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DCC500 DAS Control Rack User Manual

Front View

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Revision History

Date	Revision	Description
09/17/2014	1	DCC500-A01 User Manual
09/18/2014	1.1	Added troubleshooting section
11/19/2014	2	Updated web interface, added remote firmware upgrade and dry contact alarm section
05/05/2015	2.1	IPv6, SNMP v.3
09/15/2015	3	Added sections for -B01 model, added EULA

SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation and maintenance of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Boonton Electronics assumes no liability for the customer's failure to comply with these requirements.

THE INSTRUMENT MUST BE GROUNDED

To minimize shock hazard the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a NEMA three conductor, three prong power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to a two-contact adapter with the (green) grounding wire firmly connected to an electrical ground in the power outlet.

DO NOT OPERATE THE INSTRUMENT IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions dangerous voltages may exist even though the power cable was removed, therefore; always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE

Do not attempt internal service or adjustment unless another person, capable or rendering first aid and resuscitation, is present.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT

Do not install substitute parts or perform any unauthorized modifications on the instrument. Return the instrument to Microlab/FXR for repair to ensure that the safety features are maintained.

LITHIUM BATTERIES

This product contains Lithium batteries that must be disposed of in strict compliance with environmental regulations in your jurisdiction.

NOTICES TO CUSTOMER

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

All documentation is dated. Please refer to our website to obtain the latest documentation available.
http://www.microlab.fxr.com/

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1   General Information

This user manual provides the user with information needed to install, operate, and maintain the DCC500-A01 (AC powered version) and DCC500-B01 (DC powered version) DAS Control Rack, herein referred to as the DCR.

1.   What is the DCR?

The DCR is a broadband remote RF power monitor and control unit that operates from 698MHz to 2700MHz. It contains 8 simplex channels, 4 Uplink and 4 Downlink, with a total of 16 SMA connectors. A block diagram is shown in Figure 1.
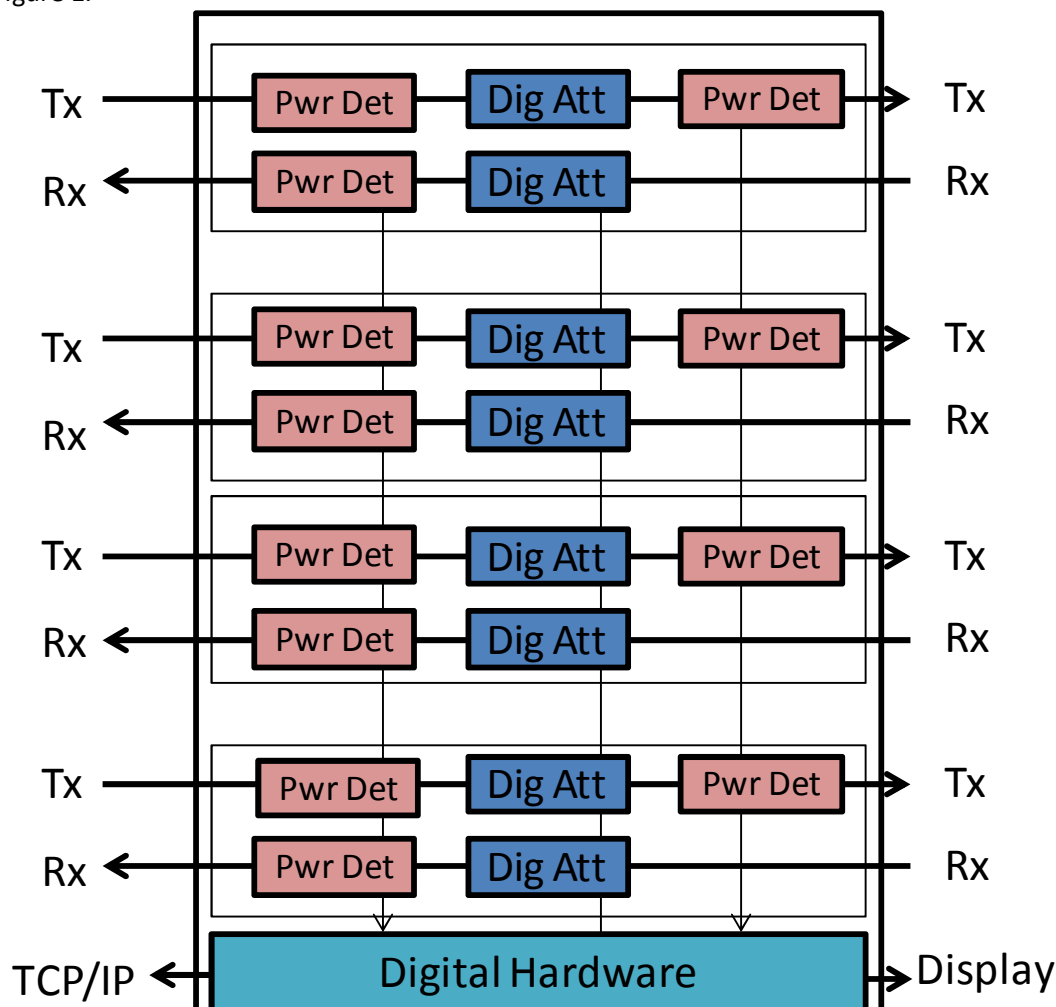
Figure 1 - DCR Block Diagram

The downlink /Tx side contains an input and output RF power monitor that can measure from -40dBm to +18dBm, and an RF attenuator that can be set from 0-31dB in 1dB steps. The uplink/Rx side contains an output RF power monitor that can measure from -90dBm to +10dBm, and an RF attenuator that can be set from 0-62dB in 1dB steps.

The DCR is an active point of interface (POI) between the base transceiver station (BTS)and the DAS fiber head end. The BTS can be an eNodeB, a small cell, remote radiohead, or a mix of them. The DCR is typically paired with a high power point of interface (HPOI) DCC™ series DAS tray. The HPOI is frequency and power level specific based on the customer requirements. At a minimum the HPOI contains a set of duplexers and a fixed high power attenuators as shown in Figure 2.

From BTS
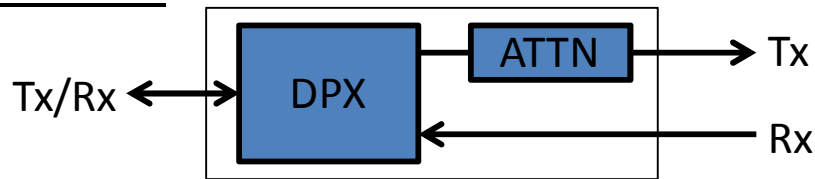
Figure 2 - Simple HPOI Block Diagram (single channel)

The DCR can only accept +18dBm maximum average power, so in most cases the signals must attenuated by an HPOI unit.

CAUTION!!! Do not exceed the indicated maximum input of the DCR, otherwise there is potential to damage the device. The DCR does not self protect against input powers above the rated limit.

The HPOI modules can take on many different forms depending on power level and frequency. A block diagram of the DCR combined with an HPOI is shown in Figure 3.
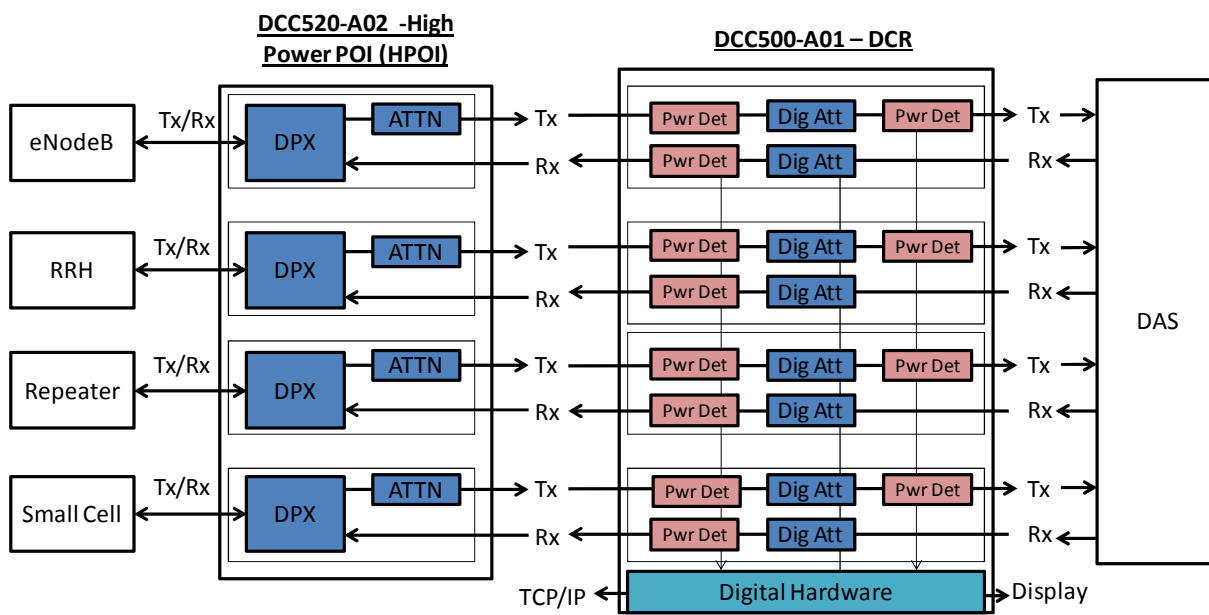
Figure 3 - DCR Typical Use Case

In this case the DCC520-A02 is used for the HPOI. The DCC520-A02 is a dual band (700 & AWS) MIMO DAS tray that can accept 20W per channel. The duplexed signal output of the BTS is conditioned by the HPOI before it enters the DCR. The DCR can be paired with many different HPOI models to meet the needs of any application. For existing HPOI models, consult the website. For custom HPOI models, contact your nearest sales representative.

The DCR is sized for a standard 19 inch rack, and it is only 1RU high.

Other models of the DCR include a monitor only option (DCC550) and an attenuator only option (DCC560).

2. Features

- 8 simplex channels
    - o 4 uplink (Rx)
    - o 4 downlink (Tx)
- RMS Power monitors
    - o -90dBm to 0dBm on uplink (Rx)
    - o -40dBm to +18dBm on downlink (Tx)

- Digital attenuators
  - 0 to 62dB in 1dB steps on uplink (Rx)
  - 0 to 31dB in 1dB steps on downlink (Tx)
- Front panel control & display
- Dual ethernet connections (front and back)
- Software defined alarms
- 3 dry contact alarm inputs (NO/NC)
- 1 dry contact alarm output (NO/NC)
- 2 fans for self cooling
- HTTPS IPv4 and IPv6 compatible
- SNMP v1 and v3

3. Interface Diagrams
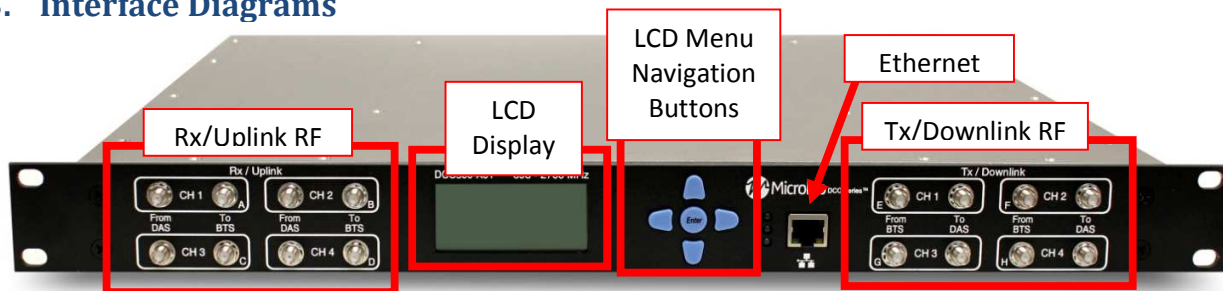
Figure 4 - DCC500 Front Panel (all models)

Figure 5 - DCC500-A01 (AC powered) Rear Panel

Figure 6 - DCC500-B01 (DC powered) rear panel

4. System Connection Diagram

Figure 7 and Figure 8 show examples of cabling between an HPOI (DCC520-A27) and the DCR. The pre-formed cables are designed, so that the units can only be connected properly. Any bending of the pre-formed cables can result in an improper connection or signal degradation.

Figure 7 - Example of pre-formed cabling between DCC520-A27 HPOI and a DCR
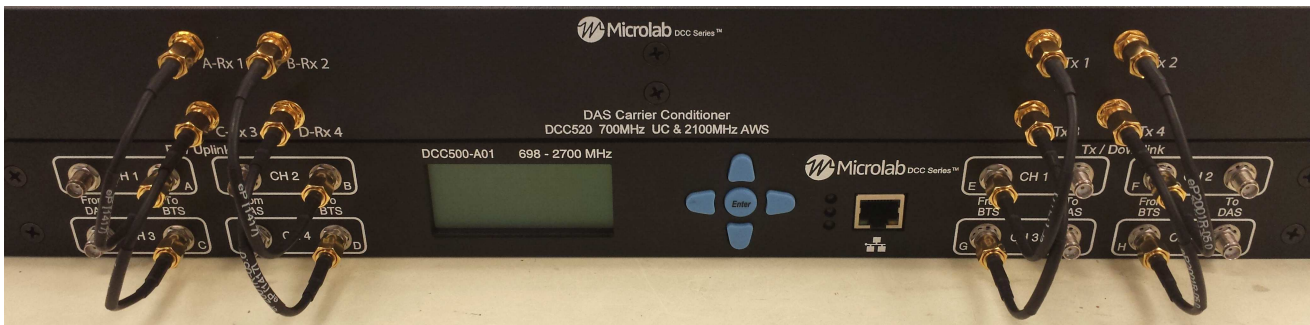
Figure 8 - Example of flex- cabling between DCC520-A27 HPOI and a DCR
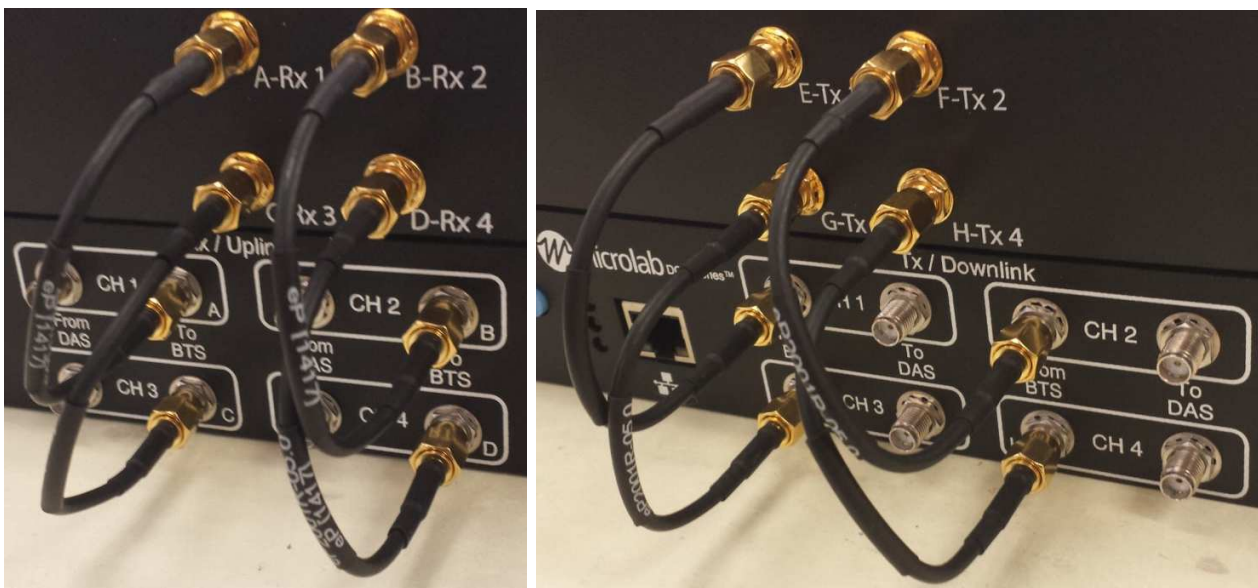
Figure 9 - close up of flex cabling

The designator letters A through H are used as a reference for the connections between the units. The A-RX1 port on the HPOI connects to the A Rx port on the DCR (to BTS), the E-TX1 port on the HPOI connects to the E Tx port on the DCR (from BTS), etc.

The DCR can also be used with legacy DCC Series™ DAS trays. Figure 10 shows an example of cabling between a legacy DCC102 and the DCR. Note that the cable lengths are excessive, and this is shown for reference only.

Figure 10 - Example of cabling between legacy DCC102 and DCR

For integration with legacy DCC series trays, the attenuator knob on the legacy tray should be set to 0dB.

5. Equipment List

The AC powered DCR consists of the following:

- DCC500-A01   4-channel DCR
- 56810400A   Power cord

The DC powered DCR consists of the following:

- DCC500-B01   4-channel DCR

Available accessories:

- DCC-401   Rack mid-mount kit
- 54554900A   AC Power Fuse, 0.5A, 250VAC, 0.250" Dia x 1.250" L (6.35mm x 31.75mm)
- 0034.2516   DC Power Fuse, 1A, 250VDC, 1/4" Dia x 1-1/4" (5mm x 20mm)

HPOI models are sold separately, but can be attached to a DCR as requested by the customer. Please consult the factory and/or website.

2   Operations

This section instructs the user on initial set up and operation of the DCR.

1. Front Panel Interface

The front panel interface allows the user to view or modify all status and settings of the DCR except for: Offsets, External Alarm Contacts, and SNMP. The user can check and modify the network settings via the front panel interface in order to access the DCR from the web console. The web console instructions are located in section 2.

SNMP is only accessible via the web console.

2.1.1 RF Connections

The Uplink (Rx) input on the front left of the unit is labeled "From DAS", and the uplink output is labeled "To BTS". The letters A, B, C, and D are used for reference when connecting to an HPOI.

Figure 11 - Uplink (Rx) RF connections

The Downlink (Tx) input on the front right of the unit is labeled "From BTS", and the downlink output is labeled "To DAS". The letters E, F, G, and H are used for reference when connecting to an HPOI.

Figure 12 - Downlink (Tx) RF Connections

2.1.2 AC Power and Ground Connections for DCC500-A01

The AC power input is on the back of the DCC500-A01 device. There is an ON/OFF switch, a fuse holder, and 2 ground lugs to the left of the power connector.

Figure 13 - Power Connection, Power Switch, Fuse holder, and Ground lugs

The power input module holds a single 1/4" x 1-1/4" (3AG) or 5 x 20mm (metric) fuse. The fuse should be rated for 0.5A.

To replace the fuse, remove the cover located near the red rectangle.

2.1.3 DC Power and Ground Connections for DCC500-B01

The DC power input is on the back of the DCC500-B01 device.

The power input has 2 screw terminals for positive (+) and negative (-). The other 2 screws are for mounting only. They are internally connected to the chassis.

CAUTION!!! Do not connect power to the screws labeled "NC". This will result in a short circuit to chassis ground, and it could potentially damage the unit.

The device is internally protected from a reverse voltage condition, and will still operate if connected backwards. The fuse is a single 1/4" x 1-1/4" (3AG) or 5 x 20mm (metric) fuse. The fuse should be rated for 1A.

2.1.4 Ethernet

There are 2 Ethernet ports, one on the front and one on the back.

Figure 14 - Ethernet Ports

The Ethernet ports are connected internally via an Ethernet switch.   To connect more than one unit via daisy chaining refer to section 6.

2.1.5 LED's

Figure 15 - Front Panel LED's

The three vertical LED's indicate the device status.

⬤ The green LED indicates that the device is on and ready for commands via front panel or the web.

🟡 The yellow LED is for diagnostic testing at the factory only.
🔴 The red LED indicates an alarm.

All LED's will illuminate when the unit is first turned on for a short period of time. Then they will all turn off. The green LED will then illuminate, and the red will illuminate at the same time if an alarm is present.

The front panel ethernet port also has 2 LED's built in. The yellow LED on the right indicates connectivity. The green LED indicates network traffic when blinking.

2.1.6 LCD Screen

2.1.6.1 Readings (Default View)

During normal operation the user will see the channel power readings on the LCD display as shown in Figure 16.
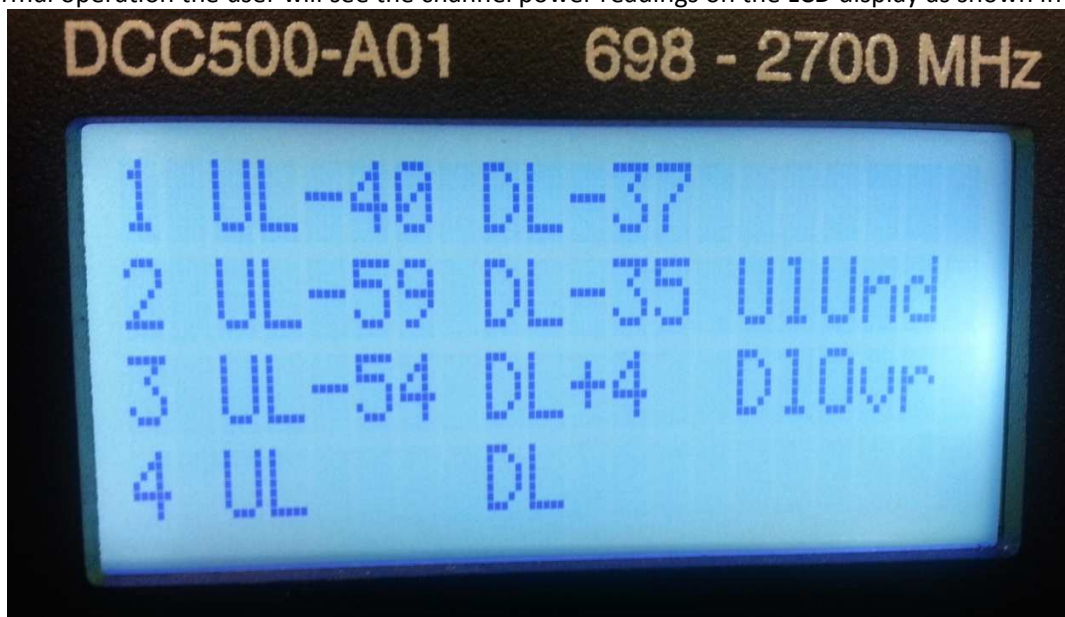
Figure 16 - Power Meter Readings

The readings display the output power of each channel for both uplink and downlink, and whether an alarm is present. The readings are refreshed faster than once per second.

In Figure 16:

Channel 1 uplink output power is -40dBm, the downlink output power is -37dBm and, and there are no alarms.

Channel 2 uplink output power is -59dBm, the downlink output power is -35dBm and, and there is an Uplink Under-range alarm present.

Channel 3 uplink output power is -54dBm, the downlink output power is +4dBm and, and there is a downlink over-range alarm present.

Channel 2 is disabled.

2.1.6.2 Pin Code

Press any key and the front panel will the network information as shown in Figure 17.
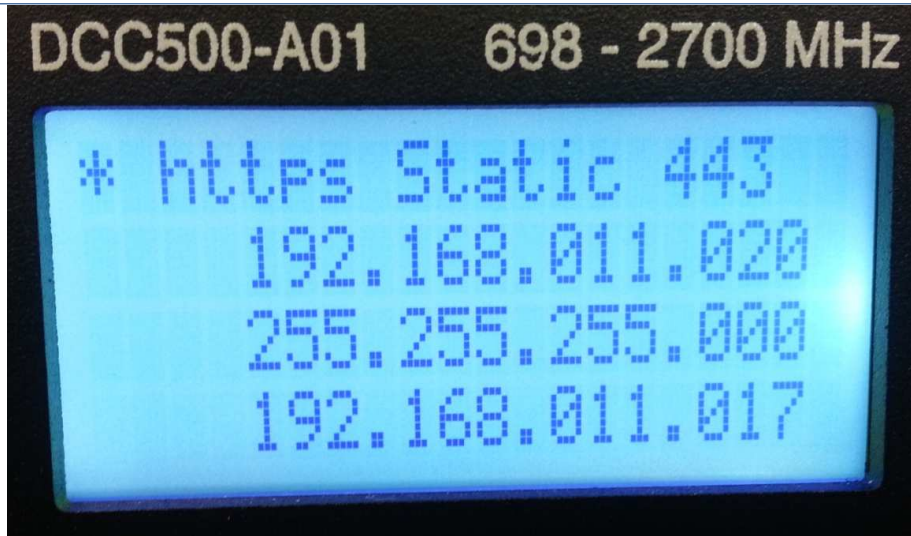
Figure 17 - Network Information

Press the Enter key and it will prompt the user for a pin code as shown in Figure 18. Press the up and down keys to change the value, and the left and right keys to change the cursor location. The default pin code to log in to the front panel is 9000 or 9###. (This pin code can be changed via the front panel or the web server.)

Figure 18 - Pin Code Input

2.1.6.3   Front Panel Menu

After entering the pin code the display will enter the main menu.
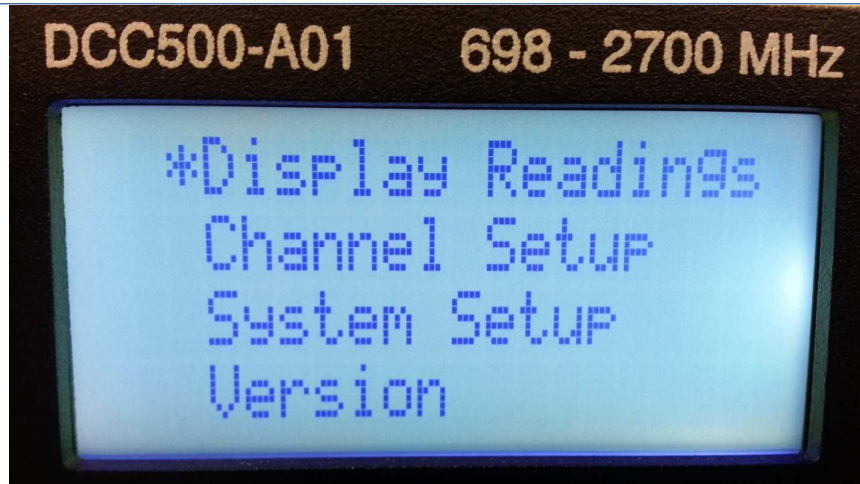
Figure 19 - Front Panel Main Menu

Figure 20 shows the navigation for the front panel interface menu.
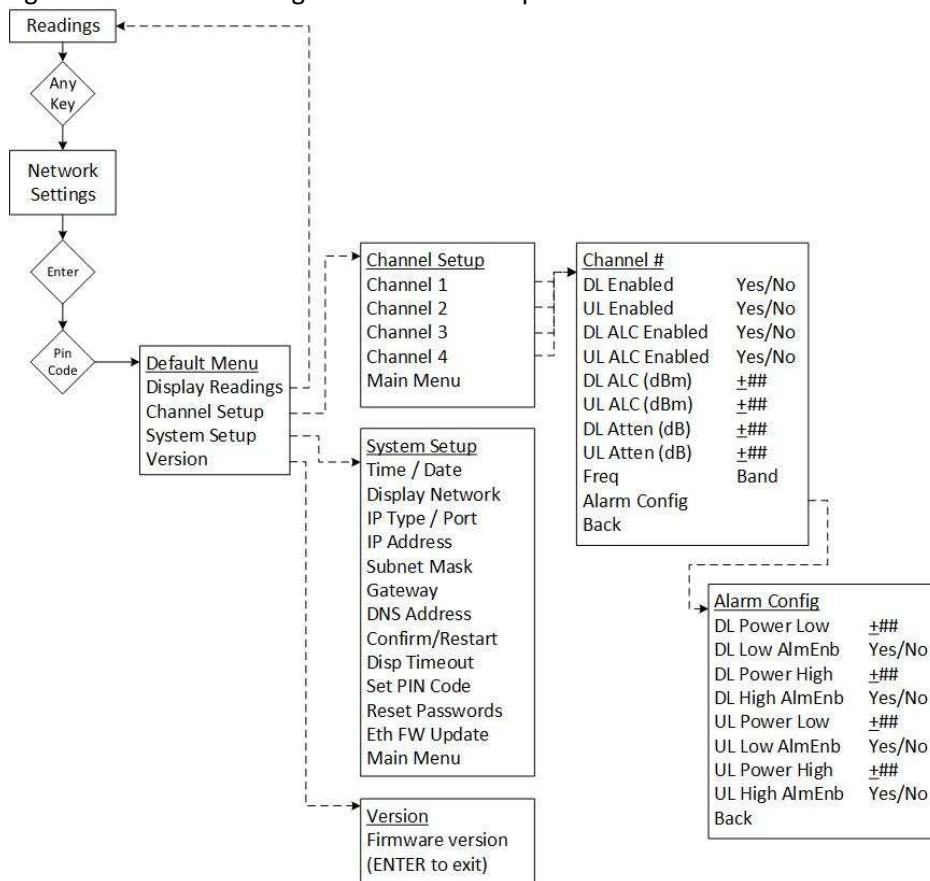
Figure 20 - Front Panel Menu Tree Diagram

Note: Enable = Yes, Disable = No

The function of each menu item is defined below:

- Display Readings - returns to the main screen that displays the channel output power readings and alarm status. Locks the front panel, so the PIN code is required to enter the menu again.
- Channel Setup
  - DL Enabled - enable or disable that channel's downlink readings and alarms

Note: when disabled the attenuation will be set to maximum -31dB. When re-enabled the attenuation will remain at maximum until changed by the user.

- o UL Enabled - enable or disable that channel's uplink readings and alarms

  Note: when disabled the attenuation will be set to maximum -62dB. When re-enabled the attenuation will remain at maximum until changed by the user.
- o DL ALC Enabled - enable or disable that channel's downlink Automatic Level Control
- o UL ALC Enabled - enable or disable that channel's downlink Automatic Level Control
- o DL ALC (dBm) - set the nominal power for the downlink
- o UL ALC (dBm) - set the nominal power for the uplink
- o DL Atten (dB) - set the fixed attenuation for the downlink
- o UL Atten (dB) - set the fixed attenuation for the uplink
- o Freq - set the frequency band to recall the calibration settings for power detection
- o Alarm Config - configure the uplink and downlink alarms for that channel
 - ▪ DL Power Low - set the value for the downlink power under-range alarm
  - ▪ DL Low AlmEnb - enable or disable the downlink under-range alarm
  - ▪ DL Power High - set the value for the downlink power over-range alarm
  - ▪ DL High AlmEnb - enable or disable the downlink over-range alarm
  - ▪ UL Power Low - set the value for the uplink power under-range alarm
  - ▪ UL Low AlmEnb - enable or disable the uplink under-range alarm
  - ▪ UL Power High - set the value for the uplink power over-range alarm
  - ▪ UL High AlmEnb - enable or disable the uplink over-range alarm
  - ▪ Back - goes back to previous menu
- • System Setup

  Note: network settings are not saved until "Confirm/Restart" is selected followed by the Enter key
  - o Time/Date - change the time and date of the real time clock and calendar (RTCC)
  - o Display Network - displays the IP address, subnet mask, and gateway
  - o IP Port - set the HTTPS IPv4 port number (default is 80)
  - o IP Address - change the IPv4 address
  - o Subnet Mask - change the IPv4 subnet mask
  - o Gateway - change the gateway
  - o DNS Address - set the Domain Name Server address
  - o Confirm/Restart - after selecting this and hitting enter again, all changes will be applied and the device will reboot
  - o Disp Timeout - sets the time (in minutes) for the display to return to the readings screen and require the pin code again. 0 (zero) disables the timeout.
  - o Set PIN Code - set the pin code to enter the menu on the front panel
  - o Reset Passwords - resets to default for web password and SNMP settings. Does not reset the PIN for the front panel.
    - ▪ Default values
      - • System: password
      - • SNMP v3 username: microlab
      - • SNMP v3 SHA Authentication: auth12345
      - • SNMP v3 AES Privacy: priv12345
      - • SNMP v1/v2c Read Community: public
      - • SNMP v1/v2c Write Community: private
- • Version - displays firmware version

Note: the front panel cannot be used to set up the IPv6 address. The IPv6 settings must be set in the web GUI systems configuration page. See Section 2.2.3.

2.1.6.4 *Front Panel Alarms*

On the far right side of the readings an abbreviation of the alarm condition will be displayed. The alarm will be displayed for as long as it is present. If more than one alarm is present, only the last alarm to take place will be shown. The abbreviations are defined below:

- blank - No alarm
- "DlOvr" - Downlink over-range
- "DlUnd" - Downlink under-range
- "UlOvr" - Uplink over-range
- "UlUnd" - Uplink under-range
- "HiTmp" - High temperature
- "TxOD" - Tx Overdrive
- "RxOD" - Rx Overdrive
- "OvTmp" - Over Temperature
- "Ext_1" - External Alarm 1
- "Ext_2" - External Alarm 2
- "Ext_3" - External Alarm 3
- "NoCal" - calibration file not found
- "NoLog" - failed to write to alarm log

2.1.6.5 *Front Panel Error Messages*

At startup the error messages below may display on the front panel:

- Net File Not Found - Network configuration file missing. Power cycle. If problem persists return to factory for repair.
- Memory Failure - memory not found or not readable. Power cycle. If problem persists return to factory for repair.
- Param file not found - system configuration file not found. Power cycle. If problem persists return to factory for repair.

2. Web Interface

The web interface is accessed as described in the following sections. First, the unit must be connected to a router or directly to a computer or laptop via an ethernet cable.

2.2.1 If the unit is connected through a router

1. Determine the gateway of the router (the router's IP address), for example 192.168.1.1
2. Determine the subnet mask of the router, for example 255.255.255.0
3. Determine the desired IP address of the DCR. It must be within the range of the gateway.
4. Set the IP address of the DCR, as determined in step 3, via the front panel, as described in 2.1.6.3.
5. Continue to follow instructions in 2.2.3.

2.2.2 If the unit is connected directly to a PC/laptop

1. Open the start menu and click on Control Panel. Under Network and Internet click View network status and tasks (see Figure 21).
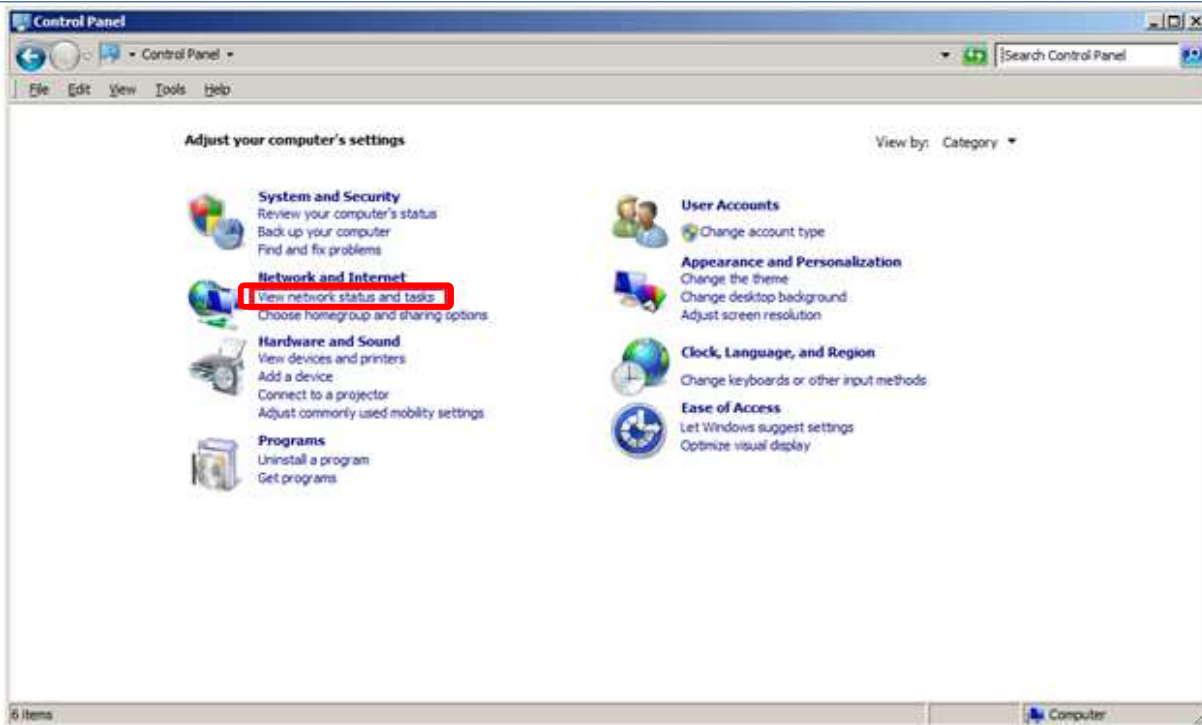
Figure 21 - Click view network status and tasks

2. Click on change adapter settings (see Figure 22).

Figure 22 - Click on Change Adapter settings.

You may have more than one Internet connection. If so, you will need to determine which adapter is your connection to the DCR. Once you have the connection right click on your network adapter and choose

properties to open up the properties window of this internet connection (see Figure 23).

Figure 23 - Right click on the Local Area Connection to access properties.

3. Click Internet Protocol Version 4(TCP/IPv4) and then the Properties button (see Figure 24).

Figure 24 - Select TCP/IPv4 and then click the properties button.

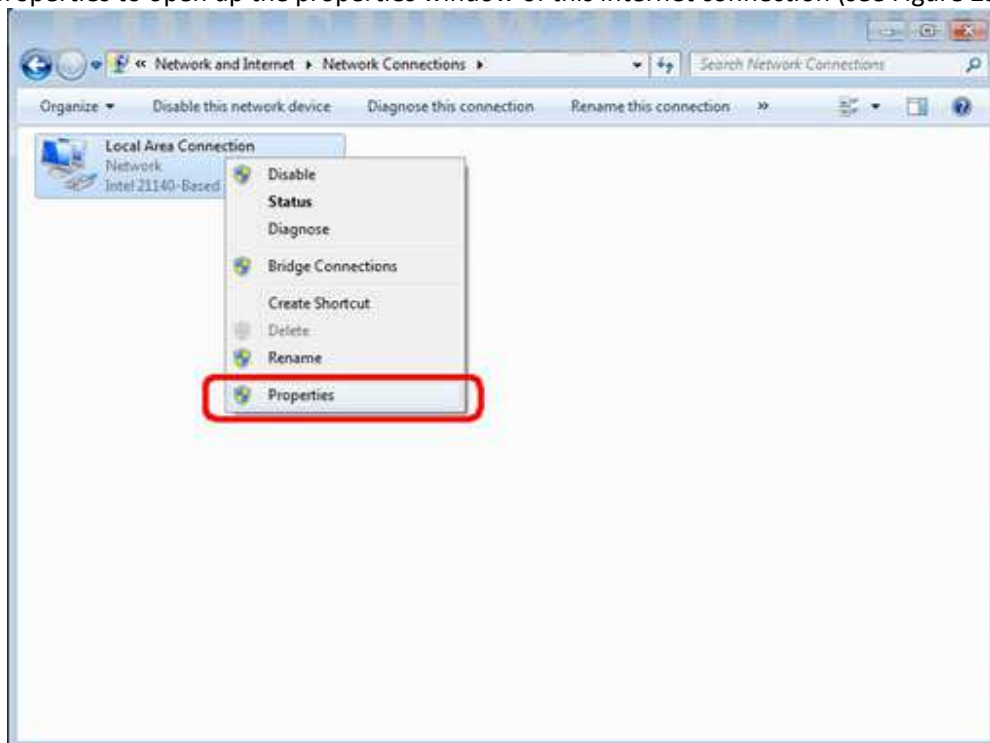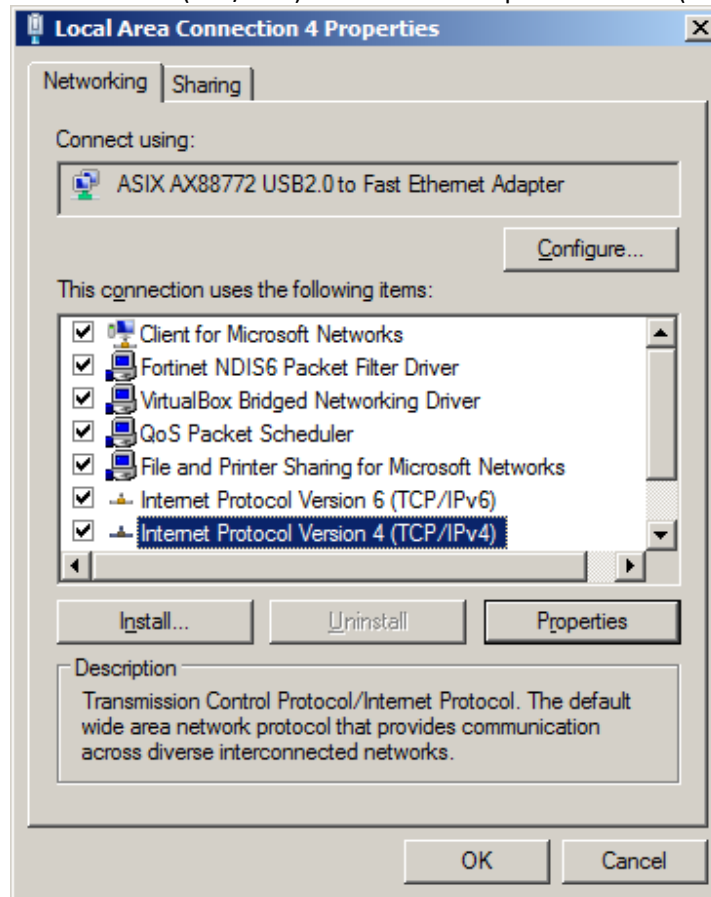4. Use the front panel interface, as described in section 2.1.6.3, to determine the IP address of the DCR. The factory default is 192.168.1.4

5. Go to the "General" tab. Select "Use the following IP address:" and set the PC to a static IP address that differs in the final three digits. For example, if the DCR's address is 192.168.1.4 you can set the PC's address to 192.168.1.99 (see Figure 25).
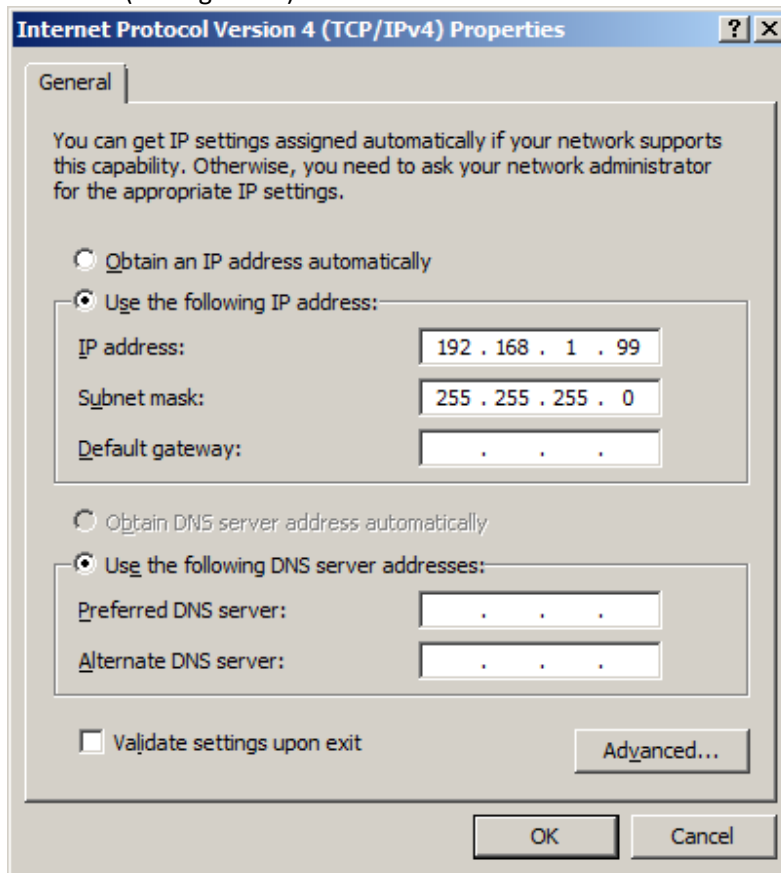
Figure 25 - Set the PC to a static IP address

6. Click "OK" to close the "Internet Protocol (TCP/IPv4) Properties" dialog box.
7. Click "OK" to close the "Local Area Connection Properties" dialog box.
8. Continue to follow instructions in 2.2.3.

2.2.3 Continued instructions to access web console

1. Open a modern internet browser (e.g. IE 8+, Chrome, Firefox) on any device with access to the network the DCR is on (PC, tablet, smartphone).
2. In the address bar type "https://" followed by the IP address of the DCR.
3. An error may appear because the DCR does not have an SSL digital certificate. The description of the error depends on the browser.
   3.1. Internet Explorer will display a "Certificate Error" as shown in Figure 26. Click "Continue to this website".

There is a problem with this website's security certificate.

The security certificate presented by this website was not issued by a trusted certificate authority.
The security certificate presented by this website was issued for a different website's address.

Security certificate problems may indicate an attempt to fool you or intercept any data you send to the server.

We recommend that you close this webpage and do not continue to this website.

Click here to close this webpage.

Continue to this website (not recommended).

More information

Figure 26 - Internet Explorer Certificate Error

The navigate bar will turn red and display "Certificate error".

Even though the DCR does not have a certificate the connection is still secure.

3.2. The latest version of Chrome will not work with the DCR. Chrome prevents connections to self signed HTTPS certificates. Note:
Even though the DCR does not have an authenticated certificate the connection is still secure.

3.3. Firefox will display an "Untrusted Connection" as shown in Figure 27. Click "I Understand the Risks" and then click "Add Exception".

Figure 27 - Firefox Untrusted Connection

3.4. Firefox will display a pop-up window as shown in Figure 28. Check the box for "Permanently store this exception" then click "Confirm Security Exception".
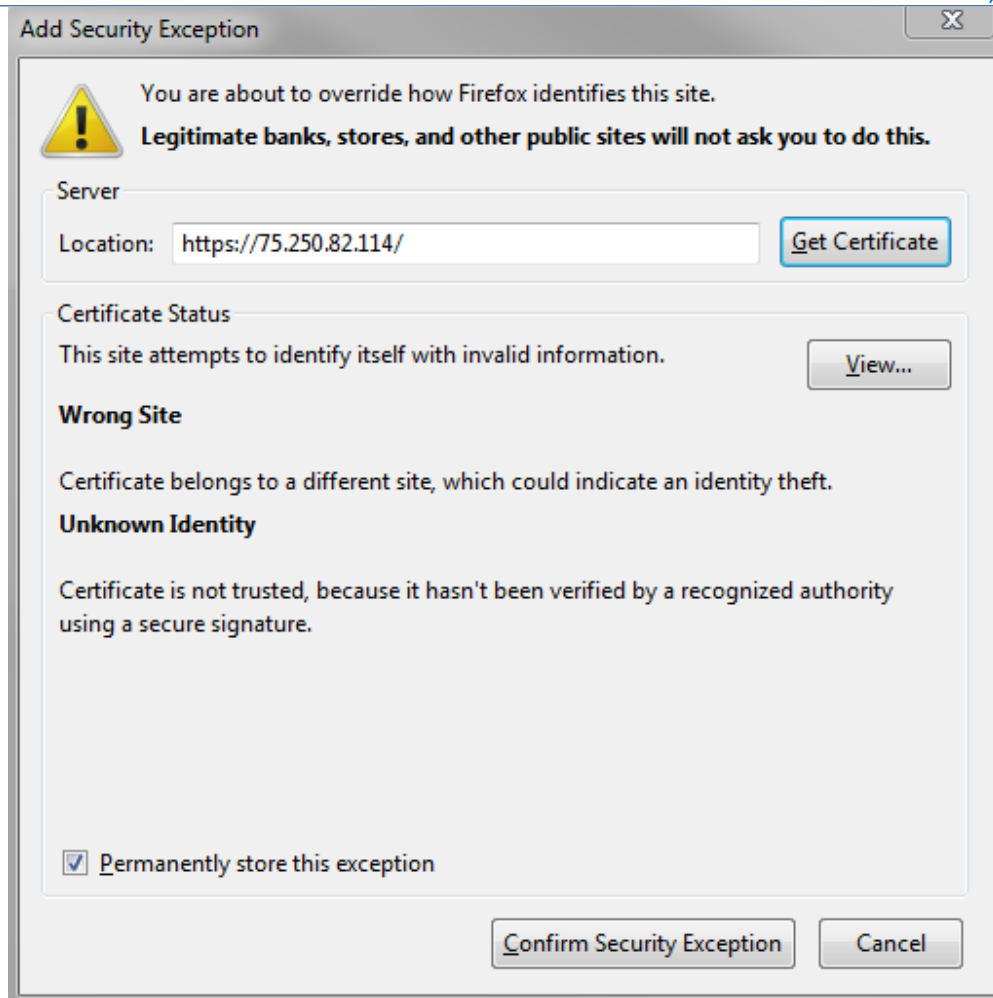
Figure 28 - Firefox Add Security Exception

4. The Log In screen will appear. The default password is "password". Enter the password and press Enter or click Submit.

Note: *Sometimes due to factory debugging the password can default to the letter "q".*
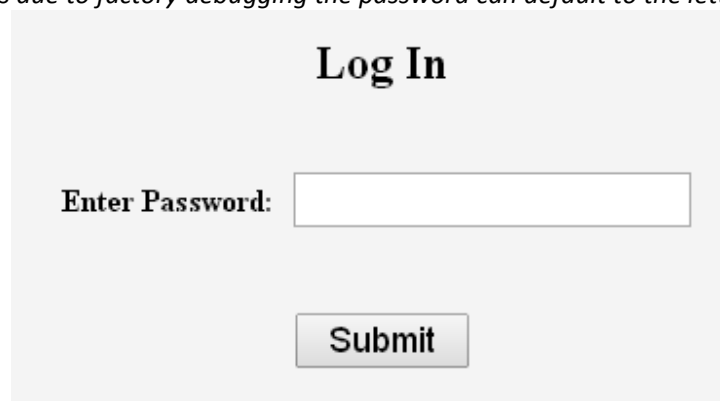
Figure 29 - Log In Screen

2 Web Console

After logging in the web page shown in Figure 30.

Note: the website adjusts to the screen resolution, so the GUI pictured may differ slightly from what the user sees

2.2.1   Web Console Main Table

The main table shown in Figure 30 contains the primary diagnostic information and controls for the DCR unit.

Wireless Telecom Group

Alarm Configuration   Alarm Log   System Configuration   Network Configuration   Documentation

Active DCC

Chan Number Description	Frequency Band	Power Detection Enabled	Automatic Level Control	UPLINK Attenuator (1) ALC Setting (2)	Uplink Output Power (dBm) (3)	Downlink Input Power (dBm) (2)	DOWNLINK Attenuator (1) ALC Setting (2)	Downlink Output Power (dBm) (2)	Alarm Status
1 Channel 1	1900 PCS	☑ UL Enab ☑ DL Enab	☐ UL ALC ☐ DL ALC	0 dB ▼ -36 dBm ▼	----	----	0 dB ▼ -35 dBm ▼	----	
2 Channel 2	700 Upper C	☑ UL Enab ☑ DL Enab	☐ UL ALC ☐ DL ALC	62 dB ▼ -30 dBm ▼	----	----	31 dB ▼ -20 dBm ▼	----	
3 Channel 3	2100 AWS	☑ UL Enab ☑ DL Enab	☐ UL ALC ☐ DL ALC	62 dB ▼ -30 dBm ▼	----	----	31 dB ▼ -20 dBm ▼	----	
4 Channel 4	700 Upper C	☑ UL Enab ☑ DL Enab	☐ UL ALC ☐ DL ALC	62 dB ▼ -30 dBm ▼	----	----	31 dB ▼ -20 dBm ▼	----	

| Model	Serial Number	S/W Version	Date / Time	Up Time	Temp °C (4)
DCC500-A01	0017	2.60h 3.10p	01/01/2014 17:24:49	0.05:24:57	32

Absolute Maximum Input Power: Uplink +10dBm, Downlink +18dBm (average)

Note 1) Attenuator Setting Accuracy: +/- (0.1 + 3% of atten setting) from DC to 1GHz, +/-(0.1 5+ 5% of atten setting) from 1GHz to 2.2GHz

Note 2) Downlink Power Detector and ALC accuracy: +/- 1dB from -40dBm to +18dBm

Note 3) Uplink Power Detector and ALC accuracy: +/- 1dB from -75dBm to 0dBm, +/- 2dB from -90dBm to -75dBm

Note 4) Temperature accuracy: +/-2 degrees C

User Configurable Alarms

Channel	Uplink Output Over Range (dBm)	Uplink Output Under Range (dBm)	Downlink Output Over Range (dBm)	Downlink Output Under Range (dBm)
1 Enable All / Disable All	-30 ▼ ○ Enable Alarm ⊙ Disabled	-88 ▼ ○ Enable Alarm ⊙ Disabled	16 ▼ ○ Enable Alarm ⊙ Disabled	-39 ▼ ○ Enable Alarm ⊙ Disabled
2 Enable All / Disable All	-30 ▼ ○ Enable Alarm ⊙ Disabled	-88 ▼ ○ Enable Alarm ⊙ Disabled	16 ▼ ○ Enable Alarm ⊙ Disabled	-39 ▼ ○ Enable Alarm ⊙ Disabled
3 Enable All / Disable All	-30 ▼ ○ Enable Alarm ⊙ Disabled	-88 ▼ ○ Enable Alarm ⊙ Disabled	16 ▼ ○ Enable Alarm ⊙ Disabled	-39 ▼ ○ Enable Alarm ⊙ Disabled
4 Enable All / Disable All	-30 ▼ ○ Enable Alarm ⊙ Disabled	-88 ▼ ○ Enable Alarm ⊙ Disabled	16 ▼ ○ Enable Alarm ⊙ Disabled	-39 ▼ ○ Enable Alarm ⊙ Disabled

Non Configurable System Alarms						
Uplink Input Overdrive (dBm)	Downlink Input Overdrive (dBm)				High Temperature	Over Temperature
	1	2	3	4		
10	18	18	18	18	45 °C	50 °C

Figure 30 - Web Console Main Table

Power Detection Enable and Automatic Level Control (ALC) - these check boxes enable or disable the power detectors and ALC control for each channel.
Note: when disabled the attenuation will be set to maximum. -31dB for downlink and -62dB for uplink. When re-enabled the attenuation will remain at maximum until changed by the user.

Power Detection Enabled	Automatic Level Control
☐ UL Enab ☐ DL Enab	☐ UL ALC ☐ DL ALC
☑ UL Enab ☑ DL Enab	☐ UL ALC ☐ DL ALC
☐ UL Enab ☐ DL Enab	☐ UL ALC ☐ DL ALC
☐ UL Enab ☐ DL Enab	☐ UL ALC ☐ DL ALC

When ALC is disabled the Attenuator setting box will illuminate.
When ALC is enabled the ALC setting box will illuminate.

Automatic Level Control	UPLINK Attenuator (1) ALC Setting (2)	Uplink Output Power (dBm) (3)	Downlink Input Power (dBm) (2)	DOWNLINK Attenuator (1) ALC Setting (2)	Downlink Output Power (dBm) (2)
☐ UL ALC ☐ DL ALC	62 dB ▼ -30 dBm ▼	-96.5	-46.0	31 dB ▼ -20 dBm ▼	-43.0
☑ UL ALC ☑ DL ALC	0 dB ▼ -30 dBm ▼	-30.3	-20.8	0 dB ▼ -29 dBm ▼	-29.5

Power Settings and Readings - this section of the display shows the settings for attenuators or ALC control and the power readings for each channel. When a channel's power measurement is disabled these cells will be blank.

UPLINK Attenuator (1) ALC Setting (2)	Uplink Output Power (dBm) (3)	Downlink Input Power (dBm) (2)	DOWNLINK Attenuator (1) ALC Setting (2)	Downlink Output Power (dBm) (2)	Alarm Status
0 dB ▼ -30 dBm ▼	-28.2	-20.8	0 dB ▼ -20 dBm ▼	-26.6	

Device Information - this table displays the model number, serial number, software version, Time/Date, Up Time, and temperature of the unit

Model	Serial Number	S/W Version	Date / Time	Up Time	Temp °C (4)
DCC500-A01	0007	2.2h 2.2p	09/15/2014 15:43:35	0.05:20:31	29

2.2.1   User Configurable Alarms

By clicking "Alarm Configuration" at the top of the page or by scrolling down the web page will show the alarm tables shown in Figure 31. From here the user can set the upper (over-range) and lower (under-range) limits for the power monitor alarms for each channel.

Figure 31 - Web Console, Alarm Tables

Each alarm can be enabled or disabled. For convenience the buttons on the left can enable or disable the alarms for the entire channel. The drop down box selects the threshold level of the alarm.

Figure 32 shows a plot that is representative of the power measurement and alarm settings on a downlink channel. The over-range alarm is set for +5dBm, and the under-range alarm is set for -5dBm.

Downlink Power vs. Time
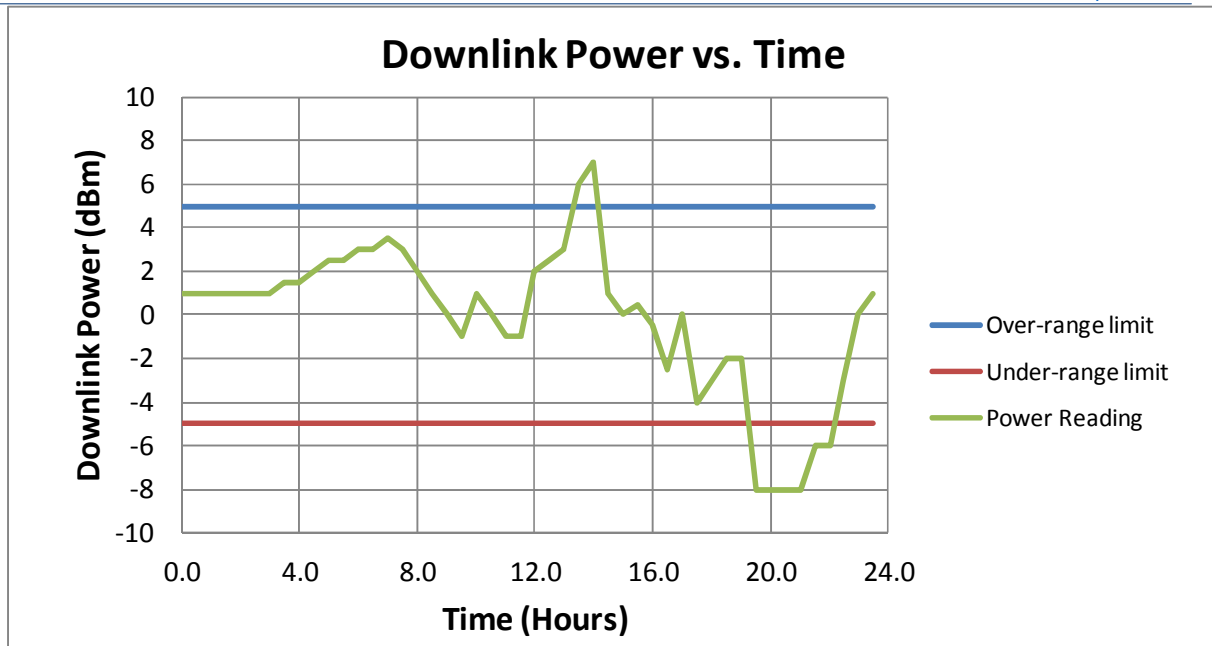
Figure 32 - Example for Alarm Log

At 13:50, the power goes above the over-range threshold, and this would trigger an over-range alarm. At 14:30, the power returns to within the limits, and the alarm would clear.

At 19:30, the power goes below the under-range threshold, and this would trigger and under-range alarm. At 22:30, the power returns to within the limits, and the alarm would clear.

When the power reading crosses out of or into the specified ranges a record will be kept in the alarm log.

At the very bottom of the page are the non-configurable system alarms.

Non Configurable System Alarms					
Uplink Input Overdrive (dBm)	**Downlink Input Overdrive (dBm)**				**High Temperature**	**Over Temperature**
	1	**2**	**3**	**4**		
10	18	18	18	18	45 °C	50 °C

Figure 33 - Non configurable system alarms

These alarms are hard coded into the device and cannot be changed by the user. The input overdrive alarms and over temperature alarms indicate possible system damage.

Note: The uplink measurements do not have an input power detector, so the uplink overdrive alarm is inferred based on the uplink output power and maximum insertion loss specified on the datasheet.

2.2.2   Alarm Log

The "Alarm Log" link at the top of the page will take the user to the screen shown in Figure 34.

Alarm Log

```
01/01/2014 16:59:48, 1, Channel 1, U1 Under, Set
01/01/2014 16:59:48, 1, Channel 1, U1 Under, Set
01/01/2014 16:59:48, 1, Channel 1, U1 Under, Set
01/01/2014 17:02:03, 1, Channel 1, U1 Under, Clr
```

Refresh   Erase Log   Exit

Save As: 050515_1716.txt   Save Text to File
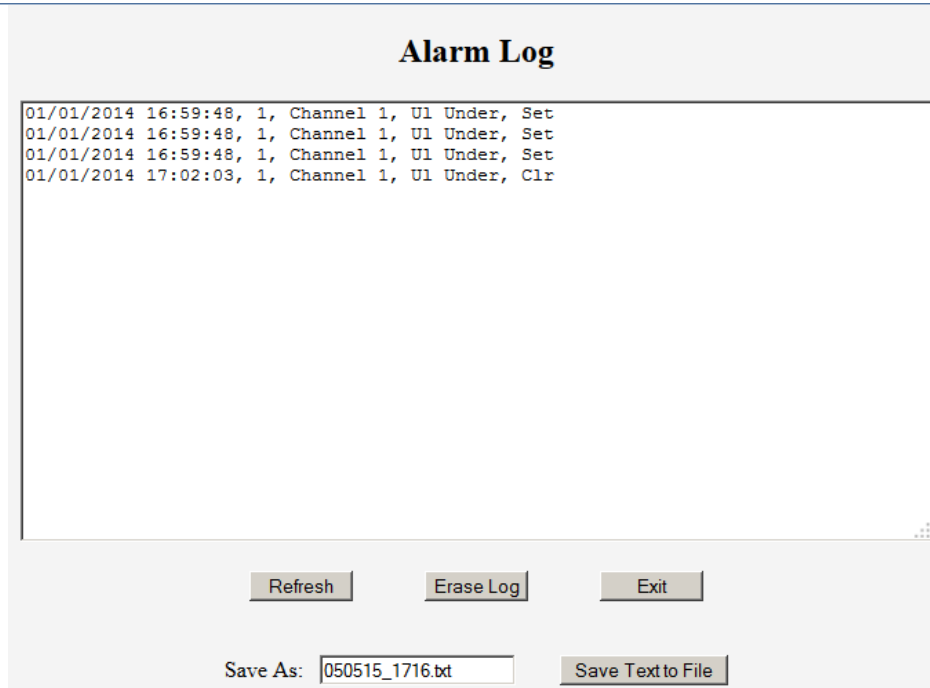
Figure 34 - Alarm Log Display

From this page the user can view what alarms occurred and when. Note that the alarm log only keeps track of when the alarm first occurs. It does not consistently log the alarm state in order to save memory. When the alarm clears another log entry will be added (denoted by "Clr").

Refresh - will update the alarm log display

Erase Log - will erase the entire alarm log

The user can save the alarms to a text file. The defaults file name is the date and time (MMDDYY_hhmm.txt)

The number of days before the alarm log purges data is set on the System Configuration page defined below.

2.2.3   System Configuration

The "System Configuration" link at the top of the main page will take the user to the screen shown in Figure 35 (user will be prompted to enter the password again).

Active DCC System Configuration

Channel Settings

Chan Number Description	Frequency Band	Tx Offset (dB) (1)	Rx Offset (dB) (1)
1 Channel 1	1900 PCS	0.0	0.0
2 Channel 2	700 Upper C	0.0	0.0
3 Channel 3	2100 AWS	0.0	0.0
4 Channel 4	700 Upper C	0.0	0.0

Note 1) A positive offset compensates for a loss.
A negative offset compensates for a gain.

System Settings

Change Password	Front Panel PIN Code	Front Panel Reset Time (minutes)	Alarm Log Purge (days)	Date Time
New Password: ● Reenter: ●	9000	2 0 = No Timeout	10 1 to 10	(mm/dd/yyyy hh:mm) Blank leaves time unchanged

External Alarms

Output Alarm	Input Alarm 1	Input Alarm 2	Input Alarm 3
● Off ○ NO ○ NC	● Off ○ NO ○ NC	● Off ○ NO ○ NC	● Off ○ NO ○ NC

Submit Setting Change   Cancel Exit

Save instrument configuration to file: DCC500A01.cfg   Save Config   0 %"

Restore instrument configuration from file: Browse… No file selected.   Restore Config   0 %"

Figure 35 - System Configuration

From this page the user can change:
- o Channel Settings
  - ▪ Channel frequency band (see section 2.2.4)

- Power offset (see section 2.2.5.2)
  - Web password
  - Front panel PIN code
  - Front panel reset time - elapsed time before the front panel reverts to the readings, and requires PIN code to access menu again. A 0 (zero) will prevent timeout.
  - Alarm Log Purge - length of the alarm log (in days). Alarms further back in time will be purged after this amount of days.
  - Date Time - set the date and time of the DCR
  - External Alarm Settings (see section 7)
  - IP address
  - Subnet Mask
  - Gateway
  - DNS Server
  - SNMP settings
    - User name
    - Password
    - Read Community
    - Write Community

"Submit Setting Change" will restart the device.

CAUTION!!! Make sure to write down the new values before restarting. Without the IP address, password, and PIN the user will not be able to connect to the unit. The user can still view the IP address from the front panel, but only if the unit is local to the user.

"Cancel/Exit" will go back to the main page without making any changes.

There also is a save and restore settings feature. These will save or recall all of the configurations (channel settings, network settings, passwords, etc) to or from a file stored on the PC accessing the web page.

Save instrument configuration to file: Enter file name to save, click Save Config to open file dialogue box

Restore instrument configuration from file: Choose File opens a dialogue box to select a file. Restore Config will load this file into the device. The percentage complete will show next to the button. When the upload is complete, the website will ask you to refresh the page.

Save instrument configuration to file:	DCC500A01.cfg	Save Config	0 %"
Restore instrument configuration from file:	Browse_ No file selected.	Restore Config	0 %"
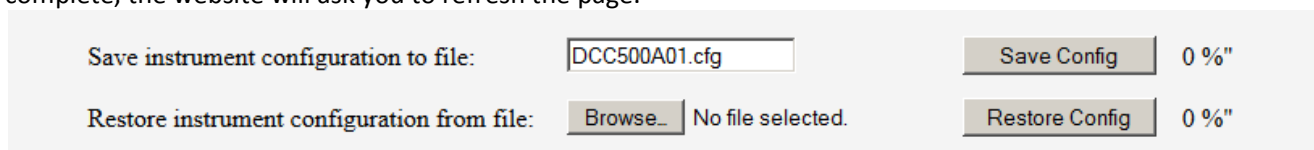
Figure 36 - System Configuration Save and Restore

2.2.4   Network Configuration

The "System Configuration" link at the top of the main page will take the user to the screen shown in Figure 35 (user will be prompted to enter the password again).

Active DCC Network Configuration

IPv4 Network Settings				
Type	Ip Address	Subnet Mask	Gateway	Dns Server
Static	192 . 168 . 1 . 4	255 . 255 . 255 . 0	192 . 168 . 1 . 1	192 . 168 . 1 . 1

IPv6 Network Settings			
Type	Unicast Ip Address	Gateway	Link-Local Address
Static	fda8:bf:1:0015::4	fe80::1	fe80:0:0:0:21e:c0ff:febf:5a69

Snmp Network Settings			
IPv4 Host	IPv6 Host	Snmp Listen Port	Snmp Trap Port
192 . 168 . 1 . 100	fda8:bf:1:15::100	161	162

Snmp Settings					
Version	Username	SHA Auth Password	AES Priv Password	Read Community	Write Community
⦿ v1 ○ v3	microlab	auth12345	priv12345	public	private

Figure 37 - Network Configuration

2.2.5 Channel Settings

2.2.5.1 Frequency Band Selection

Channel Number/Description - The first column contains the channel number and a field that can be used for remote or future reference. The field can be up to 20 characters long. Examples are shown below.

Figure 38 - Channel Description

Frequency Band - this column contains a drop-down list where the user can select the frequency band that the channel uses. Once the band is selected, the DCR will use the internally stored calibration factors for that frequency to determine the power levels.

Note: This band selection needs to match the band of HPOI that is connected. It may also be pre-configured by the factory for a set frequency based on customer requirements. In that case the box will be grayed out.
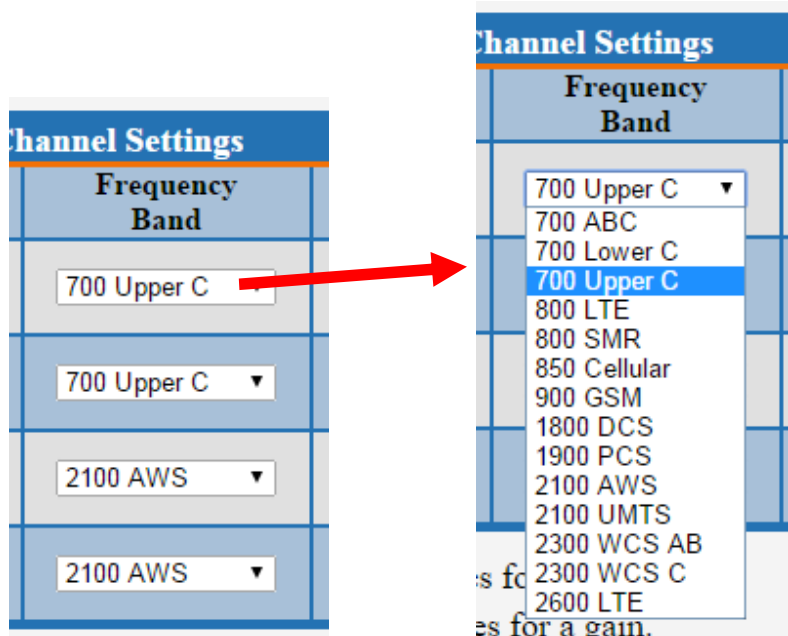
Figure 39 - Frequency Band Selection

2.2.5.2   Power Level Offsets

For standalone DCC500-A01 units, the user can select the frequency band and power level offsets for each channel pair. This allows the user a wide range of DAS trays to use with the unit, and it gives the user the power at the other end of their equipment if desired.

Figure 40 - Channel Settings for DCC500-A01

For an integrated unit the frequency band and offsets will be fixed. The user will not be able to change the band or offset without sending the unit back to the factory for recalibration.

Active DCC System Configuration

Channel Settings

fixed configuration

Chan Number Description	Frequency Band	Tx Offset (dB) [1]	Rx Offset (dB) [1]
1 Channel 0	700 Upper C ▼	1.2	3.1
2 Channel 1	700 Upper C ▼	0.0	0.0
3 Channel 2	2100 AWS ▼	1.4	3.3
4 Channel 3	2100 AWS ▼	0.0	0.0

Note 1) A positive offset compensates for a loss.

A negative offset compensates for a gain.

Figure 41 - Channel Settings for Integrated Unit (i.e. DCC500-A05)

The power level offsets are used so that the power level reported is representative of the power level present at a set reference point in the user's particular system. An example using an HPOI is described below.

With a zero offset, as in Figure 40, the DCR will measure the Downlink input power at the input of the DCR, and it will measure the Uplink output power at the output of the DCR. The offset allows the user to enter the insertion loss of an HPOI unit, and the measurements will be translated to the other side of the HPOI. This is illustrated in Figure 42.

Figure 42 - Offset Level Diagram

The Downlink input power will measure the input to the HPOI, and the Uplink output power will measure the output of the HPOI.

Non Configurable System Alarms						
Uplink Input Overdrive (dBm)	Downlink Input Overdrive (dBm)				High Temperature	Over Temperature
	1	2	3	4		
10	28	30	31	32	45 ℃	50 ℃

Figure 43 - Downlink Input Overdrive Alarm with offset
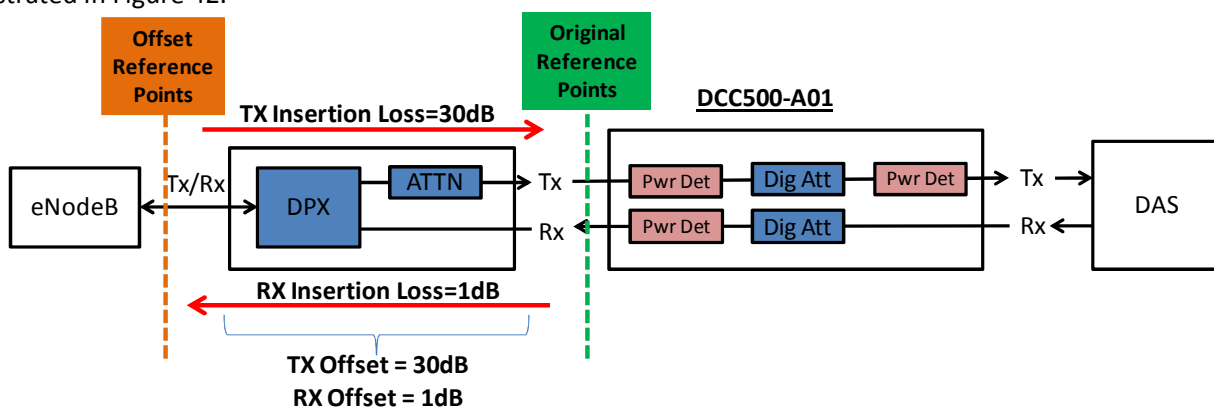
In the example of Figure 42, the Tx insertion loss is 30dB. The range of TX input power measurements is moved from [-40dBm to +18dBm] to [-10 to +48dBm]. The range of RX output power measurements is moved from [-91dBm to 0dBm] to [-91dBm to -1dBm].
Note: The Rx alarm range will not change.

3   Automatic Level Control

The DCR provides a mode for Automatic Level Control (ALC) of the RF output power. This feature can be used when a constant output power is desired. When enabled, the ALC feature will maintain the level of the RF output to within +/-1dB of the nominal set point selected by the user, as long as it is attainable within the range of the attenuator. If the attenuator reaches its limit (high or low), the nominal power level will not be kept.
It is up to the user to set an alarm range that monitors the power level within the acceptable output level range. There is no alarm for attenuator limit. The only alarms are for over and under power level ranges.

4   Battery Backup

The DCR is equipped with a battery backup that will maintain the RF attenuator settings during a power outage for a duration of 1 week.
Note*: the attenuator settings are the only feature to remain intact during a power outage. The power monitors, web server, front panel, and every other feature will not be accessible during a power outage. The battery backup is provided as a safety precaution to other equipment attached to the network.*

5   SNMP Interface

MIB available at: http://www.microlab.fxr.com/
SNMP V1 and V3 are available.
Note: when SNMP V3 is selected on the configuration page, V1 is disabled. If V1 is selected, V1 and V3 are available.
Available commands:
- Set (read-write)
  - Frequency Band
  - Downlink Enable
  - Uplink Enable
  - Downlink ALC setting
  - Uplink ALC Setting
  - Downlink Attenuator
  - Uplink Attenuator
  - Downlink over range alarm threshold
  - Downlink under range alarm threshold
  - Uplink over range alarm threshold

- o   Uplink under range alarm threshold
- o   Enable/Disable alarms
- o   Channel description
- Get (read only)
  - o   Downlink Input Power
  - o   Downlink Output Power
  - o   Get All measurements for channel
  - o   Get All settings for channel
  - o   Get alarms

There are several freeware SNMP browsers available.
iReasoning MIB browser for SNMP V1 http://ireasoning.com/download.shtml
Unbrowse for SNMP V3 http://www.unleashnetworks.com/products/unbrowse-snmp.html
Note: Microlab does not endorse the software above, it is only provided as a reference. Commercial use of the above requires purchase of a license from the developer.

6   Daisy chaining (linking multiple units)

The dual ethernet ports on the DCR are connected internally via an ethernet switch. This means that the traffic to or from one port will be passed through to the other. The IP address determines where the commands are ultimately sent. This feature allows multiple DCR's (or other ethernet devices) to plug into the DCR instead of requiring another port on the router.
Notes on daisy chaining:

- each device requires a unique IP address from the router
- there is no limit to the number of devices connected in series, but normal ethernet network design guidelines should be followed
- a shielded ethernet cable is recommended
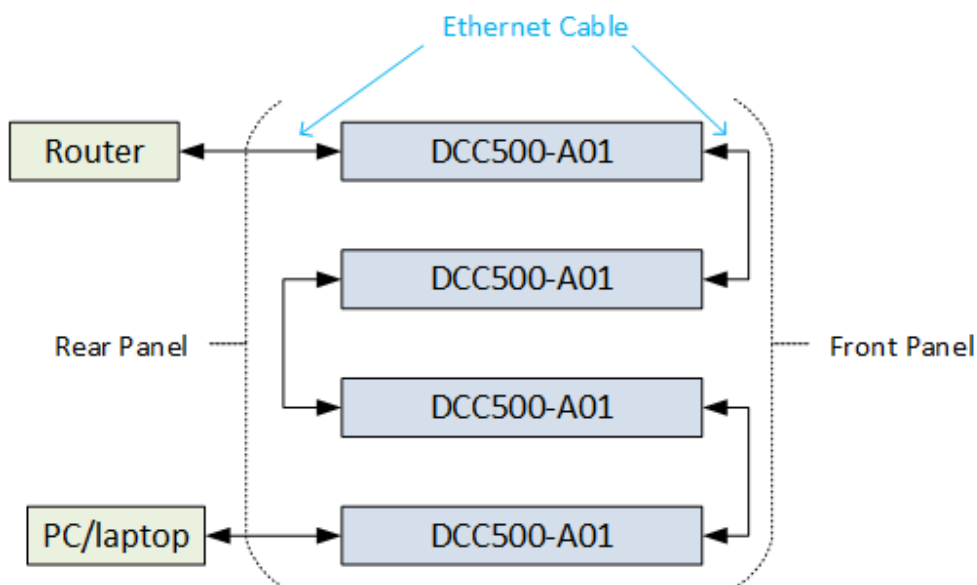
Figure 44 - Daisy Chaining Diagram

7 Dry Alarm Contacts

The DCR features "dry contact" alarms. These are located on the rear panel via the terminal blocks. There are 3 pairs of external inputs and 1 pair of outputs on the rear panel that can be used to monitor NO/NC (normally open/normally closed) external circuits or monitor for DCR alarms respectively.

Figure 45 - Rear Panel Dry Alarm Contacts

The internal connections for these contacts is shown in Figure 46.
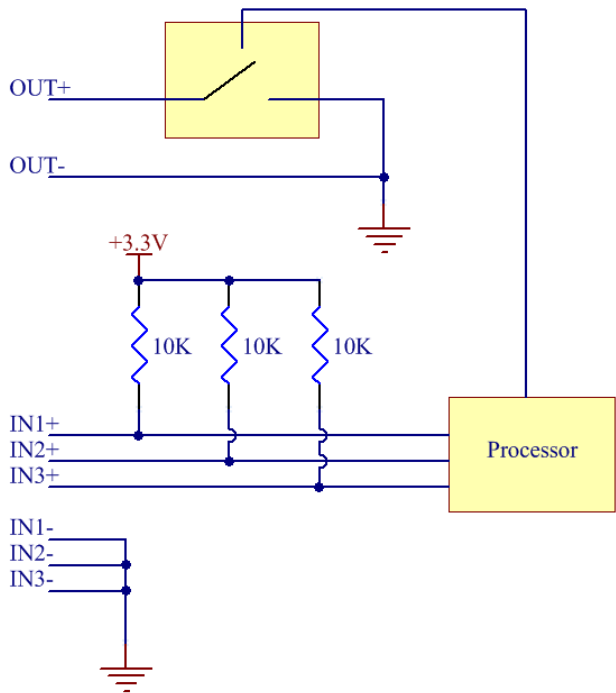
Figure 46 - Dry Alarm Contact Schematic

The software is configurable within *System Configuration* to monitor either NO or NC input alarm types. Or the external input can be turned off. Additionally, the DCR can provide a user selectable NO or NC output alarm.

External Alarms			
Output Alarm	Input Alarm 1	Input Alarm 2	Input Alarm 3
⦿ Off	⦿ Off	⦿ Off	⦿ Off
◯ NO	◯ NO	◯ NO	◯ NO
◯ NC	◯ NC	◯ NC	◯ NC

Figure 47 - External Alarm Settings

Output Alarm

     Off - Circuit is open and will not change states

     NO - Circuit is open and will close upon any alarm

     NC - Circuit is closed and will open upon any alarm

Input Alarm

     Off - Signal is not monitored

     NO - When circuit is closed, alarm will trigger

     NC - When circuit is open, alarm will trigger

Notes on EMC compliance:

- *When the input alarm circuits are open, +3.3V is present on the connectors. When shorted to ground (closed) the output current is 0.33mA.*
- *When external wires are NOT connected to the dry alarm contacts, the DCR WILL meet FCC Part 15 Class B*
- *When external wires ARE connected to the dry alarm contacts, the DCR will NOT meet FCC Part 15 Class B*

Troubleshooting Guide

- In general, the first step to troubleshooting a connection issue is to reboot the unit by turning power off then on again.
- Another good practice is to close the web browser and open it back up again to clear any locally stored page information on the PC. Especially after changing any settings.
- Net file not found - Memory read failure. Power cycle the unit. If problem persists, contact the factory.
- NoCal - no calibration file found for the frequency selection. Power cycle the unit. If problem persists, contact the factory. Note that some units are only calibrated at specific frequencies based on customer specified requirements. Please note the part number and serial number when contacting the factory.

Acronyms

Acronym	Definition
ALC	Automatic Level Control
BTS	Base Transceiver Station
DAS	Distributed Antenna System
DCC™	DAS Carrier Conditioner
DCR	DAS Control Rack
DL	Downlink
DNS	Domain Name Server
HPOI	High Power Point of Interface
IP	Internet Protocol
LCL	Local (with respect to the Ethernet connection)
MIB	Management Information Base
NO/NC	Normally Open/Normally Closed
POI	Point of Interface
RMS	Root Mean Square
RRH	Remote Radio Head
RTCC	Real Time Clock & Calendar
Rx	Receive
SNMP	Simple Network Management Protocol
Tx	Transmit
UL	Uplink
WTG	Wireless Telecom Group

Appendix A - Microlab EULA

END-USER LICENSE AGREEMENT

IMPORTANT-READ CAREFULLY: This End-User License Agreement ("EULA") is a legal agreement between you (either an individual or a single entity) and Microlab, a subsidiary of the Wireless Telecom Group, Inc., for the Microlab "product" identified above, which includes device software and may include associated media, printed materials, "online" or electronic documentation, and Internet-based "services". An amendment or addendum to this EULA may accompany the Product.

YOU AGREE TO BE BOUND BY THE TERMS OF THIS EULA BY INSTALLING, COPYING, OR OTHERWISE USING THE PRODUCT. IF YOU DO NOT AGREE, DO NOT INSTALL OR USE THE PRODUCT; YOU MAY RETURN IT TO YOUR PLACE OF PURCHASE FOR A FULL REFUND.

1. GRANT OF LICENSE. Microlab grants you the following rights provided that you comply with all terms and conditions of this EULA:

*Installation and use. You may install, use, access, display and run one copy of the Product.

*Reservation of Rights. Microlab reserves all rights not expressly granted to you in this EULA.

2. UPGRADES. To use a Product identified as an upgrade, you must first be licensed for the product identified by Microlab as eligible for the upgrade. After upgrading, you may no longer use the product that formed the basis for your upgrade eligibility.

3. TRANSFERABILITY. Th services are transferable only to other DCC500 devices. You may not move the services to a different instrument or computer.

4. LIMITATION ON REVERSE ENGINEERING, DECOMPILATION, AND DISASSEMBLY. You may not reverse engineer, decompile, or disassemble the Product, except and only to the extent that it is expressly permitted by applicable law notwithstanding this limitation.

5. TERMINATION. Without prejudice to any other rights, Microlab may cancel this EULA if you do not abide by the terms and conditions of this EULA, in which case you must destroy all copies of the Product and all of its component parts.

6. NOT FOR RESALE SOFTWARE. This product is "Not for Resale" and may not be separately resold, transferred or used for any purpose.

7. EXPORT RESTRICTIONS. You acknowledge that the Product is of U.S. origin and subject to U.S. export jurisdiction. You agree to comply with all applicable international and national laws that apply to the Product, including the U.S. Export Administration Regulations, as well as end-user, end-use, and destination restrictions issued by U.S. and other governments.

10-2 Appendix C

8. U.S. GOVERNMENT LICENSE RIGHTS. All Product provided to the U.S. Government pursuant to solicitations issued on or after December 1, 1995 is provided with the commercial license rights and restrictions described elsewhere herein. All Product provided to the U.S. Government pursuant to solicitations issued prior to December 1, 1995 is provided with "Restricted Rights" as provided for in FAR, 48 CFR 52.227-14 (JUNE 1987) or DFAR, 48 CFR 252.227-7013 (OCT 1988), as applicable.

9. APPLICABLE LAW. If you acquired this Product in the United States, this EULA is governed by the laws of the State of New Jersey. If this Product was acquired outside the United States, then local law may apply.

10. ENTIRE AGREEMENT. This EULA (including any addendum or amendment to this EULA which is included with the Product) are the entire agreement between you and Boonton Electronics relating to the Product and the support services (if any) and they supersede all prior or contemporaneous oral or written communications, proposals and representations with respect to the Product or any other subject matter covered by this EULA. To the extent the terms of any Boonton Electronics policies or programs for support services conflict with the terms of this EULA, the terms of this EULA shall control.

11. The Product is protected by copyright and other intellectual property laws and treaties. Microlab owns the title, copyright, and other intellectual property rights in the Product.

Appendix B - Warranty & Repair

Microlab/FXR warrants its products to the original Purchaser to be free from defects in material and workmanship and to operate within applicable specifications for a period of one year from date of shipment for instruments, probes, power sensors and accessories. Microlab/FXR further warrants that its instruments will perform within all current specifications under normal use and service for one
year from date of shipment. These warranties do not cover active devices that have given normal service, sealed assemblies which have been opened, or any item which has been repaired or altered without Boonton's authorization.

Microlab/FXR's warranties are limited to either the repair or replacement, at Microlab/FXR's option, of any product found to be defective under the terms of these warranties. There will be no charge for parts and labor during the warranty period. The Purchaser shall prepay inbound shipping charges to Boonton or its designated service facility and shall return the product in its original or an equivalent shipping container. Microlab/FXR or its designated service facility shall pay shipping charges to return the product to the Purchaser for domestic shipping addresses. For addresses outside the United States, the Purchaser is responsible for pre-paying all shipping charges, duties and taxes (both inbound and outbound).

THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Microlab/FXR will not be liable for any incidental damages or for any consequential damages, as defined in Section 2-715 of the Uniform Commercial Code, in connection with products covered by the foregoing warranties.

Appendix D - Front Panel Menu Tree
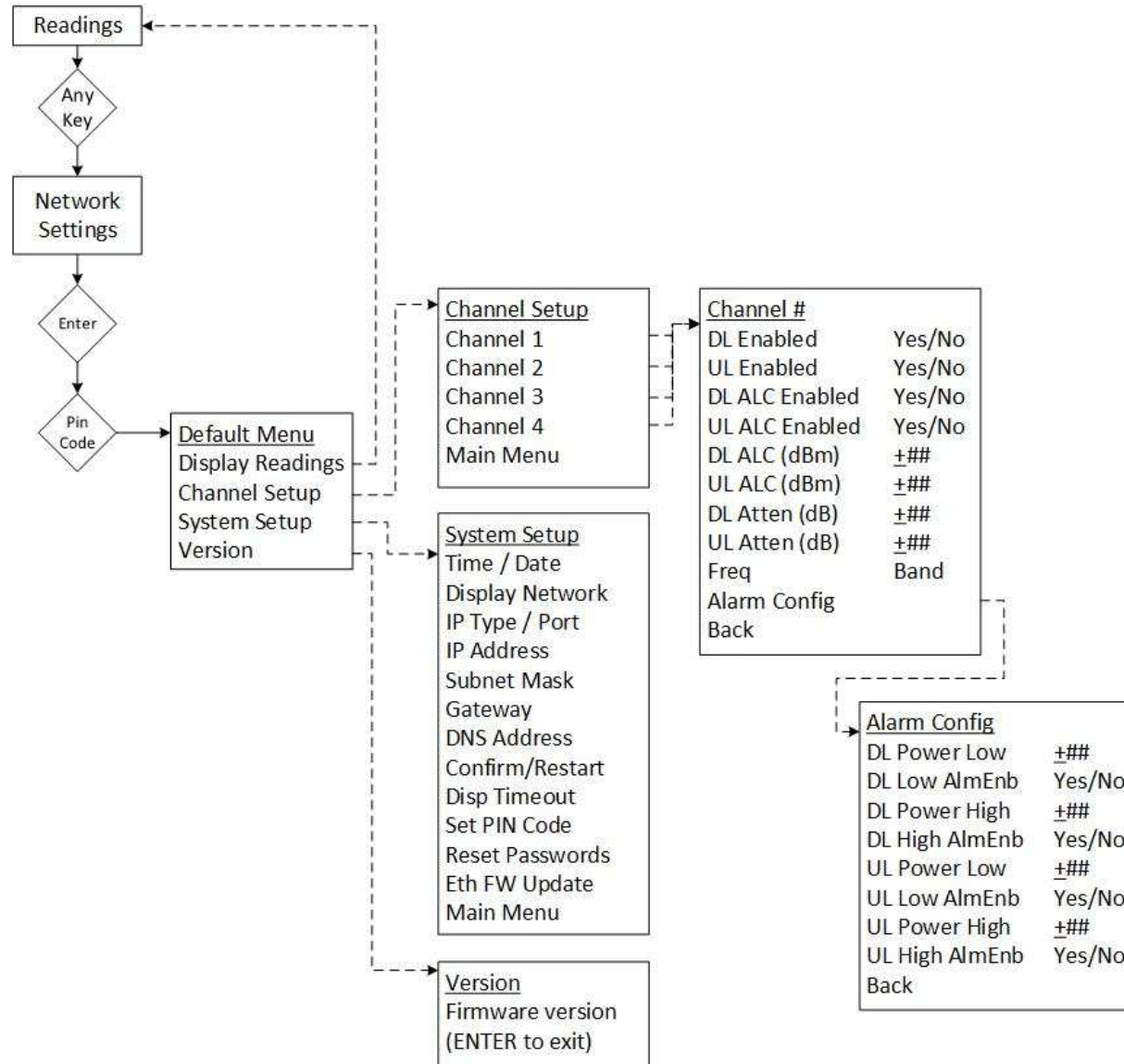
Appendix E - Frequency Definitions

Frequency Band	Common Name	GUI Name	Uplink Frequency Range			Bandwidth	Downlink Frequency Range		
			Lower Edge	Center	Upper Edge		Lower Edge	Center	Upper Edge
700	700 A, B, Lower C	700 ABC	698.0	707.0	716.0	18.0	728.0	737.0	746.0
700	700 Lower C	700 Lower C	704.0	710.0	716.0	12.0	734.0	740.0	746.0
700	700 Upper C	700 Upper C	776.0	781.5	787.0	11.0	746.0	751.5	757.0
800	LTE-800	800 LTE	791.0	806.0	821.0	30.0	832.0	847.0	862.0
800	SMR/800MHz	800 SMR	806.0	815.0	824.0	18.0	851.0	860.0	869.0
850	Cellular	850 Cellular	824.0	836.5	849.0	25.0	869.0	881.5	894.0
900	E-GSM	900 GSM	880.0	897.5	915.0	35.0	925.0	942.5	960.0
1800	DCS-1800	1800 DCS	1710.0	1748.0	1785.0	75.0	1805.0	1842.5	1880.0
1900	PCS	1900 PCS	1850.0	1880.0	1910.0	60.0	1930.0	1960.0	1990.0
2100	AWS	2100 AWS	1710.0	1732.5	1755.0	45.0	2110.0	2132.5	2155.0
2100	UMTS	2100 UMTS	1920.0	1950.0	1980.0	60.0	2110.0	2140.0	2170.0
2300	WCS A & B Combined	2300 WCS AB	2305.0	2310.0	2315.0	10.0	2350.0	2355.0	2360.0
2300	WCS Block C	2300 WCS C	2315.0	2317.5	2320.0	5.0	2345.0	2347.5	2350.0
2600	LTE-2600	2600 LTE	2500.0	2535.0	2570.0	70.0	2620.0	2655.0	2690.0

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