INSTALLATION

&

OPERATION

M A N U A L

RACK MOUNT REMOTE CONTROL UNIT (1RU)

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PROPRIETARY INFORMATION

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Table of Contents

List of Figures

List of Tables

Safety

Introduction

In addition to the *High Voltage Equipment Personnel Operating Guidelines* given in this chapter, included by reference are the following pertinent sections of the International Standard EN60215, *Safety Requirements for Radio Transmitting Equipment*:

- Appendix D, Guidance on Assessing the Competence of Personnel for Designation as Skilled, and also Sub-clause 3.1 of the Standard.

- Appendix E, Guidance on Safety Precautions to be Observed by Personnel Working on Radio Transmitting Equipment, and also Sub-clauses 3.2, 3.7, and 22.1 of the Standard.

High Voltage Equipment

Personnel Operating Guidelines

This guideline document presents operating practices for operators and technicians who work with high voltage equipment. In the context of this discussion any voltage that is lethal is viewed as "high voltage." Therefore, even prime power (115 to 440VAC) is dangerous because prime power potentials have been known to cause death or injury.

Electrical circuits operate quickly and do not allow a careless individual a second chance. When dealing with high voltage, the results are very consistent and predictable and hazards associated with high voltage are always present. **The fact that the control switch says OFF does not mean you are safe**.

NOTE: *The guidelines presented in this chapter are not academic. They are based on the experience of engineers and technicians who have years of experience with high voltage circuits.*

When is Voltage "High"?

As stated earlier, any voltage that can kill you should be treated as high voltage. Voltages associated with prime power generally do not jump the air gap between people and the equipment. Usually exposed circuit elements such as a terminal, bare piece of wire, or some non-insulated surface must be touched.

One of the problems associated with prime power is some equipment can be "floating" above ground. In this case, if you place one hand on the equipment chassis and the other on earth ground, you can be jolted, injured, or killed. 440VAC can stimulate an involuntary muscle response that will either literally throw you across a room or seize and hold you across the voltage terminals. 600 or more volts can hold you indefinitely. If the potential is sufficient to drive 200 milliamps through your body you will be held indefinitely. Some people consider the 200 to 600 volt range to be worse than potentials of thousands of volts.

General Guidelines

In addition to the above, the following practices have proven effective for personnel who deal with high voltage equipment.

   a. **Hands off.** Avoid contact with any potential source of high voltage. Keep hands out of the equipment when it is operating.

   b. **Avoid accidental contact.** Make sure that some other part of your body does not come in contact with the high voltage circuits. It is easy to forget the hazards when you are concentrating on a frustrating or interesting task. Pens and badges in shirt pockets could contact the equipment.

   c. **Never work on high voltage circuits when you are alone.** If anything should happen to you, your only chance may be prompt action by some other person. Be sure someone else is present and knows what to do in any emergency (e.g., how to shut equipment off, first aid, who to call, etc.)

   d. **Use one hand when working with high voltage circuits.** Many people recommend that you put one hand in your pocket when you use a probe or other piece of equipment inside a high voltage section.

   e. **Do not float measuring equipment above ground.** Make all measurements with respect to ground. If you float an instrument, do not reach inside the equipment. Although it is more difficult to get the right setup, it is well worth the effort.

   f. **Do not assume that the level of risk is a function of size.** Some large high power voltage equipment looks docile. One reason the equipment is so big is to get the proper separation between high voltage points. On the other hand, just because

the equipment is small is no assurance of safety. Dense packaging results in more difficult access and increases the chance that you will accidentally hit the wrong point.

g. **Always discharge high voltage capacitors.** High voltage capacitors store a lot of energy for long periods of time. High voltage capacitors also exhibit a "memory" in that they can recover after discharge and reach lethal levels. In addition to the "memory" problem, there have been instances where the built-in safety features have failed or have been miswired. **Each and every time you go to work on a piece of high voltage equipment, use a discharge device with a long handle to discharge every high voltage capacitor.**

h. **Do not depend on the automatic features of the equipment to save you.** You never know when someone has left a circuit disabled, if there has been a wiring error, or if a component has failed.

i. **Take personal responsibility to assure that no one can turn on the high voltage circuits when you are working on the equipment.** Precautions would include taping down (or installing a keeper) on controls/circuit breakers and/or disconnecting the power source to the high voltage circuits, activating interlocks that prevent high voltage turn on, etc. Know where the power disconnects are and use them. Do NOT rely on anyone not to turn on the high voltage.

j. **Set up your test equipment with the power off.** Conduct the power-on operations when you have your hands out of the equipment.

k. **Do not use short probes for high voltage measurements.** A short probe does not allow any margin for error. If your hand slips you could accidentally come into contact with a danger point. A long probe avoids the whole problem.

l. **Read the instruction manual.** The best insurance is foreknowledge of hazards.

m. **Create a favorable environment for safe operations.** This means that if people are crowding you, stop the operation if it involves high voltage. Pressure can lead to carelessness. In the same way, fatigue is also an enemy. STAY ALERT AT ALL TIMES WHEN WORKING WITH HIGH VOLTAGE.

n. **Do not become over-confident.** Maintain a healthy respect for high voltage.

o. **A good operating practice is to check the potential between the equipment chassis and earth ground before you complete**

the circuit with your body. As voltage levels increase, the protection you get from insulation and air gap diminishes. For example, in a piece of equipment that involves beam voltages of about 16kV, the beam transformers look very safe with massive insulation on the outside of the coils. Physical contact with the beam coil when the system is operating can be fatal. Although the equipment is placard to warn people of the presence of high voltage, it is virtually impossible to placard every point of danger in a system.

p. **If you do not know how the equipment works and what the hazards associated with the equipment are in specific terms, do NOT handle the equipment**. The greatest protection you can have when dealing with high voltage equipment is specific detailed knowledge on that particular piece of equipment.

q. **Avoid "haywire" test setups**. It is easy to get in trouble if the setup you are using has a jumble of wires.

r. **Make sure your connections are secure**. Do NOT allow leads to slip off and move about in an uncontrolled fashion. Even if it is not one of the high voltage leads, a free lead could (and generally does) move exactly to where you do not want it. The only safe connection is a mechanically secure one.

s. **Watch out for unterminated high voltage leads**. Some connectors depend on circuit loading to avoid arcing between closely spaced terminals. Unloaded high voltage lines or plugs can lead to arcing situations.

t. **Shut off the high voltage when you are making low voltage measurements**. It does not make sense to increase danger needlessly. While there may be times when you cannot shut off the high voltage during a low voltage measurement, this is generally not the case.

u. **Remove the test equipment when you have finished a measurement program.** There have been many instruments destroyed or damaged because a test program was conducted in a haphazard manner, rather than in an orderly progression from start to finish. Experience has shown in many instances when a little order would have prevented a tragedy or avoided an expensive mistake.

v. **Be extremely wary when making filament voltage measurements.** The cathode of tubes is elevated above (or below) ground and the filament voltages usually cannot be measured with reference to ground. Do everything you can to assure that the high voltage cannot be turned on when you are making your measurements. This includes disconnecting the high voltage drive source, shorting out appropriate leads,

taping down switches, and anything else you can think of to protect yourself.

w. **When troubleshooting a unit, assume that the switches and components are defective.** You may shut off the high-voltage switch in some systems, but if the switch were defective, the high voltage would still be on. Returned units are potential booby traps.

x. **Make sure that your workstation is stable.** Flimsy work surfaces or supports for the equipment or the test instruments represent a real threat. Do NOT use a setup that you know is unstable and/or dangerous.

y. **Use a 1-minute rule.** Wait 1 minute or more after you have shut off the equipment before you work on a unit. Part of the reason for a
1-minute rule is that some of the dielectrics (insulators) used for high voltage circuits can store a charge. While the amount of charge stored is a function of the size of the object, a 1-minute rule provides an additional margin of safety.

z. **Maintain a healthy respect for any kind of live circuit. Complacency can hurt or kill you.** Your continued wariness is your best insurance against injury or death.

Microwave Radiation

Personnel Operating Guidelines

This guideline presents operating practices appropriate for operators and technicians who work with equipment involving microwave radiation. Keep in mind that levels of microwave radiation that do not induce immediate physical discomfort in most individuals can be sufficiently high to induce longer-term effects.

CPI Satcom Division equipment usually is related to amplification of a RF signal from an external source. Even if a source is not connected to the amplifier you are working with, there are situations where the amplifier can go into a self-induced mode and generate high levels of RF energy. This condition can exist if the unit is operated with high voltage ON and without proper termination on the input and output of the amplifier.

ELECTRICAL HAZARD! PROTECT YOURSELF AND THOSE AROUND YOU FROM UNWANTED RF EXPOSURE. ALWAYS TERMINATE THE AMPLIFIER INPUT AND OUTPUT WITH A RF DUMMY LOAD BEFORE YOU TURN THE HIGH VOLTAGE ON. THIS WILL REDUCE THE CHANCES OF OSCILLATION DUE TO INTERNAL AMPLIFIER NOISE.

Microwave Discussion

Limit exposure to microwave radiation to prevent unwanted biological effects. There are other effects that can lead to problems if you are careless in operating or servicing microwave equipment. The permissible levels are quite low in comparison to the power levels of the amplifiers built by CPI (e.g., less than 10 milliwatts vs. 20 to 10,000 Watts delivered by different units)

Local radiation levels can be detected with the proper equipment. The permissible levels are currently being studied by a number of organizations. In the past the U.S. Safety Codes established a dosage rate of 10mw/cm. Sq. Recently the permissible level has been reduced to 1mw/cm. sq. in the United States, as has been the case in several European countries.

General Microwave Guidelines

The purpose of these guidelines is to provide practical approaches to control unwanted microwave energy associated with the operation and servicing of CPI Satcom Division equipment.

The following approaches are effective in both laboratory or field environments:

a. **Always terminate the output waveguide or coaxial connector with a dummy RF load (capable of dissipating full CW RF power). Similarly, terminate the input to avoid the possibility of the amplifier being driven by stray leakage signals.** Incorporate the terminations prior to applying prime power to the amplifier. This procedure prevents self-oscillation and irradiation of the local equipment.

b. **Do not look into the output port of the powered RF amplifier.** Treat the powered amplifier as though it is a loaded gun. Your eyes are particularly vulnerable parts of your body.

c. **Shut off the unit if you are trying to locate a RF leak.** As noted earlier, the levels of concern are very low. Examine the physical unit with the high voltage OFF. If you have to survey the RF runs with the power ON to find the leaky joint or component, start by testing the system with low RF input and a radiation meter.

   If the microwave radiation exceeds 0.5mw/cm. sq., shut OFF the high power voltage and consult your supervisor. Work quickly (not at a panic pace) to minimize the dose level. The dose you get is directly proportional to the power level and the time you are exposed. Exposure to microwave radiation can induce both thermal and non-thermal biological effects, especially with the eyes. If you damage the lens of your eyes by exposure to microwave radiation, cataracts can result. Consider that small microwave ovens are very effective in cooking foods. If you follow these guidelines you can minimize exposure of yourself and other people in the operations that you control.

Chapter 1
Introduction

1.1 Overview

The CPI Rack Mount Remote Control Unit is packaged in a Single Rack Unit and is designed to provide both direct control and/or interfacing with an M&C system. The Remote is capable of full monitoring and control of up to 10 Amplifiers or a Single Switch System (1:1, 1:1 Power Combined, 1:2).

The following are some of the general features of the RCU.

- Compact Design: One Rack Unit High

- Two dedicated ports (Serial And Ethernet) for simultaneous connection to an M&C System

- Dedicated system control point selection and display

- Dedicated control for switch system status and configuration functionality

- Dedicated Amplifier unit number selection and display

- Display of all Amplifier operating parameters and Event Log data

- Full control of Amplifier parameter and configuration settings

- Selectable Amplifier meter display on Amplifier Status screen

- Automatic Multi-Amplifier recognition and identification

- Built-in Amplifier address setting functionality

- 16X280 High Brightness Vacuum Fluorescent Display

The RCU operates with AC input (line) voltages of 100 - 240 ± 10% VAC at any frequency between 47 and 63 Hz.

Figure 1-1 shows a front view of the Rack Mount Remote Control Unit.

Figure 1-1. Rack Mount Remote (Front View)

All of the RCUs are the same size weight. They weigh approximately 5 pounds (2.2 kg.), the overall dimensions, excluding switches, connectors, and mounting brackets, are 1.75 by 10.25 by 19.0 inches.

Detailed specifications for the Rack Mount RCU are provided in Chapter 4, "Drawings".

1.2 About This Manual

This manual describes the Rack Mount Remote Control Unit installation and operation procedures.

The Safety section that precedes Chapter 1 provides practical guidelines regarding High Voltage operating practices.

Chapter 1, "*Introduction*," contains a brief description of the Rack Mount Remote Controller unit and this manual.

Chapter 2, "*Unpacking and Installatio*n", contains procedures for unpacking and installing Rack Mount RCU.

Chapter 3, "*Initial Power ON, Checkout and Operation*", describes the controls and indicators on the front panel of the RCU and a description of the operation of the RCU. It also includes the procedures to use for initial checkout after the RCU has been installed.

Chapter 4, "*Drawings*", contains relevant engineering drawings and specifications of the Hub Mount Low Power Amplifier.

The Appendices, "A" through "G", contain additional topics such as "Service and Warranty" information and optional features.

1.3 Conventions

The following symbols and conventions are used in this manual. These symbols differ slightly from International symbols to emphasize the specific nature of the hazards.

Notes and Cautions

NOTE: *Notes provide additional commentary or technical information.*

CAUTION! Cautions identify conditions, operations, or procedures that could potentially damage the equipment.

Warnings

There are three different warnings, Electrical Hazards, Radiation (microwave) Hazards, and Physical Hazards (mechanical, chemical, miscellaneous).

ELECTRICAL HAZARD! IDENTIFY CONDITIONS, OPERATIONS, OR PROCEDURES THAT EXPOSE THE OPERATOR TO POTENTIALLY LETHAL HIGH VOLTAGES.

PHYSICAL HAZARD! IDENTIFY CONDITIONS, OPERATIONS, OR PROCEDURES THAT COULD INDUCE STRAIN, MAIM, OR KILL PEOPLE. THIS INCLUDES HEAVY WEIGHTS, SHARP EDGES OR PROTRUSIONS, AND CHEMICAL HAZARDS.

Text Conventions

When operator action is required for software entries, the action required is key-in commands will be in *Italics* and items shown in the display will be in **Bold**. For example, press *ENTER*.

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Chapter 2
Unpacking & Installation

2.1 Overview

This chapter contains instructions for unpacking and installing the Rack Mount Remote Control.

2.2 Pre-Inspection

Inspect the exterior of the shipping container(s) for evidence of damage in shipment. If damage is evident, immediately contact the carrier that delivered the equipment and submit a damage report. Failure to do so could invalidate future claims.

2.3 Unpacking

Carefully unpack and remove all items from the shipping container(s). Inspect the interior of the container for damage. Save all packing material until all inspections are complete. It is recommended that all packing material be saved for potential future use. Verify that all items listed on the packing slips have been received.

Inspect all items for evidence of damage in shipment. If damage seems evident, immediately contact the carrier that delivered the equipment and file a claim. Failure to do so could invalidate future claims.

2.4 Installation

Installation of the Rack Mount Remote Control includes:

- Mechanical installation
- Electrical power connection
- Remote control interface connections

2.4.1   RCU Installation

Refer to the appropriate Outline Drawing in Chapter 4 "Drawings" for outline and mounting information.

The RCU may be mounted using the four holes located on the front of the panel (refer to the Outline Drawing). These holes are patterned to interface with a standard 19-inch wide rack, one RU high.

It is recommended that the area directly behind the RCU be kept clear to provide access for cabling.

The RCU requires no special cooling considerations, but it is recommended that the Unit be isolated from outside heat or magnetic sources such as indoor amplifiers that might be installed in the same rack.

2.4.2   Electrical Power Connections

All electrical and communications connections to the RCU are located on the rear panel (Figure 2-1).

ELECTRICAL HAZARD! DO NOT APPLY POWER TO THE RCU UNTIL YOU ARE DIRECTED TO DO SO IN THE PROCEDURE.

Prime power is applied to connector AC IN located on the rear panel of the amplifier. Prime power is 100 - 240VAC +/- 10% (nominal), 47-63 Hz. A prime power mating cable is supplied in the ship kit with the unit. Do not connect the cable to the amplifier at this time.

Proper grounding of the RCU amplifier to the station ground bus or to earth ground is necessary for personnel and equipment safety. The 6-32 threaded ground screw on the amplifier front panel is used for grounding. #18AWG wire or larger is recommended for the grounding cable.

The RCU should be protected against lightning.
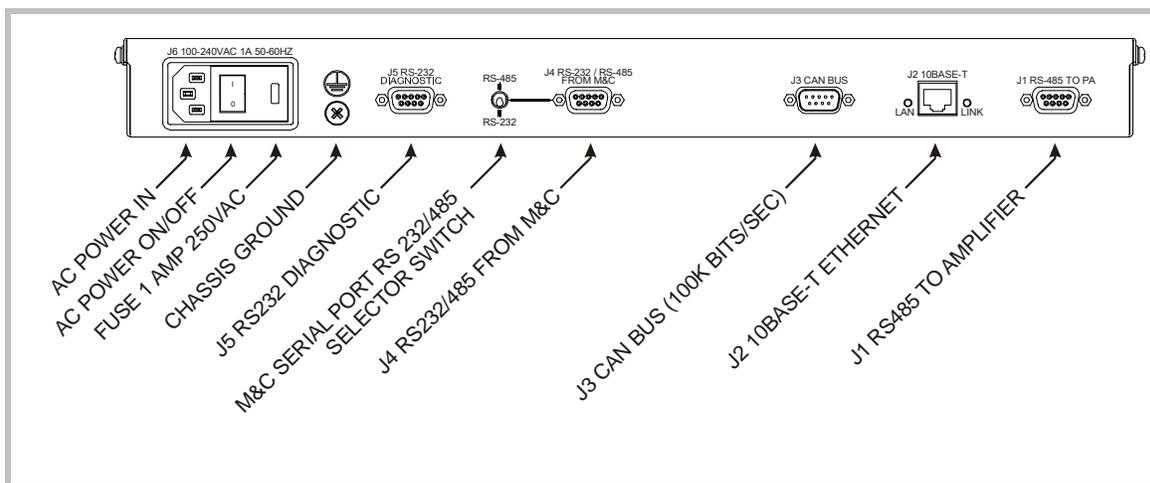
2.4.3 Remote Interfaces

J1 is the communication link to the Amplifier(s). It is a 9-pin socket, D-type DB9F connector, with pin assignments as shown in Table 1.

Interconnect cables between the RCU and Amplifier(s) should be wired for RS-422/485 (see table 1). A cable assembly similar to CPI drawing #01032322(if from the DB9 connector of the RCU to the circular connector of the outdoor type amplifier), or drawing #01023630 (if from the DB9 connector of the RCU to the DB9 connector of the rack mount type amplifier) should be used (see Chapter 4). The cable may be daisy-chained for up to 10 units in multi-drop configuration. All amplifiers MUST have a unique address.

Table 2-1. J1, 4-wire RS-422/485 Interface Pin-out

Pin	Description
1	GND
2	
3	RX-
4	TX-
5	
6	TX+
7	-
8	-
9	RX+

J2 is an Ethernet connection used between the RCU and M&C via LAN. It is an RJ-45 connector, with pin assignments as shown in Table 2. This connection may be used for software updates from CPI.

Table 2-2. J2, Ethernet 10-BASE-T Interface Pin-out

Pin	Description
1	TD+
2	TD-
3	RD+
4	TD-CT
5	RD-CT
6	RD-
7/8	-

J3 is a CAN-BUS connection and is for factory use only. It is a 9-pin socket, D-type DB9M connector, with pin assignments as shown in Table 3.

Table 2-3. J3, CAN-BUS Interface Pin-out

Pin	Description
1	-
2	CAN-L
3	GND
4	-
5	-
6	GND
7	CAN-H
8	-
9	-

J4 is a selectable RS-232/RS-485 connection used between the RCU and M&C. 9-pin socket, D-type DB9F connector, with pin assignments as shown in Table 4.

Table 2-4. J4, RS-232/RS-485 M&C Interface Pin-out

| Pin	Description
1	GND
2	RS-232TX
3	RS-232RX/RX-
4	TX-
5	GND
6	TX+
7	-
8	-
9	RX+

Chapter 3
OPERATION

3.1 Overview

The Rack Mount Remote Control Unit is normally operated in the REMOTE mode via the one of three serial interface types connected to an M&C system (via LAN for Ethernet).

- The front and rear panels of the Remote Control Unit are shown in Figure 3-1.

- The functions of the unit are split as shown in Figure 3-2.

- The Control Keys are discussed in Section 3.2.

- The Display and LED group are discussed in Section 3.3.

- Multi-drop functionality and Amplifier addressing are discussed in Section 3.4.

- Remote Control Panel Screens are discussed in Section 3.5.

- Firmware Updates are discussed in Section 3.6.
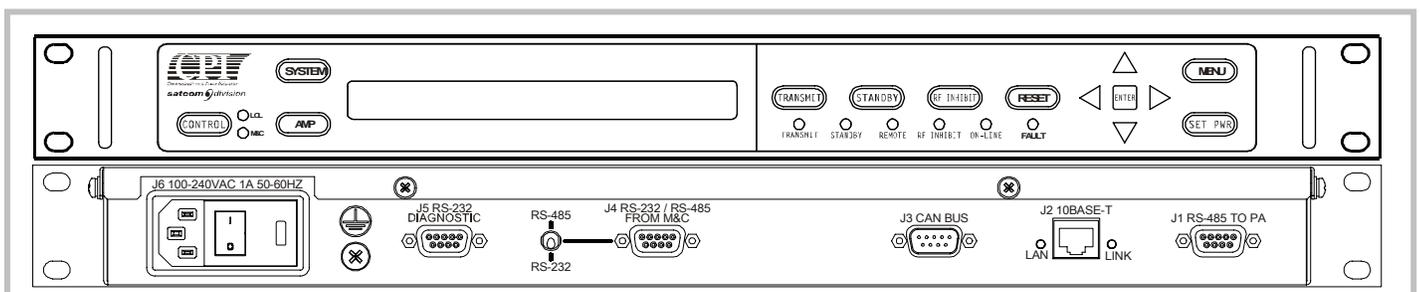
**Figure 3-1. Remote Control Unit Front and Rear Panels**

The AC Power switch is on the left end of the rear panel. The power required is 100 – 240VAC 50/60 Hz, single phase, < 10Watts.

3.2 Control Keys

The Remote Control Unit Control Keys are functionally grouped as described in Table 3-1. These keys are shown in Figure 3-2.

Table 3-1. Front Panel Control Keys

Key	Description
CONTROL	Sets the control point for the amplifier. Toggles between Local, Serial and Ethernet.
	In local mode the LCL LED will be lit and only the RCU can control the amplifiers. An M&C system can still query on the Serial or Ethernet ports.
	In Serial or Ethernet mode the M&C LED will be lit and only the Serial or the Ethernet port can control the amplifiers. The RCU can still query the amplifiers.
SYSTEM	If a switch system is detected (1:1, 1:1 Power Combined, 1:2):
	1st press: Switch system status screen
	2nd press: Switch system configuration screen
AMP	Shows the amplifier status screen. When several amplifiers are connected, use LEFT/RIGHT keys to switch amplifier as indicated by the amplifier number on the left-hand side of the display.
TRANSMIT	If the RCU control point is local, a transmit command will be sent to the amplifier.
STANDBY	If the RCU control point is local, a standby command will be sent to the amplifier.
RF INHIBIT	Sets/ Resets the RF Inhibit state of the Amplifier.
RESET	Resets the fault state of the Amplifier.
MENU	Displays the menu selections for the amplifier. Repeat pressing the key to show the menu for other amplifiers or to set RCU configuration
	(P shown on the left hand side of the display).
SET PWR	Displays the output power and attenuation set points of the amplifier.
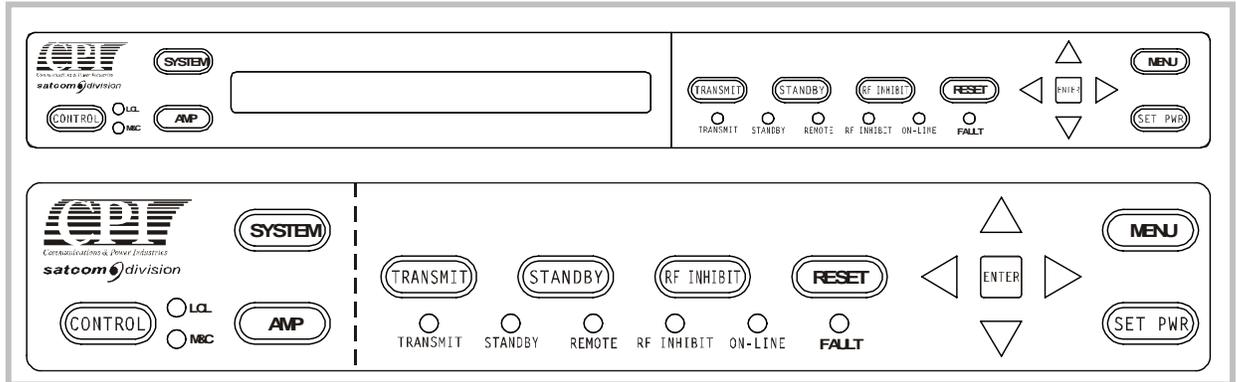
Figure 3-2. Remote Control Unit Control Keys

3.3 LED Group and Display

Refer to Table 3-2 for the Display and LED Group details. Figure 3-3 shows the Display and LED Groups.

Table 3-2. LED Group and Display Description

Indicator	Color	Description
LCL	Amber	On if the control point is set to Local.
M&C	Amber	On if the control point is set to Serial or Ethernet.
DISPLAY	Amber	Displays Amplifier and RCU information.
TRANSMIT	Green	On when the amplifier is in Transmit state.
STANDBY	Amber	On when the amplifier is in Standby state.
REMOTE	Amber	On if the amplifier is in Remote control mode. Off when in Local control mode.
FAULT	Red	Flashes whenever any amplifier is in fault state.
RF INHIBIT	Red	On if the amplifier is in RF Inhibit mode.
ONLINE	Amber	On if the amplifier is Online.

Note: When in System screen, Indicators showing the state of a single amplifier will be turned off (REMOTE, TRANSMIT, STANDBY, RF INHIBIT and ONLINE).
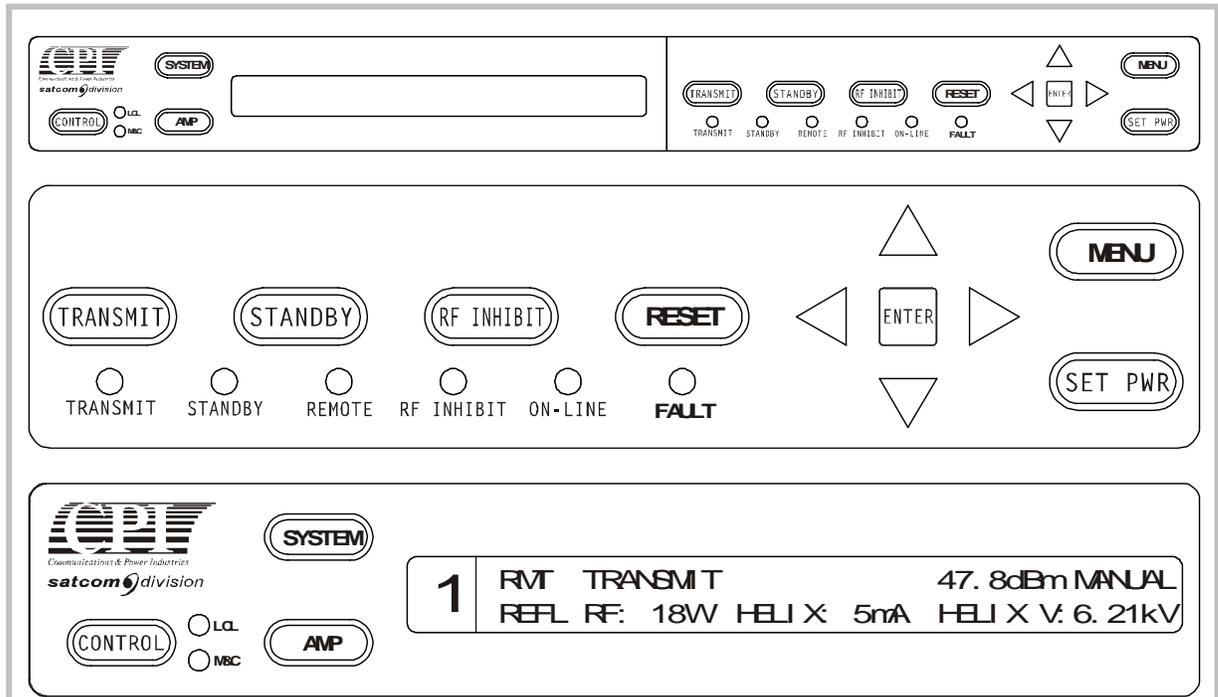
Figure 3-3. LED and Display Group

The menu tree shown in Figure 3-4 identifies the first level displayed messages associated with each of the main Remote Control Unit display modes with an Amplifier selected.

For a more complete Menu tree by individual product, refer to appendices in this manual.

Control Screen

LOCAL
SERIAL
ETHERNET
(TOGGLE CONTROL BUTTON)

Amp Screen

AMPLIFIER #
REMOTE/ LOCAL STATUS
FTD MM:SS/STANDBY/
BEAM ON SEQUENCE/
TRANSMIT
RF OUT XXX W
POWER MODE ALC/MAN
SELECTABLE METERS

Menu Screen

SETTINGS
METERS
METER LOG
TIME
VERSION

System Screen

SYSTEM CONFIGURATION
SYSTEM STATUS
(TOGGLE SYSTEM BUTTON)

Set Pwr Screen
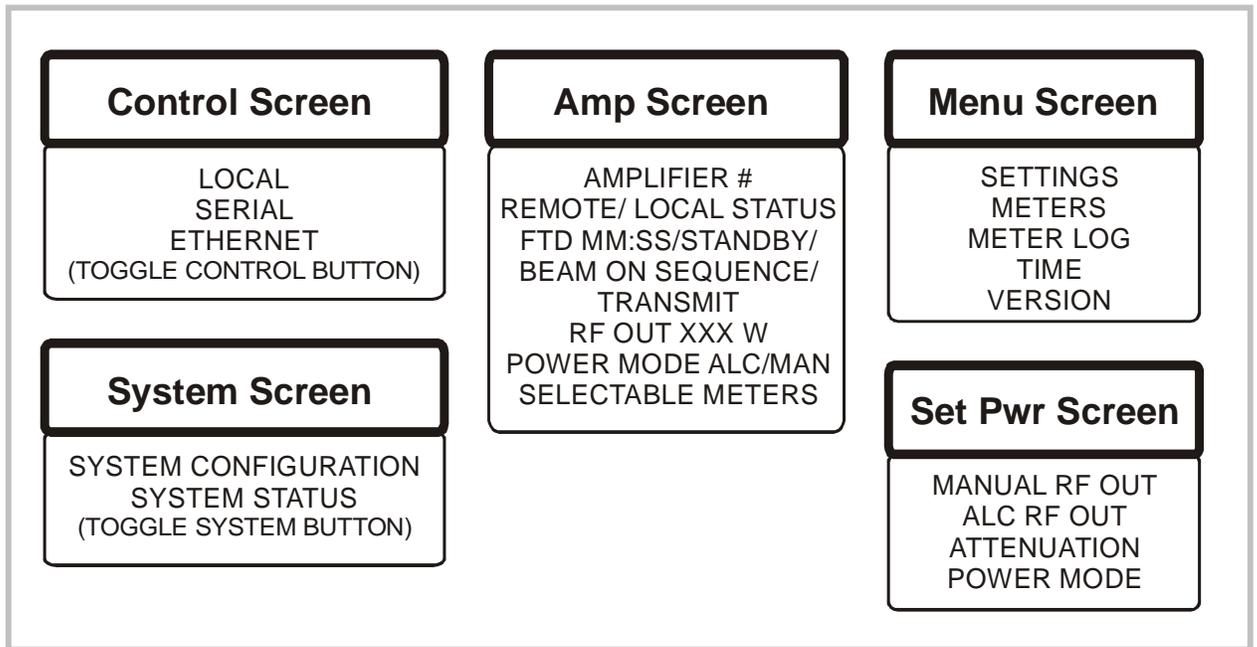
MANUAL RF OUT
ALC RF OUT
ATTENUATION
POWER MODE

Figure 3-4. Remote Control Unit Menu Tree

3.4 Multi-Drop Operation

Multi-Drop Functionality can control up to 10 units of the same type (types cannot be mixed) or a Single Switch System (1:1, 1:1 Power Combined, 1:2). After installation, the first step is to assign amplifier addresses.

Amplifier Address Assignment

The Remote Panel has a built-in utility to easily change the address   (from 48 to 111) of the units to be connected together in any of the above modes. In order to assign an address, only one unit can be operational at a time. All other amplifiers **must be powered off**.

For simplification of this section, key-in commands will be in *Italics* and items shown in the display will be in **Bold**.

After the first unit is powered up, press the *MENU* key until **P** is displayed at the left end of screen. Use the arrow keys to highlight **CIF Ports** box then press *ENTER* key twice. Use the *up/down* keys to highlight **AMPLIFIER ADDRESS RESCAN: NO**. Press the *up* arrow to change the display from **NO** to **YES** then press *ENTER*. The RCU will restart and rescan. Only one amplifier should be found. Press *MENU* and verify unit **1** and **SETTINGS** are selected. Press *ENTER* and then down arrow four times until **UNIT ADDRESS:** is displayed in the bottom left of screen. Press *ENTER* and then the left arrow until **UNIT ADDRESS:** is highlighted.

Use the *up/down* arrows to change to desired address. Press *ENTER* to set the change. The new address will only take effect after power cycling the amplifier.

The Remote Panel can also monitor and control the optional internal 1:1, 1:1 Power Combined or 1:2 switch controller in an amplifier if so equipped. The desired unit can be selected using the *AMP* or *left/right* keys as described above. Switch position is monitored using the *SYSTEM* key to scroll to the Status Screen until the switch position (**ON-line/OFF-line**) is shown on the display. The Amplifier state (**STBY/XMIT/FLT**), Output Power and switch mode (**AUTO** or **MANUAL**) is also displayed in this screen.

Press the *SYSTEM* key a second time to acquire the Configuration screen. The switch mode (**Auto/Manual**) and **ON-line/OFF-line** status of the selected unit can be manually changed by pressing the *ENTER* key and then the *left/right* arrow keys to toggle between positions to first place the units in Manual.

Once the desired amplifier is reached, pressing the *up/down* arrows followed by the *ENTER* key will change the state of the selection. If the Manual mode is selected, the switch position can be changed between A1 and A2 by using the *ENTER* key followed by the *left/right* arrow keys to cycle to either amplifier **ON-line** or **OFF-line** position. Once the desired amplifier is selected, use the *up/down* arrows to change state followed by the *ENTER* key to activate the selection.

If the units are to be used in a switch system they must also be given a **SYSTEM ID** number. After pressing *ENTER* to activate the UNIT ADDRESS, press *ENTER* again to select **SYSTEM ID:**. Use *up/down* arrows to select **SYSTEM ID:** from **1** to **3**. On a 1:2 switch system, the backup amplifier must be selected as **AMPLIFIER 3**. Press *ENTER* to activate selection. The amplifier power must now be recycled to allow the address changes to be accepted and set.

Power down the first amplifier, and repeat the above process for the remaining amplifiers, one at a time. Once all amplifiers in the chain have been assigned their own address, apply power to the entire system, including recycling to power to the RCU.

Operational Summary of the Remote Control Unit (RCU)

At start up, the Panel will scan the full address range looking for units and assigning a unit number to the units found (1 for the first, 2 for the second, etc).

> # SCANNING: 54

When an amplifier is found, the type and address will show briefly before scanning resumes. Scanning stops at address 111 or restarts at 48 if no amplifiers are found.

> # FOUND 400W AT 55

After the address scanning is complete, the display will show the Amplifier status screen or the System screen if a switch system was found. The number on the left-hand side of the display shows which amplifier is currently being monitored.

System Screen:

| A1: XMIT 53.3 dBm ON-line   A2: FLT 00.0 dBm OFF-line |
| A3: XMIT 52.1 dBm ON-line MANUAL |

Amplifier Screen:

| 1 | RMT TRANSMIT   47.8 dBm MANUAL |
| | REFL RF: 18 W   HELIX I: 5 mA   HELIX V: 8.61 kV |

The RCU will continue to monitor the fault status of all units found but can only display the settings and meter readings for one unit at a time. To select a different unit, press the *AMP* key or press the *left/right* arrows. The address of the newly selected unit is shown at the far left side of the display. Pressing the *ENTER* key takes you to the Main menu for that unit.

If a fault occurs in a unit not currently selected, the Panel will automatically switch to the faulted unit and display its fault status. Other units can be selected as described above, but the alarm will sound as long as any unit has a fault.

If another fault occurs in a unit other than the first faulted one, the Panel will switch to the second faulted unit. The Remote Panel will always switch if there is a communication fault.

The Menu selections for the amplifier are shown when the *MENU* key is pressed. Press the *left/right* arrows or repeat pressing the *MENU* key to show the menu selections for other amplifiers. Use the *up/down* arrows to make a selection then press *ENTER* to go to the selected screen.

| 1 | □ SETTINGS   □ METERS   □METER LOG |
| | □ TIME   □VERSION |

To configure the RCU, change the amplifier number by pressing the *MENU* or *left/right* arrows until a **P** is shown on left-hand side of the display. The Menu now shows the configuration selections for the RCU. Use the *up/down* keys to make a selection then press *ENTER* to go to the selected screen.

| P | □UNITS   □BUZZER   □DISPLAY |
| | □IP CONFIG   □CIF PORT   □VERSION |

3.5 Remote Control Panel Screens

System Status Screen

If a switch system is detected when the RCU scans for amplifiers, the switch system status will be shown when the *SYSTEM* key is pressed. The system screen shows the current state, power output and the amplifier **On-line/ Off-line** status. If the amplifier has a switch controller installed, the switch controller state will be shown (**Manual** or **Auto**).

1:1 System

```
A1:  XMIT 53.3 dBm   MANUAL     ON-line
A2:  XMIT 53.2 dBm   MANUAL        Off-line
```

1:2 System

```
A1: XMIT 53.3 dBm ON-line  A2: FLT 00.0 dBm OFF-line
A3: XMIT 52.1 dBm ON-line  MANUAL
```

1:1 Power Combined System

```
A1: XMIT   53.3 dBm   LOAD      MANUAL
A2: XMIT   53.2 dBm   OUT       MANUAL
```

System Configuration Screen

To enter the system configuration screen, press the *SYSTEM* key again in the System status screen.

In the system configuration screen the amplifiers can be set On-line or Off-line and the switch control system can be set to Auto or Manual. The amplifier **On-line/Off-line** status can only be changed if the switch control system is in Manual mode.

1:1 System

```
A1:   MANUAL     ON-line
A3:   MANUAL     OFF-line
```

1:2 System

```
A1:  ON-line        A2: OFF-line
A3:  MANUAL         ON-line
```

For the 1:1 power combined system, also the individual switches can be toggled.

1:1 Power Combined System

A1: LOAD MANUAL	SW1: 2	SW2: 1	SW3:2
A3: OUT MANUAL			

Amplifier Screen

The amplifier screen is displayed when the *AMP* key is pressed. The number of the selected amplifier is shown on the left-hand side of the display. The top line shows the amplifier control mode (**Local** or **Remote**), the amplifier state, current RF output power and power mode (**Manual** or **ALC**). The second line shows the meter readings for the amplifier. Use the *up/down* arrows to browse through the meter readings.

To show the status of another amplifier, hit the *AMP* key again or use the *left/right* keys.

1	RMT TRANSMIT 47.8 dBm MANUAL
	REFL RF: 18 W HELIX I: 5 mA HELIX V: 8.61 kV

Menu Screen

The Menu selections for the amplifier are shown when the *MENU* key is pressed. Press the *left/right* arrows or repeat pressing the *MENU* key to show the menu selections for other amplifiers. Use the *up/down* arrows to make a selection and press *ENTER* to go to the selected screen.

2	□SETTINGS	□METERS	□METER LOG
	□TIME	□VERSION	

To configure the RCU, change the amplifier number by pressing the *MENU* or *left/right* arrows until a '**P**' is shown on left-hand side of the display.

P	□UNITS	□BUZZER	□DISPLAY
	□IP CONFIG	□CIF PORT	□VERSION

The Menu now shows the configuration selections for the RCU. Use the *up/down* arrows to make a selection and press *ENTER* to go to the selected screen.

Settings Screens

The settings screens show the current power set point, high/low alarm and fault trip points and other configurable items for the Amplifier. These settings can only be changed if the amplifier is in Remote mode (REMOTE LED is lit on the front panel of the Amplifier) and the RCU control is set to Local (LCL LED is lit).

| 1 | MANUAL RF OUT: 0.0 dBm ALC RF OUT: 0.0 dBm
REFL RF FAULT: 50 W   ATTENUATION: 20.0 dB |

| 1 | LOW RF ALARM: 0 W   LOW RF FAULT: 0 W
HIGH RF ALARM: 700 W   HIGH RF FAULT: 750 W |

| 1 | HLX O/V FLT: 12.70 kV HLX O/I FLT: 10 mA
HLX U/V FLT: 1.70 kV   HLX V/STB FLT: 4.00 kV |

| 1 | RELAY 1:   5   RELAY 2:   5
AUTO LOG TIME: 1.0 M   RST METERLOG? NO |

If only 1 amplifier is connected to the RCU, the address of the amplifier (Unit Address) can be changed (range 48-111). The address change takes effect when the amplifier is re-powered. If the amplifier is a part of a switch system, also the system ID must be set: 1 or 2 for AMP1 or AMP2 and 3 for the backup amplifier.

| 1 | RST TO DFLTS? NO |

To reset the settings to default, change the **RST TO DFLTS** field to **YES** and press *ENTER*. All settings will be reset to factory defaults except for the following: Helix Over Voltage Fault Trip Point, Helix Under Voltage Fault Trip Point, Helix Over Current Fault Trip Point and CIF Unit Address.

Meter Readings Screens

Shows the meter readings for the selected amplifier.

| 1 | RF OUT: 47.8 dBm   HELIX V: 8.61 kV
REFLECTED RF: 18 W   HELIX I: 5 mA |

1	CABINET TEMP: 27°C FAN CONTROL: 4.0 V
	TUBE TEMP: 41°C ATTENUATION: 20 dB

Meter Log Screens

To browse the meter log, press the *ENTER* key and then change the meter log index using the *up/down* arrows. The time of entry and the event will update as you scroll through the meter log. To browse the meter readings for the selected meter log entry, press *ENTER* and then use the *up/down* arrows to scroll through the meter readings.

1	METER LOG: 0011 11:57:12 1/29/2006
	STANDBY

1	METER LOG: 0011 11:57:12 1/29/2006
	RF OUT: 59 W REFL RF: 18 W ATTEN: 20 dB

1	METER LOG: 0011 11:57:12 1/29/2006
	HLX I: 5 mA HLX V: 8.61 kV FAN CTRL: 4.0 V

1	METER LOG: 0011 11:57:12 1/29/2006
	CABINET: 25 °C TUBE: 41°C

Time Screens

The first screen shows the current time on the selected amplifier.

To edit the time press *ENTER* and then use the *left/right* arrows to select a field and up/down arrows to change the value. Press *ENTER* to set the time. The time will be set on all amplifiers connected to the RCU.

Standby/Transmit or **Unit on Time** is shown in **DAYS: HRS: MIN: SEC** format.

1	TIME: 13:31:41 01/29/2006
	STANDBY TIME: 001:10:52:22

1	UNIT ON TIME: 002:08:25:33
	TRANSMIT TIME: 000:18:49:26

1	HEATER TIME DELAY: 00:00

Amplifier Version

The amplifier version screen shows the boot and main software versions of the amplifier.

1	BOOT VERSION: 01.00.03 MAIN VERSION: 01.00.17

Remote Control Unit Configuration

To get to the RCU configuration menu, press the *MENU* button until a '**P**' is shown on the left-hand side of the display. Use the *up/down* arrows to make a selection and press the *ENTER* key to go to the selected screen.

P	□UNITS □BUZZER □DISPLAY □IP CONFIG □CIF PORTS □VERSION

RF Units

Set the RF output units shown on the System and Amplifier status screens to either **Watts** or **dBm**.

P	RF OUTPUT UNITS: dBm

Audible Buzzer

This will Enable/Disable the Alarm and Keypad buzzer.

P	MUTE ALARM : NO MUTE KEYPAD : NO

Display

This sets display brightness and enables/disables the screen saver. The screen saver will turn the brightness of the display to the lowest setting (12.5%) and reverse the display approximately every 3 seconds. The screen saver is activated approximately 20 minutes after the last key-press. The screen saver is de-activated when a key is pressed on the front panel.

P	DISPLAY BRIGHTNESS: 50%
	SCREEN SAVER: YES

IP Configuration

Configures the IP parameters for the RCU.

P	IP ADDRESS:	192.168.100.010
	IP MASK:	255.255.255.000

CIF Port Settings

The first line sets the baud rate for the serial CIF port (J4) to the M & C. The rate can be set to 9600, 19200 or 38400 baud. The second line resets the RCU and starts a new scan for amplifiers.

P	M&C SERIAL PORT BAUD RATE: 9600
	AMPLIFIER ADDRESS RESCAN: NO

Serial communications at the amplifier are factory preset to the following:

BAUD RATE: 9600

CHECK SUM TYPE: Longitudinal

PARITY: Even

PROTOCOL: STX/ETX

WORD LENGTH: 7-Bit

Communications to ports J1 and J4 must be set to match these parameters, except the baud rate from the RCU to J4 can be changed as noted above.

Version

This shows the version of the boot and main software of the RCU.

1	BOOT VERSION:	01.00.02
	MAIN VERSION:	01.01.04

Set Power Screen

The RCU Power Screen shows the current RF output power and attenuation set points of the amplifier. To make a change, press *ENTER* then use the *left/right* arrows to select field to be modified. Use the *up/down* arrows to change the value.

The new setting is immediately sent to the amplifier (without pressing the *ENTER* key).

The lower right corner of the display shows the current power mode status of the amplifier (**Manual** or **ALC**).

1	MANUAL RF OUT: 52.1 dBm ALC RF OUT: 52.1 dBm ATTENUATION: 8.4 dB POWER MODE: MANUAL

Remote M&C

The amplifiers can be monitored using either the serial port (RS-232/RS-422) on J4 or the LAN port on J2. When using the serial connection make sure to set the switch at the rear panel to reflect the serial interface used. Also configure the CIF Baud rate in the RCU configuration screen.

To monitor the amplifiers using a LAN connection, first set the appropriate IP parameters in the RCU configuration screen. Then make a TCP connection on socket 50000 to the RCU. The CIF protocol is the same as for the serial interface.

Although both the serial and the LAN interface can monitor the amplifiers at the same time, only one interface has control at any one time. The control point can be set using the CONTROL key on the front panel.

| CIF CONTROL POINT:
□LOCAL □SERIAL □ETHERNET |
|---|

3.6 Firmware Updates

The main code on the RCU can be updated either through the diagnostic port (J5/RS-232) or by using FTP over the LAN (J2) connector.

## Updating Firmware using HyperTerminal in Windows

Turn off the RCU and connect a cable between J5 and the PC serial COM port. Start HyperTerminal and set the communications parameters as shown below.
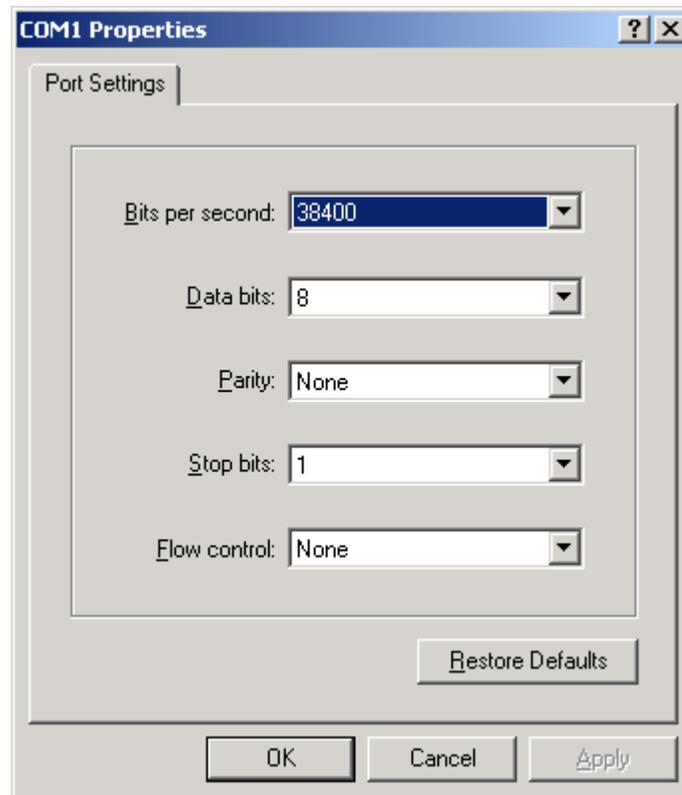
Next, open the Transfer/Send File dialog and select the file containing the firmware update. Set the transfer protocol to 1K Xmodem.
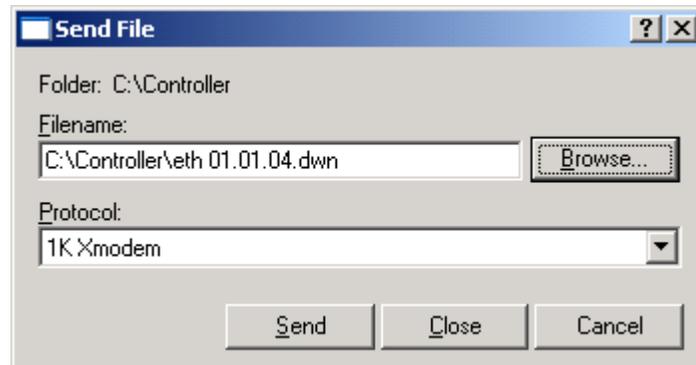
Press the Send button, then turn on the RCU and the file transfer should start.
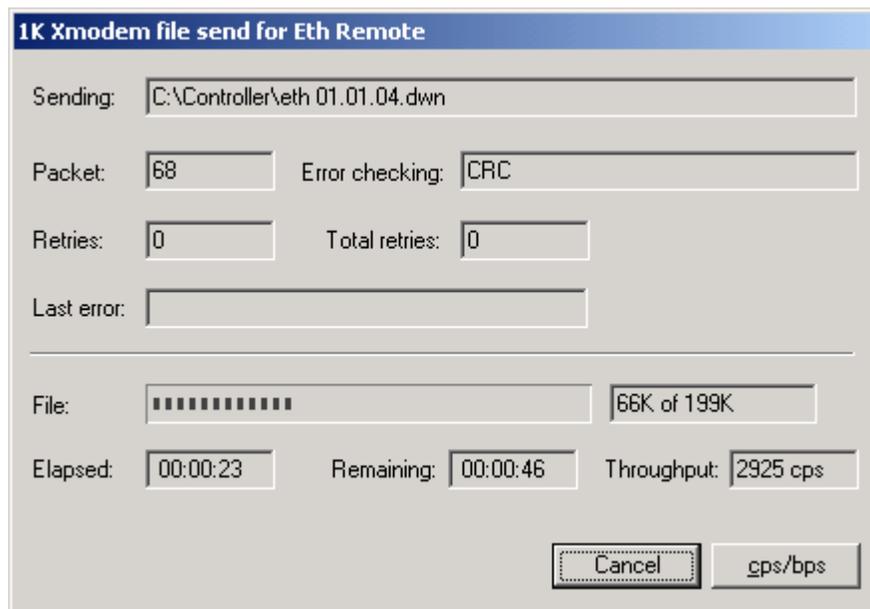
When the update is finished, the RCU will automatically reboot using the new firmware.

Updating Firmware using FTP from Internet Explorer

Set the IP parameters of the RCU to match the setting for the LAN it is to be connected to.

Using Internet Explorer, make an FTP connection to the RCU by typing ftp:// and then the IP address of the RCU. Press Enter to make a connection then drag and drop the firmware file to the Internet Explorer window.
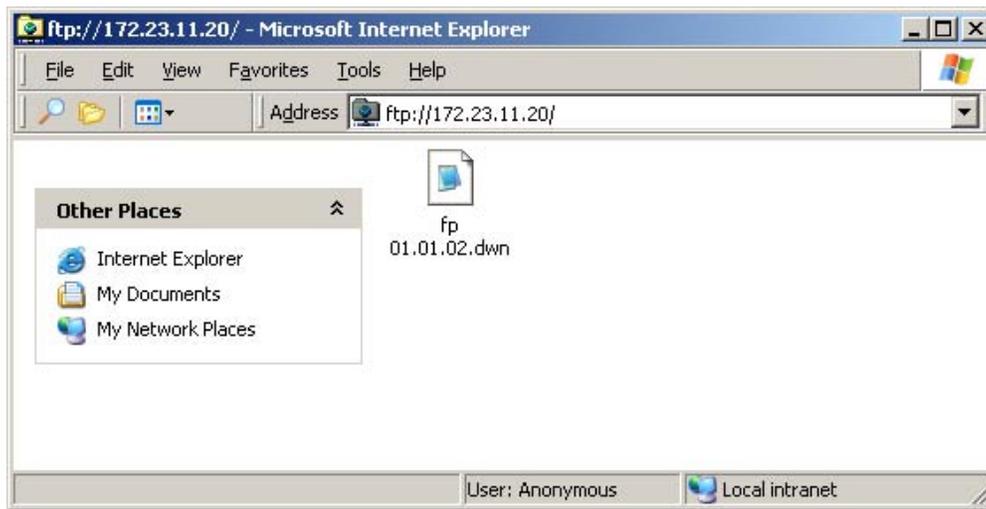
When the file transfer is done, close the Internet Explorer window and the RCU will start programming the flash memory. When the flash memory has been reprogrammed, the RCU will automatically restart.

Programming Flash, Please Wait...

Remote Panel Jumper Settings

There are three configurable termination jumpers on the RCU logic card. JP1 is used to terminate the CAN Bus connection (J3 on rear panel). JP2 is used to terminate the RS-485 connection to the amplifiers (J1 on rear panel). JP3 is used to terminate the RS-485 connection from the M & C system (J4 on rear panel). Figure 3-5 shows the physical locations of the jumpers on the logic card.
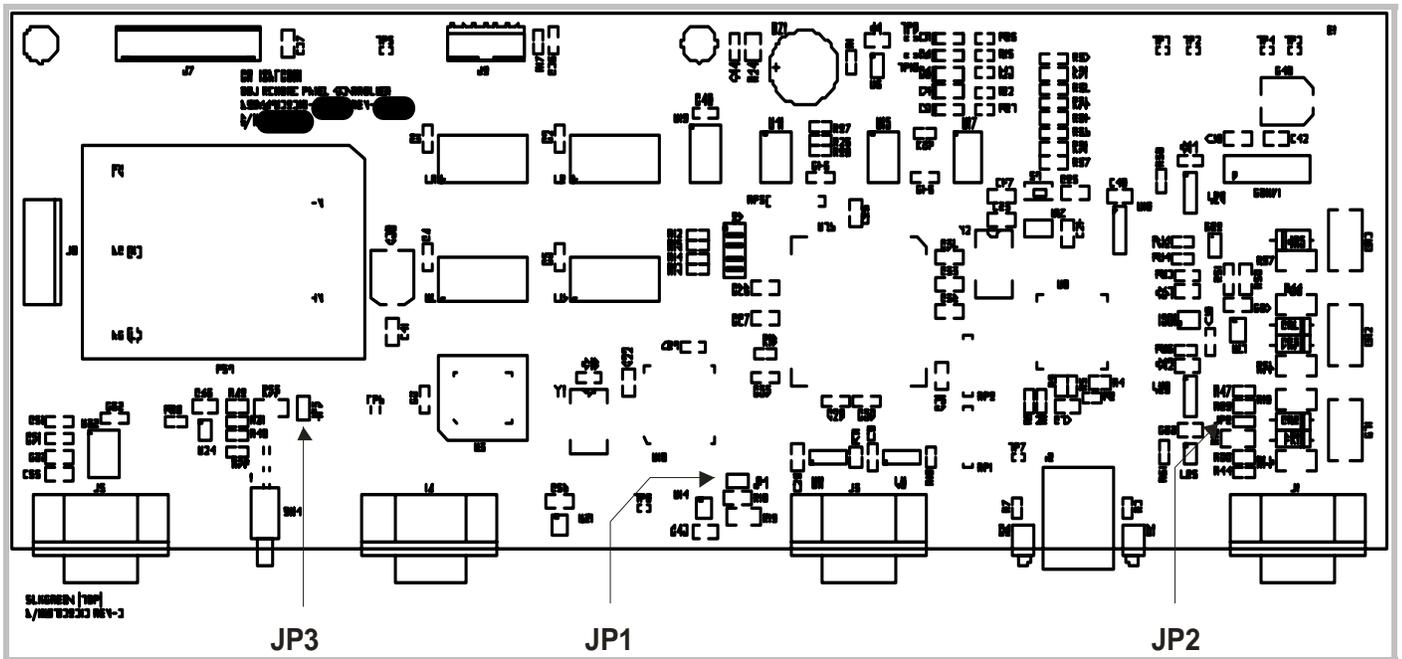

Figure 3-5. Remote Control Unit Jumper locations

3.7 Detailed Specifications

ENVIRONMENTAL:

SIZE: One Rack Unit High X 19'' Wide X 10'' Deep

WEIGHT: 5 LBS (estimated)

POWER: 100 – 240VAC 50/60 Hz, < 10Watts

OPERATING TEMPERATURE: 0 - +50C

INTERFACES WITH THE FOLLOWING ODU'S:

200W, 250W, 400W, 750W

FRONT PANEL DISPLAY AND INDICATORS:

DISPLAY:

16X280 Vacuum Fluorescent Graphics Display

137X11MM Display Area

4.74X2.34MM Minimum Character Size (5X7 Dots)

Blue / Green Display Color

8 Levels of Brightness Control

DISPLAY SCREENS:

Switch System

Status

Configuration

Amplifier

Status	Settings
Menu	Meter Log
Meters	Time

Panel System Configuration

Units	IP Config
Buzzer	CIF Port
Display	Version

Chapter 4
Drawings

The Rack Mount Remote Control Unit drawings listed below are included in this chapter.

Drawing Number	Title
01023630-XX	Cable Assembly, Remote Panel to PA (XX refers to cable length-up to 10 feet)
01032300	Assembly, 1 RU Mimic CTRL*
01032301	Outline Drawing, 1 RU Mimic CTRL
01032303-00	Ship Kit, 1 RU Mimic CTRL
01032304	Interconnect Diagram, 1 RU Mimic CTRL
01032322-XX	Cable, Remote Single Drop, RS-422 (XX refers to cable length-up to 10 feet)
01039983-XX	Interconnect Diagram Cable, Remote Multi-Drop, RS-422 (XX refers to cable length-up to 10 feet)

NOTE:

Paper Manual: Printed drawings follow this page.

CDROM Manual: Drawing files are in the "Drawing" folder.

* Refer to service manual for respective LM's.

Drawings are in numerical order.

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APPENDIX A
Warranty & Support

For details, refer to separate supplement included with this manual.

HARD COPY: Refer to Warranty and Support supplement located at the front of this manual.

CD: Refer to separate folder titled "Warranty and Support"

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APPENDIX B
Typical Functional Trees

The trees displayed in Figures B-1 and B-2 are a roadmap to viewing, selecting and modifying the various functions of the RCU. Figure B-1 describes the controls that will be found using the MENU key. Figure B-2 describes the controls that will be found using the AMP, SYSTEM, CONTROL and SET PWR keys.

Find the item on the tree that you wish to view or modify then follow the map, pressing the appropriate keys as shown, until you reach the function you the item.

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