



**TELEDYNE
PARADISE DATACOM**
A Teledyne Technologies Company

Indoor IF to L-Band Rack-Mountable Block Up/Down Converter Installation/Operation Manual



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Teledyne Paradise Datacom, a Teledyne Telecommunications company, is a single source for high power solid state amplifiers (SSPAs), Low Noise Amplifiers (LNAs), Block Up Converters (BUCs), and Modem products. Operating out of two primary locations, Witham, United Kingdom, and State College, PA, USA, Teledyne Paradise Datacom has a 20 year history of providing innovative solutions to enable satellite uplinks, battlefield communications, and cellular backhaul.

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1.0 Introduction

Teledyne Paradise Datacom's IBC Series of Rack-Mountable Block Up/Down Converters has been designed to offer the maximum utility in satellite communication systems while maintaining the highest possible reliability.

The converters are designed to work over the 950 to 2050 MHz L-Band RF frequency range and the 70 or 140MHz IF frequency range. Each individual chassis is able to accommodate up to two converter modules with up and down combinations being acceptable. The converter also can be configured as a single, dual independent or redundant. The IBCs are capable of using an external or internal 10 MHz reference signal to phase lock the internal local oscillators.

A wide range of monitor and control is standard and includes

- Standard Teledyne Paradise Datacom RS485/232
- Ethernet interface supporting:
 - ◆ UDP
 - ◆ SNMP
 - ◆ Internal Web Browser

1.1 Physical Mounting

The Indoor Dual Converters are designed to be installed with any standard 19 inch equipment cabinet or rack and requires 1 Rack Unit (RU) mounting space (1.75 inches or 4.44 cm) vertically and 19 inches (48.26cm) of depth. See **Figure 1-1**. Total rack depth should include room for cabling (2 to 3 inches). The rear panel will have power entry from both sides of the chassis and cabling in between.



Figure 1-1: Indoor Dual Converter Unit

1.2 Physical Characteristics

The Rack-Mount Block Converter is packaged in a standard 19" EIA indoor rack mount chassis. The Indoor Converter is capable of accepting any two L-Band to IF band Up or Down converter modules. These converter modules are interchangeable and are hot-swappable. The unit also contains a single control card for M&C, module detection, control and fault indication. The unit also comes with dual redundant power supplies and power entry modules.

1.3 Rear Panel Interfaces

Figure 1-2 shows the main rear panel interface, with a variety of connectors. All converter connections must be made with appropriate mating connectors, as described below.

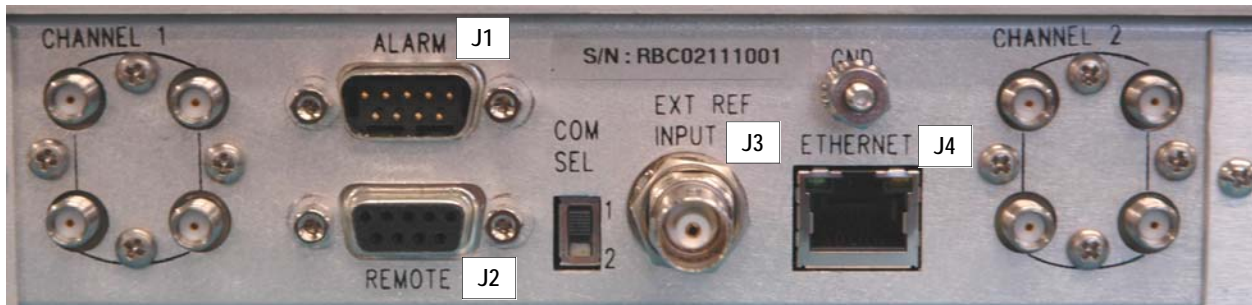


Figure 1-2: Rear Panel View

1.3.1 Alarm Port Connector (J1) (ALARM)

This connector is a 9-pin D-sub (M). This is a status port that allows monitoring of several system status indications at the back panel.

A form C is a single pole double throw, SPDT, where the common pin is normally connected to one of the contacts (de-energized), and then flips over to the other contact upon energizing the coil. See **Figure 1-3**.

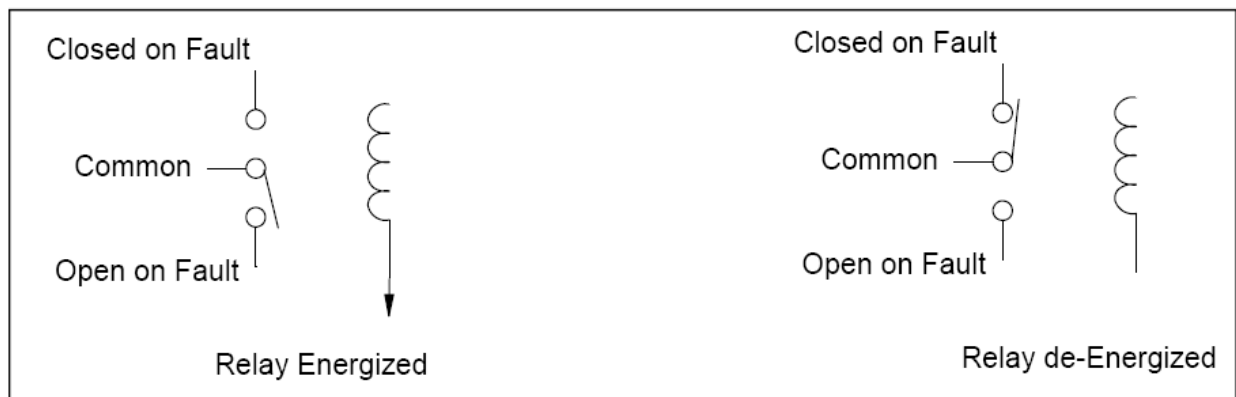


Figure 1-3: Form C SPDT relay

The pin-outs for this connector are shown in **Table 1-1**.

Table 1-1: Alarm Port Connector (J1)

PIN	DESCRIPTION	DETAILS
1	Form-C normally Closed A side	SUM_A_NC
2	Form-C normally Open A side	SUM_A_NO
3	Form-C Common B side	SUM_B_COM
4	No Connect	NC
5	No Connect	NC
6	Form-C Common A side	SUM_A_COM
7	Form-C normally Closed B side	SUM_B_NC
8	Form-C normally Open B side	SUM_B_NO
9	No Connect	NC

1.3.2 Remote Monitor & Control Connector (J2) (REMOTE)

This connector is an 9-Pin D-sub (F) connector and is used to transmit and receive the monitor and control signals between the converter and a modem or computer.

Table 1-2 shows the Remote Monitor & Control Connector (J2) pin-outs.

Table 1-2: Remote Monitor & Control Connector (J2)

PIN	DESCRIPTION	DETAILS
1	No Connect	NC
2	Serial Communication	RS-232-TX
3	Serial Communication	RS-232-RX
4	No Connect	NC
5	Serial Communication	GROUND
6	Serial Communication	RS-485RX (+)
7	Serial Communication	RS-484RX (-)
8	Serial Communication	RS-485TX(+)
9	Serial Communication	RS-485TX(-)

1.3.3 External Reference Input (J3) (EXT REF INPUT)

External reference input allows the operator to synchronize the synthesizer for a phase coherent system with an external 10 MHz reference, or optionally a 5 MHz reference. The connector is a BNC-type (F) connector. After an external reference is applied the front panel LED will illuminate, the internal reference will be muted and the PLL will lose lock temporarily before acquiring lock to the new external reference.

When the external reference is removed the PLL will lose lock, the front panel LED will turn off the internal reference will un-mute and the PLL will re-acquire and lock.

1.3.4 RF Ethernet (J4)

The Ethernet connector can be used for Monitor & Control functions of the converter. The Physical interface is a standard RJ-45 connector.

1.3.5 Communication Selection Switch (COM SEL)

The Communication Selection Switch is a 2-pole switch which selects between RS-232 or RS-485 modes of communication.

When Position 1 is selected, the unit is set for communication via RS-232. When Position 2 is selected, the unit is set for communication via RS-485.



Figure 1-4: COM SEL switch

1.3.6 IF Connector (IF)

The IF Connector is an 50 ohm BNC connector. This connector is standard on both up and down converter modules. Refer to **Figure 1-5**.

Warning! Do not apply DC voltage to the IF connector.

1.3.7 RF Connector (RF)

The RF Connector is an “N” type female. This connector is standard on both up and down converter modules. Refer to **Figure 1-5**.

Warning! Do not apply DC voltage to the RF connector.



Figure 1-5: IF/RF Connectors

1.3.8 Redundant Failsafe Relays

The redundant failsafe relays are RF Transfer switches. The frequency range for the switches is DC to 18GHz with an insertion loss of 0.2 dB and isolation of 80 dB. These switches come standard with SMA connectors and are only installed in redundant systems. Refer to **Figure 1-6**.



Figure 1-6: Fault Relays

1.3.9 Power Entry Module

The power entry modules are snap-in – factory replaceable only – units that are Appliance Inlet Protection Class 1, line filters. They have VDE, UL and CSA approvals and are rated for 10A @ 250VAC at 50Hz and 15A @125VAC at 60Hz. See **Figure 1-7**.



Figure 1-7: Power Entry Modules

Two IEC line cords are included with each unit. The line cords are 3x14 AWG rated for 300V and 60 °C. The power supply cords are the mains disconnect device; the equipment should be located close to an easily accessible wall socket outlet (90-265 VAC, 47-63 Hz). To disconnect the unit from supply mains, unplug the power cords from the wall outlet or appliance coupler.

Each power supply supplies power to both converter modules; however, both power cords should be utilized for dual power supply redundancy.

Maximum power consumption for the unit is 0.30 A at 100V or 0.15 A at 240V.

1.3.10 Chassis Ground Stud

This is a #6 stud for connecting a safety earth conductor directly to the chassis of the unit.

1.4 Front Panel

Figure 1-8 shows the front panel of the Indoor Converter.



Figure 1-8: Front Panel view

1.4.1 LED indicators

Five (5) LEDs indicate operation status for the Indoor Converter. These include Power, Channel 1, Channel 2, External Reference and Redundancy.

1.4.1.1 Power

When illuminated, this LED indicates that there is power applied to at least one internal power supply.

1.4.1.2 Channel 1

Green indicates that the channel has a recognized converter module present. Amber indicates the channel does not have a recognized module present. Red indicates the channel oscillator has lost lock and has been muted. If in a redundant configuration, the RF path will be switched to the back up converter module.

1.4.1.3 Channel 2

Green indicates that the channel has a recognized converter module present. Amber indicate the channel does not have a recognized module present. Red indicates the channel oscillator has lost lock and has been muted.

1.4.1.4 External Reference

This is illuminated Green when an external reference has been detected, otherwise it is off.

1.4.1.5 Redundant

When illuminated Green the unit is populated with two of the same module types and has been configured for redundant operation.

1.4.2 LCD Display

The backlit LCD is a graphical display formatted to give two lines of 40 text characters and is legible in strong ambient light.

1.4.3 Front Panel Menu Organization

In order to avoid unnecessary duplication of information we will only describe the menu order and traversal methods in this section. The Keypad section will describe the data input methods, and the meaning of the fields are described in the terminal page section of this manual

The Front Panel Menus are presented in the same order and organization as the Terminal or Web Interface pages. In this way the front panel user is provided a sliding two-line view of the pages provided to a terminal user.

In order to provide symmetric navigation between a Front Panel user and a Terminal or Web user, the navigation is made to conform to a page-like interface. Top level Left/Right navigation allows the user to select a Page. Once a page is selected, Left/Right navigation will wrap Last/First sections within a page.

The top-most menu corresponds to the terminal page selection. The second tier corresponds to sectional areas within a terminal page. The lower tier menus correspond to the fields within a page's section or column. These will be referred to as:

- Page List Menus
- Section List Menus
- Sectional Field Menus

1.4.3.1 Page List Menu Navigation

RightArrow navigation will move the cursor from field to field and will wrap from the last field to the first field

LeftArrow navigation will move the cursor from field to field and will wrap from the first field to the last field

The user enters a page by pressing the indicated number on the numeric section of the keypad or using the LeftArrow or RightArrow buttons to place the cursor at the desired selection and then pressing either the Enter or the DownArrow button.

1.4.3.2 Section List Menu Navigation

RightArrow navigation will move the cursor from field to field. If the cursor is in the last field of the menu; then the menu will also be changed and the cursor will be placed on the first field of the next menu. If the field is the final field of the final menu, the cursor will wrap to the first field of the first menu.

LeftArrow navigation will move the cursor from field to field. If the cursor is in the first field of the menu; then the menu will also be changed and the cursor will be placed on the last field of the previous menu. If the field is the first field of the first menu the cursor will wrap to the last field of the last menu.

The user enters a page by pressing the indicated number on the numeric section of the key pad or using the LeftArrow or RightArrow buttons to place the cursor at the desired selection and then pressing either the Enter or the DownArrow button.

Section List Menu traversal amounts to a wrapping of page selections at the Page List level. The example below shows how the RightArrow button would traverse the ring of the Section List menus.

```
USER ALARMS, MASKS & STATUS
1) SYstem   →      2) ASide           →      3) BSide           →

OPERATOR CONTROLS & SETTINGS
1) SYstem   →      2) ASide           →      3) BSide           →

IP CONFIG: MASKS & ADDRESSES
1) Host     → 2) Gateway           →      3) SNmp           →

USER ALARMS, MASKS & STATUS
1) SYstem   →      2) ASide           →      3) BSide           →
```

1.4.3.3 Sectional Field Menu Navigation

Typically there is only one editable field per line; but there are instances of multiple editable fields per lines. An IP address with its mask is an example of a five field entry area; one for each octet and one for the mask.

RightArrow navigation will move the cursor from field to field. If the cursor is in the last field of the menu; then the menu will also be changed and the cursor will be placed on the first field of the next menu. If the field is the final field of the final menu, the cursor will wrap to the first field of the first menu.

LeftArrow navigation will move the cursor from field to field. If the cursor is in the first field of the menu; then the menu will also be changed and the cursor will be placed on the last field of the previous menu. If the field is the first field of the first menu the cursor will wrap to the last field of the last menu.

Sectional Field Menu Right/Left traversal amounts to a wrapping of page sections. The example below shows how the RightArrow button would traverse the ring of the sectional field menus.

UpArrow navigation will move the cursor to the last editable field in the parent menu. If the menu is the first in the Sectional Field chain then the user will be returned to the entry point from the Sectional Menu. UpArrow traversal will not wrap.

DownArrow navigation will move the cursor to the first editable field in a sub-menu, if a sub-menu exists. If the current menu is the bottom menu in the chain then the down arrow will return the user to the top most menu within that page and section.

Sectional Field Menu DownArrow traversal amounts to a wrapping of fields within a page section. The example below shows how the DownArrow button would traverse the ring of the sectional field menus.

```

USER ALARMS, MASKS & STATUS
1) SYstem      2)ASide      3)BSide
                ↓
ASide USER ALARMS
      PS: Alarm-Off      Mask-ON
                ↓
ASide USER ALARMS
      5V: Alarm-ON      Mask-ON
                ↓
...
                ↓
ASide USER ALARMS
      USERMute:: True
                ↓
ASide USER ALARMS (TOP Menu of ASide Section)
      PS: Alarm-Off      Mask-ON

```

1.4.4 Front Panel Display Descriptions

The current Page and Section title are always displayed on the top line of the display and the cursor is only placed at editable fields

This manual uses the strings “Line 1 — “, “Line 2 — “, or “Line 2e — “ to describe the front panel menus. These characters are not displayed on the front panel. If the letter ‘e’ is displayed after the line number on a menu that indicates that there is an editable field on that line; otherwise the information is read only. In this manual editable fields use *italicized* text

In this manual, when Line 1 is the same for multiple menus it is only displayed once with multiple Line 2 entries afterward. This indicates that the Line 1 will not change but the second line will change when the DownArrow key is pressed to go to the next child menu.

Line 1 also has a mode field which is blank when the user is navigating the front panel. If the user has pressed the Enter Key while the cursor is positioned at an editable field the key pad will be placed into edit mode. Edit mode is reflected in the status area of line 1 by displaying the word “EDIT”. So the first line appears similar to

```
MENU TITLE STRING           "EDIT" | BLANK
```

1.4.4.1 Splash Menu

This corresponds with Page 0 on the Terminal and Web Interfaces.

```
Line 1 - TELEDYNE PARADISE DATACOM Inc.  
Line 2 - (c)2009-10, All rights reserved
```

This is a read-only view displayed directly after powering the unit. Any key press will clear this menu and present the top level menu.

1.4.4.2 Top Level Menu

This is a Page List Menu, and corresponds with the page selection field on the Terminal displays and the navigation window in the Web Interface. This Menu is read-only and contains a three item selection list. This is the primary entry point to the three areas of information presented as pages in the Terminal and Web Interfaces.

```
Line 1 - 1)USER          2) OPERATOR      3) IP CONFIG  
Line 2 - ALARMS...      CONTROLS...
```

1.4.4.2.1 USER ALARMS, MASKS & STATUS Menu

This is a Section List Menu and corresponds with Terminal's Page 1 display sections. This Menu is read-only and contains a three item selection list.

```
Line 1 - USER ALARMS, MASKS & STATUS  
Line 2 - 1)SYstem      2)ASide          3)BSide
```

1.4.4.2.1.1 SYStem USER ALARMS, 1)SYstem

This is a Sectional Field Menu and corresponds with Terminal's Page 1 SYstem section. This Menu contains enumerated boolean fields for ON/Off control, and a button press prompt.

```
Line 1 - SYStem USER ALARMS      "EDIT" | BLANK  
Line 2e - CORE:      Alarm-ON  Mask-ON  
Line 2e - ETH:      Alarm-Off  Mask-Off  
Line 2e - UPROC:    Alarm-Off  Mask-Off  
Line 2e - UART:     Alarm-Off  Mask-Off  
Line 2 - CLRAlarms:  <<PRESS_ENTER>>  
Line 2e - EXtref:   Off  
Line 2e - REDundant: Off  
Line 2 - PRIMary:  Ready  
Line 2 - SEConDary: Off
```

1.4.4.2.1.2 SYStem USER ALARMS, 2)ASide

This is a Sectional Field Menu and corresponds with Terminal's Page 1 ASide section. This Menu contains enumerated boolean fields for ON/Off and True/False control .

```
Line 1  -      ASide USER ALARMS          "EDIT" | BLANK
Line 2e -      PS:           Alarm-Off Mask-ON
Line 2e -      5V:           Alarm-Off Mask-OFF
Line 2e -      12V:          Alarm-Off Mask-OFF
Line 2e -      FAULT:        Alarm-ON  Mask-OFF
Line 2e -      PLL:          Alarm-ON  Mask-OFF
Line 2e -      TEST:         OFF
Line 2  -      TXunit:       TRue
Line 2  -      RXunit:       False
Line 2  -      MUTE:         TRue
Line 2e -      USERMUTE:    TRue
```

1.4.4.2.1.3 SYStem USER ALARMS, 2)BSide

This is a Sectional Field Menu and corresponds with Terminal's Page 1 BSide section. This Menu contains enumerated boolean fields for ON/Off and True/False control .

```
Line 1  -      BSide USER ALARMS          "EDIT" | BLANK
Line 2e -      PS:           Alarm-Off Mask-ON
Line 2e -      5V:           Alarm-Off Mask-OFF
Line 2e -      12V:          Alarm-Off Mask-OFF
Line 2e -      FAULT:        Alarm-Off Mask-OFF
Line 2e -      PLL:          Alarm-Off Mask-OFF
Line 2e -      TEST:         OFF
Line 2  -      TXunit:       False
Line 2  -      RXunit:       TRue
Line 2  -      MUTE:         False
Line 2e -      USERMUTE:    False
```

1.4.4.2.2 OPERATOR CONTROLS & SETTINGS

This is a Section List Menu and corresponds with Terminal's Page 2 display sections. This Menu is read-only and contains a three item selection list.

```
Line 1 - OPERATOR CONTROLS & SETTINGS
Line 2 - 1)SYstem          2)ASide          3)BSide
```

1.4.4.2.2.1 OPERATOR CONTROLS & SETTINGS, 1)SYstem

This is a Sectional Field Menu and corresponds with Terminal's Page 2 SYstem section. This Menu contains numeric entry and enumerated boolean fields for ON/OFF control.

```
Line 1 - SYSTEM OPERATOR CONTROLS "EDIT" | BLANK
Line 2 - PN:          IBC3xxCxxAKxxxxx
Line 2 - SWRev:       4.0.2
Line 2 - SWTime:      13:47:40
Line 2 - SWDate:      Jan 24 2011
Line 2e - REFAdjust:   2048 (1-4095)
Line 2e - REDundant:   OFF
```

1.4.4.2.2.2 OPERATOR CONTROLS & SETTINGS, 2)ASide

This is a Sectional Field Menu and corresponds with Terminal's Page 2 ASide section.

```
Line 1 - ASide OPERATOR CONTROLS "EDIT" | BLANK
Line 2 - MID:         255
Line 2e - FRequency:  1000000000 Hz
Line 2e - ATTenuate:   0 /10 dB
Line 2e - REFIn:      10 MHz
```

1.4.4.2.2.3 OPERATOR CONTROLS & SETTINGS, 3)BSide

This is a Sectional Field Menu and corresponds with Terminal's Page 2 BSide section. This Menu contains numeric entry fields for unit control.

```
Line 1 - BSide OPERATOR CONTROLS "EDIT" | BLANK
Line 2 - MID:         255
Line 2e - FRequency:  1000000000 Hz
Line 2e - ATTenuate:   0 /10 dB
Line 2e - REFIn:      10 MHz
```

1.4.4.2.3 IP CONFIG: MASKS & ADDRESSES

This is a Section List Menu and corresponds with Terminal's Page 3 display sections. This Menu is read-only and contains a three item selection list.

```
Line 1 - IP CONFIG: MASKS & ADDRESSES
Line 2 - 1)Host                2)Gateway                3)SNmp
```

1.4.4.2.3.1 IP CONFIG: MASKS & ADDRESSES, 1)Host

This is a Sectional Field Menu and corresponds with Terminal's Page 3 Host section. This Menu contains IP address, IP mask and text entry fields for system control.

```
Line 1 - Host IP CONFIG                "EDIT" | BLANK
Line 2e - 192.168.000.006/24
Line 2e - USERName: *****
Line 2e - PASSword: *****
Line 2e - KEYword: ParadiseRbc
```

1.4.4.2.3.2 IP CONFIG: MASKS & ADDRESSES, 2)Gateway

This is a Sectional Field Menu and corresponds with Terminal's Page 3 Gateway section. This Menu contains IP address, IP mask fields for system control.

```
Line 1 - Gateway IP CONFIG            "EDIT" | BLANK
Line 2e - 192.168.000.007/24
```

1.4.4.2.3.3 IP CONFIG: MASKS & ADDRESSES, 3)SNmp

This is a Sectional Field Menu and corresponds with Terminal's Page 3 SNmp section. This Menu contains IP address, IP mask, enumerated Boolean TRue/FAlse and text entry fields for system control.

```
Line 1 - SNmp IP CONFIG                "EDIT" | BLANK
Line 2e - 192.168.000.008/24
Line 2e - ENABLESnmp:  False
Line 2e - Public:(ro)   Public
Line 2e - PRIVate(rw)  Private
```

1.4.5 Keypad

In order to avoid unnecessary duplication of information we will only describe the primary function of each button and the data input methods. The primary use of the buttons will be described and the change of it's use in each context will be explained here. The Front panel display section describes the menu organization. The field usage and meaning is described in the terminal page section of this manual

The keypad is a sealed tactile membrane and allows menu navigation and full alpha-numeric entry. The key output value is mode and context sensitive. See **Figure 1-9**.

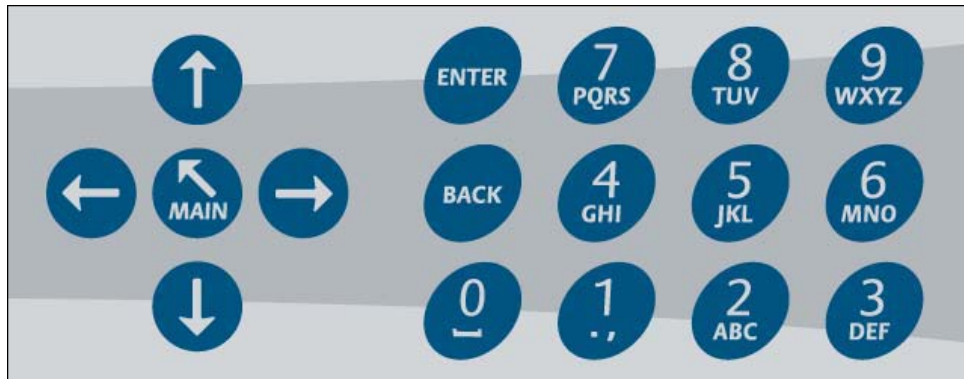


Figure 1-9: Front Panel Keypad

The modes of use are :

- Navigation
- Field Entry/Editing

The Navigation contexts are:

- Item Selection List Navigation
- Section List Menu Navigation
- Sectional Field Menu Navigation

The field entry/editing contexts are:

- Enumerated Boolean values
- Numeric values
- IP Address / Mask Entry
- Text Entry such as User Names or Passwords.
- Button press prompt

1.4.5.1 Button Press Prompts

This is not a particular button on the front panel but rather an indication to the user as to which button should be pressed to perform the titled action. For instance <<PRESS ENTER>>, indicates if the user presses the 'ENTER' button an action will be performed one time.

1.4.5.2 *Edit Mode Entry/Exit Buttons*

These buttons can change the mode of the front panel input as well as possible change the active menu.

1.4.5.2.1 MainArrow

In Navigation mode this button will always return the user to the first field in the Top Level menu. If the user is in edit mode and presses this key any changes in the field will be discarded; then. navigation mode will be entered but the active menu will not be changed.

1.4.5.2.2 ENTER

When the cursor is placed on a menu selection item this button will cause a lower level menu to be accessed and the mode will remain in Navigation.

If the active field is an editable field the unit will enter edit mode for that field. The work “EDIT” will be displayed on the first line of the display to indicate to the user that value entry may occur.

1.4.5.2.3 BACK

When the front panel is in Navigation mode this button behaves like an UpArrow button and the menu will be changed to the parent menu.

If the user is editing an Enumerated Boolean field this button behaves like an abort. Any changes to the field are discarded and the front panel is returned to Navigation mode without a change in menu.

If the user is editing an Numeric, IP, or Text field the character preceding the cursor is deleted and the characters beneath and to the right of the cursor are moved left one space. If the cursor is in the first space of the field, the character beneath the cursor is deleted and the characters to the right of the cursor are moved left one space.

1.4.5.3 *Arrow Buttons*

The MainArrow button is described in the Edit Mode Entry/Exit section. The Front Panel organization portion of this manual gives a description of the arrow keys basic functionality when in Navigation mode. Therefore only the key definition is listed here.

1.4.5.3.1 UpArrow — Navigation Mode

Move up to parent menu/field.

1.4.5.3.2 UpArrow — Enumerated Boolean Edit

Display the next valid entry value available, i.e.,

- TRue → FALSE, FALSE → TRue
- ON → OFF, OFF → ON
- ENable → DISable, DISable → ENable

1.4.5.3.3 UpArrow — Numeric Edit

No effect, not used.

1.4.5.3.4 UpArrow — IP Address and Mask Edit

No effect, not used.

1.4.5.3.5 UpArrow — Text Edit

The characters underneath the cursor and to it's right are moved right and a space is inserted underneath the cursor. If the field is full the last character in the field is discarded and replaced by a null string terminator. A null string terminator is not a space.

1.4.5.3.6 DownArrow — Navigation Mode

Move down to child menu/field and wrap if appropriate.

1.4.5.3.7 DownArrow — Enumerated Boolean Edit

Display the next valid entry value available, ie,

- TRue ->FALSE, FALSE->TRue
- ON ->OFF, OFF->ON
- ENable->DISable, DISable->ENable

1.4.5.3.8 DownArrow — Numeric Edit

No effect, not used.

1.4.5.3.9 DownArrow — IP Address and Mask Edit

No effect, not used.

1.4.5.3.10 DownArrow — Text Edit

The character underneath the cursor is deleted and the characters to the right are moved left one space. The characters at the end of the field are replaced by null string terminators. A null string terminator is not a space.

1.4.5.3.11 LeftArrow — Navigation Mode

Move to previous adjacent menu/field and wrap if appropriate.

1.4.5.3.12 LeftArrow — Enumerated Boolean Edit

Behaves analogous to the DownArrow button when editing an Enumerated Boolean.

1.4.5.3.13 LeftArrow — Numeric Edit

No change is done to the field by this button, it positions the cursor left one character. If the cursor is in the first or only character position the button has no effect.

1.4.5.3.14 LeftArrow — IP Address and Mask Edit

No change is done to the field by this button, it positions the cursor left one character. If the cursor is in the first or only character position the button has no effect.

1.4.5.3.15 LeftArrow — Text Edit

No change is done to the field by this button, it positions the cursor left one character. If the cursor is in the first or only character position the button has no effect.

1.4.5.3.16 RightArrow— Navigation Mode

Move to next adjacent menu/field and wrap if appropriate.

1.4.5.3.17 RightArrow— Enumerated Boolean Edit

Behaves analogous to the UpArrow button when editing an Enumerated Boolean.

1.4.5.3.18 RightArrow— Numeric Edit

No change is done to the field by this button, it positions the cursor right one character. If the cursor is in the last or only character position the button has no effect.

1.4.5.3.19 RightArrow— IP Address and Mask Edit

No change is done to the field by this button, it positions the cursor right one character. If the cursor is in the last or only character position the button has no effect.

1.4.5.3.20 RightArrow— Text Edit

No change is done to the field by this button, it positions the cursor right one character. If the cursor is in the last or only character position the button has no effect.

1.4.5.4 Data Entry Buttons

These buttons are similar to a telephone data entry keypad but present some extra characters as well. Typically the buttons will provide number values when editing a Numeric, IP or Mask field.

When editing a string field, pressing the same key repeatedly will cycle through the characters indicated in the title of the button. The cursor will advance after a pause in character entry or if a change in buttons is detected.

1.4.5.4.1 Data Entry Buttons — Navigation Mode

When Navigating a Section List Menu or a Sectional Field Menu a numeric button may be used to short cut to listed field and enter the sub-menu.

1.4.5.4.2 Data Entry Buttons — Enumerated Boolean Edit

Not used for enumeration entry.

1.4.5.4.2.1 "0_" Button

- a) Numeric Edit: The numeric value of '0' will replace the character under the cursor.
- b) IP Address and Mask Edit: The numeric value of '0' will replace the character under the cursor.
- c) Text Edit: The numeric value of '0' or a ' ' (space) will replace the character under the cursor.

1.4.5.4.2.2 "1,," Button

- a) Numeric Edit: The numeric value of '1' will replace the character under the cursor.
- b) IP Address and Mask Edit: The numeric value of '1' will replace the character under the cursor.
- c) Text Edit: The numeric value of '1' or a ',' (comma) will replace the character under the cursor.

1.4.5.4.2.3 “2abcABC: Button

- a) Numeric Edit: The numeric value of '2' will replace the character under the cursor.
- b) IP Address and Mask Edit: The numeric value of '2' will replace the character under the cursor.
- c) Text Edit: The numeric value of '2' and the characters 'a', 'b', 'c', 'A', 'B', 'C' will cycle as a selection to replace the character under the cursor.

1.4.5.4.2.4 “3defDEF” Button

- a) Numeric Edit: The numeric value of '3' will replace the character under the cursor.
- b) IP Address and Mask Edit: The numeric value of '3' will replace the character under the cursor.
- c) Text Edit: The numeric value of '3' and the characters 'd', 'e', 'f', 'D', 'E', 'F' will cycle as a selection to replace the character under the cursor.

1.4.5.4.2.5 “4ghiGHI” Button

- a) Numeric Edit: The numeric value of '4' will replace the character under the cursor.
- b) IP Address and Mask Edit: The numeric value of '4' will replace the character under the cursor.
- c) Text Edit: The numeric value of '4' and the characters 'g', 'h', 'i', 'G', 'H', 'I' will cycle as a selection to replace the character under the cursor.

1.4.5.4.2.6 “5jklJKL” Button

- a) Numeric Edit: The numeric value of '5' will replace the character under the cursor.
- b) IP Address and Mask Edit: The numeric value of '5' will replace the character under the cursor.
- c) Text Edit: The numeric value of '5' and the characters 'j', 'k', 'l', 'J', 'K', 'L' will cycle as a selection to replace the character under the cursor.

1.4.5.4.2.7 “6mnoMNO” Button

- a) Numeric Edit: The numeric value of '6' will replace the character under the cursor.
- b) IP Address and Mask Edit: The numeric value of '6' will replace the character under the cursor.
- c) Text Edit: The numeric value of '6' and the characters 'm', 'n', 'o', 'M', 'N', 'O' will cycle as a selection to replace the character under the cursor.

1.4.5.4.2.8 “7pqrsPQRS” Button

- a) Numeric Edit: The numeric value of '7' will replace the character under the cursor.
- b) IP Address and Mask Edit: The numeric value of '7' will replace the character under the cursor.
- c) Text Edit: The numeric value of '7' and the characters 'p', 'q', 'r', 's', 'P', 'Q', 'R', 'S' will cycle as a selection to replace the character under the cursor.

1.4.5.4.2.9 “8tuvTUV” Button

- a) Numeric Edit: The numeric value of '8' will replace the character under the cursor.
- b) IP Address and Mask Edit: The numeric value of '8' will replace the character under the cursor.
- c) Text Edit: The numeric value of '8' and the characters 't', 'u', 'v', 'T', 'U', 'V' will cycle as a selection to replace the character under the cursor.

1.4.5.4.2.10 “9wxyzWXYZ” Button

- a) Numeric Edit: The numeric value of '9' will replace the character under the cursor.
- b) IP Address and Mask Edit: The numeric value of '9' will replace the character under the cursor.
- c) Text Edit: The numeric value of '9' and the characters 'w', 'x', 'y', 'z', 'W', 'X', 'Y', 'Z' will cycle as a selection to replace the character under the cursor.

2.0 Electrical Characteristics

See Appendix C for the specification sheet for the Teledyne Paradise Datacom Indoor Block Converter.

2.1 Frequency Bands

The standard frequency bands for the IBC are; 950 to 2050MHz for the RF and 70 or 140MHz for the IF.

Custom frequency bands are available upon request.

2.2 Gain Variation

Gain is user-adjustable by up to 20 dB in 0.1 dB steps via the Monitor & Control ports. This value is controlled in 0.1 dB steps, but the output channel is only specified to a precision of 0.5 dB.

Figure 2-1 shows the user window of the M&C using Hyperterminal. Each channel (CH1 or CH2) may be attenuated separately. Move the cursor to the desired field and modify the attenuation for a particular channel and press Enter.

```
PG: 2 of 3          OPERATOR CONTROLS & SETTINGS
LOGIn: TRue

-----SYStem-----|*|-CH1--ASide LBand->70---|*|-CH2--BSide LBand->70----
PN: IBC2KxCKxAKxxxx          MID: 17          MID: 17
SWRev: 4.0.2          FRequency: 1500000000 Hz          FRequency: 1800000000 Hz
          14:16:23          ATTenuate: 0 /10 dB          ATTenuate: 0 /10 dB
          Dec 1 2010          REFIIn: 10 MHz          REFIIn: 10 MHz

REFAdjust: 2047 (1-4095)
REDundant: Off
CMDline: False
```

Figure 2-1: Hyperterminal M&C Window

2.3 Local Oscillator Phase Noise

Table 2-1 shows the phase noise of the IBC local oscillator.

Table 2-1: Local Oscillator Phase Noise

Offset	Guaranteed Max.	C-Band <i>Typical</i>	X-Band <i>Typical</i>	Ku-Band <i>Typical</i>	Units
10 Hz	-30	-60	-60	-50	dBc/Hz
100 Hz	-60	-65	-65	-65	dBc/Hz
1 KHz	-70	-80	-75	-74	dBc/Hz
10 KHz	-80	-85	-90	-83	dBc/Hz
100 KHz	-90	-120	-100	-100	dBc/Hz
1 MHz	-90	-125	-122	-115	dBc/Hz

2.4 Gain Transfer Characteristics

Gain Flatness over full band (including temperature effects): ± 1.0 dB

Gain Slope per 40 MHz: ± 0.50 dB

Gain Level Stability/24 hours: 0 ± 0.25 dB

2.5 External Reference

The IBC is capable of automatically detecting the frequency of an external reference signal of 10 MHz, or an optional 5 MHz signal. By default, a IBC will automatically switch to an externally applied reference signal if one is detected.

2.6 Internal Reference

The specifications of the internal reference are as follows:

Frequency Stability over temperature:	$< \pm 1 \cdot 10^{-8}$
Aging per day:	$< \pm 1 \cdot 10^{-9}$
Aging per year:	$< \pm 5 \cdot 10^{-8}$
Frequency Accuracy:	$\pm 1 \cdot 10^{-8}$
Warm up time:	20 minutes

Internal Reference Phase Noise:

10 Hz	-120 dBc/Hz
100 Hz	-140 dBc/Hz
1 kHz	-145 dBc/Hz
10 kHz	-152 dBc/Hz
100 kHz	-155 dBc/Hz

2.7 Module detection

Each RF converter module has embedded identification bits which define itself. When inserted into the main chassis the control card detects the presence of a module, reads the module ID and loads the appropriate information into the converter module.

3.0 Hot swapping

The converter modules are designed to be “hot-swappable”, meaning that the unit may remain in operation while a module is removed and replaced.

To uninstall a module, remove the two mounting screws and slide the module from the chassis. When an existing module is removed the M&C will detect the empty slot. When the new module is inserted the M&C will auto-detect the module and read the ID bits and load the appropriate control information into the converter module.

Refer to **Figure 3-1**. Note that the cover need not be removed to swap a module.

Note: PLL lock detection may be interrupted if a converter module is not swapped out correctly.

Important! If the module does not easily slide into the slot, remove the module and examine the enclosure for any obstruction. Remove any covers from the converter module’s M&C connector and the Reference Input connector prior to installation.

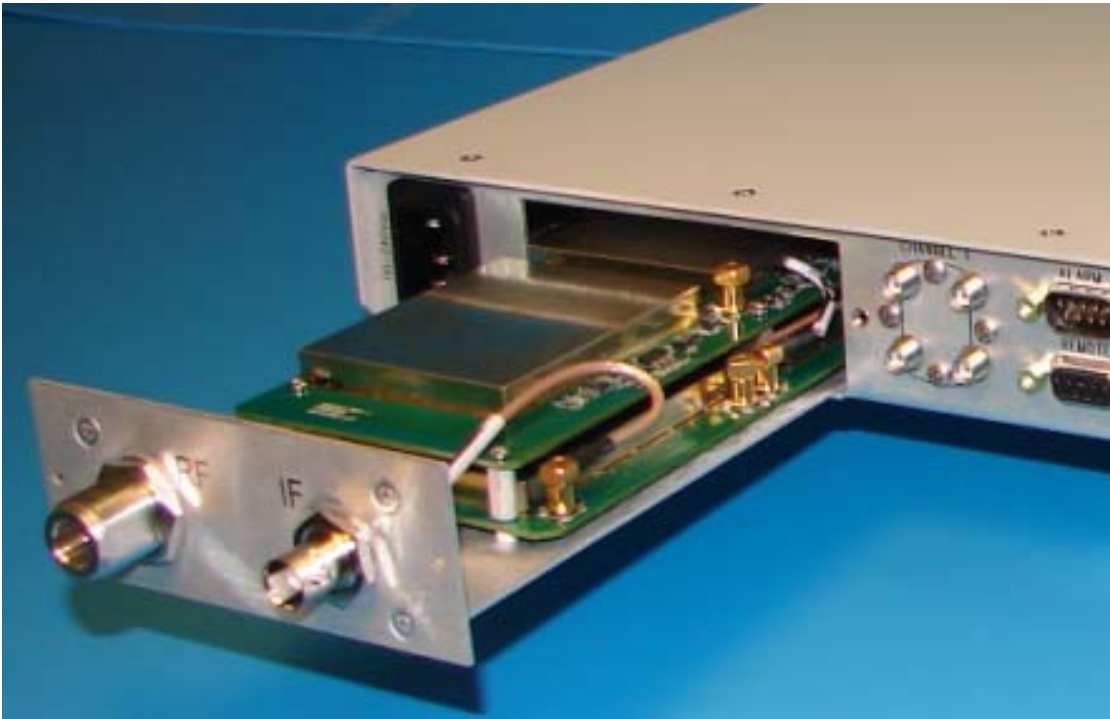


Figure 3-1: Hot-swappable converter module

3.1 RF Tray

Figure 3-2 is a view of the RF tray removed. The guide pins are present to help the user properly insert a converter module into an empty slot in the chassis. The module should not be forced into the slot. Use of excessive force in installation may damage the unit.

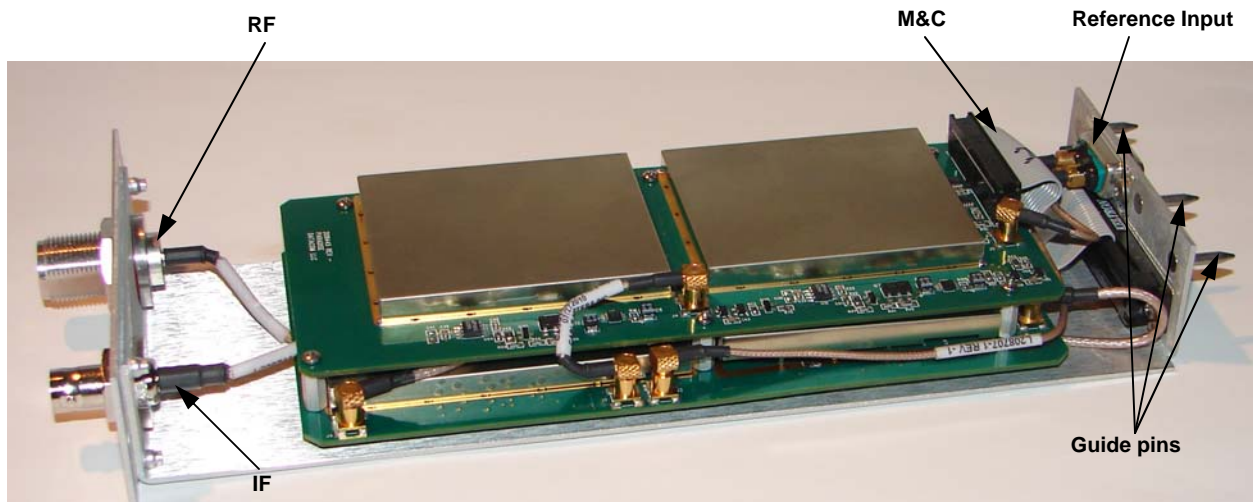


Figure 3-2: RF Tray

4.0 Connecting via Remote Terminal

This section describes the various Alarms/Faults available via the Remote Terminal M&C. The faults listed below can be manually masked. An alarm that has been masked will be ignored if the unit fails and the unit will not respond. This function aids in trouble shooting system problems.

4.0.1 Making the connection

If communicating via serial, connect the Remote Port of the IBC unit to a PC's COM port using a customer-supplied RS-232 straight-through cable with a DB9 (f) connector at either end.

On the PC, launch the HyperTerminal application by clicking Start → Run and typing in 'hypertrm' and clicking on the [OK] button.

Enter a name for the connection, select an icon and click the [OK] button. See **Figure 4-1**. Next, select the type of connection to be used, via either one of the PC COM ports (See **Figure 4-2**).



Figure 4-1: Connection Description



Figure 4-2: Connect via COM1 or 2

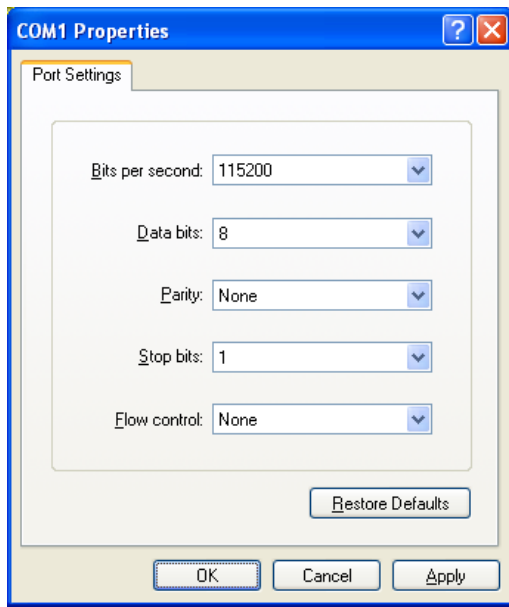


Figure 4-3: COM Properties

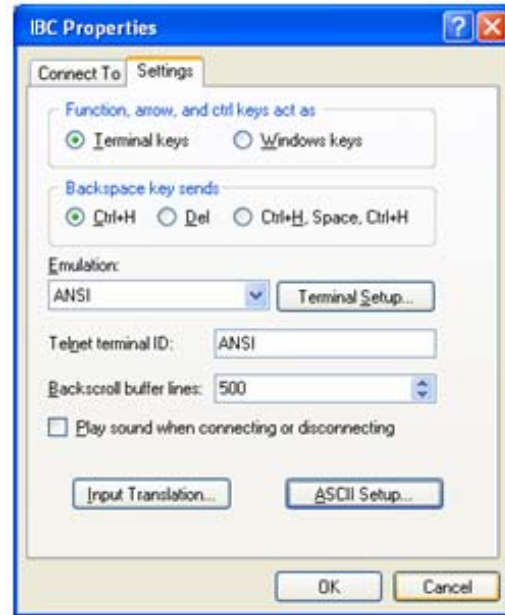


Figure 4-4: Properties window

Select the baud rate (115200), data bits (8), Parity (none), stop bits (1) and flow control (none) and click the [OK] button. See **Figure 4-3**.

Set the properties to ANSI emulation (**Figure 4-4**) and set ASCII Setup to send line ends with line feeds with a 25ms line delay and a 2ms character delay. Force incoming data to 7-bit ASCII. See **Figure 4-5**.

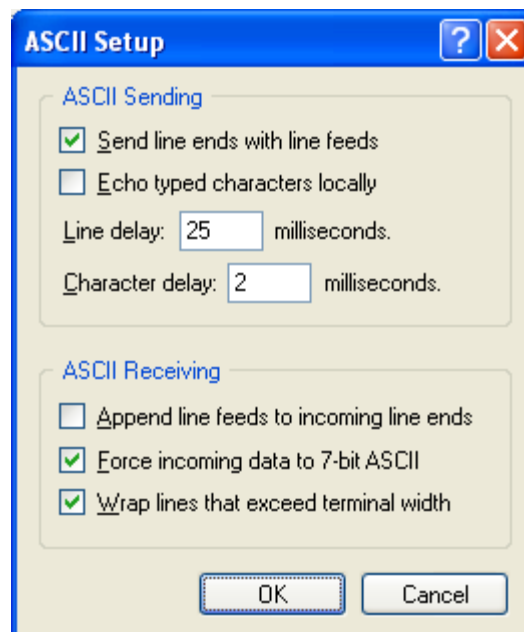


Figure 4-5: ASCII Setup window

Click the [OK] button on the ASCII Setup window, then the [OK] button on the Properties window. The terminal window will open and display a “Connected” message at the lower left of the screen.

4.1 Terminal Screen Description

Each page is displayed in non-edit mode. The page may be re-painted and refreshed by pressing the <ESC> key twice.

The user can traverse the fields by using the left, right and up, down arrow keys on the keyboard. The left and right arrow keys will move from one field to the next editable field in sequential order. The left and right keys will span rows and columns. The up and down keys will move the cursor to the next editable field within the same column of entries but will not span rows.

Editable fields may have the values changed by first pressing the <Enter> key. In edit mode, the background of the field change color, and the user may then enter the new values and press <Enter> again to have the values accepted.

4.1.1 Page 0 – Copyright, LOGin and Version Splash Page

Page 0 is the entry page. See **Figure 4-6**. Once the user logs in, the active page will automatically be set to Page 1. A user who is logged in is only able to return to Page 0 by setting the LOGin field to false.



Figure 4-6: Terminal Screen 0

LOGin: TRue or FALSE, on Page 0 this is simply a place holder indicating that the user is not currently logged in. On any other page this editable field is used to log out by setting the value to FALSE.

PN: The Part Number field is a display-only field and indicates the detected values of the IBC’s configuration. This value should match the purchased part number unless one or both of the converter modules is swapped out with a different converter model.

SWRev: This display-only field indicates the installed software revision and the software build date and time. These values are kept with the revision control so that

customer issues may be addressed and corrected. The software is not a field updated feature.

USERName: This is an editable field for a user name up to 12 characters long. The username is case sensitive and should be alpha-numeric. **If the user name is lost or forgotten, it cannot be recovered by the factory.**

PASSword: This is an editable field for the associated password for the user name. This field is case sensitive and should be alpha-numeric. **If the password is lost or forgotten, it cannot be recovered by the factory.**

USERName and PASSword can be entered in either order. A successful login will set the LOGIN field to TRue and automatically change the page to Page 1, User Status, Control and Masks.

4.1.2 Page 1 – User Status, Control and Masks

This page is organized in a fashion similar to the front panel of the system, making the best use of space available. The middle portion of the screen, after the column descriptions, shows the alarms. Each system or component alarm (ASide or BSide) is displayed with its current state and the current mask state. The bottom portion shows the system status and mute controls. See **Figure 4-7**.

```
PG: 1 of 3
Login: TRue
USER ALARMS, MASKS & STATUS
-----SYStem-----|*|-CH1--ASide LBand->70---|*|-CH2--BSide LBand->70----
ALarm MAsk          ALarm MAsk          ALarm MAsk
CORE:  Off ,Off     PS:    Off ,Off     PS:    ON  ,Off
ETH: Off ,ON       5V: Off ,Off       5V: ON  ,Off
UPROC: Off ,ON    12V: Off ,Off      12V: ON  ,Off
UART: Off ,ON     FAUlt: Off ,Off    FAUlt: Off ,Off
                    PLL: Off ,Off      PLL: Off ,Off

CLRAlarms: False   TEST: Off           TEST: Off

Extref: Off        TXunit: False      TXunit: False
REDundant: Off     RXunit: TRue       RXunit: TRue
PRIMary: READY     Mute: False        Mute: False
SECondary: READY   USERMute: False   USERMute: False
```

Figure 4-7: Terminal Screen 1

Alarms are not editable but are controllable. The alarms have three states: Inactive, Active and Latched. Inactive alarms are displayed in the normal non-editable color. Active alarms are displayed with red and blinking format. Latched alarms are alarms which are not currently active but have occurred and then subsided. The Latched alarm is indicated by a blinking standard foreground.

It is important to note that Latched alarms are not detectable from the front panel display alone. When in Redundant Mode, an alarm will cause the RF relays to switch and if the initiating alarm condition subsides, the latched alarm is the only way to know why the Primary TxUnit/RxUnit is off and the Secondary TxUnit/RxUnit is active or off.

Also, the latched alarm side effects are different in Redundant vs. Standard mode. In Redundant mode, the alarms are latched in as usual and the output carrier is muted.

However, in Standard mode, the carrier will remain muted only while the alarm is on. In Redundant mode the carrier will mute and re-route relays will activate and will persist in this condition until the user clears the latched alarms manually.

The alarms are hierarchal in nature:

Core Alarm: The core alarm is composed of the ETH (Ethernet) alarm, the UPROC (micro-processor) alarm and the UART (serial comms) alarm. The core alarms are detected at startup, and indicate whether some hardware was not properly initialized. Also, if the system is unable to detect an up/down conversion unit in either slot a core fault will be raised. Absence of a converter presumes an internal communications problem.

Power Supply Alarm: The PS (power supply) alarm is composed of a 5V alarm and a 12V alarm. Neither power supply is dedicated to a side. They are redundant and are actually system alarms. But the terminal is organized in the same format as the front panel so that a user can identify which hardware component has failed.

Side Fault Alarms: Side Fault alarms are composed of the TEMP (temperature sensor) alarm, PLL (frequency phase lock loop) alarm and a user settable TEST alarm.

MAsk: Masks are either ON/TRue or OFF/FALSE. The mask fields are editable and will be saved to non-volatile memory and restored to the user settings after power on.

PAGE: 1 of x: This is an editable field used to access the available terminal pages.

LOGin: This is an editable field pressing <Enter> and setting this field to FALSE or OFF will log the user out and return the terminal active page to 0.

CORE: Inactive, Active or Latched state, followed by a user alarm mask. The alarm mask is saved to non-volatile memory. The Core alarm, if not masked, will activate when an unmasked ETH, UPROC, or UART alarm activates. The Core alarm activat-

ing will also initiate the closing of the fault relays on the back panel. Default condition is False (OFF).

ETH: Inactive, Active or Latched state, followed by a user alarm mask. The alarm mask is saved to non-volatile memory. The ETH alarm indicates that the system was unable to activate or sustain hardware for Ethernet communications. This includes the use of SNMP or WEB services; however, protocol errors are not included in this alarm.

UPROC: Inactive, Active or Latched state, followed by a user alarm mask. The alarm mask is saved to non-volatile memory. The UPROC alarm indicates that the system was unable to activate or sustain hardware for Maintenance and Control (M&C). This includes the use ADCs, DACs, PWMs or other components.

UART: Inactive, Active or Latched state, followed by a user alarm mask. The alarm mask is saved to non-volatile memory. The UART alarm indicates that the system was unable to activate or sustain hardware for serial communications required for Monitor and Control (M&C).

PS: Inactive, Active or Latched state, followed by a user alarm mask. The alarm mask is saved to non-volatile memory. The PS alarm, if not masked, will activate when an unmasked 5V or 12V alarm activates. The PS alarm activating will also initiate the closing of the fault relay on the back panel. Also, note that both power supplies entering a fault state will create a Core fault.

5V: Inactive, Active or Latched state, followed by a user alarm mask. The alarm mask is saved to non-volatile memory. The 5V alarm indicates that the system has detected through its analog to digital converter channels that the regulated 5V power is no longer within recommended tolerances.

12V: Inactive, Active or Latched state, followed by a user alarm mask. The alarm mask is saved to non-volatile memory. The 12V alarm indicates that the system has detected through its analog to digital converter channels that the regulated 12V power is no longer within recommended tolerances.

FAUlt: Inactive, Active or Latched state, followed by a user alarm mask. The alarm mask is saved to non-volatile memory. The FAUlt alarm, if not masked, will activate when an unmasked TEMP, PLL or user set TEST alarm activates. The FAUlt alarm activating will also initiate the closing of the fault relay on the back panel and mute the RF output of the associated TxUnit. If the system is in redundant mode the RF relay will be activated and the secondary Tx/RxUnit will be used for the carrier path. The primary pathway will not be restored until the alarm (both active and latched) is cleared.

TEMP: Inactive, Active or Latched state, followed by a user alarm mask. The alarm mask is saved to non-volatile memory. The TEMP alarm indicates that the system has detected through its analog to digital converter channels that the temperature sensor in the BUC/BDC component is no longer within recommended tolerances.

PLL: Inactive, Active or Latched state, followed by a user alarm mask. The alarm mask is saved to non-volatile memory. The PLL alarm indicates that the system has detected through its CPLD that the BUC/BDC frequency phase locked loop is no longer converged.

TEST: Inactive, Active or Latched state. This is a user settable field which is NOT saved non-volatile memory. The TEST alarm is typically used to create an alarm condition without disconnecting cables or components from the system. The system behavior should be the same as with a hardware fault, i.e. a PLL lock failure. The TEST alarm is not maskable since it is set by the user, so when the user edits the field and sets the value to FALSE the alarm state will automatically progress to LATCH. LATCH alarm states are all cleared by the CLRALarms field being set to True.

CLRALarms: False or TRue state. This is an editable field used to clear all the LATCH alarm states. This operates as a push button, the user sets the value to TRue and the system will clear the latches then restore the value to False. In redundant mode, clearing the latched alarms will also restore the primary carrier pathway by unlatching the RF relays. Note: the fault relays on the back panel are not tied to the latched state of the alarms, only to the active state of the alarms.

EXtRef: ON or OFF state. This is a non-editable field which shows the presence of a detected external clock reference. The external clock reference must be above the required power levels specified elsewhere in this manual. If an external reference is detected, the reference will be used for both sides BUC/BDC PLL reference. It is important that the user set the reference frequency appropriately; the frequency to use is located on the OPERATOR CONTROLS AND SETTINGS page.

REDundant: ON or OFF state. On the user status page, this field is non-editable field which shows the state of the commanded value which is set on the OPERATOR CONTROLS AND SETTINGS page.

PRImary: READY, ON or OFF state. This is a non-editable field used to display the state of the primary carrier pathway (ASide) for the redundant mode. When not in redundant mode this field has the state of READY or OFF. The state is dependent upon the presence of alarms on the channel.

SECondary: READY, ON or OFF state. This is a non-editable field used to display the state of the secondary carrier pathway (BSide) for the redundant mode. When not in redundant mode this field has the state of READY or OFF. The state is dependent upon the presence of alarms on the channel.

BUC: TRue or FALSE state. This is a non-editable field used to display the detected presence of a block up converter for the carrier chain. This field is analogous to the BUC LED on the front panel.

BDC: TRue or FAlse state. This is a non-editable field used to display the detected presence of a block down converter for the carrier chain. This field is analogous to the BDC LED on the front panel.

MUte: TRue or FAlse state. This is a non-editable field used to display the state of the carrier output for the carrier chain. This field is analogous to the MUTE LED on the front panel.

USERMute: TRue or FAlse state. This editable field is used to control the output of the carrier chain. With no alarms present this control should be mirrored by the MUte field.

4.1.3 Page 2 – Operator Controls and Settings

This page is used to configure what should be set and forget values for the system. Once these parameters are set-up it is unlikely that the day-to-day user will need to change or access this page.

The page is organized with the same general layout as the previous page. The middle section has a header indicated the field use for SYstem, ASide, or BSide. Both channels have VCO and PLL parameters which should be consistent with the system’s intended use. See **Figure 4-8**.

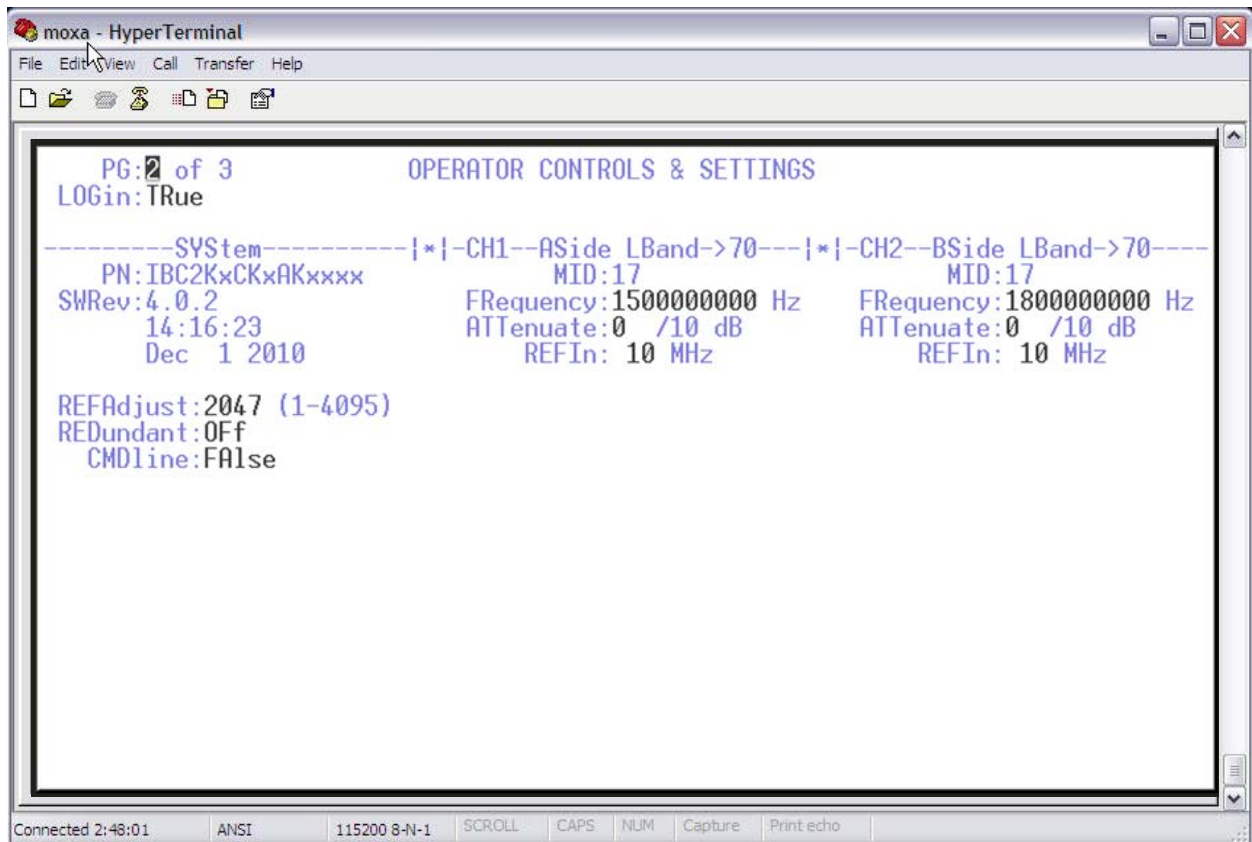


Figure 4-8: Terminal Screen 2

PAGE: 2 of x: This is an editable field used to access the available terminal pages.

LOGin: This is an editable field; pressing <Enter> and setting this field to FALSE or OFF will log the user out and return the terminal active page to 0.

PN: The Part Number field is a display-only field and indicates the detected values of the unit's configuration. This value should match the purchased part number unless one or both of the converter modules is swapped out with a different converter model.

SWRev: Is a display-only field which indicates the installed software revision. As well as the software build date and time. These values are kept with the revision control so that customer issues may be addressed and corrected. The software is not a field updated feature.

CONvid: 0-32, Each channel has a module which can be inserted for use. The modules have identifiers which allow the Monitor and Control Software to determine the programming required. These identifiers are decoded and used to build the PN field and to display the VCO and PLL default information. Note that a change in module type changes this field and will change the PN value.

LODefault: A MHz frequency identifier. This is a non-editable field used to display the Local Oscillator value used for the up/down conversion basis. This value is based on the CONvid field and is for informational purposes when talking to customer support.

VCODefault: A MHz frequency identifier. This is a non-editable field used to display the Voltage Controlled Oscillator value used for the up/down conversion. This value is based on the CONvid field and is for informational purposes when talking to customer support. The primary purpose of this field is to indicate the value which should be set into the VCOFreq, if the Non-Volatile memory of the M&C processor were to be corrupted.

VCOFreq: A MHz frequency control field. **This value, which is set by the ID bit of the converter module, should not be edited as it will cause the unit to lose lock and operate at an unknown frequency.** The field IS editable, and may be used to manipulate the Voltage Controlled Oscillator value used for the up/down conversion. This value is typically used only by factory technicians and engineers. The operator should usually have the value set to the same value as the VCODefault field.

REFIn: A MHz frequency control field, typically a value of 10 or 50MHz. **This value should not be edited, as it will cause an un-lock condition.** This is an editable field used to dictate the external clock reference supplied via the back panel. The external reference should be as fast an oscillator as possible to maintain minimum phase noise. This value will be used in the PLL programming when an external reference is detected as being active.

CMPfreq: A MHz frequency control field, typically a value equal to the REFIn value. This value will be used in the PLL programming.

LDetect: TRue or FAlse, This is a read only field giving the direct value provided by the PLL for an indication of lock.

REFAdjust: A digital control field, used to set the internal 10 MHz frequency offset reference for the unit. This value will typically be set at the factory for each unit but may be adjusted for a fine adjustment of the internal reference frequency.

REDundant: ON or OFF state. An editable field used to command redundant mode for the system. A redundant system must have two converter modules of compatible type to work. When in redundant mode both systems will have the PLL programmed to the same values as the Primary carrier (the ASide). Note: Setting the converter to REDundant mode will momentarily interrupt traffic.

ATTenuate: 000–400 in 0.1 dB steps. An editable field used to command the channel attenuation set by the channel Digital to Analog Converter (DAC). Actual attenuation is based upon the attenuation calibration table resident in the system non-volatile memory. The attenuation is specified only accurate to one-half of a dB. The current family of converter modules is specified for only 20.0 dB of attenuation (for a value of 200). This attenuation is based on the calibration tables loaded by the factory.

CMDline: FAlse, changing this field to true will stop the terminal interface and start the command line interface. All terminal commands are translated into command line inputs and displayed before execution. The primary reason for this is to provide special command access for factory personnel. Most commands and parameters change frequently and should not be used by an untrained person as improper input may require the unit to be returned to the factory for calibration or reset. To return to the terminal mode when in command line mode use: CMDline=FAlse<CR>.

4.1.4 Page 3 – IP Config, Masks and Addresses

This page is used to configure what should be “set and forget” values for the user interfaces to the system. Once these parameters are set-up it is unlikely that the day-to-day user will need to change or access this page.

The page is organized with the local parameters under the LOCAL UNIT heading, the IP access gateway parameter under the GATEWAY heading and the SNMP trap system parameters under the SNMP AGENT heading. See **Figure 4-9**.

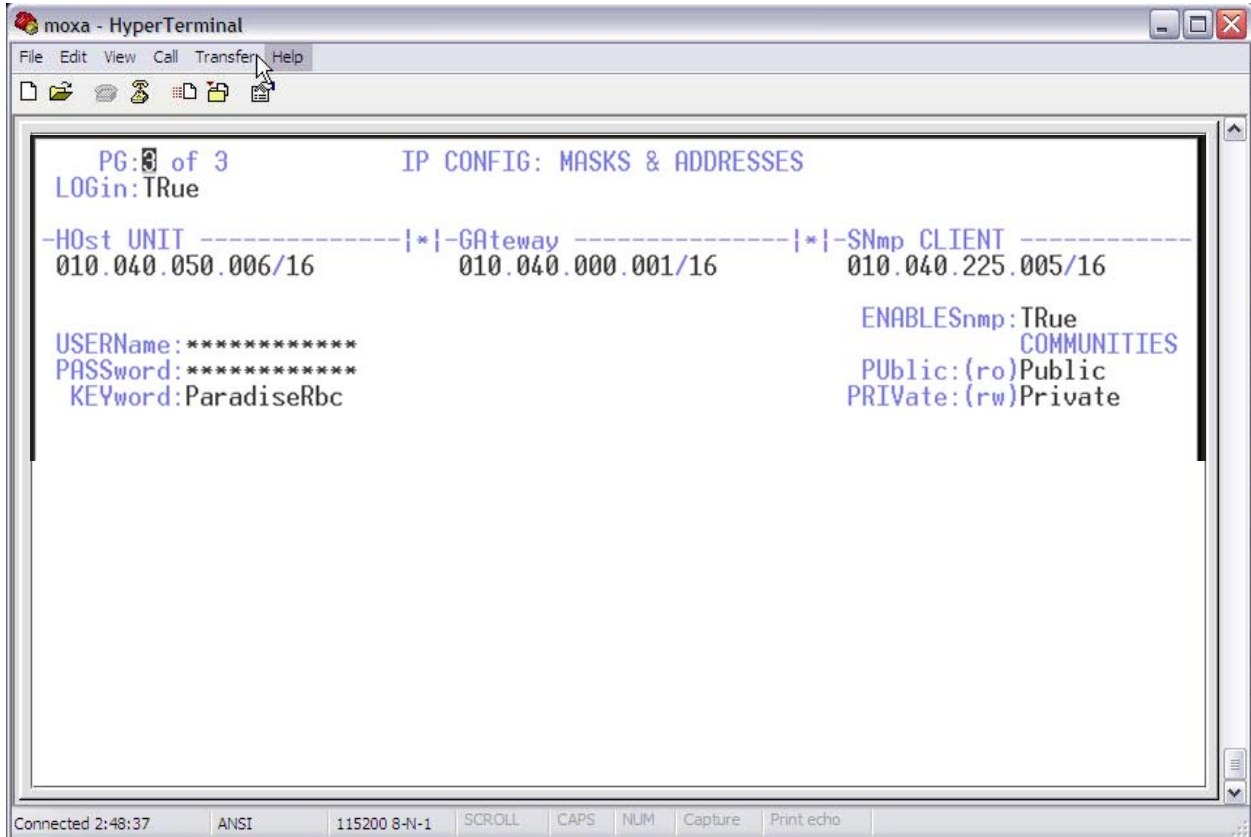


Figure 4-9: Terminal Screen 3

PAGE: 3 of x: This is an editable field used to access the available terminal pages.

LOGin: This is an editable field pressing <Enter> and setting this field to FALSE or OFF will log the user out and return the terminal active page to 0.

IP ADDRESS and **MASK** width entry is achieved for each of the components in the same way. The IP address is specified by setting a 4-tuple octet with the mask width following the '/' character.

USERNAME: 12 alpha-numeric character input field. This field can be used to change the user login name. The entry is case sensitive and allows non-printable characters, but the use of non-printable characters is discouraged. The entry does not have a

minimum length, but it is recommended that at least six characters be used. The default user name leaving the factory is “Paradise”.

PASSword: 12 alpha-numeric character input field. This field can be used to change the password for the user. The entry is case sensitive and allows non-printable characters, but the use of non-printable characters is discouraged. The entry does not have a minimum length, but it is recommended that at least six characters be used. The default password leaving the factory is “Paradise”.

KEYword: 12 alpha-numeric character input field. This field is used to scramble the user name and the user password. It is recommended that this field not be changed. A change to this value will require that the user name and pass word be re-entered before exiting the session by logging out. The entry is case sensitive and allows non-printable characters, but the use of non-printable characters is discouraged. The entry does not have a minimum length, but it is recommended that at least six characters be used. The default KEYword leaving the factory is “ParadiseRbc”.

Important: A change to the KEYword requires the user to re-enter a username and password.

PUBlic: 12 character entry. Editable entry field used to set the public community name. The public community name is used for Read Only SNMP communications. The default PUBlic Community leaving the factory is “Public”.

PRIVate: 12 character entry. Editable entry field used to set the private community name. The private community name is used for Read and Write access within SNMP communications. The default PRIVate Community leaving the factory is “Private”.

5.0 Redundant System Concepts

The IBC is ideally suited for a self-contained, stand alone and cost effective 1:1 redundant system. To be a redundant system, both Channel 1 and Channel 2 must be populated with the same type of converter module. See **Figure 5-1** for a block diagram of a standard 1:1 Redundant System.

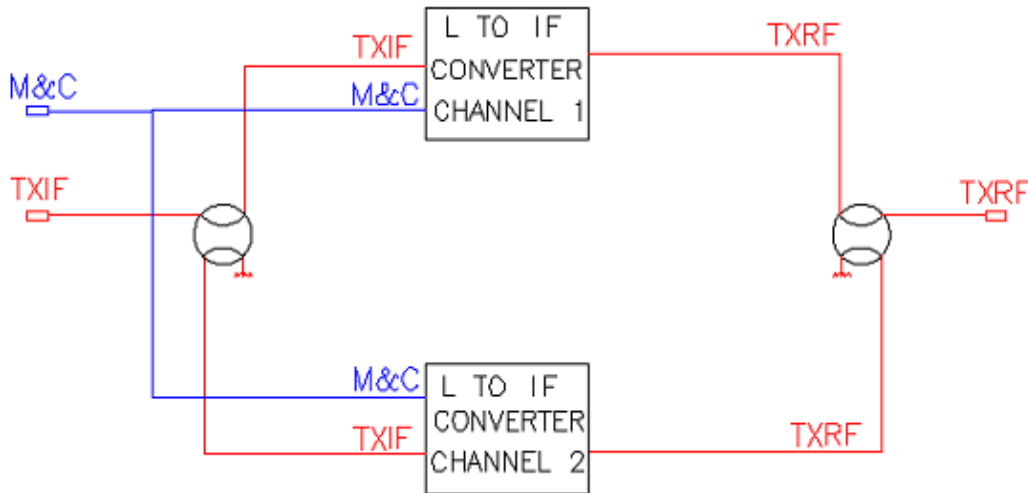


Figure 5-1: Standard 1:1 Redundant System Block Diagram

A unit configured for 1:1 redundancy utilizes a pair of Form-C fault relays which come standard with SMA connectors. The frequency range for the switches is DC to 18GHz with an insertion loss of 0.2 dB and isolation of 80 dB.

The unit must be cabled per **Figure 5-2** and must be configured for redundant operation. See **Section 5.1** for a description of the cables and **Section 5.2** for direction on how to configure your unit for redundancy using Hyperterminal.

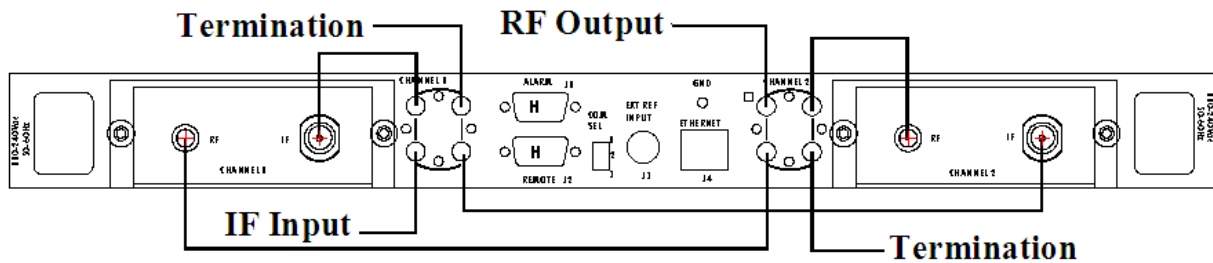


Figure 5-2: Standard 1:1 Redundant System

5.1 1:1 Redundancy Cables

The redundancy cables include EHW00028, EHW00029, EHW00030 and EHW00031. Two 50Ω terminators are also included in the 1:1 redundancy cable kit, and should be fitted to the upper right SMA (F) connector of the Channel 1 fault relay and the lower right SMA (F) connector of the Channel 2 fault relay.

IF input is introduced into the unit into the lower left SMA (F) connector on the Channel 1 fault relay.

RF output is produced at the upper left SMA (F) connector on the Channel 2 fault relay.

5.1.1 Cable EHW00028

Cable EHW00028 is a 13" flexible coaxial cable with a Type-N (M) connector on one end and an SMA (M) connector on the other. This cable connects between the Channel 2 module's IF port and the lower right SMA (F) connector of the Channel 1 fault relay. See **Figure 5-3**.

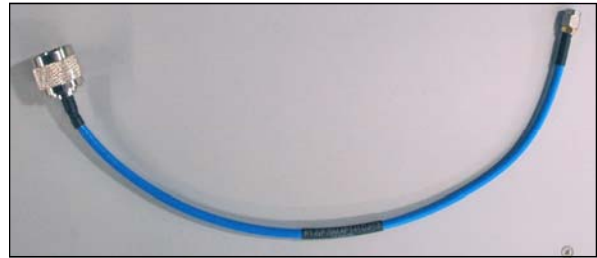


Figure 5-3: Cable EHW00028

5.1.2 Cable EHW00029

Cable EHW00029 is a 13" flexible coaxial cable with a SMA (M) connector on either end. This cable connects between the Channel 1 module's RF port and the lower left SMA (F) connector of the Channel 2 fault relay. See **Figure 5-4**.



Figure 5-4: Cable EHW00029

In cases where the converter module was supplied with the optional N-type connector on the RF port, instead use Cable EHW00028.

5.1.3 Cable EHW00030

Cable EHW00030 is a 5" flexible coaxial cable with a SMA (M) connector on either end. This cable connects between the Channel 2 module's RF port and the upper right SMA (F) connector of the Channel 2 fault relay. See **Figure 5-5**.



**Figure 5-5:
Cable
EHW00030**

5.1.4 Cable EHW00031

Cable EHW00031 is a 5" flexible coaxial cable with a Type-N (M) connector on one end and an SMA connector on the other. This cable connects between the Channel 1 module's IF port and the upper left connector of the Channel 1 fault relay. See **Figure 5-6**.



Figure 5-6:
Cable
EHW00031

In cases where the converter module was supplied with the optional N-type connector on the RF port, instead use Cable EHW00030.

5.1.5 Cable Connections

Figure 5-7 shows an outline of how each cable should be placed to complete a redundant configuration.

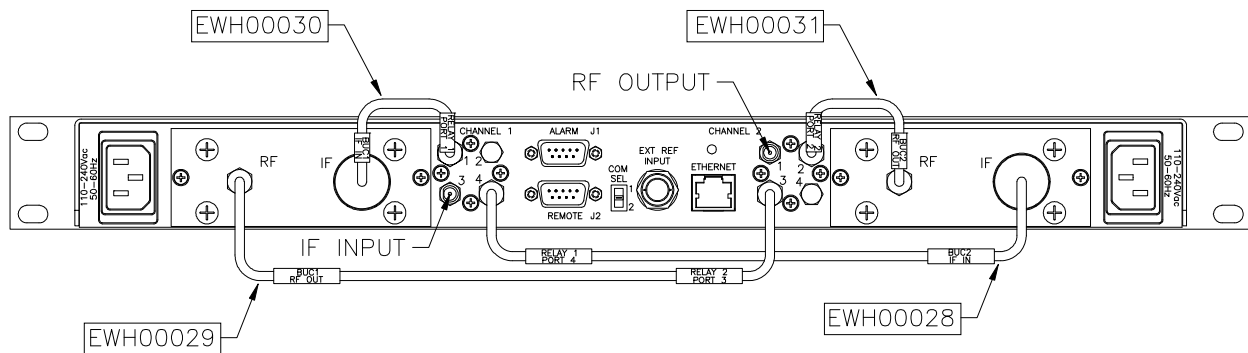


Figure 5-7: Redundancy Cable Connections

5.2 Configure the Unit for Redundancy

Connect your unit to a PC and launch the Hyperterminal application.

Log in to the unit so that Page 2, the OPERATOR CONTROLS AND SETTINGS screen is loaded.

Use the arrow keys to navigate the Terminal Screen to the "REDundant" line and press <Enter>. Type 'TRUE' and press <Enter>.

The system will process the Redundant command and if it finds that there are two different converter types installed in the unit then the processor will ignore the command and return the "REDundant" state to FALSE. If the Processor finds like converter modules, the system is configured for redundancy. Should the primary channel converter fault, the secondary converter will be activated.

5.2.1 Fault Testing

When in a redundant configuration it is possible to force a fault on one channel in the system. This feature is beneficial during system testing.

To force a fault, navigate to Page 1, ASide, TEST location. Press <Enter> and type 'TRUE'. Press <Enter>.

Channel 2 should become the active thread in the system and Channel 1 should be muted.

To clear the fault, navigate to Page 1, ASide, TEST location. Press <Enter> and type 'FALSE'. Press <Enter> and the alarm state will automatically progress to 'LATCH'.

Navigate to the CLRAlarms field. Press <Enter> and type 'TRUE'. Press <Enter> and the TEST location will switch to 'FALSE' and Channel 1 will become the active thread in the system.

6.0 Overview

A system can be managed from a remote computer over an Ethernet interface using SNMP. The Ethernet interface is fixed to the 10/100Base-T standard. Normally, a straight-through CAT5 cable is used to connect the unit to a computer's Ethernet port.

6.1 Ethernet Interface

The IBC supports the SNMPv1 IP network protocols to provide a full featured remote M&C interface over an Ethernet LAN.

- SNMPv1 protocol - protocol intended for integration into large corporate NMS architectures.

In order to utilize the SNMP protocol, the relevant interface option has to be turned on.

Of course, standard IP level functions such as ICMP Ping and ARP are supported as well. There is currently no support for dynamic IP settings, all IP parameters.

6.1.1 SNMPv1

A IBC unit supports the most popular SNMPv1 format (SMIv1, RFC1155), SNMP Get, SNMP Get Next and SNMP Set commands. SNMP Traps are currently unsupported.

In order to utilize SNMP protocol, the user has to enable this feature via remote serial protocol. SNMP uses the UDP fixed port 161 for sending and receiving requests.

The definition of managed objects is described in the Paradise Datacom MIB. The MIB files are available for download from the Software Downloads section of the Paradise Datacom web site, <http://www.paradisedata.com>. Download the **IPOS.MIB** and the **PARADISE-IBC.MIB** files.

6.1.2 Description of IPOS.MIB entities

deviceINFO

This field includes general device information.

deviceID

Octet string type; maximum length 60; field specifies device model and serial number; read only access; OID -1.3.6.1.4.1.20712.1.1

deviceLocation

Octet string type; maximum length 60; field allow customer to store information about device physical location or any other textual information related to the device; read/write access; OID -1.3.6.1.4.1.20712.1.2

deviceRevision

Octet string type; maximum length 60; field specifies device firmware revision; read only access; OID -1.3.6.1.4.1.20712.1.3

deviceType

Enumeration, integer type; field allows simple detection of SNMP device type. Values: rmsspa(1), cosspa(2), rcp2fprc(3), rcp21000rm(4), rcp21000co(5), rcp21000rcp(6), tx(7), rx(8); read only access; OID -1.3.6.1.4.1.20712.1.4

devices

This field is subdivided into 5 branches: paradiseDevice, paradiseDeviceA, paradiseDeviceB, paradiseDeviceC and modem. The paradiseDevice branch is currently used for all Paradise Datacom LLC SNMP-enabled device except for Modems. See the Evolution Modem manual for modem-specific MIB information. Branches for Device A, B and C are reserved for future use.

paradiseDeviceA

These field contents tables hold specific device information for the IBC, as described in the following sections.

6.1.3 SNMP MIB tree (IPOS.MIB)

```
--paradiseDatacom(1.3.6.1.4.1.20712)
|
+--deviceINFO(1)
| |
| +-- r-n OctetString deviceId(1)
| +-- rwn OctetString deviceLocation(2)
| +-- r-n OctetString deviceRevision(3)
| +-- r-n Enumeration deviceType(4)
|
+--devices(2)
|
+--paradiseDevice(1)
| |
| +--settings(1)
| | |
| | +--settingsEntry(1) [settingIndex]
| | |
| | +-- rwn Integer32  settingIndex(1)
| | +-- rwn Integer32  settingValue(2)
| | +-- r-n OctetString settingTextValue(3)
| |
| +--thresholds(2)
| | |
| | +--thresholdsEntry(1) [thresholdIndex]
| | |
| | +-- rwn Integer32  thresholdIndex(1)
| | +-- r-n Integer32  thresholdValue(2)
| | +-- r-n Enumeration thresholdStatus(3)
| | +-- r-n OctetString thresholdText(4)
| |
| +--conditions(3)
| | |
| | +--conditionsEntry(1) [conditionsIndex]
| | |
| | +-- rwn Integer32  conditionsIndex(1)
| | +-- r-n Integer32  conditionsValue(2)
| | +-- r-n Counter    conditionsEventCount(3)
| | +-- r-n OctetString conditionsText(4)
| |
+--paradiseDeviceA(2) ... used for RBC/IBC products
|
+--paradiseDeviceB(3)
|
+--paradiseDeviceC(4)
|
+--modem(5)
```

6.1.4 Description of PARADISE-IBC.MIB entities

The PARADISE-IBC.MIB file requires an import of other MIB files, including: IPOS.MIB, SNMPv2-SMI, SNMPv2-CONF, INET-ADDRESS-MIB, and SNMPv2-TC.

6.1.5 SNMP MIB tree (PARADISE-IBC.MIB)

rwn OctetString

```
rbcMibModule
|
+--rbcMIB (rbcMibModule 1)
|
|  +--rbcStatus (rbcMIB 1)
|  |
|  |  +--rbcFpLeds (rbcStatus 1)
|  |  |
|  |  |  +--rbcFpLedTable (rbcFpLeds 1)
|  |  |  |
|  |  |  |  +--rbcFpLedEntry (rbcFpLedTable 1)
|  |  |  |  |
|  |  |  |  |  +--rbcFpLedId (rbcFpLedEntry 1)
|  |  |  |  |  +--rbcFpLedASide (rbcFpLedEntry 2)
|  |  |  |  |  +--rbcFpLedBSide (rbcFpLedEntry 3)
|  |  |  |
|  |  |  +--rbcUserSystemStatus (rbcStatus 2)
|  |  |  |
|  |  |  |  +--rbcExtRefStatus (rbcUserSystemStatus 1)
|  |  |  |  +--rbcRedundantStatus (rbcUserSystemStatus 2)
|  |  |  |  +--rbcPrimaryChannelStatus (rbcUserSystemStatus 3)
|  |  |  |  +--rbcSecondaryChannelStatus (rbcUserSystemStatus 4)
|  |  |
|  |  +--rbcFaults (rbcMIB 2)
|  |  |
|  |  |  +--rbcSystemFaultTable (rbcFaults 1)
|  |  |  |
|  |  |  |  +--rbcSystemFaultEntry (rbcSystemFaultTable 1)
|  |  |  |  |
|  |  |  |  |  +--rbcSystemFaultId (rbcSystemFaultEntry 1)
|  |  |  |  |  +--rbcSystemFault (rbcSystemFaultEntry 2)
|  |  |  |  |  +--rbcSystemMask (rbcSystemFaultEntry 3)
|  |  |  |
|  |  |  +--rbcSideFaultTable (rbcFaults 2)
|  |  |  |
|  |  |  |  +--rbcSideFaultEntry (rbcSideFaultTable 1)
|  |  |  |  |
|  |  |  |  |  +--rbcSideFaultId (rbcSideFaultEntry 1)
|  |  |  |  |  +--rbcASideFault (rbcSideFaultEntry 2)
|  |  |  |  |  +--rbcASideMask (rbcSideFaultEntry 3)
|  |  |  |  |  +--rbcBSideFault (rbcSideFaultEntry 4)
|  |  |  |  |  +--rbcBSideMask (rbcSideFaultEntry 5)
|  |  |
|  +--rbcControl (rbcMIB 3)
```

```

| |
| |--rbcUserControl (rbcControl 1)
| | |
| | |--rbcUserSystemControl (rbcUserControl 1)
| | | |
| | | |--rbcClrALARms (rbcUserSystemControl 1)
| | | |
| | |--rbcUserASideControl (rbcUserControl 2)
| | | |
| | | |--rbcASideTest (rbcUserASideControl 1)
| | | |--rbcASideMute (rbcUserASideControl 2)
| | | |
| | |--rbcUserBSideControl (rbcUserControl 3)
| | | |
| | | |--rbcBSideTest (rbcUserBSideControl 1)
| | | |--rbcBSideMute (rbcUserBSideControl 2)
| | | |
|--rbcOperatorControl (rbcControl 2)
| |
| | |--rbcOperatorSystemControl (rbcOperatorControl 1)
| | | |
| | | |-- rw- Integer32 rbcRefAdjust (rbcOperatorSystemControl 1)
| | | |--rbcRedundant (rbcOperatorSystemControl 2)
| | | |
| | |--rbcOperatorSideControlTable (rbcOperatorControl 2)
| | | |
| | | |--rbcOperatorSideControlEntry (rbcOperatorSideControlTable 1)
| | | | |
| | | | |--rbcOperatorSideControlChannelId (rbcOperatorSideControlEntry 1)
| | | | |-- r-- Integer32 rbcOperatorSideControlConvId (rbcOperatorSideControlEntry 2)
| | | | |-- r-- Integer32 rbcOperatorSideControlLoDefault (rbcOperatorSideControlEntry 3)
| | | | |-- r-- Integer32 rbcOperatorSideControlVcoDefault (rbcOperatorSideControlEntry 4)
| | | | |-- rw- Integer32 rbcOperatorSideControlVcoFreq (rbcOperatorSideControlEntry 5)
| | | | |-- rw- Integer32 rbcOperatorSideControlRefIn (rbcOperatorSideControlEntry 6)
| | | | |-- rw- Integer32 rbcOperatorSideControlCmpFreq (rbcOperatorSideControlEntry 7)
| | | | |--rbcOperatorSideControlLDetect (rbcOperatorSideControlEntry 8)
| | | | |-- rw- Integer32 rbcOperatorSideControlAttenuate (rbcOperatorSideControlEntry 9)
| | | | |
|--rbcEvents (rbcMIB 4)
| |
|--rbcConf (rbcMIB 5)
| |
| | |--rbcConfObjectGroups (rbcConf 1)
| | | |
| | | |--rbcFpLedsGroup (rbcConfObjectGroups 1)
| | | |--rbcUserSystemStatusGroup (rbcConfObjectGroups 2)
| | | |--rbcSystemFaultGroup (rbcConfObjectGroups 3)
| | | |--rbcSideFaultGroup (rbcConfObjectGroups 4)
| | | |--rbcUserSystemControlGroup (rbcConfObjectGroups 5)
| | | |--rbcUserASideControlGroup (rbcConfObjectGroups 6)
| | | |--rbcUserBSideControlGroup (rbcConfObjectGroups 7)
| | | |--rbcOperatorControlGroup (rbcConfObjectGroups 8)
| | | |--rbcOperatorSideControlGroup (rbcConfObjectGroups 9)
| | | |
| | |--rbcConfNotificationGroups (rbcConf 2)

```



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This section describes the basic network setup of a Windows based host PC for a peer-to-peer network connection with the IBC.

Important! Use a straight-through RS232 cable for direct PC to IBC connection!

1. Connect the RS232 Cable between the ALARM port of the IBC and a COM port of the host PC. See Section 4.0.1 for details.

2. If the PC NIC card has not previously been set, do so now using the following procedure, otherwise skip to Step 3.

2.1 From Windows Control Panel select Network icon;

2.2 Select TCP/IP properties of your LAN card. The window shown in **Figure A-1** will appear:



Figure A-1: TCP/IP Properties Window

2.3 Select "Specify an IP Address". And enter the appropriate parameters for your network in the IP address and Subnet fields. For example:

IP Address.....:192.168.0.3
Subnet Mask.....:255.255.255.0

After you press "OK", depending on the operating system, you may need to re-boot the workstation.

4. You may now ping the IBC unit from host PC:

```
C:\>ping 192.168.0.9
```

This will display:

```
Pinging 192.168.0.9 with 32 bytes of data:
Reply from 192.168.0.9: bytes=32 time<10ms TTL=128
Reply from 192.168.0.9: bytes=32 time<10ms TTL=128
Reply from 192.168.0.9: bytes=32 time<10ms TTL=128
Reply from 192.168.0.9: bytes=32 time<10ms TTL=128
Ping statistics for 192.168.0.9:
    Packets: Sent=4, Received=4, Lost=0 (0%loss),
    Approximate round trip times I milli-seconds:
    Minimum=0ms, Maximum=0ms, Average=0ms
```

5. Run the Hyperterminal application on the host PC to check all M&C functions. Refer to **Section 4.1** for details. When prompted, select an Internet connection to the unit using IP Address 192.168.0.9, local port address to 1007. The IBC should be connected to your host workstation for remote M&C.



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This section briefly describes the basic theory related to the physical layer of 10/00Base-T networking, as well as proper wiring techniques.

There are several classifications of cable used for twisted-pair networks. Recommended cable for all new installations is Category 5 (or CAT 5). CAT 5 cable has four twisted pairs of wire for a total of eight individually insulated wires. Each pair is color coded with one wire having a solid color (blue, orange, green, or brown) twisted around a second wire with a white background and a stripe of the same color. The solid colors may have a white stripe in some cables. Cable colors are commonly described using the background color followed by the color of the stripe; e.g., white-orange is a cable with a white background and an orange stripe.

The straight through and crossover patch cables are terminated with CAT 5 RJ-45 modular plugs. RJ-45 plugs are similar to those you'll see on the end of your telephone cable except they have eight versus four or six contacts on the end of the plug and they are about twice as big. Make sure they are rated for CAT 5 wiring. (RJ means "Registered Jack"). A special Modular Plug Crimping Tool (such as that shown in **Figure B-1**) is needed for proper wiring.



Figure B-1: Modular Plug Crimping Tool

The 10BASE-T and 100BASE-TX Ethernets consist of two transmission lines. Each transmission line is a pair of twisted wires. One pair receives data signals and the other pair transmits data signals. A balanced line driver or transmitter is at one end of one of these lines and a line receiver is at the other end. A simplified schematic for one of these lines and its transmitter and receiver is shown in **Figure B-2**.

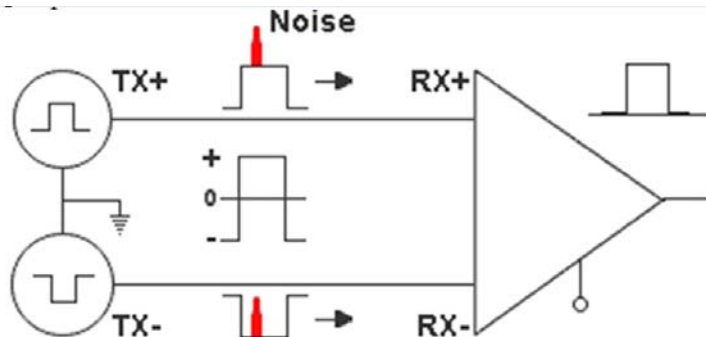


Figure B-2: Transmission Line

The main concern is the transient magnetic fields which surrounds the wires and the magnetic fields generated externally by the other transmission lines in the cable, other network cables, electric motors, fluorescent lights, telephone and electric lines, lightning, etc. This is known as noise. Magnetic fields induce their own pulses in a transmission line, which may literally bury the Ethernet pulses.

The twisted-pair Ethernet employs two principle means for combating noise. The first is the use of balanced transmitters and receivers. A signal pulse actually consists of two simultaneous pulses relative to ground: a negative pulse on one line and a positive pulse on the other. The receiver detects the total difference between these two pulses. Since a pulse of noise (shown in red in the diagram) usually produces pulses of the same polarity on both lines one pulse is essentially canceled by out the other at the receiver. In addition, the magnetic field surrounding one wire from a signal pulse is a mirror of the one on the other wire. At a very short distance from the two wires, the magnetic fields are opposite and have a tendency to cancel the effect of each other. This reduces the line's impact on the other pair of wires and the rest of the world.

The second and the primary means of reducing cross-talk between the pairs in the cable, is the double helix configuration produced by twisting the wires together. This configuration produces symmetrical (identical) noise signals in each wire. Ideally, their difference, as detected at the receiver, is zero. In actuality, it is much reduced.

Pin-out diagrams of the two types of UTP Ethernet cables are shown in **Figure B-3**.

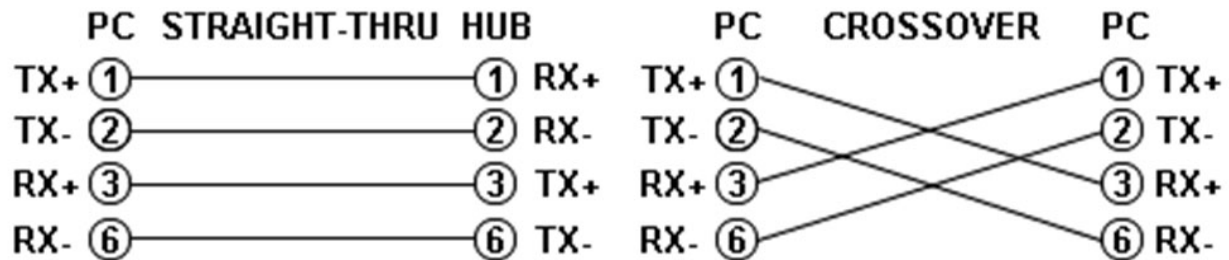


Figure B-3: Ethernet Cable Pin-Outs

Note that the TX (transmitter) pins are connected to corresponding RX (receiver) pins, plus to plus and minus to minus. Use a crossover cable to connect units with identical interfaces. If you use a straight-through cable, one of the two units must, in effect, perform the crossover function.

Two wire color-code standards apply: EIA/TIA 568A and EIA/TIA 568B. The codes are commonly depicted with RJ-45 jacks as shown in **Figure B-4**. If we apply the 568A color code and show all eight wires, our pin-out looks like **Figure B-5**.

Note that pins 4, 5, 7, and 8 and the blue and brown pairs are not used in either standard. Quite contrary to what you may read elsewhere, these pins and wires are not used or required to implement 100BASE-TX duplexing.

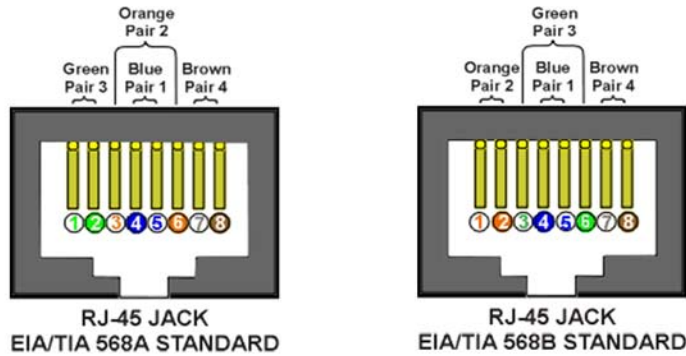


Figure B-4: Ethernet Wire Color Code Standards

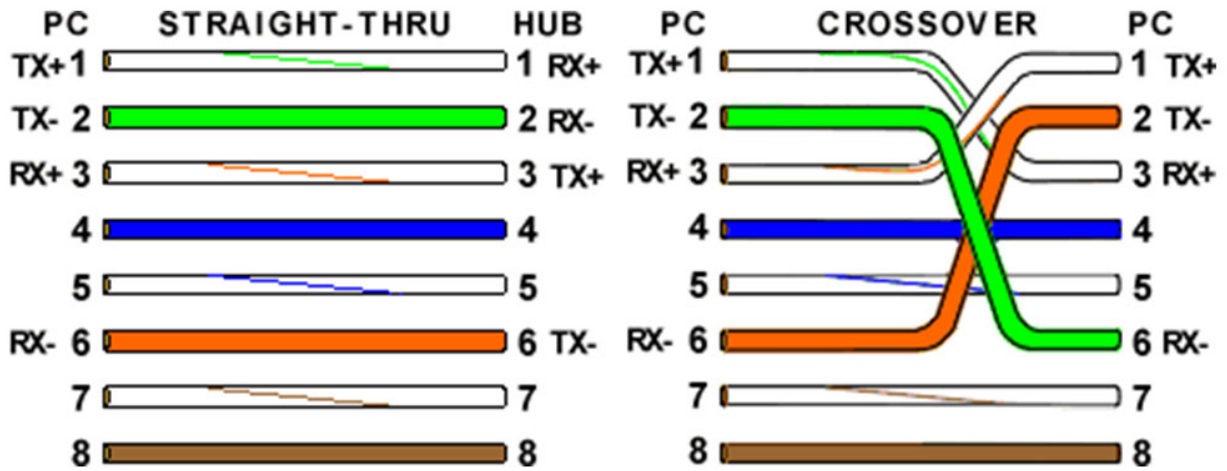


Figure B-5: Wiring Using 568A Color Codes

There are only two unique cable ends in the preceding diagrams, they correspond to the 568A and 568B RJ-45 jacks and are shown in **Figure B-6**.

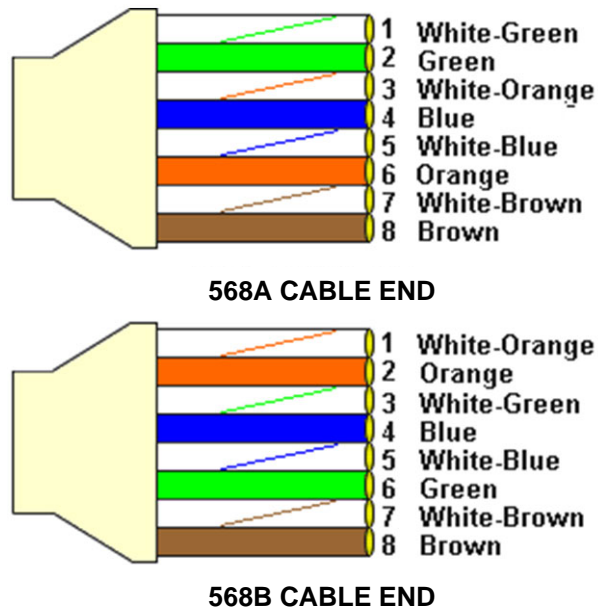


Figure B-6: Wiring Using 568A and 568B Color Codes

Again, the wires with colored backgrounds may have white stripes and may be denoted that way in diagrams found elsewhere. For example, the green wire may be labeled Green-White. The background color is always specified first.

Now, all you need to remember, to properly configure the cables, are the diagrams for the two cable ends and the following rules:

- A straight-thru cable has identical ends.
- A crossover cable has different ends.

It makes no functional difference which standard you use for a straight-thru cable. You can start a crossover cable with either standard as long as the other end is the other standard. It makes no functional difference which end is which. 568A patch cable will work in a network with 568B wiring and 568B patch cable will work in a 568A network

Here are some essential cabling rules:

1. Try to avoid running cables parallel to power cables.
2. Do not bend cables to less than four times the diameter of the cable.
3. If you bundle a group of cables together with cable ties (zip ties), do not over-cinch them. It's okay to snug them together firmly; but don't tighten them so much that you deform the cables.
4. Keep cables away from devices which can introduce noise into them. Here's a short list: copy machines, electric heaters, speakers, printers, TV sets, fluorescent lights, copiers, welding machines, microwave ovens, telephones, fans, elevators, motors, electric ovens, dryers, washing machines, and shop equipment.
5. Avoid stretching UTP cables (tension when pulling cables should not exceed 25 LBS).
6. Do not run UTP cable outside of a building. It presents a very dangerous lightning hazard!
7. Do not use a stapler to secure UTP cables. Use telephone wire/RG-6 coaxial wire hangers, which are available at most hardware stores.

The following pages comprise the documentation package for the IBC family of Teledyne Paradise Datacom Rack-mountable 70MHz to L-Band Converters.

This package consists of:

Specification Sheet: **207931** (check our web site <http://www.paradisedata.com> for the most recent version of this document);

Outline Drawing, specific to your system;

Block Diagram, specific to your system;

and Schematic, specific to your system.



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