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2 EQUIPMENT DESCRIPTION

2.1 INTRODUCTION

DRB-25 equipment consists of modular hardware, which is easily installed as a desktop cabinet, floor-mount cabinet or into standard 19-inch racks.

The DRB-25 chassis and its component modules are described in the following paragraphs.

2.2 POWER SOURCE OPTIONS

2.2.1 AC Power Supply

The DRB-25 may be powered from the 240 or 110 V AC power supply via one or two Power Supply Modules. Figure 2-1 shows the power distribution of an AC powered DRB-25.

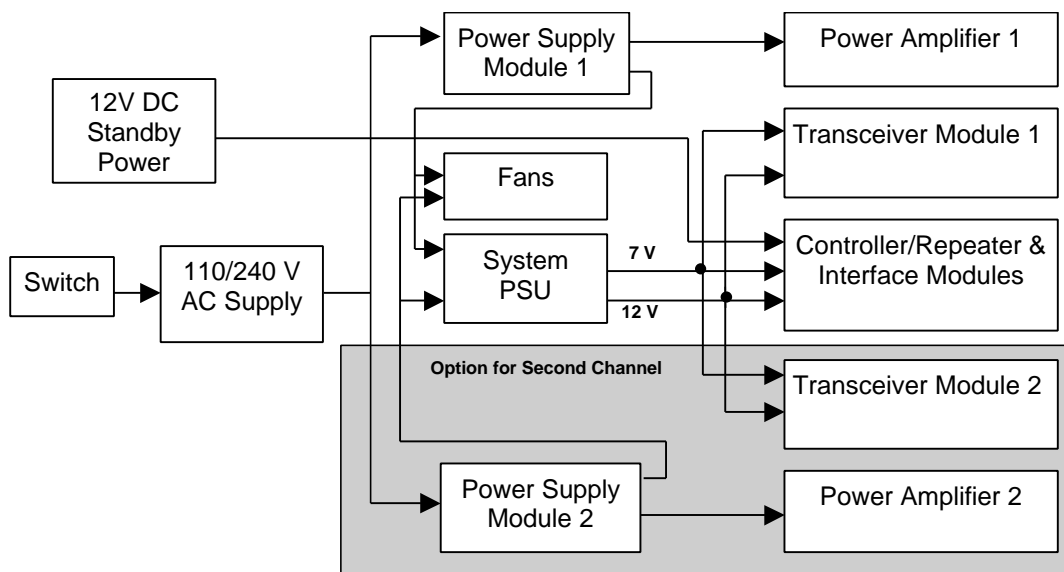


Figure 2-1 Power Distribution of an AC powered DRB-25

2.2.2 AC Powered with DC Revert

The DRB-25 may be powered from the 240 or 110 V AC power supply via one or two Power Supply Modules with provision for 12V DC Revert (13.6V DC nominal +/- 20%) in the event that the AC power fails.

When using DC Revert the RF output power of the DRB-25 is derated by upto 3dB if the DC voltage is at the low end of the specified range. Operation below 11V DC is not recommended. When

operating from a direct DC power source the Power Supply Modules are replaced with blank panels.

AC powered with 24 and 48 V DC revert is also available using external power supplies, however, where a 48 V DC battery backed supply of sufficient capacity is available it is generally preferable to use this as the main power source for the DRB-25.

2.2.3 DC Power Supply

The DRB-25 may be powered directly from a 12 V DC (13.6V DC nominal +/- 20%) power source using the AC/DC Revert option. In scenarios where the DC supply is likely to drop below 11V DC it is recommended that a DC-DC supply is used.

Figure 2-2 shows the power distribution of a DC powered DRB-25.

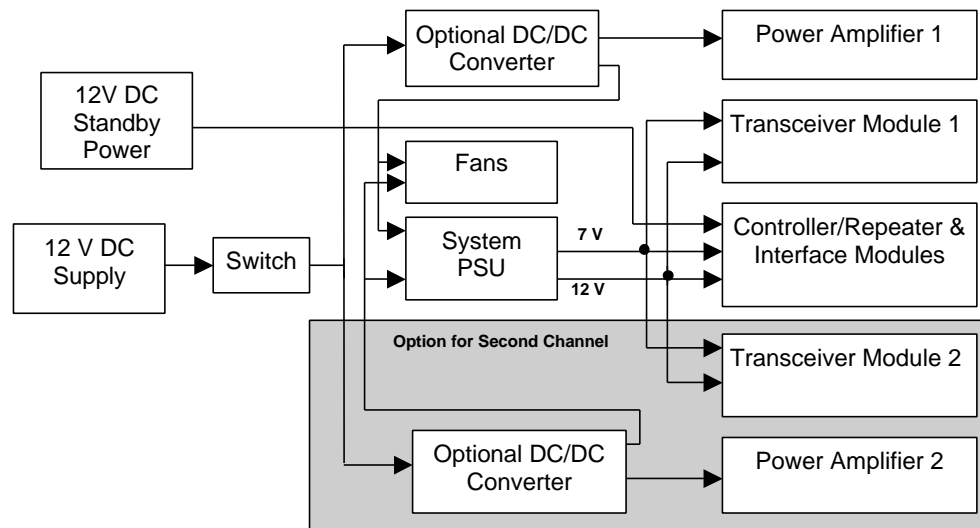


Figure 2-2 Power Distribution of a DC Powered DRB-25

2.2.4 Reference Oscillator Backup Power

The DRB-25 has provision for a user to connect a 12V DC backup supply to keep the system reference oscillator oven at its operating temperature in the event of a brief primary power failure. An interface module connector acts as the connection point for the keep-alive power.

If the backup supply is not used, any interruption to the primary supply will cause the reference oscillator to lose stability, and a warm-up time of up to ten minutes may be required after power is restored to the DRB-25.

2.3 *PLUG-IN MODULES*

The DRB-25 has the following types of plug-in Modules:

- Transceiver Module.
- Controller Module
- Repeater Module
- Power Amplifier Module.
- Interface Module.
- Power Supply Module.

2.3.1 *Transceiver Module*

The Transceiver Module (TM) provides full duplex radio operation for analog and digital modulation schemes. Each module consists of an RF card for receive and transmit and a daughter board for digital signal processing. Modules are standard half-Eurocard layout measuring 10.5 inches (6 Rack Units) high by 10 inches (250 mm) deep. The Transceiver Modules plug into a common backplane with the Controller Module, providing seamless transfer and switching of traffic and control data.

Transceiver Modules are specific to frequency bands and are available for frequency bands; VHF (136 to 174 MHz), and UHF (low) (400 to 470 MHz). Each Transceiver module may be programmed with up to 512 channels.

Transceiver Modules of different bands are interchangeable provided the associated Power Amplifier is also changed. The Transceiver Module is powered by 12 V and 7 V supplies from the System Power Supply within the case of the DRB-25.

Two RJ style connectors are provided on the module front panel. The upper connector (RJ11) provides a standard RS-232 serial interface that allows maintenance staff to program and configure the module using the Transceiver Module Programmer application software from an external PC. The lower (RJ45) connector provides an audio interface for the connection of a speaker, microphone or handset.

Internally to the DRB-25 the Transceiver Module provides two connections to its associated power amplifier; an RF output and a serial data link for control and communication between the two modules. Figure 2-3 shows the front panel controls, indicators and connectors and Table 2-1 lists the control and indicator functions.

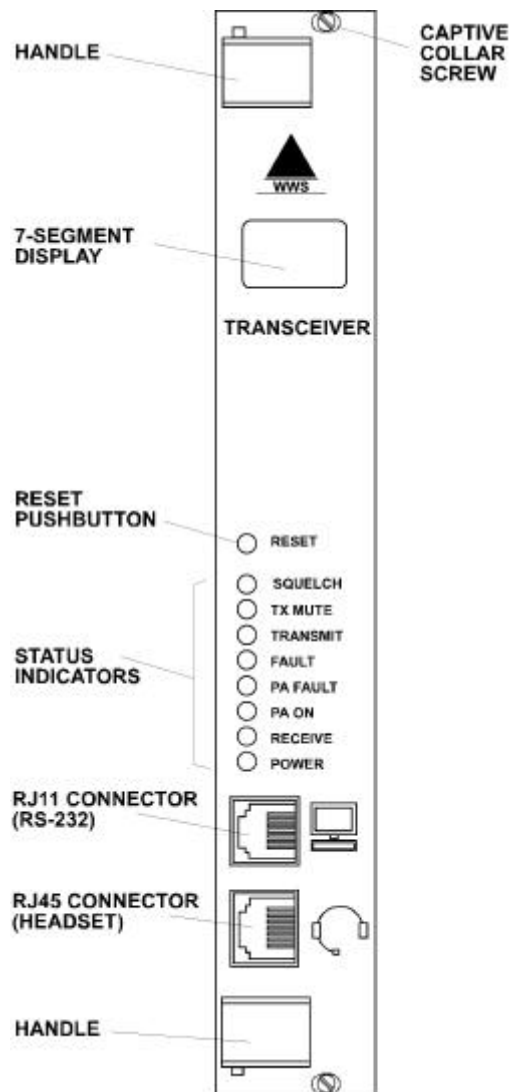


Figure 2-3 Transceiver Module Front Panel

The Transceiver Module provides internal interfaces for audio, data and control. The Transceiver Module also provides an audio output interface for connection to a front panel speaker when configured as a single channel system with optional front panel speaker module.

Table 2-1 Transceiver Module Controls and Indicators

ITEM	Description
7-segment display	In normal operation indicates the current channel being used by the Transceiver Module (in the range 0 to 511). If an error condition is detected in either the Transceiver or PA Module then the display indicates the relevant error code. An "E" is displayed with a number in the range "1" to "99" displayed to indicate the error condition.
RESET	Recessed pushbutton switch. Press to reset the Transceiver Module.
SQUELCH (Green LED)	Illuminated when a signal has been received and the NAC or CxCSS has been validated.
TX MUTE (Green LED)	Illuminated when the selected channel has is "receive only" mode, i.e., it receives signals and the operator can monitor the received signals, but nothing can be transmitted.
TRANSMIT (Green LED)	Illuminated when the Transceiver Module is transmitting.
FAULT (Red LED)	Illuminated when the self test and diagnostic routines have detected a fault condition in the Transceiver Module circuitry. The 7-segment display indicates the nature of the fault.
PA FAULT (Red LED)	Illuminated when the self test and diagnostic routines have detected a fault condition in the circuitry of the Power Amplifier Module used with this Transceiver Module. The 7-segment display indicates the nature of the fault.
PA ON (Green LED)	Illuminated when the Power Amplifier Module has received a transmit command from the Transceiver Module and is transmitting.
RECEIVE (Green LED)	Illuminated when a carrier has been detected on the receive frequency. If this indicator is ON but the SQUELCH indicator is OFF then an invalid signal has been received.
POWER (Green LED)	Illuminated when the Transceiver Module is receiving power from the power supply.

2.3.2 Controller Module

The Controller Module (CM) provides central control functions for the DRB-25 and high-stability timing for all radio elements. Depending on the application either one Controller Module or one Repeater Module is required for each DRB-25 system. The Controller Module is a standard half-Eurocard plugged into a common backplane with the Transceiver Modules, providing seamless transfer and switching of traffic and control data.

The Controller Module contains a 10MHz oscillator from which all system timing is derived and the Transceiver Modules are inhibited from transmitting if the reference clock fails. Depending on the option ordered the Controller Module contains either a 0.1ppm oven-controlled oscillator (OCXO) or a 1ppm temperature compensated oscillator (TCXO). At low ambient temperatures the OCXO oven may take up to 10 minutes to reach its operating temperature and achieve the required stability and provision is made for the connection of an external oven supply (12 V DC) which will keep the oven at the required temperature during power outages. It is also possible to supply an external 10 MHz reference directly to the Interface Module, which is then used instead of the Controller Module internal reference oscillator.

The DRB-25 has six general-purpose inputs and outputs (provided on the Interface Module). These can be programmed to be alarm inputs for functions such as site alarms, AC power failure alarms etc. The Controller Module monitors all internal alarms generated by Transceiver Modules, Power

Amplifier Modules and Power Supply Modules. The Controller Module also monitors the general-purpose inputs and can be programmed to activate a single general-purpose output or remotely interrogated to determine the cause of the alarm.

Figure 2-4 shows the front panel controls, indicators and connectors and Table 2-2 lists the control and indicator functions.

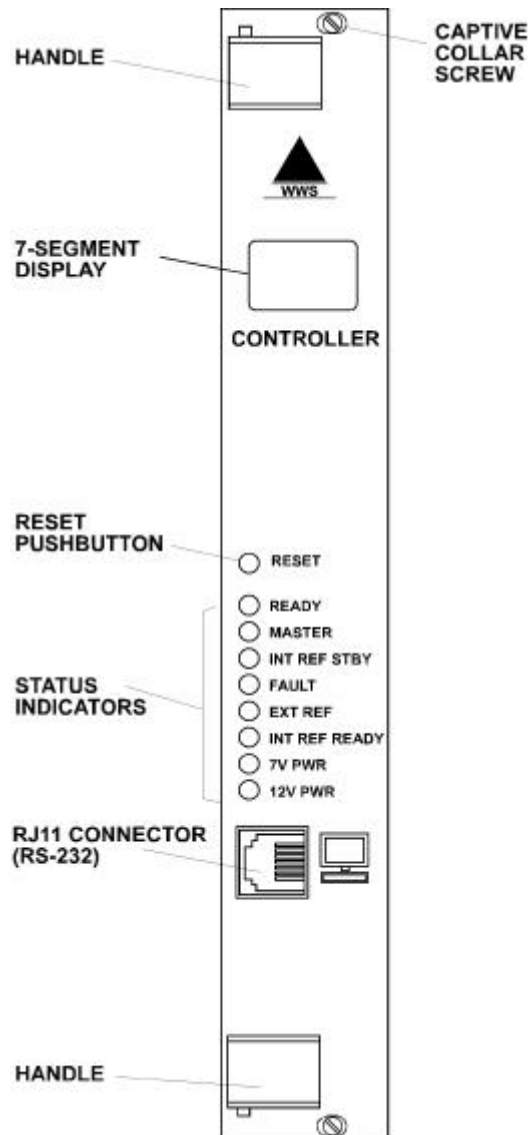


Figure 2-4 Controller Module Front Panel

There is a RESET switch, nine indicators and one RJ11 connector on the front panel of the Controller Module. The RJ11 connector provides a standard RS 232 serial interface, which allows maintenance technicians to program and configure the module using the programmer and to monitor radio functions with a computer.

Table 2-2 Controller Module Controls and Indicators

Item	Description
7-segment display	An oscillating pattern indicates normal operation of the module. If an error condition is detected in the Controller Module then the display indicates the relevant error code. A flashing "E" is displayed with number in the range "1" to "99" is displayed to indicate the error condition.
RESET	Recessed pushbutton switch. Press to reset the Controller Module.
READY (Green LED)	Illuminated when the Controller Module is operating and ready for use.
MASTER (Green LED)	Illuminated when the Controller Module is the master and is generating the 10 MHz reference clock for the unit. This indicator is always ON, unless a redundant controller is used in multi channel configurations.
INT REF STBY (Green LED)	Illuminated when the internal 10 MHz clock reference oscillator is operating from the 12 V DC STBY PWR on the Interface Module.
FAULT (Red LED)	Illuminated when the self test and diagnostic routines have detected a fault condition in the Controller Module circuitry. The 7-segment display indicates the nature of the fault.
EXT REF (Green LED)	Illuminated when an external 10 MHz clock source is connected to the BNC connector on the Interface Module.
INT REF READY (Green LED)	Illuminated when the internal 10 MHz clock reference oscillator has reached operating temperature.
7 V PWR (Green LED)	Illuminated when the 7 volt supply is present in the Controller Module
12 V PWR (Green LED)	Illuminated when the nominal 12 volt supply is present in the Controller Module.

2.3.3 Repeater Module

The Repeater Module (RM) provides high-stability timing for all radio elements and is used when the DRB-25 is only required to operate as a repeater and external control functions (DTMF/Tone Remote) are not required. The Repeater Module may be used when the DRB-25 is configured with two transceiver modules and transceiver linking; either cross-band or cross-mode is required. The Repeater Module supports the inputs and outputs (provided on the Interface Module) for transmit/receive relays and transmit inhibit but the remaining general-purpose inputs and outputs are not supported.

The Repeater Module contains a 10MHz oscillator from which all system timing is derived and the Transceiver Modules are inhibited from transmitting if the reference clock fails. Depending on the option ordered the Repeater Module contains either a 0.1ppm oven-controlled oscillator (OCXO) or a 1ppm temperature compensated oscillator (TCXO). At low ambient temperatures the OCXO oven may take up to 10 minutes to reach its operating temperature and achieve the required stability and provision is made for the connection of an external oven supply (12 V DC) which can keep the oven at the required temperature during power outages. It is also possible to supply an external 10 MHz reference directly to the Interface Module which is then used instead of the Repeater Module internal reference oscillator.

2.3.4 *Power Amplifier Module*

The Power Amplifier Module (PAM) is a 6RU high plug-in module. One Power Amplifier Module is required for each Transceiver Module. Power Amplifier Modules are specific to frequency bands:

60W VHF: 136 – 165 MHz and 145 – 174 MHz

100W VHF: 136 – 165 MHz and 145 – 174 MHz

50W UHF: 400 – 450 MHz and 440 – 470 MHz

Each Power Amplifier Module has an on-board microcontroller, which supervises its operation and reports alarms via a control link to the associated radios. Power output is adjustable over a 10 dB range in increments of less than 1 dB.

Each Power Amplifier Module is powered by its associated Power Supply Module.

Figure 2-5 shows the front panel layout.

The Power Amplifier Module has two connectors. The N-type connector is the Power Amplifier output connector, and the D connector contains RF input, DC power, and serial communications lines.

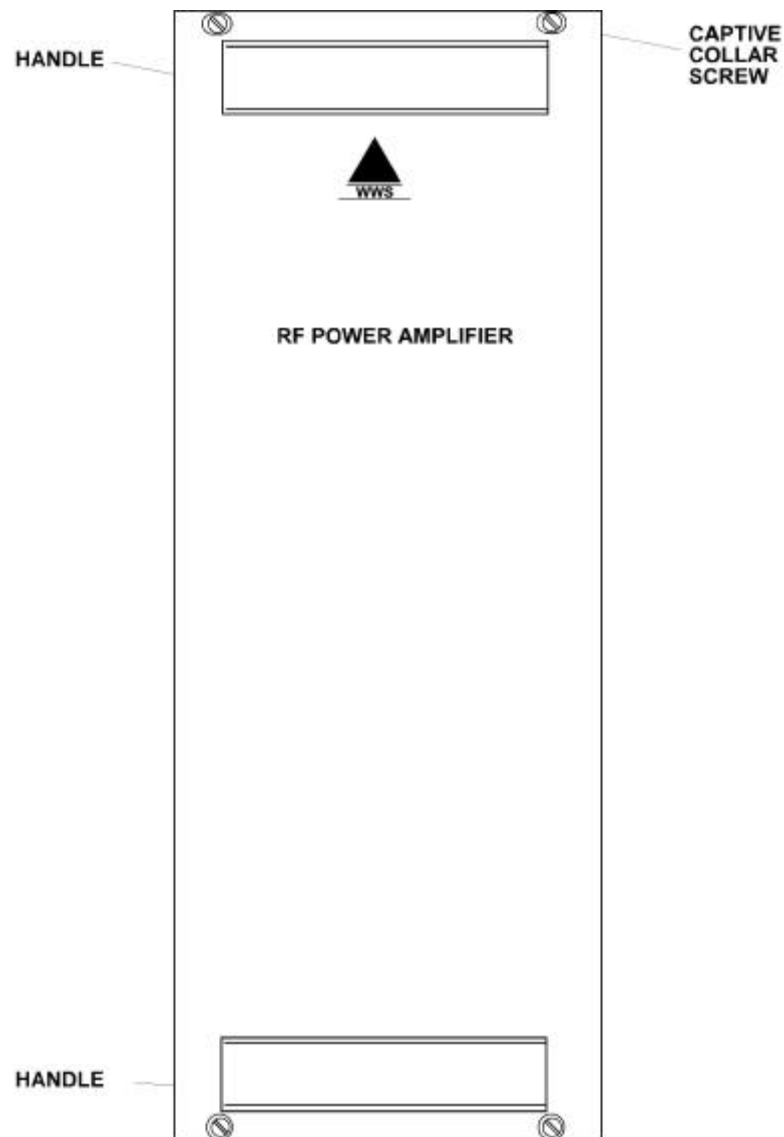


Figure 2-5 Power Amplifier Module Front Panel

2.3.5 Power Supply Module

The Power Supply Module provides the system power supply and one Power Amplifier Module with DC power derived from the 240 or 110 V AC power. Different versions are available depending on the Power Amplifier Module being used:

- 240/110 V AC to 12 V DC for VHF 60 W Power Amplifier Modules.
- 110 V AC to 12 V DC for VHF 60W and 100W and UHF 50 W Power Amplifier Modules.
- 240 V AC to 12 V DC for VHF 60W and 100W and UHF 50 W Power Amplifier Modules.

The inputs of all power supplies are fuse-protected and the outputs are over-current protected. They have dry contact (relay contacts) alarm outputs that close when the unit is operating correctly and open in the event of a malfunction. Figure 2-6 shows the Power Supply Module front panel indicators and Table 2-3 lists the indicator functions.

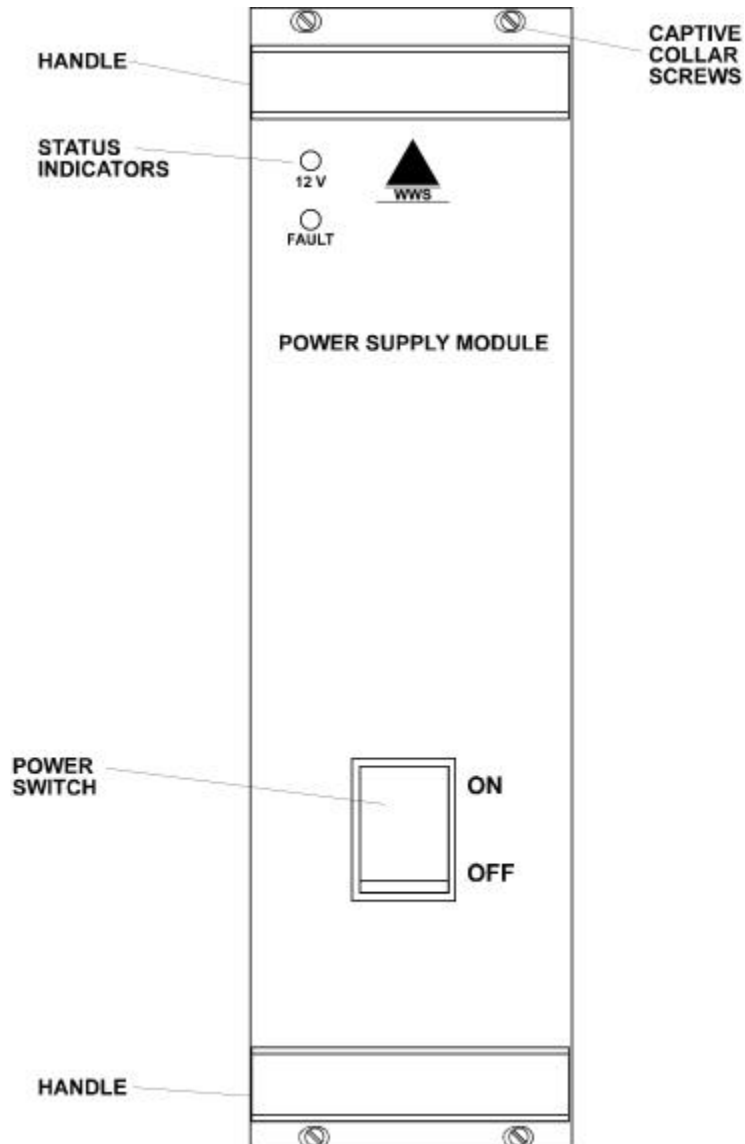


Figure 2-6 Power Supply Module Front Panel

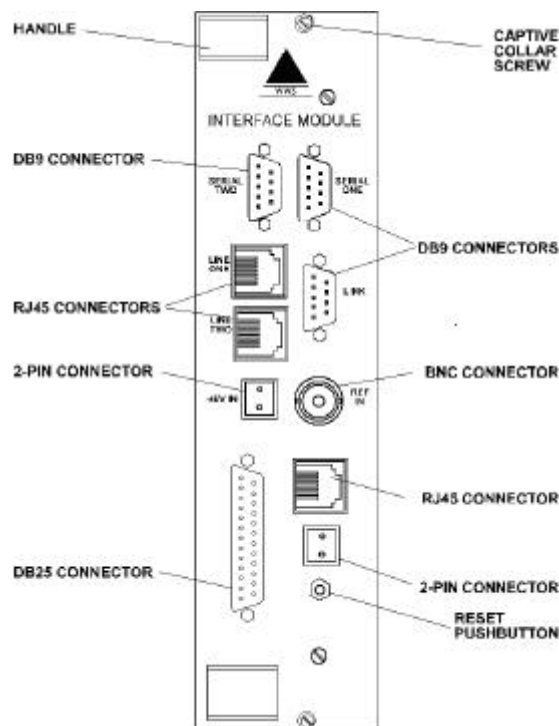
Table 2-3 Power Supply Module Controls and Indicators

Item	Description
ON/OFF Switch	Controls application of AC supply to the Power Supply Module.
Red neon indicator (part of switch)	Illuminated when supply is present.
12 V (Green LED)	Illuminated when the DC supply is present.
FAULT (Red LED)	Illuminated when there is a fault within the Power Supply Module

2.3.6 4W Interface Module (Discontinued)

The 4W Interface Module (IM) has been replaced by the 2-4W Interface Module. The following is provided for existing 4W Interface Module users.

The 4W Interface Module provides connections for the DRB-25 external interfaces. The Front Panel of the Interface Module is shown in Figure 2-7 and the connector functions listed in Table 2-4. Connector pin-outs are listed in section 3.6.5.

**Figure 2-7 4W Interface Module Front Panel**

The 4-wire configuration of the Line 1 and Line 2 interfaces for telephone/microwave/tone remote control connection is provided by a line interface daughterboard on the Interface Module.

Table 2-4 4W Interface Module External Interfaces

Designation	Connector	Function
LINE 1	RJ45	Radio 1 connections for: 4 wire + E & M microwave interconnect 4 wire tone remote unit
LINE 2	RJ45	Radio 2 connections for: 4 wire + E & M microwave interconnect 4 wire tone remote unit
SERIAL 1	DB9 Socket	Radio 1 diagnostic data connection (RS-232)
SERIAL 2	DB9 Socket	Radio 2 diagnostic data connection (RS-232)
LINK	DB9 Plug	RS485 serial data connection for APCO Project 25 Fixed Station Interface (Ef) , digital console interface or multi-site voting (future options)
NET	RJ45	Ethernet connection for VOIP and network management interface (future option)
I/O	DB25 Socket	General purpose input and output lines (6 inputs and 6 outputs), including dedicated outputs for antenna relay control and dedicated inputs for transmit disable
REF IN	BNC	External 10 MHz reference oscillator input
STBY PWR	2-pin plug	Standby power for reference oscillator oven.
-48 V IN	2-pin plug	DC input for E & M signaling

The general-purpose digital I/O provides six configurable inputs and outputs. Two of the output lines may be configured by jumper selection in the Interface Card to provide to drive 12 volt antenna relays for each of the transceivers. All other outputs, and these two when not configured as antenna drivers, provide optically-isolated contact closures which can be used to control other equipment.

The six inputs are also optically isolated. With an input of 5v to 10v they are sensed as active (on), when open circuited, they are sensed as inactive (off). The first two inputs are used to disable the transmitter during test.

The general purpose input and output lines, apart from the antenna relay outputs and transmit disable inputs, are unused in the present software release. In future releases user-configurability will be available.

2.3.7 2-4W Interface Module

The 2-4W Interface Module (IM) provides connections for the DRB-25 external interfaces. The Front Panel of the Interface Module is shown in Figure 2-7 and the connector functions listed in Table 2-4. Connector pin-outs are listed in section 3.6.5

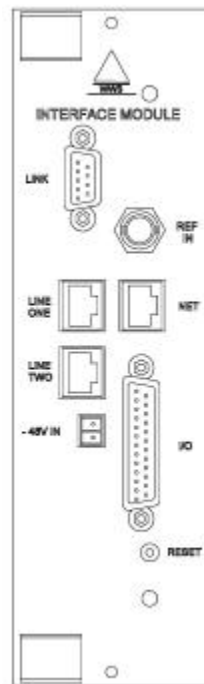


Figure 2-8 2-4W Interface Module Front Panel

The 2-4-wire configuration of the Line 1 and Line 2 interfaces for telephone/microwave/tone remote control connection are provided by a daughterboard on the Interface Module.

Designation	Connector	Function
LINE 1	RJ45	Radio 1 connections for: 2 or 4 wire PSTN or PABX 2 or 4 wire + E & M microwave interconnect 2 or 4 wire tone remote unit
LINE 2	RJ45	Radio 2 connections for: 2 or 4 wire PSTN or PABX 2 or 4 wire + E & M microwave interconnect 2 or 4 wire tone remote unit
LINK	DB9 Plug	RS485 serial data connection for APCO Project 25 Fixed Station Interface (Ef) , digital console interface or multi-site voting (future options)
NET	RJ45	Ethernet connection for VOIP and network management interface (future option)
I/O	DB25 Socket	Radio 1 and 2 diagnostic data Standby power for reference oscillator oven. General purpose input and output lines (6 inputs and 6 outputs), including dedicated outputs for antenna relay control and dedicated inputs for transmit disable
STBY PWR	2-pin plug	Standby power for reference oscillator oven.
-48 V IN	2-pin plug	DC input for E & M signaling