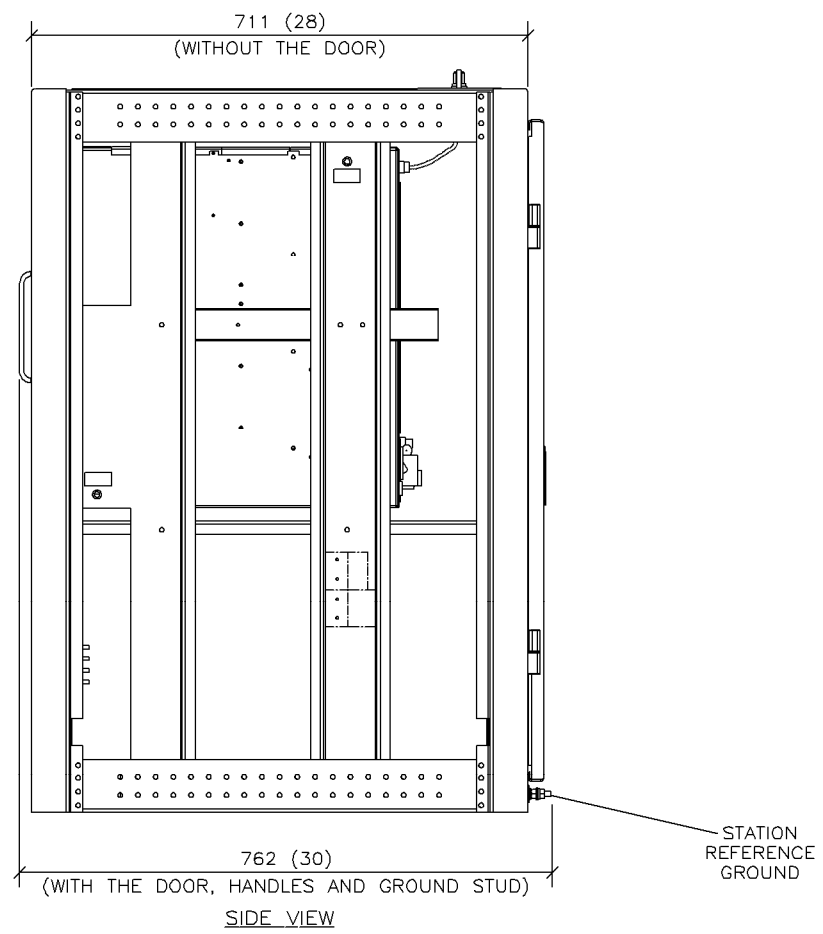
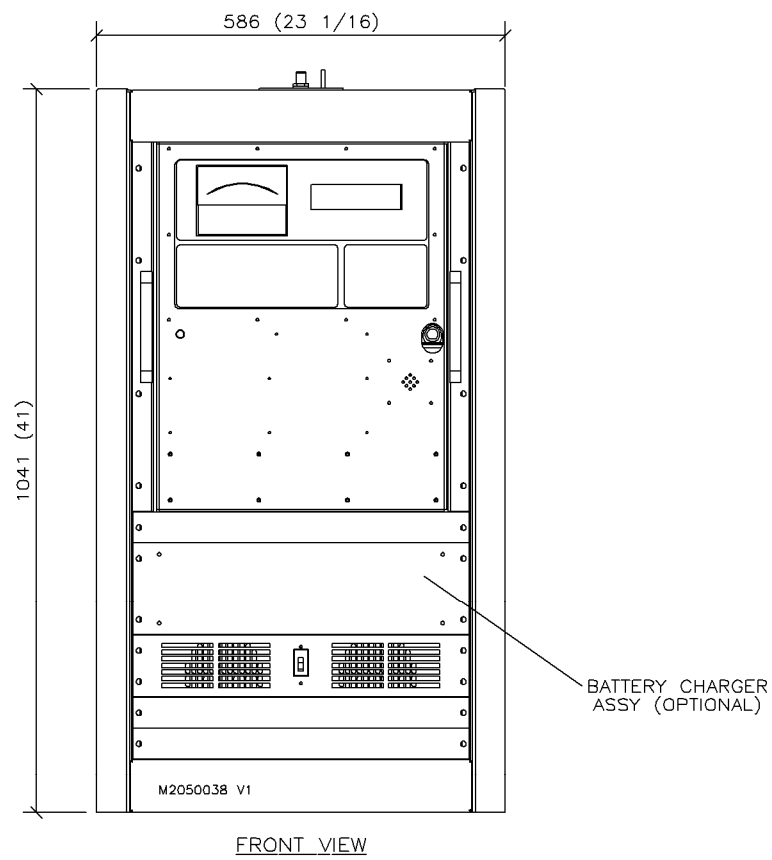
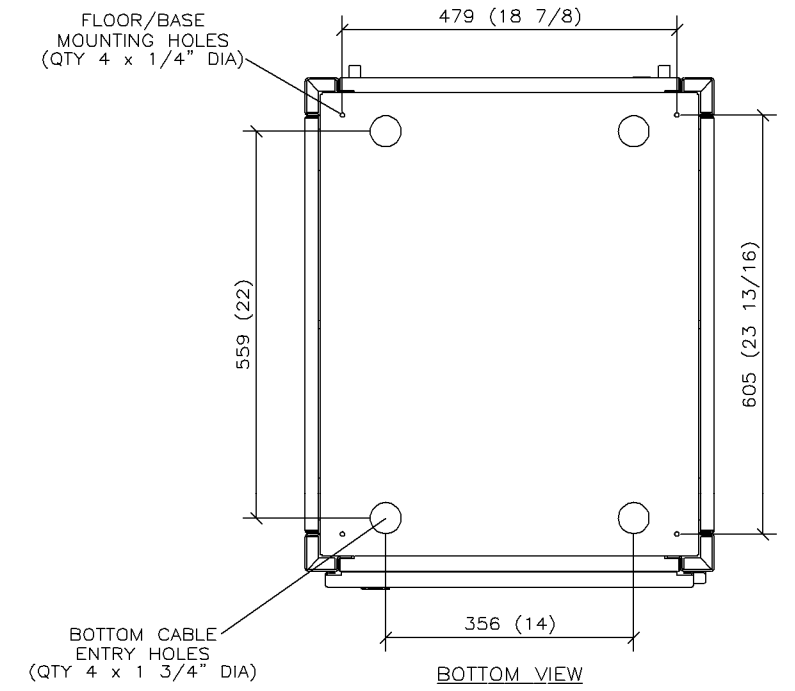
Dimensions = mm (inches)

Assembly Detail and Dimensional Information- Vector-LP Transmitter (Installed in an IP66 Cabinet)			
Issue 1.8.1	Not to Scale	Figure MD-1C	Sheet 1 of 1





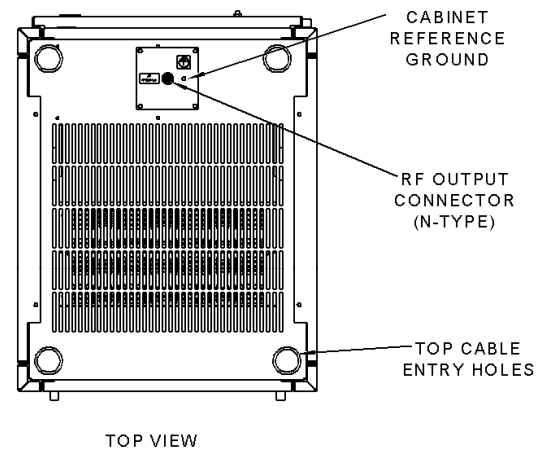
ALL DIMENSIONS ARE IN MM (INCHES)



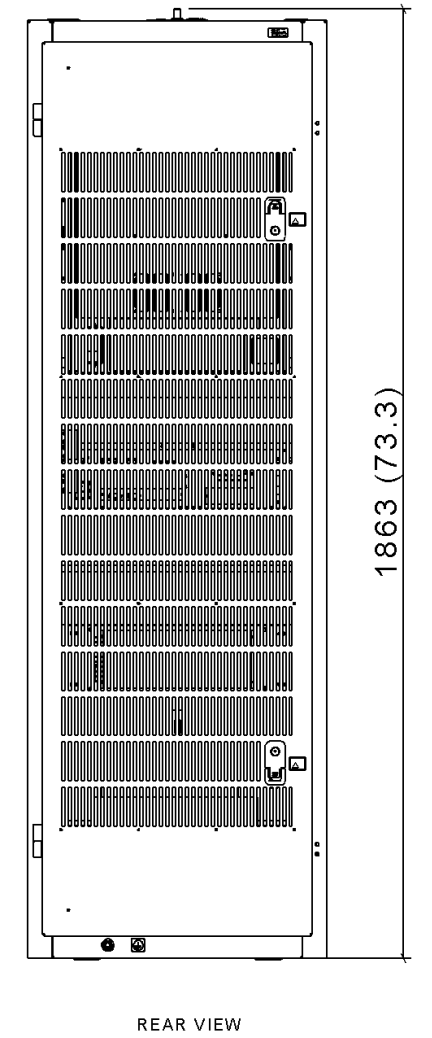
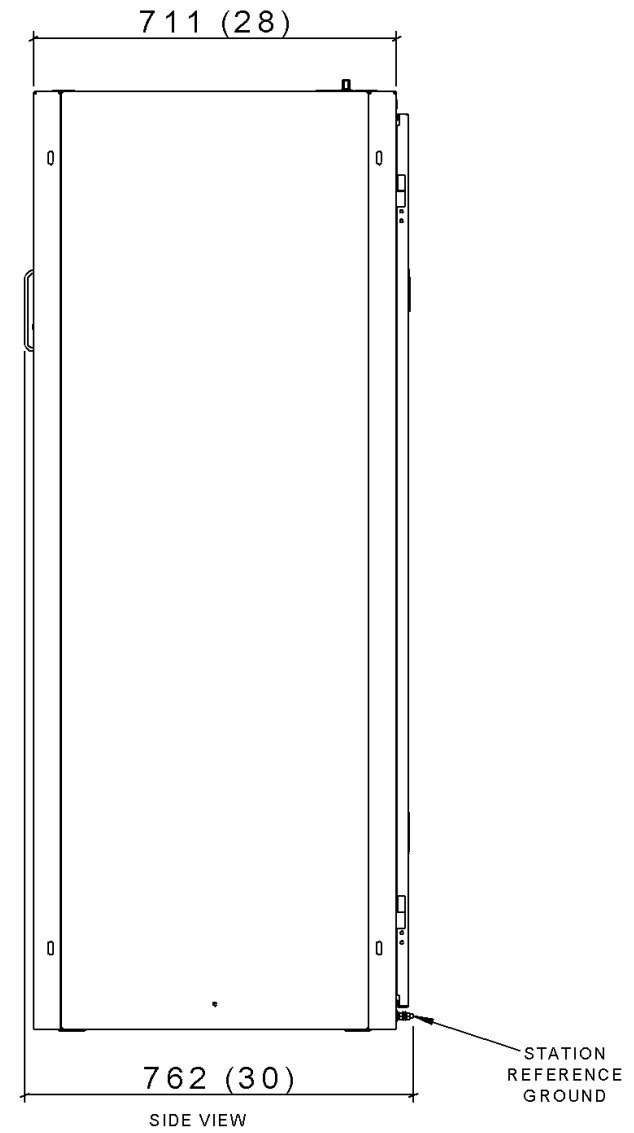
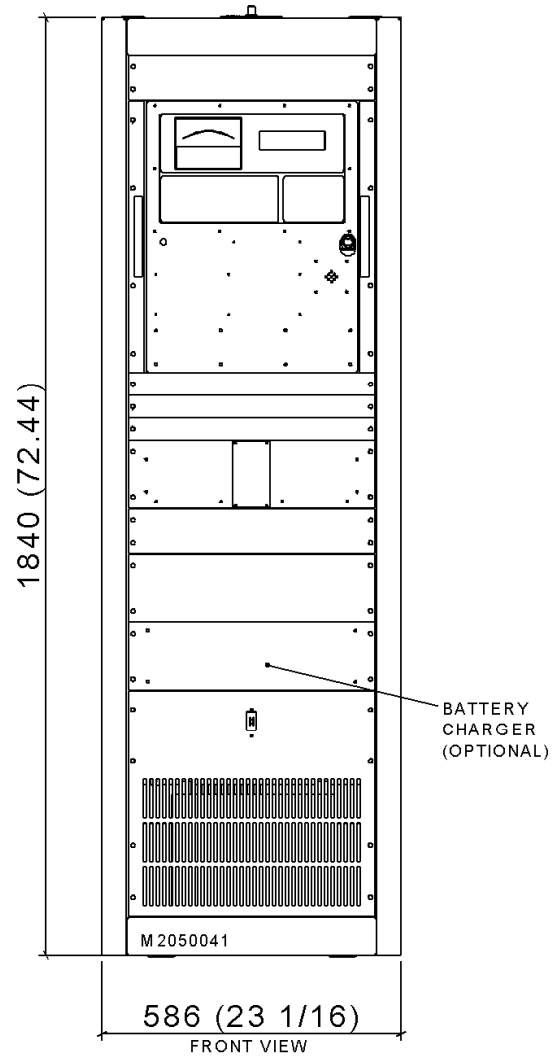
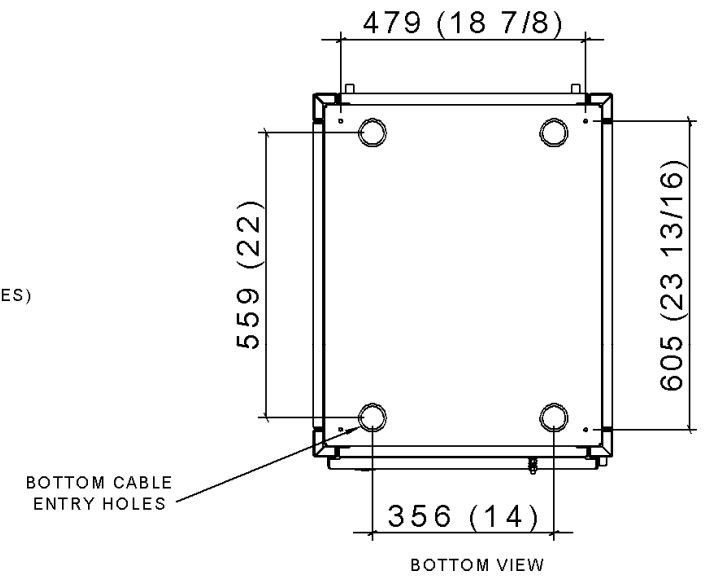
Dimensions = mm (inches)

Assembly Detail and Dimensional Information- Vector-LP Transmitter (Installed in a Short Cabinet)			
Issue 1.8.1	Not to Scale	Figure MD-1D	Sheet 1 of 1





ALL DIMENSIONS ARE IN MM (INCHES)



Dimensions = mm (inches)

Assembly Detail and Dimensional Information- Vector-LP Transmitter (Installed in a Tall Cabinet)			
Issue 1.8.1	Not to Scale	Figure MD-1E	Sheet 1 of 1



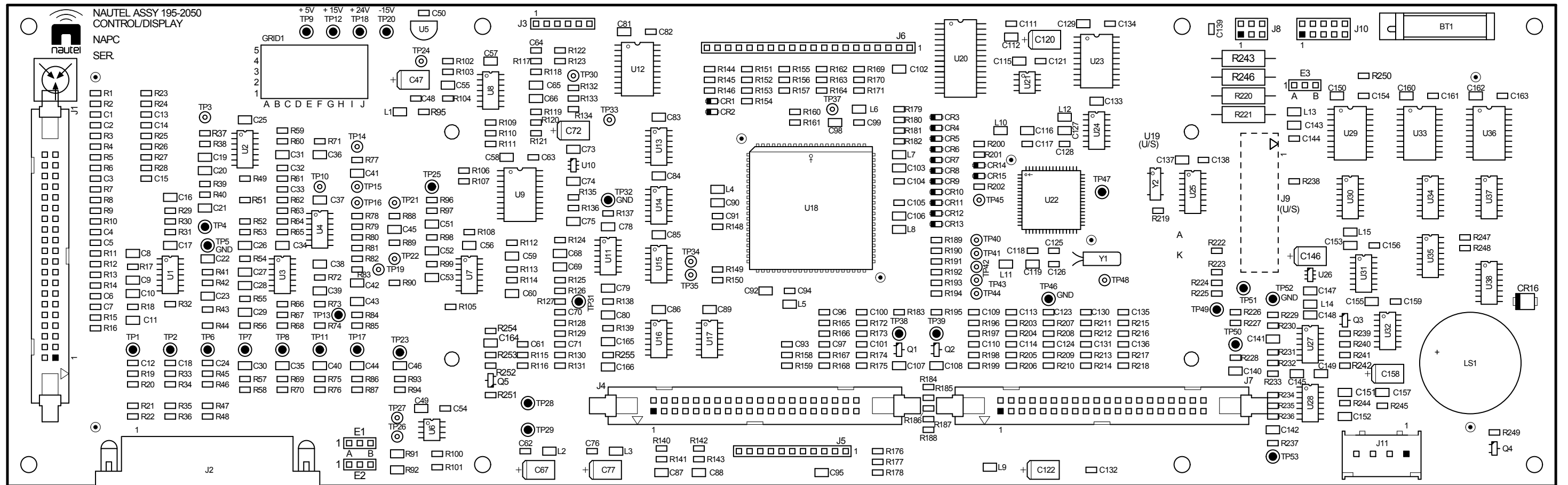
5

4

3

2

1



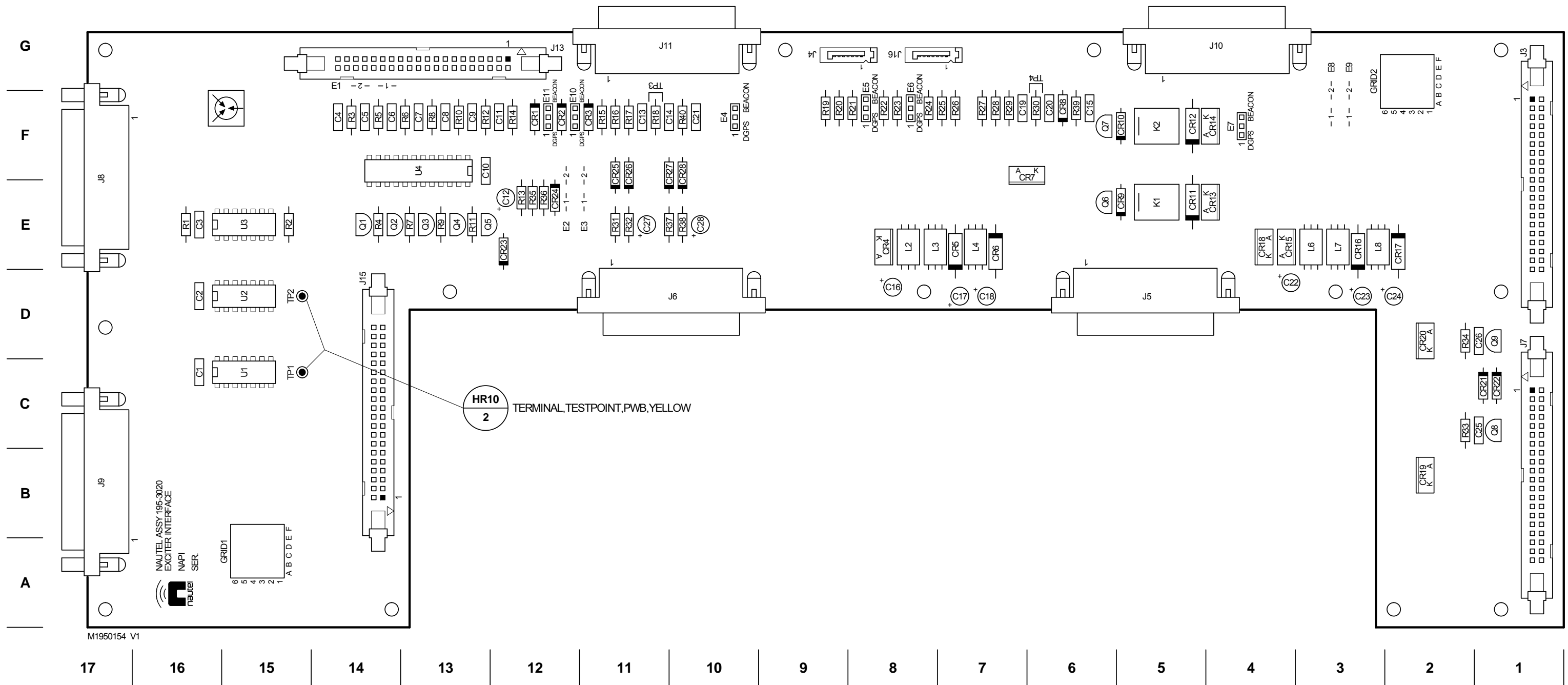
M1950078 V1

A B C D E F G H I J K L M N O



Dimensions = mm (inches)

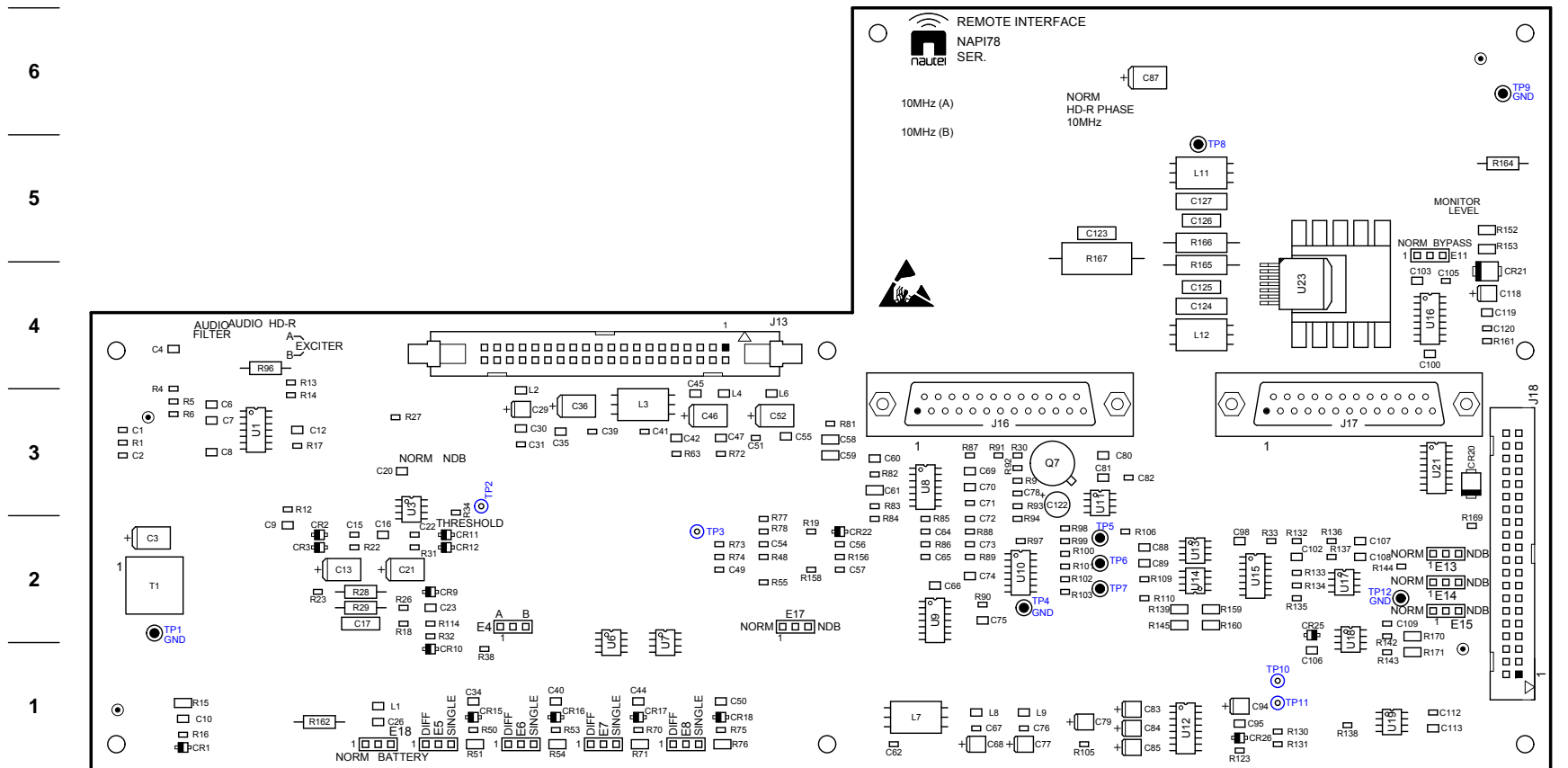
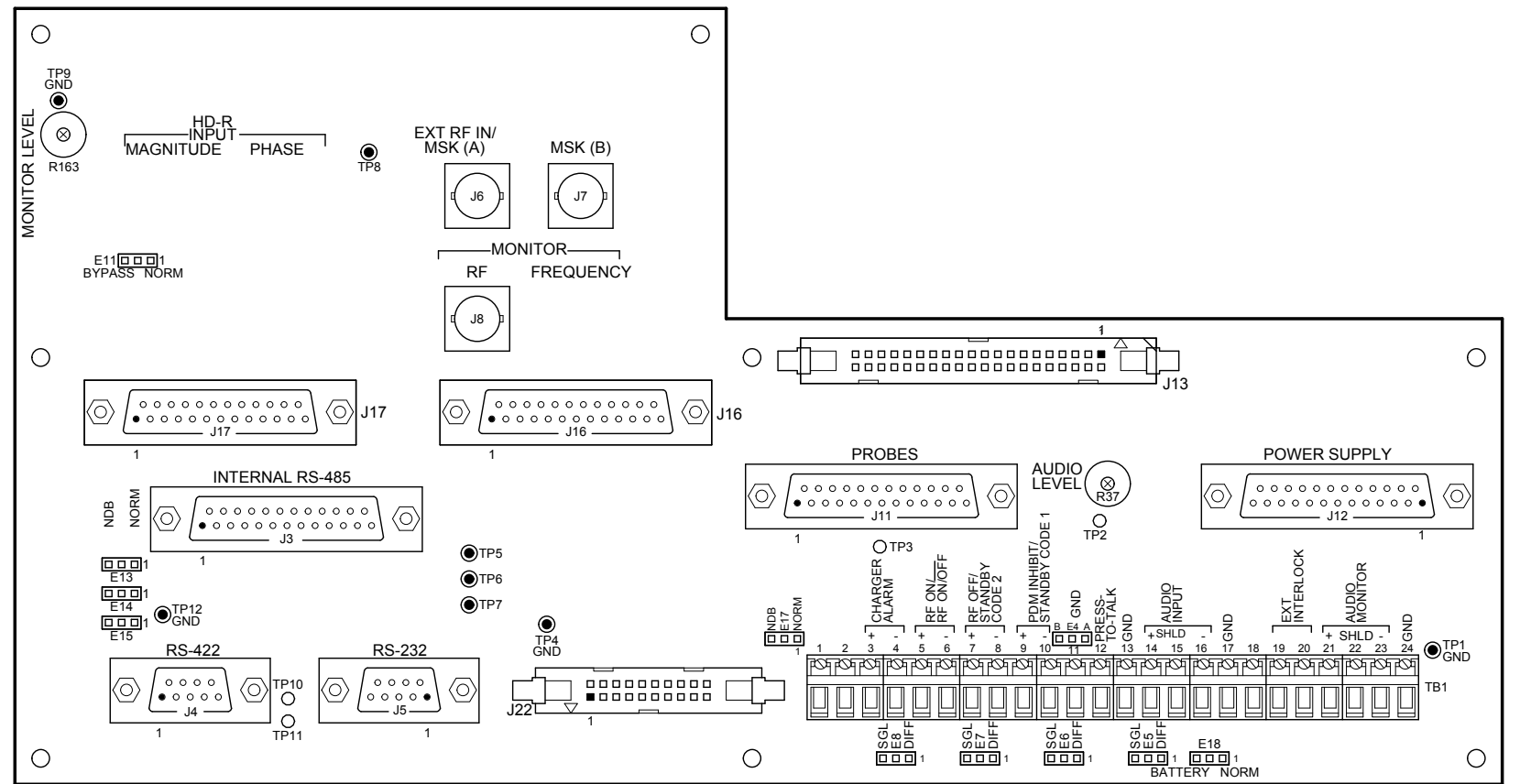
Assembly Detail - NAPC147D Control/Display PWB			
Issue 1.8.1	Not to Scale	Figure MD-2	Sheet 1 of 1

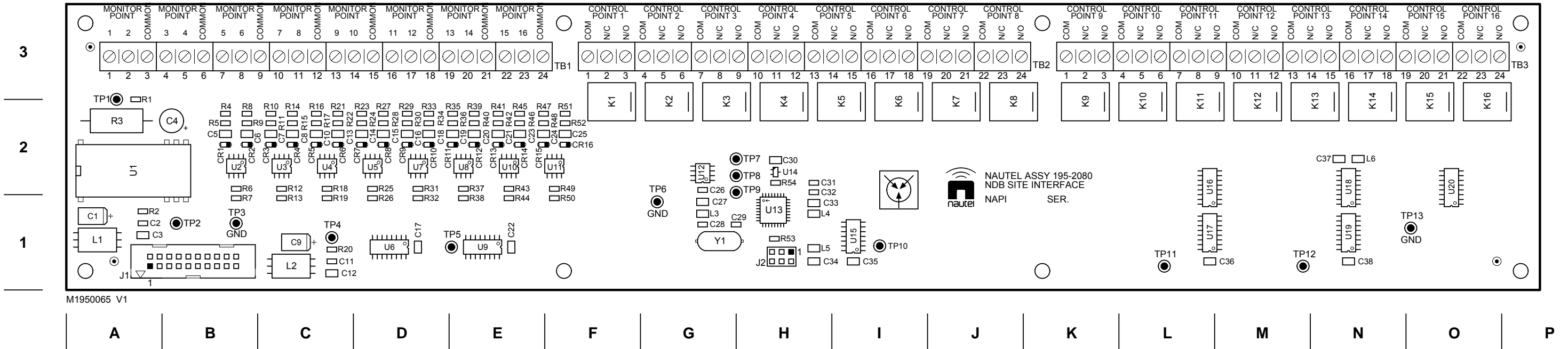


Dimensions = mm (inches)

Assembly Detail - NAPI76A/02 Exciter Interface PWB			
Issue 1.8.1	Not to Scale	Figure MD-3	Sheet 1 of 1





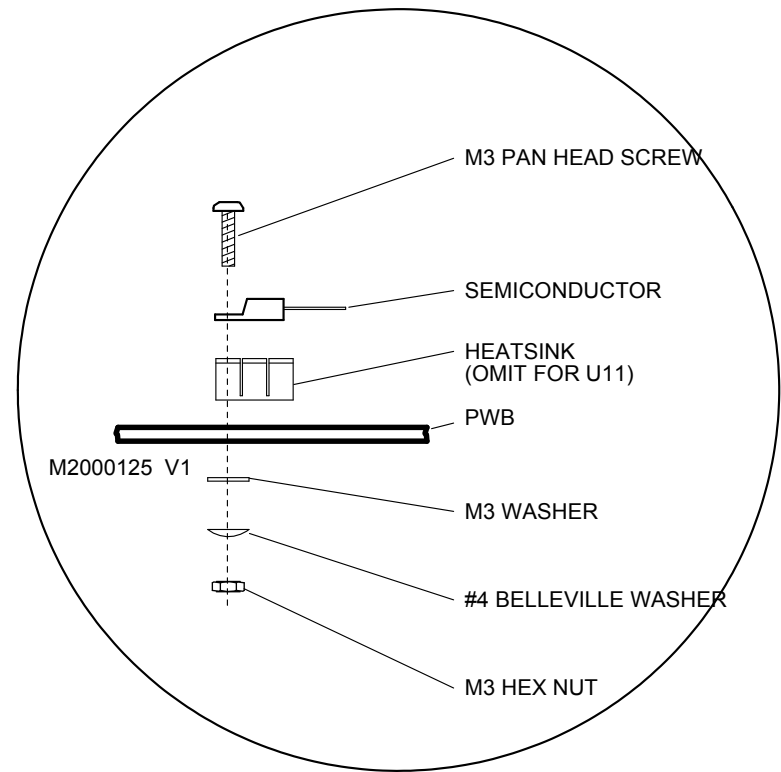


M1950065 V1

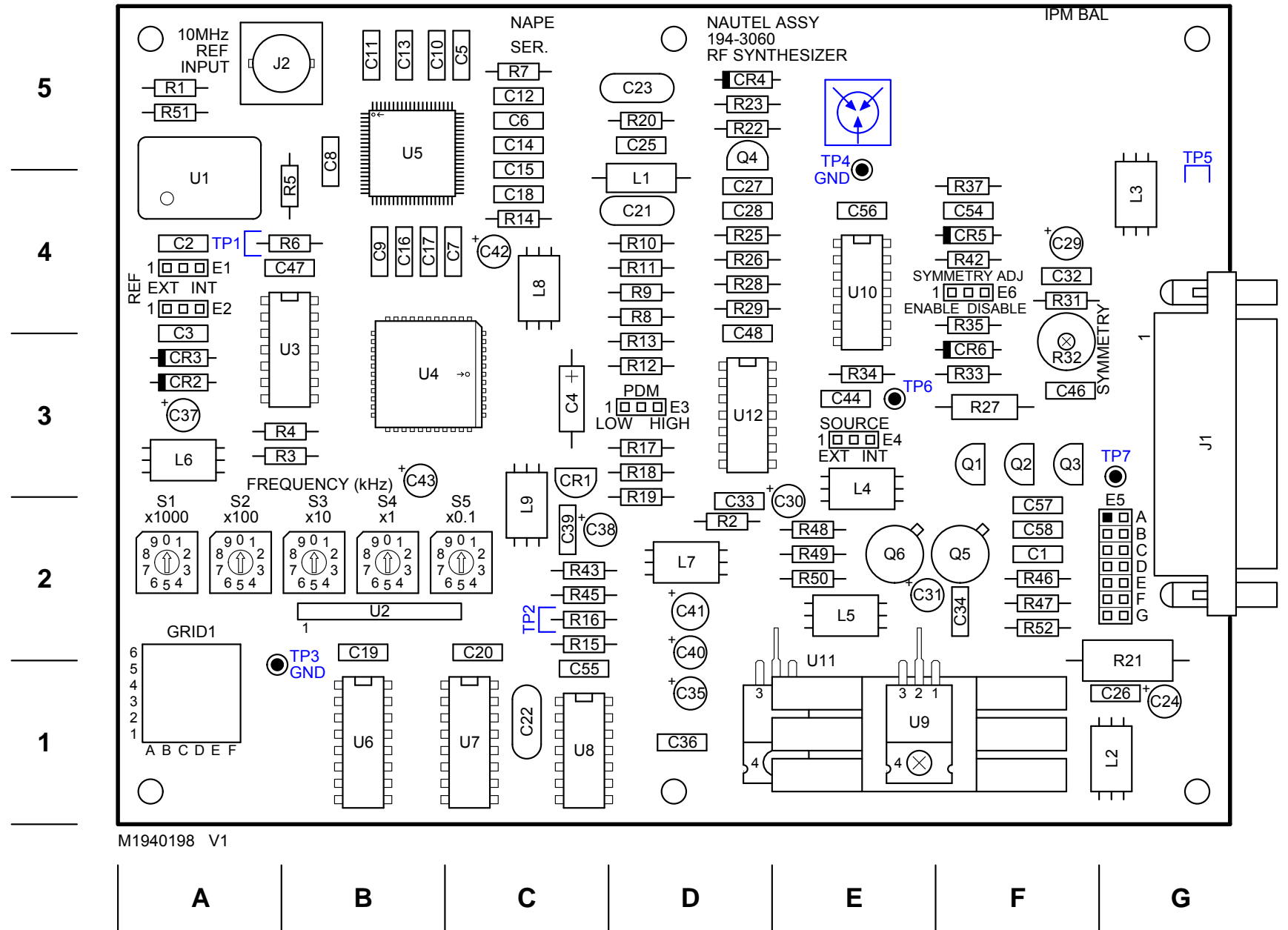
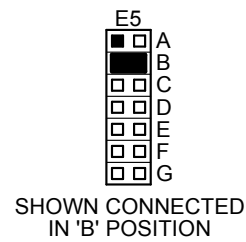
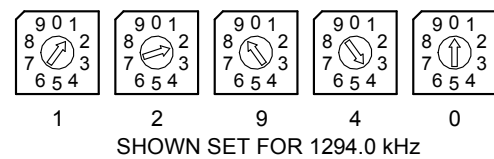
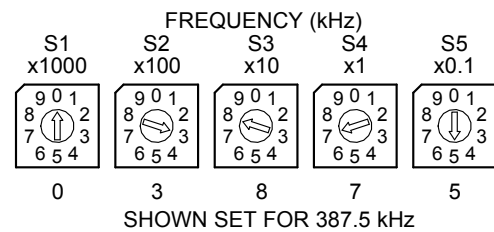
Dimensions = mm (inches)

Assembly Detail - NAPI80 Site Interface PWB (Optional)			
Issue 1.8.1	Not to Scale	Figure MD-5	Sheet 1 of 1





U9 & U11 MOUNTING DETAIL
TORQUE ATACHING HARDWARE TO
4.0 INCH POUNDS (0.45 NEWTON METERS)



Dimensions = mm (inches)

Assembly Detail - NAPE70C/01 RF Synthesizer PWB

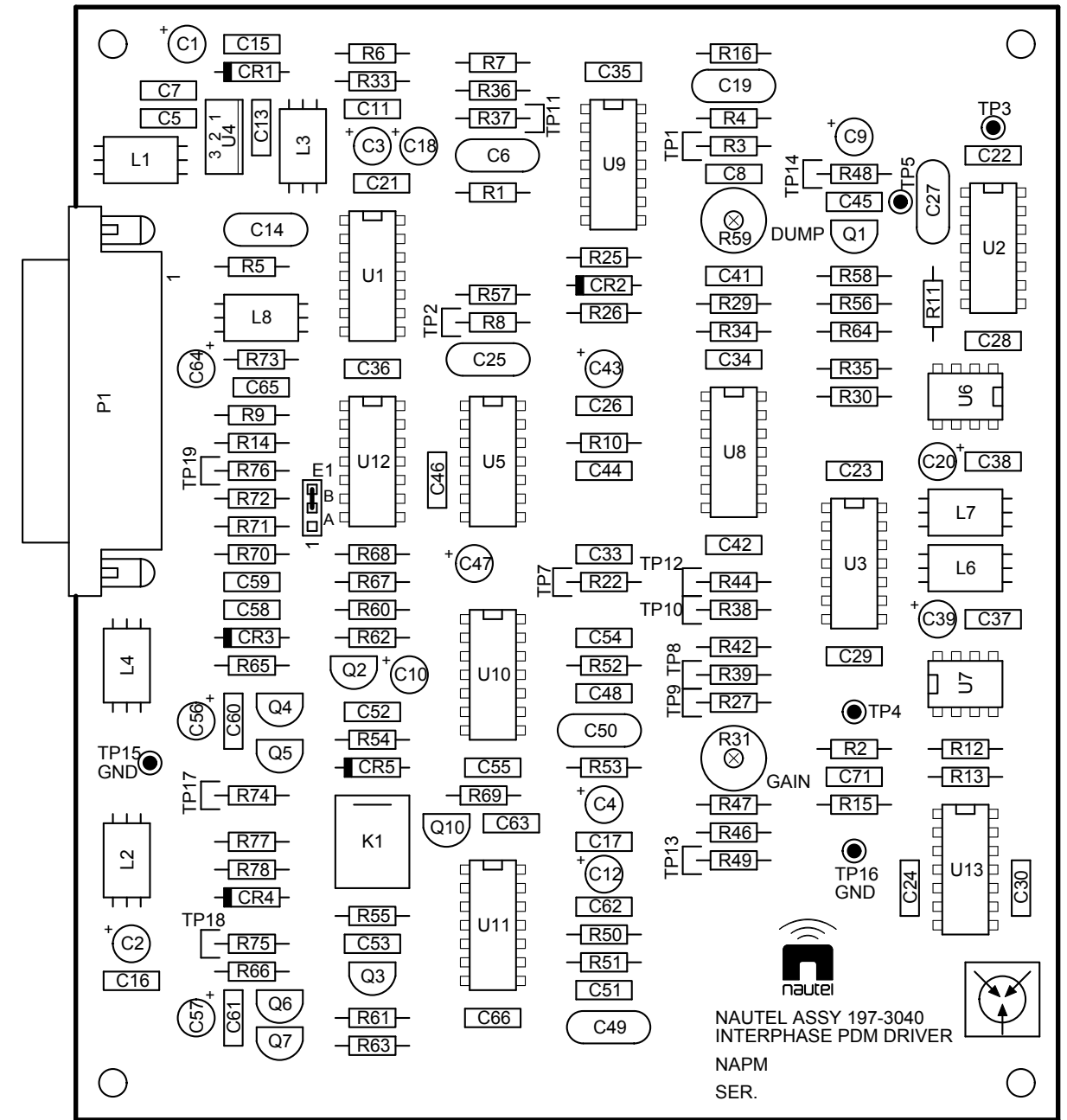
Issue 1.8.1

Not to Scale

Figure MD-6

Sheet 1 of 1



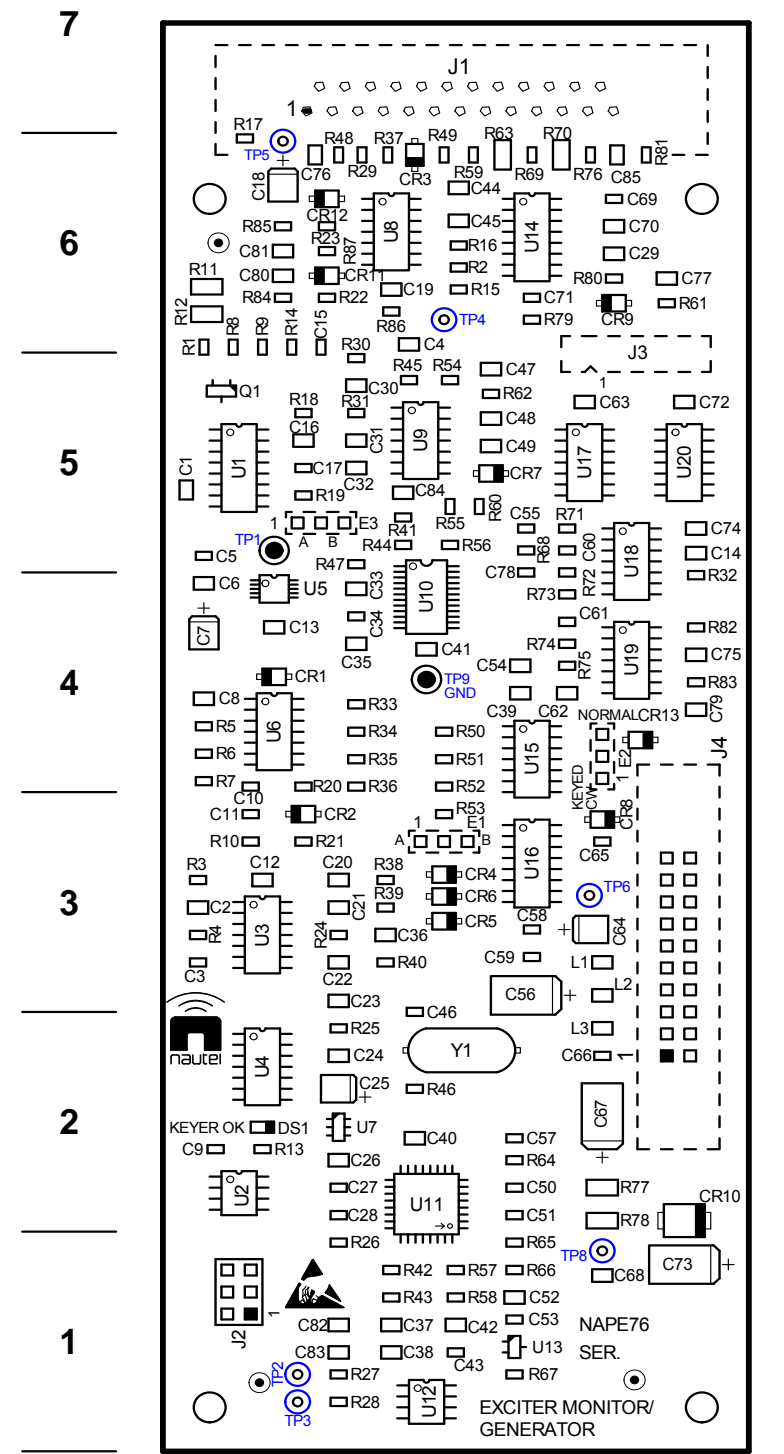
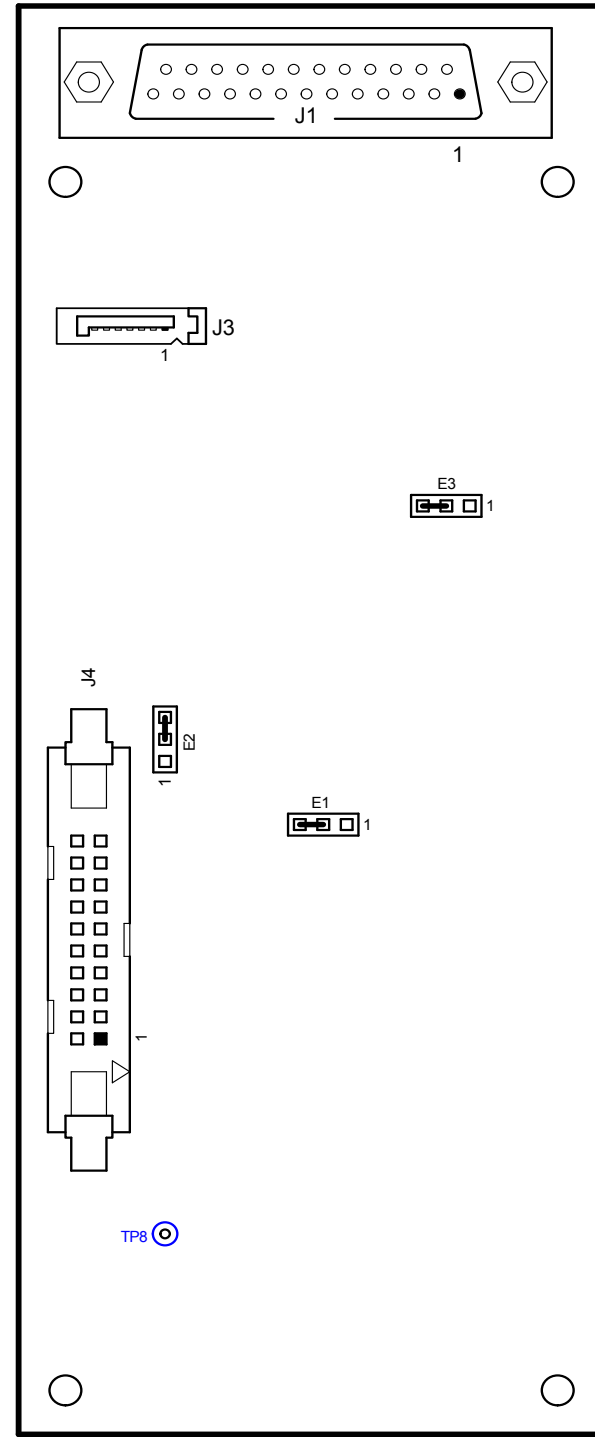


M1970044 V2

Dimensions = mm (inches)

Assembly Detail - NAPM11 Interphase PDM Driver PWB			
Issue 1.8.1	Not to Scale	Figure MD-7	Sheet 1 of 1





M1950152 V2



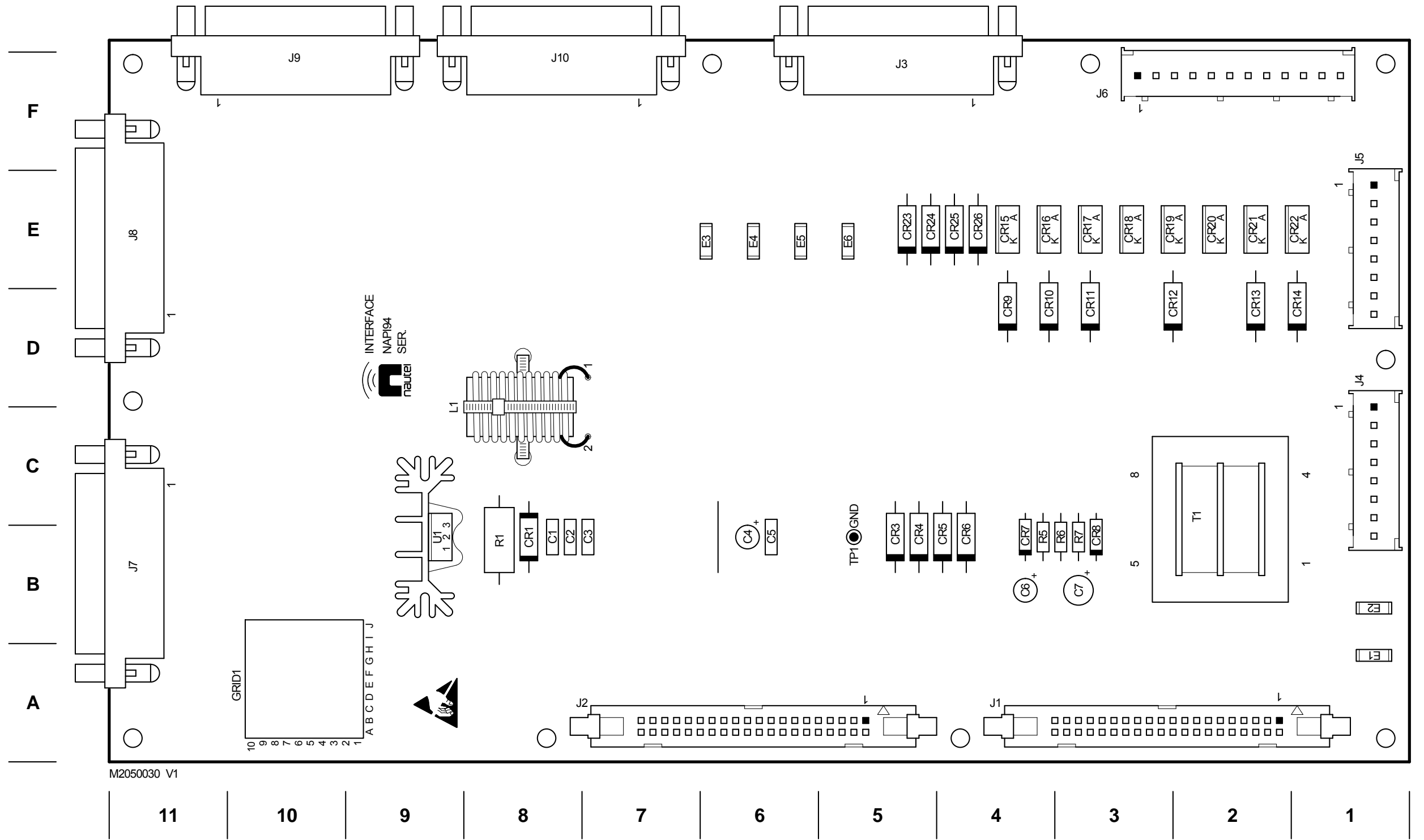
REAR VIEW

TOP VIEW

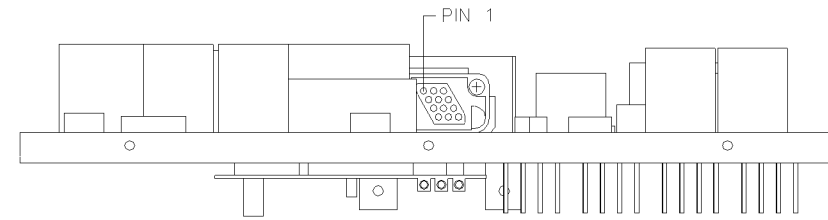
Dimensions = mm (inches)

Assembly Detail - NAPE76A/03 Exciter Monitor/Generator PWB			
Issue 1.8.1	Not to Scale	Figure MD-8	Sheet 1 of 1












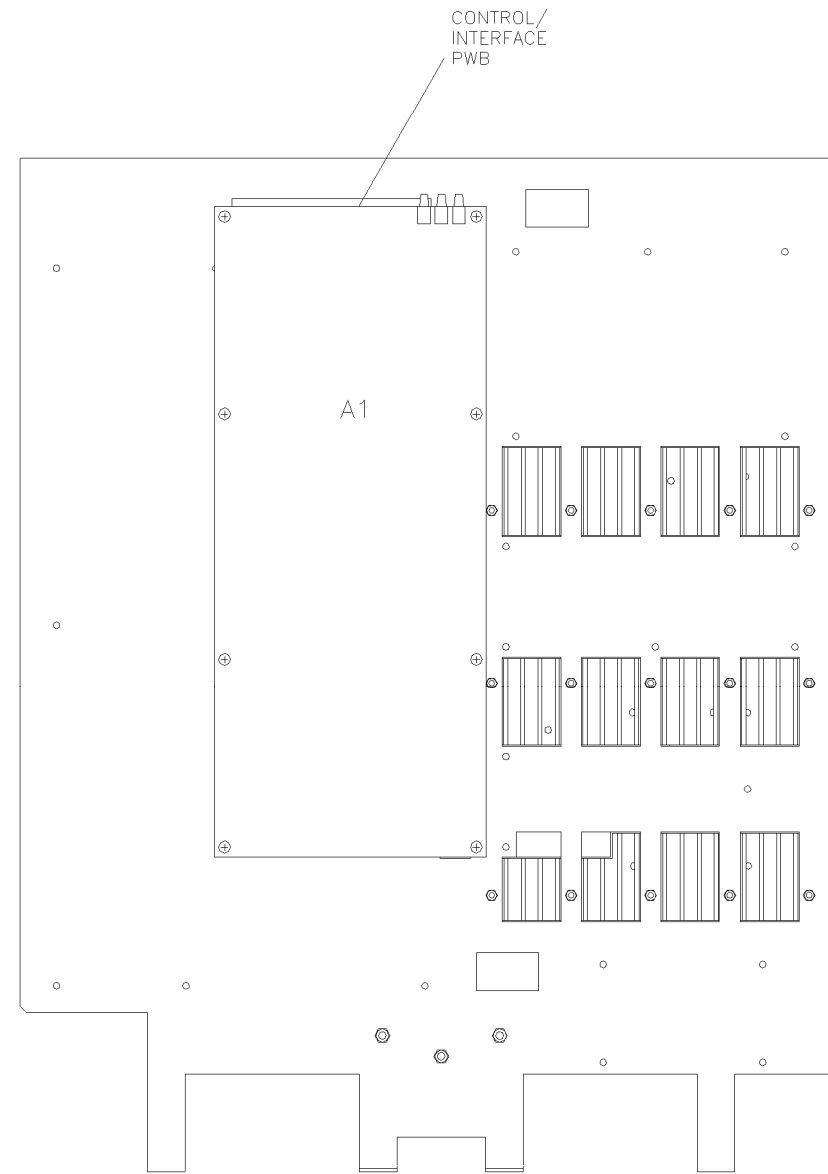
Assembly Detail - NAPI94A Interface PWB			
Issue 1.8.1	Not to Scale	Figure MD-9	Sheet 1 of 1



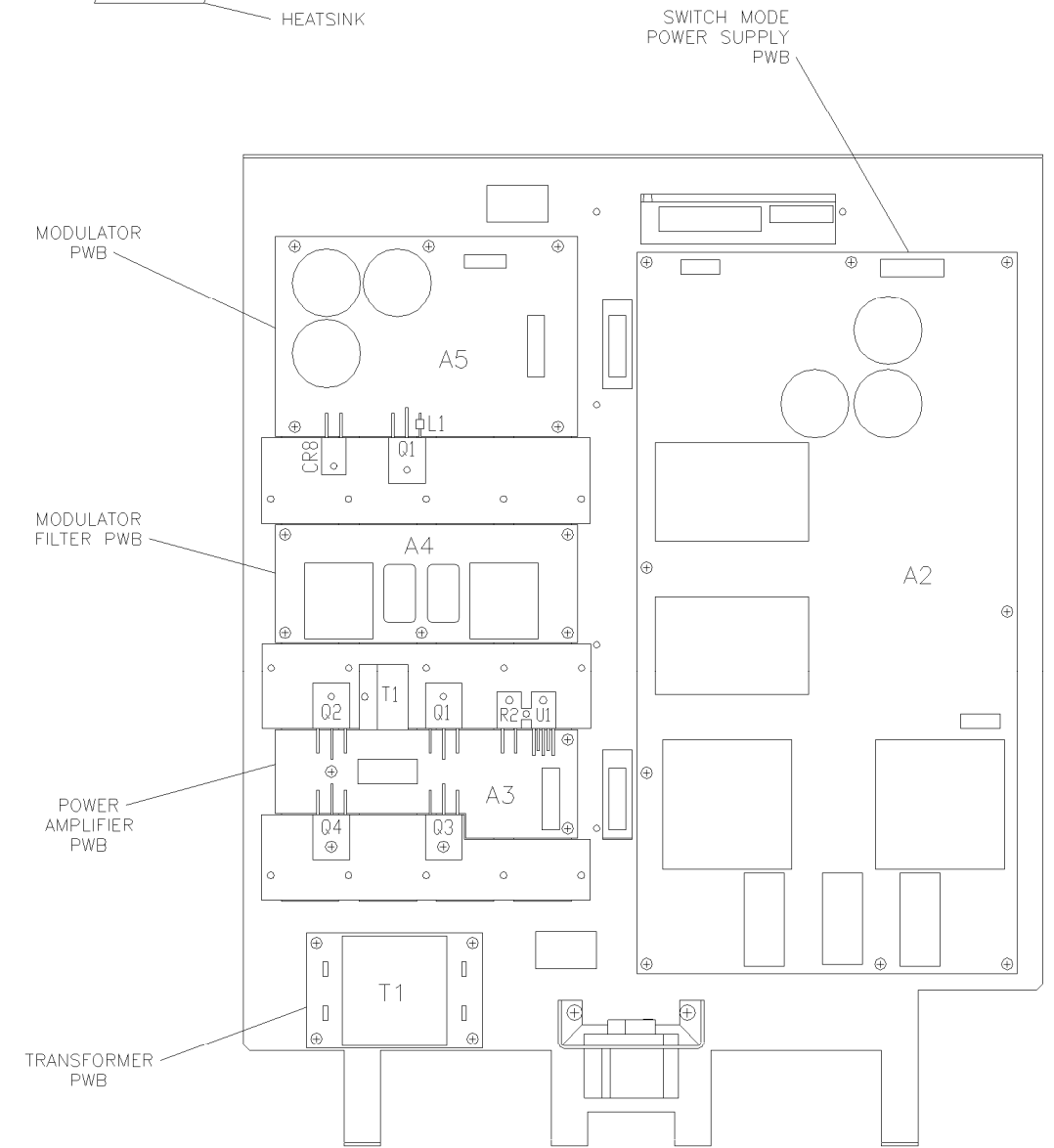
TOP VIEW

SEE DETAIL BELOW FOR MOUNTING INSTRUCTIONS FOR A3Q1, A3Q2, A3Q3, A3Q4, A5Q1 AND A5CR8. NOTE THAT THE SHOULDER WASHER IS ONLY USED ON A5CR8.

-  M3 SCREW
-  #4 BELLEVILLE
-  M3 FLAT WASHER
-  SHOULDER WASHER
-  SEMICONDUCTOR
-  INSULATOR
-  HEATSINK



FRONT VIEW

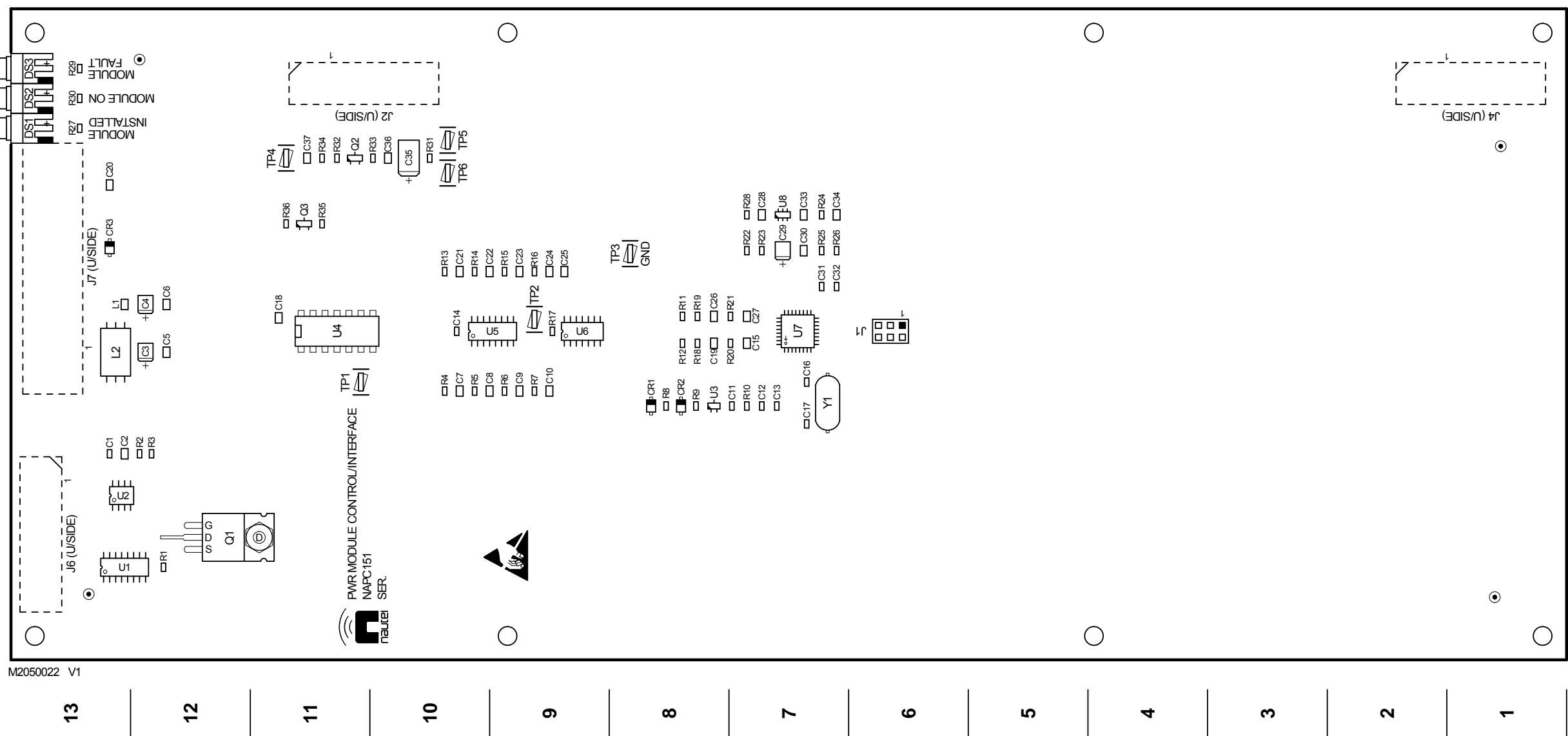


REAR VIEW

Dimensions = mm (inches)

Assembly Detail - NAP35B/01 RF Power Module			
Issue 1.8.1	Not to Scale	Figure MD-10	Sheet 1 of 1



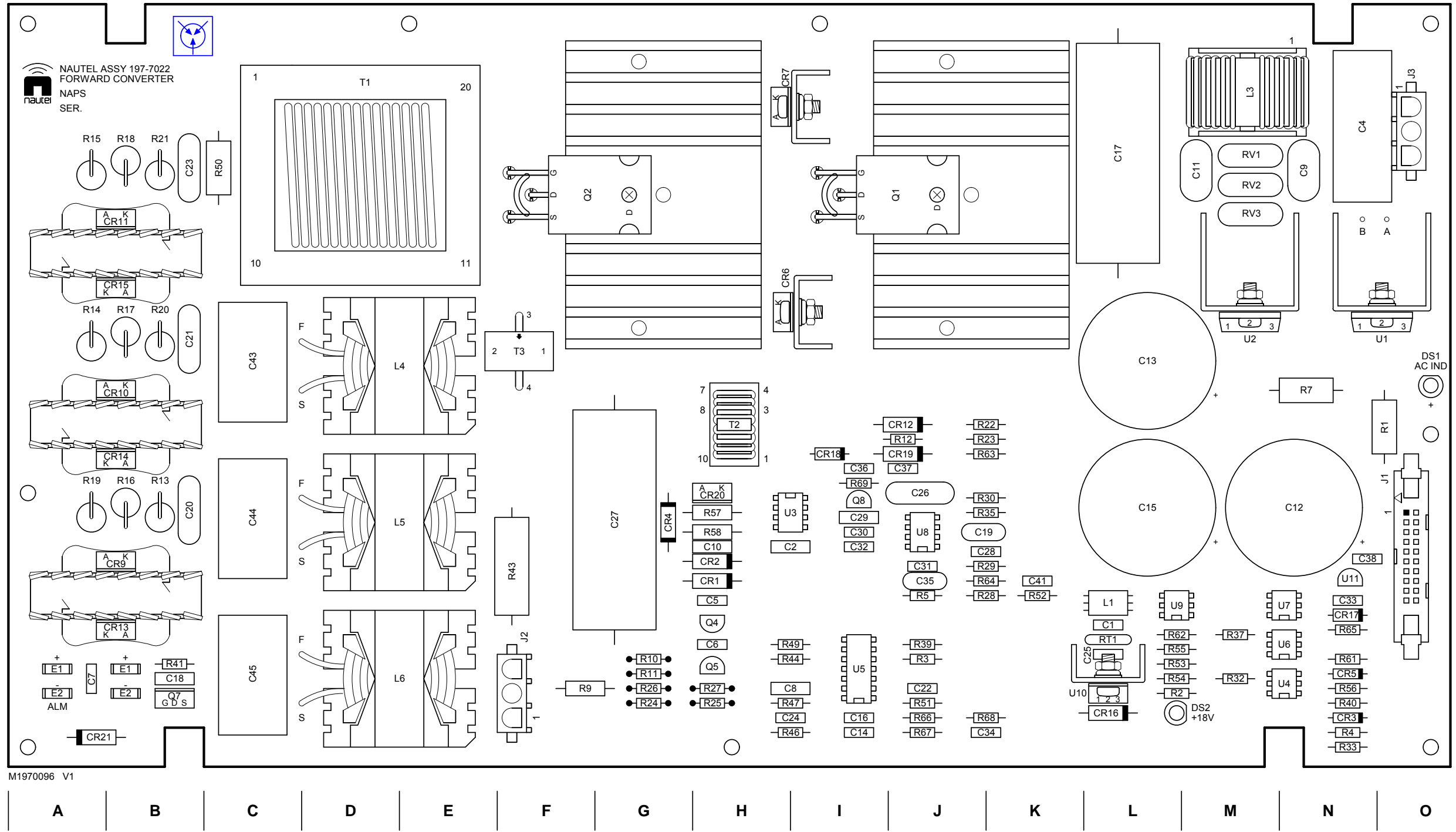


M2050022 V1

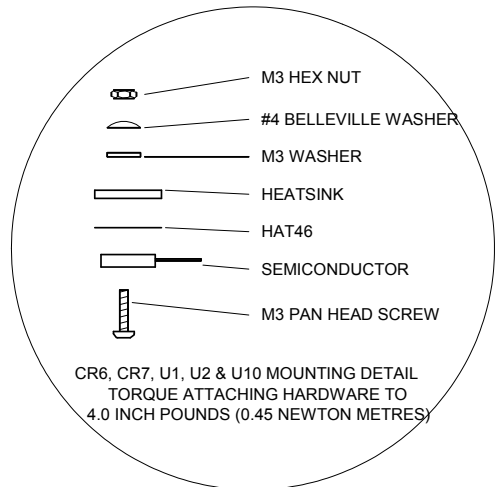
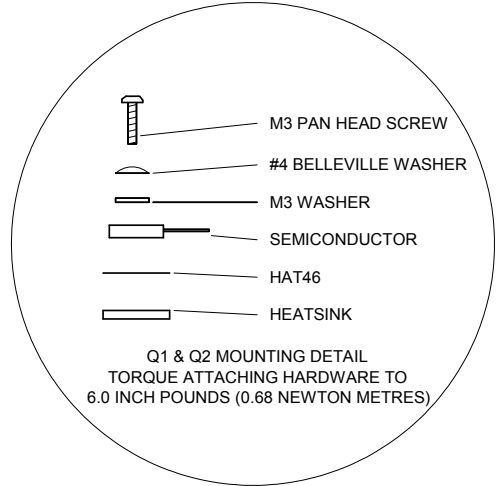
Dimensions = mm (inches)

Assembly Detail - NAPC151A Power Module Control/Interface PWB			
Issue 1.8.1	Not to Scale	Figure MD-11	Sheet 1 of 1

A | B | C | D | E | F










M1970096 V1

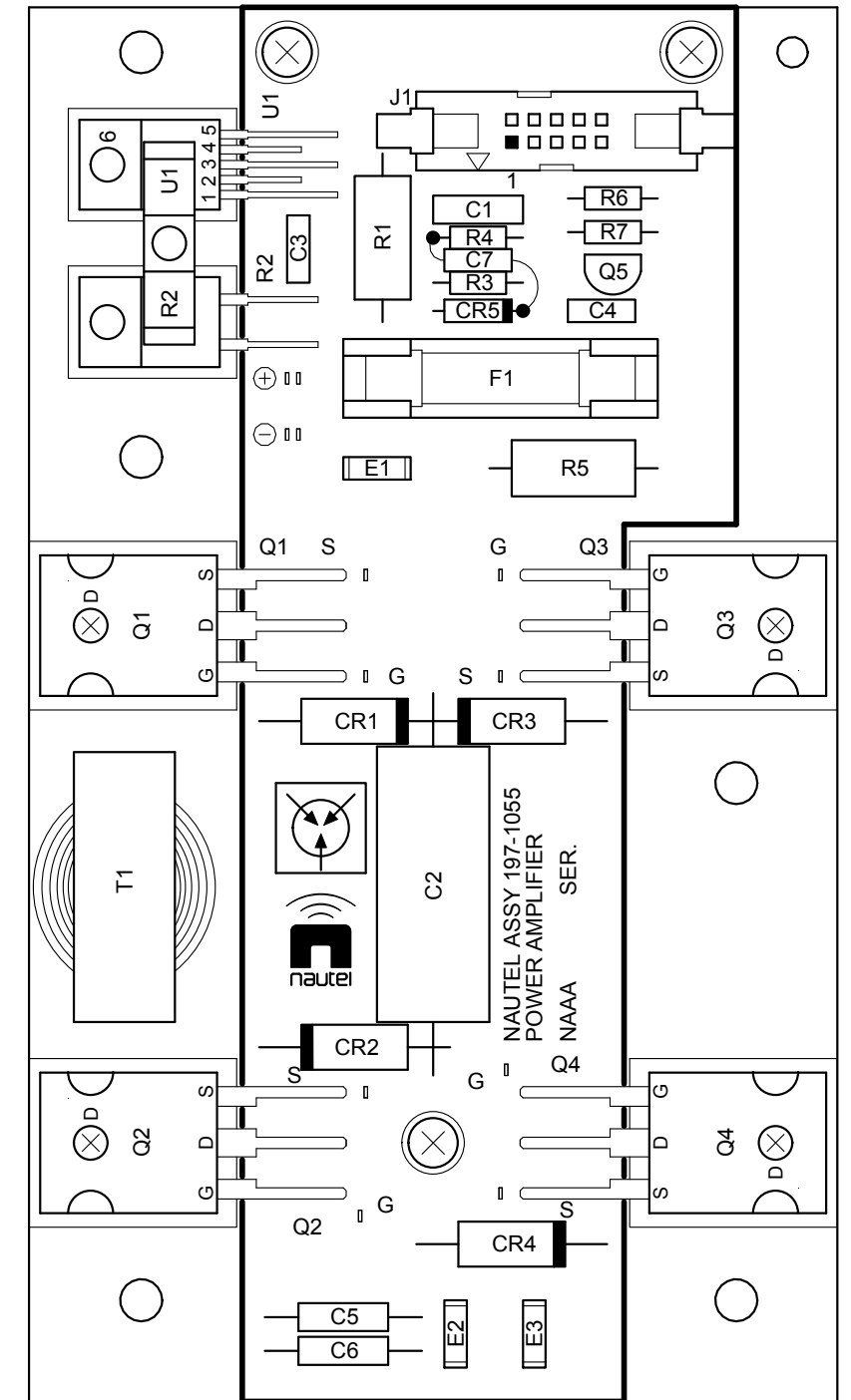


Dimensions = mm (inches)



-  M3 HEX NUT
-  #4 BELLEVILLE WASHER
-  M3 WASHER
-  SEMICONDUCTOR
-  INSULATOR
-  CHASSIS
-  M3 PAN HEAD SCREW

TORQUE ATTACHING HARDWARE TO
4.0 INCH POUNDS (0.45 NEWTON METRES)

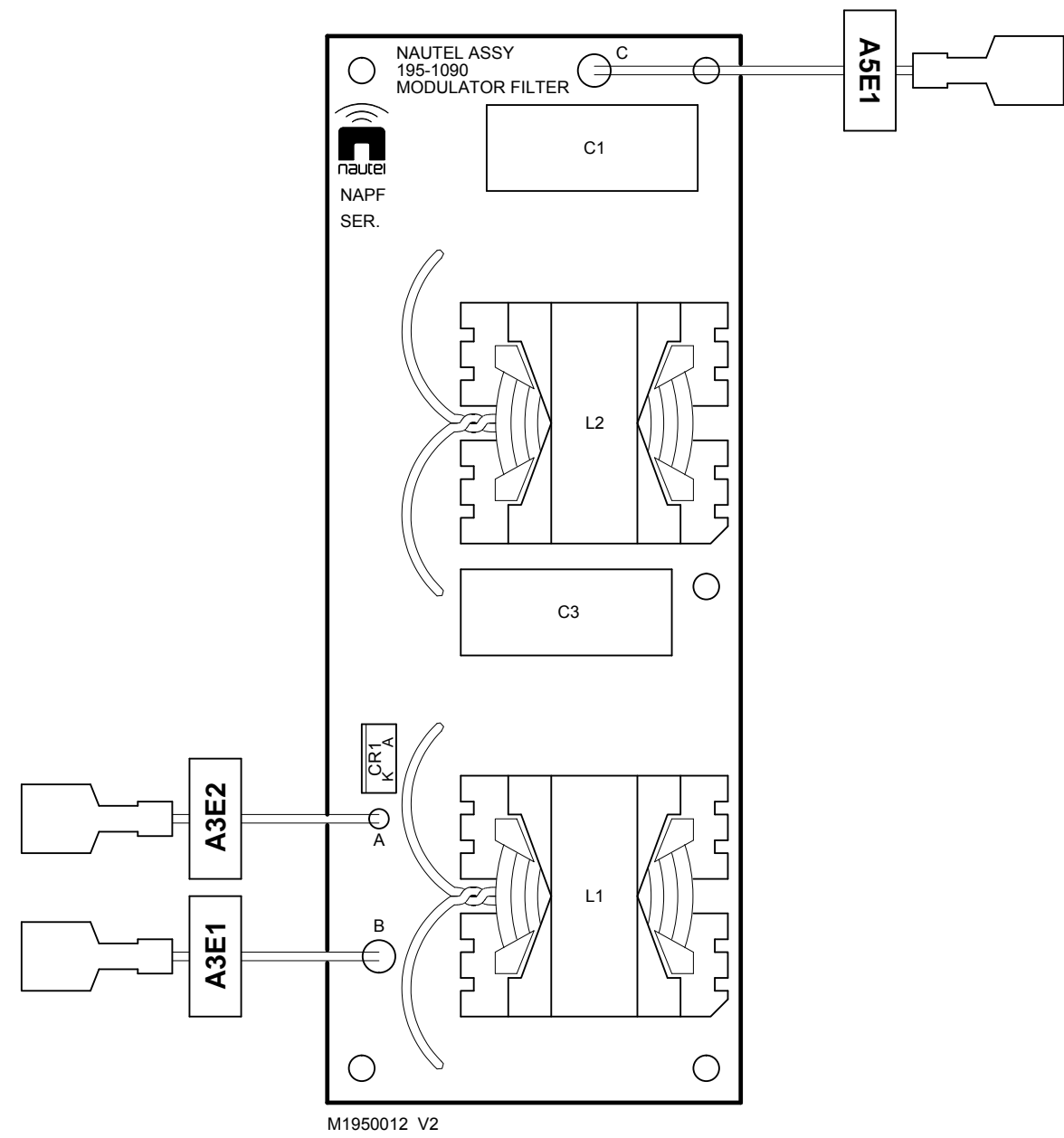


M1970016 V1

Dimensions = mm (inches)

Assembly Detail - NAAA06 Power Amplifier			
Issue 1.8.1	Not to Scale	Figure MD-13	Sheet 1 of 1

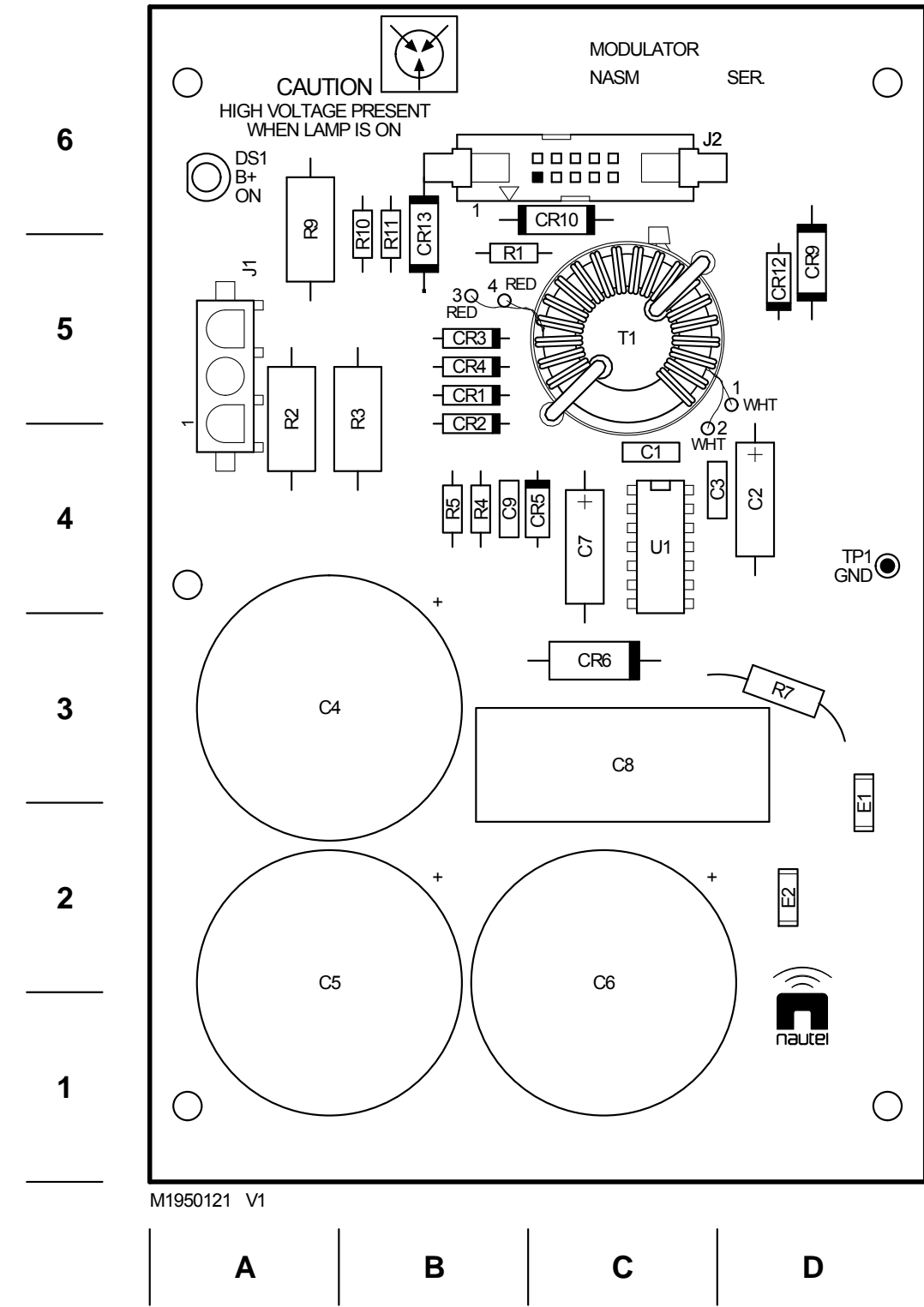




Dimensions = mm (inches)

Assembly Detail - NAPF06A Modulator Filter PWB			
Issue 1.8.1	Not to Scale	Figure MD-14	Sheet 1 of 1





Dimensions = mm (inches)

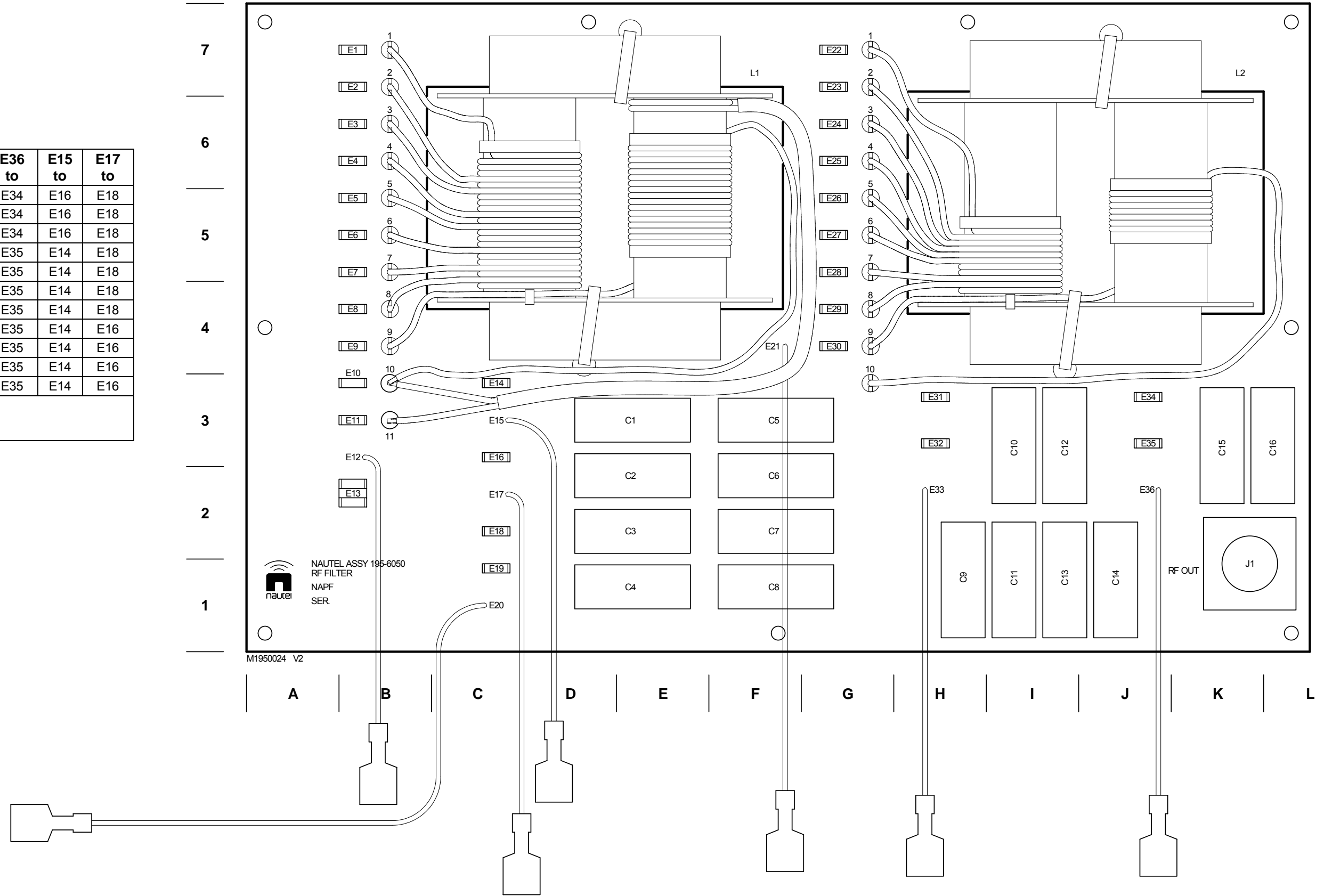
Assembly Detail - NASM11A/01 Modulator Assembly			
Issue 1.8.1	Not to Scale	Figure MD-15	Sheet 1 of 1



JUMPER SETTINGS

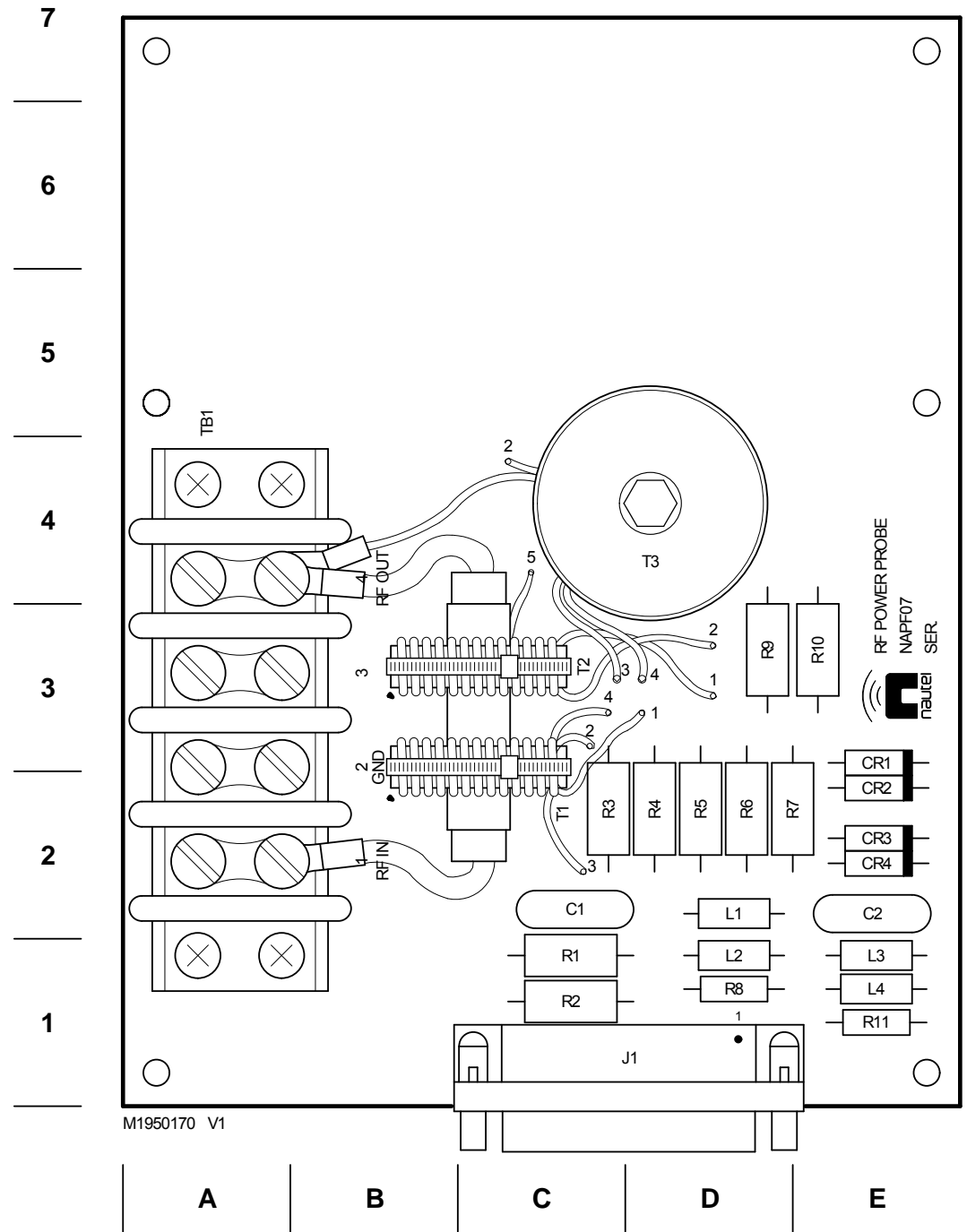
Frequency (kHz)	E20 to	E21 to	E33 to	E36 to	E15 to	E17 to
190.0 - 209.0	E1	E22	E31	E34	E16	E18
209.1 - 229.9	E2	E23	E31	E34	E16	E18
230.0 - 252.9	E4	E25	E31	E34	E16	E18
253.0 - 278.2	E3	E24	E31	E35	E14	E18
278.3 - 306.0	E5	E26	E31	E35	E14	E18
306.1 - 336.6	E6	E27	E31	E35	E14	E18
336.7 - 370.3	E7	E28	E31	E35	E14	E18
370.4 - 407.3	E6	E27	E32	E35	E14	E16
407.4 - 447.9	E7	E28	E32	E35	E14	E16
448.0 - 492.9	E8	E29	E32	E35	E14	E16
493.0 - 535.0	E9	E30	E32	E35	E14	E16

Connect E12 to E11



Dimensions = mm (inches)





Dimensions = mm (inches)

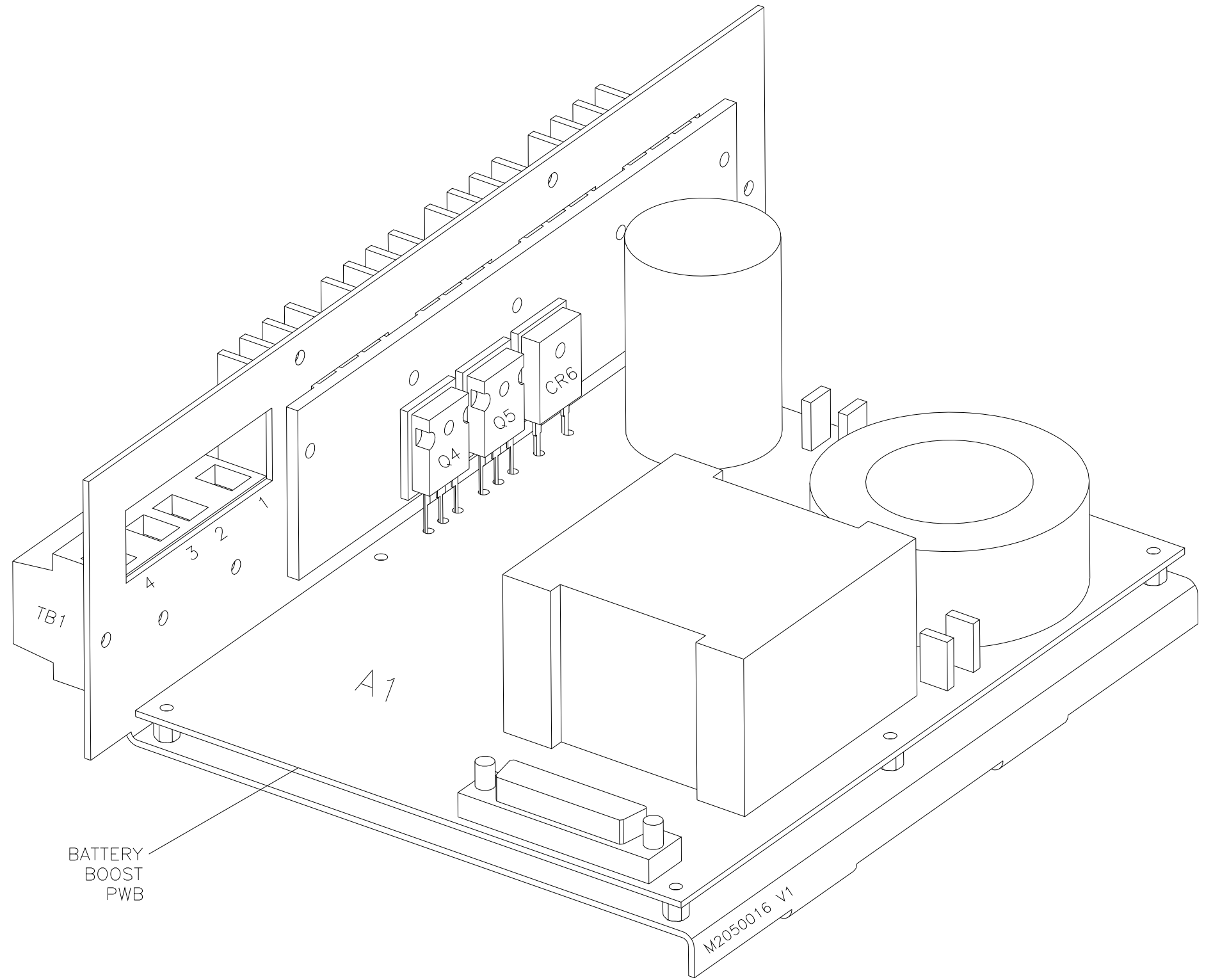
Assembly Detail - NAPF07C/01 RF Power Probe

Issue 1.8.1

Not to Scale

Figure MD-17

Sheet 1 of 1



BATTERY
BOOST
PWB

Dimensions = mm (inches)

Assembly Detail - 205-8035 Battery Boost Assembly

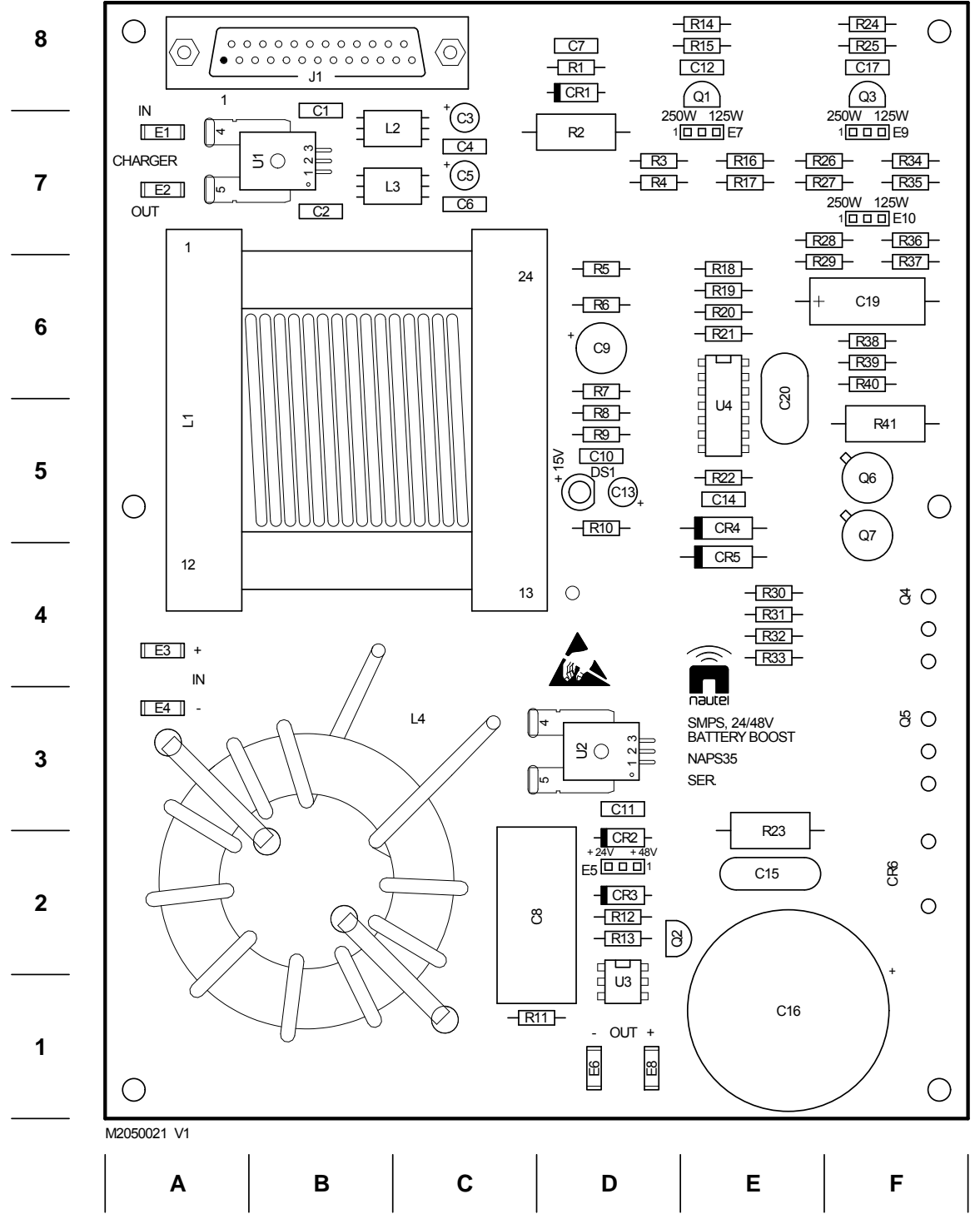
Issue 1.8.1

Not to Scale

Figure MD-18

Sheet 1 of 1





Dimensions = mm (inches)

Assembly Detail - NAPS35 Battery Boost PWB			
Issue 1.8.1	Not to Scale	Figure MD-19	Sheet 1 of 1