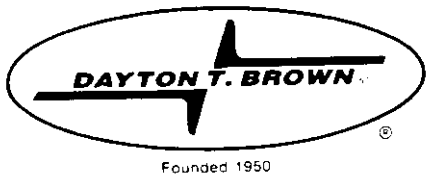

Enclosure 3

Installation, Operation and Maintenance Instructions

NOTICE
PROPRIETARY AND PRIVATE

The Information contained in this enclosure is the property of Microwave Power Devices, Inc. (MPD), and shall be kept in strict confidence. Except with the written permission of MPD, such information shall not be published, or disclosed to others, or used for manufacture or sale for any other purpose. This enclosure shall not be duplicated in whole or in part. Any recipient so agrees by acceptance of this enclosure.

MODEL FFPA8689-35

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR FEED FORWARD LINEAR POWER AMPLIFIER

PREPARED
NOVEMBER 7, 1997

MPD TECHNOLOGIES, INC.
49 WIRELESS BOULEVARD HAUPPAUGE, NEW YORK 11788 (516)231-1400 FAX (516)231-8081

EXHIBIT 1

MODEL FFPA8689-35

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR FEED FORWARD LINEAR POWER AMPLIFIER

PREPARED
JANUARY 15, 1998

MPD TECHNOLOGIES, INC.
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2. INSTALLATION

2.1 Introduction

This section contains receiving, unpacking and installation recommendations for the model FFPA8689-35 feed forward linear power amplifier. Carefully read and review all of the information contained in this section before attempting to install or operate the LPA. In addition, read and review the operating instructions contained in Section 3 before operating the equipment.

2.2 Electrical Service Recommendations

MPD Technologies strongly recommends the use of AC line conditioning and surge suppression devices at the primary AC input to the power source for the LPA. All electrical connections should be in accordance with National Electric Code, and any applicable state and local codes. In addition, lightning protection for all systems is strongly recommended. Lightning arrestors are recommended at the service entrance as well. The electric service must be well grounded.

The amplifier power source should be equipped with a separate circuit breaker, installed in a load center with a separate mains switch or breaker. This arrangement permits service and maintenance of the LPA without the necessity for removing power to the entire site.

2.3 Receiving, Unpacking and Inspection

The LPA has been tested and calibrated at the factory prior to shipment. No additional readjustment is required prior to installation.

The LPA is shipped in a single container. Check the exterior of the shipping container for any visible signs of damage. If possible, open the container in the presence of the delivery agent. Carefully unpack the LPA and save all packing material for possible reshipment. After removal from the container, check the LPA for physical damage such as scratched panels, damaged connectors, etc. If damage is noted, immediately file claim with the delivery agent or freight carrier.

2.4 Repackaging for Shipment

Should it ever become necessary to return the LPA for service or repair, the following procedure should be followed.

a. Use the original container, if possible.

b. Wrap the item in heavy paper or plastic before placing it in the shipping container.

c. Use packing material around all sides of the item.

d. Use a heavy cardboard box or a wooden container to house the item. Seal the container with heavy duty tape (Fiberglas) or strap the container with metal bands.

e. Mark the container: "FRAGILE - DELICATE INSTRUMENT". If the item is to be shipped to MPD for service or repair, attach a tag identifying the owner and include a description of the difficulty. Refer to the Notification of Returned Goods at the rear of this manual. In all correspondence regarding the unit, identify the assembly by both model and serial number, noting the difficulty in detail.

2.5 Environmental Limitations

The LPA is designed to operate in an environment as noted in Table 1 of this manual. The LPA must be installed in an area where an adequate and unrestricted supply of air is available for cooling. Adequate clearance must be provided to prevent obstruction of air flow. Confirm that proper dc power is available for the equipment.

2.6 Installation

Refer to the outline and installation drawing contained in Appendix A and the following paragraphs for installation details.

The LPA is designed for rack mounting in a standard 19-inch rack. It is secured in the rack at each corner of the front panel. Install the LPA in the desired location in the rack, making sure that an unrestricted supply of air is available at the front and rear of the enclosure.

2.7 Cable Interconnections

!! CAUTION !!

DO NOT CONNECT AC POWER TO LPA UNTIL PROPER AC POWER OUTPUT HAS BEEN VERIFIED. DAMAGE TO THE LPA CAN OCCUR IF IMPROPER VOLTAGES ARE APPLIED.

2.7.1 J3 - Input Power Connector Wiring

The DC input power is applied to the LPA through the 15-pin D-sub male connector J3. Connections are as shown in the Table 2.

Table 2. J3 - Input Power Interface Connector

J3-Connector Pin	Signal Name	Description
1 through 7	DC Input (+)	Power Supply Input
8	No Connection	
9 through 15	DC Return (-)	Power Supply Return

2.7.2 J4 - I/O Connector Wiring

All status and control functions are made available at the 25-pin D-Sub female I/O connector, J4. Refer to Table 3 for interconnections to this connector. Recheck all connections prior to installation of the connector on the LPA.

2.7.3 J1, J2 - RF Input/Output Connectors

Connect the RF output cable to the LPA at J2.

Connect the RF input cable (from the exciter) at J1.

2.7.4 Verify Connections

Recheck all connections. Make certain that all connections are correct and secure.

2.7.5 Verify DC Supply Voltage

Measure the DC supply voltage which will power the LPA. The voltage must be 25 vdc ±0.5 vdc. Refer to Section 3 for operating instructions.

!! CAUTION !!

DO NOT OPERATE LPA WITH A DC SUPPLY VOLTAGE OUTSIDE OF THESE LIMITS. DAMAGE WILL OCCUR TO THE LPA FROM IMPROPER SUPPLY APPLICATION.

3. OPERATING INSTRUCTIONS

3.1 Safety Precautions

During normal LPA operation, personnel must be cognizant of the intrinsic hazards related to electronic equipment in general, and RF power amplifiers in particular. This amplifier subsystem generates high RF power (35 watts) which is dangerous and can cause serious RF burns if contacted. Caution must be exercised when working with this amplifier. While every practicable safety precaution has been incorporated into this amplifier, the following rules must be strictly observed:

!! WARNING !!

Keep Away From Live Circuits

Operating personnel must observe all safety regulations at all times. Do not make adjustments inside equipment with hazardous voltages present. Do not operate the amplifier without proper RF termination.

Do Not Service or Adjust Alone

Under no circumstances should any person reach within or enter any enclosure for purposes of servicing or adjustment without the immediate presence and assistance of another person capable of rendering aid. Knowledge of first aid for electrical shock and burns is necessary.

Personnel

Only trained personnel are to service and adjust the amplifier. Personnel must be trained in the maintenance of equipment with hazardous RF power, and must be familiar with this amplifier. In addition, the following precautions must be observed during operation.

!! WARNING !!

Maintain proper termination at the output port of the LPA. Do not remove or exchange RF cables of the output load circuit while the LPA is in operation. Dangerous RF voltage may exist at the foremost terminal of the interrupted load circuit during operation.

!! CAUTION !!

All interconnecting cables must be connected prior to application of RF power. Although the LPA is designed to withstand all output load conditions including open and short circuit conditions, it is recommended to connect an appropriate RF load to the output port of the LPA prior to application of RF power.

!! CAUTION !!

Maintain proper RF input to the amplifier. Damage to the amplifier may occur if excessive RF input is applied.

3.2 Controls and Indicators

The LPA is equipped with local controls and indicators on the front panel, and a rear panel I/O interface for remote status monitoring and control. The following paragraphs detail these features.

3.2.1 Local Controls and Indicators

Figure 3 is the front view of the LPA, and the following controls and indicators:

a. POWER ON/OFF - line switch/circuit breaker, connects input prime dc power to the LPA.

b. TEMP WARNING ALARM - Yellow LED indicating excessive operating temperature.

c. OVERPOWER ALARM - Red LED indicating that the RF output power from the LPA is greater than +47.4 dBm.

d. TEMP ALARM - Red LED indicating excessive LPA temperature.

e. POWER SUPPLY ALARM - Red LED indicating a power supply generated voltage is out of range.

f. VSWR ALARM - Yellow LED indicating load VSWR is greater than 3.0:1.

g. LOOP ALARM - Yellow LED indicating control loops can no longer minimize IMD performance.

h. FAN ALARM - Yellow LED indicating a blocked or non-functioning fan.

i. ENABLE ON - Green LED indicating presence of an ENABLE command.

j. DC ON - green LED indicating presence of dc from power supply, and POWER ON/OFF circuit breaker switched ON.

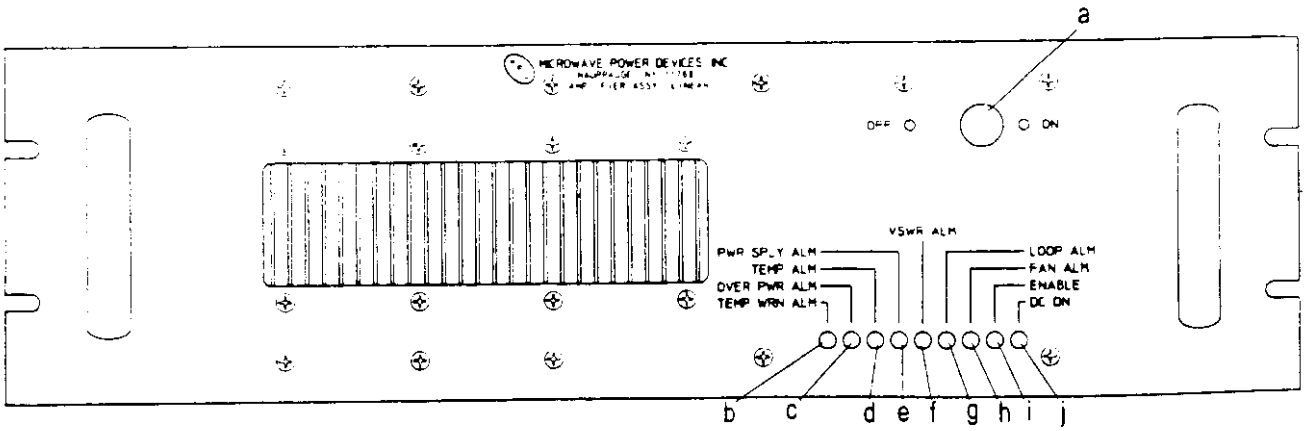

Figure 3. Model FFPA8689-35
Local Controls and Indicators

3.2.2 Remote Control/Status Interface

The LPA is equipped with control inputs as well as built-in-test (BIT) status outputs at I/O connector J4. Table 3 details the interface and describes the signals.

Table 3. J4 - I/O Connector Pin-out and Description

I/O Connector Pin	Signal Name	Description
1	Data Out (+)	RS-422
2	Data Out (-)	RS-422
3	Data In (+)	RS-422
4	Data In (-)	RS-422
5	Return	Return
6	Forward RF output power monitor	Analog Voltage, 0-5 V
7	Shield	Return
8 to 25	Spare	Spare

3.3 Initial Turn On Procedure

The following procedure is intended to verify operation of the LPA following installation or repair/replacement.

!! WARNING !!

Equipment operators must be familiar with all safety precautions outlined at the beginning of this section prior to operating the LPA. Operator injury and/or equipment damage will result from improper operation.

a. Verify that all connections to the LPA have been properly made in accordance with Section 2 of this manual, and the outline and installation drawing, Figure 2.

b. With no RF applied to the LPA, set the POWER ON/OFF switch to the ON position. The DC ON and ENABLE LED's will be illuminated, and the fans will be activated.

c. Observe that only the following indicators are illuminated on the front panel of the LPA:

DC ON

ENABLE

d. Apply reduced RF input (-60 dBm) to the LPA RF IN connector within the 869-894 MHz frequency range, and observe that all indicators remain as in step b.

!! CAUTION !!

Maintain proper RF input level within the 869-894 MHz operating band. Improper RF input may cause severe LPA damage.

e. Increase input level to between -17 and -14 dBm, and observe that only the following indicators are illuminated on the front panel of the LPA:

DC ON

ENABLE

3.4 Normal Operation

The LPA requires minimum attention during normal operation. Monitoring of the BIT status output and output meter provides an overall indication of LPA health.

3.5 Shut Down Procedure

a. Reduce RF input signal level to minimum (-60 dBm).

b. Set the PWR ON/OFF switch to the OFF position.

c. If maintenance or service is to be performed on the LPA, deactivate prime dc power to the LPA.

4.5 Power Distribution

The amplifier employs a DC/DC converter to regulate the amplifier sub-circuits to the required voltage, based on a 20-30V DC input. The power supply board converts the input voltage to +/-5V, and +/-15V used by the loop processor and microprocessor.

4.6 Intermodulation

The FFPA8689-35 amplifier is designed to deliver 35W average power, multicarrier signal, operating over the passband of 869-894 MHz.

4.6.1 Two Tone Intermodulation

When measured with two equal CW tones, spaced anywhere from 30 kHz to 20 MHz apart, and at any power level up to the peak power, the third order intermodulation products are below -55 dBc.

4.7 Alarms

The amplifier reports various alarms, indicated via a front panel LED, and via the I/O connector on the rear.

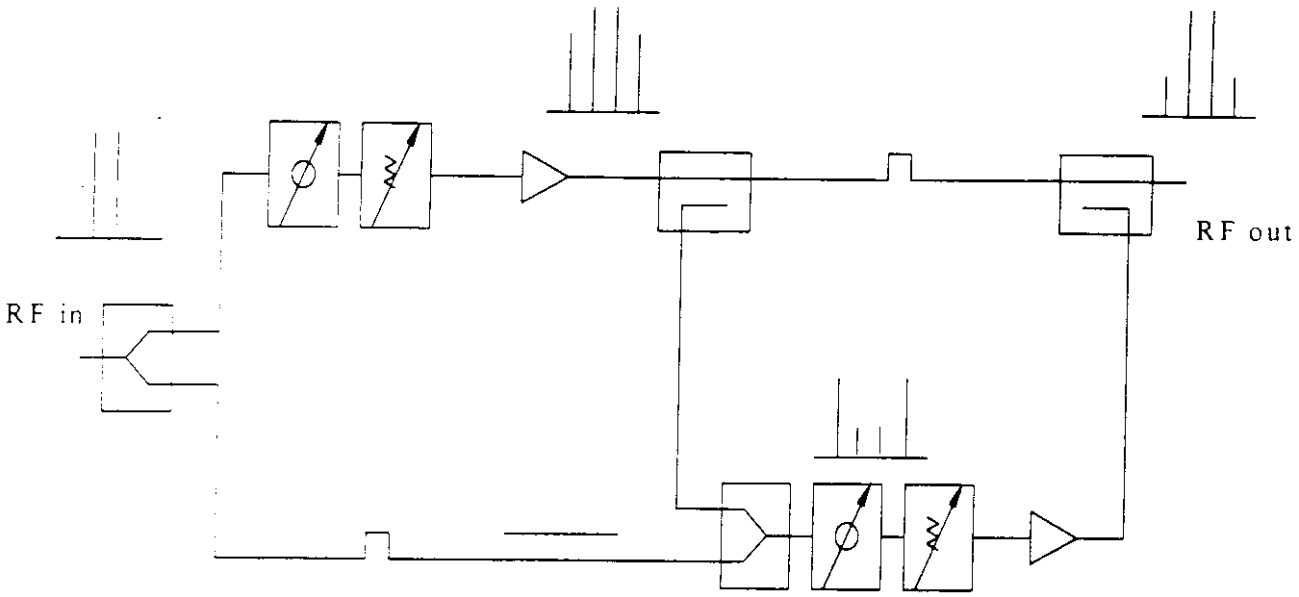

Figure 4. Block Diagram, Model FFPA8689-35 LPA

5. MAINTENANCE

5.1 Introduction

This section provides information for periodic maintenance of the LPA, as well as tests which are recommended in order to evaluate performance of the amplifier.

NOTE

Do not attempt to repair the LPA. The amplifier contains no user-serviceable components, with the exception of the fans. Do not break the seals on the equipment as this will void the warranty. A Return Authorization Number must be obtained from the factory prior to returning any equipment. Refer to the Notification of Returned Goods form at the rear of this manual for further instructions.

5.2 Periodic Maintenance

Periodic maintenance tasks and recommended intervals are listed in Table 4.

Table 4. Periodic Maintenance Tasks

TASK	INTERVAL	ACTION
Cleaning		
Air Inlets/Outlets	30 Days	Inspect and clean in accordance with paragraph 5.3.
Inspection		
Cables and Connectors	12 Months	Inspect all cables for any signs of damage or wear. Check and verify that all connections are secure.
Performance Tests	12 Months	Perform tests as outlined in paragraph 5.5.

5.3 Cleaning Air Inlets/Outlets

The air inlets and outlets are located at the front and rear of the unit. Air is drawn in from the front, and exhausted through the rear of the LPA. These areas should be cleaned at 30 day intervals, or sooner, if the equipment is operated in a severe dust environment. Use dry, low pressure compressed air or a brush with soft bristles to loosen remove and clean off any accumulated dust from the air inlet and outlet areas.

5.4 Test Equipment Required

Table 5 lists the test equipment required for evaluating LPA performance. Suitable equivalents may be substituted.

Table 5. Test Equipment Required

NOMENCLATURE	QTY	MANUFACTURER	MODEL
Signal Generator	1	H/P	8565B
Attenuator, 40 dB, 250 Watt	1	Weinschel	S3-40-43
Attenuator, 20 dB, 20 Watt	2	Weinschel	AT20
Spectrum Analyzer	1	H/P	8560E
Directional Coupler, 30 dB	1	RF Power	DDC-901-931-R5-30
Power Meter/Sensor	1	H/P	437B/8481A
Power Supply	1	H/P	6673A
(OTHERS A/R FROM ATP)			

5.5 Performance Tests

Performance tests should be performed at 12 month intervals, or as directed by the resident maintenance authority, to ensure that the LPA is functioning properly and within expected specification limits. The equipment required for test is shown in Appendix A, paragraph 2. Refer to Appendix A, Figure 1 for the test setup.

Perform the tests in the order shown in Appendix A, Acceptance Test Procedure.