

***IDEN Digital Repeater Installation Manual
MW-DR-800-50W90B***



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3 Introduction.

Dekolink Wireless channel selective repeaters employ digital processing techniques to attain versatile programmable filter array.

The input RF signal is sampled and converted to digital signals. The digital signal is filtered using fast parallel logic. Using digital processing techniques the system generates up to 8 (12 optional) separate, programmable and independent filters. The filter parameters can be easily modified and tailored to meet specific customer requirements.

3.1 Computer Program.

Repeater Management Software (RMA) supplied with the repeater and provide full access to all control setting and monitoring capabilities. The RMA software can be installed on Windows 95, Windows 98, Windows 2000 & Windows XP operation systems.

Dekolink's Repeater Management Application software (RMA) is used to manage and control the repeater by local connection via RS232 or remotely by Modem.

3.2 Programmable Modules

All Repeater settings made through Controller unit (CB-04), This unit controls the active components in the repeater, and communicate with two DDF (Dekolink Digital Filter) units Up& Downlink through RS232 Communication.

The controller controls RF Gain, Power On/Off, AGC On/Off & provides Alarms Report .

The controller also set DDF parameters to each DDF units (Uplink & downlink) it sets Center Frequency, Bandwidth & Enable/Disable each one of the 8 channels separately of the Uplink/ Downlink path. It allows independence shaping of several filters, by controlling frequency, frequency bandwidth and type.

4 Electrical Specifications

Frequency Range	Downlink 851-866 MHz	Uplink 806-821 MHz
Pass band Gain @Min attenuation.	Up to 100 dB	
Channel Bandwidth	See Sample from Table	
Channel Setting Resolution	0.5 kHz	
Passband Ripple	± 2.5 dB max	
Channel Ripple	± 0.5 dB max	
Delay Ripple	± 250 nSec max	
Noise Figure @max gain	5.0 dB max	
3rd Order Output Intercept Point	+62 dBm typical	+50 dBm typical
IMD @ 4 tone	48 dBc typical @ 2.5 Watt/tone	48 dBc typical @ 0.25 Watt/tone
IMD @ 8 tone	45 dBc typical @ 1.25 Watt/tone	45 dBc typical @ 0.125 Watt/tone
Power Output @1 dB Gain Compression	50 Watt	10 Watt
Composite Output Power	+40dBm	+30 dBm
Automatic Gain Control (user enable)	15 dB attenuation Range	
Impedance Level	50 ohms	
V.S.W.R In/Out	1.5: 1 max	
Spurious Outputs	-13dBm max	
Power Supply	90 to 260 VAC	
Digital Gain Control	0-31dB@1dB/step	
Size	400X600X300 cm (15.7x23.6x12 inch)	
RF Connectors	N-type Female	
Weight	40 kg. (90 lb) Approx.	
Operating temperature	- 30°C to + 50°C	
Controller Backup Battery	2 Hours Approx.	

Examples for filters capability:

Filter Description	0.5 [dB] Bandwidth (min)	Min Rejection	Delay [uSec] (max)
Single Channel @3Channel Spacing	25[KHz]	50[dB] @ $F_c \pm 87.5$ KHz	25
Single Channel @2Channel Spacing*	25[KHz]	50[dB] @ $F_c \pm 62.5$ KHz	32
Single Channel @1Channel Spacing	25[KHz]	50[dB] @ $F_c \pm 37.5$ KHz	50
4 Channel @4 Channel Spacing*	100[KHz]	50[dB] @ $F_c \pm 150$ KHz	22
4 Channel @2 Channel Spacing*	100[KHz]	50[dB] @ $F_c \pm 100$ KHz	31
4 Channel @1 Channel Spacing	100[KHz]	50[dB] @ $F_c \pm 75$ KHz	46

*These filters are installed in the demonstration unit.

Additional filters can be added based on specific customer requirements.

5 RF Block Diagram

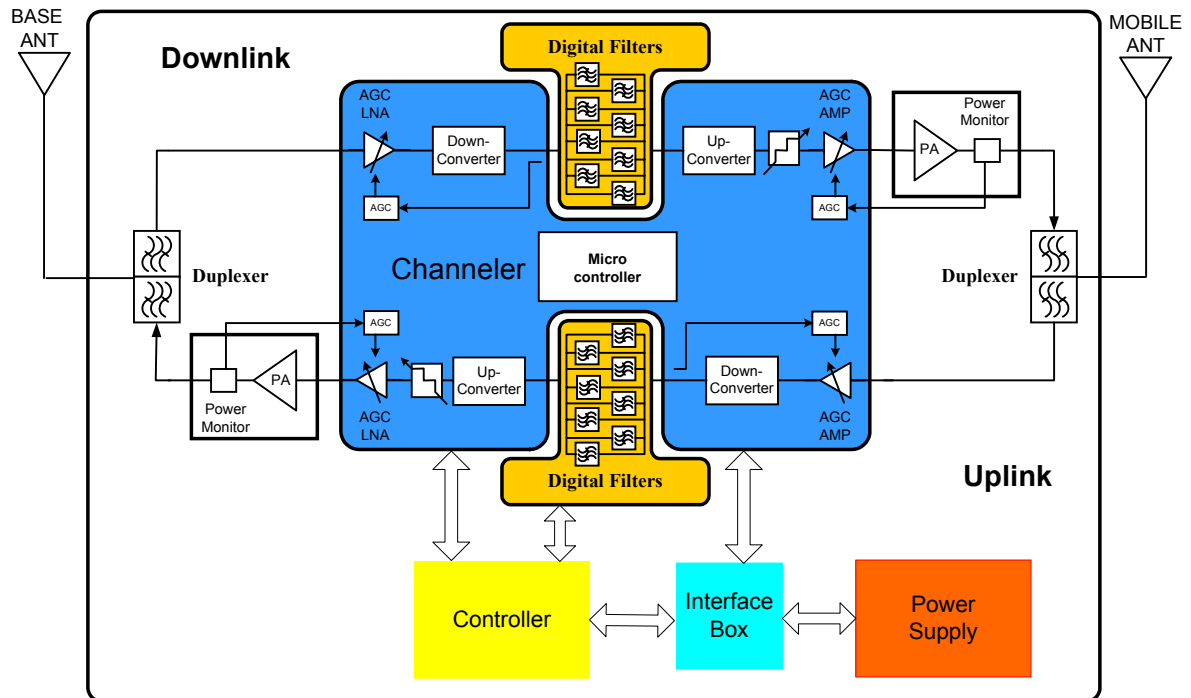


Figure 1: Digital Repeater RF Block Diagram.

Dekolink Wireless channel selective repeaters employ digital processing techniques to attain versatile programmable filter arrays in both the uplink & downlink paths.

The RF signal entering the repeater, is filtered by a duplexer, amplified, down converted & sampled to digital signals. The digital signal is filtered using fast parallel logic.

Using digital processing techniques, the system generates up to 8 separate, programmable and independent filters.

After filtration is accomplished, the digital signals are up-converted to an RF signal, amplified by a High Power Amplifier & combined by a duplexer to the output port.

6 System Components description.

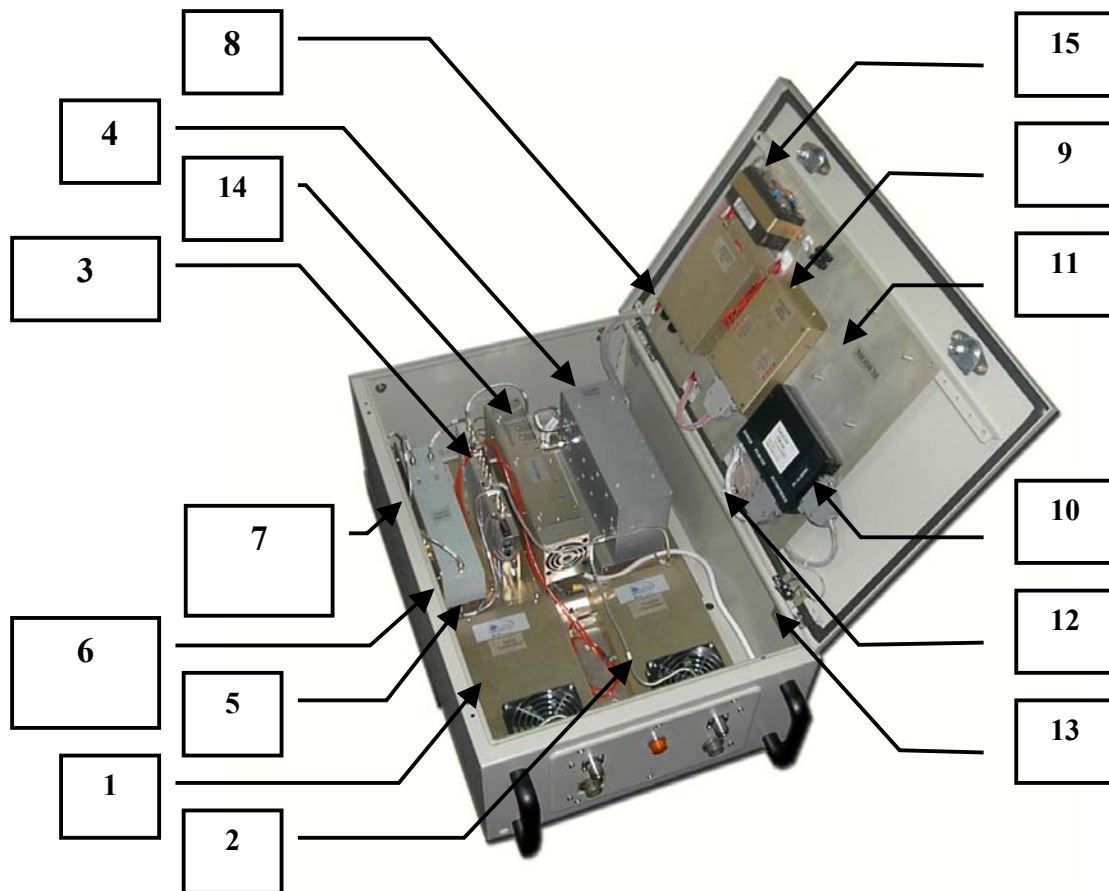


Figure 2: Digital Repeater Layout.

Component Description:

1. Digital Filter Module for Downlink (include operation indication LED)
2. Digital Filter Module for Uplink (include operation indication LED)
3. Channler (Dual Up/down Converter for Uplink & Downlink Paths).
4. Diplexer to donor Antenna.
5. Diplexer to mobile Antenna (High Power).
6. Coupler for Modem Antenna.
7. Isolator for Uplink Amplifier.
8. Connections Box (include Repeater ON/Off switch).
9. BDA Monitor unit. (include alarm test button)
10. Controller Unit. (include operation status indication LED).
11. iDEN Modem Unit.
12. Door plate.
13. Door Alarm Switch.
14. Power Supply.
15. Controller Backup Battery.

7 Repeater Monitor And Control

The BDA Monitor Box monitors the DC functioning of the BDA. These faults are sent to the Control Box. The Control Box detects these faults and controls the BDA functions. These functions can be monitored or controlled by an external PC through the serial interface connector on the Control Box.

A cellular modem is installed in the BDA. This modem interfaces with the control box and a remote PC.

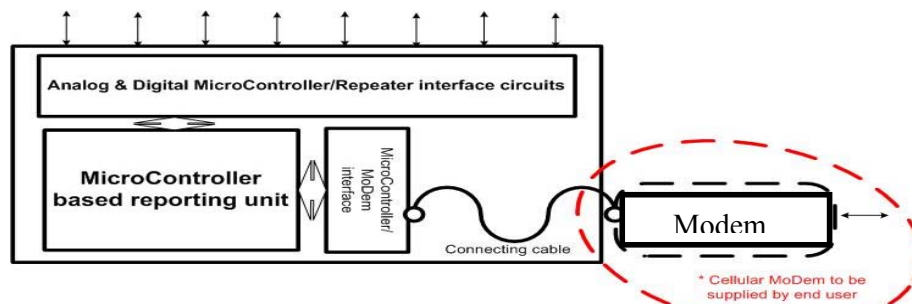


Figure 3: Remote Alarm and Control unit – zoom-out

7.1 REPEATER MONITOR AND CONTROL SET-UP

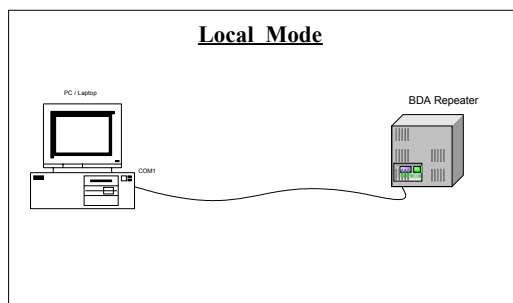


Figure 4: Local Mode

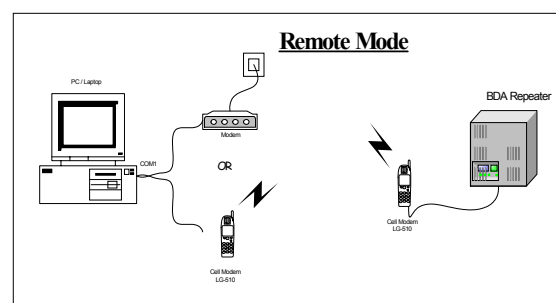


Figure 5: Remote Mode

8 Installation of the Repeater in Lab.

NOTE! In case that Antennas are not connected, terminate the Base & Mobile marked connectors with a 30dB attenuator, in order to prevent damage (by a regressing signal) to protect the Test equipment.

The attenuators power rating should be at least 50W at the Mobile marked repeater's terminal, and 10W at Base marked repeater's terminal.

- Connect power supply. A supplied voltage in the range of 90 to 260VAC should be connected to the repeater's AC power connector.
- Inject to the repeater's Downlink route terminal (Base connector), RF Signal from the connected RF Generator, and a Spectrum Analyzer, to the repeater's Mobile terminal, and test the repeater RF performance (see test set up diagram below).

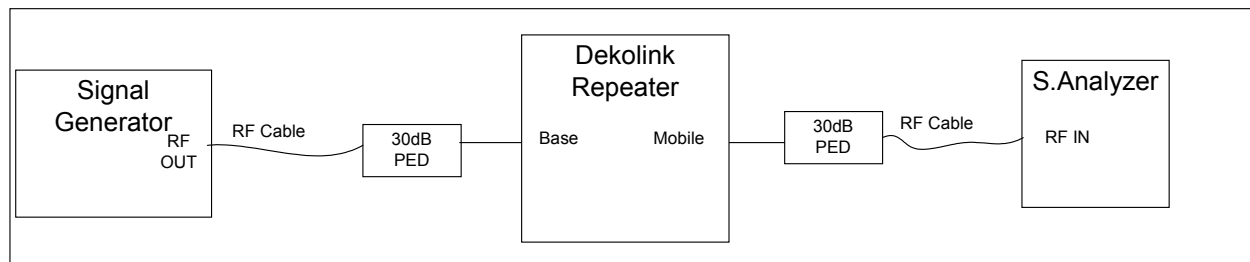


Figure 6: Repeater Downlink rout RF performance test set up.

- Test the Repeaters' Uplink route, by connecting RF Signal Generator to the repeater's Mobile marked terminal and a Spectrum Analyzer to the Base marked terminal (see test set up diagram below).

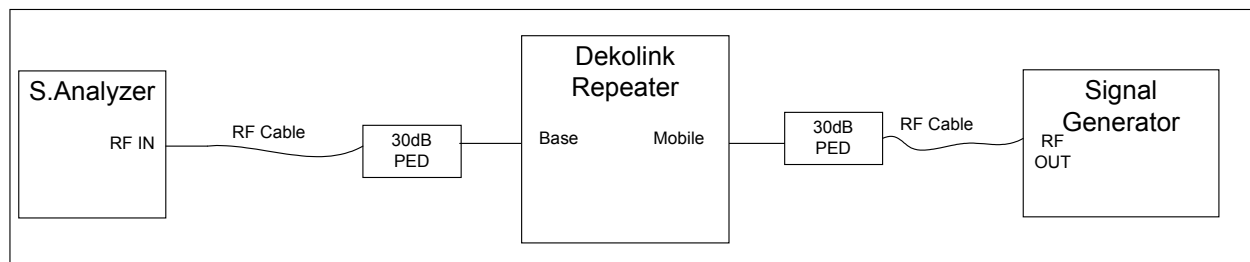


Figure 7: Repeater Uplink rout RF performance test set up

9 REPEATER (BDA) OPERATION

The RF connection is made via two type “N” female connectors. The RF connector labeled “Base” must be connected to the antenna pointing to the base station; usually a rooftop antenna. The RF connection labeled “Mobile” must be connected to the antenna pointing into the area to be covered by the Repeater such as inside a building or outdoor shaded area.

The repeater operates from 110V/220 VAC @ 2A.

9.1 AGC (ALC) FUNCTION

The repeater has AGC (Automatic Gain or Level Control) function on both paths that serve to prevent the saturation of the power amplifier. The amplifier has a directional coupler and a detector at the output of the high power amplifier to monitor the output power. When a high signal is received the automatic level control detects the amplitude and sends a feedback signal to a voltage variable attenuator that attenuates the signal level so that the output power of the amplifier does not exceed the preset limit. This level control ensures the power amplifier operation in the linear region only.

9.2 RF GAIN SETTING

For proper operation of the Repeater, the isolation between the base station antenna and the mobile antenna should exceed the Repeater gain by at least 10 dB. If the Repeater gain is higher than the isolation between the antennas, oscillation will build up and will saturate the amplifier. The step attenuator on the low noise amplifier can reduce the Repeater gain. The repeater gain can be reduced by 31 dB in 1 dB steps.

10 BDA INSTALLTION

Install the BDA Repeater in a shielded, ventilated and easy to reach area.

Use low loss cables to connect antennas to the BDA. Install the BDA close to the service area to improve output power and noise figure.

The BDA Base/Donor connector port is connected to donor antenna, usually a Yagi antenna, while the BDA Mobile/Remote connector port is connected to a mobile antenna; outdoor indoor.

10.1 BASE / DONOR ANTENNA INSTALLTION

Typically this is a directional antenna such as Yagi or Dish antenna of 10 to 15 dB gain. This antenna is pointed to the base station to get maximum input power. This antenna should be in line of sight with the base site. Raise this antenna higher if no line of site is achieved. The required Base signals should be the dominant signals; at least 6 dB higher power than other signals.

Choose the antenna site to get the maximum isolation from the remote (mobile serving) antenna.

10.2 REMOTE / MOBILE ANTENNA INSTALLTION

The second antenna is connected via cable that has typical 1~10 dB attenuation (depends on the length of the cable) to the CBDA MOBILE port. This type of antenna is omni directional (isotropic), or wide beam, with 0 to 2 dBi typical gain and is installed and distributes indoor (in buildings, tunnels, basements, park lots, shopping centers etc.). Typical specifications: gain: 2 dBi, VSWR: better than 2:1, Impedance: 50 ohm. For direct connection to the BDA this antenna must be installed to provide a minimum separation distance of 2 m (200 cm) from persons within the area.

Less separation is needed if the power from this power is divided into many antennas covering many floors or areas.

10.3 ANTENNA ISOLATION

For proper operation the isolation between these two antennas must be at least 10 dB higher than the BDA gain. Lower isolation would lead to high in-band ripple.

Oscillations will build up when the isolation is lower than BDA gain.

The isolation between the antennas is critical for high gain outdoor repeaters.

To measure the isolation, inject a known signal into one antenna and measure the coupled output at the other antenna. This should be done across the frequency range of both uplink and downlink bands.

11 INSTALLATION STEPS

1. Install all antennas and connect them to the BDA inputs.
2. Set “MAX Gain” according to isolation (at least 15 dB lower) and available donor power.
This allows the SAGC to smartly limit the output power of the BDA.
Optional: The SAGC on the Downlink path guarantees constant downlink power (relative to cell traffic) when and if the Donor power changes.
3. Uplink will set ultimately according to the downlink gain.
4. Check that the uplink FWD power, if power is at constant maximum then isolation between antennas is low (BDA oscillations) or the BDA is faulty. In such a case:
 - Disconnect one of the cables from the BDA connectors and connect a load at the connectors.
 - If the FWD power is at constant maximum then the BDA is faulty (oscillating) and needs replacing.
 - If FWD power isn't at constant maximum then the isolation between the donor and remote antennas is low. Either improve the isolation (e.g. increase separation) or reduce BDA gain.
 - To reduce gain, reconnect the antenna cables. Reduce the “MAX Gain FWD power isn't at constant maximum. Reduce the gain further by 10 dB.

12 RF EXPOSURE WARNING

In order to satisfy the FCC RF exposure requirements, you must ensure that the installation complies with the following:

One antenna is connected via cable that has typical 1~10 dB attenuation (depends on the length of the cable) to the BDA base port. This antenna is installed outdoor and has very sharp beam (Yagi type or similar) pointed to the donor (BTS). This type of antenna has about 10dBi gain. Typical specifications: gain: 8 dBd (=10.1 dBi), VSWR: better than 1.5:1, Impedance: 50 ohm. The outdoor antenna must be installed to provide a minimum separation distance of 1 m (100 cm) from persons within the area.

The second antenna is connected via cable that has typical 1~10 dB attenuation (depends on the length of the cable) to the BDA MOBILE port. This type of antenna is omnidirectional (isotropic), or wide beam, with 0 to 2 dBi typical gain and is installed and distributes indoor (in buildings, tunnels, basements, park lots, shopping centers etc.). Typical specifications: gain: 2 dBi, VSWR: better than 2:1, Impedance: 50 ohm. For direct connection to the BDA this antenna must be installed to provide a minimum separation distance of 2 m (200 cm) from persons within the area.

Less separation is needed if the power from this power is divided into many antennas covering many floors or areas.

13 BDA MONITORING AND ALARMS

The BDA monitors its functions and alarms are declared when necessary.

Some of these alarms illuminate a red LED on the BDA monitor box.

13.1 LINK ALARMS (up link & down link)

13.1.1 Power Amplifier

Uplink Forward power amplifier Current Alarm: Declared when the Power Amplifier current is above or below its specified limits.

Downlink Threshold forward output power alarm: Declared when the Power Amplifier output is lower the specified limits.

13.1.2 Channeler

Declared when the Channeler current is above or below its specified limits.

13.1.3 Channeler lock-detect

Declared when the Channeler synthesizers are unlocked.

13.1.4 DDF Current.

Declared when the DDF current (include Internal FAN) is above or below its specified limits.

13.1.5 DDF Communication.

Declared when Repeater Controller failed to communicate with The DDF unit.

13.1.6 VSWR >3:1.

This unit is include VSWR >3:1, Declared when the return loss of the downlink antenna or cable connection exceeds 6 dB (=VSWR 3:1).

13.2 GENERAL ALARMS

13.2.1 Temperature Declared When the chassis temperature exceeds 60 C.

13.2.2 Main Voltage Declared when the Power Supply voltage is below or above its limits.

13.3 Measurements.

13.3.1 Temperature Measurements

13.3.2 Downlink Forward Power Measurements.

14 Repeater Mechanical Outline.

14.1 Repeater Case.

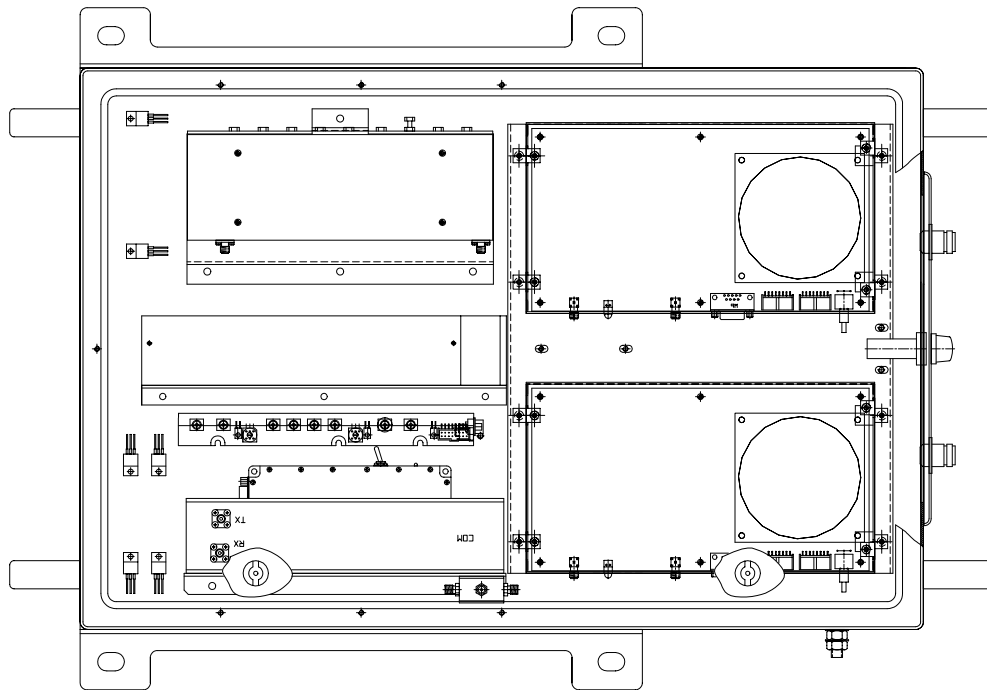


Figure 8: Digital Repeater Mechanical Outline - Case

14.2 Repeater Cover.

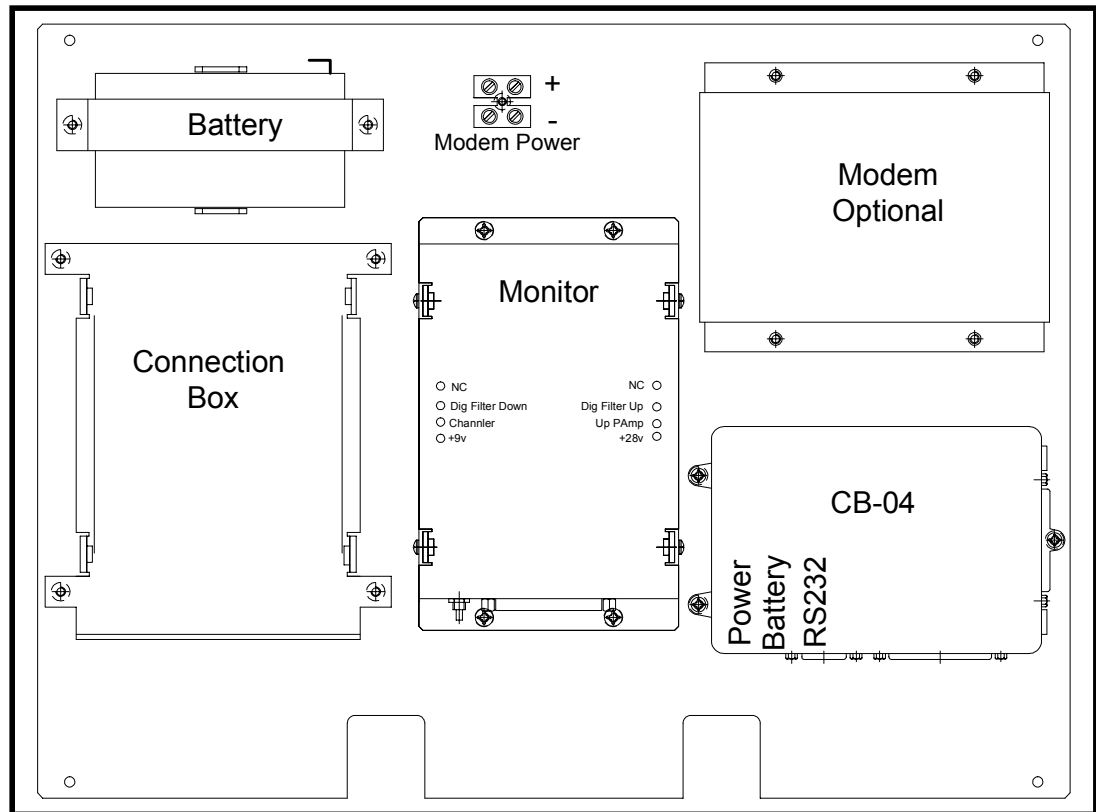


Figure 9: Digital Repeater Mechanical Outline - Cover

15 External Alarm Cable.

Pinout Definition:

A	External Swith No.2	Green/White
B	Ground	Black
C	Not Connected	-
D	Alarm Out from Monitor Unit (Also shorten to DC connector pin D)	Black/White
E	Alarm In from Monitor Unit (Also shorten to DC connector pin B)	Black/White
F	Ground	Black
G	External Swith No.1	Gray
H	Ground	Black

Alarm Connector on Cable

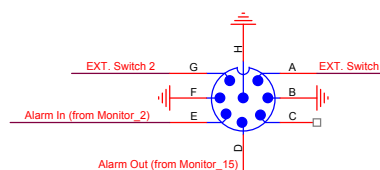


Figure 10: External Alarm Connector

- Use Gray & Black Wires for External Alarm 1.
(Open/Close according to the connected device).
- Use Green/White & Black Wires for External Alarm 2.
(Open/Close according to the connected device).

16 Dekolink Wireless Limited Warranty.

Dekolink Wireless [Ltd.] ("Dekolink"), manufacturer of this product (the "Product") warrants to the original purchaser ("Purchaser") that the Product is free from defects in materials and workmanship for a term that ends on the earlier of twelve (12) months from the date of activation of the Product or fifteen (15) months from the date of shipment of the Product by Dekolink. The obligations of Dekolink under this warranty shall be limited solely to the repair or exchange or giving credit for, at the option of Dekolink, any Product that may prove defective in accordance with evidence satisfactory to Dekolink. Any repair or replacement of the Product by Dekolink shall not extend the original warranty period. This warranty is exclusive to the original Purchaser and is not assignable.

This warranty applies only upon the condition that the Product has been installed, maintained and operated under conditions of normal use. The provisions of this warranty shall not apply if, in Dekolink's judgment, the Product has been subject to misuse or neglect, damaged in an accident or by act of vandalism, or repaired or altered in any way that adversely affects its performance or reliability.

To obtain warranty service, Purchaser may, upon the prior written authorization of Dekolink or its authorized service representative, return the defective Product to Dekolink's authorized service center. All shipping and insurance charges are the sole responsibility of Purchaser and are not included in this warranty.

Dekolink expressly excludes and disclaims all other warranties, including but not limited to any warranties of merchantability or fitness for a particular purpose.

Dekolink shall in no event be liable for any special, indirect, incidental, consequential or punitive damages or for loss, damage, or expense, including loss of use, profits, revenue, or goodwill, directly or indirectly arising from purchaser's use or inability to use the merchandise, or for loss or destruction of other property or from any other cause, even if Dekolink has been advised of the possibility of such damage. Some states do not allow the exclusion or limitation of incidental or consequential damages so these limitations may not apply under certain circumstances.

The liability of Dekolink shall in no event exceed an amount equivalent to the purchase price paid by the purchaser for the defective product.

This warranty shall not be extended, altered or varied except by a written instrument duly signed by Dekolink.