

FM4900

User
Manual

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Metrodata FM4900 User Manual

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1 INTRODUCTION

1.1 About The FM4900

The FM4900 Data Service Unit (DSU) is used to connect high performance bridges and routers to high speed 34 Mbps services.

The FM4900 interfaces an E3 service (34-368 Mbps) and Data Terminal Equipment (DTE) presenting a High Speed Serial Interface (HSSI) port.

FM4900 DSU's are used in pairs, one at either end of a Wide Area Network (WAN) link. One end is called the LOCAL node, and the other the REMOTE node.

The FM4900 also provides extensive performance monitoring facilities. It can monitor degraded line performance and has extended alarm processing on the connection, giving the network manager extensive visibility and control of the wide-area link.

A record of all error conditions, including major and minor alarms and bit errors, is kept for the last 24 hours. Statistics are recorded every 15 minutes and processed into G.821 format. Ninety-six 15 minute periods are kept, which means that 24-hour coverage is maintained on a rolling basis.

Diagnostics are provided to localise a fault condition on the line. These are provided by various types of loopback.

The FM4900 may be managed by connecting a video terminal to the unit, either directly through a serial interface, or via a multiplexer or modem. With the optional LM1100 SNMP Enabler the FM4900 can be managed remotely with a Simple Network Management Protocol (SNMP) management system connected to the LAN. Telnet access can also be achieved through the LM1100.

Finally, with a video terminal connected to the serial interface port, the FM4900 doubles as a terminal adapter and connection may be made to remote Telnet-accessible devices via the LM1100 SNMP Enabler.

1.2 Typical FM4900 Installation

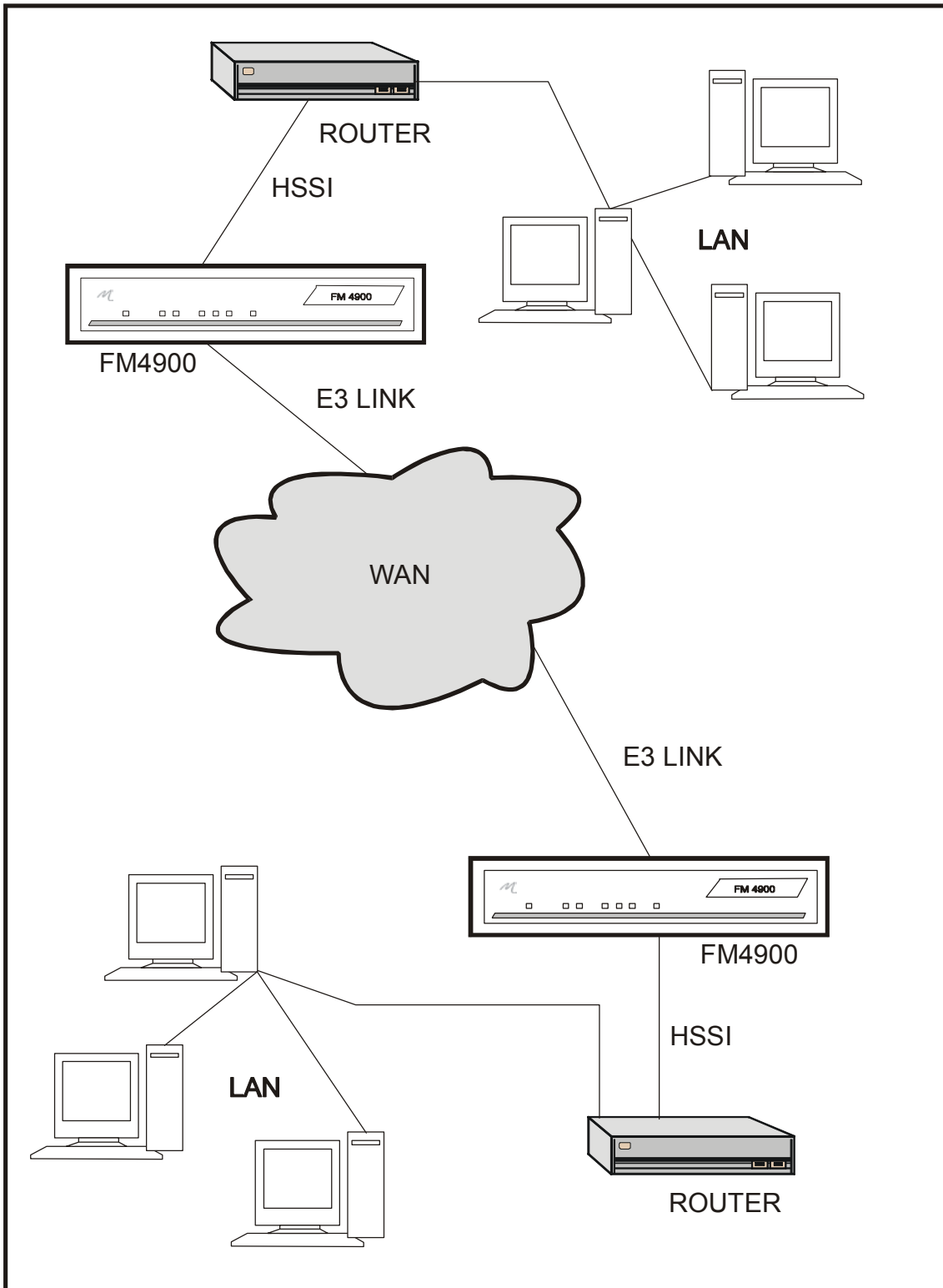


Figure 1. 1 FM4900 typical deployment

1.3 About This Manual

This user manual describes the installation, commissioning and operation of the Metrodata FM4900 Data Service Unit. It describes the operational functions of the unit, as well as the extensive performance monitoring facilities. A glossary is provided at the rear which explains the abbreviations introduced by this manual.

It is important that you read and understand the performance and operating limitations in Section 2 and specifications in Section 10 of the FM4900 before attempting any connections. Also, familiarise yourself with each of the connectors at the rear of the unit, which are described in Section 4.2.

Section 3, Technical Overview describes the G.703 and G.751 standards applicable to the operation of the FM4900.

Section 4 describes the front and rear panels of the FM4900 with details of connectors, connector layouts and alarm lights. It is worthwhile to study the detail of Sections 3 and 4 since this helps in installing and testing the unit.

Section 5, Installing & Setting-up, takes you through the basic steps of connecting the FM4900 to the external devices that you may have.

The structure of the menus is described in Section 6, Configuring the FM4900, as well as each of the options on every menu. Part of this Section describes a typical commissioning procedure, and acts as a checklist for both first-time and experienced users of the FM4900.

Section 7, Analysing Performance, shows you how to monitor the E3 link and change the summary report options for the FM4900.

Section 8 introduces the concept of remote management of the FM4900 using Simple Network Management Protocol with an LM1100 SNMP Enabler. However, this subject is too detailed to be described in this manual, and you should refer to the LM1100 SNMP Enabler User manual.

The extensive diagnostic testing and troubleshooting functions of the FM4900 are described in Section 9, including testing both local and remote connections. The troubleshooting subsection is provided to assist with isolating any errors or faults that may occur. Section 10 lists the various specifications of the FM4900 together with a Glossary of terms, and at the rear of the manual a menu chart is included as an aid to installing the FM4900.

1.4 Conventions

Notes are used to provide the reader with either statutory information which must be observed for safety reasons, or additional information which may increase the FM4900's effectiveness.

A pair of arrows around a word indicates a key on the keyboard, such as

<space> or **<escape>**

There are two exceptions to this, which appear on some of the menus:

<display> indicates that selecting the option will lead to data being displayed on the screen.

<menu> indicates that the option leads to another menu, from which further options may be chosen.

Screen displays that contain variable information, such as the current date or time, show the variable in italics, surrounded by square brackets, i.e. *[time]*, or "*[nodename]*". The speechmarks indicate that the field contents can be specified by the user.

Where menu items are referred to in the text, these are shown in italics to help the reader to cross relate to menu information.

Screen examples: the FM4900 allows you to use one of three options for displaying the menus on a terminal - ANSI, VT100/VT220 or TTY.

The screen examples in this manual use VT100/VT220 and are shaded to allow easy identification by the reader.

2 STATUTORY INFORMATION

2.1 Performance

The FM4900 complies with the requirements of G.703 at 34.368 Mbps, G.751, British Telecom specification SIN219 and BS6328 Section 8.2 Clause 5.2. It has a port defined as 5C (Unstructured operation) in the context of OfTel OTR.001. These standards permit connection to the public 34.368 Mbps network.

The FM4900 maintains bit integrity between the network port and the DTE port.

The FM4900 should not be connected to cabling which would be required by BS6701 to be equipped with over-voltage protection.

The worst case delay through the FM4900 is 0.6 microseconds, and the worst case round trip delay is 2.4 microseconds.

2.2 Safety

The following ports are designated SELV (Safety Extra Low Voltage) within the scope of EN41003:

- HSSI port (DTE port)
- Terminal port
- Management port
- Alarm extension port
- E3 Line Port (WAN port)

These ports should only be connected to SELV ports on other equipment in accordance with EN60950 clause 2.3.

2.3 Electromagnetic Compatibility

In order to ensure EMC compliance all signal and data cables and connectors must use a screened connector shell with a screened cable. The cable screen must be terminated to the screened connector shell and not connected to any pins of the connector. Failure to use the correct connector may compromise EMC compliance.

2.4 EN55022 Declaration

The FM4900 is a Class A product. In a domestic environment it may cause radio interference in which case the user may be required to take adequate measures.

2.5 FCC Declaration

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

2.6 Power Supply

The FM4900 is powered by a mains power supply with an input voltage range 100-250 VAC / 50-400 Hz. The maximum input current is approximately 0.2A rms. at 240V.

An alternative -48V DC power supply unit is available, the supply definition being minus 36 to minus 72VDC. The maximum input current is 1.0A. The -48V DC power supply provides cable ends for connection by the user to the main power source. The cable colour codes are:

| | |
|--------------|--------|
| Green/yellow | Earth |
| Blue | 48V DC |
| Black | Zero |

Figure 2. 1 DC connections

Safety Notes:

Excessive voltages are present inside the unit. There are no user serviceable parts inside the unit, and the cover should not be removed by unqualified personnel. The unit must not be exposed to damp or condensing conditions. The FM4900 must be connected to safety earth for correct operation.

2.7 On board batteries

The user is reminded that Metrodata motherboards use Lithium/Thionyl Chloride 3.6 volt battery cells for the maintenance of RAM.

These batteries must be handled with care. There may be a risk of explosion if a battery is incorrectly replaced. Do not recharge, force open, heat or dispose of by fire. Replace only with the same type of battery. Disposal must be in accordance with the manufacturer's instructions. If in doubt about any aspect of battery replacement or disposal, please call Metrodata Technical Support Department.

3 TECHNICAL OVERVIEW

The FM4900 is used on unframed G.703 digital services, and can be used in either unframed G.703 or framed E3 G.751 modes. Technical overviews of G.703 and G.751 are provided.

3.1 G.703 Signal Transmission

The signal is transmitted on 75 Ohm RG59 unbalanced coax. The signal has alternate mark inversion (AMI) characteristics in accordance with G.703. A mark is transmitted as a 0.5 unit interval (UI) wide pulse of amplitude 2.37V. Alternate marks have opposing polarity so that '111' is transmitted as a positive pulse, a negative one and then another positive one. The pulses have a duration of 50% so that strings of '1s' can be identified as a series of pulses. This is because clocking information is derived from the transmitted signal. In addition, strings of zeros are replaced with high-density binary 3 (HDB3) code words to ensure pulse density (and therefore clocking information) and an average DC potential of 0V. The transmission rate is 34.368 Mbps.

3.2 G.751 Framing

Groups of 1524 bits are grouped into frames together with a 12-bit overhead at the start of the frame. The frame length is therefore 1536 bits, and the frame repetition rate is 22.375 KHz. Data from the payload is presented to the HSSI DTE in bursted fashion. Bursted data comprises a sequence of bits with a bit rate equal to the line rate, followed by a gap in the data equivalent in length to the synchronisation pattern.

3.3 Path Overhead

The 12 bits are used for path overhead and provide framing, alarm information, error detection and management. They are used as follows:

| Bit No | Function |
|---------|---|
| 1 to 10 | Frame alignment signal (FAS) 1111010000 |
| 11 | Remote alarm indication (RAI) |
| 12 | National bit |

Figure 3. 1 Path overhead

3.4 Payload

The FM4900 operates with a DTE port data rate of 34.368 Mbps in unframed mode, or 34.099 Mbps in framed mode.

4 INTRODUCING THE FM4900

The FM4900 is supplied in a metal enclosure for tabletop or 19" rack mounting using the optional rack mounting ears that bolt onto the side of the module.

4.1 Front panel

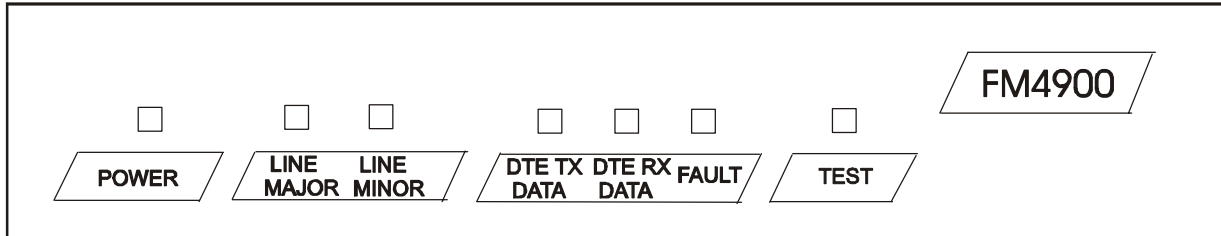


Figure 4.1 FM4900 front panel

The FM4900 provides you with essential information through a series of LED's on the front panel. The colour of some of these LED's will depend on the type of data that is being handled at the time, and these are described in Figure 4.2 below.

| LED | Colour | Meaning |
|---------------------------|------------------------|---|
| Power | Red | Mains power is being received. |
| Line | | |
| Major Minor | Red Yellow | LOS, LOF or SQ alarm is present AIS or RAI alarm is present. |
| DTE | | |
| Fault | Red | The TT clock is out of specification or the FM4900 has a hardware timing fault. |
| TX Data and RX Data | Red Green Orange | Data being transmitted or received = 1 Data being transmitted or received = 0 The data is switching rapidly between 0 and 1 |
| Test | | |
| | Red | The E3 port is looped locally or remotely; or the remote loop pattern has been sent. |
| | Green | The DTE port is looped, or the external DTE loop has been selected |

Figure 4.2 Front panel alarms

4.2 Rear panel

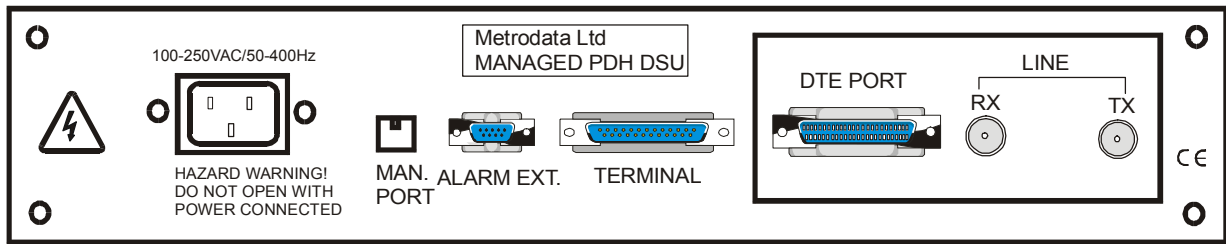


Figure 4.3 FM4900 Rear panel

4.3 Power Supply

The FM4900 is powered by a mains power supply with an input voltage range 100-250 VAC / 50-400 Hz. The maximum input current is 0.2A rms. at 240V.

An alternative -48VDC powered unit is available. The input voltage and current ranges are - minus 36 to minus 72 volts DC. A Buccaneer type socket is fitted to the rear panel, and a plug is provided with the unit for the customer's own wiring. The connections are labelled on the rear panel of the unit.

On some units, an additional Ground stud may be located on the rear panel to permit a separate Ground connection to be made.

| Pin no | Connection |
|--------|------------|
| 1 | -48VDC |
| 2 | Ground |
| 3 | 0VDC |

Figure 4.4 -48VDC connections

TNote: The FM4900 must be connected to safety earth for correct operation.

4. 4 Remote Management port

If you have chosen the LM1100 SNMP Enabler option this port will contain an RJ45 connector, otherwise it will contain a blanking plug.

This port is labelled *MAN PORT* on the rear panel. The LM1100 SNMP Enabler option gives access to the SNMP network management system via an IEEE 802.3/10BaseT interface on the rear of the DSU. The layout of this port's RJ45 connector is shown below:

Note: The Management port is regarded as a SELV port within the scope of EN 41003.

| Pin | Signal |
|-----|---------------|
| 1 | Tx Data + ve |
| 2 | Tx Data - ve |
| 3 | Rx Data + ve |
| 4 | Not connected |
| 5 | Not connected |
| 6 | Rx Data - ve |
| 7 | Not connected |
| 8 | Not connected |

Figure 4. 5 Management port layout

4. 5 Alarm Extension

This port contains either a 6-pin mini-DIN connector or a 9-pin D-type connector, allowing you to connect the major and minor alarm relay contacts within the FM4900 to a remote indicator, such as a bell or a lamp. The two types of connectors are described below. The Major alarm contacts are normally open, so that major alarm indication is given if the mains power supply to the DSU should fail. The Alarm Relay port is regarded as a SELV port within the scope of EN41003.

| Pin | Function |
|-----|--------------|
| 1 | Major common |
| 2 | Minor N/C |
| 3 | Major N/O |
| 4 | Minor N/O |
| 5 | Major N/C |
| 6 | Minor common |

Figure 4.5 6-pin connector layout

| Pin | Function |
|-----|---------------|
| 1 | Shield |
| 2 | Major common |
| 3 | Minor N/O |
| 4 | Minor N/C |
| 5 | Not connected |
| 6 | Major N/C |
| 7 | Major N/O |
| 8 | Minor common |
| 9 | Not connected |

Figure 4. 6 9-pin D-type connector layout

4. 6 Terminal Port

The terminal port is provided for local management of the FM4900. It is a female 25-pin D-type connector with a full RS232 layout which is shown below.

Note: The Terminal port is regarded as a SELV port within the scope of EN 41003.

| Pin | Function |
|------|---------------|
| 1 | Chassis |
| 2 | Transmit |
| 3 | Receive |
| 4 | RTS |
| 5 | CTS |
| 6 | DSR |
| 7 | Ground |
| 8 | DCD |
| 9-25 | Not connected |

Figure 4. 7 Terminal port connector layout

If the *MODEM SUPPORT* item in the *V.24 SET-UP* menu is set to its default value *ON*, then RTS (pin 4 on the DSU terminal port) needs to be correctly driven, otherwise the user will be permanently logged out of the DSU. To drive the RTS correctly, a fully configured cable can be used together with a terminal that supports hardware handshaking. An alternative approach is to connect the RTS and DSR signals together (pins 4 and 6) at the DSU end of the cable. Obviously, the loop-backs should not be implemented if the management terminal is remote, and connected via a modem.

4 . 6. 1 Minimum RS232 connection

A cable to connect a local terminal to this port (without a modem) may have the minimum RS232 connection when this is suitable for the terminal being used, as shown in Figure 4.8.

| Pin | Function | Connection |
|------|----------|---------------|
| 1 | | Not connected |
| 2 | Transmit | 2 |
| 3 | Receive | 3 |
| 4 | | Loop to 6 |
| 5 | | Not connected |
| 6 | | Loop to 4 |
| 7 | Ground | 7 |
| 8-25 | | Not connected |

Figure 4. 8 Local terminal cable pin-out

4 . 6. 2 V.24 Terminal Cable 25 Way to 25 Way

A full RS232 connection via a 25-way cable is shown below:

| 25 Way D Male (DSU) | Function | 25 Way D Female (Terminal) |
|---------------------|---------------|----------------------------|
| 2 | Transmit | 2 |
| 3 | Receive | 3 |
| 4 | RTS | 4 |
| 5 | CTS | 5 |
| 6 | DSR | 6 |
| 7 | Ground | 7 |
| 8 | DCD | 8 |
| 1,9-25 | Not connected | 1,9-25 |

Figure 4. 9 Terminal port cable 25 way to 25 way

Note: To inhibit the modem control function for reasons explained earlier in this section, loop pins 4 and 6 at DSU end of cable.

4 . 6. 3 Connecting to a PC COM port

A converter cable can be supplied to convert from the 25-way female D-type connector on the rear panel of the DSU to a 9-way D-type connector. This may be required if a PC is being used as the management terminal to connect to the PC's 9-pin COM port. The connections are given in the figure below.

| 25 Way D Male (DSU) | Function | 9 Way D Female (PC) |
|---------------------|-----------------------------|---------------------|
| 2 | Transmit | 3 |
| 3 | Receive | 2 |
| 4 | RTS Loopback to pin 6 (DSR) | 7 |
| 5 | CTS | 8 |
| 6 | DSR Loopback to Pin 4 (RTS) | 6 |
| 7 | Ground | 5 |
| 8 | DCD | 1 |
| 1,9-25 | Not connected | 4,9 |

Figure 4. 10 Terminal port converter cable 25 way to 9 way

Notes: To inhibit the modem control function for reasons explained earlier in this section, loop pins 4 and 6 at DSU end of cable.

If you are using Windows/Hyperterm as your terminal emulator, click on **View/Font** and activate **MSLinedraw** for optimum picture quality.

4.7 HSSI Port

The HSSI EIA613 DTE port is used to connect to the router. It consists of a female miniature 50-pin AMP connector, whose pins are described below.

AMP connector, part number 749111-4 or should be used for connections to this port.

Note: The HSSI port is regarded as a SELV port within the scope of EN 41003.

| +VE Pin No | -VE Pin No | Function | CCT No. |
|------------|------------|----------|---------|
| 1 | 26 | SG | 102 |
| 2 | 27 | RT | 115 |
| 3 | 28 | CA | 107 |
| 4 | 29 | RD | 104 |
| 5 | 30 | LC | |
| 6 | 31 | ST | 114 |
| 7 | 32 | SG | 102 |
| 8 | 33 | TA | 108.2 |
| 9 | 34 | TT | 113 |
| 10 | 35 | LA | 141 |
| 11 | 36 | SD | 103 |
| 12 | 37 | LB | 140 |
| 13 | 38 | SG | 102 |
| 14-18 | 39-43 | Reserved | |
| 19 | 44 | SG | 102 |
| 20-23 | 45-48 | Reserved | |
| 24 | 49 | TM | |
| 25 | 50 | SG | 102 |

Figure 4. 11 HSSI port connector layout

4.8 Network Connection

The network connection is made to the BNC connectors at the rear of the unit. Connections are as follows:

| Pin | Function |
|------|----------|
| Tip | Signal |
| Ring | Shield |

Figure 4.12 BNC connection

Cable lengths should be restricted to those defined below:

| Cable | Max. Length (metres) |
|--------|----------------------|
| UR202 | 180 |
| RG59/U | 150 |
| BT2002 | 160 |
| BT2003 | 165 |

Figure 4.13 Cable lengths

Note: The total maximum attenuation of each of the cables attached to the network port must not exceed 6dB when measured at 17.184 MHz.

The frequency/attenuation characteristic of the cables attached to the network port shall follow a root frequency law.

The port type is classified as 5C (unstructured port) within the scope of OTR.001. The FM4900 provides bit integrity between the E3 port and the DTE port with a worst case round trip delay of 2.4 microseconds.

5 INSTALLING & SETTING-UP

This chapter describes how to set up the FM4900 ready for use. It covers the initial connections, powering on the unit, and how to access the software that controls the operating parameters.

Setting and changing these parameters is covered in Section 6, Configuring FM4900.

Safety Notice: Ports that are identified as SELV in this manual should only be connected to SELV ports on other equipment in accordance with EN 60950 clause 2.3.

5.1 Connections

Step 1: Mounting

The FM4900 is housed in a convenient 1U table top enclosure. The unit may also be installed in a 19" rack using the 1U rack mounting brackets supplied.

Step 2: DTE

Connect the FM4900 to the DTE, using the 50-way AMP connector labelled DTE on the rear panel of the unit. The DSU should ideally be placed close to the DTE, with no more than 2m of cable connecting the two.

Step 3: WAN

Connect the WAN by means of the two BNC bayonet connectors on the rear panel of the unit.

Note: Before connecting the network port, make sure that you have read the information under Network connection in section 4.8.

Step 4: Terminal

Connect the management terminal (Teletype or VDU) using the 25-way D- type connector labelled *TERMINAL* on the rear panel of the unit.

Step 5: Alarm Extension

If you wish to use an external alarm device, connect this to the alarm extension port.

Step 6: SNMP Management Port

If you have the LM1100 SNMP Enabler option and wish to use it, connect the LAN to the port labelled MAN PORT using an RJ45 connector.

Step 7: Power Supply

Finally, connect the mains power lead (or DC power cable) and re-check all connections for security. See section 2.4 for connection details for the optional -48V DC power supply. Turn on the terminal and external alarm device if used, then turn on the power supply.

Warning: Do not connect the FM4900 to excessive voltages. Read the safety information before continuing.

5.2 Power-Up Sequence

When the FM4900 is powered up, it performs several system tests. After a few seconds the start-up screen is shown on the terminal. Figure 5.1 below is an example only:

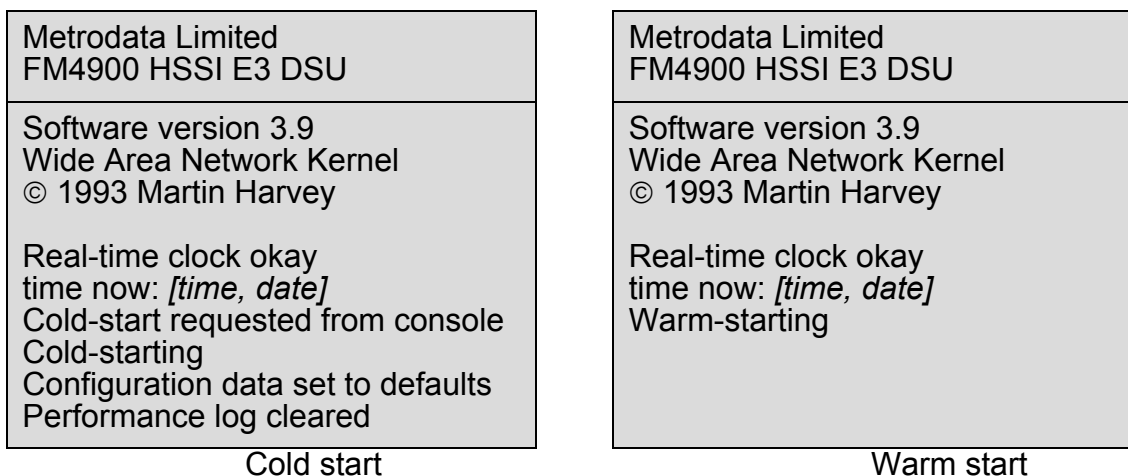


Figure 5. 1 Start-up screens

In order to check or change any of the operating parameters, you will first need to gain access to the FM4900's software by logging in. Press any key, and a logon message will be displayed:

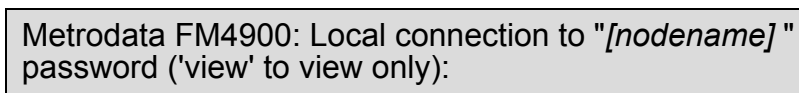


Figure 5. 2 Logon screen

There are two levels of user - Observer, or Operator. If you type *VIEW* as the password, you will only be able to look at the current settings, and will not be able to change any of them. If you enter the correct operator password, you can change any parameters that are not defined as read-only.

The default operator password is the same as the model number, i.e. *FM4900*. When you have entered this once, you will be able to change the password if you wish, as described in Section 6.3. When you enter the appropriate password, you will be presented with the *MAIN SET-UP* menu. All of the FM4900's operating parameters are accessed through this initial menu.

5.3 User Interface

The display of the menu, and the way you select menu options, will depend on which type of terminal you have connected to the unit, and which version of FM4900 firmware you have. This section describes the differences between the three main types of display - how to change the display set-up is described at the end of this section.

5.3.1 TTY terminal

With a TTY terminal, options are selected by pressing the first capital letter in the name. Generally, this will be the first letter, but where two menu options start with the same letter one of them will have another letter capitalised. An example of a TTY display is shown below:

| | |
|------------------|-----------|
| MAIN SET-UP | |
| alarm eXtension | <menu> |
| General set-up | <menu> |
| WAN port set-up | <menu> |
| DTE set-up | <menu> |
| V.24 set-up | <menu> |
| Remote logon | <display> |
| Management | <menu> |
| Testing | <menu> |
| Special | <menu> |
| Performance data | <menu> |

| |
|---|
| Select item by using first CAPITAL letter of name |
| <escape> - exit menu |

Figure 5.3 TTY Main set-up menu

When you press a letter which leads to a further menu, the screen will scroll up and the new menu will be displayed. The highlighted menu item *REMOTE LOGON* only appears on the screen when *G.751* Framed mode is selected and *DATALINK* is enabled. The item *MANAGEMENT* only appears if the LM1100 SNMP Enabler has been fitted to the FM4900.

Pressing a letter corresponding to a menu option will lead to additional prompts at the bottom of the screen:

| | |
|----------|-----------------------|
| <space> | - change value |
| <enter> | - save new value |
| <escape> | - exit without saving |

Figure 5.4 Prompt screen

The current value of that option will then be shown. Each time you press the space bar, the next value will be displayed, cycling through the available values. When the required value is displayed, simply press the <enter> key to accept the value or press <escape> to cancel your choice. This process is known as toggling.

5 . 3. 2 VT100/VT220 and ANSI terminals

The displays you see on a VT100/VT220 or an ANSI terminal are very similar, and examples are shown below:

| MAIN SET-UP | |
|------------------|-----------|
| alarm eXtension | <menu> |
| General set-up | <menu> |
| WAN port set-up | <menu> |
| DTE set-up | <menu> |
| V.24 set-up | <menu> |
| Remote logon | <display> |
| Management | <menu> |
| Testing | <menu> |
| Special | <menu> |
| Performance data | <menu> |

| |
|----------------------------------|
| HIGHLIGHTED letter - select item |
| <escape> - exit menu |

Figure 5. 5 VT/ANSI Main set-up menu

When you press a letter which leads to a further menu, the screen will be refreshed without scrolling, displaying the new menu.

The highlighted menu item *REMOTE LOGON* only appears on the screen when *G.751 Framed* mode is selected and *DATALINK* is enabled. The item *MANAGEMENT* only appears if the LM1100 SNMP Enabler has been fitted to the FM4900.

If you press a letter corresponding to a menu option, the value opposite that option will be highlighted. You will also see the prompts at the bottom of the screen, similar to the TTY display:

| |
|--------------------------------|
| <space> - change value |
| <enter> - save new value |
| <escape> - exit without saving |

Figure 5. 6 Prompt screen

Pressing the space bar will cause the next available value to be displayed opposite the option. When the required value is displayed, simply press the **<enter>** key to accept the value or press **<escape>** to leave the existing value unchanged. This process is known as toggling.

Note that if you use a PC with the Windows Hyperterm terminal emulator set to VT100/220, click on **View/Font** and activate **MS Linedraw** to achieve best picture quality.

5.4 Default settings

The default settings for the terminal connected to the management port are given in the table below.

The terminal must be set to the FM4900's default values after performing a cold start. Once this is done, the FM4900's V.24 settings can be changed using the *V.24 SET-UP* menu, which is accessed from the *MAIN SET-UP* menu described in the next section.

The default terminal is a Teletype (*TTY*), but the vast majority of users will employ a *VT100/220* or an *ANSI* terminal either directly or on a PC via a terminal emulator. The TTY output screens do not have graphic capability, and are therefore not so easy to read when setting up the system.

After a making change in the FM4900's stored terminal set-up (with the terminal on default settings), select *LOAD NEW CONFIG* on the menu screen. The physical terminal must then be re-set to correspond to the new values stored in the unit.

| V.24 Item | Defaults | Options |
|---------------|----------|-------------------------|
| Terminal type | TTY | TTY, VT100/220, ANSI |
| Baud rate | 9600 | 2400, 4800, 9600, 19200 |
| Parity | None | Odd, Even |
| Data bits | 8 | 7 or 8 |
| Stop bits | 1 | 1 or 2 |
| Flow control | Xon/Xoff | |

Figure 5.7 V.24 Terminal set-up defaults and options

6 CONFIGURING THE FM4900

6.1 Menu Structure

When you have completed the installation, and have successfully logged in, you will be presented with the *MAIN SET-UP* menu. In order to view or change a parameter, you need to know which menus or options to display. This section describes how to navigate your way through the menus. In Figure 6.1 below, the shaded boxes represent screens that lead to further menus.

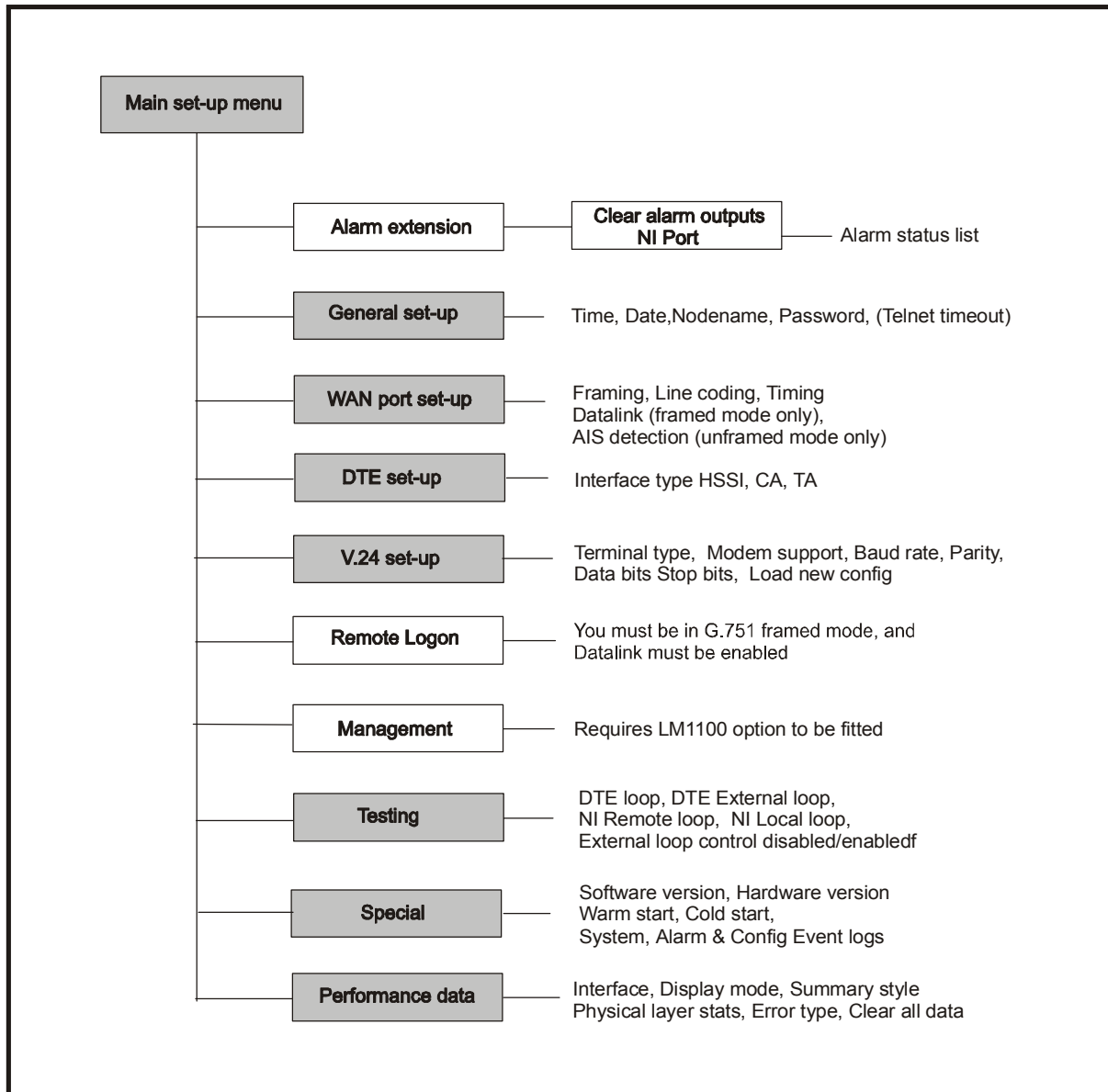


Figure 6. 1 FM4900 Menu structure

When the FM4900 powers up it automatically seeks to logon to the local node, as described in section 5.2. Pressing the <escape> key on any screen will return you to the previous screen in the structure.

6.2 Main Set-up Menu

| MAIN SET-UP | |
|--------------------|-----------|
| alarm eXtension | <menu> |
| General set-up | <menu> |
| WAN port set-up | <menu> |
| DTE set-up | <menu> |
| V.24 set-up | <menu> |
| Remote logon | <display> |
| Management | <menu> |
| Testing | <menu> |
| Special | <menu> |
| Performance data | <menu> |

| |
|----------------------------------|
| HIGHLIGHTED letter - select item |
| <escape> - exit menu |

Figure 6.2 Main set-up menu

The menu item *MANAGEMENT* only appears if the LM1100 SNMP Enabler has been fitted. The item *REMOTE LOGON* only appears if the FM4900 is in G.751 framed mode and *DATALINK* is enabled.

6.2.1 Alarm extension

Selecting the menu item *ALARM EXTENSION* on the *MAIN SET-UP* menu leads to a further menu.

| ALARM EXTENSION | |
|------------------------|-----------|
| Clear alarm outputs | <display> |
| NI port | <menu> |

| |
|----------------------------------|
| HIGHLIGHTED letter - select item |
| <escape> - exit menu |

Figure 6.3 Alarm extension screen

6 . 2. 2 Clear Alarm Outputs

If the FM4900 has detected a major or minor alarm condition the alarm extension is activated. The alarm extension device may be muted by selecting *CLEAR ALARM OUTPUTS*. When this option is selected the alarm extension status (prior to the clear command) is shown below the menu.

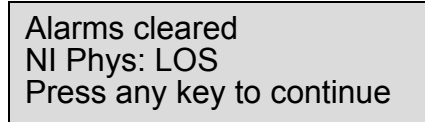


Figure 6. 4 Alarm status screen

Note: If the alarm extension has been cancelled with the *CLEAR ALARM OUTPUTS* option, the alarm is still indicated on the front panel indicator lights and in the performance statistics.

The *NI PORT* option shown below provides a display of all the alarms which are valid for the FM4900. in each operating mode. The alarms are labelled from 0 to 9 and A to Z in the firmware, and can be selected by their label.

| NI PORT | |
|---------|-------|
| 0 - LOS | Major |
| 1 - LOF | Major |
| 3 - AIS | Minor |
| 4 - RAI | Minor |
| 5 - SQ | Major |

Framed mode alarms

| NI PORT | |
|---------|-------|
| 0 - LOS | Major |
| 3 - AIS | Minor |

Unframed mode alarms

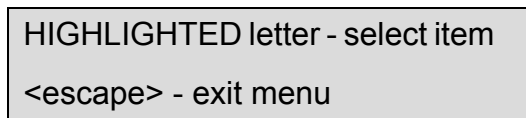


Figure 6. 5 NI Port alarm config

Note: When in UNFRAMED mode, AIS only appears on the alarm listing if it has been *ENABLED* on the *WAN PORT SET-UP* menu. Toggling the space bar permits the alarm to be configured by the user to *MAJOR*, *MINOR* or *NONE*. This affects which alarm extension relay is affected by an alarm. The configuration rules are:

| | |
|-------|-------------|
| MAJOR | major relay |
| MINOR | minor relay |
| NONE | no relay |

Figure 6. 6 Alarm relay config

Even if the alarm extension menu item is set to *NONE*, the performance reports described in Section 7 will continue to count alarms.

6.3 General Set-Up Menu

| GENERAL SET-UP | |
|----------------|--------------|
| Time | 16:24:32 |
| Date | Mon 2/4/01 |
| Node name | "[nodename]" |
| Password | |
| tElnet timeout | 60 |

HIGHLIGHTED letter - select item
 <escape> - exit menu

Figure 6.7 General set-up menu

Note: the *TELNET TIMEOUT* option appears only if you are using *SNMP* or *DATALINK* facilities.

6.3.1 Time

When you select Time, you will be prompted to enter the current time in the format hh:mm:ss. Note that this format uses the 24-hour clock. For example:

t

```
Enter time (hh:mm:ss)
> 14:30:00
```

Figure 6.7 Time prompt

6.3.2 Date

Enter the current date in the format dd/mm/yyyy. For example, April 4th 2001 would be entered as 4/4/2001. The corresponding day of the week is also displayed when you press <enter>. Leading zeros are suppressed by the date display.

```
Enter date "[dd/mm/yyyy]"
> 4/4/2001
```

Figure 6.8 Date prompt

The year is entered as an explicit 4 digit number (e.g. 2004), and processed as such in the firmware. Dates between 01/01/1980 and 31/12/2047 are valid.

6 . 3. 3 Node name

This is the name of the unit to which you are currently connected. The top of the screen indicates the current node by displaying

```
Local connection to "[nodename]"
```

or

```
Remote connection to "[nodename]".
```

At the *ENTER NEW NAME* prompt, you can enter the name you wish to give this node. The name may be up to 16 characters with no spaces permitted.

```
Enter new name
>
```

Figure 6. 9 Enter new name

6 . 3. 4 Password

This option is used to change the current password. The supervisory password, which allows you to change settings, is initially set to the model number, i.e. *FM4900*. If you wish to change the password, select this item and then enter the new password.

The password may be up to 16 characters with no spaces permitted.

The password is not case-sensitive, which means that if you enter the password as upper case letters, the unit will accept either upper or lower case, or a mixture of both, when you next log on.

```
Enter new password
Password> *****
Verify>
```

Figure 6. 10 Password prompt

For security, the characters you type are displayed on the screen as asterisks. You will also be asked to re-enter the password as a check.

6 . 3. 5 Telnet Timeout

If you are using either the SNMP Management or *DATALINK* facilities, then the *TELNET TIMEOUT* option appears in the menu. It is used to close automatically the Telnet session if there is no activity or if the Telnet session was incorrectly ended. This is useful since the timeout prevents lockout of other operators by leaving telnet sessions open inadvertently.

Two concurrent telnet sessions are permitted, but with a single timeout setting. The value is in seconds (the default is 60), with a maximum value of 3600. If 0 is entered then the timeout is disabled. For the reasons above, timeout disabling is not recommended.

6.4 WAN (Line) Port Set-up Menu

The menu is shown below for each operating mode.

| WAN PORT SET-UP | | WAN PORT SET-UP | |
|-----------------|----------|-----------------|----------|
| Framing | G.751 | Framing | Unframed |
| Line coding | HDB3 | Line coding | HDB3 |
| Timing | Internal | Timing | Internal |
| data-link | On | als detection | Enabled |

G.751 Framed mode

Unframed mode

Figure 6. 11 WAN Port set-up menus

6.4.1 Framing

This option can be set to either *G.751* or *UNFRAMED* mode.

If *UNFRAMED* mode is selected 34.368 Mbps of bandwidth is available to the DTE.

If *G.751* framed mode is selected 34.100 Mbps of bandwidth is available to the DTE.

6.4.2 Line coding

This setting cannot be altered, and is for information only. The value is *HDB3* (High Density Binary 3).

6.4.3 Timing

This details the clocking employed in the FM4900, and the values are *INTERNAL* and *LOOP*.

The E3 Line TX clock is derived from the DTE using CCT 113 (TT: terminal timing). The HSSI specification requires this signal to be a non-gated version of CCT 114 (ST: send timing).

The E3 Line Rx clock is always used to generate the CCT 115 timing (RT: receive timing).

We recommend that one end is set to *INTERNAL* timing and the other end is set to *LOOP* timing, although they will operate with both set to *INTERNAL* timing.

The units may operate with both set to *LOOP* timing but this is not recommended. The clocking diagram is shown in Figure 6.11 below.

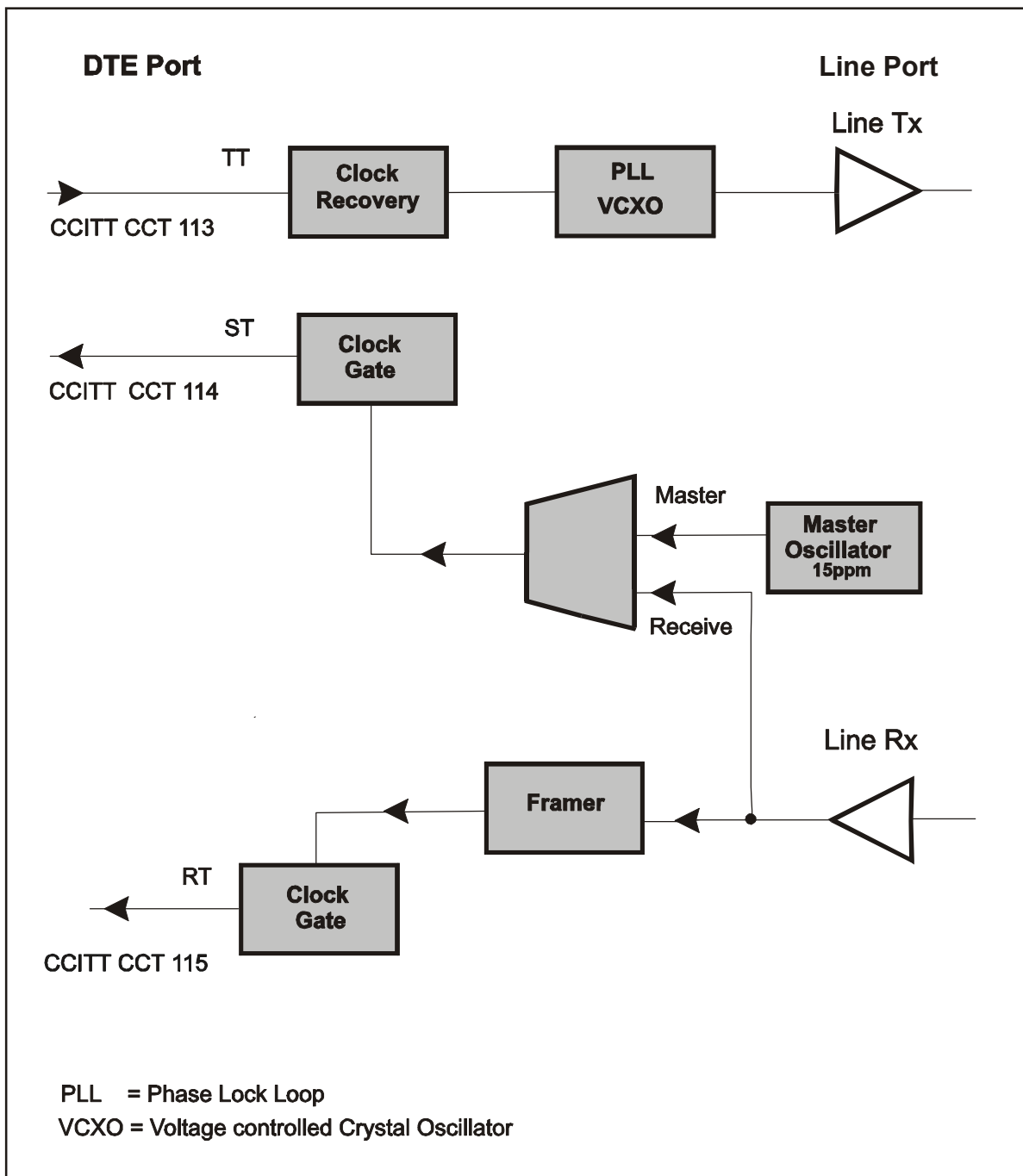


Figure 6. 12 FM4900 Clocking diagram

6 . 4. 4 Datalink

The *DATALINK* facility is only available in G.751 Framed mode. It enables you to control and monitor statistics from the remote FM4900. The options are *ON* or *OFF*.

When *DATALINK* is set to *ON*, The National bit (Bit 12 of the framing overhead described in Section 3) is used to provide 22.375 Kbit/sec of datalink bandwidth. When *OFF* the National bit is set to 1.

When *FRAMED* mode has been selected and *DATALINK* has been set to *ON*, a *REMOTE LOGON* option appears on the *MAIN SET-UP* menu. When you select *REMOTE LOGON*, the local FM4900 Telnets across the datalink to the far end unit and allows you to logon to the remote unit directly.

Note: This assumes that the remote unit's datalink facility has also been enabled, and the password is known.

When the datalink is in use the display will show as one of those below depending on which of the two units is selected:

either

Metrodata FM4900 : Local connection to "[nodename]"

or

Metrodata FM4900 : Remote connection to "[nodename]"

Figure 6. 13 Datalink screens

We advise that each unit be given a unique node name to make identification easier. To logout of the remote unit and return to the local unit: press **<CTRL>** and **<J>**.

6 . 4. 5 AIS Detection

This option will only appear on the menu when the mode is set to *UNFRAMED*. It allows *AIS DETECTION* to be *ENABLED* or *DISABLED*. The AIS detector should always remain enabled under normal datacomms conditions, and should only be disabled when there is a very low zero density in the traffic.

6.5 DTE Set-up Menu

This menu is presented as below:

| DTE SET-UP | |
|-------------------|------|
| Interface type | HSSI |
| CA | On |
| TA | Off |

| |
|----------------------------------|
| HIGHLIGHTED letter - select item |
| <escape> - exit menu |

Figure 6. 14 DTE setup menu

6.5.1 Interface type

This shows the type of DTE port fitted to the FM4900 - *HSSI* - and is for information only.

6.5.2 CA

This controls the *CA* (Control Available) signal. It can be set to *ON*, *OFF*, or *THROUGH*. When set to *THROUGH*, the control signal reflects the current state of the E3 receive port.

6.5.3 TA

This displays the current state of the *TA* signal (DTE Terminal Available), and is for information only.

6.6 V.24 Set-up Menu

This screen allows you to set up the communications parameters for the terminal anagement port.

| V.24 SET-UP | |
|-----------------|-------------|
| Terminal type | Vt100/VT220 |
| Baud rate | 9600bps |
| Parity | None |
| Data bits | 8 |
| Stop bits | 2 |
| Modem support | Off |
| Load new config | |

| |
|----------------------------------|
| HIGHLIGHTED letter - select item |
| <escape> - exit menu |

Figure 6. 15 V.24 setup menu

6 . 6. 1 Terminal type

The terminal type can be *ANSI*, *VT100/VT220* or *TTY*.

The ANSI and VT100/VT220 options give you a graphical presentation of the menus, whereas TTY is used where a dumb device such as a Teletype is used for configuration and data presentation. The screen displays for these terminal types are shown in Section 5.

6 . 6. 2 Baud rate

The baud rates supported are *2400*, *4800*, *9600* and *19200* baud.

6 . 6. 3 Parity

Parity may be set to *NONE*, *ODD* or *EVEN*.

6 . 6. 4 Data bits

The number of data bits may be *7* or *8*.

6 . 6. 5 Stop bits

The number of stop bits may be *1* or *2*.

6 . 6. 6 Modem support

Modem support causes you to be logged-out if the Ready-to-send (RTS) signal is dropped on the terminal port. This means that if the modem goes off-line your current logon session is terminated, preventing unauthorised access to the software. The RTS line needs to be driven for V.24 operation if modem support is on, so we recommend using a fully configured 25-way cable. Section 4 includes details of cable layouts.

6 . 6. 7 Load new config

Except for the *TERMINAL TYPE*, the changes you make on the V.24 Set-up screen do not take effect until you register the changes in the FM4900. This is done by selecting *LOAD NEW CONFIG* after you have made the necessary changes to the other values on this screen. You should then change your terminal settings to match these new values.

6. 7 Testing

This option gives you access to the FM4900's diagnostic functions, which are explained in detail in Section 9, Testing.

6. 8 Special

| SPECIAL | |
|------------------|-----------|
| Software version | 3.9 |
| Hardware version | 3.9 |
| Warm start | |
| Cold start | |
| system Event log | <display> |
| alarM event log | <display. |
| cOnfig event log | <display> |

| |
|----------------------------------|
| HIGHLIGHTED letter - select item |
| <escape> - exit menu |

Figure 6. 16 Special menu

This menu handles equipment version status and start-up modes, and event logs.

6 . 8. 1 Software version

This option displays the current version of the software on your FM4900. This is provided for information only.

6 . 8. 2 Hardware version

This option displays the current version of the hardware on your FM4900. This is also provided for information only.

6 . 8. 3 Warm start

Selecting *WARM START* simulates turning the mains power off then on again. This may be necessary if a network component hangs up. A warm start does not adversely affect the FM4900's configuration parameters, performance statistics database or event log.

6 . 8. 4 Cold start (Caution!)

Selecting *COLD START* returns the FM4900's software configuration to the default settings. All configuration parameters will be reset to their defaults, and the performance statistics database and event log will be cleared. The "[nodename]" will be erased, but the real-time clock will not be affected.

For security, you will be asked to confirm this request. Pressing Y will perform the cold start, pressing any other key will cancel the request.

Note: This option should only be selected when absolutely necessary, since it may cause disruption to the network.

Operational reasons for needing to *COLD START* include real time clock problems when the RTC must be reset; a change of firmware version number in the FM4900 owing to carrying out an upgrade; an invalid configuration, probably caused by corruption of the FM4900 RAM.

The management terminal may need to be reset to default settings before you can communicate with the FM4900 after a cold start. Section 5 shows the FM4900's default settings.

6 . 8. 5 Event Logs

Event logs are intended to provide a long-term history of major occurrences on the system. They can be the first port of call for a network manager when investigating a problem, and serve to confirm the status of the FM4900 at any point in time from the last cold start. If a cold start is performed, this log will be cleared and the first entry in the log will be the date and time of that cold start.

The logs are all accessed from the *SPECIAL* menu. The logs record the most recent events at the top of the screen, with events sorted into backwards order of time. The log is divided into three separate logs on separate screens: *SYSTEM EVENT LOG*, *ALARM EVENT LOG* and *CONFIG EVENT LOG*.

The *SYSTEM EVENT LOG* records system level events

| --- System Event Log --- | | |
|---------------------------|----------|-------------------|
| 16/8/99 | 23:27:35 | power restored |
| 16/8/99 | 23:19:07 | illegal interrupt |
| 15/8/99 | 00:09:33 | power restored |
| 15/8/99 | 00:09:28 | power-down |
| Press any key to continue | | |

Figure 6. 17 System event log

Note: If the system event log contains either the message *SPURIOUS RESET* or *ILLEGAL INTERRUPT*, please register this occurrence with your Supplier or Distributor of the product.

The *ALARM EVENT LOG* records alarms that have arisen since the last cold start. They are recorded simply as MAJOR or MINOR alarms with *ON* or *OFF* status.

| --- Alarm Event Log --- | | |
|---------------------------|----------|--------------|
| 17/2/2001 | 08:20:23 | Major ON NI |
| 16/2/2001 | 13:21:00 | Minor OFF NI |
| 16/2/2001 | 12:52:38 | Minor ON NI |
| Press any key to continue | | |

Figure 6. 18 Alarm event log

The *CONFIG EVENT LOG* records any configuration changes on the system. This can be very useful since configuration actions may have been taken remotely, without the knowledge of the local user of a node

| --- Config Event Log --- | | |
|---------------------------|----------|----------------|
| 16/7/2001 | 08:20:23 | Config updated |
| 16/5/2001 | 13:21:00 | Config updated |
| 14/5/2001 | 11:32:38 | Config updated |
| Press any key to continue | | |

Figure 6. 19 Config event log

6. 9 Performance Data

This option gives you access to the FM4900's performance monitoring functions. These are described in detail in Section 7, Analysing Performance.

6. 10 Unit Set-up Checklist

FM4900 DSU's are used in pairs, one at each end of a WAN link. This section acts as a checklist for setting up each unit before establishing a valid configuration for a particular application. It assumes that you have already connected the unit as required, and logged in with the Operator password. The procedure below should be carried out on **both** units.

Step 1: Set Terminal

Set your terminal's communication parameters to the FM4900's V.24 default values, then switch on power to the FM4900.

Step 2: V.24 Set-up Menu

Establish the communication parameters so that the FM4900 and the terminal are using the same settings. Set the terminal parameters at first to the default values, which are listed in Section 5.4.

Change the FM4900's *BAUD RATE*, *PARITY*, *DATA BITS* and *STOP* bits if necessary, then select *LOAD NEW CONFIG*.

If you have changed any of the default settings, you will now need to update them on the terminal, so that the FM4900 and the terminal are still on identical settings.

Step 3: Local Node - General Set-up Menu

Check the current time and date, and change them if necessary as already described. Check the "[nodename]" of the local FM4900, and change it if necessary. Check the Operator Password, and change it if necessary.

Step 4: WAN Set-Up Menu

From the *MAIN SET-UP* menu, select the WAN Set-up option and set the *FRAMING*, *TIMING*, *DATALINK* (if in Framed mode) and *AIS DETECTION* (if in Unframed mode) parameters as appropriate.

FRAMING: Two options are available - *G.751 FRAMED* or *UNFRAMED* operation. Both units should be set to the same configuration. When *UNFRAMED* mode is selected an extra field appears in the *WAN SET-UP* menu which allows AIS detection to be set to *ENABLED* or *DISABLED*. The AIS detector should always remain enabled under normal datacomms conditions, and should only be disabled when there is a very low zero density in the traffic.

TIMING: We recommend that one FM4900 is set to *INTERNAL* timing and the other is set to *LOOP* timing. The units will operate with both set to Internal timing. The units may work if both are set to *LOOP* timing but this is not recommended.

Step 5: DTE Set-Up Menu

From the *MAIN SET-UP* menu, select the DTE Set-up option and set the parameters as appropriate.

Note: After steps 1 to 4 have been successfully carried out, basic operation of the link should now be possible.

7 ANALYSING PERFORMANCE

7.1 Introduction

The FM4900 provides you with extensive performance analysis functions, which allow you to monitor and record service information about the E3 link.

The first part of this section describes the Errors and Alarms that are valid for the modes of operation of the FM4900. Performance data is displayed in the form of an on-screen report or summary. Information is grouped into periods of 15 minutes. Examples of the screens are shown in later subsections.

7.2 Errors and Alarms

7.2.1 Error types

The following error types are reported:

| | |
|-------------|---|
| Code Errors | Indicate bipolar violations leading to HDB3 code errors. In Unframed mode this is the only type of Error shown. |
| FAS Errors | Frame Alignment Signal which indicates a fault in the frame alignment pattern. This measurement is only valid in G.751 framed mode. |

Figure 7.1 FM4900 Error types

7.2.2 E3 Port Alarm responses

The default responses in Figure 7.2 below are established in the presence of an alarm condition on the E3 port. An alarm or alarms can be cancelled by selecting the *ALARM EXTENSION / CLEAR ALARM OUTPUTS* option from the *MAIN SET-UP* menu. After the alarm has been cancelled as above, it is still indicated on the front panel indicators and in the performance statistics.

| Alarm | Response |
|--|--|
| LOS | MAJOR alarm lamp lights CA cleared if THROUGH E3 port transmits RAI if in framed mode. |
| LOF (Framed mode only) | MAJOR alarm lamp lights CA cleared if THROUGH E3 port transmits RAI if in framed mode. |
| SQ (Framed mode only) | MAJOR alarm lamp lights CA cleared if THROUGH E3 port transmits RAI if in framed mode. |
| AIS (Framed mode, or if AIS is enabled in Unframed mode) | MINOR alarm lamp lights CA cleared if THROUGH E3 port transmits RAI if in framed mode. |
| RAI (Framed mode only) | MINOR alarm lamp lights. |

Figure 7.2 E3 Port alarm default responses

7 . 2. 3 DTE Port responses

If there is an operational problem on the DTE port, TA is set to *OFF*

| Condition | Response |
|-------------------------|-------------------------|
| DTE port not responding | DTE Set-up shows TA off |

Figure 7. 3 DTE port response

7 . 2. 4 Summary of Errors amnd Alarms by mode

The options described above are given in the table below to show which of them appear on the performance summary screens for each operating mode.

| Error Types | Unframed | G.751 |
|-------------|----------------------|-------|
| | CODE | CODE |
| | | FAS |
| Alarms | Unframed | G.751 |
| | LOS | LOS |
| | AIS (if AIS enabled) | AIS |
| | | LOF |
| | | RAI |
| | | SQ |

Figure 7. 4 Errors & Alarms by mode

Notes:

a) The AIS alarm only appears in the Alarms section of the Performance reports/summaries in Framed mode or if AIS has been *ENABLED* in Unframed mode.

b) The *CLEAR ALL DATA* option clears the complete performance statistics database. This may be necessary if the FM4900 contains data that is invalid, perhaps because the data was obtained from a different circuit or the unit has been powered down, or reconfigured. You will be prompted to confirm this option. It is performed automatically on a *COLD START*

7 . 2. 5 Error and Alarm definitions

The definitions corresponding to Performance reporting are given below:

| Errors | Definition |
|---------------------|---|
| LCV Code | Indicate bipolar violations leading to HDB3 code errors. |
| FAS | Frame Alignment Signal which indicates a fault in the frame alignment pattern. This measurement is only valid in G.751 framed mode. |
| G.821 Errors | Definition |
| Err. Count | The number of errors in the interval. |
| Total secs | Valid number of seconds in the interval (less than 900 means that the 15- min. period was incomplete). |
| EFS | Error-free seconds. |
| ES | Errored seconds: seconds with an error. |
| BES | Bursty errored seconds: seconds ≥ 2 errors, <1 in 10^3 errors |
| SES | Severely errored seconds: seconds >1 in 10^3 errors. |
| UAS | Unavailable seconds: declared after SES for 10 consecutive seconds. |
| DM | Degraded minutes: >1 in 10^6 errors/minute. |
| Alarms | Definition |
| LOS | Loss Of Signal: No data and therefore no clocking information. The units are alarm seconds if the summary style is G.821, or events if the style is set to counts. |
| LOF | Loss of Frame: Clocking information is there but the frame alignment pattern is faulty. The units are alarm seconds if the summary style is G.821, or events if the style is set to counts. |
| AIS | Alarm Indication Signal: All '1s' being received. The units are alarm seconds if the summary style is G.821, or events if the style is set to counts. |
| RAI | Remote Alarm Indication: the Remote FM4900 has detected a problem. The units are seconds if the summary style is G.821, or events if the style is set to counts. |
| SQ | Signal Quality : >1 in 10^3 FAS errors. The units are alarm seconds if the summary style is G.821, or events if the style is set to counts. |

Figure 7. 5 Performance data definitions

7.3 Performance menu

| PERFORMANCE DATA | |
|------------------|----------------|
| Interface | NI |
| Display mode | Static summary |
| Summary style | G.821 |
| Phys layer stats | <display> |
| Error type | LOS |
| Clear all data | |

| |
|--|
| HIGHLIGHTED letter – select item <escape> - exit menu |
|--|

Figure 7.6 Performance data menu

7.3.1 Interface

This field is for the selection of the interface for which statistics are to be displayed. This option is fixed at *NI*.

7.3.2 Display mode

This sets the type of display and the options are:

Full report and Rolling report

Static summary, Updated summary and 15 minute summaries

These modes are described in the subsections below describing reports and summaries. Reports and summaries are dealt with separately since they have different characteristics.

The *SUMMARY STYLE* menu option only appears when a Summary has been selected (as opposed to a Report) from the Display mode menu item, and this is therefore described in section 7.5.3.

7.4 Physical layer stats – Reports

7.4.1 Full Report

This presentation gives six sequential screens of information extending over the previous 24 hours for each type of error. The entries show the performance statistics for each 15-minute interval, referenced from the current real-time clock time. The alarm columns displayed are in for G.751 framed mode. In Unframed mode only LOS and AIS (if it has been *ENABLED*) will be listed.

Note: If the real-time clock is altered then the relative times of this database are also modified.

| Metrodata FM4900: Local connection to "[nodename]" | | | | | | | | | | | | | | |
|--|-------|-------|----|----|-----|-----|-----|----|-------|------------------|-----|-----|-----|----|
| NI Interface | | | | | | | | | | 1 of 6 | | | | |
| FAS Errors: | | | | | | | | | | Alarmed seconds: | | | | |
| Period Starting | Count | Valid | EF | ES | BES | SES | UAS | DM | Valid | LOS | LOF | AIS | RAI | SQ |
| 14:09:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 14:24:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 14:39:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 14:54:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 15:09:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 15:24:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 15:39:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 15:54:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 16:09:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 16:24:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 16:39:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 16:54:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 17:09:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 17:24:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 17:39:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 17:54:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 18:09:23: | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |

<Escape> to exit, any other key to continue

Figure 7.7 Full report screen

7 . 4. 2 Rolling report

The *Rolling report* option gives a single line summary of the statistics at the end of each 15-minute period. This option is a more economic version of the *15-minute summaries* option where a line printer is used, since only one report line is added to the printout every 15 minutes.

| Metrodata FM4900: Local connection to "[nodename]" | | | | | | | | | | | | | | | |
|--|------------|-------|-------------|----|-----|-----|-----|----|--------|------------------|-----|-----|-----|----|---|
| NI Interface | | | | | | | | | 1 of 6 | | | | | | |
| Period Starting | I Count | Valid | FAS Errors: | | | | | | Valid | Alarmed seconds: | | | | | |
| | | | EF | ES | BES | SES | UAS | DM | | LOS | LOF | AIS | RAI | SQ | |
| 14:09:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 14:24:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 14:39:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 14:54:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |
| 15:09:23 | 0 | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 900 | 0 | 0 | 0 | 0 | 0 |

<Escape> to exit, any other key to continue

Figure 7. 8 Rolling report screen

7.5 Physical layer stats - Summaries

7.5.1 Screen presentation

The summary report screens are designed to give a view of the alarm and error status on a single screen. There is a choice of update frequencies of the data so that the user can choose the optimum presentation at any time.

The type of Alarm or Error being monitored is shown in the left hand column of the screen. Always check this when viewing a screen for the first time. If a diagnostic test is being run, its name appears at the top right of the screen entitled *DIAGS*.

The *Temporary counts* column is used to obtain error counts over a user definable test period, the duration of which need not be time related to anything else, without erasing the entire statistics database. You can reset the *Temporary counts* by pressing *C*. This means that a measurement may be started after a 15 minute interval has partly elapsed. The counts are displayed for the temporary measurement period from its start until you clear it down by pressing *C*.

Pressing any key other than *C* or <esc> will instantly refresh the display. This applies to each of the display styles - *Static*, *Updated* and *15 minute* displays.

The *Current 15-mins* column gives the error counts for the current partial 15 minute period. Therefore the duration of statistics within this column varies between 0 and 15 minutes in a cyclical fashion as time passes.

The *Previous 15-mins* column gives the error counts for the previous complete 15 minute period, assuming that there has been one.

The *Last 24 hours* column gives the error counts for the previous 24-hour period, as an accumulation of the last 96 complete *Previous 15-mins* periods.

7.5.2 Presentation display modes

The three *DISPLAY MODES* for summaries define the frequency with which the display data is updated.

Static summary

This option presents the data as a single screen display, giving a snapshot of the current status. The information in the display may be updated by pressing any key except <escape>.

Updated summary

This is similar to a static summary except that the screen is refreshed approximately every 5 seconds, and provides a dynamic display of events.

15 minute summaries

This updates the information in a summary at the end of each 15 minute period. This mode is useful where a printer is connected to the terminal port and a detailed log is required.

Once one of these summary types has been selected for display, three styles of display are available for selection, as described below.

7 . 5. 3 Summary style

This option determines the method of presenting the error information in the summaries. These options are not available for the full or rolling reports, which have a fixed style. The *SUMMARY STYLE* option only shows on the menu when a *SUMMARY* has been selected in the *DISPLAY MODE*. The styles available are:

| | |
|---------------|---|
| Counts | Errors and alarms accumulate and are quoted as an absolute count. |
| G.821 | Errors and alarms are expressed as G.821 parameters per second. |
| %G.821 | Errors and alarms are shown in terms of normalised percentage G.821 parameters. |

Figure 7. 9 Summary styles

7 . 5. 4 Summary display - COUNTS style

| | | | | |
|---|-----------|---------------------|----------|------------|
| Metrodata FM4900: Local connection to "[nodename]" | | | | |
| 13:32:54 Tue3/4/2001 | | PERFORMANCE SUMMARY | | NI |
| Current Alarms: None | | ----- | | Diag: None |
| | Temporary | Current | Previous | Last |
| | Counts | 15 mins | 15 mins | 24 hours |
| Alarm counts | | | | |
| Total Secs | 856 | 510 | 900 | 86400 |
| LOS | 0 | 0 | 0 | 0 |
| LOF | 0 | 0 | 0 | 0 |
| AIS | 0 | 0 | 0 | 0 |
| RAI | 0 | 0 | 0 | 0 |
| SQ | 0 | 0 | 0 | 0 |
| FAS Errors: | 0 | 0 | 0 | 0 |
| Total secs | 856 | 510 | 900 | 86400 |
| Err Count | 0 | 0 | 0 | 0 |
| Error rate | 0 | 0 | 0 | 0 |
| <Escape> - exit, N - next interface, C - clear temp, other key - refresh | | | | |

Figure 7. 10 Performance summary screen - COUNTS style

Notes:

a) The display above is for G.751 Framed mode. In Unframed mode, only LOS and AIS (if enabled) will show as alarms, and Code Errors will be the only Errors displayed.

b) If an alarm appears in Counts style, it appears only once as a single event, and is recorded in the Temporary Counts column only. It may be best to confirm an alarm situation by setting the summary screen to G.821 style when an alarm is present.

7 . 5. 5 Summary display - G.821 style

| | | | | |
|--|-----------|---------------------|----------|------------|
| Metrodata FM4900: Local connection to "[nodename]" | | | | |
| 13:32:54 Tue 3/4/2001 | | PERFORMANCE SUMMARY | | NI |
| Current Alarms: None | | ----- | | Diag: None |
| | Temporary | Current | Previous | Last |
| | Counts | 15 mins | 15 mins | 24 hours |
| Alarm counts | | | | |
| Total Secs | 856 | 510 | 900 | 86400 |
| LOS | 500 | 500 | 0 | 0 |
| LOF | 0 | 0 | 0 | 0 |
| AIS | 0 | 0 | 0 | 0 |
| RAI | 0 | 0 | 0 | 0 |
| SQ | 0 | 0 | 0 | 0 |
| Code Errors: | 0 | 0 | 0 | 0 |
| Total secs | 856 | 510 | 900 | 86400 |
| ES | 0 | 0 | 0 | 0 |
| BES | 0 | 0 | 0 | 0 |
| SES | 0 | 0 | 0 | 0 |
| UAS | 500 | 500 | 0 | 0 |
| DM | 0 | 0 | 0 | 0 |
| <Escape> - exit, N - next interface, C - clear temp, other key - refresh | | | | |

Figure 7. 11 Performance summary screen - G.821 style

Notes:

a) The display above is for G.751 Framed mode. In Unframed mode, only LOS and AIS (if enabled) will show as alarms, and Code Errors will be the only Errors displayed.

b) If an alarm appears in G.821 style, it is updated incrementally in the Temporary Counts and other columns as appropriate for its duration. The definition of G.821 as parameters per second gives a different summary layout than that for Counts style. In Counts style, an event is recorded once only.

7 . 5. 6 Summary display - Percent G.821 style

| | | | | |
|--|-----------|---------------------|-----------|------------|
| Metrodata FM4900: Local connection to "[nodename]" | | | | |
| 13:32:54 Tue 3/4/2001 | | PERFORMANCE SUMMARY | | NI |
| Current Alarms:None | | ----- | | Diag: None |
| | Temporary | Current | Previous | Last |
| | Counts | 15 mins | 15 mins | 24 hours |
| Alarmed time: | | | | |
| Total secs | 856 | 510 | 900 | 86400 |
| %LOS | 00.0000% | 00.0000% | 00.0000% | 00.0000% |
| %LOF | 0.0000% | 0.0000% | 0.0000% | 0.0000% |
| %AIS | 0.0000% | 0.0000% | 0.0000% | 0.0000% |
| %RAI | 0.0000% | 0.0000% | 0.0000% | 0.0000% |
| %SQ | 0.0000% | 0.0000% | 0.0000% | 0.0000% |
| FAS Errors: | | | | |
| %EFS | 100.0000% | 100.0000% | 100.0000% | 100.0000% |
| %ES | 0.0000% | 0.0000% | 0.0000% | 0.0000% |
| %BES | 0.0000% | 0.0000% | 0.0000% | 0.0000% |
| %SES | 0.0000% | 0.0000% | 0.0000% | 0.0000% |
| %UAS | 0.0000% | 0.0000% | 0.0000% | 0.0000% |
| %DM | 0.0000% | 0.0000% | 0.0000% | 0.0000% |
| <Escape> - exit, N - next interface, C - clear temp, other key - refresh | | | | |

Figure 7. 12 Performance summary screen - Percent G.821 style

Note:

a) The display above is for G.751 Framed mode. In Unframed mode, only LOS and AIS (if enabled) will show as alarms, and Code Errors will be the only Errors displayed.

8 REMOTE MANAGEMENT

In addition to using the terminal port, the FM4900 may be managed remotely by using a LAN-based network management system. In order to do this, the LM1100 SNMP Enabler option must be fitted to the FM4900.

The operating parameters, event log, performance statistics database and diagnostics functions are known collectively as the Management Information Base (MIB). The FM4900's MIB can be accessed remotely by using a Network Management System (NMS) connected to the LAN. The NMS should use SNMP (Simple Network Management Protocol), and could be located on the local LAN or on a remote LAN connected to the local LAN via a LAN bridge or IP router.

When the LM1100 SNMP Enabler is fitted to the FM4900, the *MAIN SET-UP* menu contains the option *MANAGEMENT*.

| MAIN SET-UP | |
|--------------------|-----------|
| alarm eXtension | <menu> |
| General set-up | <menu> |
| WAN port set-up | <menu> |
| DTE set-up | <menu> |
| V.24 set-up | <menu> |
| Management | <menu> |
| Remote logon | <display> |
| Testing | <menu> |
| Special | <menu> |
| Performance data | <menu> |

| |
|---|
| <p>HIGHLIGHTED letter - select item</p> <p><escape> - exit menu</p> |
|---|

Figure 8. 1 Main set-up menu

The *MANAGEMENT* menu leads to a series of menus which permit you to configure the various system management protocols and parameters.

| MANAGEMENT | |
|-------------------|-----------|
| Ethernet | <menu> |
| Data-link | <menu> |
| IP | <menu> |
| UDP | <menu> |
| tCp | <menu> |
| sNmp | <menu> |
| tFtp | <menu> |
| telnet | <display> |

| |
|----------------------------------|
| HIGHLIGHTED letter - select item |
| <escape> - exit menu |

Figure 8. 2 Management menu

The item *TFTP* is shown unshaded because it is a future release item, but is shown here to indicate its forthcoming availability.

For further information on the management interface and the MIB definition, refer to the LM1100 SNMP Enabler user manual.

The MIB definitions supported have been placed in the public domain by Metrodata and can be parsed in to any NMS supporting an ASN.1 MIB parser.

9 TEST & TROUBLESHOOTING

Several diagnostic tests are supported by the FM4900. The fact that the E3 signal is framed is used to identify a faulty or failed connection. In addition loop-backs may be activated to segment the link, and test patterns may be generated or monitored to validate signal flow along the path of the link.

Four types of test loops are available:

DTE Loop
DTE External Loop
NI Remote Loop
NI Local Loop

Diagrams showing the functioning of these test loops are given in this Section.

9.1 Testing Menu

When you select the *TESTING* option from the *MAIN SET-UP* menu, the *TESTING* menu is displayed.

| TESTING | |
|------------------|------------|
| DTE | Loop |
| NI | Local loop |
| Ext loop control | Disabled |

| |
|----------------------------------|
| HIGHLIGHTED letter - select item |
| <escape> - exit menu |

Figure 9.1 Testing menu

The interface to be tested and the type of test to carry out are selected using this screen. Definitions of the menu items are given below.

9.1.1 DTE

When *DTE* is selected, you can toggle between *LOOP*, *EXTERNAL LOOP*, and *NONE*.

9.1.2 NI

When *NI* is selected, you can toggle between *LOCAL LOOP*, *REMOTE LOOP*, and *NONE*.

9.1.3 External loop control

This item is either *ENABLED* or *DISABLED*. Note that if *EXTERNAL LOOP CONTROL* is *DISABLED*, the unit cannot be put into *EXTERNAL LOOP* by remote units. The default setting is *DISABLED*.

When *DISABLED*, the remote loop code receiver in the DSU is inhibited, so the FM4900 will not accept remote loop commands from other DSU's on the network. The HSSI control lines LA and LB are also inhibited.

9.2 DTE interface

9.2.1 DTE Loop

When *DTE LOOP* is activated the signal received from the local DTE is passed directly back to the DTE at the DTE interface. The signal from the remote DTE passes through both the FM4900's and is looped adjacent to the local FM4900's DTE port. This therefore validates:

a) the local DTE cable (without the effect of the FM4900) if the local DTE recognises its own transmissions.

b) the remote DTE cable, the E3 link and both FM4900's if the remote DTE recognises its own transmissions.

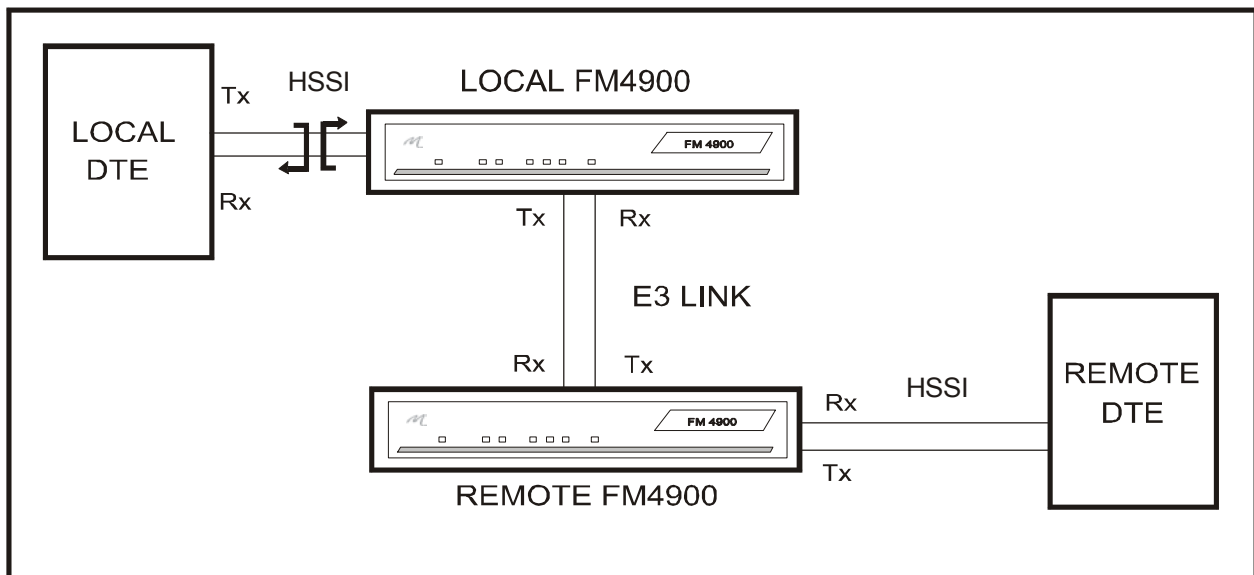


Figure 9.2 DTE loop test

9 . 2. 2 DTE External Loop

When the *EXTERNAL LOOP* is *ENABLED* the FM4900 uses one of the HSSI control lines (LC) to put the local DTE into loop.

This validates the E3 link, both FM4900's and both sets of DTE cables if the remote DTE recognises its own signals.

Note that if *EXTERNAL LOOP CONTROL* is *DISABLED*, the remote loop code receiver in the DSU is inhibited, so the FM4900 will not accept remote loop commands from other DSUs on the network. The HSSI control lines LA and LB are also inhibited.

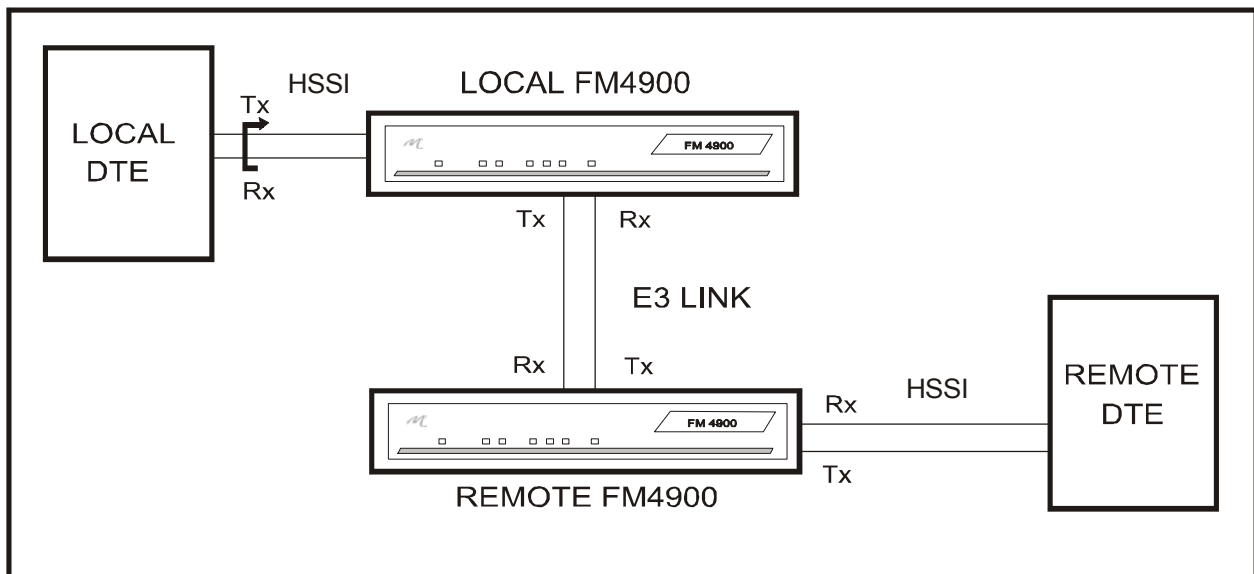


Figure 9. 3 DTE External loop test

9.3 Network Interface (NI)

9.3.1 NI Remote Loop

When the *REMOTE LOOP* is activated, a loop-up code is transmitted to the remote FM4900, switching it in to *LOOP*. Therefore a Loop may be performed at the remote end without any need for maintenance staff to attend the remote site.

Remote Loop-Up is transmitted as repeated '10000' while Remote Loop-Down is transmitted as repeated '100'. The Loop-Up code is transmitted for 5.5 seconds with the remote FM4900 going into Loop after 4.5 seconds.

The remote FM4900 stays in this mode until Loop-Down is transmitted from the local unit.

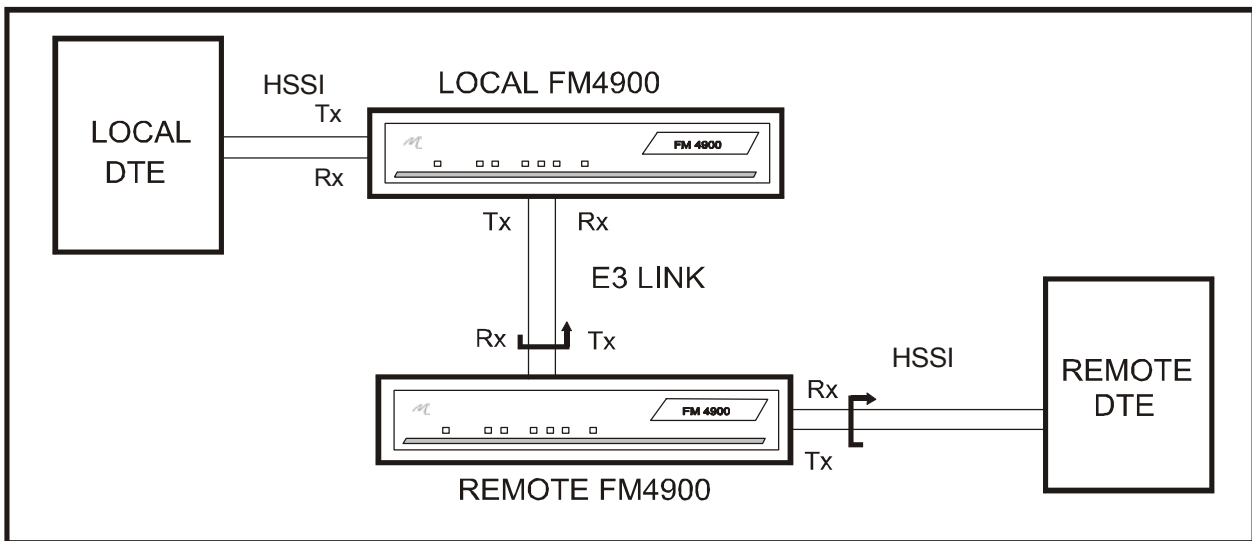


Figure 9.4 NI remote loop test

The unit receiving the remote Loop-Up signal loops both the E3 and DTE ports adjacent to each of those ports, therefore removing its own influence. This therefore validates:

- the remote DTE cable if the remote DTE recognises its own transmissions
- the local DTE cable, the local FM4900 and the E3 link if the local DTE recognises its own transmissions.

9.3.2 NI Local Loop

When the *LOCAL LOOP* is activated the signal received from the local E3 transmit port is passed directly back to the local E3 receive port. The signal from the remote DTE passes through the remote FM4900 and is looped at the local E3 port.

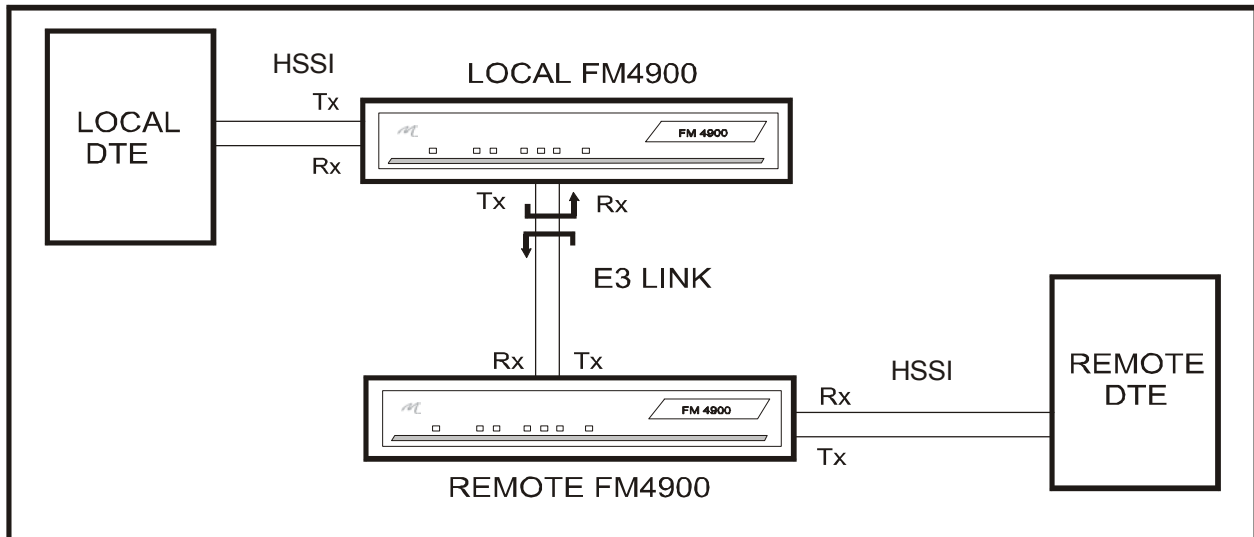


Figure 9.5 NI local loop test

This therefore validates:

- the local DTE cable and the local FM4900 if the local DTE recognises its own signals
- the remote DTE cable, the remote FM4900 and the E3 link if the remote DTE recognises its own signals.

Notes:

- The DTE may also activate the *DTE (LOCAL)*, *NI LOCAL* or *NI REMOTE LOOPS* using two of the HSSI control lines (LA and LB). These loops may also be activated from the *TESTING* menu.
- The *DTE EXTERNAL LOOP* may only be activated via the *TESTING* menu.

9.3.3 Remote management during testing

Care must be taken when testing. If the FM4900 is managed with SNMP or Telnet, and if the LAN to which the NMS is connected passes over the wide-area link to which the FM4900 is interfacing. It may be possible to lose contact with the FM4900.

For example, if a local NMS is in contact with a remote FM4900 via a remote segment of LAN and a router, and the remote FM4900 is set to loopback, then connection with the remote router (and therefore the remote FM4900) is lost.

It is therefore important to ensure that control of FM4900 testing is exercised on a local basis, or that there are alternative paths available for management when remote testing is performed.

9.4 Troubleshooting

Step 1: Establish and verify the E3 Link

Check the power LED at both ends. If power is not present, check the mains fuse. Set both units to *UNFRAMED* mode using the *WAN PORT SET-UP* menu:

If the MAJOR alarm LED is on, try swapping the BNC connections at one end.

If the MAJOR alarm remains on, try looping the BNC connections on the unit with a short piece of cable. If the MAJOR alarm LED goes off then the cabling is faulty. Check for cable continuity and network connections, etc.

If the MAJOR alarm LED goes off, you may now enable framing if required. Make sure you do it at both ends or the MAJOR alarm will come on again.

Step 2: Establish and verify the DTE Links

If the MINOR alarm LED is on, check that the Bridges/Routers are switched on.

If the MINOR alarm LED remains on, check that the DTE connections are in place and secure.

If the MINOR alarm LED is still on check the Bridge/Router configuration. Check to see whether the Bridge/Router's port status is up or down.

If the MINOR alarm LED goes out but problems persist, check the DTE cabling configuration. Transmit and Receive data connections may be crossed, as may any of the handshaking or signalling lines. Also check that line protocol, data scrambling or data/clock inversion are correct at both ends.

Step 3: Bridge/Router Configuration

As the FM 4900 is used in a variety of locations and with many different manufacturer's equipment it is impossible for us to cover all eventualities here, so please consult other manufacturer's operating manual for further information.

10 FM4900 SPECIFICATIONS

| Parameter | Definition |
|----------------------|---|
| E3 interface | G.703 compliant, Sensitivity: -10dB. Line coding: HDB3. <u>Interface type</u> : 75 Ohm unbalanced coax (BNC) |
| Jitter Tolerance: | Per G.823. |
| Barrier: | EN 41003 compliant barrier provided on both interfaces. |
| Framing: | G.751 or G.703 Unframed. |
| DTE Interface: | HSSI: 50-way miniature AMP connector. |
| Clocking modes | <u>E3 WAN port</u> : Circuit 113 (normally slaved to Circuit 114 by DTE) <u>DTE port (Circuit 114)</u> : INTERNAL, LOOP <u>DTE Receive timing RT</u> : (Circuit 115) is always sourced from the E3 Receive clock |
| Diagnostics | DTE loop, DTE External loop, NI Local loop, NI Remote loop. |
| Display Style | Counts, G.821, percent G.821 |
| Error type | FAS (G.751 mode), Code errors |
| Management | V.24 terminal through terminal port. SNMP through management port. Telnet through management port.. Management port can also be used for outgoing Telnet sessions Management port complies with IEEE 802.3 / 10 Base T. |
| Statistics database | Real time statistics time-stamped and logged in a database accumulating over 15 minutes. 96 x 15 minute buckets are stored for rolling 24 hour database. |
| General | Definition |
| Power supply | 100-250 VAC 50-400 Hz or -36 to -72 VDC, Buccaneer connector |
| Dimensions | 1U x 19": 436 x 213 x 44 mm (w x d x h) with 19" mounting flanges |
| Environmental | Range |
| Ambient Temperature: | 0 degC to +50 degC |
| Storage Temperature: | -20 degC to +70 degC |
| Relative Humidity: | 0% - 95% non condensing |
| Barometric Pressure | 86 KPa - 106 KPa |

10. 1 FM4900 Default Settings

When a cold start is performed, all values are returned to their default settings. The table below lists the default values.

| Option | Default |
|------------------|--------------------|
| Node name | This field cleared |
| Password | FM4900 |
| Telnet Timeout | 60 seconds |
| Framing | G.751 |
| Timing | Internal |
| Datalink | On |
| CA | On |
| Terminal type | TTY |
| Baud rate | 9600 bps |
| Parity | None |
| Data bits | 8 |
| Stop bits | 2 |
| Modem support | On |
| Ext loop control | Disabled |

10. 2 Glossary

| | |
|------|------------------------------------|
| AIS | Alarm Indication Signal |
| AMI | Alternate Mark Inversion |
| BES | Bursty errored seconds |
| CA | Control Available |
| DM | Degraded minutes |
| DSU | Data Service Unit |
| DTE | Data Terminal Equipment |
| EFS | Error-free seconds |
| ES | Errored seconds |
| FEBE | Far End Block Error |
| HDB3 | High-Density Binary 3 |
| LAN | Local Area Network |
| LOF | Loss of Frame alarm |
| LOS | Loss of Signal alarm |
| MIB | Management Information Base |
| NI | Network Interface |
| NMS | Network Management System |
| RAI | Remote Alarm indication |
| REBE | Remote End Block Error |
| RT | Receive Timing |
| SELV | Safety Extra Low Voltage |
| SES | Severely Errored seconds |
| SNMP | Simple Network Management Protocol |
| SQ | Signal Quality alarm |
| ST | Send Timing |
| TA | Terminal Available |
| TT | Terminal Timing |
| UAS | Unavailable seconds |
| UI | Unit Interval |
| WAN | Wide Area Network |

