OPERATOR'S MANUAL

BIDIRECTIONAL REPEATER

MODEL R280

DECEMBER 2003

Toronto, Ontario

GUARANTEE

This unit is guaranteed for a period of one year from the date of shipment against failure due to defective parts or improper assembly.

This guarantee is limited to replacement of defective material and does not cover damages or other costs resulting from the use of this material whether used correctly or otherwise.

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SECTION 1. GENERAL INFORMATION

1.1 INTRODUCTION

1.1.1 Scope of Manual. - This manual is intended to familiarize personnel installing the R280 Repeater with all pertinent aspects of the repeater. Included in this manual are a brief physical description, a technical summary, and installation and operating data.

1.1.2 Purpose of Equipment. - The R280 Repeater is used as a wireless repeater. The repeater can be configured for either the cellular or PCS band of operation. Refer to Tables 1-2 and 1-3 for the various unit configurations. A typical use of the R280 is to provide signal coverage in enclosed areas by enhancing signals to and from the mobile phones.

1.1.3 Physical Description. - The unit, shown in Figure 3-1, is designed to be mounted on a flat vertical surface. The unit has two N connectors for antenna connections and a DIN receptacle for connection to an external DC power source. Alarm relay contact terminals are provided to connect to remote monitoring equipment.

1.1.4 Electrical Description. - The PCS version of the unit provides a maximum of approximately 70 dB of gain for signals in the uplink band in one direction and 70 dB of gain for signals in the downlink band in the opposite direction. The cellular and SMR versions of the unit provide a maximum of approximately 75 dB of gain for signals in the uplink band in one direction and 75 dB of gain for signals in the downlink band in the opposite direction.

An external AC-DC power source is available to be used to provide power via a DIN receptacle on the bottom of the unit.

1.2 TECHNICAL SUMMARY

The power requirements, performance characteristics and dimensions and weight of the R280 Repeater are summarized in Table 1-1.

TABLE 1-1. Performance Characteristics and Salient Features of the R280 Repeater

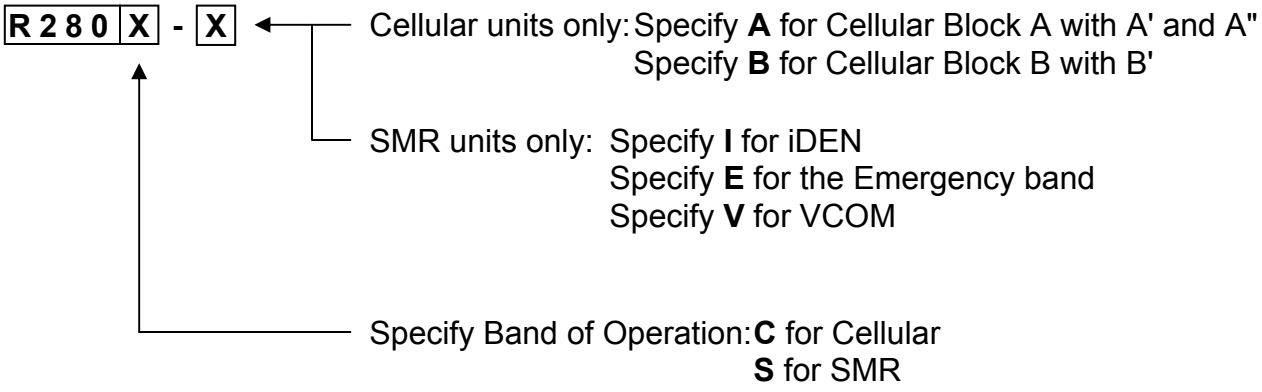
	Parameter	Specification
1.	Input Power:	11 to 15 VDC @ 6 A Max. (negative ground)
2.	Frequency Range:	
	- Base Receive (Uplink)	See Tables 1-2 and 1-3
	- Base Transmit (Downlink)	See Tables 1-2 and 1-3
3.	Bandwidth	See Tables 1-2 and 1-3
	Note: The following specifications apply in both directions	
4.	Maximum Gain:	70 dB Typical for PCS units 75 dB Typical for cellular and SMR units
5.	Attenuator Range:	30 dB in 2 dB Steps
6.	Impedance (Input and Output):	50 Ohms
7.	Rated Output Power* :	+19 dBm
8.	Output 1 dB Compression Point	+28 dBm Typical
9.	3rd Order Output IP:	+45 dBm Typical
10.	Environmental Limits	
	(a) Ambient Temperature Range:	0°C to 50°C Operating
	(b) Ambient Relative Humidity:	Up to 85%
11.	Dimensions:	
	(a) Enclosure Dimensions:	19.2” H x 18.0” W x 9.3” D 488mm H x 457mm W x 236mm H
	(b) Weight:	62 Lbs (28 Kg)
12.	Connections:	
	RF Input/Output:	Type N Female
	DC Supply:	5-pin DIN Receptacle
	Relay Contacts	Screw Terminals

* Note: Refer to Table 1-2 for definition of composite output power rating.

1.2 UNIT CONFIGURATION

The R280 is available in various configurations. The Model Number of the R280 is expressed as shown below:

For 800 MHz Band Units:



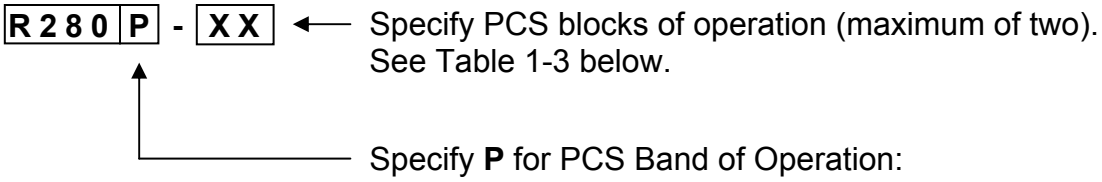
For example the R280C-A is a cellular band repeater covering the cellular A block including A' and A".

Table 1-2 below lists the frequencies of operation for the configurations available for the 800 MHz band.

TABLE 1-2 800 MHz Band Repeater Frequencies of Operation

Band of Operation	Uplink Frequency Band (MHz)	Downlink Frequency Band (MHz)
Cellular Block A (includes A' and A")	824 to 835 and 845 to 846.5	869 to 880 and 890 to 891.5
Cellular Block B (includes B')	835 to 845 and 846.5 to 849	880 to 890 and 891.5 to 894
iDEN	806 to 821	851 to 866
Emergency Band	821 to 824	866 to 869
VCOM	821 to 823	866 to 868

For 1900 MHz Band Units:



For example the R280P-DE is a PCS band repeater covering the both the D and E blocks.

Table 1-3 below lists the frequencies of operation for the configurations available for the 1900 MHz band.

TABLE 1-3 1900 MHz Band Repeater Frequencies of Operation

Frequency Block (Bandwidth)	Uplink Frequency Band (MHz)	Downlink Frequency Band (MHz)
PCS Block A (15 MHz)	1850 to 1865	1930 to 1945
PCS Block B (15 MHz)	1870 to 1885	1950 to 1965
PCS Block C (15 MHz)	1895 to 1910	1975 to 1990
PCS Block C1 (5 MHz)	1895 to 1900	1975 to 1980
PCS Block C2 (5 MHz)	1900 to 1905	1980 to 1985
PCS Block C3 (5 MHz)	1905 to 1910	1985 to 1990
PCS Block D (5 MHz)	1865 to 1870	1945 to 1950
PCS Block E (5 MHz)	1885 to 1890	1965 to 1970
PCS Block F (5 MHz)	1890 to 1895	1970 to 1975

NOTE IMPORTANT RATING INFORMATION

Manufacturer's rated output power of this equipment is for single carrier operation. For situations when multiple carrier signals are present, the rating would have to be reduced as per Table 1-4, especially where the output signal is re-radiated and can cause interference to adjacent band users. This output power reduction is to be achieved by reduction of input power or by gain reduction and not by an attenuator at the output of the device.

TABLE 1-4

Rated Power Output for Linear Operation

The total composite output power in multiple tone or wideband signals shall NOT exceed the following level or else it may result in improper operation of the device and cause interference. The composite output power rating is defined as the total average RMS output power of all inband signals. The unit should be operated at or below this level to ensure linear operation with low distortion. This holds true for any number of carriers with total average power adding up to the composite output power rating listed in the table below.

Parameter	Specification
Base Transmit (Downlink) Total Power:	+19 dBm
Portable Transmit (Uplink) Total Power:	+19 dBm

SECTION 2. THEORY OF OPERATION

2.1 THEORY OF OPERATION

The R280 is a bidirectional repeater, providing gain in both the uplink and downlink frequency bands. The block diagram of the R280 is shown in Figure 2-1. The PCS unit has a typical gain of 70 dB in both the uplink and downlink bands. The cellular and SMR units have typical gains of 75 dB in both the uplink and downlink bands. The unit is composed of IF conversion modules, amplifiers, and diplexers as well as a control module.

Please refer to Figure 2-1. The downlink signal enters the unit via the Base Antenna connector. After the signal passes through the high band port of the diplexer within the Uplink Amp module, the signal is split and then fed into the 2 Downlink IF Conversion Modules. The modules use IF conversion to provide sharp filtering of downlink signals in order to reject out of band signals. The conversion modules have a typical gain of 50 dB. After the 2 downlink signals are combined within the Downlink Amp module, they are fed into the downlink amp and then into the high band port of the diplexer within the Downlink Amp module. The downlink signal then appears at the Distribution Antenna connector.

The unit's operation in the uplink band is similar to the downlink band discussed in the previous paragraph but uses the Uplink IF Conversion Modules along with the uplink amp in the Uplink Amp module and the low band ports of the diplexers to provide gain from the Distribution Antenna to the Base Antenna.

The Controller module sets the center frequency of the IF conversion modules. When the unit is first switched on, the controller module sends a signal to set the center frequency of the IF conversion modules. It then enables the modules once the PLLs have locked and stabilized to the specific band of operation. The controller is pre-programmed at the factory with the correct customer frequencies.

The controller module also contains the attenuation control. The rotary switch on the module adjusts the attenuation setting of both the uplink and downlink IF conversion modules to the value indicated by the switch knob pointer. The attenuators can be set over the range of 0 to 30 dB in 2 dB steps. Changing the setting has a immediate affect on the attenuators.

External DC power is fed to the unit through the DIN power jack on the bottom of the unit. Power is fed from this module to the Uplink Amp, Downlink Amp and Controller modules. The IF conversion modules obtain their power through the Controller module.

The interface module contains two LED indicators. The red LED indicates a PLL unlock condition and may illuminate briefly when the unit is first switched on while the PLLs are locking and the modules are disabled. Under normal operation, only the green LED will be on.

Both normally open and normally closed alarm relay contact terminals are provided on the interface module for connection to external remote monitoring equipment. An alarm condition exists for PLL unlock condition or when unit is not powered.

Each module employs internal voltage regulators to maintain the same unit performance over the entire power supply range of 11 to 15 VDC.

The unit may be operated from any DC supply (negative ground) in the range of 11 to 15 VDC with a current capability of 6 A. This allows for flexibility in powering the unit from a variety of power sources which may be available at the installation site. The unit may be powered from any of the following: a local nominal 12 VDC source, an external AC to 12 VDC power source, or from –48 VDC site voltage by using the correct converter. Most typical installations will use the external AC to 12 VDC power source PS338.

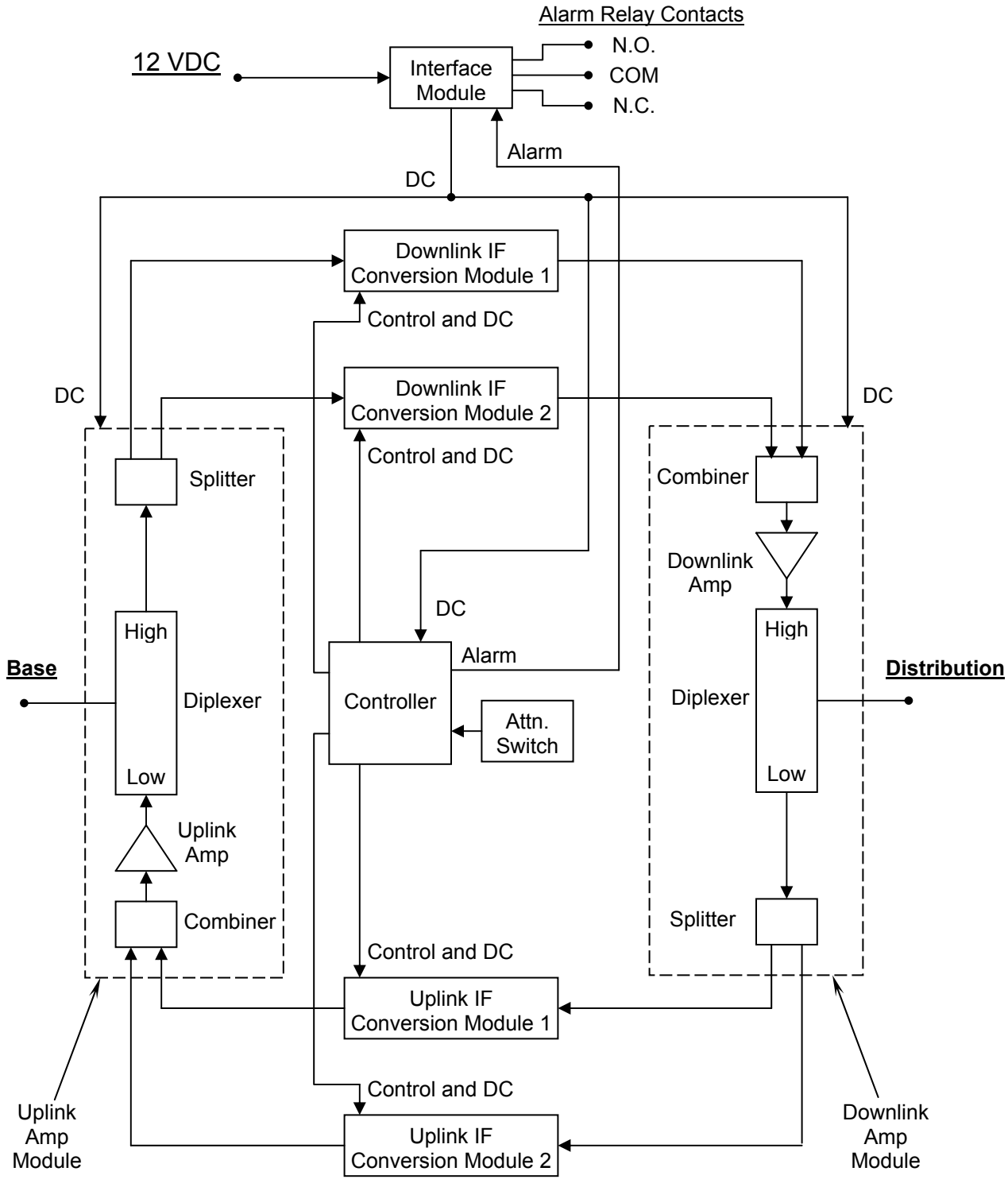


Figure 2-1 R280 Repeater Block Diagram

SECTION 3. INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS

3.1 UNPACKING AND INSPECTION

The following checks are recommended after receipt of the equipment from shipping agent:

1. Check for any external damage that could have occurred in transit. If damage is found, report to the shipping agent and to the supplier immediately.

2. Check that all items on the packing slip are present. If any are missing, report to the supplier immediately.

3.2 INSTALLATION

NOTE: The unit attenuator has been factory set to the maximum value (30 dB) at time of shipment. This results in a typical unit gain of 40 dB. The installer must know the base station signal level to be fed into the unit. The gain of the unit must be set to a value such that the Rated Output Power of +19 dBm is not exceeded. The unit must not be operated above this Rated Output Power as specified in Tables 1-1 and in 1-2.

The Repeater is designed for mounting on a flat vertical surface. Proceed as follows:

1. Locate a suitable mounting location allowing a clearance to route mating cable and connectors to the unit. Drill four pilot holes on 10.5 x 17.9 inch centers for 3/8" bolts. Refer to the installation diagram shown in Figure 3-1.

2. Mount the unit ensuring there is good air circulation.

3. Set the unit attenuator according to the above note such that the Rated Output Power is never exceeded.

4. Connect "BASE" to the cable leading to the base antenna.

5. Connect "DISTRIBUTION" to the cable leading to the distribution antenna.

6. If desired, connect external alarm monitoring equipment to the interface module relay contact terminals as required.

7. Connect external DC power to the DIN receptacle on the bottom of the unit. The unit may be powered by DC voltages in the range of 11-15 VDC (negative ground). The unit is typically powered with the PS338 AC to 12 VDC adapter provided with the unit.

This completes the installation.

3.3 OPERATING INSTRUCTIONS

When powered, the unit green LED on the Interface module will be illuminated and the alarm relay terminals will be in their normal condition.

When the unit is first turned on, the red LED may illuminate briefly and the alarm relay may switch to indicate an alarm condition while the PLLs are locking and the modules are disabled. Under normal operation, only the green LED will be on.

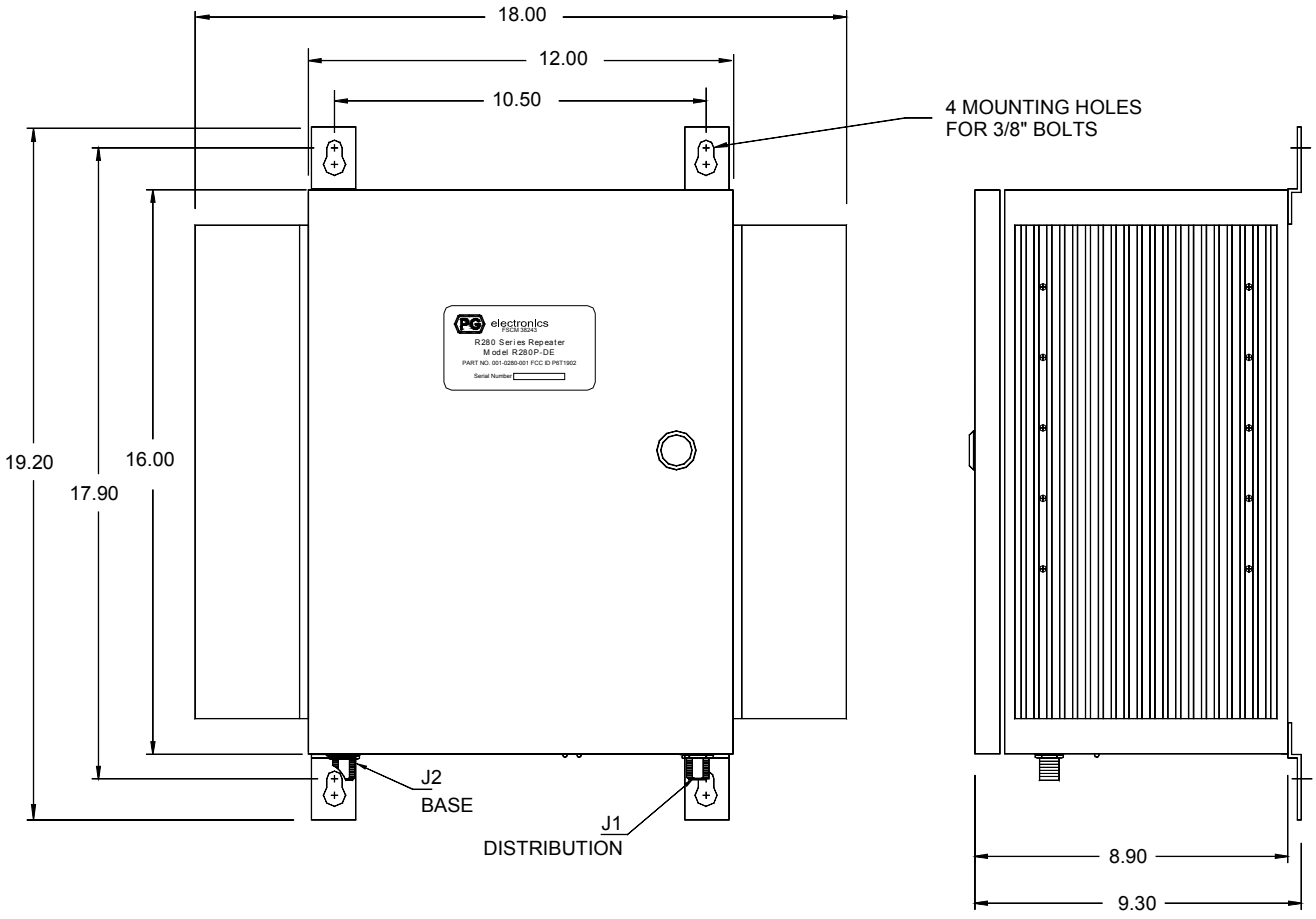


Figure 3-1 Installation Data