OPERATIONS / MAINTENANCE MANUAL

For

400MHz Fiber Optic Fed & RF Fed Bi-Directional Amplifier
AE04A-D1248-001
AE04A-D1246-001

800MHz Fiber Optic Fed & RF Fed Bi-Directional Amplifier
AE04A-D1437-002
AE04A-D1436-002

MANUAL NO. AE04B-A1669
REVISION B

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AMENDMENT RECORD SHEET

Rev Nō.	Date	ECN	Reason	Page Amended	Incorporated By
A	6/16/04		1st Issue		J. Hsu/ E. Yearby
B	6/18/08		800 MHz Re-band to New Operating Frequency	2, 9, 10, 11, 29 and 36	K. Black/ E. Yearby

INTRODUCTION

Scope

This handbook is for use solely with the equipment identified by the Andrew Part Numbers shown on the front cover. It is not to be used with any other equipment unless specifically authorized by Andrew Corporation.

Purpose

The purpose of this handbook is to provide the operator/maintainer with sufficient information to operate, maintain and repair the equipment while in the filed. All repairs and adjustments that are not filed repairable will be performed by Andrew Corporation Richardson, Texas facility.

Limitation of Information Notice

This manual is written for the use of technically competent operators/service persons. No liability is accepted by Andrew Corporation for the misuse of the information contained within this manual.

GLOSSARY OF TERMS

ALC	Automatic Level Control
AC	Alternating Current
BDA	Bi-Directional Amplifier
C/N	Carrier-to-Noise Ratio
DC	Direct Current
dB	Decibel
dBc	Decibel Below Carrier
dBm	Decibel referenced to 1 mW
ESD	Electrostatic Discharge
EMI	Electromagnetic Interference
FC/APC	Fiber Connector /Angle Polish Connector
GND	Ground
HPA	High Power Amplifier
Hz	Hertz
kHz	Kilohertz
kM	Kilometer
LED	Light Emitting Diode
LPA	Low Power Amplifier
MHz	Megahertz
mW	Milliwatt
nm	nanometer
NF	Noise Figure
OIP3	Output Third-Order Intercept Point
Ω	Ohm
RF	Radio Frequency
Rx	Receiver
Tx	Transmitter
V	Volt
VAC	Volt Alternating Current
VSWR	Voltage Standing Wave Ratio

1.0 SAFETY CONSIDERATIONS

1.1 Electric Shock Hazard

To avoid electric shock, switch the BDA "OFF" prior to performing any repairs. All repairs beyond modular replacement must be performed by Andrew Trained Technicians.

1.2 Hot Surface Hazard

RF power into the BDA will be limited by the use of high power attenuators. These attenuators will be located at the transmitter source. Caution should be taken when working near high power attenuators due to the risk of being burned by its hot surface.

Due to the amount of heat dissipated by the BDA heat fins, caution should be taken when working near heat fins due to the risk of being burned by its hot surface.

1.3 Optical Laser Hazard

To avoid injury to the eyes, do not look directly into fiber optic transceiver transmit port (Tx).

1.4 Emergency Contact Numbers

Andrew Engineering Department contact information:

Andrew Corporation
Attn: Wireless Innovations Group
2601 Telecom Parkway
Richardson, Texas U.S.A. 75082-3521

Telephone: 972-952-9700
Fax: 972-952-0018

2.0 EQUIPMENT OVERVIEW / DESCRIPTION

MBTA System Wide Radio Tunnel Antenna Distribution System provides extended radio coverage within MBTA rail transit tunnels. The new tunnel antenna system is a two-way communication system consisting of 400 MHz base transceiver stations, 800 MHz base transceiver stations, antennas, radiating cable, fiber optic cable and BDAs. Both the 400 MHz and 800 MHz systems operate independently. The 400 MHz system operate as a conventional analog voice communication system and the 800 MHz system operate as a digital trunked radio system for voice and data communications. Radio signals routed from the base transceiver stations to the BDAs are performed via fiber optic cable. Once the optical signal is received by the BDA, it is converted back into an electrical (RF) signal, amplified and transmitted throughout the tunnel antenna distribution system. For RF signals transmitted within the tunnel, they are received by the BDA, amplified, converted into a optical signal and sent via fiber cable to the base transceiver stations.

Each BDA is designed for a 19" rack mount cabinet and is equipped with interchangeable modules. These modules are field replaceable by removing them from the front chassis of the BDA. The modules consist of a downlink amplifier, uplink amplifier, high isolation duplexer, low isolation duplexer (400 MHz RF fed BDA only), fiber optic transceiver (fiber fed BDA only) and a AC to DC power supply. and alarm module (Optional Equipment). All BDA controls are performed via a RS232 connector located on the front panel of each amplifier module.

Each BDA has 30 dB of gain adjustment for both the uplink and downlink RF path. This adjustment is varied electronically thru the amplifier modules' front panel RS232 connector. Additionally, each of the amplifier modules are equipped with an Automatic Level Control (ALC) circuit which can limit the maximum power level produced by the BDA.

OPTIONAL EQUIPMENT (Not Used By MBTA)

An alarm module is available as an option to serve as a central communication agent to monitor the status of each module and send a summary alarm to remote locations via the fiber optic transceiver module.

3.0 SPECIFICATION

3.1 Parts Lists

3.1.1 400 MHz Bi-Directional Amplifier

Andrew Part Number	Description	Qty.	Section
AE04A-D1264-001	400 MHz EO Cell Amplifier Module	2	5.1
AE04A-D1442-001	480 MHz High Isolation Duplexer	1	5.2
AE04A-D1443-001	480 MHz Low Isolation Duplexer[1]	1	5.3
AE04A-D1100-009	Fiber Optic Transceiver Module	1	5.6
AE04A-D0803-002	+48V Power Supply Module	1	5.7
AE04A-D0805-007	Alarm Module (Optional Equipment)	1	5.8

1.Used in RF Fed BDA.

3.1.2 800 MHz Bi-Directional Amplifier

Andrew Part Number	Description	Qty.	Section
AE04A-D1265-001	800 MHz EO Cell Amplifier Module	2	5.4
AE04A-D1438-002	800 MHz High Isolation Duplexer[1]	1	5.5
AE04A-D1100-009	Fiber Optic Transceiver Module	1	5.6
AE04A-D0803-002	+48V Power Supply Module	1	5.7
AE04A-D0805-007	Alarm Module (Optional Equipment)	1	5.8

1.Two units required for RF Fed BDA.

3.2 Electrical Specifications

3.2.1 400 MHz Bi-Directional Amplifier Downlink Specification

PARAMETER	DOWNLINK SPECIFICATION
Operating Frequency Range	483.1625 – 483.2375 MHz
Pass Bandwidth	75 kHz
Gain Typical	48 dB
Output Gain Adjustment[1]	30 dB
Power Output @ 4 Carriers	+19.0 dBm/C
Composite Output Power	+30 dBm max.
Composite Input Power	-18 dBm max.
Impedance	50 Ohms
VSWR	2:1
OIP3[2]	+44 dBm
Noise Power max. @ 48dB Gain	-64 dBm/Hz (-110 dBm/Hz; RF Fed BDA)
AC Power	120 VAC Single Phase

Notes:

1.Via Front Panel RS232 Connector.
2. Two-Tone Intermodulation: Measured two-output carriers at +20.0 dBm/C (+19.0 dBm/C for RF Fed BDA) at 483.1625 MHz and 483.2375 MHz with a BDA gain setting of 48 dB.

3.2.2 400 MHz Bi-Directional Amplifier Uplink Specification

PARAMETER	UPLINK SPECIFICATION
Operating Frequency Range	486.1625 – 486.2375 MHz
Pass Bandwidth	75 kHz
Gain Typical	48 dB
Output Gain Adjustment[1]	30 dB
Composite Output Power	+5 dBm max.
Composite Input Power (With ALC Activated)	-14 dBm max.
Impedance	50 Ohms
VSWR	2:1
OIP3[2]	+ 26 dBm (+44 dBm; RF Fed BDA)
Noise Power max. @ 48 dB Gain	-110 dBm/Hz
AC Power	120 VAC Single Phase

Notes:

1.Via Front Panel RS232 Connector.
2. Two-Tone Intermodulation: Measured two-input carriers at – 48 dBm/C (-30 dBm/C for RF Fed BDA) at 486.1625 MHz and 486.2375 MHz with a BDA gain setting of 48 dB.

3.2.3 800 MHz Bi-Directional Amplifier Downlink Specification

PARAMETER	DOWNLINK SPECIFICATION
Operating Frequency Range	851 – 856 MHz
Pass Bandwidth	5 MHz
Gain Typical	48 dB
Output Gain Adjustment[1]	30 dB
Power Output @ 16 Carriers	+11.1 dBm/C
Power Output @ 8 Carriers	+16.8 dBm/C
Composite Output Power	+30 dBm max.
Composite Input Power	-18 dBm max.
Impedance	50 Ohms
VSWR	2:1

OIP3[2]	+44 dBm
Noise Power max. @ 48dB Gain	-64 dBm/Hz (-110 dBm/Hz; RF Fed BDA)
AC Power	120 VAC Single Phase

Notes:

1.Via Front Panel RS232 Connector.
2. Two-Tone Intermodulation: Measured two-output carriers at +23.5 dBm/C (+16.8 dBm/C for RF Fed BDA) in the 851 – 856 MHz band, with a BDA gain setting of 48 dB.

3.2.4 800 MHz Bi-directional Amplifier Uplink Specification

PARAMETER	UPLINK SPECIFICATION
Operating Frequency Range	806 – 811 MHz
Pass Bandwidth	3 MHz
Gain Typical	48 dB
Output Gain Adjustment[1]	30 dB
Composite Output Power	+5 dBm max.
Composite Input Power (With ALC Activated)	-14 dBm max.
Impedance	50 Ohms
VSWR	2:1
OIP3[2]	+ 26 dBm (+44 dBm; RF Fed BDA)
Noise Power max. @ 48 dB Gain	-110 dBm/Hz
AC Power	120 VAC Single Phase

Notes:
1.Via Front Panel RS232 Connector.
2. Two-Tone Intermodulation: Measure at two-input carriers of -48 dBm/C (-30 dBm/C for RF Fed BDA) in the 806 – 811 MHz band, with a BDA gain setting of 48 dB.

3.3 Mechanical Specifications

PARAMETERS	SPECIFICATION
RF Connectors	Type-N Female
RS232 Connector	D-Sub, 9 pin
Mounting Configuration	19.0 inch Rack Mount
Dimensions Typical (HxWxD)	6.4 in. x 19.0 in. x 15.8 in.
Cooling	Convection, External Heatsink
Chassis Stud	Ground

3.4 Environmental Specifications

PARAMETERS	SPECIFICATION
Operating Temperature	-20°C to +60°C
Operating Relative Humidity	5% to 95% (Non-Condensing)
Dry Storage Temperature	-25°C to +60°C
ESD & EMI[1]	IEC 65 (Secretariat) 129 Draft Pub. 801-2
Shock, Vibration and Moisture Resistance[2]	MIL-STD810(E)

Notes:
1. Electromagnetic Compatibility (ESD) Part 2.
2. Shock-Method 516.4 Procedure I (20g's), Vibration-Method 514.4 Category 1, Moisture Resistance-Method 506.3 Procedure II.

4.0 EQUIPMENT PHOTOGRAPHS

4.1 400 MHz Fiber Optic Fed Bi-Directional Amplifier

4.2 800 MHz Fiber Optic Fed Bi-Directional Amplifier

5.0 MODULES

5.1 400 MHz EO Cell Amplifier Module (AE04A-D1264-001)

5.1.1 Description

This 2Watt, 483 - 487 MHz, class A Power Amplifier Module provides a nominal 52 dB of gain. It has 30 dB of gain adjustment range, which can be varied electronically thru the front panel RS232 connector. Additionally, the module has an internal Automatic Level Control (ALC) circuit, which can be set to limit the maximum power level produced by the BDA. This module has an on board RISC processor that provides optional alarming/status monitoring and communications capabilities. The same module design is used for both the Downlink and Uplink amplifier.

The amplifier modules contain high reliable RF parts to provide a long trouble-free operating life. In the unlikely event of failure, the entire amplifier module should be replaced.

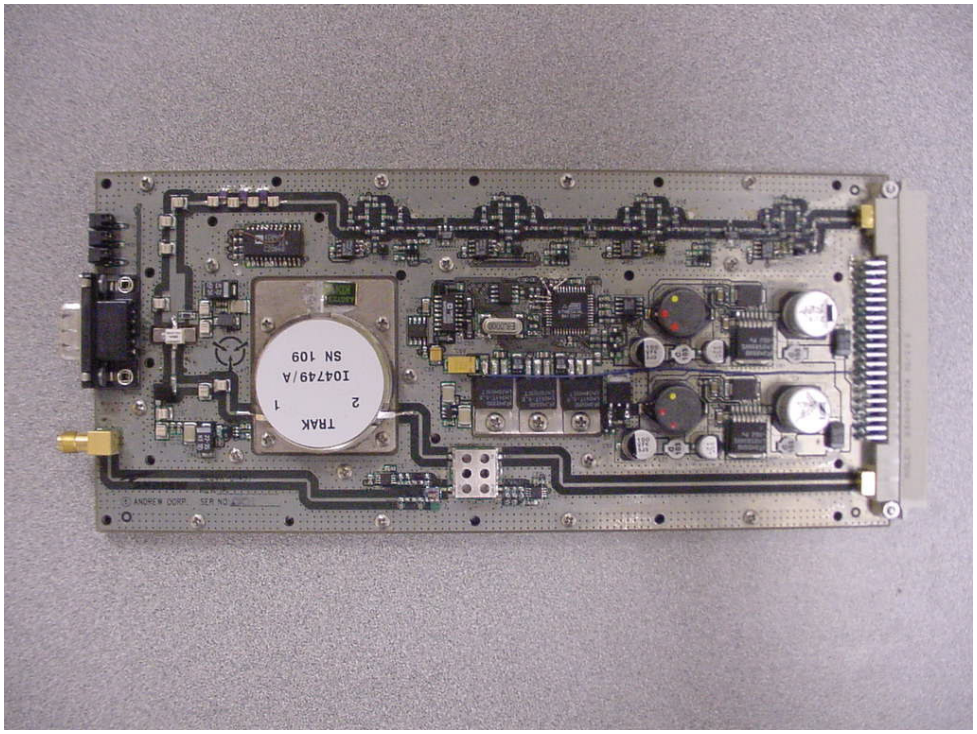
5.1.2 Specification

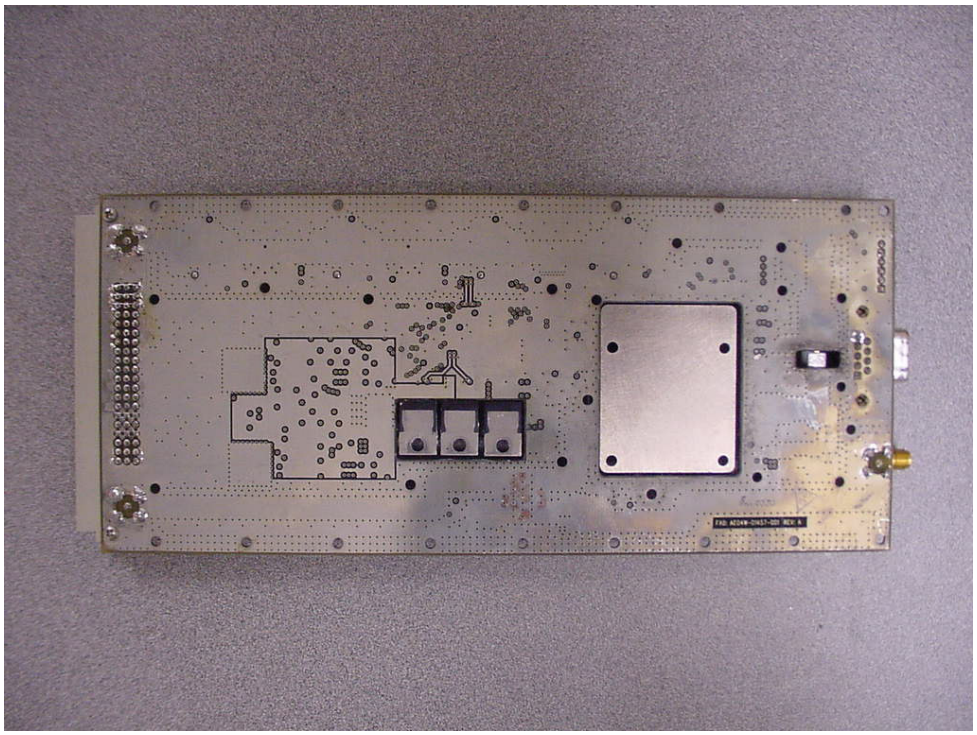
PARAMETER	SPECIFICATION
Operating Frequency Range	483.1625 – 486.2375 MHz
Gain Typical	51.5 dB
Output Gain Adjustment[1]	30 dB
Composite Output Power	≥ +33.5 dBm
Impedance	50 Ohms
VSWR	2:1
OIP3[2]	≥ + 47.5 dBm
Noise Power max. @ 51.5 dB Gain	-111.5 dBm/Hz
DC Power	+ 48 VDC
Operating Temperature	-20°C to +60°C

Note:

1.Via Front Panel RS232 Connector.
2.Two-Tone Intermodulation: Measured two-output carriers of +23.5 dBm/C at 483.1625 MHz and 483.2375 MHz with 51.5 dB gain setting.

5.1.3 Photographs





5.1.4 400 MHz EO Cell Amplifier Module Schematics

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5.2 480 MHz High Isolation Duplexer (AE04A-D1442-001)

5.2.1 Description

The 480 MHz, high isolation duplexer provides the high bandpass selectivity and isolation for the Uplink and the Downlink frequency. The duplexer is based on a 5-cavity cross-coupled bandpass filter design and is aligned carefully during production to optimise the insertion loss, selectivity, and VSWR

The duplexer is a fully passive device and should have an extremely long trouble-free working life and requires no maintenance. Should the duplexer be suspect of failure, the entire duplexer module should be replaced.

5.2.2 Specification

PARAMETER	SPECIFICATION
Frequency Range: Downlink Uplink	483.1375 – 483.2625 MHz 486.1375 – 486.2625 MHz
Passband Insertion Loss	3.5 dB
Passband VSWR	< 1.2:1
Impedance	50 Ohms
Power Handling	10 Watt
Downlink-To-Uplink Isolation	> 96 dB @ Receive Port
Uplink-To-Downlink Isolation	> 96 dB @ Transmit Port
Operating Temperature	-20°C to +60°C

5.2.3 Photograph

5.3 480 MHz Low Isolation Duplexer (AE04A-D1443-001)

5.3.1 Description

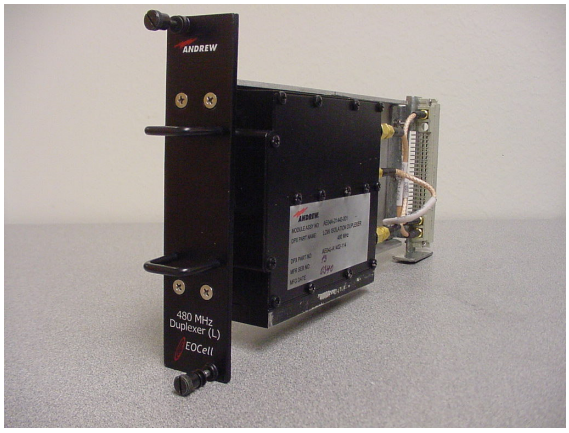
The 480 MHz, low isolation duplexer provides the band selectivity and isolation for the Uplink and the Downlink frequency. The duplexer is based on 4 ceramic coaxial resonators design and is aligned carefully during production to optimize the insertion loss, isolation, and VSWR

The duplexer is a fully passive device and should have an extremely long trouble-free working life and requires no maintenance. Should the duplexer be suspect of failure, the entire duplexer module should be replaced.

5.3.2 Specification

PARAMETER	SPECIFICATION
Frequency Range: Downlink Uplink	483.1375 – 483.2625 MHz 486.1375 – 486.2625 MHz
Passband Insertion Loss	3.5 dB
Passband VSWR	< 1.2:1
Impedance	50 Ohms
Power Handling	5 Watt
Downlink-To-Uplink Isolation	> 50 dB @ Receive Port
Uplink-To-Downlink Isolation	> 55 dB @ Transmit Port
Operating Temperature	-20°C to +60°C

5.3.3 Photograph



5.4 800 MHz EO Cell Amplifier Module (AE04A-D1265-001)

5.4.1 Description

This 2Watt, 806-856 MHz, class A Power Amplifier Module provides a nominally 51 dB of gain. It has 30 dB of gain adjustment range, which can be varied electronically thru the front panel RS232 connector. Additionally, the module has an internal Automatic Level Control (ALC) circuit, which can be set to limit the maximum power level produced by the BDA. This module has an on board RISC processor that provides optional alarming/status monitoring and communications capabilities. The same module design is used for both the Downlink and Uplink amplifier.

The amplifier module contains high reliable RF parts to provide a long trouble-free operating life. In the unlikely event of failure, the entire amplifier module should be replaced.

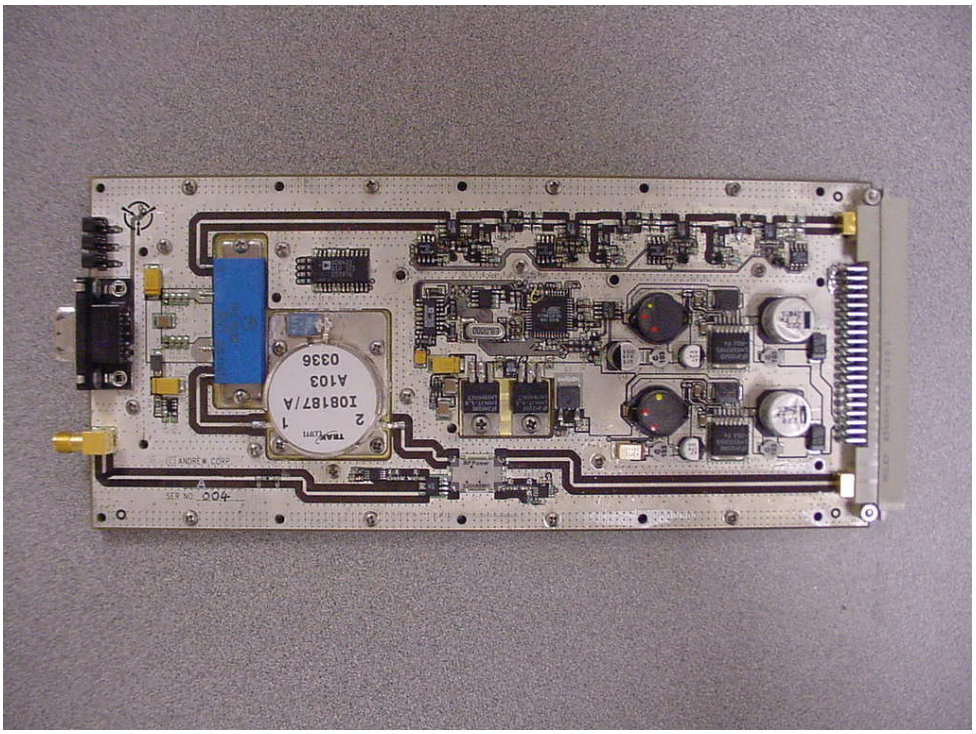
5.4.2 Specification

PARAMETER	SPECIFICATION
Operating Frequency Range	806 – 856 MHz
Gain Typical	51 dB
Output Gain Adjustment[1]	30 dB
Composite Output Power	≥ +33 dBm
Impedance	50 Ohms
VSWR	2:1
OIP3[2]	≥ + 47 dBm
Noise Power max. @ 51 dB Gain	-111 dBm/Hz
DC Power	+48 VDC
Operating Temperature	-20°C to +60°C

Note:

1.Via Front Panel RS232 Connector.
2.Two-Tone Intermodulation: Measure at two-output carriers of +23.5 dBm/C at 845 MHz and 845.6 MHz with 51 dB gain setting.

5.4.3 Photographs



5.4.4 800 MHz EO Cell Amplifier Module Schematics

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5.5 800 MHz High Isolation Duplexer (AE04A-D1438-002)

5.5.1 Description

The 800 MHz, high isolation duplexer provides the high bandpass selectivity and isolation for the Uplink and the Downlink frequency. The duplexer is based on a 5-cavity cross-coupled bandpass filter design and is aligned carefully during production to optimize the insertion loss, selectivity, and VSWR

The duplexer is a fully passive device and should have an extremely long trouble-free working life and requires no maintenance. Should the duplexer be suspect of failure, the entire duplexer module should be replaced.

5.5.2 Specification

PARAMETER	SPECIFICATION
Frequency Range: Downlink Uplink	851 – 856 MHz 806 – 811 MHz
Passband Insertion Loss	1 dB
Passband VSWR	< 1.2:1
Impedance	50 Ohms
Power Handling	10 Watt
Downlink-To-Uplink Isolation	> 96 dB @ Receive Port
Uplink-To-Downlink Isolation	> 96 dB @ Transmit Port
Operating Temperature	-20°C to +60°C

5.5.3 Photograph

5.6 Fiber Optic Transceiver Module (AE04A-D1100-009)

5.6.1 Description

The Fiber Optic Transceiver Module converts the Downlink and Uplink electrical (RF) signals into optical signals prior to routing the signals between remote BDAs and the base transceiver station. The fiber optic transceiver is capable of providing up to 18 dB of RF gain. So for fiber optic links with 9 dB or less of optical loss, the fiber transceiver can negate that loss and in turn provide a fiber link that is lossless. During the BDA setup, the fiber optic link is set to 0 dB.

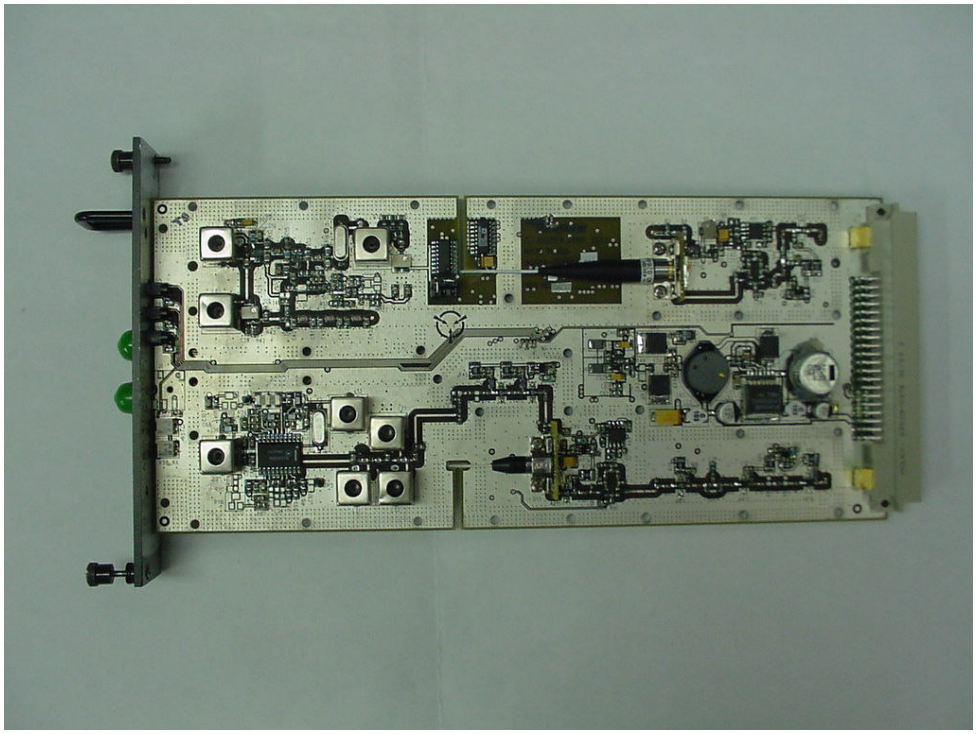
The fiber optic transceiver module has an on board RISC processor that provides optional alarming/status monitoring and communications capability. The fiber transceiver is also equipped with high reliable parts to provide a long trouble-free operating life. Should the module be suspect of failure, the entire module should be replaced. Note, due to the possibility of laser radiation hazard, the fiber optic transceiver module cover should never be removed to troubleshoot or to adjust the laser optical power.

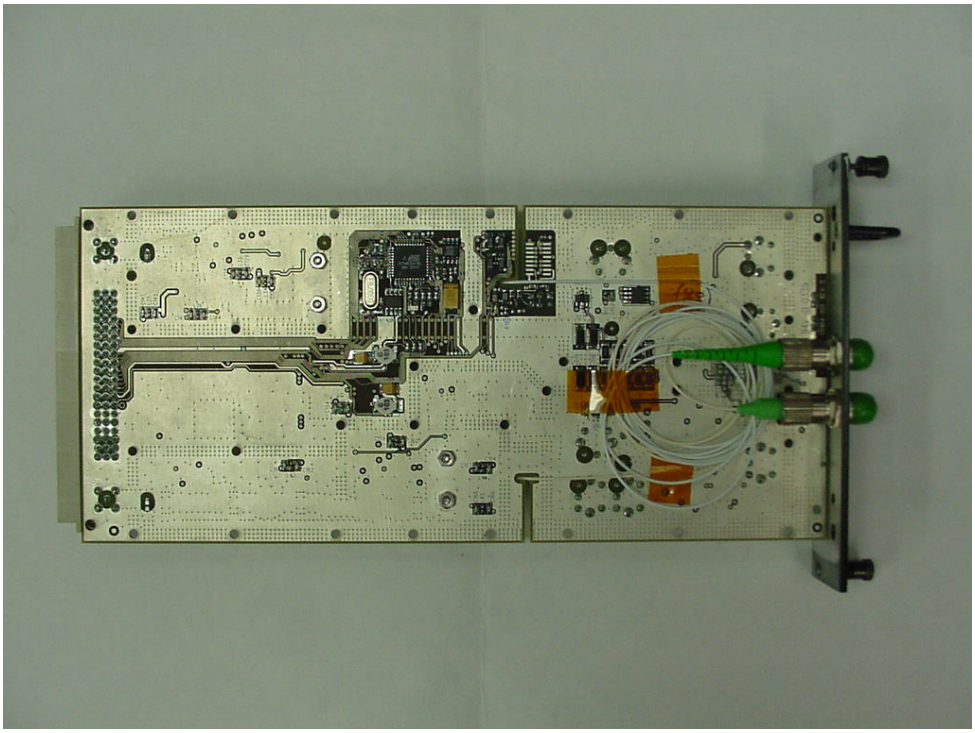
5.6.2 Specification

OPTICAL PARAMETER	SPECIFICATION
Maximum Optical Link Loss	9 dBo
Wavelength	1310±30 nm
Laser Type	DFB, single-mode
Optical Output Power	> 2 mW
Optical Return Loss	> -60 dB
Connector Style FC/APC post-fix	 FC/APC

RF PARAMETER	SPECIFICATION
Frequency Range	483-870 MHz
Link Gain	0 dB nominal 18 dB Front panel adjustable
Link Noise Figure	58 dB typical
1 dB Compression Point	≥ + 13 dBm typical
Input Third Order Intercept Point	≥ + 26 dBm minimum
Spur Free Dynamic Range	95 dB/Hz
Data Link Related Spurs Levels	> -70 dBc and 32 MHz from any desired signal
Power Supply Switching Noise	< -80 dBc
Operating Temperature	-20°C to +60°C

5.6.3 Photographs





5.6.4 Fiber Optic Transceiver Module Schematics

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5.7 +48V Power Supply Module (AE04A-D0803-002)

5.7.1 Description

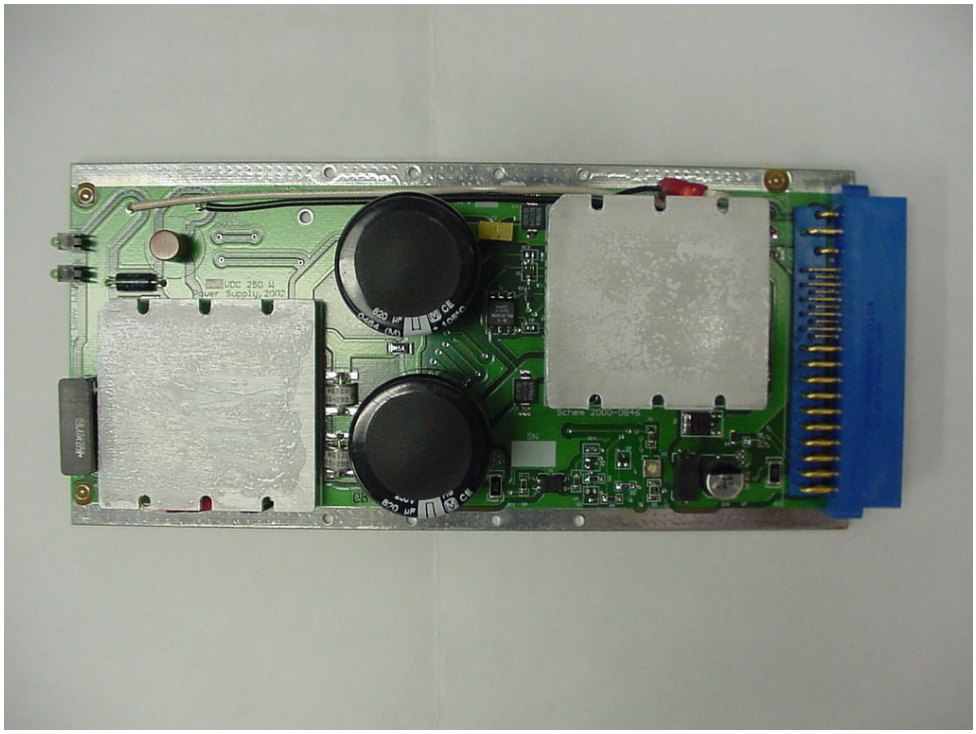
The AC to DC Power Supply Module provides + 48VDC from the main AC source to the BDA Chassis. The power supply module contains an AC front-end FARM (Filter/Autoranging Rectifier Module) followed by a DC-DC Converter Module. The AC to DC power supply module is capable of interfacing directly with various sources of AC power. The power supply module is equipped with a EMI filter, a autorange line rectifier and a inrush current limiting circuit.

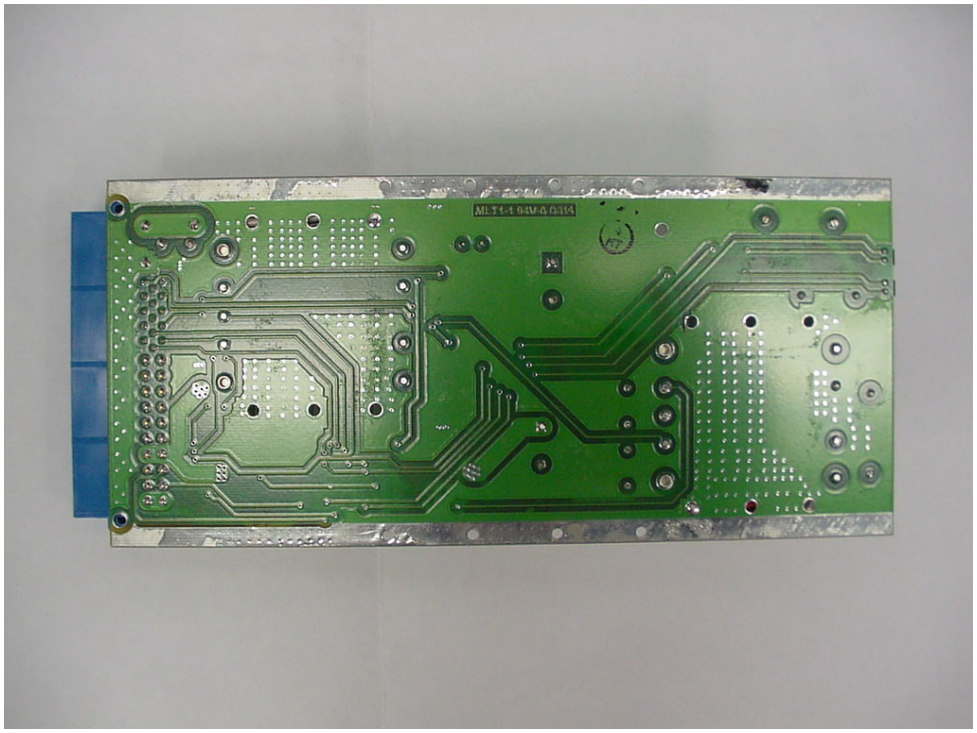
In the unlikely event of failure, the entire power supply module should be replaced.

5.7.2 Specification

PARAMETER	SPECIFICATION
Input Voltage	115/230 VAC Autoranging
Output Voltage	+48V
Output Current	5.2 Amps
Output Power	250 Watts
Operating Temperature	-20°C to +60°C

5.7.3 Photographs





5.7.4 +48 V Power Supply Schematic

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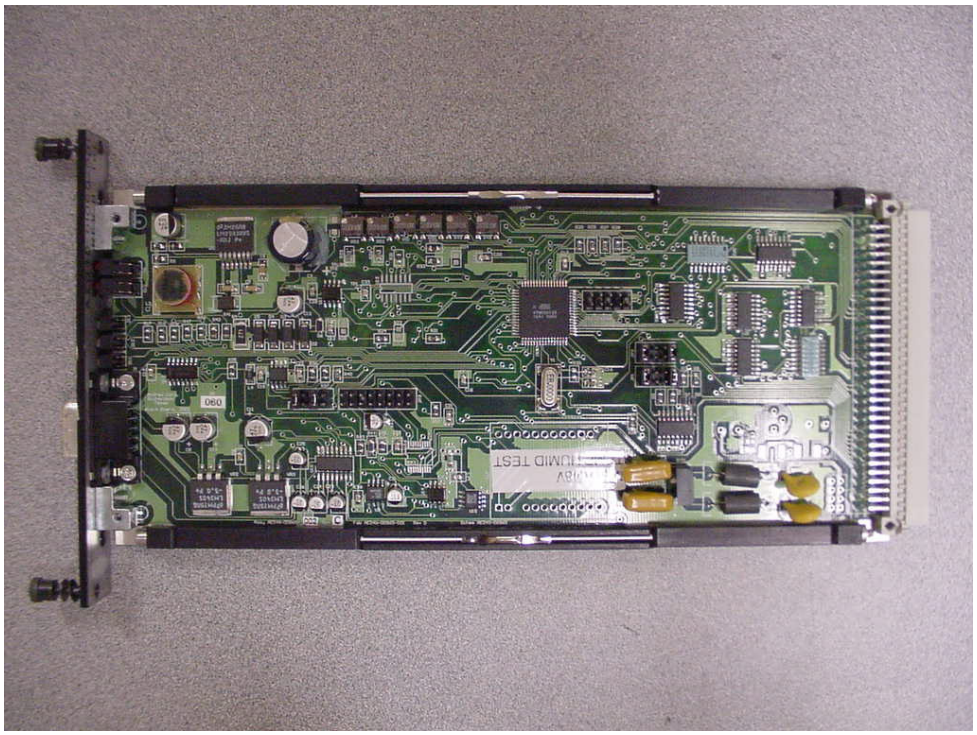
5.8 Alarm Module (AE04A-D0805-007): Optional

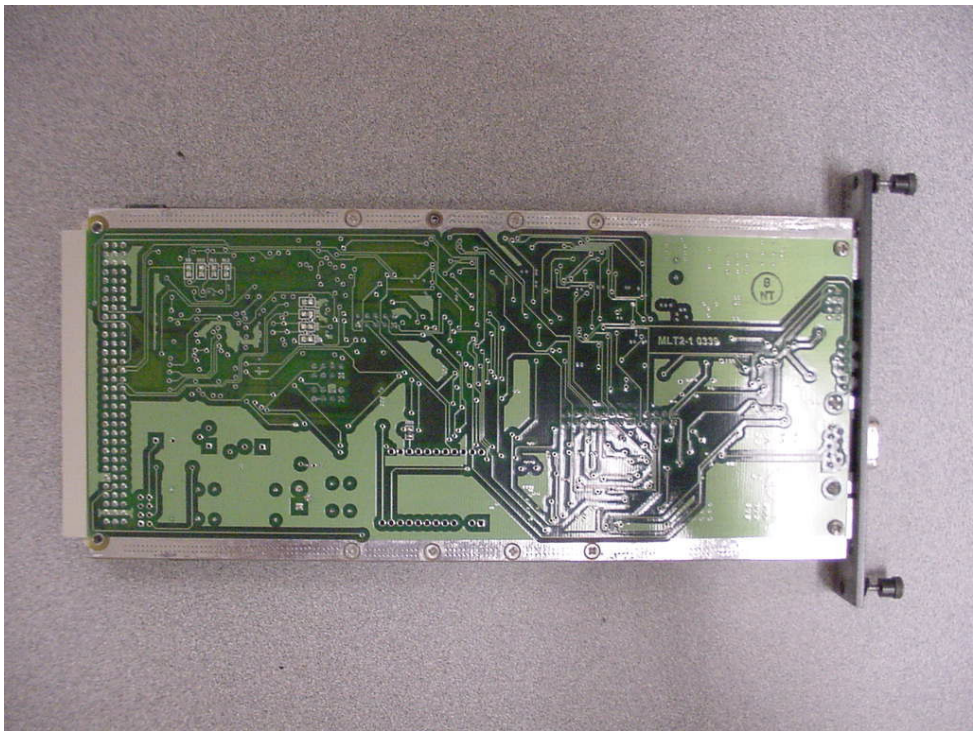
5.8.1 Description

The optional Alarm Module serves as a communication processor to provide a single point of monitoring interface for all the modules within the Fiber Optical Fed BDA. The summary alarm/monitoring status of each module can then be provided over Alarm Module's RS-232 interface or sent thru the Fiber Optic Transceiver Module to a remote control location.

In the unlikely event of failure, the entire Alarm Module should be replaced.

5.8.2 Photographs





5.8.3 Alarm Module Schematics

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6. INSTALLATION

6.1 BDA Installation & Gain Setup

INSTALLATION

1 Install the BDA in a standard 19" rack. The BDA should be placed in a location where the interconnect cables (i.e. fiber, RF and serial cable) can be easily installed and not susceptible to damage. If the BDA is not installed in a controlled environment, a 5U high space should be located above and below the unit for airflow.

2 Plug the BDA into a 120 VAC single phase three wire grounded receptacle (5-15R).

3 Connect the RF antenna cable to the antenna port (Type-N Female) on the rear panel of the BDA. If a RF fed BDA was installed, connect the base station RF cable to the base station port (Type-N Female) on the rear panel of the BDA.

4 If a fiber fed BDA was installed, connect the fiber optic cable to the BDA front panel FC/APC connectors. If both fiber connection indicators (i.e. LEDs) are illuminating a green color, the connection between the optical source and the BDA was successful.

DOWNLINK GAIN SETUP

The fiber fed BDA provides 18 dB of gain for 9 dB of optical loss. The factory gain setting for the fiber fed BDA is 48 dB, with a maximum FCC RF output limit of +30 dBm. Due to the various fiber optic link losses found in a communication system, the fiber optic gain must be adjusted so not to exceed the BDA FCC power limit. The equipment needed and the gain test setup required for this adjustment is shown in Figure 6.1 below.

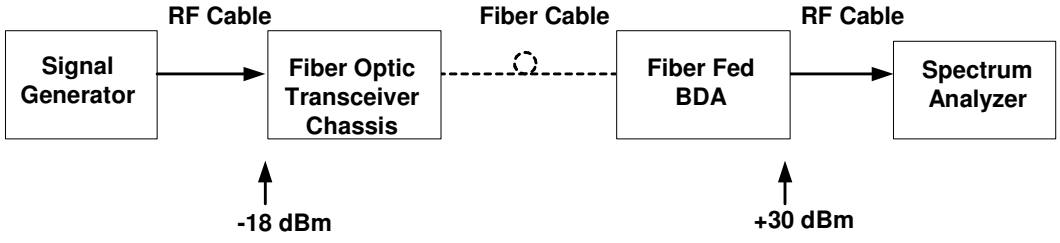

Figure 6.1 Downlink Gain Test Configuration

1 Using the signal generator, inject a –18 dBm signal into the downlink operating passband of the fiber fed BDA.

2 Measure the output signal level of the fiber fed BDA using the spectrum analyzer.

3 If the measured output signal level exceeds +30 dBm, reduce the fiber optic gain (i.e. adjust BDA's fiber optic transceiver front panel potentiometer) so that the output power level is equal to +30 dBm.

NOTE: No additional fiber gain adjustment will be required after the fiber optic gain has been set. If any additional gain adjustments are required they must be performed via the RS232 port.

The RF fed BDA gain setting is performed at the factory and no field adjustments are required. With a 48 dB factory gain setting, the maximum input signal level is –18 dBm. This input level will ensure that FCC power limit (+30 dBm) is not exceeded.

UPLINK GAIN SETUP

The fiber fed BDA provides 18 dB of gain for 9 dB of optical loss. The factory gain setting for the fiber fed BDA is 48 dB. Due to the various fiber optic link losses found in a communication system, the uplink fiber optic gain must be adjusted so not to overdrive the fiber optic link when high power transmitters are operating near the BDA. The equipment needed and the gain test setup required for this adjustment is shown in Figure 6.2 below.

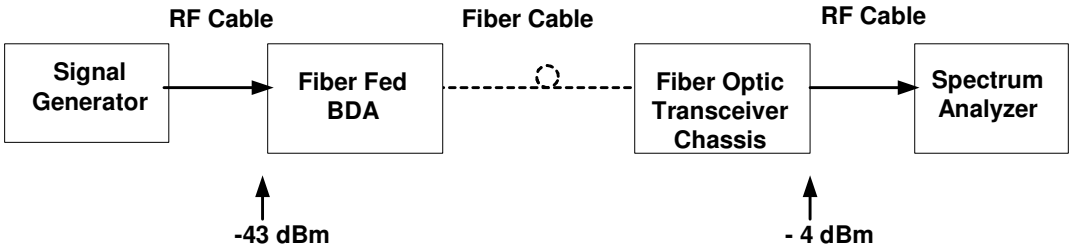

Figure 6.2 Uplink Gain Test Configuration

1 Using the signal generator, inject a – 43 dBm signal into the uplink operating passband of the fiber fed BDA.

2 Measure the output signal level of the fiber optic transceiver chassis (i.e. located near the base receiver station) using the spectrum analyzer.

3 If the measured output signal level exceeds – 4 dBm, reduce the fiber optic gain (i.e. adjust fiber optic transceiver front panel potentiometer) so that the output power level is equal to - 4 dBm.

NOTE: No additional fiber gain adjustment will be required after the fiber optic gain has been set. If any additional gain adjustments are required they must be performed via the RS232 port.

The RF fed BDA uplink gain setting was performed at the factory and no field adjustments are required. For a 48 dB gain setting, the maximum input signal level is – 14 dBm with ALC active and – 43 dBm without ALC active. Note, the ALC is activated at the factory and when the input level exceeds – 43 dBm, the ALC will go into operation.

7. BDA MAINTENANCE / TROUBLESHOOTING & MODULE CARE

7.1 Maintenance

The BDA does not require any routine or preventative maintenance once in operation.

7.2 BDA Troubleshooting Procedure

FAULT	Troubleshooting Procedure
No Downlink Signal	-Verify BDA power is switched "ON". -Check fiber fed BDA cable connections. -Check RF fed BDA cable connections. -Verify fiber fed BDA Rx fiber port LED is green. -Check Radio Transmitter at base station.
No Uplink Signal	-Verify BDA power is switched "ON". -Check fiber fed BDA cable connections. -Check RF fed BDA cable connections. -Check fiber optic connection at base station Fiber Optic Transceiver Chassis. -Check for output signal at Fiber Optic Transceiver Chassis located at the base station.
Low FF BDA Downlink Gain (Gain Set: 48 dB)	-Using a Signal Generator, inject a –18 dBm signal at base fiber optic transceiver and measure output power level of BDA with Spectrum Analyzer (+30 dBm).
Low RF BDA Downlink Gain (Gain Set: 48 dB)	-Using a Signal Generator, inject a – 18 dBm signal in the base station port of the BDA and measure the output power level of BDA with Spectrum Analyzer (+30 dBm).
Low FF BDA Uplink Gain (Gain Set: 48 dB)	-Using a Signal Generator, inject a – 43 dBm signal at the BDA antenna port and measure the output power level at the Fiber Optic Transciever Chassis at the base station port using the Spectrum Analyzer (- 4 dBm).
Low RF BDA Uplink Gain (Gain Set: 48 dB)	-Using a Signal Generator, inject a – 43 dBm signal at the BDA antenna port and measure the output power level at the BDA base station port using the Spectrum Analyzer (+ 5 dBm).

7.3 Tools & Test Equipment

The minimum tools and test equipment listed below are needed to successfully service the BDA:

Spectrum Analyzer:	100kHz to 2GHz
Signal Generator:	30MHz to 2GHz
Attenuator:	20dB, 10W, DC-2GHz, (N male – N female)
Optical Meter:	Universal Volt-Watts
Test cable x 2:	N male – N male, 2M long RG214
Test cable x 2:	SMA male – N male, 1m long RG223
Hand tools:	Philips tip screwdriver
	SMA torque wrench

7.4 Module Care

The EOCell Amplifier module, Fiber Optic Transceiver module +48V Power Supply module and optional Alarm module contain semiconductor devices that are susceptible to damage from electrostatic discharge (ESD). Correct handling of modules is mandatory to ensure long-term reliability.

Furthermore, to prevent electrical damage to modules during the removal or installation process, disconnect the BDA from the AC power source.

7.4.1 Module Removal

1 Verify that AC power to the BDA has been removed.
2 Disconnect the system RF or fiber optic cable as required.
3 Loosen the module's top and bottom wedge locks using a 9/64"allen wrench. (Not Applicable for Duplexer Module).
4 Loosen the module's front plate screws.
5 Slowly but firmly, pull the module straight out of the chassis. Take care not to twist or turn the module during withdrawal. The RF connectors on the rear of the module are easily damaged if handled carelessly.

7.4.2 Module Installation

1 Verify that AC power to the BDA has been removed.
2 Carefully align module into its location and then slowly push the module directly straight fully into its position. Take care not to twist or turn module during installation.
3 Fasten front plate module screws.
4 Tighten module top and bottom wedge locks using a 9/64" allen wrench. (Not Applicable for Duplexer Module).
5 Verify all modules are connected prior to applying AC power.
6 Connect the system RF and Fiber Optic cables to BDA.

7.4.3 Alarm Module Removal (Optional Equipment)

Not applicable if alarm module is not being used.

1 Verify AC power to the BDA has been removed.
2 Disconnect the system RF and Fiber Optic cables.
3 Loosen the screws and remove the blank front plate right of the Alarm module.
4 Loosen the module top and bottom wedge locks using a 9/64" allen wrench.
5 Loosen the module front plate screws.
6 Slowly but firmly, pull the module straight out of the chassis. Take care not to twist or turn the module during withdrawal. The RF connectors on the rear of the module are easily damaged if handled carelessly.

7.4.4 Alarm Module Installation (Optional Equipment)

Not applicable if alarm module is not being used.

1 Verify AC power to the BDA has been removed.
2 Disconnect the system RF and Fiber Optic cables.
3 Carefully align module into its location and then slowly push the module directly straight fully into its position. Take care not to twist or turn module during installation.
4 Fasten the module front plate screws.
5 Tighten the module top and bottom wedge locks using a 9/64" allen wrench.
6 Reinstall the blank front plate right of the Alarm module.
7 Verify module connections have been made prior to connecting AC power. Reconnect the system RF and fiber optic cables.

7.4.5 Module Transportation

To maintain the operation, performance and reliability of each module they must be stored and transported properly. Exercise caution when handling the modules, if the units are dropped or knocked the sensitive internal components can become damaged and the duplexer modules can become misaligned. Any active module not installed in a BDA must be kept in an anti-static bag or container. Any module sent back to Andrew Corporation for investigation/repair must be shipped in a anti-static container. Please contact Andrew Corporation quality department before returning a module.

7.4.6 BDA Connections

When tightening RF Type-N connectors located on the rear of the BDA, use a dedicated N-Type torque wrench. If Type-N connectors are over-tightened, irreparable damage will occur. Do not use adjustable pliers to loosen or tighten connectors.

When connecting or disconnecting the fiber optic cable connectors located on the front panel of the fiber optic transceiver module, exercise caution not to touch the optical connector center pin. In the event that the connector center pin needs cleaning, use only high quality lens-grade tissue, moistened with isopropyl alcohol.