RF INPUT
+7dBm (PK-SYNC + AURAL)
+4dBm (DTV)

A7 R2
PHASE
ADJUST

A1-A1
PHASE
SHIFTER BD
1198-1602

+7dBm (PK-SYNC + AURAL)
+4dBm (DTV)

+30V

A1-A2
FILTER
AMP BD
1198-1606

+19.5dBm (90mW PK-SYNC + AURAL)
+16.5dBm (DTV)

+30V

A2-A1
VHF
AMP BD
1198-1605

+41.5dBm (14W PK-SYNC + AURAL)
+38.5dBm (DTV)

A2-A2
OVERDRIVE
PROTECTION
ASSEMBLY
1198-1601

PIN ATTEN. BIAS OVERRIDE

+30V

+41.3dBm (13.5W PK-SYNC + AURAL)
+38.3dBm (DTV)

A2-A3
3-WAY
SPLITTER
ASSEMBLY
1198-1607 CH 2-4
OR
1198-1608 CH 5-6

+36.3dBm
(4.3W PK-SYNC + AURAL)
+33.3dBm (DTV)

A3-A1
VHF AMP BD
P-400-L
1304348

+54.3dBm
(268W PK-SYNC + AURAL)
+51.3dBm (DTV)

+30V

+36.3dBm
(4.3W PK-SYNC + AURAL)
+33.3dBm (DTV)

A3-A2
VHF AMP BD
P-400-L
1304348

+54.3dBm
(268W PK-SYNC + AURAL)
+51.3dBm (DTV)

+30V

+36.3dBm
(4.3W PK-SYNC + AURAL)
+33.3dBm (DTV)

A3-A3
VHF AMP BD
P-400-L
1304348

+54.3dBm
(268W PK-SYNC + AURAL)
+51.3dBm (DTV)

+30V

AGC OVERRIDE

(DS2)
ENABLE
INDICATOR

(DS3)
MODULE
FAULT
INDICATOR

(J3-11)
+30V

+12V

PIN ATTN. BIAS

INPUT LOSS

A5
AGC CONTROL BOARD
1142-1601
OR
1306482

FORWARD POWER SAMPLE

A4-A2
L.P. FILTER
1198-1628

REFLECTED POWER SAMPLE

A4-A3
L.P. FILTER
1198-1628

A4-A1
COMBINER/
COUPLER BD.
ASSEMBLY
1198-1625 CH 2-4
OR
1198-1626 CH 5-6

(J2)
RF OUTPUT
750W
+58.8dBm (PK-SYNC + AURAL)
OR
375W
+55.8dBm (DTV)

(DS5)
OVERTEMP
INDICATOR

(J3)
REMOTE
METERING

(J5)
FRONT
PANEL
SAMPLE

THERMAL SWITCH

HEATSINK #1 OVERTEMP

HEATSINK #2 OVERTEMP

THERMAL SWITCH

(DS4)
VSWR
CUTBACK
IND

A9
FRONT PANEL
METER

GAIN
ADJUST
A6

ENABLE (J3-9)

INHIBIT

(J4)
230 VAC
INPUT

15A
CIRCUIT
BREAKER

A10
2000W
30V
POWER SUPPLY

+30V

A8
CURRENT
METERING BD
1304362

+30V TO TRAY

CHANGED "A" NUMBERS TO AGREE WITH THE I/C. ADDED A4-A2 & A4-A3. (RGE)

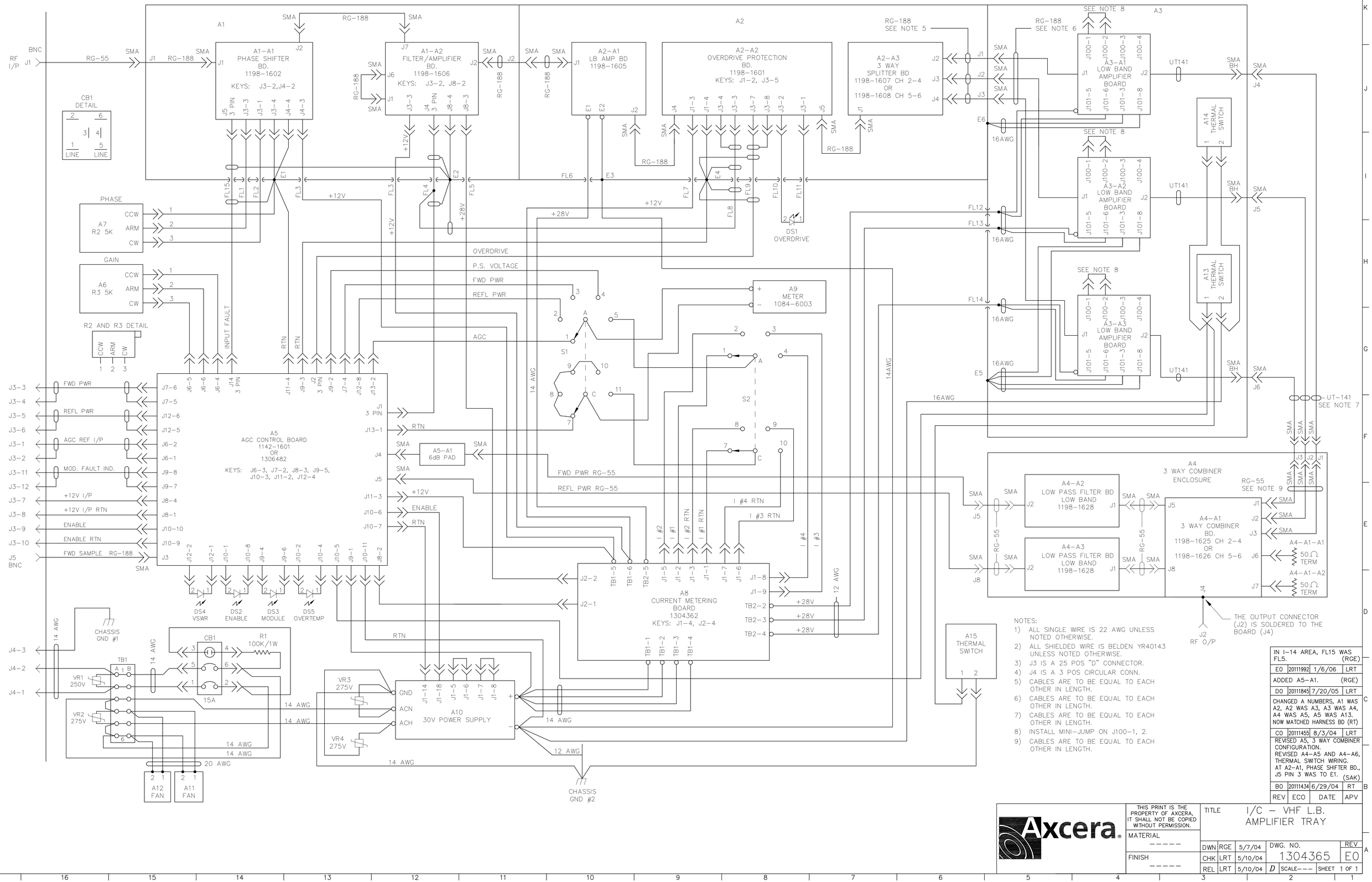
REV	ECO	DATE	APV
B0	20111992	1/6/06	LRT

MATERIAL
– – – –

FINISH
– – – –

TITLE
B/D – VHF L.B.
AMPLIFIER TRAY

			DWG. NO.	REV
DWN	RGE	5/7/04	1304364	B0
CHK	LRT	5/10/04		
REL	LRT	5/10/04	C SCALE – –	SHEET 1 OF 1



NOTES:

1) ALL SINGLE WIRE IS 22 AWG UNLESS NOTED OTHERWISE.
2) ALL SHIELDED WIRE IS BELDEN YR40143 UNLESS NOTED OTHERWISE.
3) J3 IS A 25 POS "D" CONNECTOR.
4) J4 IS A 3 POS CIRCULAR CONN.
5) CABLES ARE TO BE EQUAL TO EACH OTHER IN LENGTH.
6) CABLES ARE TO BE EQUAL TO EACH OTHER IN LENGTH.
7) CABLES ARE TO BE EQUAL TO EACH OTHER IN LENGTH.
8) INSTALL MINI–JUMP ON J100–1, 2.
9) CABLES ARE TO BE EQUAL TO EACH OTHER IN LENGTH.

REV	ECO	DATE	APV
	IN I–14 AREA, FL15 WAS FL5.		(RGE)
EO	20111992	1/6/06	LRT
	ADDED A5–A1.		(RGE)
DO	20111845	7/20/05	LRT
	CHANGED A NUMBERS, A1 WAS A2, A2 WAS A3, A3 WAS A4, A4 WAS A5, A5 WAS A13. NOW MATCHED HARNESS BD (RT)		
CO	20111455	8/3/04	LRT
	REVISED A5, 3 WAY COMBINER CONFIGURATION. REVISED A4–A5 AND A4–A6, THERMAL SWITCH WIRING. AT A2–A1, PHASE SHIFTER BD., J5 PIN 3 WAS TO E1.		(SAK)
BO	20111434	6/29/04	RT

MATERIAL: ———

FINISH: ———

TITLE: I/C – VHF L.B. AMPLIFIER TRAY

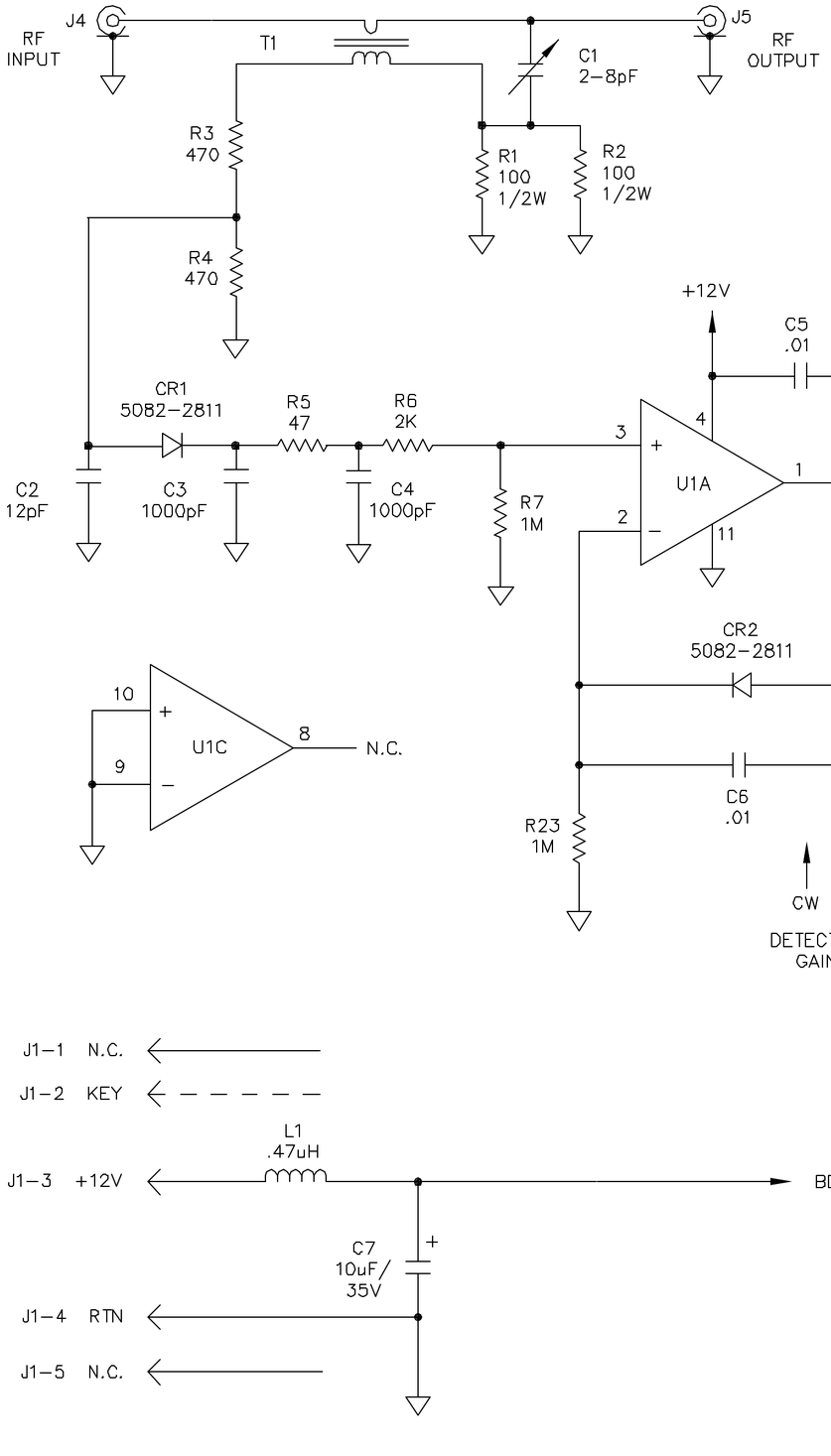
DWN	RGE	5/7/04
CHK	LRT	5/10/04
REL	LRT	5/10/04

DWG. NO. 1304365 REV EO

D SCALE––– SHEET 1 OF 1

NOTES:

1) ALL RESISTORS ARE IN OHMS UNLESS OTHERWISE NOTED.
2) ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE NOTED.



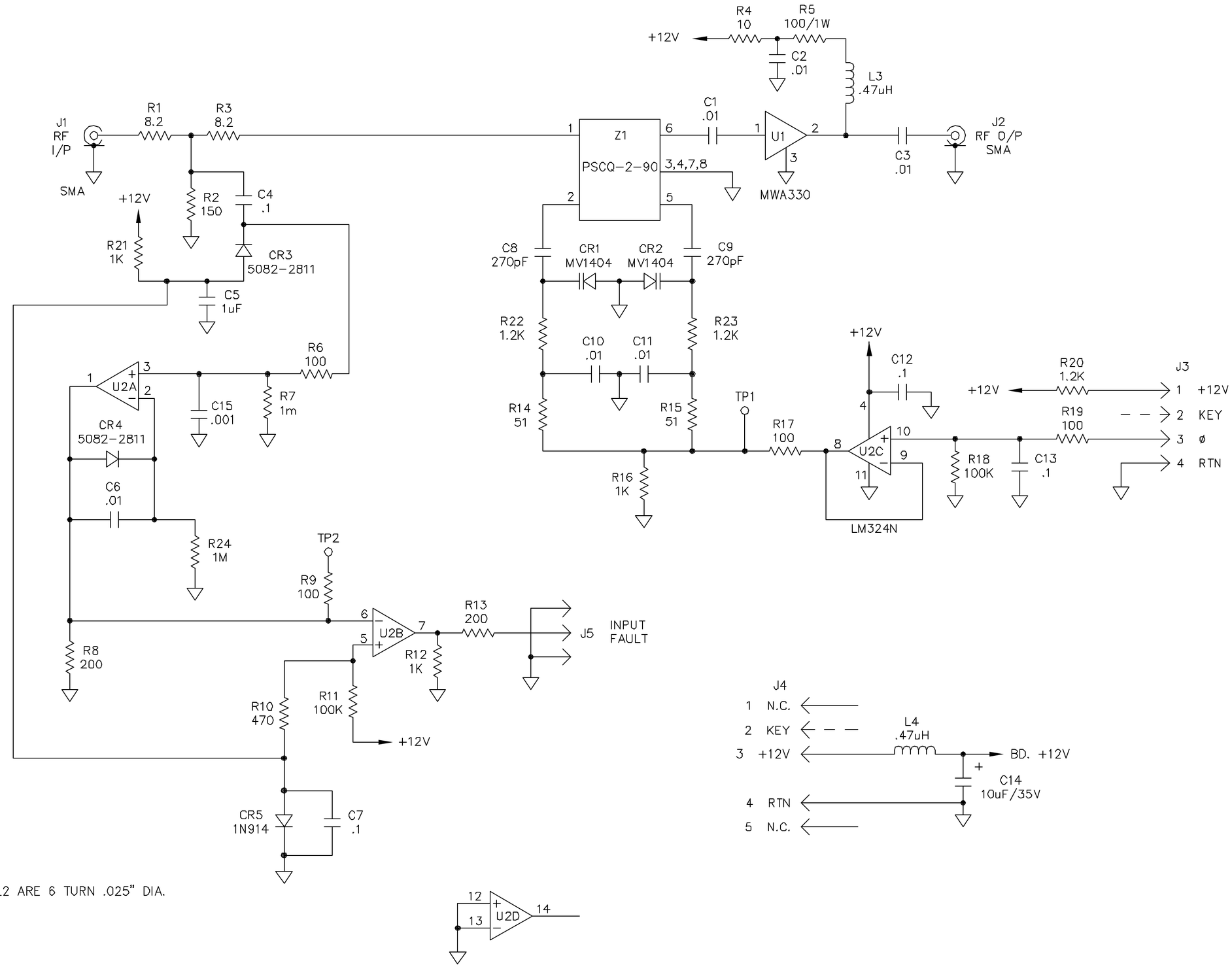
REV	ECO	DATE	APV
			MADE C8 OPTIONAL. JKF
B0	20112979	6/20/08	LRT
			VOLTAGE AT J1-3 WAS +26V. (SAK)
A0	20110553	11/19/02	LRT

MATERIAL ---

FINISH ---

TITLE SCHEMATIC – OVERDRIVE PROTECTION BD. (1198–1601)

			DWG. NO.	REV
DWN	SJM	3/4/93	1198–3601	B0
CHK	DWB	3/4/93		
REL	DWB	3/4/93	C SCALE ---	SHEET 1 OF 1



CR3 WAS CR4. U2 WAS LM-324. SJM

REV	ECN	DATE	APV
1	7327	8/9/93	

ITS CORPORATION

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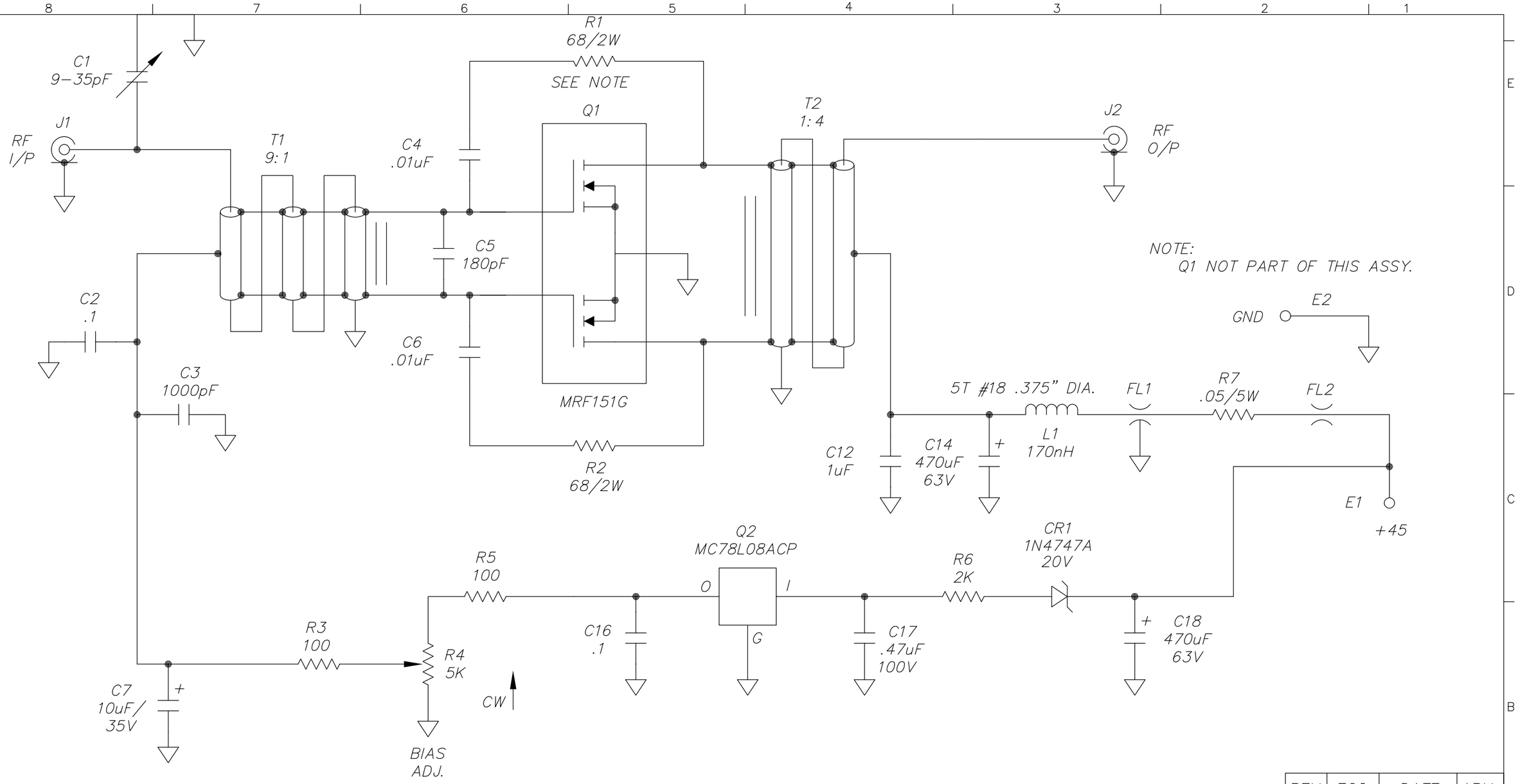
MATERIAL ---

FINISH ---

TITLE: SCHEMATIC – PHASE SHIFTER BOARD LOW BAND (1198-1602)

DWN	RFB	5/3/93	DWG. NO. 1198-3602 REV 1
CHK	DWB	5/11/93	
REL	DWB	5/11/93	C SCALE --- SHEET 1 OF 1



REV	ECO	DATE	APV

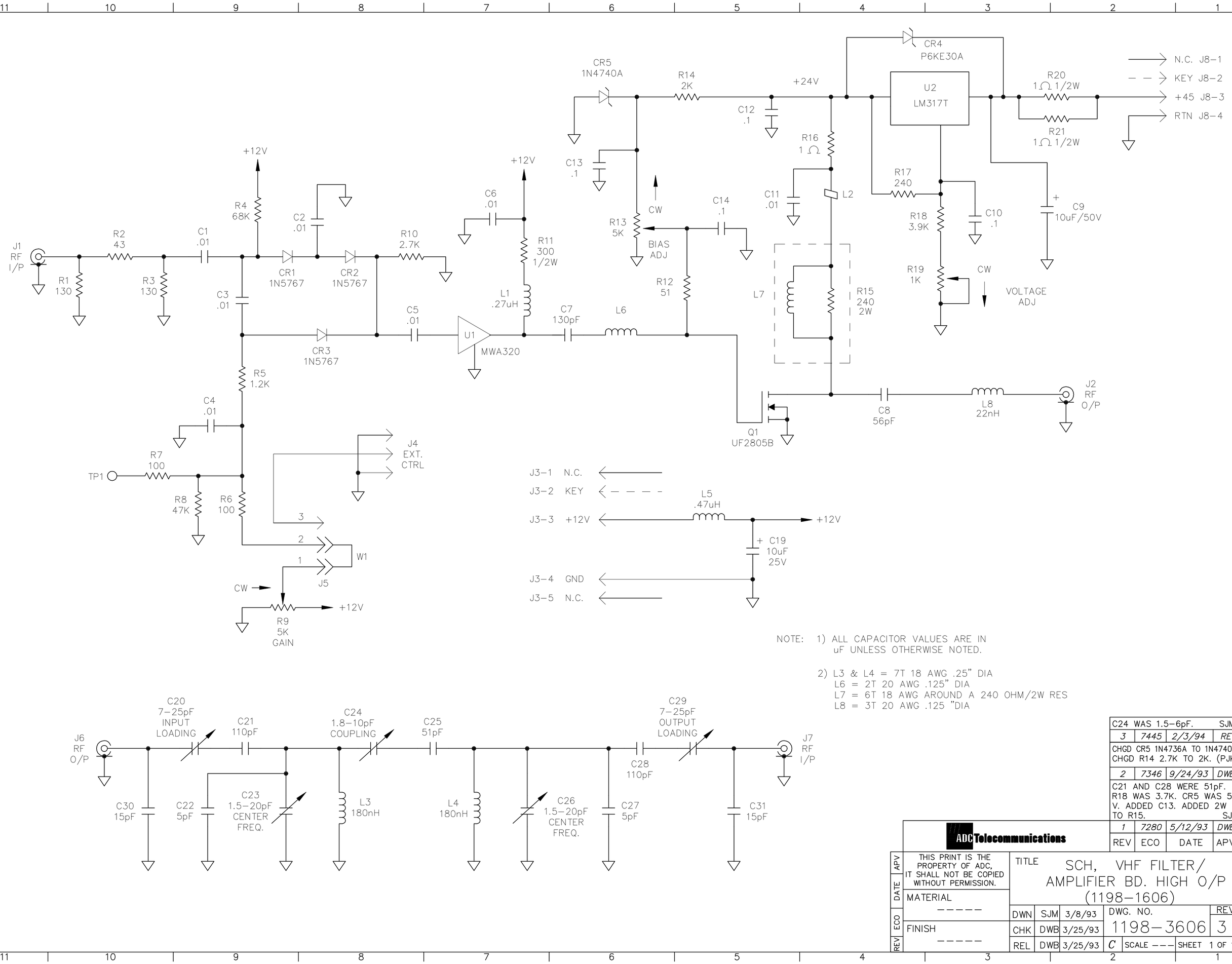
Axcera®

MATERIAL — — — —

FINISH — — — —

TITLE SCHEMATIC – LOW BAND AMPLIFIER, +45V, I/P (1198–1605)

			DWG. NO.	REV
DWN	SJM	2/24/93	1198–3605	0
CHK	DWB	3/1/93		
REL	DWB	3/1/93	B SCALE – –	SHEET 1 OF 1



NOTE: 1) ALL CAPACITOR VALUES ARE IN uF UNLESS OTHERWISE NOTED.

2) L3 & L4 = 7T 18 AWG .25" DIA
L6 = 2T 20 AWG .125" DIA
L7 = 6T 18 AWG AROUND A 240 OHM/2W RES
L8 = 3T 20 AWG .125 "DIA

REV	ECO	DATE	APV
		C24 WAS 1.5-6pF.	SJM
3	7445	2/3/94	RE
		CHGD CR5 1N4736A TO 1N4740A. CHGD R14 2.7K TO 2K. (PJK)	
2	7346	9/24/93	DWB
		C21 AND C28 WERE 51pF. R18 WAS 3.7K. CR5 WAS 5.1 V. ADDED C13. ADDED 2W TO R15.	SJM
1	7280	5/12/93	DWB

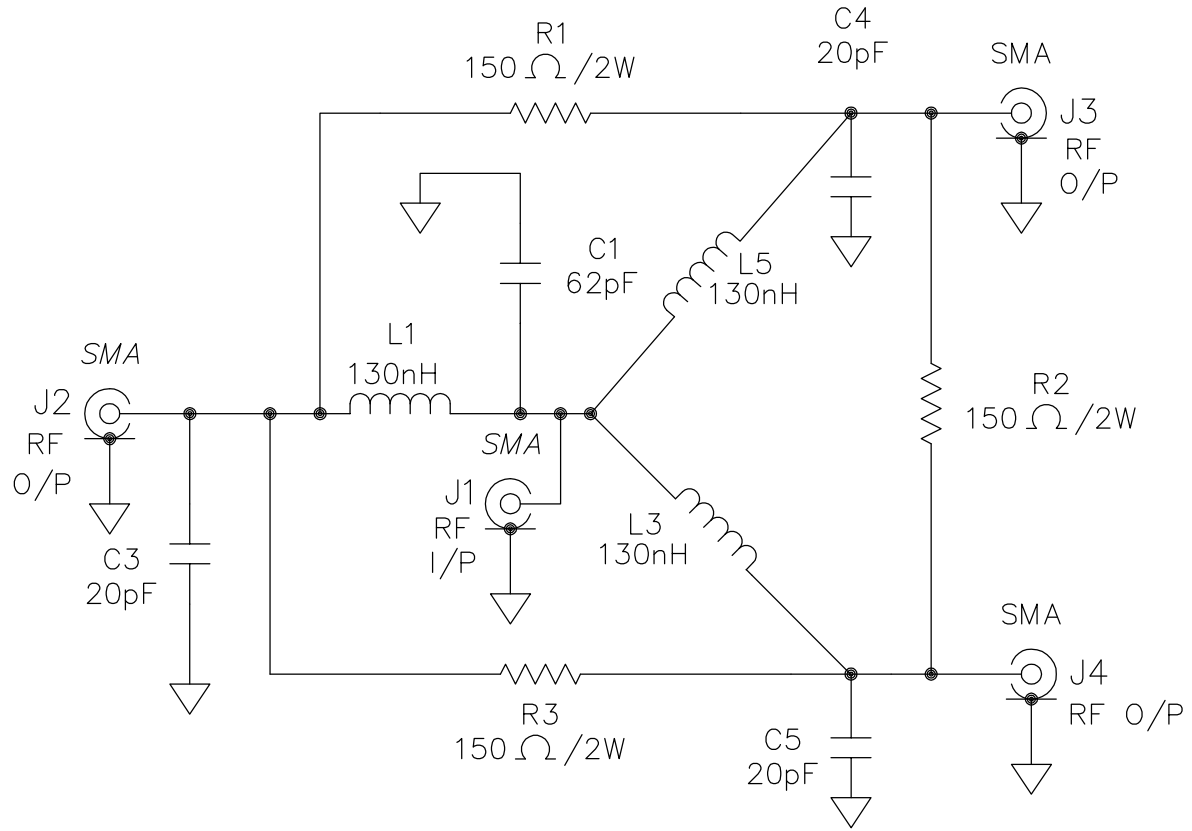
ADC Telecommunications

MATERIAL: -----

FINISH: -----

TITLE: SCH, VHF FILTER/ AMPLIFIER BD. HIGH O/P (1198-1606)

			DWG. NO.	REV
DWN	SJM	3/8/93	1198-3606	3
CHK	DWB	3/25/93		
REL	DWB	3/25/93	C SCALE ---	SHEET 1 OF 1



NOTE: L1–L3 4T #18 AWG .375" DIA

REV	ECO	DATE	APV

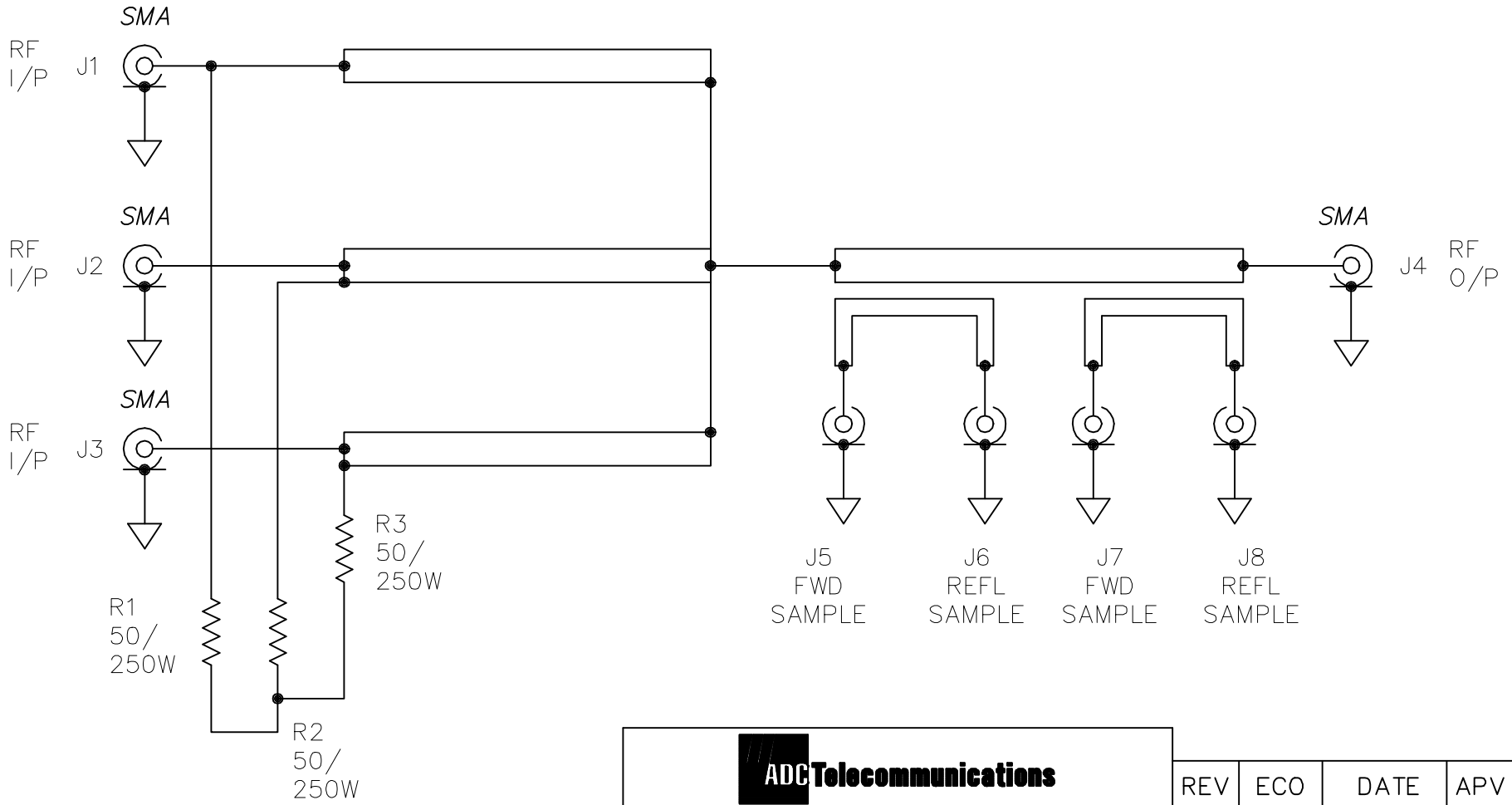
Axcera®

MATERIAL
— — — —

FINISH
— — — —

TITLE
SCHEMATIC –
3 WAY SPLITTER BD
CH 5–6 (1198–1608)

			DWG. NO.	REV
DWN	SJM	3/12/93	1198–3608	0
CHK	DWB	3/24/93		
REL	DWB	3/24/93	A SCALE – –	SHEET 1 OF 1



ADC Telecommunications

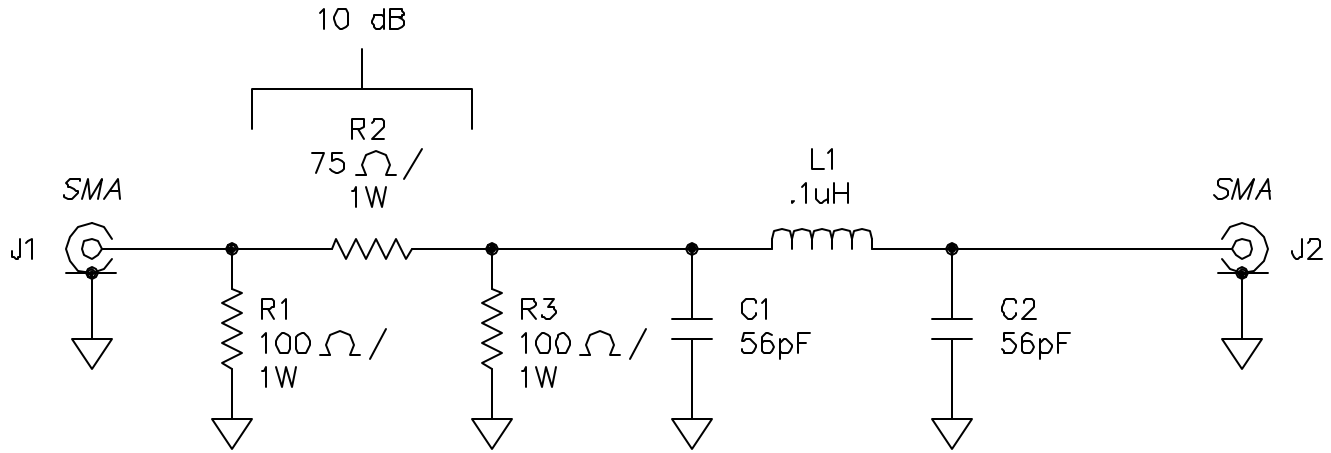
REV	ECO	DATE	APV

MATERIAL
———

FINISH
———

TITLE
3 WAY COMBINER CH 5–6 (1198–1626)

DWN	SJM	7/26/93	DWG. NO. 1198–3626	REV 0
CHK	DWB	7/26/93		
REL	DWB	7/26/93	A SCALE ———	SHEET 1 OF 1



ITS CORPORATION	REV	ECN	DATE	APV

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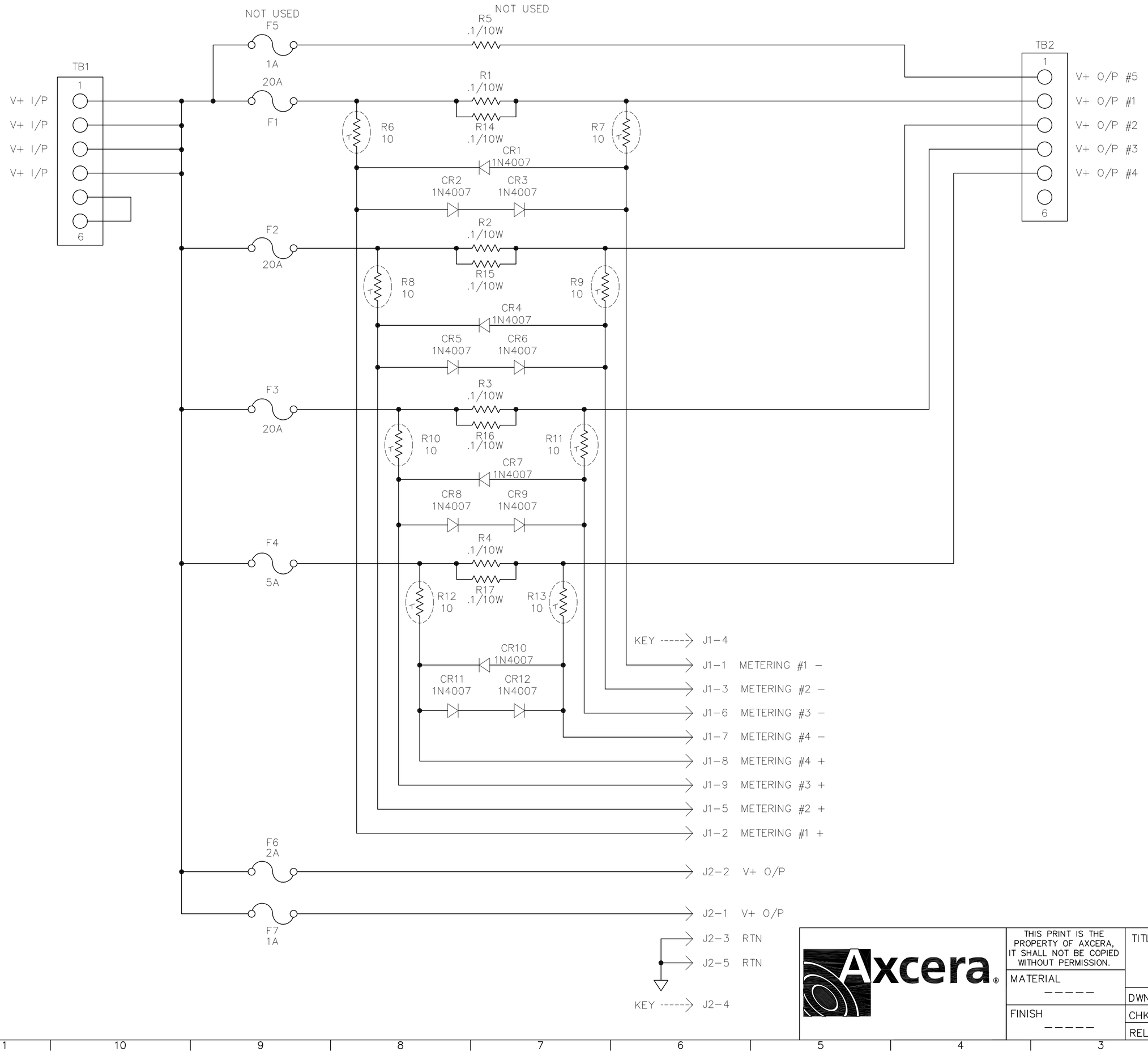
MATERIAL
———

FINISH
———

TITLE *LOW PASS FILTER BD, LOW BAND VHF (1198–1628)*

DWN	SJM	7/26/93	DWG. NO. 1198–3628		REV 0
CHK	DWB	7/26/93			
REL	DWB	7/26/93	A	SCALE———	SHEET 1 OF 1



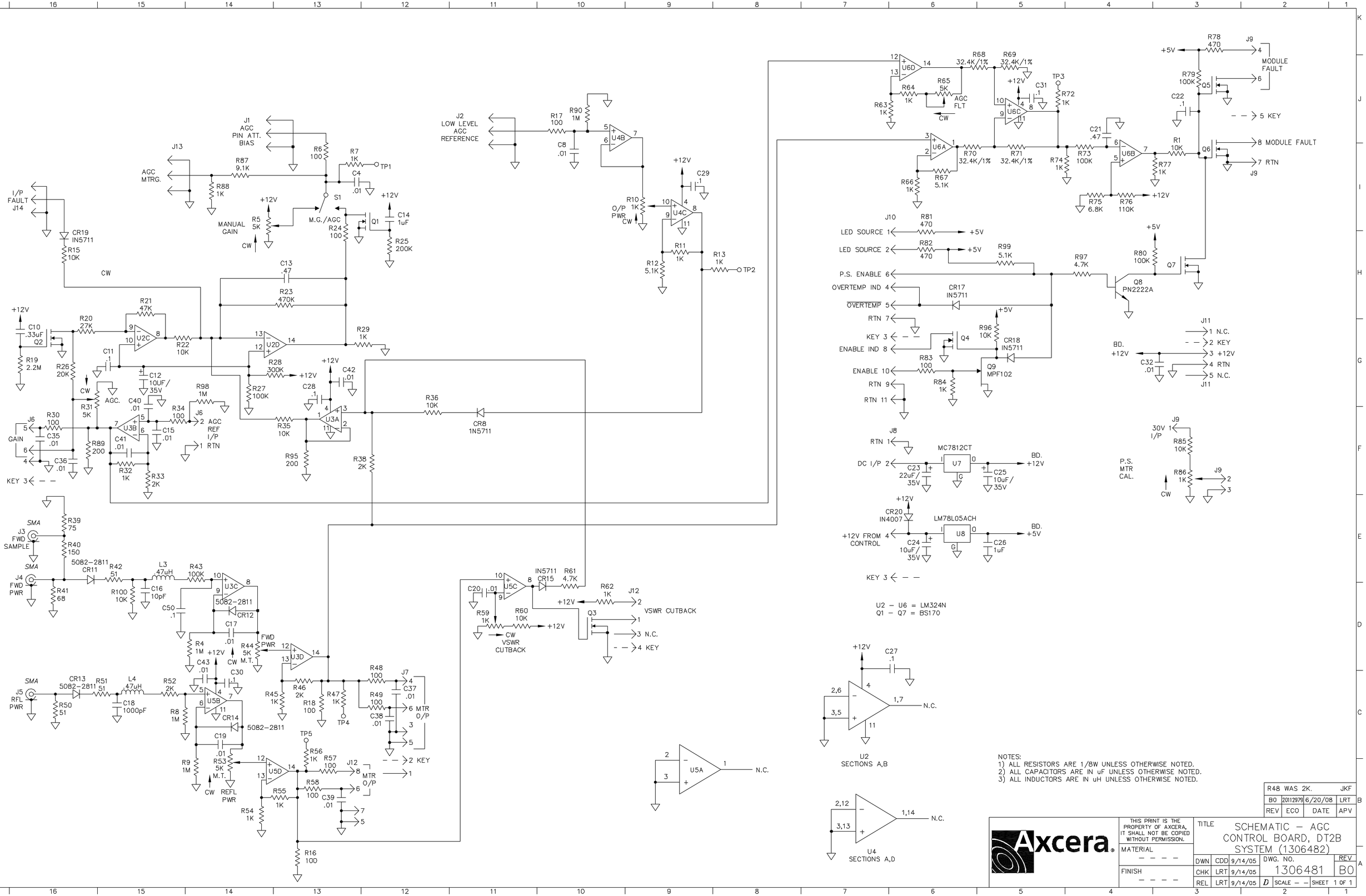
REV	ECO	DATE	APV

MATERIAL
———

FINISH
———

TITLE
SCHEMATIC,
CURRENT METERING
BOARD, DTV LB VHF AMP

DWN	RGE	5/4/04	DWG. NO.		REV
CHK	LRT	5/10/04	1304366		A0
REL	LRT	5/10/04	C	SCALE ———	SHEET 1 OF 1



NOTES:
1) ALL RESISTORS ARE 1/8W UNLESS OTHERWISE NOTED.
2) ALL CAPACITORS ARE IN uF UNLESS OTHERWISE NOTED.
3) ALL INDUCTORS ARE IN uH UNLESS OTHERWISE NOTED.

R48 WAS 2K.			JKF
B0	20112979	6/20/08	LRT
REV	ECO	DATE	APV

Axcera

MATERIAL – – – –

FINISH – – – –

TITLE SCHEMATIC – AGC CONTROL BOARD, DT2B SYSTEM (1306482)

DWN	CDD	9/14/05	DWG. NO. 1306481 REV B0
CHK	LRT	9/14/05	
REL	LRT	9/14/05	D SCALE – – SHEET 1 OF 1

1806

Part Number

P400-VHF-L-18

Amplifier Name

Revision 1.c Release Date July 11 2007
Revision Notes

Technical Specifications Summary

Frequency Range:	50 - 88 MHz	Gain:	19 dB
P1dB:	450 Watts CW	Efficiency:	40%
Class:	AB	Temperature Range:	0 to 70°C
Supply Voltage:	+32.0V	Max VSWR:	5:1

Amplifier General Description

The P400-VHF-L is an integrated TV linear amplifier designed for the television integrator. Providing a minimum of 350W Pk sync linear power, the P400-VHF-L is the perfect amplifier for any low band VHF transmitter. Featuring quadrature input and output combining, this unit is isolated from most external circuit problems. This amplifier is MOSFET based.

- ® No RF assembly or circuit tuning!
- ® 400 Watts of Output Power!
- ® Combined Video and Aural operation at full rated power!
- ® 18dB typical gain at Channel 6!
- ® Modular Construction for ease of Integration!

Amplifier Picture

Delta RF Technology, Inc.
High Power RF Amplifiers and Accessories
350 South Rock Boulevard • Reno • NV • 89502 • USA

Phone +1.775 DELTA RF [775 335 8273]
Fax +1.775 DELTA FX [775 335 8239]
website: http://www.drft.com
email: sales@drft.com

1806 P400-VHF-L-18

Electrical Specifications

Parameter	Min	Typ	Max	Units	Notes
Frequency	50		88	MHz	
P1dB		450		W, CW	
Linear Power Out	350	400		W	
IMD3	-40			dBc	For 2 tones, 1MHz spacing, 350 W PEP
Power Input		6	10	W, CW	
Gain	18	19		dB	
Vsupply		32		V, DC	
Drain Current		20	23.5	A, DC	
Input VSWR		1.2:1	1.5:1		
Insertion Phase Variation		±5		°	Unit to unit
Gain Variation		±1		dB	Unit to unit
F2 Second Harmonic		-30		dBc	
F3 Third Harmonic		-10		dBc	
Baseplate Operating Temperature	0		+70	°C	

Physical Dimensions 7.5" x 4.0" x 1.5"

All specifications valid for 50 Ω output load, V_{sup} = +32VDC, I_{dq} = 1.6A

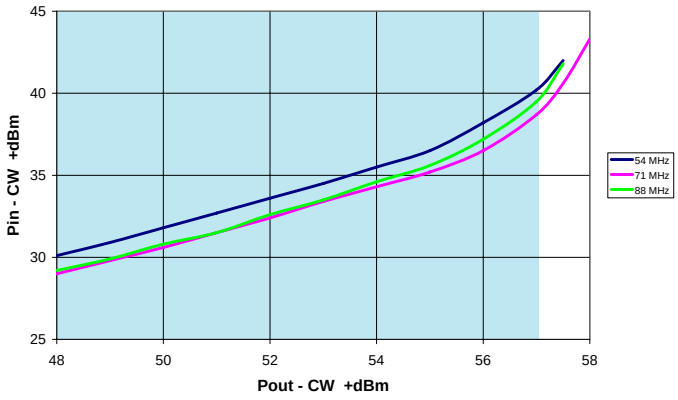
Absolute Maximum Ratings

Parameter	Value	Units	Notes
Maximum Operating Voltage	+34.0	VDC	
Stable Operating Voltage	+26.0 to +32.0	VDC	
Maximum Bias Current	3.0	A	
Maximum Drain Current	28	A	
Load Mismatch Survival	5:1		
Storage Temperature	-40 to +105	°C	
Maximum Operating Baseplate Temp	+70	°C	

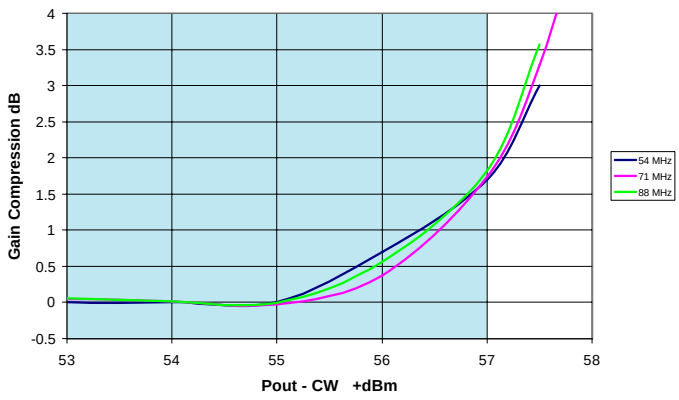
Features, Auxillary Functions

- Temperature Compensated Bias
- Temperature Controller - Analog Temperature Output
- High Temperature Alarm with Selectable Automatic PA Disable
- High Temperature Alarm Output
- Amplifier Disable
- Current Sense, Each Transistor
- Connectorized Power and I/O

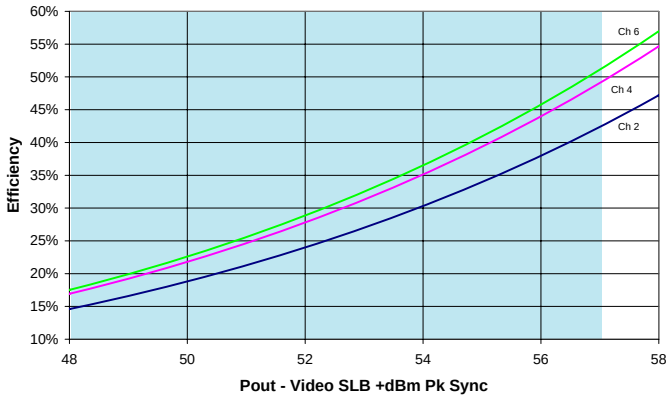
Pin vs. Pout



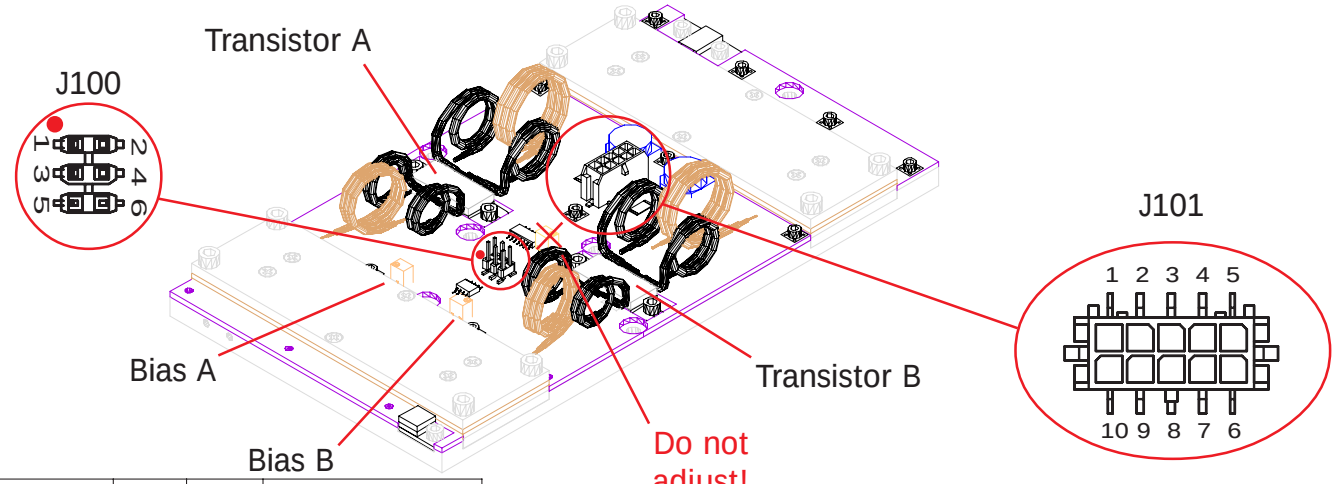
Gain Compression



Efficiency



Electrical Connections:



I/O Standard 0.100" pitch DIP /IDC header: SAMTEC type IDSD, HCSD 3M type 89106-0101 AMP 102393-1, 102398-1 BERG 71602-306 -or- Solder directly to Pin in I/O connector	**J100-1**	ALARM_OUT	TTL Hi when baseplate exceeds 70C
	J100-2	ALARM_IN	Jumper to J100-1 for automatic shutdown at 70C, automatically re-enables at 60C
	J100-3	GROUND	
	J100-4	BIAS_SUP	Optional - remove R-108 to power control circuitry at this point. With R-108 installed, Vsup is present at this pin.
	J100-5	TEMP	Baseplate Temperature
	J100-6	DISABLE	TTL Hi to Disable amplifier
Power 3.0mm Micro Connector: MOLEX 43025-1000 MOLEX Pin 43030-0001, 43030-0007 AMP 1-794617-0 AMP Pin 794610, 794606 -or- Solder directly to pad adjacent to connector	**J101-1**	CURRENT_B	Current Sense, Transistor B
	J101-2,3,8,9	GROUND	System Ground
	J101-4,5,6,7	Vsup	+28 to +32 VDC
	J101-10	CURRENT_A	Current Sense, Transistor A

Connections:

Connect amplifier to +Vsup and Ground using either 3.0mm modular 10-position plug (J101) or soldering directly to pads adjacent to connector. If using Single connection, 14 gauge wire to each side is recommended, 12 gauge ground wire. 20 gauge wire is recommended for use in modular connector, and all power connections must be used! In all cases, use of teflon insulated wire is highly recommended.

I/O connector (J100) connections are optional. Resistor R108 brings power from Drain to Bias control circuitry. It may be removed to allow power control through J100-4.

Connect coaxial cable to input and output RF connections (semi rigid or flexible) using best RF practices. Ensure output cable is of sufficient power handling rating. Pads are provided for ground on co-axial connections.

Amplifier Startup

+Vsup should be applied to amplifier with no drive and with no bias applied. The system must allow drain voltage to reach +26V minimum before applying bias and drive or damage will result to the amplifier and void warranty. This typically takes between 2 - 10 seconds and should be verified by the system integrator. This can be accomplished in several ways:

1) Apply power to amp at J101, remove power from J100-4, and remove R108. After proper voltage has been reached, apply +28V - +32V to J100-4. Amplifier is ready for use.

2) Apply power to amp at J101. Place a TTL Hi (+5V) to J100-6 DISABLE. After proper voltage has been reached, remove TTL Hi from J100-6 DISABLE. Amplifier is ready for use.

Bias Current:

Bias current is controlled via temperature compensated bias system that uses a hermetically sealed glass thermistor as reference. If excessive air is directed above the amplifier such that the thermistor is cooled below the temperature of the baseplate, this circuitry may not perform properly. Bias has been pre-set at the factory to 0.8A each side at +32.0V DC. This bias point has been selected to offer the optimum balance between IMD performance, efficiency, and gain. If the bias point is changed, take great care to set the same bias point on each transistor, and not to exceed the bias maximum listed on page 1.

Fault Condition - Bad VSWR

Current sense J101-1, J101-10 should be monitored for excessive current. The voltage difference between J100-10 (transistor A) to J100-4,5,6,7 and J100-1 (transistor B) to J100-4,5,6,7 is scaled 1A per 0.010 V. If either transistor experiences currents in excess of normal operation, a fault condition exists, and the amplifier should be disabled through J100-6 DISABLE. If current on either transistor drops to below 0.5A indicated, a fault condition exists, and the amplifier should be disabled through J100-6 DISABLE.

Temperature Sense and Temperature Fault

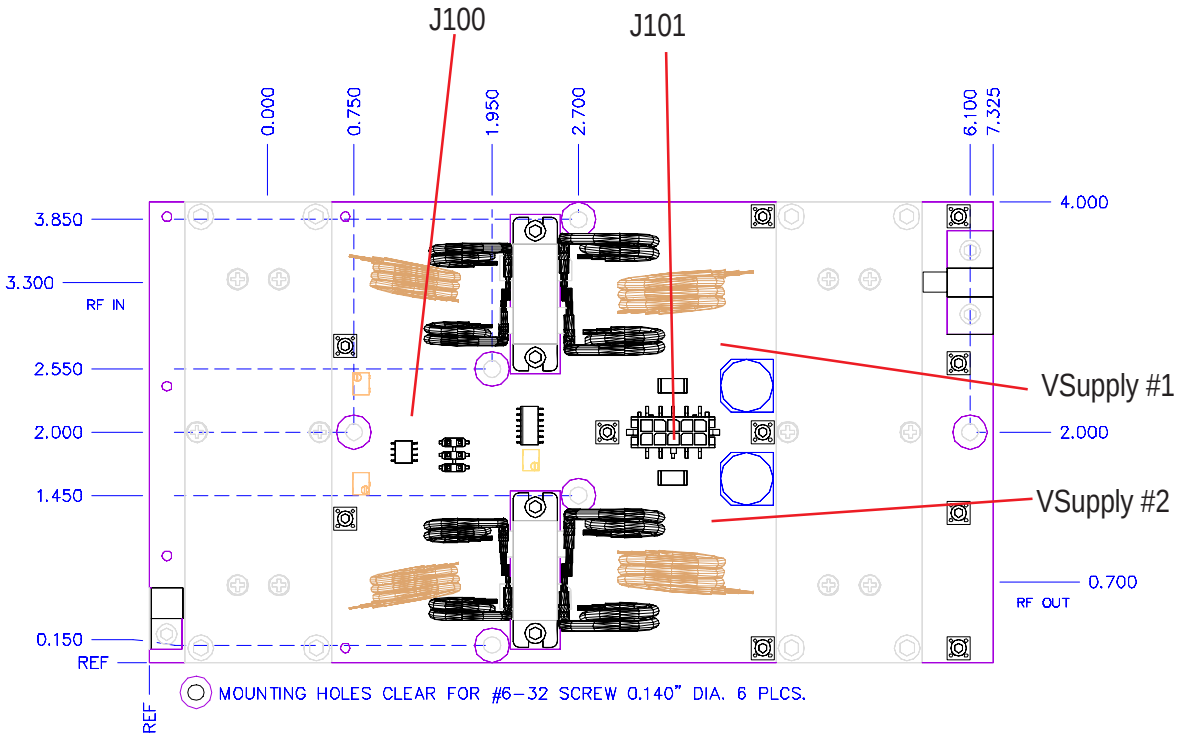
An on board temperature controller reports temperature on pin J100-5 TEMP. This is scaled to +395mV + (Temperature °C X +6.20mV/°C) and has an output impedance of 1.5kohm typical. An output alarm, J100-1 ALARM OUT, is TTL Low when the temperature exceeds approximately 70°C, and the alarm is cleared when the baseplate temperature drops below approximately 60°C. For automatic operation, jumper J100-1 ALARM OUT to J100-2 ALARM IN and the amplifier will automatically disable by removing bias when the temperature exceeds 70°C, and automatically re-enable when the temperature drops below 60°C.

Amplifier Shutdown

To prevent damage to amplifier and surrounding systems, bias and drive should be removed prior to powering down PA. This can be accomplished by removing voltage from J100-4 with R-108 removed, or by applying TTL Hi (+5V) to J100-6 DISABLE. Power can safely be removed from PA.

Miscellaneous:

It is normal for the output quadrature and the output transformers (flexible coax on the output of transistors A and B) to get warm during operation. These components are rated for continuous operation in excess of 150°C. Placing noisy analog or digital systems, such as additional control circuitry, directly over the top of transistors or RF path can cause improper operation. Care should be taken to locate these components where they will not cause interference.



Tips for Mechanical Mounting:

1 All holes are clear for #6 Screw. Stainless Steel mounting hardware is recommended, grade 18-8 or better. A lock washer of same material should also be used.

2 Ensure mounting surface is flat to better than 0.003" / "

3 Use a thin layer of thermal compound on the backside of the PA - no more than 0.001" - 0.002" thickness!

4 Torque all screws to 10-12 in-lbs

Considerations for Mechanical Mounting:

- Considerations for proper thermal design include
- Total power dissipated = Total DC Power Consumed x (1-Efficiency)
- Ambient Airflow
- Thermal Resistance of Heat Sink
- VSupply #1 and #2 must both be connected.

Ordering Information:

Order Code	Description	DRFT Reference
P400-VHF-L	500W VHF Band I TV Linear Pallet Amplifier	1806
PAB400-VHF-L	Amplifier in Enclosure	TBA
Options		
-A11	SMA Female Connectors In / Out	0201
-A12	Heat Sink Option	0202
-A13	Heat Sink Option with DC Fan, pre wired	0203
-A14	Ruggedized for vibration	0204
-A15	Wire harness, 1' length, 10 wires for pallet amplifier only (NON-FM)	0205
-A16	Wire harness, customer specified length for pallet amplifier only	0206
-T2	Extended Burn In	0271
-T3	Extended Data Collection	0272

Standard Pallet Options:

SMA Female Connectors, Input and Output. Stainless Body, Gold Center pin, 4-hole SMA bolted to pallet amplifier edge through bottom two holes located at amplifiers RF IN and RF OUT locations. All stainless steel hardware.

Enclosure- all aluminum machined enclosure available for most pallet amplifiers. Alodyned aluminum, alloy 6061-T6. SMA Female input and output RF connectors. Supply voltage and ground through solder / feedthrough connections. Module must be bolted to appropriate heatsink.

Heat Sink - aluminum extruded heat sink, black anodized. Pallet amplifier or module will be bolted to heatsink. Customer will be required to provide adequate airflow.

Heat sink with fan - aluminum extruded heat sink as above, with included fan bolted to push air through the heat sink. Depending on heat requirements, a second fan may also be provided on the output of the unit.

Ruggedized - all screws have threadlocking compound applied, and all flying components are staked and attached to base. Designed to withstand MIL-STD-810E 514.4 Category 8.

Power Connector - a 10 pin molex connector is used on all standard pallet amplifiers to supply +Vsup and Ground connections, as well as hi-side current shunts for current monitoring. Delta RF offers the mating connector with 1' wires - Red (Vsup), Black (Ground), Yellow (Current monitor). All wires are 18 gauge teflon insulated wires. Customer may optionally specify wire length and wire color.

Testing Options:

Standard - includes power test and brief burn - in under laboratory conditions. Printed test report gives graph of Gain and Input Return Loss at rated P1dB and Voltage Conditions. Report shows pass/fail critera. All amplifiers include this test.

Extended burn in - 8-hour burn in at P1dB with standard test run at completion. Unit is monitored during test and any discrepancy reported. Standard test data is included.

Extended data collection - Standard data is run and included. Detailed data is taken point by point giving the customer 25 - 70 frequency points, depending on the amplifier model. For each frequency point, data is generated to include gain, input power, input return loss, current, second harmonic, third harmonic, efficiency, audio distortion.

Other tests available - Vibration, Temp cycling, Shock. Please inquire.