

MODEL HPC8689-400

INSTALLATION AND OPERATION INSTRUCTIONS FOR COMBINER SHELF ASSEMBLY

PREPARED
SEPTEMBER 1, 1999

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Publication # & Edition

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Table of Contents

<i>1. GENERAL DESCRIPTION.....</i>	<i>5</i>
<i>1.1 Introduction</i>	<i>5</i>

1.2 General Description	5
1.3 Equipment Functional and Physical Specifications.....	7
2. <i>INSTALLATION</i>	8
2.1 Introduction	8
2.2 Electrical Service Recommendations	8
2.3 Receiving, Unpacking and Inspection	8
2.4 Repackaging for Shipment	8
2.5 Environmental Limitations	9
2.6 Installation	9
2.7 Cable Interconnections	12
2.8 DC Power Wiring	12
2.9 I/O Connector	12
2.10 RF In/Out Connections	12
2.11 Verify Connections	13
2.12 Verify DC Supply Voltage.....	13
3. <i>OPERATING INSTRUCTIONS</i>	14
3.1 Safety Precautions.....	14
3.2 Controls and Indicators	15
3.3 Local Controls and Indicators	15
3.4 Remote Control/Status Interface	16
3.5 Initial Turn On Procedure	17
3.6 Normal Operation	17
3.7 Shut Down Procedure	18

List of Figures

Figure 1. Model HPC8689-400 Combiner Shelf Assembly	6
Figure 2. Front View, Outline/Installation Drawing	10
Figure 3. Side View , Outline/Installation Drawing	10
Figure 4. Back View, HPC8689-400	11
Figure 5. Local Controls/Indicators.....	16

List of Tables

Table 1. Performance Characteristics, Model HPC8689-400	7
Table 2. DC Power Interface Connector	12
Table 3. J4 - I/O Connector Pin-out and Description	13

1. GENERAL DESCRIPTION

1.1 Introduction

This manual provides information for the installation, operation and maintenance of MPD Technologies, Inc. model HPC8689-400 combiner shelf assembly. This manual should be used in conjunction with the Operation and Installation Manual for the related FFPA module. The manual is organized in 3 sections as follows:

- Section 1. General Description of the combiner shelf assembly
- Section 2. Installation
- Section 3. Operating Instructions

1.2 General Description

The HPC8689-400 (Figure 1-1) is a microprocessor-controlled combiner shelf assembly that operates over the frequency range of 869 to 894 MHz. The design of the combiner shelf assembly is solid state, providing trouble free operation and a minimum of maintenance. The combiner shelf assembly is equipped with microprocessor controlled status monitoring and control circuitry which monitors key operating conditions and provides remote status output via the rear panel I/O connector. Local operating status is provided via front panel LED indicators. The combiner shelf assembly is powered by an external (customer supplied) 24-28 vdc power supply.

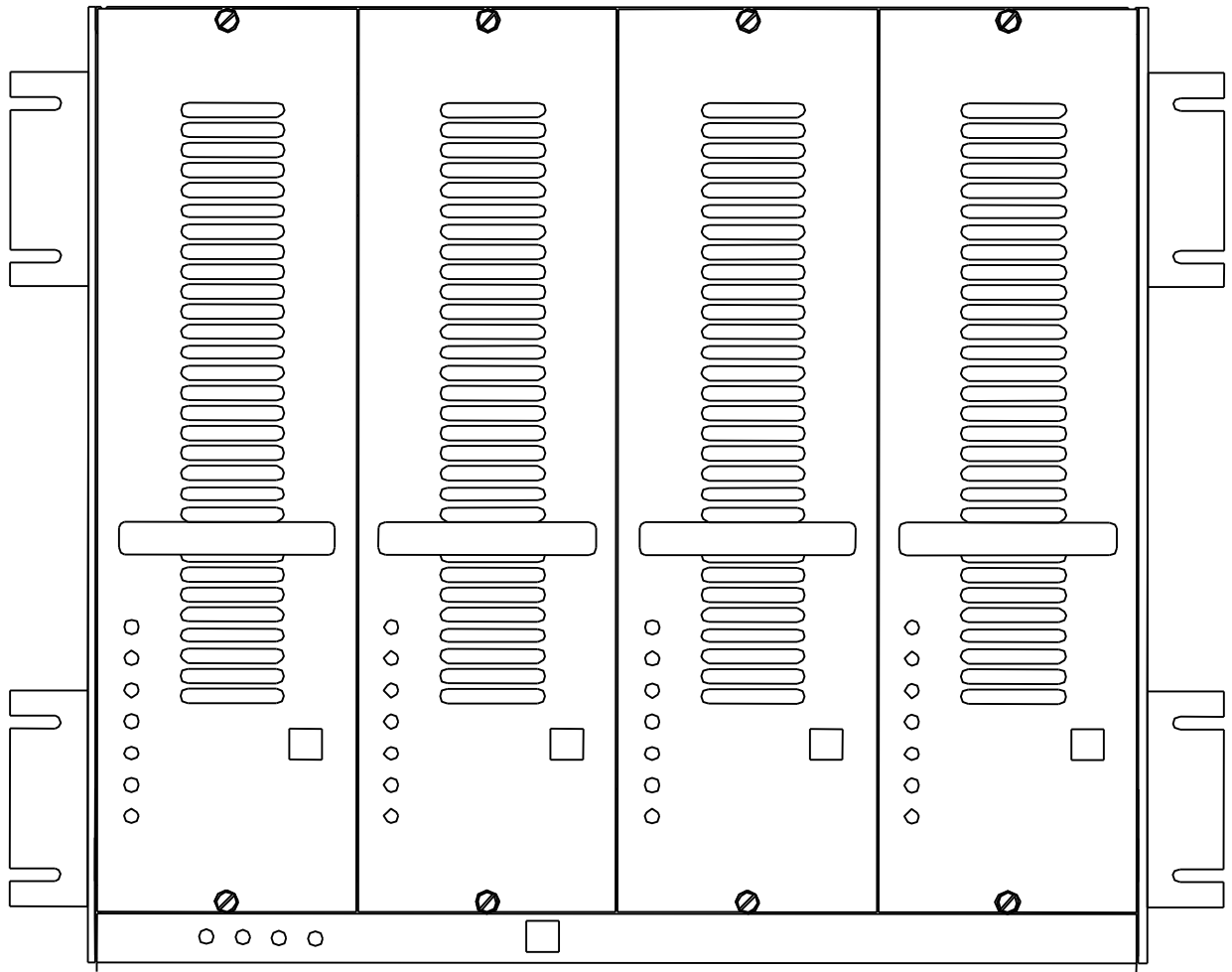


Figure 1. Model HPC8689-400 Combiner Shelf Assembly

1.3 Equipment Specifications

Table 1 lists the specifications of the HPC8689-400 combiner shelf assembly.

Table 1. Specifications
Model HPC8689-400 Combiner Shelf Assembly

PERFORMANCE CHARACTERISTICS	
Parameter	Specification
Frequency	869 - 894 MHz
Combined RF Output Power	100 Watts Average (1x 120W FFPA any combination) 200 Watts Average (2x 120W FFPA any combination) 300 Watts Average (3x 120W FFPA any combination) 400 Watts Average (4x 120W FFPA any combination)
Divider Section	A passive four way divider is used to split the input into four equal paths to the individual FFPAs. Typical insertion loss of 7.7 dB.
Combiner Section	A reconfiguring combiner is used to effectively combine from 1 to 4 FFPAs.
Input Return Loss	14 dBr minimum
Output VSWR	2:1 Minimum
Load Stability	VSWR unconditional, all phases
Current Consumption	0.4 Amp typical, 1.0 amp maximum @ 27 Vdc
DC Input	Fully operational from 24 to 28 VDC
Operating Temperature	0° to 50° C
Operating Humidity	20% to 80% RH, non condensing
Storage Humidity	20% to 95% RH, non condensing
Dimensions	351 mm H x 662 mm W x 424 mm D
Combiner Total RF Input connector	SMA female
Combiner Total RF Output connector	N female
Combiner Total RF fwd Sample	SMA female, 50 dB +/-0.5dB from the main output level
Combiner Total DC Pwr Interface	8 Position Terminal Block
Combiner Total I/O Interface	25 Pin D subminiature female, Serial RS-232 protocol
LED Status Monitoring	Low Power FFPA1 through FFPA4, and DC On

2. INSTALLATION

2.1 Introduction

This section contains receiving, unpacking and installation recommendations for the model FFPA8689-120 feed forward linear power amplifier. Carefully read and review all of the information contained in this section before attempting to install or operate the FFPA. 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 FFPA. 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 FFPA without the necessity for removing power to the entire site.

2.3 Receiving, Unpacking and Inspection

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

The Combiner Shelf Assembly 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 Combiner Shelf Assembly and save all packing material for possible reshipment. After removal from the container, check the Combiner Shelf Assembly 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 Combiner Shelf Assembly 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 Combiner Shelf Assembly is designed to operate in an environment as noted in Table 1 of this manual. The Combiner Shelf Assembly 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 airflow. Confirm that proper DC power is available for the equipment.

2.6 Installation

Refer to the outline and installation drawings and the following paragraphs for installation details. Please refer to the Operation and Installation Manual for the related FFPA module.

Figure 2. Model HPC8689-400 Front View Combiner Shelf Assembly

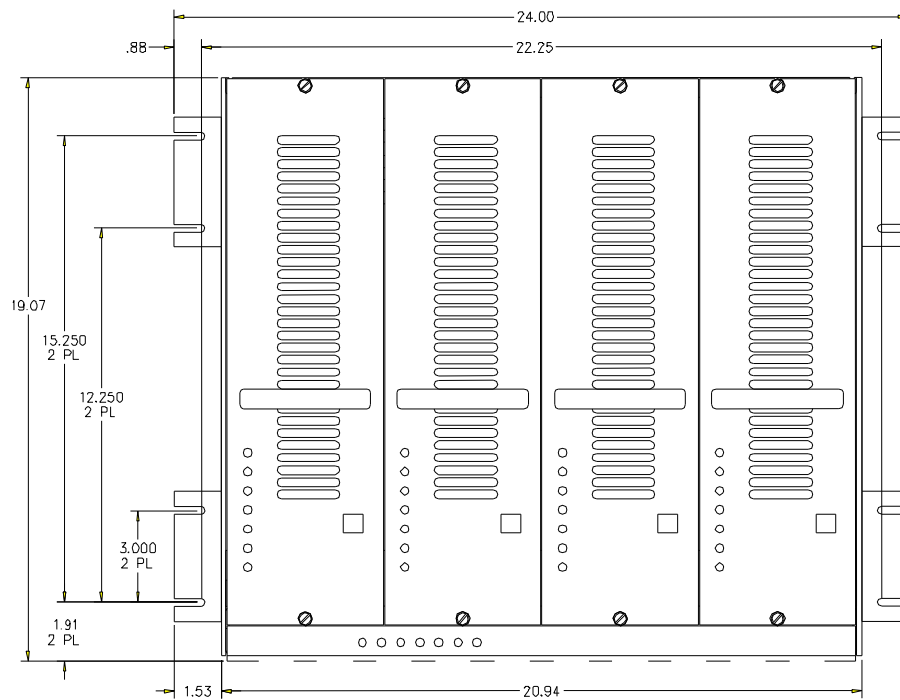


Figure 3. Model HPC8689-400 Side View Combiner Shelf Assembly

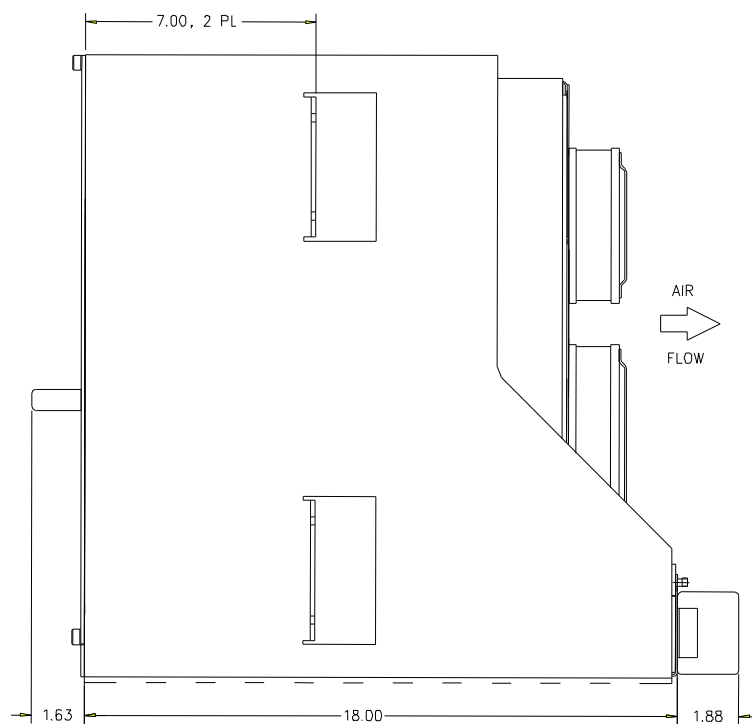
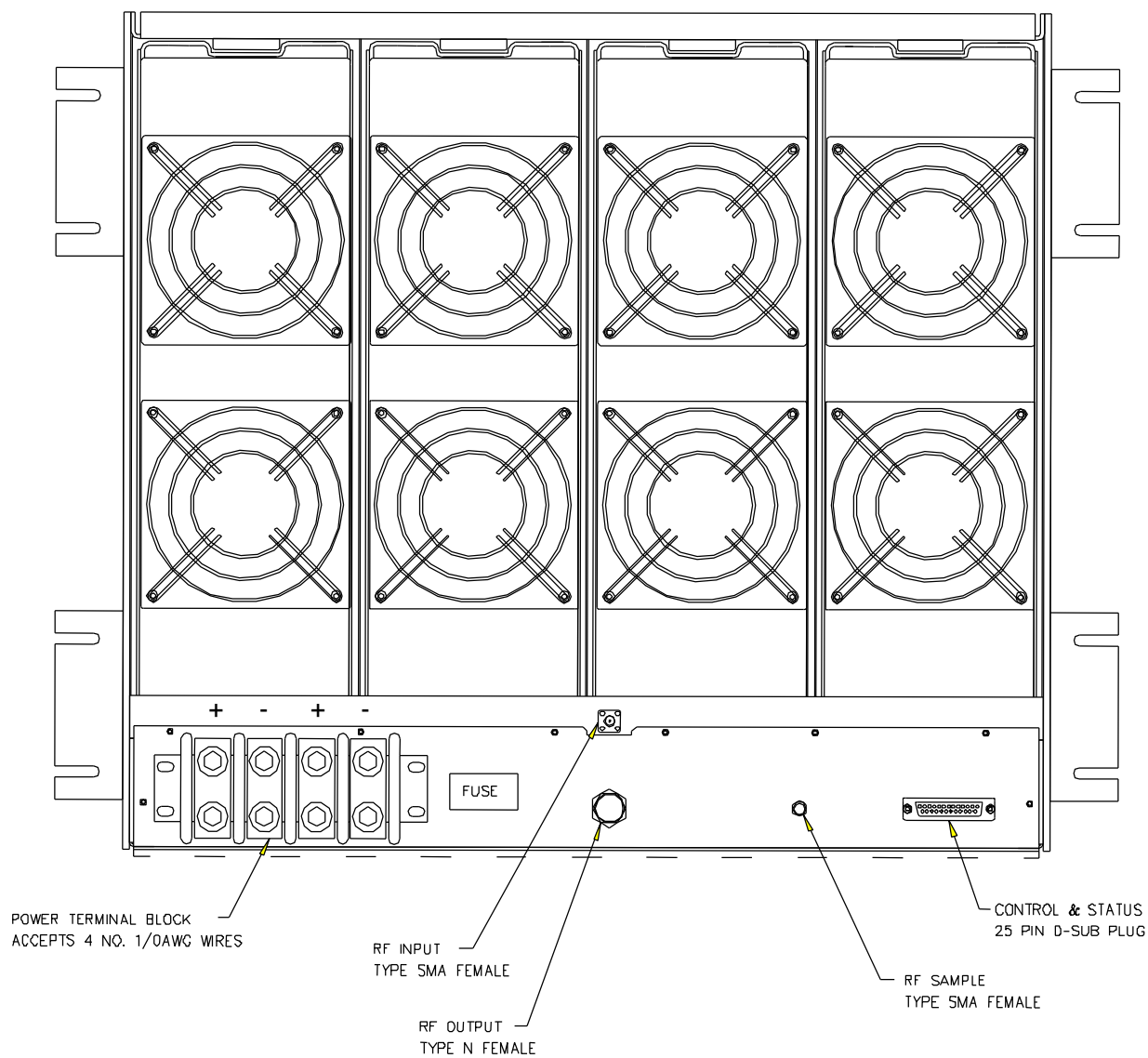


Figure 4. Model HPC8689-400 Back View of Combiner Shelf Assembly



	+	-	+	-
A0	0	0	0	
B0	0	0	0	
	4	3	2	1

Exploded view of Power Terminal Block, TB1

2.7 Cable Interconnections

!! CAUTION !!

DO NOT CONNECT DC POWER TO THE COMBINER SHELF ASSEMBLY UNTIL PROPER AC AND DC POWER OUTPUT HAS BEEN VERIFIED. DAMAGE TO THE COMBINER SHELF ASSEMBLY CAN OCCUR IF IMPROPER VOLTAGES ARE APPLIED.

2.8 TB1 – DC Power Terminal Block

The DC interface is a four position terminal block. There are two positive and two negative terminals. The positive and negative terminals are isolated from each other. Each terminal will accommodate 0 AWG wire. To ensure proper current is supplied, select a 120 amp circuit breaker or larger for each of the four pairs of DC cables. A 3/8" allen key is needed to tighten the 0 AWG to the terminals. Connections are as shown in figure 4 and Table 2.

Table 2. TB1 Power Terminal Block Connector

POSITION	DESCRIPTION
1A, 1B, 3A, 3B	DC Power Return
2A, 2B, 4A, 4B	+ DC Power In

2.9 J4 - I/O Connector

The I/O connector is a 25 Pin D subminiature female type. The I/O control and status interface is an 8-bit asynchronous serial bus, which follows EIA/TIA-422-A Standard for interfacing digital equipment using differential balanced voltages. The protocol is as follows: 1 Start bit, 1 Stop bit, 8 Data bits and no Parity similar to EIA/TIA-232-E type transmissions. The transfer rate is 9600 bits per second (baud). Refer to table 3 for signal descriptions.

Table 3. I/O Connector Wiring

PIN	DESCRIPTION	ELECTRICAL
1	Data out inverting	RS-485
2	Data out non-inverting	RS-485
3	Data out	RS-232
4	Data in	RS-232
5	Data in inverting	RS-485
6	Data in non-inverting	RS-485
7	Signal Ground	
8-25	Reserved	Internal Usage

2.10 J1, J2, J3 – RF input/RF output & RF sample connectors

The RF input to the Combiner Shelf Assembly is a SMA female type connector J1. The composite RF output from the Base Station radios gets connected here.

The RF output of the Combiner Shelf Assembly is an N type female type connector J2. The output of the Combiner Shelf Assembly is typically connected to the antenna feed.

The RF sample output of the Combiner Shelf Assembly is a SMA female type connector J3. This sample port is 50+/- 1 dB from the main RF output J2.

2.11 Verify Connections

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

2.12 Verify DC Supply Voltage

Measure the DC supply voltage that will power the combiner shelf assembly. The voltage must be 24 to 27 VDC. Refer to Section 3 for operating instructions.

!! CAUTION !!

**DO NOT OPERATE COMBINER SHELF ASSEMBLY WITH
A DC SUPPLY VOLTAGE OUTSIDE OF THESE LIMITS.
DAMAGE WILL OCCUR TO THE FFPA FROM IMPROPER
SUPPLY APPLICATION.**

3 OPERATING INSTRUCTIONS

3.1 Safety Precautions

During normal 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 (100 watts up to 400 watts) which is dangerous and can cause serious RF burns if contacted. Caution must be exercised when working with this Combiner Shelf Assembly and related amplifier(s). While every practicable safety precaution has been incorporated into this Combiner Shelf Assembly, 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 Combiner Shelf Assembly 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 Combiner Shelf Assembly. Personnel must be trained in the maintenance of equipment with hazardous RF power, and must be familiar with this assembly. In addition, the following precautions must be observed during operation.

!! WARNING !!

Maintain proper termination at the output port of the Combiner Shelf Assembly. Do not remove or exchange RF cables of the output load circuit while the Combiner Shelf Assembly 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 Combiner Shelf Assembly 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 Combiner Shelf Assembly prior to application of RF power.

!! CAUTION !!

Maintain proper RF input to the Combiner Shelf Assembly. Damage to the Combiner Shelf Assembly may occur if excessive RF input is applied.

3.2 Controls and Indicators

The Combiner Shelf Assembly 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.

3.3 Local Controls and Indicators

Figure 5 is the exploded view of the front panel on the Combiner Shelf Assembly with the following controls and indicators:

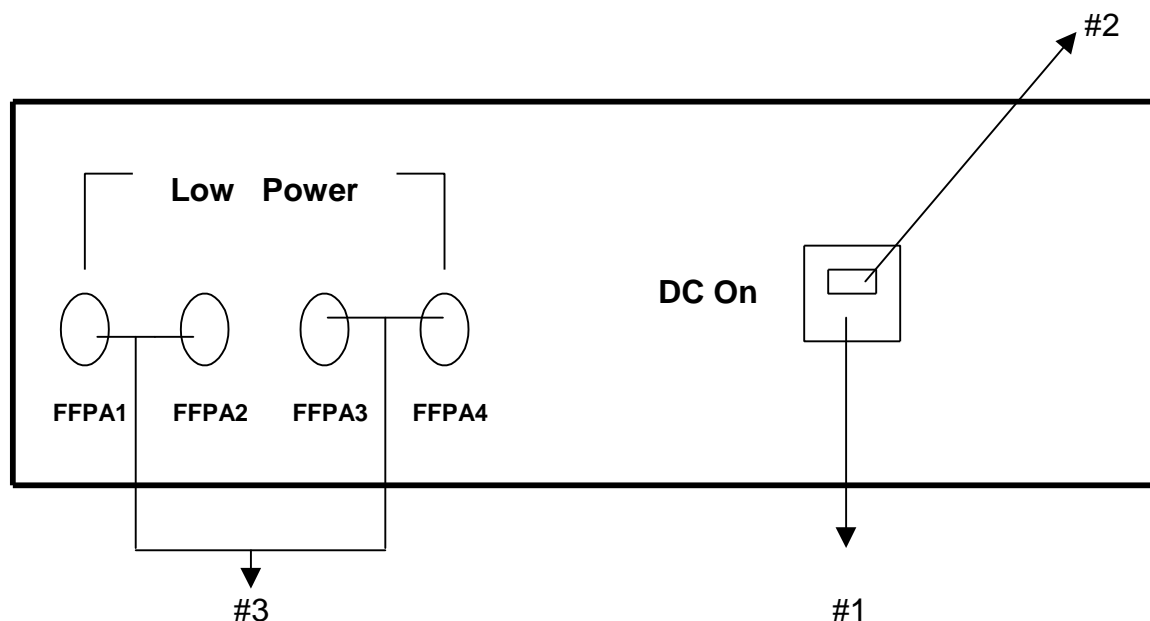


Figure 5 Model HPC8689-400
Local Controls and Indicators

Combiner Shelf Assembly Status & Alarms

1. POWER ON/OFF - Line switch that connects DC power +27V the Combiner Shelf Assembly.
2. DC ON - Green LED indicating presence of DC from the power supply circuitry when the ON/OFF switch is switched on. This LED is located on the ON/OFF switch.
3. LOW POWER FFPA1-FFPA4- Yellow LED indicating corresponding FFPA output is more than 10 dB lower than the other FFPAs output levels.

3.4 Remote Control/Status Interface

The Combiner Shelf Assembly 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.

3.5 Initial Turn On Procedure

The following procedure is intended to verify operation of the Combiner Shelf Assembly following installation or repair/replacement. Please refer to the Operation and Installation Manual of the related FFPA Module for additional instructions regarding turn on.

!! WARNING !!

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

- a. Verify that all connections to the Combiner Shelf Assembly 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 Combiner Shelf Assembly, press the POWER ON/OFF switch once. The DC ON LED on the ON/OFF switch will be illuminated.
- c. Apply reduced RF input (-60 dBm) to the Combiner Shelf Assembly's RF IN connector, J1 within the 869-894 MHz frequency range.

!! CAUTION !!

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

- d. Increase input level to between -15 and -11 dBm, and observe that only the ON LED is illuminated while the Low Power indicators are extinguished on the front panel of the Combiner Shelf Assembly.

3.6 Normal Operation

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

3.7 Shut Down Procedure

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

- b. Press the PWR ON/OFF switch once to shut down the Combiner Shelf Assembly altogether.
- c. If maintenance or service is to be performed on the Combiner Shelf Assembly, deactivate prime dc power to the assembly.