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1 INTRODUCTION

1.1 OVERVIEW

This document describes the DRB-25 Dual Radio Base Station system installation procedures, configuration and operational details.

The DRB-25, shown in Figure 1-1 and Figure 1-2, is a compact, multi-mode transceiver package that provides users with one or two analog or APCO Project 25 digital radio channels. The small size and high level of flexibility of the DRB-25 make it an ideal solution for any organization starting out on the digital migration path.

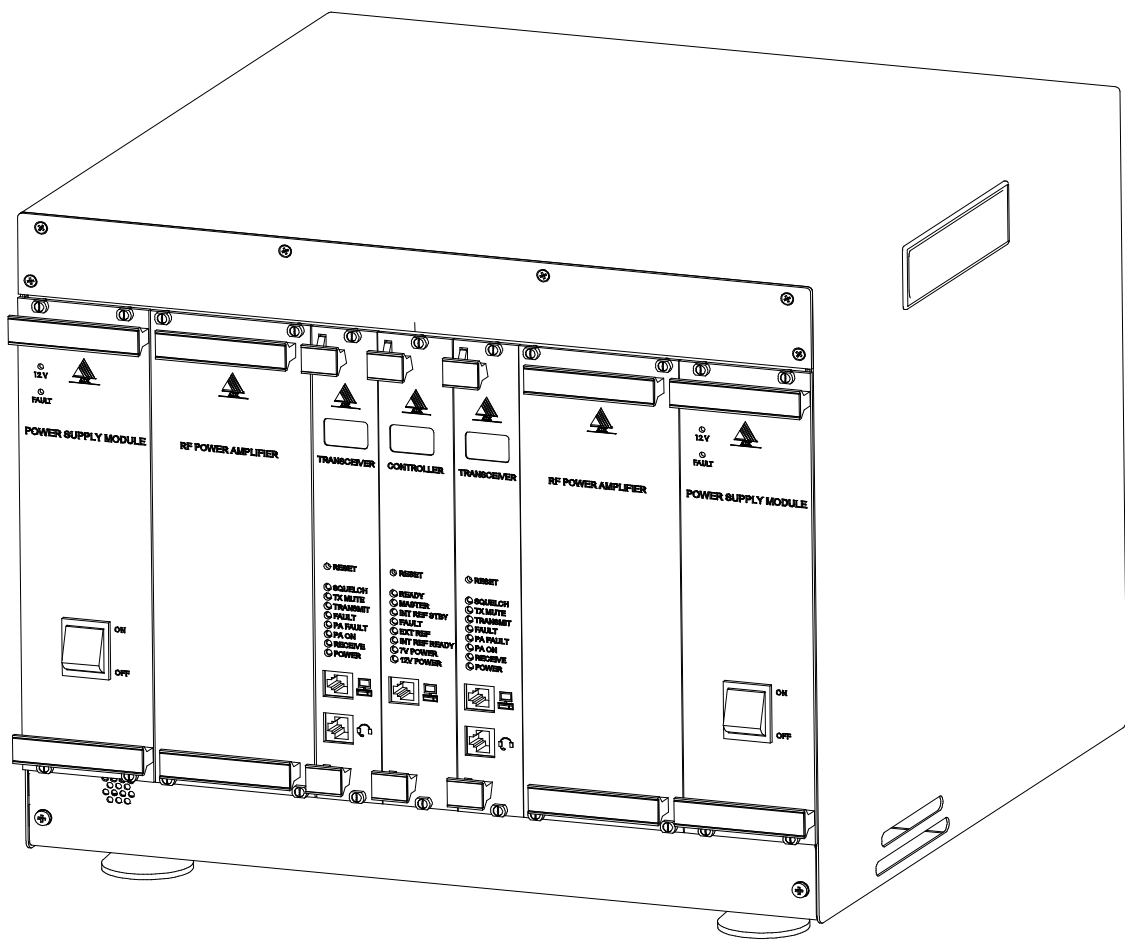


Figure 1-1 Front View - DRB-25

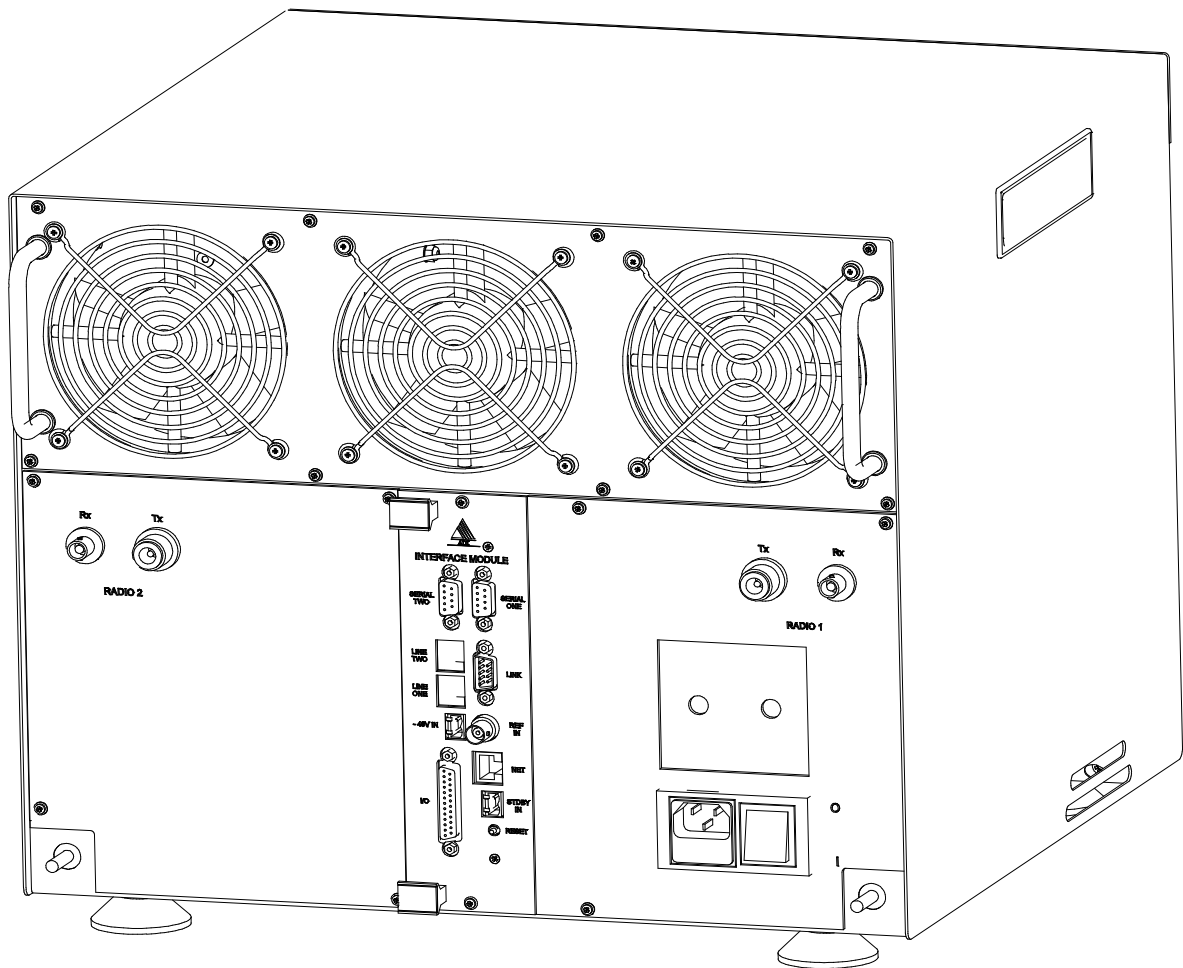


Figure 1-2 Rear View - DRB-25

The DRB-25 provides one or two independent radios in a single package. Each radio may be VHF or UHF, can be used as a base station or a repeater, and may be configured to support both APCO Project 25 compliant digital subscribers as well as providing backwards compatibility to analog users. This means that existing mobile radio equipment need not be immediately retired.

Each radio may be configured to provide an analog interface (2 wire with loop or ground start or 4 wire with E & M signaling) to the public switched telephone network (PSTN), to a private branch exchange (PBX), or to existing tone based remote control units.

The DRB-25 provides the key elements of an APCO Project 25 RF Sub-system including the air interface (Um), interfaces for telephone and PBX interconnect (Et) and host data systems (Ed). Support for Ethernet based network management, digital consoles, and the APCO Project 25 fixed station interface (Ef) will be available as future software upgrades.

The DRB-25 provides the following features:

- Automatically and concurrently supports APCO Project 25 digital and FM analog radios (TIA/EIA 603 including CTCSS selective calling).
- VHF (136-174 MHz) or UHF (400-470 MHz) frequency bands.
- VHF 60 W or 100 W; UHF 50W RF output.
- Configurable as single or dual channel with any mix of frequency bands and output power levels.
- 512 programmable channels per radio, with each channel programmable as APCO Project 25 digital or TIA/EIA 603 analog.
- Programmable channel scan of up to eight channels.
- Optional RS232, RS485, Ethernet and general purpose I/O interfaces.
- Optional 2 wire or 4 wire + E&M line interfaces for remote control or telephone interconnect.
- Compatible with industry standard tone remote control consoles.
- Compatible with Microwave Links using 4 Wire and E & M signaling.
- User friendly Windows configuration and diagnostic software for local or remote configuration.
- Self test diagnostic routines.
- Power supply: 240/110 V AC with 12 DC revert. 24 and 48 V DC versions available to special order.
- Available as a standard 19" rack mount sub-rack, as a desktop unit or housed in a secure floor mount cabinet.

In addition, the DRB-25:

- Enables a gradual migration from analog to digital terminals, or from one frequency band to another, communicating across-mode and across-bands while the migration is taking place.
- Provides link radio functions to other base stations or repeaters for geographically remote areas.
- Enables upgrade from a single-channel to dual-channel at low cost.
- Provides a low cost upgrade path from the dual-channel to a multi-channel base station.

1.2 PHYSICAL ARRANGEMENT

1.2.1 General

The DRB-25 is a completely self-contained cabinet unit housing all the components necessary to support one (single-channel) or two (dual-channel) radio configurations. The basic housing is provided with feet for desktop use and may optionally be supplied with mounting brackets for rack mounting. Alternatively the entire unit may be installed in a secure cabinet.

Integral to the housing are the system power supplies, fans and airflow control for cooling of modules and a common backplane into which the Transceiver, Controller (or Repeater) and Interface Modules are plugged. A single-channel DRB-25 requires one Controller (or Repeater) Module and the following plug-in modules:

- One Transceiver Module.
- One Power Amplifier Module.
- One Power Supply Module.
- One Interface Module (Optional - depending on external interfaces).

A dual-channel DRB-25 requires one Controller (or Repeater) Module and the following plug-in modules:

- Two Transceiver Modules.
- Two Power Amplifier Modules.
- Two Power Supply Modules.
- One Interface Module (Optional - depending on external interfaces).

A single-channel DRB-25 can be easily and inexpensively converted to a dual-channel DRB-25 by the installation of the additional modules.

The DRB-25 may be configured for AC or DC power, or as AC power with DC revert in the case of AC power failure.

A block diagram of a DRB-25 is shown in Figure 1-3.

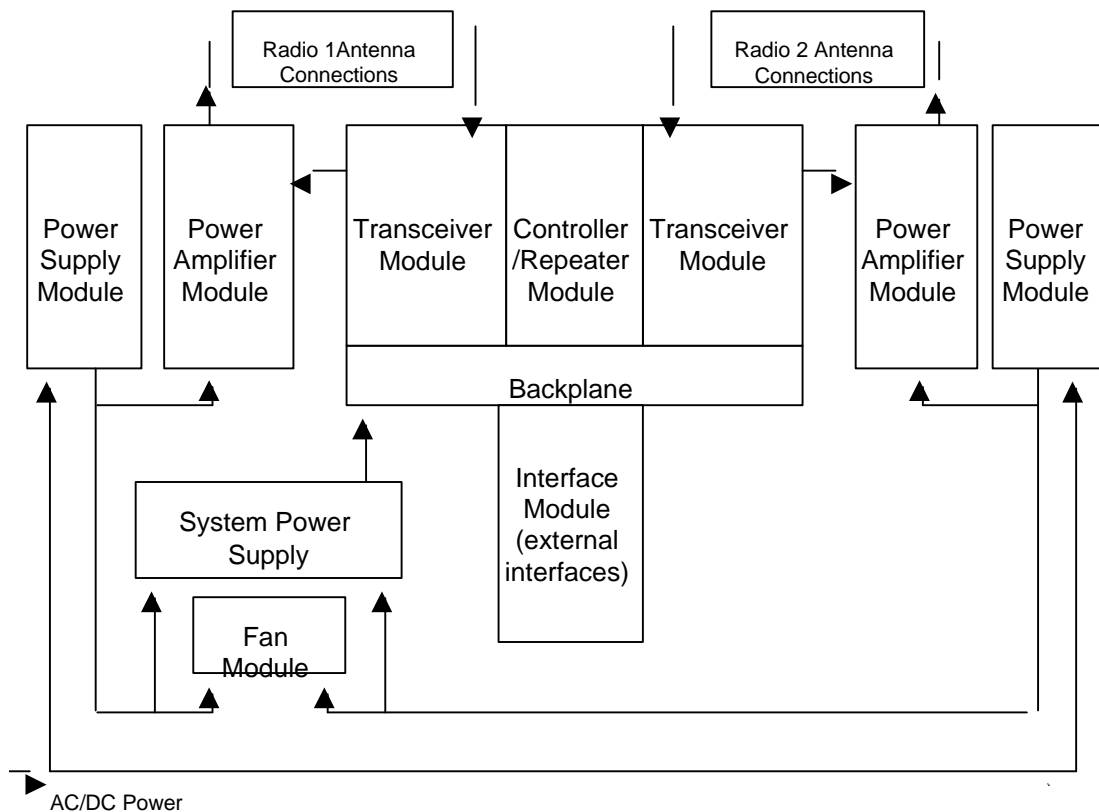


Figure 1-3 Block Diagram - DRB-25

A description of the equipment is given in Chapter 2.

1.2.2 Configuration Options

The DRB-25 may be configured as a Conventional (i.e. non-trunked) single or dual-channel radio base station. The configuration options are summarized in Tables 1-1 to 1-3.

The configurations of table 1-1 below can be achieved with the use of a Controller Module or a Repeater Module. An Interface Module is not required for this functionality.

Table 1-1 DRB-25 Operational Configurations

Mode Of Use	Description
Single-channel Repeater	The DRB-25 is configured with a single Transceiver, PA and Power Supply. If a mobile radio makes a call on the Transceiver's assigned frequency, the signal is repeated using the same format (analog or digital) used by the mobile.
Dual-channel Repeater	The DRB-25 is fitted with two Transceivers, PAs and Power Supply Modules. If a signal is received on the assigned frequencies of either of the Transceivers the signal is repeated in the same format in which it was received. Both Transceivers operate independently and two signals may be repeated simultaneously although not on the same frequency.
Scanning Repeater	The DRB-25 is configured as either a single or dual channel unit. Each transceiver is programmed with up to 8 channels which can be any mix of frequency and operating mode (analog/digital). The transceiver scans through the list of programmed channels until a valid signal is detected from a mobile when the signal is repeated using the same format (analog or digital) used by the mobile.
Crossbanding Repeater	The DRB-25 is fitted with two Transceivers and PA Modules which have operating frequencies in different bands. When a Transceiver receives a mobile call on its assigned frequency it repeats it using the same format, and passes the audio to the other Transceiver. The second Transceiver transmits the call on its assigned frequency in the user-programmed mode (analog FM or APCO Project 25).
Crossmoding Repeater	The DRB-25 is fitted with two Transceiver Modules which have operating frequencies in the same band. When a Transceiver receives a mobile call on its frequency it repeats it using the same format, and passes the audio to the other Transceiver. The second Transceiver transmits the call on its frequency in the user-programmed mode (analog FM or APCO Project 25).
Crossbanding and Crossmoding Repeater	The DRB-25 is fitted with two Transceiver Modules which have operating frequencies in different bands. When a Transceiver receives a signal on its assigned frequency it repeats it using the same format, and passes the audio to the other Transceiver. The second Transceiver operating in a different band to the first transmits the call on its assigned frequency in the user-programmed mode (analog FM or APCO Project 25).

The configurations of table 1-2 below the use of a Controller Codule. An Interface Module is not required for handset functionality but is required for all 2-wire or 4-wire connectivity.

Table 1-2 DRB-25 Voice Interconnect Configuration Options

Mode of Voice Interconnection	Description
None	The DRB-25 operates as an standalone repeater (single or dual channel) and does not have any external wired voice connections.
Handset/ DTMF Microphone	A single channel DRB-25 may be configured with a loudspeaker/handset panel in place of the second channel transceiver module and its associated power amplifier and power supply module. A DTMF microphone may be used to control the transceiver.
Tone Remote	Either one or two 2 wire or 4 wire + E & M connections are used to link the Transceiver Modules to industry standard tone remote units. Received audio is fed down the line and industry standard tone frequencies are used to control DRB-25 functions such as PTT and channel select. Existing analog tone remotes may be used with the DRB-25 operating in both analog and APCO Project 25 digital modes.
PSTN	Either one or two 2 wire or 4 wire + E & M connections are used to link the Transceiver Modules to the PSTN. Each connection can seize a line or grant a line in response to a PSTN request. Once a connection is established, monitor audio is fed down the line and tones from the remote end are used to control DRB-25 functions such as PTT and channel select.
Microwave	Either one or two 4 wire E & M connections are used to link the DRB-25 Transceivers to the outside world. The interface can be connected to a multiplexer of the microwave link.

Table 1-3 DRB-25 Programming and Diagnostic Configuration Options

Setup and Console Interconnection	Description
Programming using DMR-25 Programmer	A PC running DMR-25 is connected to the front panel serial port of either transceiver module to upload programming information into the DRB-25. DMR-25 may also be used remotely using a dial-up modem.
Diagnostics using DRB-25 Diagnostic Monitor (ZDM)	A PC running ZDM is connected to the front panel serial port of the Controller Module which enables both transceivers to be monitored and diagnostic checks to be run. The serial ports may also be used to connect the DRB-25 to a digital console (future option). ZDM may also be used remotely using a dial-up modem (future option).

1.3 SPECIFICATIONS

1.3.1 General Specifications

General Specifications for the DRB-25 are listed in Table 1-4.

Table 1-4 General Specifications

Specification	Value
Power supply	110 / 240 V AC, 12 V DC
Analog performance	TIA / EIA603
Digital performance	TIA / IS102.CAAB
Frequency bands:	VHF: 136 to 174 MHz
	UHF (low): 400 to 470 MHz
Operating frequencies	Selectable across full band
Dimensions:	Width: 19 inches (483 mm)
	Height: 14 inches (355 mm or 8 Rack Units)
	Depth: 17.5 inches (445 mm)
Weight:	Single radio: 58 lb (26 kg)
	Dual radio: 81 lb (37 kg)

1.3.2 Power Consumption

Power Consumption for the configurations of the DRB-25 are listed in Table 1-5.

Table 1-5 Power Consumption

Configuration	AC Consumption		DC Consumption	
	Receive	Transmit	Receive	Transmit
Single channel, 60 W	55 W	245 W	45 W	205 W
Single channel, 100 W	55 W	380 W	45 W	340 W
Additional channel, 60 W	26 W	210 W	20 W	180 W
Additional channel, 100 W	26 W	340 W	20 W	310 W

1.3.3 Environmental Specifications

The DRB-25 equipment is intended to be located in an indoor environment and meets the environmental specifications detailed in Table 1-6.

Table 1-6 Environmental Specifications

Specification	Value
Operating Temperature	-30°C to +60°C
Storage Temperature	-40°C to +60°C
Operating Altitude	0 to 5,000 m

Specification	Value
Relative humidity (non-condensing)	5% to 95% RH, non-condensing as defined in MIL-STD-810E Method 507.3 (humidity)
EMI/EMC	Equivalent to FCC part 15, subpart A, C, and J

1.3.4 *Applicable Standards*

The DRB-25 is designed to meet the applicable requirements of recommendations and standards detailed in Table 1-7.

Table 1-7 Applicable Standards

Function	Standard
Digital mode performance	ANSI/TIA/EIA 102.CAAB
Analog mode performance	TIA/EIA 603
RF Performance	NTIA Manual Chapter 5 , FCC - CFR47 part 90, AS4295
PSTN line isolation	TS001 (Australia), AS3260 (Australia), FCC part 68 (USA)