

FCC Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

There is no guarantee that interference will not occur in a particular installation. If this device does cause harmful interference to radio or television reception, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the device and receiver.
- Connect the device into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment.

Safety

Normal lightning and surge protection measures are assumed to have been followed in the RF plant that the ARRIS Cadant C3 CMTS RF input and output is connected to.

If AC supply is used to power the ARRIS Cadant C3 CMTS, suitable surge and lightning protection measures should be taken with this supply.

The equipment rack the ARRIS Cadant C3 CMTS is mounted in should have a separate safety ground connection. This ground should be wired in accordance with National Electric Code (NEC) requirements for domestic applications and paragraph 2.6 of EN60950/IE950 for international applications.

The safety ground wire must be #6 AWG or larger, and it must connect the equipment rack directly to the single-point ground in the service panel. The single-point ground can be an isolated ground or the AC equipment ground in the service panel or transformer. Depending on the distances between the cabinets and the location of the service panel, the wiring can be either daisy-chained through the cabinets or run independently from each cabinet to the service panel.

The remaining non-RF and non-AC supply connections of the ARRIS Cadant C3 CMTS should be made by SELV rated circuits.

Unpacking the CMTS

The carton in which the Cadant C3 CMTS is shipped is specifically designed to protect the equipment from damage. Save all shipping materials in case the product needs to be returned to the manufacturer for repair or upgrade.

Unpack the equipment carefully to ensure that no damage is done and none of the contents is lost.

The Cadant C3 package should contain the following items:

- Cadant C3 CMTS
- Rack mounting brackets and mounting screws
- Power cord and serial console cable
- Safety and Quick Start guides

If any of these items are missing, please contact your ARRIS service representative.

Note: ARRIS does not supply screws or associated cage nuts for rack-mounting.

After unpacking the equipment, but before powering it up the first time, read this document in its entirety, then perform a visual inspection of the equipment as follows:

- 1 Look for the following potential problems:
 - Physical damage to the chassis or components
 - Loose or missing connectors or hardware
 - Loose wires and power connections
- 2 If any of the above are found, do not attempt to power on the CMTS. Contact your local service representative for instructions.

Mounting the CMTS

The C3 CMTS is 1.75" (4.4 cm) high and is suitable for mounting in a standard 19"(48.3 cm) relay rack.

Note: Install the CMTS in a restricted access location.

Environmental requirements

Installation of the equipment in a rack should not restrict airflow where marked on the top of the C3 case. In particular, provide adequate side clearance.

Mount the C3 properly to prevent uneven mechanical loading on the chassis. Improper mounting can cause premature failure and potentially hazardous conditions.

When installed in a closed or multi-unit rack assembly, the operating temperature inside the rack environment may be higher than ambient temperature. Install the C3 in an environment where the ambient temperatures remains below 40° Celsius.

Follow these steps to mount the CMTS in a 19-inch rack.

- 1 Install one rack mounting bracket on each side of the CMTS so that the two-hole side is closest to the front of the CMTS and the brackets protrude away from the CMTS. Use three screws to fasten each bracket to the CMTS.

CAUTION Heavy load

The CMTS weighs approximately 20 lbs (9 Kg). If necessary, have a second person hold the CMTS while mounting it to the rack.

- 2 Mount the CMTS in the rack and secure it using two screws on each side.

Power Requirements

The C3 chassis supports two hot-swappable, load-sharing power supply modules. A single supply can provide all the power that a fully loaded system needs with sufficient safety margin.

Each type of power supply has a separate power connector mounted on the rear panel of the C3 chassis. The power connectors are typically plugged into the AC power or DC power distribution unit of the rack or cabinet using the power cords supplied with the C3.

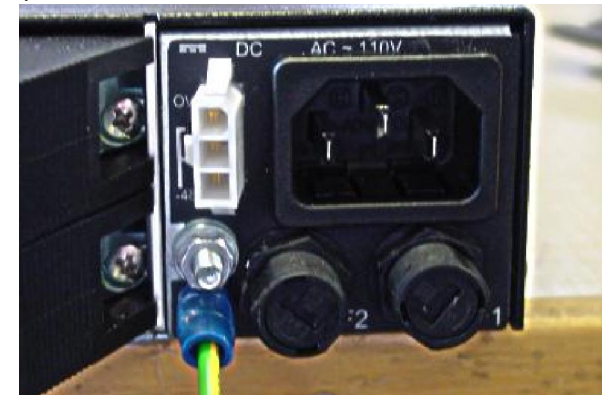
Note: Make sure that the power circuits have sufficient capacity to power the C3 before connecting power.

To disconnect power from the C3 for servicing, remove both power leads (AC and DC) from the rear socket. The C3 has no power switch.

Earthing

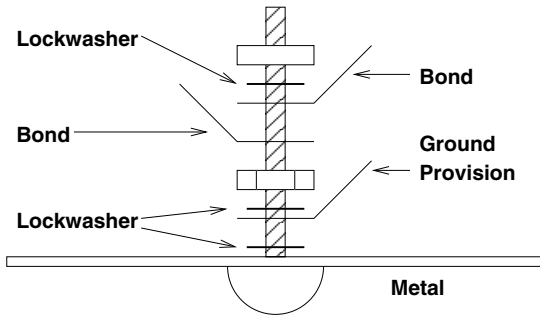
Reliable earthing of rack mounted equipment should be maintained. See "Safety" for common safety considerations. Also consider using power strips instead of direct connections to branch circuits.

When using only DC power, earth the C3 chassis using the supplied M4 stud.



Use an M4 nut and M4 lock washers with the parts stacked as shown in the figure below.

The power supply cord binding conductor may be secured either under the first (bottom) nut or the second (top) nut since replacement of either the power supply cord or the component being handled could occur first.



AC powering

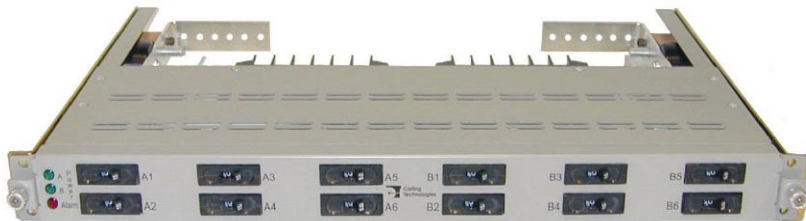
The AC power modules require 100 to 240 volt, 2A, 47 to 63 Hz AC power. The socket-outlet must be properly earthed.

DC powering

The DC power modules requires -40 to -60 V DC, 4A power from a SELV rated source.

The DC power source must have an over current protection device rated at 10 Amp.

Connect the supplied external DC cable assembly to -48V DC using a Carling Technologies Inc. Part Number LDC1-AL-10-10-10-10-10-10-J power distribution unit as shown following.



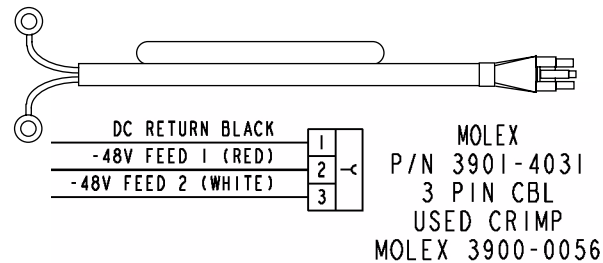
The external DC cable assembly must not be modified in the field; route any excess length to avoid snags.

Connect both Feed 1 and Feed 2 to -48V even if only one DC power supply is to be installed. This allows placing a single DC power supply in either of the two possible locations, or placing two DC power supplies in the chassis.

Signal	To	AWG	Color
DC Return	Pin 1	18	Black
-48V Feed 1	Pin 2	18	Red

Signal	To	AWG	Color
-48V Feed 2	Pin 3	18	White

The following diagram shows the connector and pin locations.



Fuse replacement

Replace F1 (AC fuse) only with: 250V / 5A Antisurge (T) Glass.

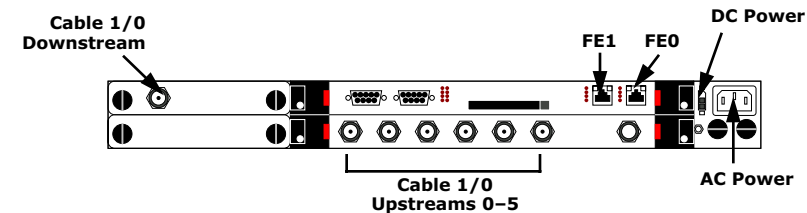
Replace F2 (DC fuse) only with: 250V / 10A Antisurge (T) Glass

Note: For continued protection against risk of fire, replace only with same type and ratings of fuses

Connecting Cables

Depending on the configuration ordered, the C3 may have 2, 4, or 6 upstreams.

Refer to the following figure to locate the cable ports.



Follow these steps to connect cables to the CMTS.

- 1 Connect the upstream cable from your plant to the appropriate upstream ports. The upstream ports are located on the lower board, and are numbered left to right as viewed from the rear.

Note: Connect all RF ports to SELV circuits (meeting the requirements of SELV as defined in UL60950). Your headend must provide suitable protection between the RF ports and the CATV outside plant.

- 2 Connect the downstream cable to the downstream port (the F-connector located at the upper left).

- 3 Connect a PC to the serial connector (male DB9 connector on the upper interface module). The pin-out for this connector is designed to function with a PC when used with a straight-through cable. The serial port operates at 38,400 bps with 8 data bits, 1 stop bit, and no parity bit.

- 4 (optional) Connect an Ethernet cable between the FE1 port and the network manager. The FE1 port is the left Ethernet connector on the top interface module.

- 5 Connect an Ethernet cable between the FE0 and the network bridge or router.

- 6 Make the power connection as follows:

- If using AC power, connect the power cord to the input socket in the upper right (above the fuses).
- If using DC power, connect the supplied DC power cable to the small white connector to the immediate left of the AC input connector.

Note: When DC powering, the chassis should be earthed to the rack using the supplied M4 earthing stud as detailed in "Earthing" above.

- 7 Apply power to the CMTS.

The cooling fans should start to turn.

Initial Configuration

Use the following sequence to start up the C3. This startup sequence assumes an "out of the box" initial condition.

Initial Boot Parameters

The boot parameters are primarily required if a boot from a remote TFTP server is required. The network boot parameters set:

- the startup configuration to provide the initial IP address of the interface, and the default gateway if a remote TFTP server based boot is required.
- the IP address and default gateway of the running configuration's management interface.
- the 802.1Q VLAN ID if booting over an 802.1Q VLAN encoded backbone is required.

The choice of the booting interface (FE0 or FE1) also pre-defines certain bridging behavior of the CMTS (in-band or out-of-band).

Note: Even if a TFTP boot is not required, you must set the gateway to the first hop backbone router.

Factory Default Network Settings

Factory default network settings are:

- IP address is one of:
 - 10.1.127.120
 - 10.1.127.121
 - 10.1.127.122
 - 10.1.127.123
- Subnet mask: 255.255.128.0
- Gateway address: 10.1.0.3

See Appendix C of the *C3 Installation, Operation, and Maintenance Guide* for a complete list of factory default settings.

Preparing the Connections

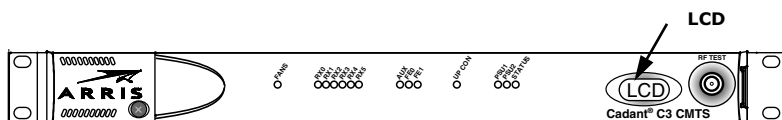
- 1 Connect the power cable to the CMTS. Do not power up yet.
- 2 Connect the RS232 serial cable to the serial port and connect the other end to a terminal (or PC with a terminal emulation program).
- 3 Start the console application and set the console configuration to:
 - Port: Com1/Com2, depending on your connection
 - Baud rate: 38400
 - Data: 8 bits
 - Parity: None
 - Stop bit: 1
 - Flow control: None

Verifying Proper Startup

Follow these steps to start the C3 CMTS for the first time.

- 1 Power on the CMTS and verify that the following status LEDs on the front panel are illuminated green:
 - FANS
 - PSU1
 - PSU2 (if second power supply is installed)
 - Status

The CMTS should display initial startup messages on the LCD screen on the front panel. The following figure shows the location of the LCD.



- 2 Verify that the FE0 and FE1 ports on the back of the CMTS have illuminated green Link LEDs (for the ports that are being used).
- 3 Wait for the message "Press any key to stop auto-boot..." to appear on the console, then press any key to stop auto booting before the count reaches 0.
Note: Auto booting continues after two seconds.
- 4 At the **[VxWorksBoot]:** prompt, type **help** or **?** and press **Return** to view the different commands available for boot options.

Setting Boot Parameters

- 1 Enter privileged mode using the **enable** command to change the boot parameters. The first time you enter this mode, there

is no password set and you can enter with no password. Use the **setpwd** command if a password is required in the future.

- 2 Decide what Ethernet interface to use for management access, using the commands **wan** (FE0) or **mgmt** (FE1).

The **bootShow** command displays the selected management interface as the "Network port" as shown in the next step.

Most CLI commands refer to the FE0 port as **fastethernet 0/0**; the FE1 port as **fastethernet 0/1**.

If the CMTS has been booting from one interface and you change this interface using the above commands, you need to power cycle the CMTS for the change to take effect.

- 3 Enter **bootshow** to view the current boot options. (Note that the CMTS does not show the TFTP server IP address unless BootCfg is selected as following).

- 4 If the C3 is to be managed over an 802.1Q VLAN, make the VLAN assignment so that remote management systems can communicate with the C3 during the boot process. This is also required if the C3 is configured to boot using TFTP, since the TFTP transfer might use the VLAN. Use the **vlanEnable** and **setVlanId** commands to set up the VLAN.

- 5 To change the above list of boot options, enter **bootCfg** at the command prompt. You can change the boot parameters one at a time. Enter the new value for each parameter in turn to modify them. Then enter **bootShow** to review the changes. Set the IP address for the ARRIS Cadant C3 to suit your network.

"Application Image path" is the name of the file and the file path if stored locally on the compact flash disk that contains the code image to be loaded. Note that the drive letter C is in UPPER CASE.

"Gateway Ip Address" is the IP address of the default router on the backbone network. The C3 uses this IP address for TFTP server booting and for the running configuration.

- 6 Once the boot parameters have been modified as required, boot the system by entering **@** at the prompt.
Once the system is booted, the serial port supports the CLI. When this is the first time the C3 has been powered up, the CMTS automatically creates all of the required run time files from the specified image file.

The CMTS loads the image file and comes online.

The following output is representative of that generated on the console screen during boot and initialization.

```
*** Current Boot Parameters ***
Boot from           : Compact Flash
Boot file           : C:/3.0.1.17.bin
CMTS IP Address     : 10.1.127.121
CMTS subnet mask   : ffff7f00
Gateway Address    : 10.1.0.3
```

```
CMTS Name           : CMTS
Network port        : WAN
Vlan Tagging        : Disabled
Attached TCP/IP interface to sbe0.
Attaching network interface lo0... done.
...etc...
```

```
! No CLI accounts - Telnet is disabled
! Please configure a login account with the "cli
account" command
Arris CMTS
```

C3>

Configuring an Initial CLI Account

You must create at least one CLI account before the CMTS allows telnet access. Follow these steps to create a CLI account.

- 1 If you have not done so already, type **enable** to enter privileged mode.
The prompt changes to a # symbol.
- 2 Enter the following commands to create an account:
C3# **configure terminal** ↵
C3(config)# **cli account** {acctname} **password** {passwd} ↵
The CMTS creates the account with the specified name and password.
- 3 Enter the following command to give privileged (enable) access to the account:
C3(config)# **cli account** {acctname} **enable-password** {enapasswd} ↵
C3(config)# **exit** ↵

Note: The login password and enable password may be the same if you prefer.

Configuring IP Networking

The C3 applies the CMTS IP address configured in the boot parameters to the fastethernet interface selected as the boot interface, and to the cable interface when booting from the default configuration (or when no startup-configuration file is available). If these settings are not suitable, use this procedure to specify the IP address information required for normal C3 operation.

Follow these steps to configure a different default route, if required.

- 1 Log into the CMTS.
- 2 To assign the management IP address to the fastethernet 0/0.0 (FE0) primary sub-interface, enter the following commands:
C3# **config terminal** ↵
C3(config)# **interface fastethernet 0/0** ↵

```
C3(config-if)# ip address {mgmt-ip-addr} {mask}↵
```

```
C3(config-if)# exit ↵
```

```
C3(config)# exit ↵
```

```
C3# copy running-config startup-config ↵
```

- 3 To assign the management IP address to the fastethernet 0/1.0 (FE1) primary sub-interface, enter the following commands:

```
C3# config terminal ↵
```

```
C3(config)# interface fastethernet 0/1↵
```

```
C3(config-if)# ip address {mgmt-ip-addr} {mask}↵
```

```
C3(config-if)# exit ↵
```

```
C3(config)# exit ↵
```

```
C3# copy running-config startup-config ↵
```

- 4 Enter the following commands to set the default gateway IP address:

```
C3# config terminal ↵
```

```
C3(config)# ip default-gateway {gw-ip-addr} ↵
```

```
C3(config)# exit ↵
```

```
C3# copy running-config startup-config ↵
```

Configuring the Cable Interface

Follow these steps to configure and enable the cable interfaces.

Configuring Downstream Parameters

Follow these steps to configure the downstream cable interface.

- 1 Connect a PC to the CMTS, using either the serial port or the Ethernet interface (telnet connection).
- 2 Log into the CMTS.
- 3 Type **enable** to enter privileged mode, and then type the enable password.
- 4 Use the following commands to begin cable interface configuration:

```
C3# conf t ↵
C3(config)# interface cable 1/0 ↵
```
- 5 Set the downstream frequency (in Hz) using the following command:

```
C3(config-if)# cable downstream frequency {freq} ↵
```

Example: **cable downstream frequency 50100000**
- 6 Set the power level (in dBmV) using the following command:

```
C3(config-if)# cable downstream power-level {pwr} ↵
```

Example: **cable downstream power-level 51**
- 7 (optional) Set the channel width using one of the following commands:

```
C3(config-if)# cable downstream annex a ↵
```

```
C3(config-if)# cable downstream annex b ↵
```

```
C3(config-if)# cable downstream annex c ↵
```

- 8 (optional) Set the downstream modulation type using one of the following commands:

```
C3(config-if)# cable downstream modulation 64qam ↵
```

```
C3(config-if)# cable downstream modulation 256qam ↵
```

- 9 Proceed to "Configuring Upstream Parameters."

Configuring Upstream Parameters

Follow these steps to configure each upstream cable interface. The parameter **us** refers to the upstream interface ID, 0 to 5, corresponding to upstreams RX0 through RX5 on the back of the C3 CMTS.

- 1 Set the upstream channel width (in Hz) using the following command:

```
C3(config-if)# cable upstream {us} channel width {width} ↵
```

The channel width specified must be a DOCSIS-standard upstream channel width: **6400000** (6.4 MHz, ATDMA only), **3200000** (3.2 MHz), **1600000** (1.6 MHz), **800000** (800 KHz), **400000** (400 KHz), or **200000** (200 KHz).

Example: **cable upstream 2 channel width 3200000**

- 2 Set the upstream channel frequency (in Hz) using the following command:

```
C3(config-if)# cable upstream {us} frequency {freq} ↵
```

The valid frequency range is **5000000** (5 MHz) to **42000000** (42 MHz) for North American DOCSIS, and **5000000** (5 MHz) to **65000000** (65 MHz) for EuroDOCSIS.

Example: **cable upstream 2 frequency 25000000**

- 3 (optional) Set the upstream channel modulation as follows:

- a Use one of the following commands to set the modulation type for a modulation profile:

```
C3(config-if)# cable modulation-profile {n} qpsk ↵
```

```
C3(config-if)# cable modulation-profile {n} 16qam ↵
```

```
C3(config-if)# cable modulation-profile {n} mix ↵
```

```
C3(config-if)# cable modulation-profile {n} advanced-phy ↵
```

- b Assign the modulation profile to an upstream using the following command:

```
C3(config-if)# cable upstream {us} modulation-pro {n} ↵
```

Where *n* is a modulation profile index, **0** to **5**.

The factory default modulation profile for each upstream is profile 1. This profile uses QPSK and is the safest profile to use to get modems online.

- 4 Set the input power level (the target receive power set during the DOCSIS ranging process) using the following command:

```
C3(config-if)# cable upstream {us} power-level {power} ↵
```

The valid power range depends on the channel width; the range **-4** to **14** is valid for all channel widths. See "cable upstream power-level" on page 6-141 of the *C3 Installation, Operation, and Maintenance Guide* for individual ranges.

Example: **cable upstream 2 power level 0**

- 5 Repeat steps 1 through 4 for each upstream that you need to configure.

- 6 Proceed to "Enabling the Interfaces."

Enabling the Interfaces

Follow these steps to enable the cable interfaces.

- 1 Enable an upstream cable interface using the following command:

```
no shutdown ↵
```

Repeat this command for each configured upstream.

- 2 Enable the downstream cable interface using the following command:

```
no cable downstream shutdown ↵
```

The CMTS is now ready to acquire and register cable modems. To display the current CMTS configuration, use the **show configuration** command.

Cadant® C3™ CMTS Quick Start

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