

9914 9-TRACK TAPE UNIT USER/DIAGNOSTIC MANUAL

Document Ref CM 1077

Issue 2 + Amdt 3

Stock Number 123477/23

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2. Any adjustment, maintenance and repair of the opened apparatus under voltage shall be carried out only by a skilled person who is **aware of the hazard involved.**

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It is hereby certified that the Magnetic Tape Unit Model 9914 in compliance with the regulations of AmtsblVfg 243/1992 is radio interference suppressed.

The German Post Office has been notified that this equipment has been introduced into the market and is granted the right to type-test the equipment for compliance with the regulations.

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This digital apparatus does not exceed the class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

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Preface

Damage in Transit

Unpack the equipment and examine it thoroughly to ascertain whether any damage has occurred in transit. Report immediately any such damage to the agent or manufacturer. Retain all packing pieces, in case a return to manufacturer should be necessary.

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All goods manufactured by the Company are guaranteed to the extent hereafter mentioned against defects arising from faulty material or workmanship subject to the goods not having suffered maltreatment or interference. The Company's liability under this guarantee is limited to replacing any part or parts found defective within a period, as laid down in Company instructions, after the date of delivery or installations.

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Descriptive Matter and Illustrations

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User/Diagnostic Manual Amendments

Revision	Details	Date
ISSUE 1	Superseded all draft issues. Diagnostic programs updated Display indications updated	May 1989
Amdt 1	Appendix A added Various minor corrections	Jun 1989
Amdt 2	Diagnostic programs 9, 10 & 24 added Amendments to the controls and indications	Sep 1989
Amdt 3	Option bytes in Appendix A updated / corrected Cleaning instructions revised Various minor corrections	Mar 1990
Amdt 4	Pertec Cache references added Appendix A updated: Pertec Cache option bytes added, Configuration byte 18 added, SCSI options updated. Numerous minor amendments	Mar 1991
Amdt 5	Diagnostic programs 03, 19, 34 & 35 added. 50/100 ips references added. I.T mains connection detail added. Interface connection illustrations added. SCSI and Pertec Cache option tables updated.	Jan 1992
ISSUE 2	Page layout re-designed for American Quarto. Super SCSI included. Mains connection details tabulated. More detail added to rack-mounting instructions. Tape loading paragraphs tabulated and re-grouped. CFC-free cleaning materials substituted. Appendices C, D & E added.	Nov 1992
Amdt 1	Changes to STUCK!! message. Programs 34 & 35: descriptions corrected, error codes added. Configuration Byte 20 added. SCSI options updated, to revision 08 code. Super SCSI options updated, to revision 03 code. <i>Unchanged pages re-mastered.</i>	Dec 1993
Amdt 2	Displayed messages consolidated into one table (3.3). SCSI options updated, to revision 11 code. Cached Pertec options updated, to revision 08 code. Super SCSI options updated, to revision 06 code.	Nov 1996
Amdt 3	Seismic tape information added Table A.1(c) updated (Byte 20, bit 7) SCSI options updated, to revision 12 code. Super SCSI options updated, to revision 07 code.	Sep 1998

Sources of 9914 Information

If you want information on:	Go to:
Product Specification	9914 Product Specification, p/n 116293
Installation, Rack or Desk	Section 2
Connection to ac Mains	Section 2
Connection to I.T. Mains	Appendix B
Power-on Information	Section 3
Operating Procedures	Section 3
Operator's Display Messages	Section 3
Table of Basic Configuration Options	Appendix A
SCSI/ Cached Pertec Config Options	Appendices C - E
Displaying/ Modifying Config Options	Section 2
SCSI Commands	SCSI User Manual p/n 121780
Pertec Cache Commands	Pertec Cache Product Description p/n 121789
Super SCSI Commands	Super SCSI User Manual p/n 124658
Problems, with a Message	Section 3 (operator-correctable), <i>otherwise</i> 9914 Servicing Manual, p/n 123478
Problems, without a Message	Section 3
Diagnostics Guide	Section 4
Block Diagram	9914V Servicing Manual, p/n 123478
Functional Descriptions	9914V Servicing Manual, p/n 123478
IPL (Illustrated Parts List)	9914V Servicing Manual, p/n 123478
Repair & Replacement	9914V Servicing Manual, p/n 123478

TABLE 1 SOURCES OF 9914 INFORMATION

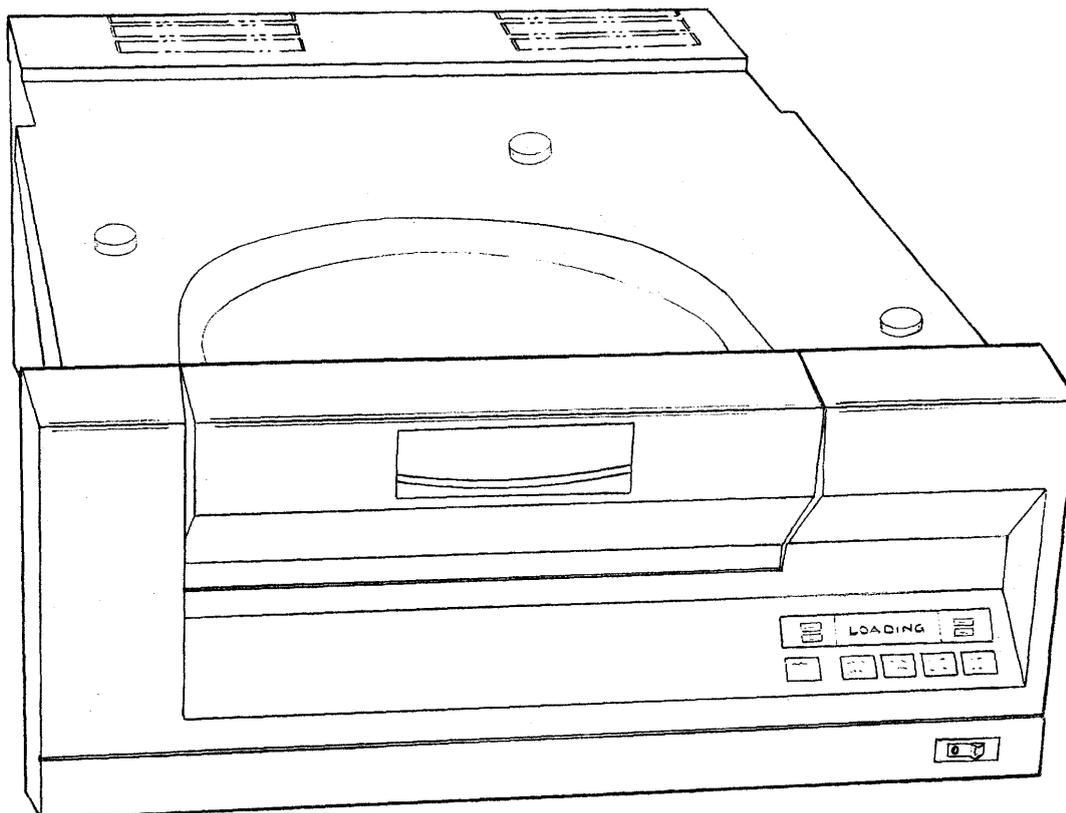


FIGURE 1.1 9914 GENERAL VIEW

1.

Introduction

The *M4 Data* 9914 is a 9-track Tape Unit of low-profile design which occupies only 8.7 inches height when mounted in a 19-inch rack.

It is also available with a full wrap-around enclosure for use as a free-standing desk-top unit, which is sufficiently quiet for office use.

Both versions are presented in a style and colour which looks at home beside modern personal computers or data processing equipment.

All four of the Industry-Standard exchange formats can be included in the basic 9914 electronics, from the long-established 800 bpi NRZ through 1600 and 3200 bpi PE to the newer extremely error-tolerant 6250 bpi.

Loading tape into the 9914 could not be simpler: you place any size reel in the loading chamber and close the door - next thing you know the drive is ready to perform.

User friendliness is fulfilled by the permanently-active 8-character display which shows internal activity (eg reading, writing, rewinding) and four status indicators which remind you of status (eg online, write protected).

Access for routine cleaning requires no tools, service access to all the printed circuit boards is very easy thanks to the hinged chassis construction with assisted lift.

The inherent high reliability for a reel-to-reel unit derives from the 9914's design team having long experience. Short down-time derives from coupling a highly modular construction with a sophisticated set of resident diagnostic programs.

The standard interface is the familiar Pertec variety, enabling easy integration into DOS-based or UNIX-based PC-to-tape or mainframe applications.

Optional interfaces are the ' standard ' SCSI, buffered Cached Pertec or Super SCSI.

This Manual describes how to unpack, install, check out, operate and clean the 9914. A companion servicing manual covers the more technical configuration and servicing procedures.

1.1 9914 Features

- 42 ips and 125 ips streaming, interface selectable, special order option of 50 and 100 ips
- Up to 270 MB unformatted data capacity
- All four IBM-compatible tape data formats to ANSI/ ECMA specifications
- Three levels of diagnostics; power-on, operator, and host; host diagnostics via either Pertec or either SCSI interface
- Auto load, actuated by door closure
- Standard 19-inch rack fittings.

1.1.1 Short-Form Specification

Reels	10.5, 8.5, 7 or 6 in on a standard IBM hub (267, 216, 178, or 152 mm)
Tape	Standard 12.7 mm (0.5 in) wide computer tape to ANSI X3.40 or ECMA 62 specification. (1.0 mil tape if extra data capacity is required)
Tape Tension	285 gm (10 oz) nominal
Format	IBM-compatible to ECMA or ANSI specifications. (there is no published ANSI or ECMA 3200 bpi specification)
Tape Speeds	Depend on the selected density, usually 42/125 ips but factory set to 50/100 ips on specially ordered machines

	Standard 9914		Special Order	
	Low	High	Low	High
800 NRZ	42	125	50	100
1600 PE	42	125	50	100
3200 PE	62	62	50	50
6250 GCR	42	125	50	100

All speeds are in inches per second (ips)

Weights (unpacked)	37 kg (82 lb) - rack-mount, with SCSI interface 42 kg (93 lb) - desk-top, with SCSI interface
Supply Requirements	100, 120, 220 or 240 V ac, +10 -15%, 48-62 Hz 190 VA working

Dimensions:

Desk Top

Height	245 mm (9.65 in)
Width	482 mm (18.97 in)
Depth	650 mm (25.59 in)

Rack-mount (behind face):

Height	220 mm (8.7 in)
Width	427 mm (16.7 in)
Depth	580 mm (22.8 in)

Rack mount (overall):

Height	220 mm (8.7 in)
Width	482 mm (19.0 in)
Depth	640 mm (25.2 in)

Note:

Screened cable connectors increase the depth dimension, by 30 mm (and the cable bending radius) for the SCSI interfaces, by 60 mm for the Cached Pertec interface.

Temperature	Operating +10 to +40 °C
Other parameters	Set out in the 9914 Product Specification

1.2 Tape Speeds

At most densities, the 9914 may be commanded to use one of two speeds, to enable more flexible application.

- the low speed (where the tape can be rapidly repositioned between data blocks) for situations where the host cannot sustain data transfer at high rates;
- the high speed (where data is normally transferred on-the-fly) where the host can sustain fast transfers and thereby achieve a high average data rate.

1.2.1 Data Rates

When a block is being transferred to tape, each byte is accepted by the tape unit at a rate determined by the tape speed, recording density (GCR, PE or NRZ), and interface (unbuffered Pertec, SCSI or buffered Pertec). At 800, 1600, and 6250 bpi, the user may select from two streaming speeds. The inter-relationship of tape speed and synchronous data rate for the unbuffered Pertec interface is detailed in Table 1.1. Where an SCSI or Pertec Cache board is fitted, the burst rate may be higher.

Density (bpi)	NRZ 800		PE 1600		DPE 3200		GCR 6250	
	Lo	Hi	Lo	Hi	Lo	Lo	Lo	Hi
Data rates (kB/s):								
42/125 ips	33.3	100	66.6	200	200	200	262	781
50/100 ips	40	80	80	160	80	80	312	625
<i>Note: Lo speed 42 ips is actually 41.66 ips; 3200's 62 ips is actually 62.5 ips</i>								

TABLE 1.2.1 9914 DATA RATES

1.3 Tape Loading

In order to load tape into the 9914, the operator places the tape reel in the loading chamber and closes the loading door in order to initiate the self-loading routine. The reel is then clamped and the tape threaded, tensioned, and advanced to BOT (which is indicated on the display).

This loading system makes for simple, speedy and reliable tape loading, without the operator touching the tape surfaces and with the milestones indicated on the operator's display.

For operator safety, the 9914 is interlocked so that its tape path cover and loading door must be shut before loading can commence or tape motion be initiated.

No take-up spool need be fitted, since this is built into the 9914 and should only be removed by service personnel.

A configuration option can inhibit ' auto load-on-closure ' and substitute the requirement for the operator to press ' LD/ONL '.

Tape loading is described in more detail in Section 3.

1.4 Operator Controls and Indications

The membrane operator controls, the 8-character display, and the backlit legends are located at the front of the tape unit on the right-hand side. In diagnostic mode, the controls have secondary functions as printed on each button membrane.

In general the alphanumeric display gives temporary internal status, activity, or diagnostic information while the backlit legends inform of permanent status such as ' write enable '.

All controls and indicators are described in detail in Section 3.

1.5 Diagnostics

When power is applied to the 9914, the self-test diagnostics are automatically invoked to check basic internal functions which would otherwise inhibit normal use of the tape unit.

The operator may use diagnostic mode to run a range of internal diagnostic programs which are suitable for assurance of machine integrity, and for first-line diagnosis of faults. These programs may be selected from a program suite to include full data tests (where a buffered interface is fitted) with or without tape motion. Diagnostic programs can be run individually, grouped together or looped. Special Status Byte registers are allocated for error logging, status, and diagnostic information; the operator may display these bytes using the front panel controls.

The host computer may also call diagnostic programs (individually, stacked, or looped) by special commands across the interface. Diagnostic results are available to the host computer by using Request Status type commands to acquire status bytes via the interface Read Data lines. The status bytes are tabulated in Section 4 and described in detail in the 9914 Product Specification.

The diagnostic programs and error messages are described in Section 4; an overview of the available features is set out below:

- Power-on health check
- Front panel or host operation
- 8-character alpha-numeric display of status and fault code
- Simple dual operation of control buttons
- Run/pass/fail indication
- Dedicated program stack, tailored stack, or program looping
- Error logging facility - report on request by host computer.

1.6 Interfaces

The 9914 may operate with one of several interfaces.

1.6.1 Industry Standard

The basic 9914 is designed to operate with the unbuffered Enhanced Pertec interface; these connections are made at the rear of the 9914, to the industry-compatible two-connector layout.

The Pertec interface supports encoded inputs for various commands, the unallocated combinations are used by the Company to provide additional commands for such purposes as controlling the resident diagnostic programs, or accessing status byte data; the command set and pin connections are both set out in Section 6. This feature gives the user improved control without requiring extra interface lines.

1.6.2 SCSI

The SCSI interface option is implemented using a single printed circuit board, plugged into the option slot within the 9914. The SCSI interface bus is connected either via a shielded connector (at the rear of the 9914) or directly to a 50-way 3M-type plug on the board. Both single-ended and differential variants are available.

1.6.3 Cached Pertec

The buffered cache option is implemented using a single printed circuit board, plugged into the option slot within the 9914. Buffered Pertec interface signals are either made via a screened connector box (at the rear of the 9914) or directly to two 50-way printed edge connectors at the top of the board.

1.6.4 Super SCSI

The Super SCSI interface option is implemented using a single printed circuit board, plugged into the option slot within the 9914. The SCSI interface bus is connected either via a shielded connector (at the rear of the 9914) or directly to a 50-way 3M-type plug on the board. Single-ended, differential, and dual variants are available.

1.7 Technical Description

The 9914 Tape Unit is constructed around an aluminium alloy deck casting which is machined to accommodate the mechanical sub-assemblies, and hinged in a box-section tray which also carries the electronic sub-assemblies.

Access to the tape path area for routine cleaning is by way of a hinged tape path cover, revealing the entire tape path when lifted. The operator may use the transparent window in the loading door to check the presence of a tape reel or observe tape motion.

The 9914 has a short tape path using one tension arm which returns to a rest position in the absence of tape tension to simplify the tape lacing path. When the self-loading procedure has been initiated, the tape reel is centralised by the reciprocating action of the hub and then clamped. The tape is then threaded through the tape path, taken up on the take-up reel, tensioned, and moved forward until BOT is reached, without any operator involvement. The fixed take-up spool is of a special Company design to enable this loading procedure.

To gain access to the tape path when mounted in a rack, personnel may release the deck latches and pull the tape unit forward until it is clear of the rack front.

Note: the user must ensure that the rack will not topple forwards under the influence of the new centre of gravity when the tape unit is pulled out in this way.

With the tape unit pulled out, service access may be obtained to all the printed circuit boards. For further service access, the deck casting may be hinged upwards for access to the mechanical sub-assemblies; only in extreme circumstance is it required to demount the tape unit from the rack.

1.8 Reposition Cycles

The 9914 employs long starts and stops while still recording tape with normal inter block gaps (IBG). The microprocessor controlled servos, together with the tachometer (which is driven by the contact of the tape around its roller) and tape position encoder, accurately reposition the tape, allowing relatively long stop and start distances to be used with space-back routines. Following a stop, a space-back reposition sequence is implemented, to a point where the tape can achieve streaming speed before the next block (see Figure 1.8).

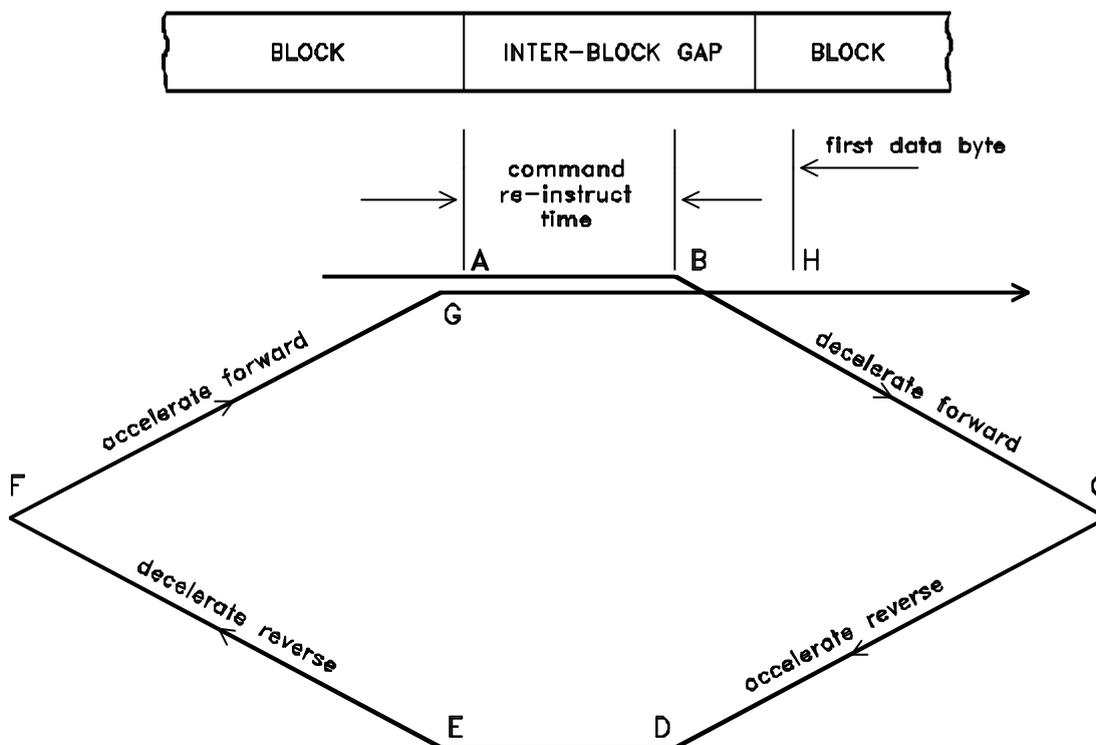


FIGURE 1.8 SIMPLIFIED REPOSITION CYCLE

1.9 Data Capacity

Table 1.9 (a) shows lengths of tape normally supplied on standard tape reels.

Reel diameter (inches)	Tape length (feet)	
	1.5 mil	1.0 mil
6.0	400	600
7.0	600	900
8.5	1200	1800
10.5	2400	3600

TABLE 1.9 (a) TAPE LENGTHS

Table 1.9 (b) shows unformatted data capacities and illustrates the variation of formatted capacity (in Mbytes) with block size, assuming an IBG of 0.6 inch at 800 through 3200 bpi and 0.4 inch at 6250 bpi.

Density (bpi)	Tape length (feet)	Unformatted capacity	Formatted capacity		
			1K	8K	64K
800	600	5.7	3.9	5.4	5.7
800	2400	23	15	21	23
800	3600	34	23	32	34
1600	600	11	5.7	10	11
1600	2400	46	22	40	45
1600	3600	69	34	61	68
3200	600	23	7.8	18	22
3200	2400	92	31	74	89
3200	3600	138	46	111	134
6250	600	45	12	33	43
6250	2400	180	50	135	172
6250	3600	270	75	203	258

TABLE 1.9 (b) 9914 DATA CAPACITIES (Mbytes)

1.10 Associated Documentation

This user/diagnostic manual outlines the various features and capabilities of the tape unit in sufficient detail to facilitate its installation and operation; the following documents are published by the Company to provide additional product information.

<i>Part No.</i>	<i>Publication Title</i>
116293	9914 Tape Unit Product Specification <i>(sets out the features and capabilities of the 9914)</i>
121780	SCSI User Manual <i>(describes the command set and options)</i>
121789	Cached Pertec Interface Product Description <i>(describes the features, control and capabilities of the buffer)</i>
124658	Super SCSI User Manual <i>(describes the command set and options)</i>
123477 (CM 1078)	9914 Tape Unit Servicing Manual <i>(provides fault-finding suggestions, configuration change details, diagnostic program listings, and servicing procedures)</i>

The following documents provide background information on data recording.

ANSI X3.22 (1983)	Recorded magnetic tape for information interchange (800 CPI NRZ).
ANSI X3.39 (1986)	Recorded magnetic tape for information interchange (1600 CPI PE).
ANSI X3.40 (1983)	Unrecorded magnetic tape for information interchange (9-track 800 bpi NRZ, 1600 bpi PE & 6250 bpi GCR).
ANSI X3.54 (1986)	Recorded magnetic tape for information interchange (6250 bpi GCR).
ANSI X3.131-1986	Small Computer Systems Interface.
ANSI S12.10-1985	Methods for the Measurement and Designation of Noise Emitted by Computer and Business Equipment.
ECMA 62	Data interchange on 12.7 mm (0.5 inch) 9-track magnetic tape. (NRZ, PE & GCR).

The following documents are published requirements for RFI limits.

VDE 0871	Radio interference suppression of radio frequency equipment for industrial and medical (ISM) and similar purposes.
CFR Rules 47-15J	Code of Federal Regulations. <i>15J = RFI requirements for computing devices.</i>

2.

Installation and Checkout

This section deals with inspection, wiring the supply plug, mounting in a rack, the operator options, and checkout.

2.1 Unpacking and Inspection

2.1.1 Unpacking the 9914

The 9914 is packed in special impact-absorbing materials which are placed inside a heavy-duty cardboard box.

Any unpacking instructions are enclosed in a polythene envelope attached to the upper face of the cardboard box.

Packed dimensions: 380 H x 605 W x 800 mm D
(15.0 x 23.8 x 31.5 in)

Packed weights: 47 kg (104 lb) rack-mount, excl slides
(incl SCSI interface) 52 kg (115 lb) desk-top.

2.1.2 Inspection

The packing box should contain the 9914 itself and associated items such as:

- a mains supply lead with a moulded IEC socket, (dc-powered models are not supplied with a power lead);
- a 9914 User/Diagnostic Manual;
- a rack-mounting kit (not with desk-top models);
- other hardware, if specified on the order.

After the 9914 has been uncrated it should be visually checked for any damage that may have occurred during transit.

All items should be checked off against the requirements of the order.

2.2 Preparing for AC Mains Supply Connection

Certain checks should be made before a 9914 is connected to a mains supply, these checks are described next.

2.2.1 Supply Suitability Checks

- Any ac-powered 9914 must be connected to a nearby mains socket outlet (or a double-pole switch with contact gaps in excess of 3 mm) as part of its installation. This is necessary because the 9914 mains switch does not isolate both mains connections.
- Only a specifically manufactured 9914 may be connected to an I.T. Mains System, which is defined as one where the neutral line is held at a substantially different voltage to the earth line.

If the 9914 has only one fuse (FS1) on the rating label near the mains input socket, follow the procedures from step (iii) below onwards.

If the 9914 has two fuses (FS1 & FS2) on the rating label near the mains input socket, it has been manufactured for use with an IT mains system; follow the procedures of Appendix B before returning to the start of Section 2.3.

- iii. The 9914 should be checked for supply setting, which is printed on a label at the rear of the machine. The actual setting, which is visible on the mains input socket (see Figure 2.2.2) must match this, otherwise the setting must be changed and the fuse rating checked.

2.2.2 Supply Voltage Resetting

Follow this procedure only if the input voltage selection setting is incompatible with the site supply voltage; otherwise go to 'Wiring the Supply Plug'. Four ac settings are possible, 100/120 V or 220/240 V, the input frequency may be between 48 and 62 Hz.

Note: when it is proposed to use the 9914 on the 120 V setting, but the supply is known to be consistently below 110 V, the input voltage setting should be changed to 100 V.

a. Changing the Voltage Setting

- i. Disconnect the supply lead from the input socket;
- ii. insert a 5 mm flat-bladed screwdriver where illustrated (in Figure 2.2.2) and hinge the panel open;
- iii. withdraw the barrel-shaped voltage selector mechanism and re-insert with the new voltage facing outwards, do not attempt to rotate the selector barrel in-situ;
- iv. withdraw the fuse holder and install the new fuse (referring to (b) below to ensure the correct rating).

b. Supply Fuse Rating (Littelfuse type 313 is suitable)

- For 100/120 V settings, FS1 is a 1.25", 4 A, slow-blow fuse;
- For 220/240 V settings, FS1 is a 1.25", 2 A, slow-blow fuse.

2.2.3 Wiring the Supply Plug

Warning - the 9914 must be earthed

The moulded IEC socket on the supply lead fits a chassis-mounted plug located at the rear of the 9914. When the other end of the supply lead is unterminated, a suitable plug must be attached.

As the colours of the cores in the 9914 mains lead may not correspond with the coloured markings identifying the terminals in your plug, the following sections relate core colour to pin identification.

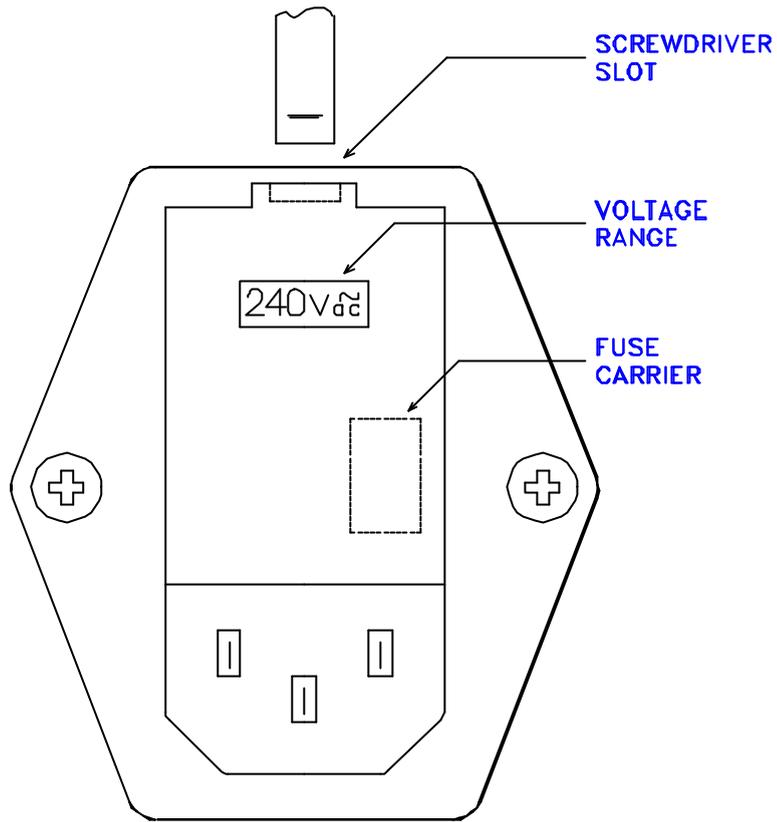


FIGURE 2.2.2 SUPPLY VOLTAGE SETTING

2.2.3.1 Outside the USA

Connect the cores as tabulated in Table 2.2.3.1.

Core which is coloured:	Must be connected to the terminal in the plug which is:
green and yellow	marked with the letter E, or coloured green and yellow, or marked with the earth symbol 
blue	marked with the letter N, or coloured black
brown	marked with the letter L, or coloured red

TABLE 2.2.3.1 PLUG WIRING - OUTSIDE THE USA

Note: 2-pin plugs are not suitable. The earth wire must be 'grounded' for safety reasons.

The following translations of pin functions and colours is given.

English	Francais	Deutsch
LIVE (brown)	LIGNE (Brun)	POSITIV (Braun)
NEUTRAL (Blue)	NEUTRE (Bleu)	NEGATIV (Blau)
EARTH (Green/ Yellow)	TERRE (Vert / Jaune)	ERDE (Gelb / Grün)

2.2.3.2 Within the USA

Connect the cores as tabulated in Table 2.2.3.2.

Core which is coloured:	Must be connected to the terminal in the plug which is:
green and yellow, or green (US-style lead)	half-round gold (ie the earth)
blue, or white (US-style lead)	flat silver (ie the neutral)
brown, or black (US-style lead)	flat gold (ie the live)

TABLE 2.2.3.2 PLUG WIRING - WITHIN THE USA

2.3 Rack Mounting with Chassis-Trak Runners

The 9914 is usually mounted on Chassis-Trak C-300 series slides which are packed with each unit and allow it to fit into a standard 19-inch EIA rack. To assist with mounting in other types of rack, the 9914 fixing dimensions are shown in Figures 2.3(b) and 2.3(c), later in this section.

Figure 2.3(a) shows the slide orientation on the right side of the 9914.

Each slide is made up of four main components:

- The chassis section which attaches to the 9914
- The intermediate section which is supplied inside the stationary section
- The stationary section which attaches to the front of the cabinet
- The (adjustable) rear support bracket which attaches to the rear of the stationary section

Note: bags of accessories such as screws and bar nuts are also supplied.

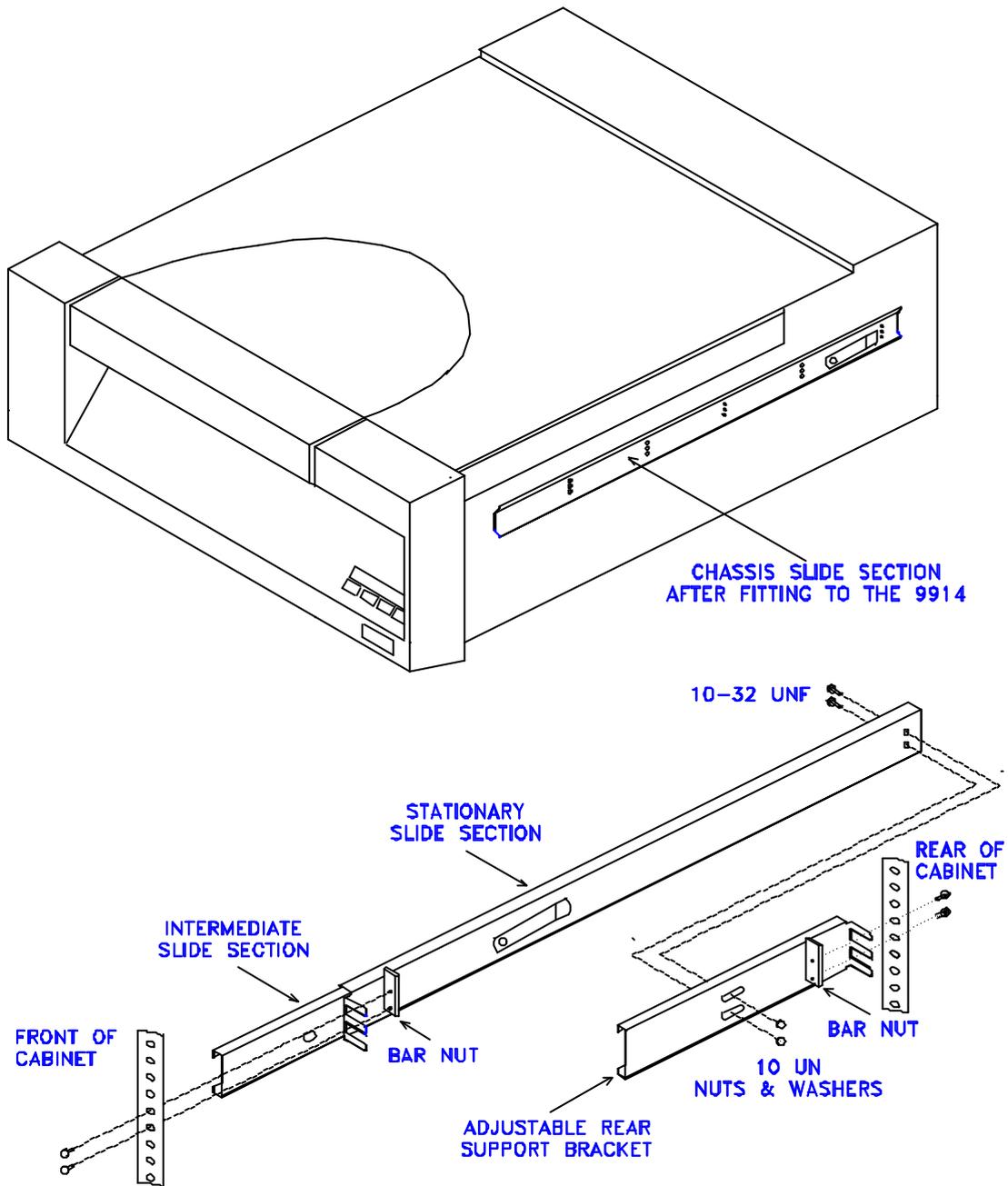


FIGURE 2.3(a) 9914 RUNNER DETAILS

Warning. The user must ensure that, when the 9914 is withdrawn from the rack, it will not topple forwards under the influence of the new centre of gravity.

This may be achieved by:

- extending any protruding foot, *or*
- using a rack with built-in projecting feet, *or*
- fixing the rack to the floor, *or*
- fixing permanent ballast in the rack.

2.3.1 Determining the Attachment Points

These procedures assume a rack with fixing holes unequally spaced; 1 at 1/2", 2 at 5/8", and so on. Some racks omit the middle 5/8" hole. Notes are given to assist where filler panels will be fitted at the same time as the 9914.

If fitting the 9914 below another unit

- i. Draw an imaginary line from the bottom surface of the unit above the 9914 over to the rack (see Figure 2.3.1, line A). Ideally line A falls between 1/2" holes.
- ii. Count down to the 7th hole below this line. Put a screw in the 7th hole and another in the 8th hole; open the accessory bag which contains the bar nuts and use the enclosed pan-head screws.

Note 1: if a filler panel will be fitted above the 9914, put the screws further down, typically in the 10th and 11th holes for a 1.75" filler.

Note 2: allow about 1 inch of free space over the vent slots at the rear of the 9914. As a dimensional aid, the IEC mains socket is about 0.8 inch wide.

- iii. Draw an imaginary line from the top surface of any unit below the 9914 over to the rack (see Figure 2.3.1, line B). Count the unused holes from line B to the lower screw of step (ii). This count must be at least 7, otherwise there is insufficient space to fit the 9914.
- iv. Proceed to Section 2.3.2.

If fitting the 9914 above another unit

- xi. Draw an imaginary line from the top surface of the unit below the 9914 over to the rack (see Figure 2.3.1, line B). Ideally line B falls between 1/2" holes.
 - xii. Count up to the 8th hole from this line. Put a screw in the 8th hole and another in the 9th hole; open the accessory bag which contains the bar nuts and use the enclosed pan-head screws.
- Note: if a filler panel is to be fitted below the 9914, put the screws further up, typically in the 11th and 12th holes for a 1.75" filler.*
- iii. Draw an imaginary line from the bottom surface of any unit above the 9914 over to the rack (see Figure 2.3.1, line A). Count the unused holes from line A to the upper screw of step (xii). This count must be at least 6, otherwise there is insufficient space to fit the 9914.

Note: allow about 1 inch of free space over the vent slots at the rear of the 9914. As a dimensional aid, the IEC mains socket is about 0.8 inch wide.

2.3.2 Assembling and Attaching the Runners

This procedure assumes slides with adjustable rear support brackets having open fingers where they attach to the rack.

Note: at this stage it is good practice to place the right stationary runner set (marked ' RH ') on the right of the rack and the left stationary runner set (marked ' LH ') on the left. This reduces the chance of later error.

- i. Attach the chassis runners to the 9914, using the 8-32 x 1/4 UNC screws from an accessory bag (normally there are 10 of these - without nuts - in a bag of their own). Where three rows of holes are provided in the chassis runner, use the top row unless previous experience suggests otherwise or there is a definite need to offset the unit downwards.

Attach the right hand chassis runner first, so that the leaf spring is at the rear of the 9914, and the leaf is located in the bottom two-thirds of the runner. See Figure 2.3.2. Note that the chassis runners are not interchangeable.

Then attach the left chassis runner, so that the leaf spring is at the rear and is located in the bottom two-thirds of the runner. Tighten the fixing screws.



FIGURE 2.3.1 RUNNER ATTACHMENT POINTS

- ii. Attach the rear support brackets to the stationary runners, noting that each stationary runner is marked ' RH ' or ' LH '. Use the support bracket hole which matches the assembly to the rack depth; use the screws and the nut/star washers sets which are normally in an accessory bag of their own.

Warning: that the consequences of not fitting the left assembly on the left and the right assembly on the right may be that the unit will not be restrained by its stops and slide out onto the floor!

- iii. Fit the stationary runner assemblies to the rack, ensure they are at the same height and parallel with each other. The precise fixing method may vary according to whether tapped or square fixing holes are provided.

Slide the intermediate sections into the fitted stationary sections, noting that left and right intermediates are not interchangeable. Pull out each intermediate until it ' clicks '. If either can be withdrawn without clicking, their fitting is incorrect. Do not proceed further until both intermediates click at the same extension length.

Warning: the consequences of not checking the click feature may be that the unit will not be restrained by its stops and slide out onto the floor!

Check that the spacing between the fitted runner intermediates will accommodate the 9914. Tighten the fixing screws.

2.3.3 Fitting the 9914 into the Rack

Warning
The 9914V should not be lifted by one person

- i. With a second person, lift the 9914 by the base tray, and engage its attached slides with the extended intermediates; slide the 9914 slowly into the cabinet while still giving it some support. **Warning:** do not lift the 9914 by holding the front bezel or the loading door, doing so could result in personal injury or damage to the 9914.
- ii. Fit any filler panels to the front of the rack. The push-fit types locate into unused fixing holes in the rack.

Note: when withdrawing the 9914 from the rack, first locate the retaining spring (via the leftmost air vent at the front of the 9914) and push it to the right; the unit may then be pulled out.

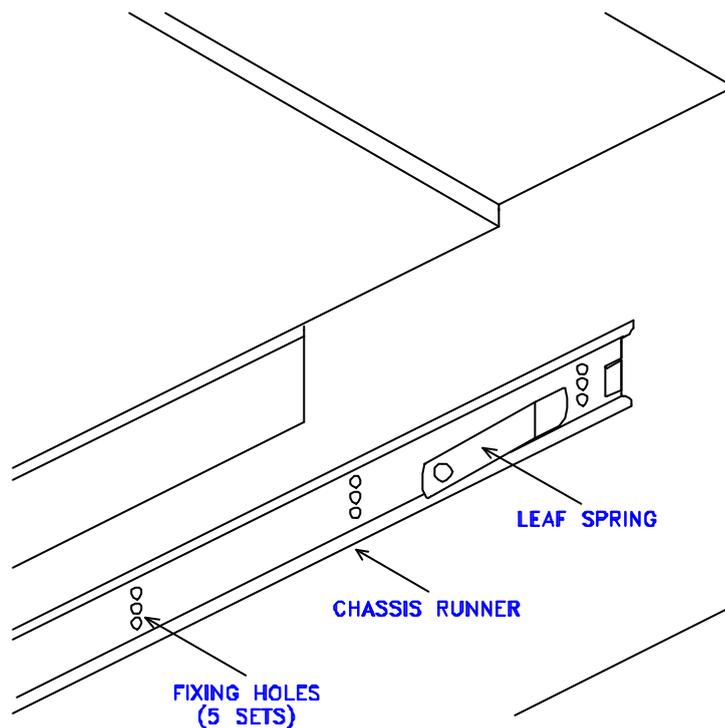


FIGURE 2.3.2 CHASSIS RUNNER ORIENTATION

2.3.4 Desk-Top Mounting

The desk-top 9914 is fitted with a clamshell enclosure, which means it is ready for use without any mechanical installation procedure.

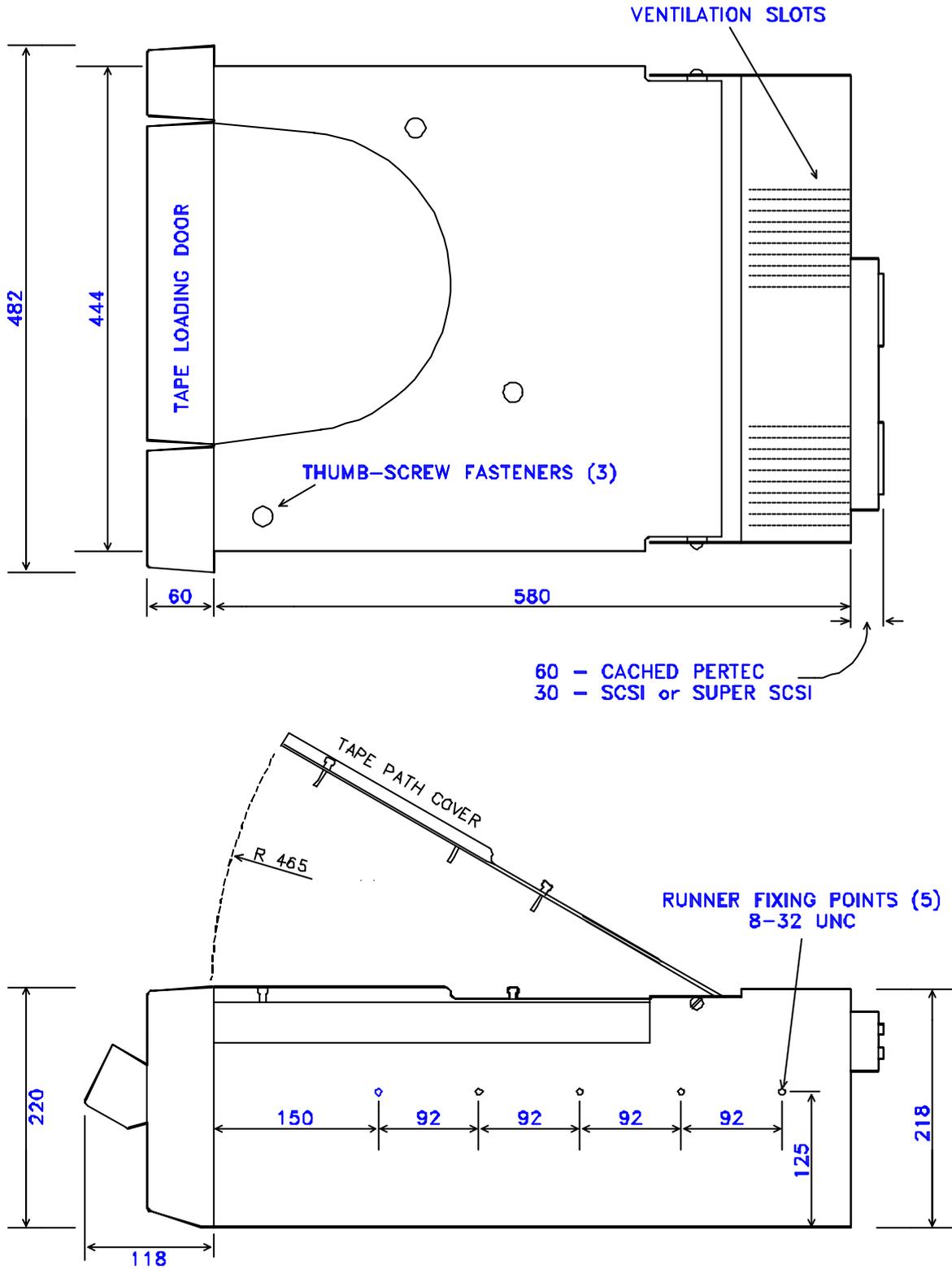


FIGURE 2.3(b) 9914 RUNNER FIXING POINTS

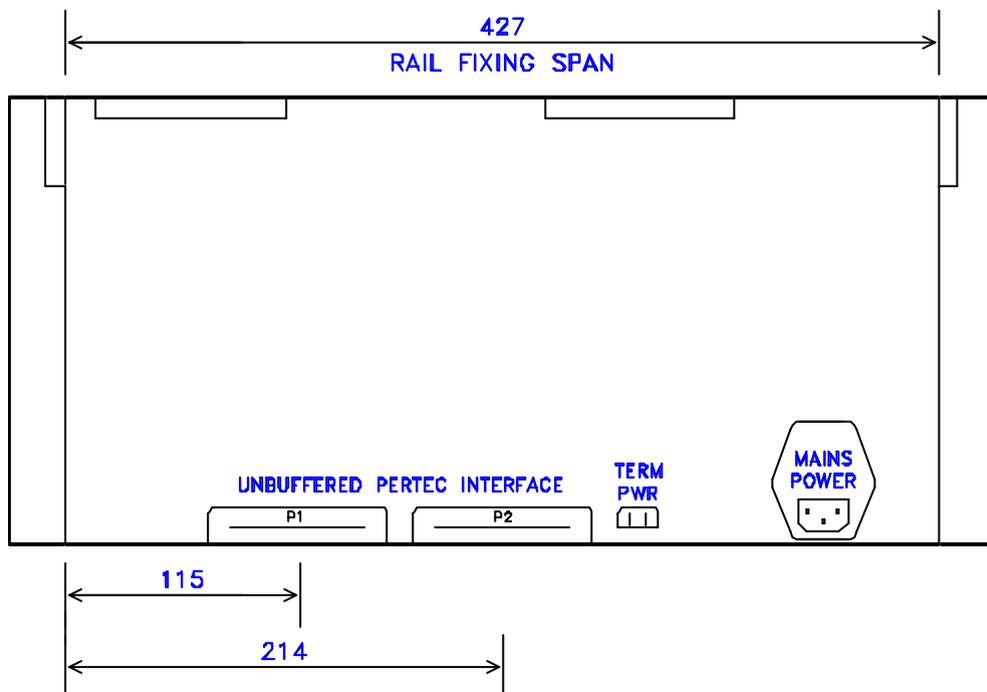
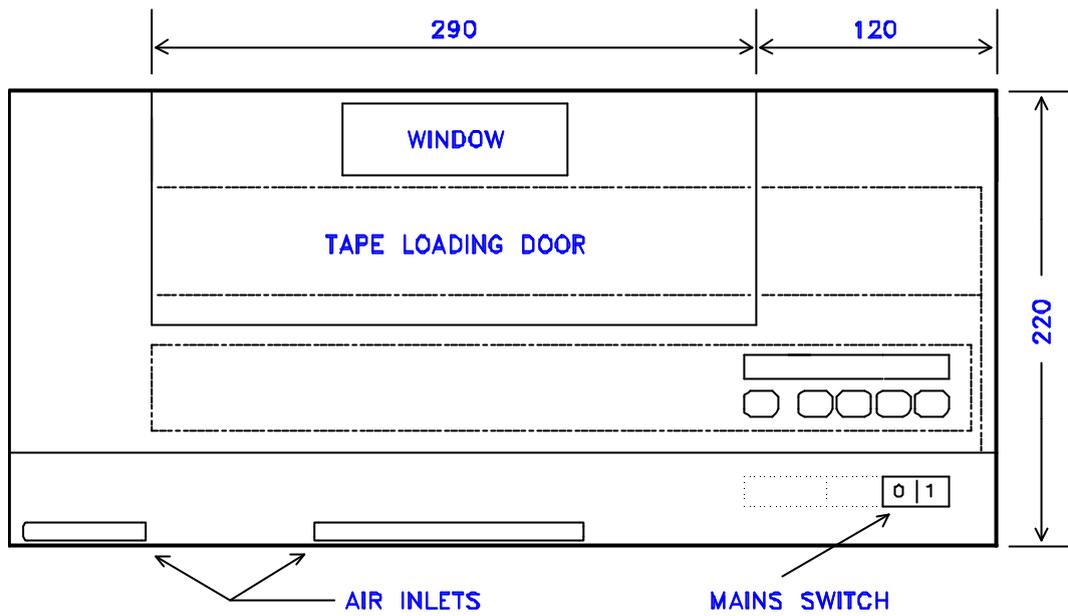


FIGURE 2.3(c) 9914 FRONT & REAR DIMENSIONS

2.4 Configuration, Link and Switch Options

2.4.1 Termination Power

A link is provided on the Data Control board to allow the 9914's unbuffered Pertec bus to receive power from an external source. The link settings are:

Link Position	Termination Power source
Away from board edge (int)	internal +5V
Near board edge (ext)	external +5V

The normal position of this link is 'int', it need only be changed if the 9914 is the last physical unit in an unbuffered Pertec daisy-chain and needs termination power from an external source (usually the host).

If an SCSI interface is fitted, Data Control termination power should remain set as ex-factory (ie 'int'). The SCSI board's termination power is determined by its TERM PWR link.

Any other links on the Control board are set during manufacture and should only be altered by trained service personnel.

2.4.2 Operator Functions

Most operator control options are held in non-volatile RAM, which can be examined or altered by running diagnostic program 67. This section describes how to alter options which do not affect the operation of the host software or the format of data written to the tape.

2.4.2.1 Displaying/Modifying Options

Run diagnostic program 67, using the following procedure.

Check that the 9914 is not exchanging data with the host, take the 9914 off-line. Press the DIAG button to bring up the 'Test 00' display, use the 'tens' and 'units' buttons until the display reads 'Test 67'. Press 'run/stop', the display indicates as follows at the various steps.

<i>OPT 01</i>	Indicated upon first entering diagnostic program 67, the desired option number (which is flashing) can now be changed by depressing the 'units' button.
<i>OPT 05</i>	When the desired option is displayed, press DIAG.
<i>UNIT 01</i>	Indicated after the desired option has been selected, and DIAG has been pressed. This is the current setting of option 05. If option 05 is to be altered, use the 'tens' and 'units' buttons to display its new setting, otherwise proceed to the next step.
<i>UNIT 02</i>	When the required option setting is displayed, press DIAG to revert to displaying option numbers.
<i>OPT 02</i>	If no further options are to be changed, press 'run/stop' to exit diagnostic program 67, otherwise repeat the procedure for other option(s).

2.4.2.2 Operator Options

The displays associated with the operator options are:

Option 01	Duration of density display
<i>DNSDIS-1</i>	Density displayed until ' run/stop ' or ' tens ' pressed
<i>DNSDIS-0</i>	Density displayed for 5 seconds only.
Option 02	Door opening after an unload
<i>Aut Open</i>	Door opens automatically after tape unloads.
<i>Man Open</i>	' Reset ' must be pressed to open the after unloading.
Option 03	Auto on-line
<i>Auto ONL</i>	9914 automatically goes on-line after loading has completed.
<i>Man ONL</i>	9914 is on-line only after ' LD/ONL ' is pressed.
Option 04	Auto load
<i>AutoLoad</i>	9914 automatically loads tape to BOT on closing the door.
<i>Man Load</i>	9914 loads tape when the ' LD/ONL ' button is pressed.
Option 05	Unit address
<i>Unit XX</i>	Where XX is the current unit address (valid in the range 0 to 7). Note: this is the SCSI's LUN address.

Warning: There are options beyond option 05, but these may re-configure the 9914 so as to alter its response to the host or change the format of recorded data. Options 06 to 17 are listed under diagnostic program 67 in Section 4, but should only be changed by personnel who are fully conversant with the system.

2.4.3 Analogue Data Paths board

There are no switch or link option settings on this board.

2.4.4 Digital Data Paths board

There are no switch or link option settings on this board. The potentiometers are set during manufacture, they must not be subsequently adjusted in the field.

2.4.5 Option boards

When an option interface board is fitted, the user should refer to the appropriate manual:

SCSI Interface	User Manual 121780 (256K, 512K, and 768K variants)
Cached Pertec Interface	Product Description 121789 (512K and 1024K variants)
Super SCSI Interface	User Manual 124658 (1 MB and 2 MB variants)

2.5 Initial Checkout

The user who is not already familiar with the 9914 controls and indicators is advised at this point to read Section 3 to gain some familiarity with the 9914's operations.

To prove the 9914's integrity:

1. Check that the 9914's supply voltage selection is correct (see Section 2.2.1).
2. Remove any protective packaging from the read/write heads.
3. Check that the 9914 is switched off, connect the supply lead to the input socket.

Warning: the 9914 mains switch does not isolate both mains connections

(a warning to this effect follows, in German):

Die Trennung vom Netz erfolgt durch Zeichnen des Netzstecker!

(Isolation from the mains is only guaranteed by removing the mains plug).

4. Switch on the 9914, the operator's panel should sequence as described in Section 3.
5. Load a scratch tape; if this procedure is unfamiliar, read ' Loading and Unloading ' in Section 3.
6. Run diagnostic program 01; this is a check of machine integrity, including writing data to the tape (when a buffered interface is fitted).
7. When diagnostic program 01 has passed, the 9914 is ready for on-line use.

2.6 Final Checkout

Caution: The 9914 meets several RFI requirements, for *industrial* use. If operated in a *residential* environment, it has a high potential for causing interference if incorrectly installed. *The user must correct any interference*, by the use of screened interface cables and/or rack mounting.

When the 9914 is fitted with a buffered interface, and the interface bus cable is not completely enclosed within a cabinet where precautions are taken to limit radiated emission, shielded connectors and cables should be used. A suitable SCSI connector (3M socket type 3565-2002 or Sun-style type 8350-8005) may already be fitted to the 9914.

1. Set the 9914's power off.
2. If connecting to a SCSI bus, take the bus out of use to avoid system errors.
3. Connect the interface cables, Table 2.6 sets out which illustration applies to a particular interface when locating the usual position of the connector(s).

Interface Type	Rack-mounted	Desk-top
Unbuffered Pertec	Figure 2.6.2 (a)	Figure 2.6.2 (a)
Cached Pertec	Figure 2.6.2 (b)	Figure 2.6.2 (b)
SCSI, differential	Figure 2.6.1 (a)	Figure 2.6.1 (b)
SCSI, single-ended	Figure 2.6.1 (a)	Figure 2.6.1 (b)

TABLE 2.6 INTERFACE CONNECTOR ILLUSTRATIONS

All Pertec interfaces use two connectors, designated P1 and P2.

All SCSI interfaces use one 50-way connector.

When the 9914 is rack-mounted, always secure the cables so as to permit pulling out of the unit without straining them.

4. Set power on:
 - wait for a successful power-up,
 - if necessary, include the 9914 in the host's configuration,
 - re-load the tape,
 - run the host diagnostic or commissioning program to prove the complete system.
5. Remove any protective peel-off sheet which is attached to:
 - the take-up hub top flange, *or*
 - the tape path cover, *or*
 - the window in the loading door.

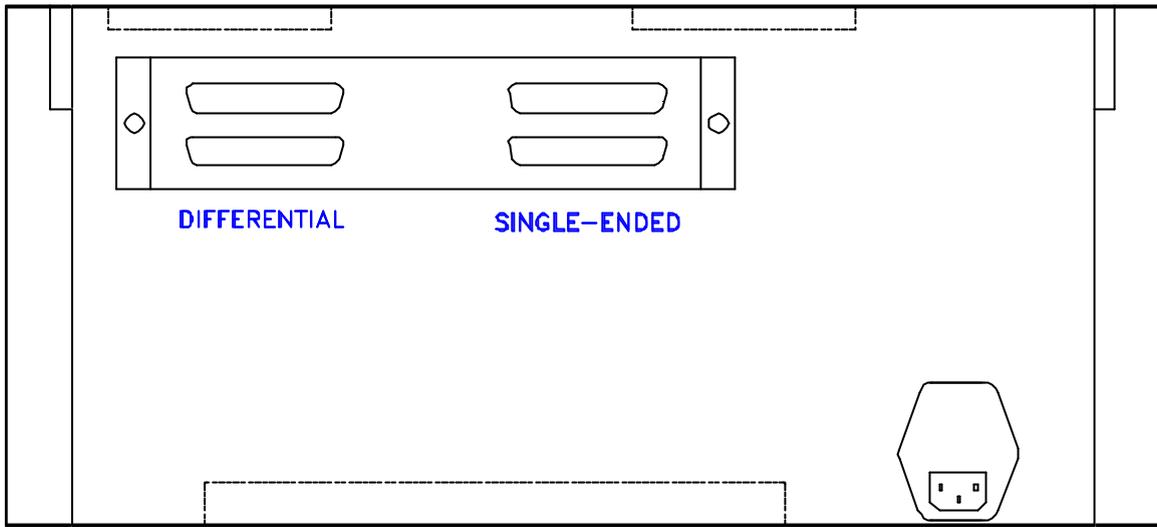


FIGURE 2.6.1 (a) SCSI CONNECTOR LOCATIONS, RACK-MOUNTED MODELS

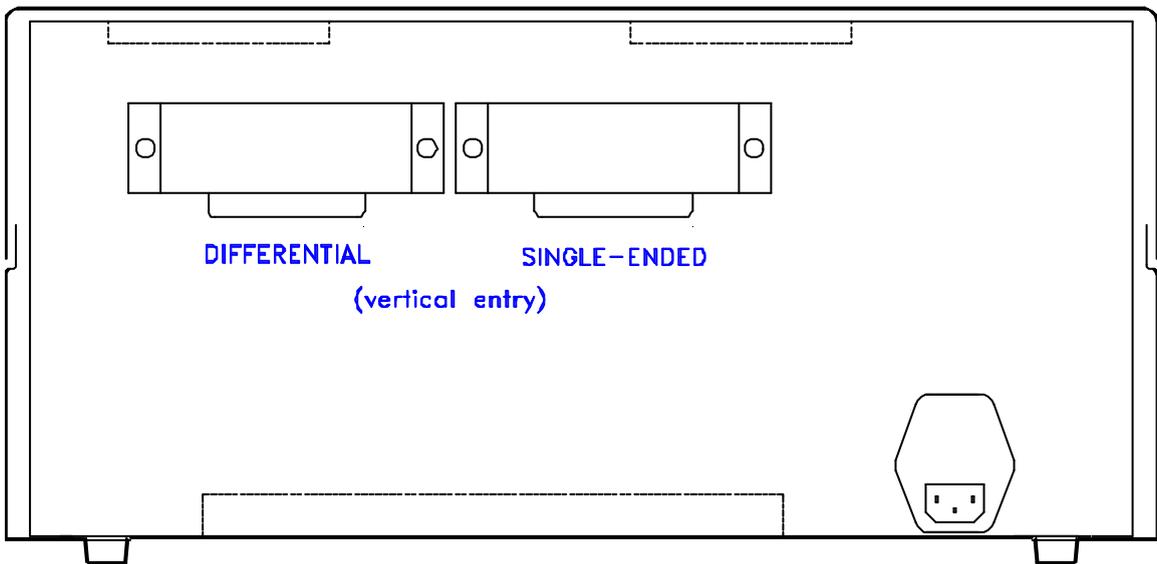


FIGURE 2.6.1 (b) SCSI CONNECTOR LOCATIONS, DESK-TOP MODELS

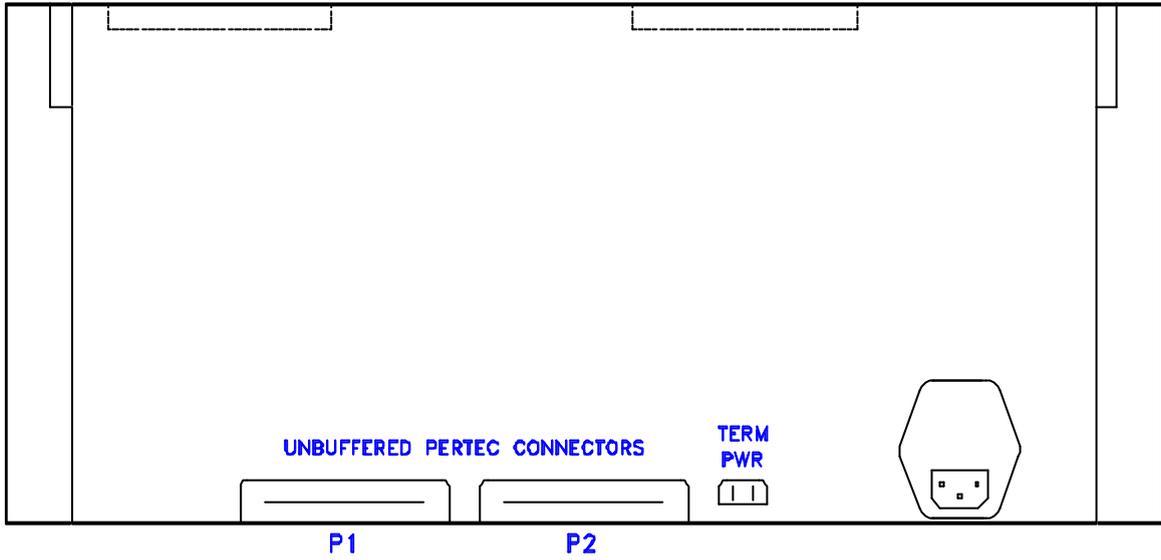


FIGURE 2.6.2 (a) CONNECTOR LOCATIONS, UNBUFFERED PERTEC

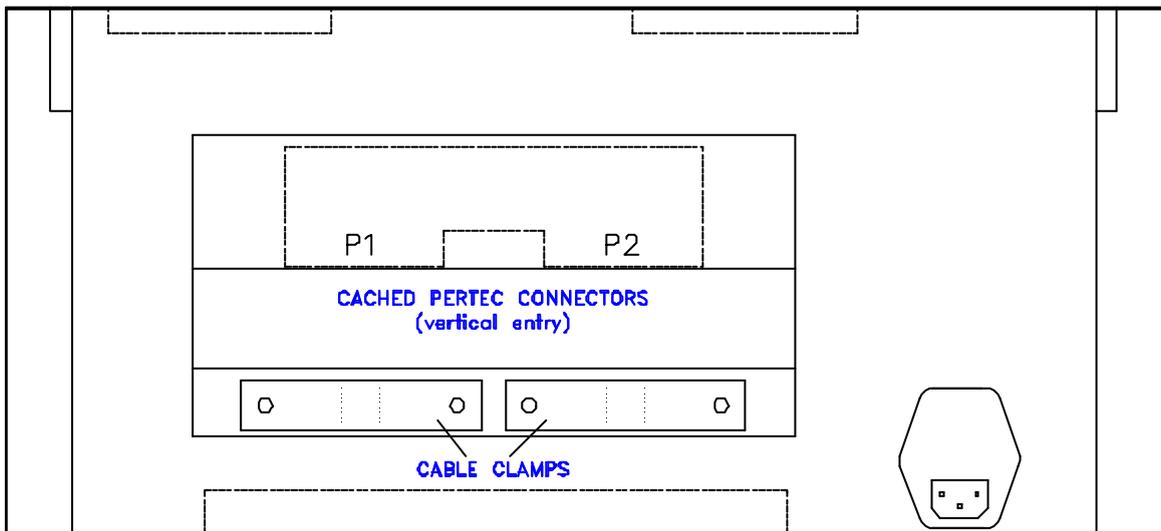


FIGURE 2.6.2 (b) CONNECTOR LOCATIONS, CACHED PERTEC

3.

This section describes the functions of the operator-accessible controls and indicators.

3.1 Operator Functions

The operator is able to perform any of the following functions:

- Switch the 9914 power on or off at the front panel.
- Select the recording density.
- Check and/or change any operator options.
- Load a reel of tape.
- Call diagnostic mode in order to run diagnostic programs, *or* identify the servo, data, or buffered interface firmware revisions, *or* analyse the status bytes.
- Cancel diagnostic mode.
- Set the 9914 online, (the host then has control of the 9914).
- Set the 9914 offline.
- Rewind the tape to BOT, and/or unload the tape.
- Unload the reel of tape.

3.2 Controls and Indicators

Figure 3.2 shows the operator's panel layout.

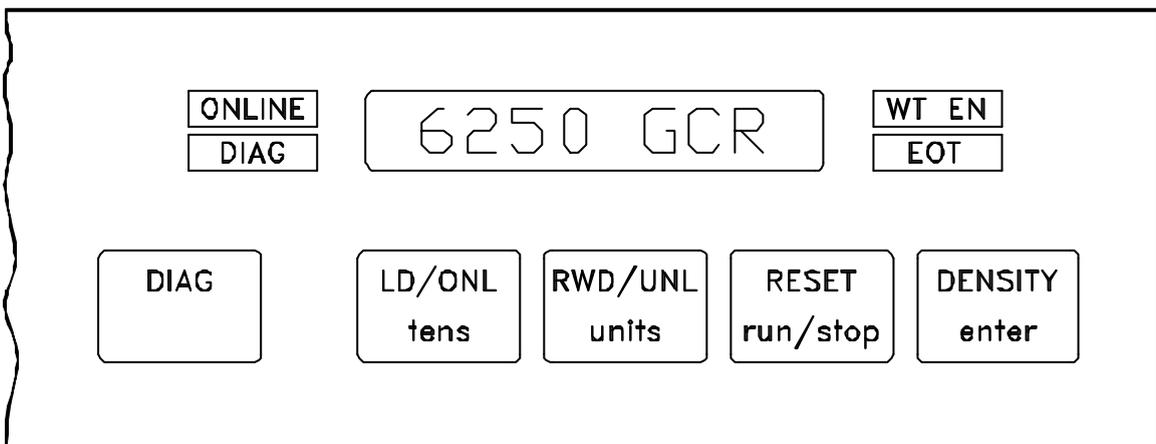


FIGURE 3.2 FRONT PANEL CONTROLS AND INDICATORS

3.2.1 Controls

Power on/off	This single-pole, two-position power switch is located at the front right hand side of the 9914 and connects mains input power to the power supply unit. When set to off, the power supply outputs are not active but mains power is still present within the 9914.
DIAG	Diagnostic mode is alternately set or cancelled by pressing this button. If DIAG is not illuminated, press to set diagnostic mode; if DIAG is illuminated and a program is not active, press to cancel diagnostic mode. This function of the DIAG control is ineffective when the 9914 is online. When certain diagnostic programs are active, DIAG is sometimes used for special functions within the program.
LD/ONL	Press to initiate loading, or to set the 9914 online when loading has completed. Note: option 04 is normally set to automatically initiate loading when the loading door is closed). Option 03 is normally set to automatically place the 9914 online when loading has completed.
RWD/UNL	Press (when the 9914 is not online) to rewind the tape to BOT. Press (when BOT is indicated) to unload the tape (ie completely rewind the tape onto the reel, unclamp it, and open the door. Note: option 02 is normally set to automatically open the door at the end of the unloading sequence. If the door does not open, press RESET. <i>Note: if RESET is held pressed while RWD/UNL is momentarily depressed, the subsequent rewind takes the tape beyond BOT and into the unloading sequence.</i>
RESET	Use to set the 9914 offline and for cancelling load or unload sequences.
DENSITY	Normally used to select the required operating density or check the current density setting (Section 3.7 gives precise operating details); exceptionally used in specific instances for other functions.
tens	In diagnostic mode, ' tens ' is used to select the tens digit of the program number. Press and hold in order to increment the displayed program number approximately every second. When the desired number is displayed, release the button.
units	Used in a similar manner to the ' tens ', this button is used to select the units digit of a diagnostic program.
run/stop	Used to start or stop a program or program stack. When a program number is displayed, pressing ' run/stop ' starts that program running; when a program is running, pressing ' run/stop ' stops that program running, pressing again usually either restarts the program from the beginning, or (if running a stack of programs) starts the next program of the stack. If a firmware halt exists in a program, then the operator actions should be obeyed, and ' run/stop ' pressed to continue.
enter	Normally used to enter a program number to a sequential list of programs known as the program stack, exceptionally used in specific instances for other functions.

3.2.2 Indicators

WT EN	<p>WT EN is illuminated when a Write Enable ring has been detected on the supply tape reel. The ring is sensed during the load sequence and WT EN is activated near the end of the sequence.</p> <p>If the indicator is not illuminated after the load sequence has completed, the Write Enable ring was not detected. All subsequent operator diagnostic programs involving writing, and all host Write commands will be rejected.</p>
ONLINE	<p>When ONLINE is illuminated, the host is able to communicate with the 9914. The 9914 may be set offline either by a host command, or by depression of the RESET button.</p>
DIAG	<p>Diagnostic mode indicates that the 9914 is either running, or is ready to run, diagnostic programs. This applies both under operator control and under host control.</p>
EOT	<p>This is illuminated when the EOT marker is opposite the photo detector in the tape path. Note that this differs from the EOT indication on the 8-character display, where ' EOT ' denotes operation at or beyond the marker.</p>
EIGHT CHARACTER DISPLAY	<p>The alphanumeric display is always illuminated, after power-on, with information such as BOT, READY, or REWIND. In some instances, a scrolled message is displayed to convey more precise information than is possible with an abbreviated message.</p>

3.3 The 8-Character Display

This section lists the messages which are placed in the 8-character display, they are classified by operating mode or circumstance. The special and scrolled messages associated with diagnostic mode are expanded in Section 4.

Note: the display is illuminated at all times after power-on. If the 8-character display is not illuminated, and none of the status indicators are illuminated, check that the front panel mains switch is set to ' 1 '. If there are no displays with power on, this could indicate a mains supply failure or a 9914 fault.

Most fault indications which are preceded by ' ** ' require the attention of an engineer, and are therefore described in the 9914 Servicing Manual.

Message	Meaning	Possible during:		
		Loading/ Unloading	Diagnostics/ Configuration	On-Line
<i>blank</i>	Mains power is not available, <i>or</i> the +5V supply is not present, <i>or</i> there is an internal fault (call a service engineer).	yes	yes	yes
Analyse	The tape has reached BOT and the data circuits are reading the ident burst to determine it's recorded density.	yes	--	--
Aut ONL	Diagnostic program 67 is being run.	--	yes	--
Aut Open	Diagnostic program 67 is being run.	--	yes	--
AutoLoad	Diagnostic program 67 is being run.	--	yes	--
-- B --	Diagnostic program 45 is being run. BOT marker is detected	--	yes	--
Bi/f X	Diagnostic program 67 is being run.	--	yes	--
Blank	A forward Read or Space interface command has been terminated because no data activity was found. The timeouts are: 7.6 m (25 ft) in NRZ and PE densities, 4.6 m (15 ft).in GCR density.	--	--	yes
BOT	Tape is at BOT and threading is complete. When set online, the display changes to ' Ld Point ' and the 9914 is then able to respond to host commands.	yes	--	--
C _ _ _ _ _	Diagnostic program 45 is being run. Chute is clear	--	yes	--
Check Media Condition	<i>Scrolled message, applies to servo firmware at assembly state 27 and after.</i> The tape appears to be stuck at the heads. Check the cleanliness of the tape path. continued . . .	--	--	yes

TABLE 3.3(a) 9914 MESSAGES

Message	Meaning	Possible during:		
		Loading/ Unloading	Diagnostics/ Configuration	On-Line
...	continued			
Check Media Condition	<i>Normal tape:</i> If tape path is clean, consider discarding that tape. Stiction may be caused by tapes stored under humid conditions, <i>or</i> being taken from store and not yet acclimatised to the new environment. <i>Seismic tape:</i> Refer to Section 3.7.1.			
CON VAL X	(X in the range 1 to 7), usually a missing or disconnected sub-assembly. Possibly a sub-assembly not detected.	--	yes	--
C R B E W L	Diagnostic program 45 is being run. Note: letters do not appear simultaneously	--	yes	--
DENS ERR	The selected density is not available (programs 82 & 83).	--	yes	--
DnsDis-X	Diagnostic program 67 is being run. X is 0 or 1.	--	yes	--
Deselect	The 9914 is online to the interface, but not selected by host computer (ie de-selected), and not at BOT.	--	--	yes
Diag Stk	Diagnostic stack entry in progress.	--	yes	yes
Diag Ded	Dedicated diagnostic stack running (program 01).	--	--	yes
DOOR	The loading door was open, after a threading sequence began, or at a time when it should not be open.	yes	--	--
___ E ___	Diagnostic program 45 is being run. EOT marker is detected	--	yes	--
EnterXX	Diagnostic program XX has been entered onto the program stack.	--	yes	--

TABLE 3.3(b) 9914 MESSAGES

Message	Meaning	Possible during:		
		Loading/ Unloading	Diagnostics/ Configuration	On-Line
EOT	End-of-tape has been detected, the current working area is therefore at or beyond the EOT marker.	--	yes	yes
EOTLIM	The tape has passed 3.6 metres (12 feet) beyond EOT and the 9914 has been commanded to move tape further forwards.	--	--	yes
Erase FL	An Erase Fixed Length command is in progress, at low speed.	--	--	yes
Erase FL +	An Erase Fixed Length command is in progress, at high speed.	--	--	yes
Erase VL	An Erase Variable Length command is in progress, at low speed.	--	--	yes
Erase VL +	An Erase Variable Length command is in progress, at high speed.	--	--	yes
Ex Sense	The extended (ie the full) Status Bytes were accessed.	--	--	yes
Flushing	The data buffer is being flushed (ie the 9914 has been set off-line, but will not go off-line until the buffer is empty).	--	--	yes
FXX ErYY	Diagnostic program XX has failed, with error code YY.	--	yes	--
HALT XX	' run/stop ' was pressed while program XX was running.	--	yes	--
HUB ERR 1	Incorrect seating of the supply reel on the supply hub.	yes	--	--
HUB ERR 2	Incorrect seating of the supply reel on the supply hub.	yes	--	--
HUB LOCK	Shortly after loading has been initiated, the reel has been clamped onto the supply hub.	yes	--	--

TABLE 3.3(c) 9914 MESSAGES

Message	Meaning	Possible during:		
		Loading/ Unloading	Diagnostics/ Configuration	On-Line
HUB SOL	The ' located ' flags are not changing, the hub lock solenoid may not have locked the supply hub.	yes	--	--
** IDENT	No identifier (compatible with the selected density) found on leaving BOT.	yes	--	yes
IN LIMIT	The tension arm has reached the limit of its travel, tape tension has been lost. May be due to stiction at the head, caused by tapes stored under humid conditions or tape not allowed to assume temperature after storage.	yes	--	--
_____ L	Diagnostic program 45 is being run. Tape tension is not in limit	--	yes	--
Ld Point	The tape is at BOT, and the 9914 is online (note, BOT is indicated when offline in the same position).	--	--	yes
LEVEL.X	Diagnostic program 49 is being run.	--	yes	--
LID OPEN	Loading has been initiated, but the tape path cover thumb-screws . are not secured.	yes	--	--
LOADING	The reel has been clamped and tape is being threaded along the tape path.	yes	--	--
LOCATING	The supply reel is being centered on the supply hub. (The reel can be seen rotating to and fro.)	yes	--	--
LOCKING	Shortly after loading has been initiated, the reel is being clamped , prior to feeding tape along the tape path; includes instances of loading which are initiated by power-on with the tape threaded.	yes	--	--
LRG REEL	Near the end of the threading sequence, the firmware has detected that a large (10.5 inch) reel has been used.	yes	--	--

TABLE 3.3(d) 9914 MESSAGES

Message	Meaning	Possible during:		
		Loading/ Unloading	Diagnostics/ Configuration	On-Line
Man ONL	Diagnostic program 67 is being run.	--	yes	--
Man Open	Diagnostic program 67 is being run.	--	yes	--
Man Load	Diagnostic program 67 is being run.	--	yes	--
MED REEL	Near the end of the threading sequence, the firmware has detected that a medium (8.5 inch) reel has been used.	yes	--	--
N I C	Not In Chute; during the early stages of threading, tape was not detected in the tape path chute (the tape end was attracted to the bulk, the foam pad had not been removed, or the loading fan was not operational).	yes	--	--
NO KEY	The called diagnostic program requires the service key code to be entered before it can run; this applies to programs where the internal configuration of the 9914 may be affected by running the program.	--	yes	--
NO TAPE	After threading had been initiated, the reel locating circuits did not conclude successfully, ie no tape reel was present on the supply hub.	yes	--	--
NO TEST	A non-existent diagnostic program has been called, <i>or</i> the stack was empty when program 99 was called.	--	yes	--
N T U	No Take Up; during the later stages of threading, tape was not gripped onto the take-up spool. No tacho pulses were detected.	yes	--	--
Offline	The tape is tensioned and forward of BOT with the 9914 not in diagnostic mode, and not online.	--	yes	(yes)
ONLINE	The 9914 is online to the host, and able to respond to host commands.	--	--	yes

TABLE 3.3(e) 9914 MESSAGES

Message	Meaning	Possible during:		
		Loading/ Unloading	Diagnostics/ Configuration	On-Line
OK	The power-up checks have been successfully completed, <i>or</i> , the 9914 does not have a fault condition.	yes	yes	--
OPT XX	Diagnostic program 67 is being run	--	yes	--
Pass XX	Diagnostic program XX has passed.	--	yes	--
POWER	A fault has been found with the Power Supply board, while all the internal dc power supply lines were being checked.	--	yes	--
_ R _ _ _ _	Diagnostic program 45 is being run. The supply reel has been located	--	yes	--
Read	A Read command is in progress, at low speed.	--	--	yes
Read +	A Read command is in progress, at high speed.	--	--	yes
READY	Tape has been threaded, and the 9914 is ready to accept host commands.	--	--	yes
Read Only	A write command has been given to a file protected tape (ie WT EN is not illuminated). If writing is required, the operator must fit a Write Enable ring to the tape reel.	--	--	yes
REEL INV	During the early stages of threading, the tape reel was found to be inserted with the Write Protect ring uppermost.	yes	--	--
Reject	The last command received was rejected (for reasons other than file protect), the reason is flagged in Status Byte F9.	--	--	yes
	' Reject ' usually remains displayed until an acceptable command is received; exceptionally (if BOT is found during a Reverse Read) BOT is displayed. Placing the 9914 offline removes ' Reject ' from the display.	--	--	yes

TABLE 3.3(f) 9914 MESSAGES

Message	Meaning	Possible during:		
		Loading/ Unloading	Diagnostics/ Configuration	On-Line
RESET	The RESET button was sensed as permanently depressed.	yes	yes	yes
Rev Read	A Reverse Read command is in progress (with data transfer) at low speed.	--	--	yes
Rev Read +	A Reverse Read command is in progress (with data transfer) at high speed.	--	--	yes
REWIND	The tape is rewinding following either host or operator Rewind command, this operation completes at BOT. If RESET is pressed during rewinding, tape motion stops and the ' REWIND ' indication is replaced by ' Offline '.	--	--	yes
REW/UNLD	An operator Rewind & Unload (ie Unthread) command has been given by holding RESET depressed while RWD/UNL is pulsed.	yes	--	--
Run XX	Diagnostic program XX is running.	--	yes	yes
Run 49.X	Diagnostic program 49 is being run.	--	yes	--
SecErase	An Security Erase command is in progress.	--	--	yes
Sense	The condensed Status Bytes were accessed.	--	--	yes
SNS FXX	Diagnostic program 68 is being run.	--	yes	--
SML REEL	Near the end of the threading sequence, the firmware has detected that a small (6 or 7 inch) reel has been used.	yes	--	--
SpcFwd	A Space Forward command is in progress, at low speed.	--	--	yes
SpcFwd +	A Space Forward command is in progress, at high speed.	--	--	yes

TABLE 3.3(g) 9914 MESSAGES

Message	Meaning	Possible during:		
		Loading/ Unloading	Diagnostics/ Configuration	On-Line
SpcRev	A Space Reverse command is in progress, at low speed.	--	--	yes
SpcRev +	A Space Reverse command is in progress, at high speed.	--	--	yes
Srch Fig	A file search forward (ignoring data) command is in progress, at low speed.	--	--	yes
Srch Fig +	A file search forward (ignoring data) command is in progress, at high speed.	--	--	yes
Srch Fwd	A File Search Forward command is in progress, at low speed.	--	--	yes
Srch Fwd +	A File Search Forward command is in progress, at high speed.	--	--	yes
Srch Rev	A File Search Reverse command is in progress, at low speed.	--	--	yes
Srch Rev +	A File Search Reverse command is in progress, at high speed.	--	--	yes
Srch Rig	A File Search Reverse (ignoring data) command is in progress, at low speed.	--	--	yes
Srch Rig +	A File Search Reverse (ignoring data) command is in progress, at high speed.	--	--	yes
STK FULL	The diagnostic stack is fully loaded with 30 programs.	--	yes	--
STUCK!!	<i>Scrolled message, applies to servo firmware prior to assembly state 27.</i> The tape appears to be stuck at the heads. Check the cleanliness of the tape path. If clean, consider discarding that tape. Stiction may be caused by tapes stored under humid conditions, <i>or</i> being taken from store and not yet acclimatised to the new environment.	--	--	yes
** TAB	The BOT tab was not detected, near the end of the threading sequence.	yes	--	--

TABLE 3.3(h) 9914 MESSAGES

Message	Meaning	Possible during:		
		Loading/ Unloading	Diagnostics/ Configuration	On-Line
TAPE NOT IN CHUTE	<i>Scrolled message.</i> The tape end has not blown clear of the bulk.	yes	--	--
TEST 00	Diagnostic mode has just been entered.	--	yes	--
TEST XX	Diagnostic mode is operative, program XX has been dialled up.	--	yes	--
TESTING	The power-up checks are in progress.	--	yes	--
UNIT XX	Diagnostic program 67 is being run	--	yes	--
UNLOAD	An unload (ie unthreading) sequence is in progress following the pressing of the RWD/UNL button while BOT was indicated.	yes	--	(yes)
UNLOCK	The reel is being unclamped, towards the end of the loading sequence. Note: UNLOAD followed by UNLOCK could be the result of failing to detect the BOT marker.	yes	--	(yes)
___ W _	Diagnostic program 45 is being run. The Write Enable flag has been detected	--	yes	--
Write	A Write command is in progress, at low speed.	--	--	yes
Write +	A Write command is in progress, at high speed.	--	--	yes
Write FM	A Write File Mark command is in progress, at low speed.	--	--	yes
Write FM +	A Write File Mark command is in progress, at high speed.	--	--	yes
** Write	No write current was detected in the heads.	--	--	yes

TABLE 3.3(i) 9914 MESSAGES

Message	Meaning	Possible during:		
		Loading/ Unloading	Diagnostics / Configuration	On-Line
X-cYYsZZ	Diagnostic program 34 is being run.	--	yes	--
X-YY ZZ	Diagnostic program 35 is being run.	--	yes	--
NNNNNNNN	All, numeric, 1s or 0s. Diagnostic program 68 is being run.	--	yes	--
800 NRZ	800 bpi NRZ density.	--	--	yes
1600 PE	1600 bpi PE density.	--	--	yes
3200 DPE	3200 bpi (double PE) density.	--	--	yes
6250 GCR	6250 bpi GCR density.	--	--	yes
>	Forward tape motion is in progress (a diagnostic program is running).	--	yes	--
<	Reverse tape motion is in progress (a diagnostic program is running).	--	yes	--
** XXXXX	XXXXX not listed previously. The 9914 has a fault which probably requires an engineer's attention. Note XXXXX and report the message to the next level of support.	yes	--	yes

TABLE 3.3(j) 9914 MESSAGES

3.4 Automatic Self-Checks

3.4.1 Power-on Checks

When power is applied to the 9914, a self-check routine of the fundamental functions is automatically initiated to detect failures which would otherwise inhibit its further use. The error messages are set out in Table 3.3.

3.4.2 Other Automatic Checks

Continuous power-fail checks are made when 9914 is not selected, error messages are as for power-on checks. Note that the host computer can request diagnostic tests when data transfers are not in progress, in which case the DIAG legend illuminates while the diagnostics are running.

3.5 Door Interlocks

The loading door and the tape path cover each operate sensors when they are closed. The load sequence cannot commence until both items are properly closed.

The tape loading door has an electrically operated latch arranged such that the door only opens under safe conditions.

Caution: do not force the loading door. It cannot normally be opened when the 9914 is without power. If access to a reel is essential then open the tape path cover and release the loading door latch with a slim pointed instrument.

3.6 Loading and Unloading

3.6.1 General

Before carrying out the following operating procedures, users should be familiar with the care of tapes. Reels should not be handled by the flange and should always be placed in a canister (or enclosed in a protective outer ring) when not in use.

Caution: once the tape has been tensioned, avoid opening the tape path cover. If the 9914 is on-line, it changes to off-line; if tape is in motion, tape motion ceases. To restore the status quo, the thumb-screw fasteners must be secured; LD/ONL must be pressed to place the 9914 online.

3.6.2 Power-on Procedure

To power on the 9914, proceed as follows:

- i. Set the power switch at the front of the 9914 to on ('1').
 - If there is no tape reel in the loading chamber, the display sequences as in Table 3.6.2.
 - If there is a tape reel in the loading chamber, the display begins as in Table 3.6.2 but proceeds from LOCATING to the LOCKING stage of Table 3.6.3.
- ii. Power-on fault indications are listed in Table 3.3, usually in the diagnostics column because the power-on diagnostic checks are running.

Display	Status	Duration	9914 Activity
TESTING	DIAG	Several seconds	Power-on health check Other indicators flash momentarily
OK	--	Momentary	Health check ok
LOCATING	ONLINE	Several seconds	Centralising the tape reel, supply hub rotates to and fro
NO TAPE	--	Several seconds	Reel not located (may be no reel in the supply chamber)
<i>Scrolled message*</i>			Tape reel may now be clamped, see next section.

* The message begins ' To load tape press LD/ONL ... '

TABLE 3.6.2 9914 POWER-ON SEQUENCE

3.6.3 Loading the Tape Reel

a. Power-on without a tape reel inserted

When there was no tape reel in the loading chamber, follow this procedure; otherwise follow the instructions in (b) below.

- i. Select a reel of tape.
- ii. Ensure that the Write Enable ring is either fitted to permit writing, or removed to prevent over-writing of existing data.
- iii. Ensure the tape end is free; for new reels remove the adhesive strip and/or rubber block which constrains the free end to the tape pack.
- iv. At the end of the power-on sequence described in Section 3.6.2, press RESET to open the loading door; if this fails, attempt to open it using gentle force. Should the door fail to yield, the latch may be still engaged.
- v. Follow the sequence of Table 3.6.3. Should tape loading malfunction, the possible display indications are listed in Table 3.3.

b. Power-on with a tape reel inserted

If the 9914 has just been powered on with a tape reel, loading is automatic and follows the sequence of Table 3.6.3 from LOCATING onwards.

This feature is effective before or after BOT.

c. Substituting a Tape Reel

- i. Unload the current reel of tape, by following the procedure described in Section 3.6.4.
- ii. Load the next reel, by following the procedure from the READY indication of Table 3.6.3.

Display	Status	Duration	9914 Activity
<i>Scrolled message</i>	ONLINE	Indefinite	<i>Waiting. Press RESET to open door</i>
	READY		<i>Insert reel of tape (Write Enable ring downwards) Close the loading door</i>
LOCATING	--	Several seconds	Centralising the tape reel
LOCKING	--	Several seconds	Clamping the reel to the hub
LOADING	--	Several seconds	Threading and tensioning the tape
XXX REEL	(WT EN)	Several seconds	Determining the reel size, XXX could be SML, MED, or LRG
BOT	--	Momentary	Tape has reached BOT
Analyse	--	Several seconds	Density determination, result is displayed for a few seconds
Ld Point	--	Indefinite	Tape is at BOT and 9914 is online, or tape is at BOT and 9914 is offline
BOT	--	Indefinite	
Notes:			
Ensure the tape reel is placed with the Write Enable ring down.			
If LID OPEN is indicated, secure all 3 tape path cover thumb-screws.			
If the 9914 is needed online at BOT, press LD/ONL.			
Online status to the host is not set until BOT is reached.			

TABLE 3.6.3 9914 TAPE LOADING PROCEDURE

3.6.4 Unloading the Tape Reel

a. Removing the tape reel (with power on)

Note 1: if the unload sequence is commenced inadvertently it can be cancelled by first pressing the RESET, then pressing LD/ONL to resume loading (in order to resume, the tape will probably move to BOT).

Note 2: for tape protection, place the reel of tape in a dust proof cover and store in a safe place.

- i. To avoid loss of data, check that the host computer is not accessing the 9914. If 'Offline' is displayed, unloading may proceed without loss of data; but many of the online indications in Table 3.3 suggest that data transfer is still in progress. Tape motion also suggests that data transfer is still in progress.

- ii. Set the 9914 offline by pressing RESET, or (if in diagnostic mode) press the ' DIAG ' control once to leave diagnostic mode (ie the DIAG legend not illuminated).

Note: if the 9914 does not go offline immediately after pressing RESET, the delay may be due to buffered data still being processed.

- iii. If ' Offline ' is displayed, hold RESET depressed while RWD/UNL is pressed, the tape rewinds (with REW/UNLD indicated) through BOT until the reel is unclamped and the loading door opened. *Note: if the door does not open, press ' RESET '.*
- iv. When the display indicates READY the tape reel may be removed.

b. Removing the tape reel during a power failure

If power to the 9914 is cut off, and it is essential that the reel of tape is recovered without waiting for power to be restored, the following procedure enables the user to do so. The user should be aware that the time required to rewind the tape increases according to the amount of tape on the take-up spool (ie the one further from the front panel).

- i. Set power off. This is essential for safety reasons.
- ii. Lift the tape path cover, rotate the supply reel anti-clockwise until all the tape has been rewound.
- iii. Gently depress the hub unlock lever (located under an access hole just behind the supply reel well - as illustrated in Section 5), while turning the tape reel anti-clockwise to unclamp it.
- iv. Carefully lift off the unclamped supply reel.
- v. Gently depress the hub unlock lever again, and turn the hub anti-clockwise until the clamp pads are fully retracted.
- vi. Close the tape path cover, secure the thumb-screw fasteners.

3.6.5 Threading the Tape by Hand

Since the 9914 is designed for fully automatic loading, it is not normally necessary (or desirable) to manually thread the tape except under fault conditions such as a failed loading fan.

- i. Set power off. This is essential for safety reasons.
- ii. Lift the tape path cover, place the tape reel centrally on the supply hub.
- iii. Thread the tape through to the take-up hub.
- iv. Wind on about two turns (an access hole is provided to facilitate take-up) until the tape is pulled through when the tape-up reel is rotated.
- v. Close the tape path cover, secure the thumb-screw fasteners.
- vi. Set power on.

The loading firmware senses that tape is already threaded and proceeds to clamp the supply reel, tension the tape, and search for BOT without the operator taking any further action.

3.6.6 Switching off with Tape Threaded

It is good practice to ensure that the tape is unloaded (or at least returned to BOT) before switching off. The reel servo circuits are designed with a dynamic braking effect to prevent tape loops forming following power failures or accidental switching off.

3.7 9914 Problems

The 9914 has extensive internal diagnostic facilities to simplify fault isolation.

If a fault is found, a message appears on the operator's display, Table 3.3 lists these indications. Read this section to determine whether the 9914 is suitable for further operation; if not, rewind the tape and unload the reel.

In general, it is only necessary to switch off when some obvious hazard is present; removing power from one 9914 in a daisy-chain configuration may disable the whole configuration.

If the 9914 does not operate as expected, and no fault indication is displayed, consult Tables 3.7.X.

3.7.1 Reading Seismic Tapes

It sometimes happens that a tape, which is known to contain seismic information, repeatedly fails to read and causes the IN LIMIT or CHECK MEDIA CONDITION message to appear on the operator's display.

Such a tape:

- a. is likely to have data blocks far exceeding the normal maximum length of 64K bytes, *and/or*
- b. may have been stored in adverse conditions, *and/or*
- c. may have been stored for a very long time,

and the normal read re-try action (involving a tape reposition) will not recover the data successfully because the tape "sticks" to the head stack (a phenomenon known as stiction).

Firmware Conditions Necessary to Read Seismic Tapes

Facilities have been provided to enable seismic tapes to be read with greater success, it is recommended that a Service Engineer installs these facilities but there follows a description of the procedure.

- Run diagnostic program 70 to establish which SCSI board is fitted. PROM 124610 denotes that Super SCSI is fitted; any other SCSI PROM does not support the seismic option. If the PROM is 124610, note its revision.

If PROM 124610 revision is 07 or later, the seismic option can be supported.

- Run diagnostic program 70 again to establish which Servo Control code is fitted. The code must be A4/28 or later in order to support the retention of servo parameters in the event of the tape tension having been lost.

Setting Up Seismic Read Parameters

If the previous 2 conditions are satisfied, seismic operation can be supported by setting another 2 conditions, as follows. **Caution:** do not set up seismic operation in order to read non-seismic tapes.

- Config Byte 14, bit 6 must be set to '1', this enables seismic operation. Alternatively, if Super SCSI options are controlled by on-board switches, SW2/2 must be set 'on'. Seismic operation causes a Read command to keep the tape streaming until the preset number of file marks is detected, without stopping on error or reporting errors.

- Config Byte 07, bit 1 must be set to '1', this enables read strobes to continue after a tape data error has been detected.

Config Byte bits can be changed by running diagnostic program 67.

Loss of Tape Tension While Reading Seismic Tapes

When the previous conditions have been set up and tape tension is lost during a read operation, the message IN LIMIT (or CHECK MEDIA CONDITION) normally appears on the operator's display:

- i. Confirm tape tension loss, by visual inspection.
- ii. Lift the tape away from the heads and clean them (refer to Section 5 for suitable cleaning materials).
Warning: the adjacent tape cleaner blades are extremely sharp, observe great care while cleaning.
- iii. Place the tape near the heads again. Manually take up any slack in the tape by rotation of the Supply reel.
- iv. Press load to start the 9914 re-tensioning the tape. The host is then able to resume reading the tape from this position. There is also the option of pressing rewind and rewind the tape to BOT.

3.8 Density Selection/Interrogation

When the appropriate density option bit (Config Byte 16, bit 1) is set to enable operator selection, the density can sometimes be interrogated and/or changed via the DENSITY button, with the current density setting indicated on the 8-character display. The selection/interrogation methods and rules are described next.

The conditions under which the operator may examine or change the recording density are outlined in Figure 3.8.

a. After power-on checks.

When the power-on checks have finished, the density defaults to the setting in the option bytes and is not displayed. Should the density button be pressed, the display does not indicate density because it is not relevant until a tape reel is present (ie no read or write operation can take place).

b. Immediately After Loading

When the Analyse function has been enabled (byte 06, bit 2), it determines the tape density at the end of the loading sequence (the tape can be seen moving to and fro, and 'Analyse' is displayed). 6250 or 1600 bpi ident bursts cause selection of the corresponding density, no ident defaults to the option byte setting, blank tape or an alien format defaults to the power-up default setting.

Manual density selection when loaded, at BOT, and offline, consists of depressing the DENSITY button to cause the display to cycle continuously through the available densities. Whichever density is displayed when DENSITY is released becomes the new recording density during the next online command.

c. Online

The density setting cannot be updated from the front panel when the 9914 is online, but can be checked at any time by pressing the DENSITY button. The current setting is shown for a short time before the display reverts to its previous indication.

d. During Diagnostic Mode

Density selection in diagnostics is special because four programs are allocated specifically for this purpose. Diagnostic programs operate in conjunction with the Data Control firmware for density selection, thus if the 9914 was set to 1600 bpi before diagnostic mode was entered, and altered to 6250 bpi during diagnostics, it will remain at 6250 bpi on leaving diagnostic mode.

When running diagnostic programs, it is recommended that the density is specifically set (by programs 41-44), rather than relying on a previous setting. If a program fails and an error of the form ' F29 Er01 ' is displayed, the current density may be displayed by pressing ' enter '. To continue the program, it is then necessary to press DIAG to skip the error, followed by ' run/stop ' to continue the program.

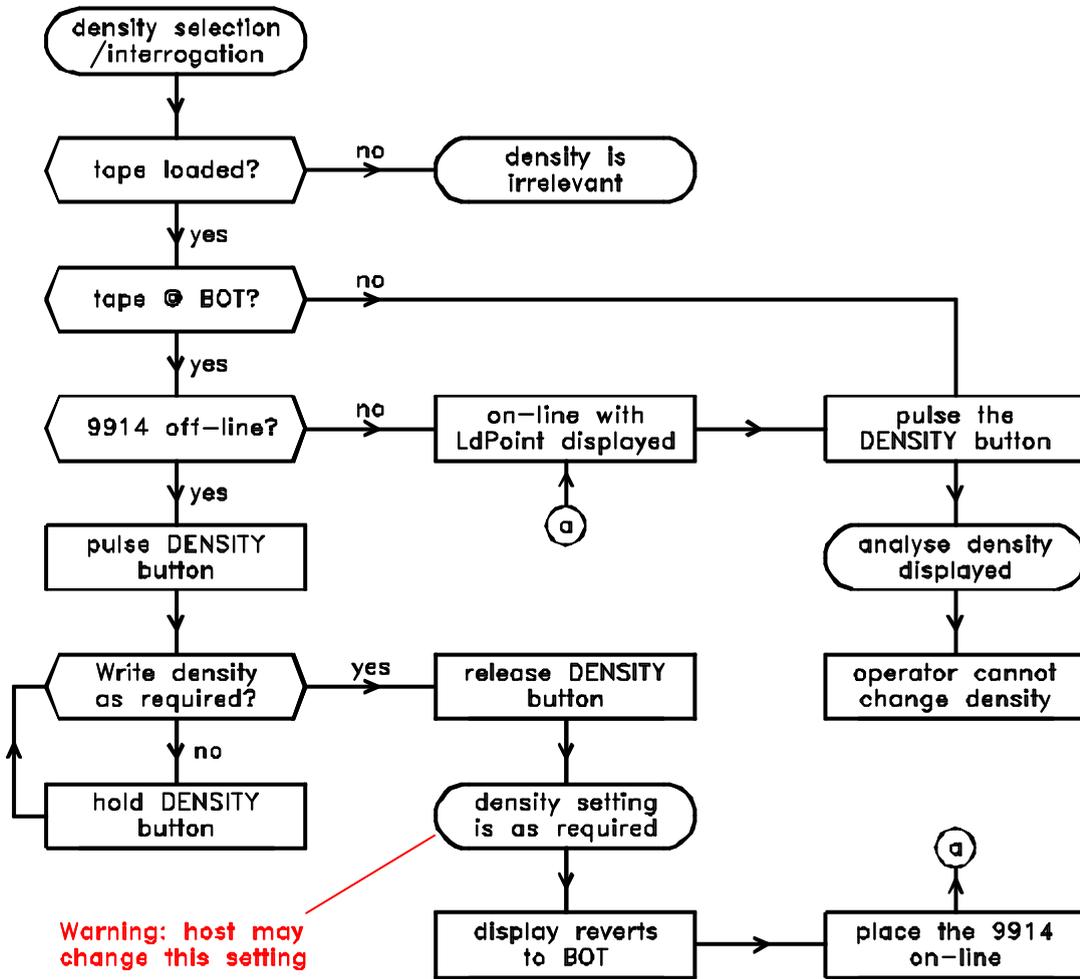


FIGURE 3.8 FRONT PANEL DENSITY SELECTION/INTERROGATION

Fault/ Possible causes	Investigation/ remedy	Notes
<p>1 Cooling fan inactive</p> <p>No input power.</p> <p>Internal power fault.</p>	<p>Check primary power is present</p> <p>Check 9914 is powered on</p> <p>Check 9914 ac input fuse</p> <p>Call next level of support</p>	<p>Refer to Section 3.6.3(b) if tape is threaded</p> <p>Front panel switch</p> <p>4.0 A (120 V in) 6.0 A (240 V in)</p>
<p>2 8-character display extinguishes (previously functional)</p> <p>Input power failed.</p> <p>Internal fault.</p>	<p>Restore power - see (1)</p> <p>Call next level of support</p>	
<p>3 Loading fan always on</p> <p>Internal fault.</p>	<p>Call next level of support</p>	
<p>4 Operator's panel button not effective</p> <p>Internal fault.</p>	<p>Call next level of support</p>	
<p>5 Door closure not effective (ie no ' LOCKING ' indicated)</p> <p>Internal fault.</p>	<p>Call next level of support</p>	
<p>6 ' LOCATING ' indicated but no reel motion</p> <p>Internal fault.</p>	<p>Call next level of support</p>	

TABLE 3.7.1(a) OFF-LINE FAULTS

Fault/ Possible causes	Investigation/ remedy	Notes
7 Tape not feeding from supply reel		
End attraction to bulk. Loading fan fault. Excessive air leak. Internal fault.	Make longitudinal pinch at end Manual thread Check tape path cover Call next level of support	Section 3.6.5 Thread manually, see Section 3.6.5
<hr/>		
8 DIAG not illuminating		
LED not energised Internal fault.	Run diagnostic program 72 Call next level of support	If LED illuminates, call next level of support
<hr/>		
9 Data tests give frequent errors		
Tape quality. Dirty tape path. Internal fault.	Substitute known good tape Routine cleaning schedule Call next level of support	Section 5
<hr/>		
10 BOT not found		
Leader too short. Marker not detected.	Manual thread Try another tape, <i>or</i> run diagnostic program 45	Section 3.6.5
No BOT marker.	Attach marker	If detector ok, call next level of support ANSI/ ECMA specifications

TABLE 3.7.1(b) OFF-LINE FAULTS

Fault/ Possible causes	Investigation/ remedy	Notes
11 Density cannot be changed Tape not at BOT Configuration option	Reverse to BOT Operator change forbidden	Call next level of support (Config byte 16)
12 Tape running off at EOT Host software Internal fault.	Call next level of support Call next level of support	

TABLE 3.7.1(c) OFF-LINE FAULTS

Fault/ Possible causes	Investigation/ remedy	Notes
100 Host does not recognise the 9914		
9914 not powered Interface cable not connected. Interface bus not properly terminated. Termination power source incorrect.	Set power on Call next level of support Call next level of support Call next level of support	Check connection
101 ONLINE status does not latch (ie legend goes out)		
Tape not loaded. DIAG illuminated. Internal fault. 'Off-Line' host command. Loading door opened Configuration problem	Cancel diagnostic mode Call next level of support Call next level of support Close and secure all thumb screws Call next level of support	
102 ONLINE status indicated, but subsequently drops out		
Loading door opened Run off EOT end of tape Internal fault.	Close it, secure all thumb screws, press LD/ONL Check options / host software Call next level of support	
103 9914 not responding to any commands		
Not on-line. Incorrect configuration. Incorrect connections. Incorrect address. Unsuitable interface	If ONLINE not illuminated, press LD/ONL Examine Config bytes Check Pertec SK1/SK2 are not interchanged or inverted Check Config byte 08 or 15 Call next level of support	Call next level of support 9914 Product Specification

TABLE 3.7.2(a) ON-LINE FAULTS

Fault/ Possible causes	Investigation/ remedy	Notes
<p>104 Density selection ineffective</p> <p>Density not available. 3200 bpi available.</p>	<p>Config byte 18 Config byte 16, bit 4</p>	<p>Call next level of support Call next level of support</p>
<p>105 Speed selection ineffective</p> <p>Operator panel enabled (inhibits interface speed selection).</p>	<p>Config byte 13, bit 3</p>	<p>Call next level of support</p>
<p>106 Tape does not move forward</p> <p>Head > 3.6 m beyond EOT</p>	<p>Rewind or reverse motion</p>	<p>Block may be only partially written</p>
<p>107a Unable to read a normal tape</p> <p>Tape is unreadable Internal fault.</p>	<p>Try on another machine Try a known readable tape Call next level of support</p>	
<p>107b Unable to read a seismic tape</p> <p>Stiction at the heads, and tension lost.</p>	<p>Refer to Section 3.7.1. Recovery possible if certain requirements are met.</p>	<p>Section 3.7.1</p>

TABLE 3.7.2(b) ON-LINE FAULTS

Fault / Possible causes	Investigation / remedy	Notes
108 Does not go off-line after pressing RESET		
Tape in motion	Wait until it stops	
Data still in SCSI (or CPI) buffer	Wait until buffer is cleared	
Host is powered off	Wait about 10 seconds	
<hr/>		
109 6250 bpi active after 3200 bpi selected		
Alternative '6250 bpi' code	Byte 16, bit 4 = 1	Call next level of support
<hr/>		
110 Host's SCSI bus unable to communicate with any unit		
9914 powered off, is last physical unit on the bus, and term pwr is set to 'int'	Arrange for 9914 power on, <i>or</i> review termination method	Call next level of support

TABLE 3.7.2(c) ON-LINE FAULTS

4.

Diagnostics

The 9914's diagnostics offer a selection of programs (numbered 00 to 99), many of which are useful to the operator and may be controlled from the operator's panel.

When a diagnostic program completes, a ' Pass XX' message is normally displayed. After a failure condition, the displayed error message usually contains the failed program number and the error code. These messages assist service personnel in locating the suspect faulty Field Replacement Unit (FRU).

Some program descriptions make reference to interface signal names (eg ICER, IHER, IFBY), these are defined in the 9914 Product Specification.

Note: because some diagnostic programs write data to tape, it is good practice to load a scratch tape before invoking diagnostic mode.

4.1 Diagnostics - from the Operator's Panel

4.1.1 Operator Diagnostics

Most diagnostic programs may be controlled from the front panel, those which cannot are host-specific functions.

The operator may use the diagnostics:

- to confirm primary functions such as tape motion;
- for proof of machine integrity; by running preset stacks;
- to inspect the record of machine performance;
- to aid identification of faulty FRUs when failures occur;
- to identify the installed revisions of servo, data, and SCSI/CPI firmware .

Fault-finding procedures which go beyond the scope of operating diagnostic programs are described in the 9914 Servicing Manual.

4.1.2 Diagnostic Mode

The operator diagnostics mode is entered by pressing the DIAG button, which is ignored when the 9914 is on-line. When the diagnostics mode becomes active, the DIAG legend illuminates, and the operator's panel display indicates ' Test 00 ', indicating program 00. This is a non-operative condition, because the operator is expected to select a program number.

Note: it is quite legal for the DIAG legend to be illuminated when the 9914 is on-line; this means that the host is running the 9914's diagnostics.

The front panel controls can be taken out of their diagnostic functions (and returned to normal operation) by choosing a time when no diagnostic program is running and pressing the DIAG button a second time.

Note: if the Super SCSI interface is fitted - and it is required to run diagnostics - the SCSI bus must be connected to the 9914, the bus must be terminated, and the host must be powered. If these conditions cannot be met, a CSE should be called to set the hardware configuration.

4.1.3 Program Selection

Individual programs are selected by pressing and holding either the ' tens ' or the ' units ' buttons.

4.1.4 Running a Program

Note: because some diagnostic programs write data to tape, it is good practice to load a scratch tape before invoking diagnostic mode.

A program is run by pressing the ' run/stop ' button once; depressing the ' run/stop ' button a second time stops the program.

The display ' No test ' indicates that there is no function allocated to the selected program number, or that function has not yet been implemented, or program 99 was called when the stack was empty.

The display ' No Key ' indicates that the selected program number requires the service key code to be entered. This access right applies to programs which are capable of altering the internal configuration of the 9914, or the read/write parameters; only service engineers should use these programs.

If a connector or a printed circuit board is missing, a message comes up after power-on, with two leading asterisks (**). These indications usually require the attention of a service engineer.

While a diagnostic program is running, the program number is continuously displayed in the right-hand characters, with an ' Runng ' on the left; ' Runng 05 ' indicates that program 05 is running. If a test program fails, the program number and the appropriate error code are displayed in the form ' F29 Er01 ' (failed program 29, error 01).

When a test program is successfully executed, the program number is prefixed by ' Pass '; ' Pass 12 ' indicates successful completion of program 12. Where a program requires operator action the required action is scrolled on the display.

4.1.5 Program Stacks

If an individual selection of programs is required, a sequence of programs may be added to the stack by use of the ' enter ' button, which adds the currently displayed program to the stack.

To run the stack, display program 99 and press ' run/stop '.

The stack is cleared by running program 98.

4.1.6 Program Loops

To run the stack continuously, display program 99 and press ' enter '.

Then display program 99 and press ' run/stop '.

4.1.7 Program Examples

4.1.7.1 Program 01

With the scratch tape loaded and the 9914 off-line:

1. press the DIAG button, the DIAG legend should illuminate and the display should indicate ' Test 00 ';
2. operate the ' units ' button to set 01;
3. press ' run/stop ' once;
4. the tests run for several minutes, after which a pass is denoted by ' Pass 98 ' (98 is the last program number in the preset stack). A failure is denoted by a message of the form ' F29 Er01 '; ' enter ' may be pressed to indicate the current density and speed eg ' 6250 Hi ', but to continue running the program DIAG must then be pressed (to skip the error) and then ' run/stop '.

4.1.7.2 Programs 04, 44, & 30 in a Stack

With the scratch tape loaded and the 9914 off-line:

1. Press DIAG;

Note: steps (b) and (c) are unnecessary if no program has been entered into the stack since power-up;

2. operate the ' tens ' and ' units ' buttons to set program 98 (to clear the stack);
3. press ' run/stop ', ' Pass 98 ' should be displayed (the program stack is now empty);
4. set program 04;
5. press ' enter ' (to enter program 04 into the stack);
6. set program 44;
7. press ' enter ' (to enter program 44 into the stack);
8. set program 30;
9. press ' enter ' (to enter program 30 into the stack);
10. set program 99 (to run the program stack);
11. press ' run/stop ';
12. programs 04, 44 and 30 run sequentially and, if successful, ' Pass 30 ' is displayed when completed.

4.1.8 Default Status

Default status consists of the internal settings which are assigned to diagnostic mode at power-up, as follows:

speed	low
density	as set by configuration byte
language	English
N =	255 ₁₀ (FF ₁₆)
block length	4096 bytes.

If power is removed from the 9914, diagnostic mode will revert to default status when the power is restored.

4.2 Diagnostics - Operation via the Interface

This section deals with the running of programs via the Pertec interface.

The host can command the 9914 to run any of the programs between 00 to 31; these may be run singly, entered into a stack, or a preset stack of programs can be run. The user may wish to utilise diagnostics during idle moments when data transfers or searches are not required.

Note: because some diagnostic programs write data to tape, it is good practice to load a scratch tape before invoking diagnostic mode.

Interface Diagnostic Features

- Interface diagnostics function without operator intervention.
- Host is able to ascertain machine integrity prior to data dumps.
- Hard error (IHER) sets if a test fails, remains clear when a test passes.
- Machine integrity can be tested by use of non-corruptive tests (ie data is not written to the tape).
- Status byte(s) may be accessed by the host to reveal error counts, failing program number, and/or detailed failure causes.

Diagnostics may also be run over the SCSI interface. The principles are very similar and use the Send Diagnostic and Receive Diagnostic Results commands, details of which are set out in the SCSI User Manuals.

4.2.1 Running a Program Stack

Program stacks containing between 1 and 30 programs may be entered and run by the host. This is initiated by the host issuing a Diagnostic Stack Entry command (Table 6.3). The command immediately clears the current stack, the host may then follow with its tailored stack of program numbers.

The user should be aware that 25 equals 32, therefore only programs 00 to 31 may be entered via the Pertec interface.

The five encoded command lines are used for transmitting program numbers (weighted as in Table 4.1) to the 9914. The IGO signal is used to strobe the command (and subsequent program numbers) into the 9914; the IDBY line goes true for 500 µs for each program number received by the 9914.

Command line	IERASE	IEDIT	IWFM	IWRITE	IREV
Line weight	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰

TABLE 4.1 COMMAND LINE WEIGHTING

When the last number has been entered; program 02 must then be entered to run the tailored stack, in the same sequential order as the programs were entered.

Note: the Company have avoided the provision of extra command lines for operating the 9914 diagnostics by using previously unused combinations to provide additional commands for diagnostic program operation.

4.2.2 Running Individual Programs

A single program is merely a special case of a stack, ie a stack of one; the method of the previous paragraph therefore applies.

If a confidence check is required, the host gives the Dedicated Diagnostic Test command. The 9914 then replaces the current stack with diagnostic program 01 (which is a preset sequence of tests designed to constitute a confidence checkout) and runs the stack without any further host action.

4.3 Program Descriptions and Error Codes

4.3.1 Common Error Codes

Some higher-numbered error codes, as tabulated next, are common to all diagnostic programs.

Code	Explanation
89	No Write Enable ring could be detected on the supply reel.
90	No write current could be detected in the erase head.
98	Data Control time-out elapsed while waiting for a response from the SCSI (or CPI) board.
99	Data Control time-out elapsed while waiting for a result from the SCSI (or CPI) board.

No	FUNCTION	No	FUNCTION
00	NULL PROGRAM	50	STEP FORWARD (<i>low speed</i>)
01	CONFIDENCE CHECK	51	STEP REVERSE (<i>low speed</i>)
02	RUN STACK FROM HOST	52	ALTERNATE FWD/REV (<i>low speed</i>)
03	ILWD LINE CHECK	53	STEP FORWARD (<i>high speed</i>)
04	AUTO SERVO CHECK	54	STEP REVERSE (<i>high speed</i>)
05	DATA CHANNELS CHECK (<i>non-corruptive</i>)	55	ALTERNATE FWD/REV (<i>high speed</i>)
06	DATA CHANNELS CHECK (<i>corruptive</i>)	56	
07	ADP E-E	57	
08	DDP E-E	58	
09	DATA CHANNEL ERROR REPORTING	59	
10	SET PARAMETERS OF PROGRAM 01	60	ERASE TO EOT
11	SET HIGH SPEED	61	
12	SET LOW SPEED	62	WRITE ALL ONES TO EOT
13	SET N	63	READ FWD TO EOT (<i>low speed</i>)
14	SET BLOCK LENGTH	64	READ FWD TO EOT (<i>high speed</i>)
15	SELECT NON-STREAMING	65	READ REV TO BOT (<i>low speed</i>)
16	SELECT STREAMING	66	READ REV TO BOT (<i>high speed</i>)
17	FAILURE SKIP	67	EXAMINE/MODIFY OPTIONS
18	INCREMENT LOOP COUNTER	68	EXAMINE FULL STATUS BYTES
19	IRD* & IWD* LINE CHECKS	69	INITIALISE STATUS BYTES
20	SET ALL ZEROS DATA	70	EXAMINE PROM REVISIONS
21	SET ALL ONES DATA	71	EXAMINE/MODIFY LANGUAGE
22	SET ALTERNATE 1/0 DATA	72	OPERATOR DISPLAY CHECK
23	SET PSEUDO RANDOM DATA	73	INTERNAL VOLTAGE CHECK
24	SET FAIL LIMITS	74	<i>Reserved</i>
25	WRITE, BACKSPACE, READ (N blocks)	75	<i>Reserved</i>
26	WRITE N BLOCKS	76	<i>Reserved</i>
27	SPACE REVERSE N BLOCKS	77	<i>Reserved</i>
28	READ FORWARD N BLOCKS	78	<i>Reserved</i>
29	READ REVERSE N BLOCKS	79	<i>Reserved</i>
30	REWIND	80	<i>Reserved</i>
31	WRITE & CHECK FILE MARK	81	<i>Reserved</i>
32	SPACE FORWARD N BLOCKS	82	<i>Reserved</i>
33	WRITE IDENT	83	<i>Reserved</i>
34	COMMAND TRACE	84	<i>Reserved</i>
35	LOG SENSE DATA	85	
36		86	
37		87	
38		88	
39		89	
40		90	
41	SET 800 bpi	91	
42	SET 1600 bpi	92	
43	SET 3200 bpi	93	EXAMINE LOOP COUNT
44	SET 6250 bpi	94	CLEAR LOOP COUNT
45	SENSORS CHECK	95	<i>Reserved</i>
46	FILE PROTECT CHECK	96	
47	TENSION ARM POSITION	97	MODIFY PROGRAM STACK
48	TENSION ARM DAMPING	98	CLEAR PROGRAM STACK
49	SERVO SETTINGS CHECK	99	RUN PROGRAM STACK

TABLE 4.3 LIST OF DIAGNOSTIC PROGRAMS

Program 00**Null Program**

Description This program is useful for entering on the stack with a view to later alterations (eg placed first for later substitution by Failure Skip, program 17) or to delete previous unwanted entries using program 97.

Error Codes *None*

Program 01**Machine Integrity Test**

Note The operator should be aware that the last program in this stack clears the stack. Therefore program 01 should be added to the end of a stack with caution.

Description A dedicated sequence of programs (to check the functionality of the 9914) which are placed in the stack. Programs 73, 4 & 30 are run before some proven pre-conditions are set, then certain programs are run:

(GCR) 44, 05, 03, 19,
 44, 12, 05, 26, 29, 28, 11, 05, 26, 29, 28;
 (DPE) 43, 11, 05, 26, 29, 28;
 (PE) 42, 12, 05, 26, 29, 28, 11, 05, 26, 29, 28;
 (NRZ) 41, 12, 26, 29, 28, 11, 26, 29, 28.

Exit When program 01 passes, the pre-set parameters remain and the stack is cleared.

Error Codes See individual programs.
 If the program is intended to tolerate a few errors, use program 24 to set the fail limits; otherwise a single error (say) when reading counts as a program failure. Raising the fail limits can allow for dropouts during reading.

- Notes
- If an SCSI (or CPI) board is not fitted, program 01 runs but omits the data-related parts.
 - If an SCSI (or CPI) board is not fitted, program 01 should not be run continuously.
 - The SCSI system bus must be properly terminated, either by resistor packs within the 9914 or by maintaining power on the terminating unit.
 - In GCR density, earlier firmware did not run programs 44, 05, 03 & 19.
 - Program 19 is omitted if bit 2 of Config Byte 20 is set.

Program 02**Run Stack from Host**

Note Cannot be run from the front panel. If called up by the operator, ' No test ' is displayed.

Description Used by the host to run the 9914 program stack, previously entered across the Pertec interface.

The DIAG legend illuminates for the duration of the program stack.

Program 03**ILWD Line Checks**

Note

Program 03 is not provided with all firmware revisions, in which case ' No test ' is displayed when ' run/stop ' is pressed.

Description

Verifies the operation of the ILWD signal (which is part of the unbuffered Pertec interface) by writing a block in E-E mode and applying a timeout during which ILWD must respond.

Error Codes

01 SCSI (or CPI) board not detected, *or*
incompatible with Data Control firmware
03 DDP fault
12 Command error
14 Timeout waiting for command (from SCSI (or CPI))
23 ILWD occurred early
24 ILWD not received

Program 04**Auto Servo Checkout**

Description

Exercises the tape servo system; a tape needs to be loaded, but not necessarily at BOT.

Error Codes

The test has failed if tape tension is lost.

Program 05**Data Channels Check (Non-corruptive)**

Notes

The SCSI (or CPI) board must be installed for program 05 to run.
Program 05 does not apply to NRZ density.

Description

Incorporate self-contained tests, designed to check the data channel and isolate a faulty FRU by writing data patterns via E-E paths through the analogue and digital electronics sections.

Data is not written to tape.

If there are no errors, tests equivalent to program 09 are automatically run.

Note

The status which is flagged by two dead tracks is determined by Config byte 07.

Error Codes

01 SCSI (or CPI) board not detected, *or*
incompatible with Data Control firmware
03 DDP fault
04 ADP fault
12 Interface command not Write.
13 Timeout expired while waiting for block
14 Timeout expired while waiting for command (from SCSI (or CPI) board)
Could be improper SCSI bus termination
15 ADP fault - no ICER status on 1-track kill
16 DDP fault - no ICER status on 1-track kill
17 ADP fault - IHER status on 1-track kill
18 DDP fault - IHER status on 1-track kill
19 ADP fault - no IHER status on 3-track kill
20 DDP fault - no IHER status on 3-track kill
21 NRZ selected
22 IFBY reset unexpectedly
23 ILWD not received

- 89 No write ring.
- 90 No write current.

Program 06 Data Channels Check (Corruptive)

Notes The SCSI (or CPI) board must be installed for program 06 to run.
 Programs 06 does not apply to NRZ density.

Description Incorporates self-contained tests, designed to check the data channel and isolate a faulty FRU by writing data patterns via E-E paths through the analogue and digital electronics sections.

Data is written to tape.

If there are no errors, tests equivalent to program 09 are automatically run.

Note The status which is flagged by two dead tracks is determined by Config byte 07.

- Error Codes**
- 01 SCSI (or CPI) board not detected, or incompatible with Data Control firmware
 - 02 Head/pre-amplifier fault, or ADP fault
 - 03 DDP fault
 - 04 ADP fault
 - 12 Interface command not Write.
 - 13 Timeout expired while waiting for block
 - 14 Timeout expired while waiting for command (from SCSI (or CPI) board)
 Could be improper SCSI bus termination
 - 15 ADP fault - no ICER status on 1-track kill
 - 16 DDP fault - no ICER status on 1-track kill
 - 17 ADP fault - IHER status on 1-track kill
 - 18 DDP fault - IHER status on 1-track kill
 - 19 ADP fault - no IHER status on 3-track kill
 - 20 DDP fault - no IHER status on 3-track kill
 - 21 NRZ selected
 - 22 IFBY reset unexpectedly

- 89 No write ring.
- 90 No write current.

Program 07 ADP E-E Check (not applicable to NRZ)
Program 08 DDP E-E Check

Note The SCSI (or CPI) interface should be removed, so that the internal 9914 Pertec interface is free.

Description When run from the front panel (or over the Pertec interface), these programs place the relevant board in E-E (electronics-to-electronics) mode and set the 9914 to ' on-line ' status (which is not indicated at the front panel), in anticipation of one or more interface Write commands. The program ends with relevant board taken out of E-E mode, and the 9914 set off-line to the interface.

When run on-line, the programs expect one interface Write command.

Programs 07 & 08 are designed for use with the SCSI (or CPI) board removed, because the internal 9914 Pertec bus is used.

- Error Codes
- 01 NRZ density selected (*program 07 only*).
 - 02 Interface command not Write.
 - 03 Timeout expired while waiting for block.
 - 04 Timeout expired while waiting for Write command.

Program 09 Data Channel Error Reporting

Note The SCSI (or CPI) board must be installed for program 09 to run.

Description The ADP board is placed in E-E (electronics-to-electronics) mode and each track is killed in turn while a block is written; ICER error is expected, but not IHER.

If the error status is incorrect, the test is repeated with the DDP in E-E mode.

Three tracks are then killed while a block is written, IHER status is expected. On error, the DDP is placed in E-E mode to isolate the faulty board.

Note The status which is flagged by two dead tracks is determined by Config byte 07.

- Error Codes
- 01 SCSI (or CPI) board not detected, or incompatible with Data Control firmware
 - 12 Interface command not Write.
 - 13 Timeout expired while waiting for block
 - 14 Timeout expired while waiting for command (from SCSI (or CPI) board)
Could be improper SCSI bus termination
 - 15 ADP fault - no ICER status on 1-track kill
 - 16 DDP fault - no ICER status on 1-track kill
 - 17 ADP fault - IHER status on 1-track kill
 - 18 DDP fault - IHER status on 1-track kill
 - 19 ADP fault - no IHER status on 3-track kill
 - 20 DDP fault - no IHER status on 3-track kill
 - 21 NRZ selected
 - 22 IFBY reset unexpectedly

Program 10 Set Parameters of Program 01

Description Allows the number of blocks, block length, and data pattern used by program 01 to be selected for its exclusive use. The defaults are tabulated next.

Program	Condition(s)
13	N = 50
14	Block length = 4K
15	Set non-streaming
23	Pseudo-random data
24	W Rty = 4, W Err = 4, R Rty = 0, R Err = 0.

Program 10 may be used if the required pre-conditions differ from those.

The value of N is first presented, to be changed (by the method of program 13) or skipped by pressing DENSITY; the block length is presented second, to be changed (by the method of program 14) or skipped by pressing DENSITY; the data pattern is presented third, to be changed by pressing ' units ' until the required pattern is displayed before pressing DENSITY or ' run/stop ' to set that pattern.

Error Codes *None*

Notes Once program 10 has been run and the data pattern set, program 01 uses that pattern until power is removed, even if programs 20 - 23 are run.

No purpose is served by running program 10 across the interface, since all its features are available via specific diagnostic programs.

Program 11 Set High Speed

Note High tape speed is not available at 3200 bpi density.

Description Program 11 sets the higher tape speed, prior to starting other programs. When run ' Hi speed ' is displayed for 1 second.

Error Codes *None*

Program 12 Set Low Speed

Description This enables the operator to set the lower tape speed, prior to starting other programs. When run ' Lo speed ' is displayed for 1 second.

Error Codes *None*

Program 13 Set N

Note The program should not be entered onto the stack because operator intervention is required.

Description Allows the operator or host to set N to a new value which is used by subsequent programs, unless overridden by program 01. N may be in the range from 1 to 255₁₀.

Operator Allows the operator to update N, which is indicated on the display, by the use of DIAG, ' tens ', or ' units ' buttons. The ' run/stop ' button is pressed when the desired value is displayed. N is set from the time of update, not just when the stack is subsequently run.

Host When an SCSI command is sent (as described in the SCSI User Manual), the host effectively updates N. The new value of N is active while the SCSI command is running, but N reverts to its previous value afterwards.

Error Codes *None*

Program 14 Set Block Length

Description Sets the length of subsequent data blocks for programs which write data to tape. Blocks may normally be from 1 byte up to 32 Kbytes long, in increments of powers of two. Some programs restrict the block length.

When run from the front panel, the display indicates (say) LEN = 16K, to increase the block size, use the ' tens ' button, to decrease the size, use the ' units ' button.

When run from the interface, the length is transferred as described in the 9914 Servicing Manual.

Error Codes *None*

Program 15 Select Non-Streaming

Description Sets the 9914 write and read programs so that the tape is repositioned after each block is traversed.

Error Codes *None*

Program 16 Select Streaming

Description Sets the 9914 write and read programs so that the tape is kept in motion after each block is traversed (ie streaming mode).

Error Codes *None*

Program 17 Failure Skip

Note Is only effective when entered in a program stack.

Description Causes subsequent failing programs to be aborted, thus allowing a stack to skip to the next program without stopping on errors.
Status bytes F4 (and C4) are incremented each time an error occurs, up to a maximum of FF₁₆ (255₁₀).

Error Codes *None*

Program 18 Increment Loop Counter

Description When entered in a program stack, program 18 increments a counter, typically to record the number of times the stack loops (assuming program 99 is at the end of the stack). The user may subsequently use programs 93/94 to examine/clear the loop counter. The counter increments up to 9,999₁₀, then sticks without overflowing.

Error Codes *None*

Program 19 IRD* & IWD* Line Checks

Note Program 19 is not provided with all firmware revisions, in which case ' No test ' is displayed when ' run/stop ' is pressed.

Description Verifies the operation of the read and write data lines (which are part of the unbuffered Pertec interface) by executing a write-rewind-read sequence and comparing the data.

Error Codes 01 SCSI (or CPI) board not detected, *or*
 incompatible with Data Control firmware
 02 IFBY line in error
 03 IRD* or IWD* line(s) in error
 04 Timeout waiting for IDBY false
 89 No write ring

Program 20 Set All Zeros Data
Program 21 Set All Ones Data
Program 22 Set Alternate 1/0 Data
Program 23 Set Pseudo Random Data

Note The SCSI (or CPI) board must be installed for programs 20 - 23 to run.

Description Used to set the data pattern, preferably immediately prior to running program 25 or 26.

Error Codes 01 SCSI (or CPI) board not detected, *or*
 incompatible with Data Control firmware.

Program 24 Set Fail Limits

Description Sets the number of errors which are encountered before programs 25, 26, 28, or 29 are deemed to have failed, when run from the front panel. When writing, any error causes a ' backspace & erase ' so that each re-try takes place over a fresh piece of tape until the re-try count is reached or writing is successful.

When run, the limits may be changed by means of the ' tens ' and ' units ' buttons:
 W Rty = number of write re-tries per block, before ' fail ' is logged
 W Err = number of block failures before ' fail ' is logged
 R Rty = number of read re-tries per block, before ' fail ' is logged
 R Err = number of block failures before ' fail ' is logged.

The various re-try results are treated as follows.

If no error occurs on the first read/write attempt, the program proceeds to the next block.

If an error occurs, and W Rty or R Rty have not reached the limit, a re-try is executed on the current block, after W Rty/R Rty has been incremented.

If no error occurs during a re-try, W Rty/R Rty is cleared to zero, and W Err/R Err is incremented.

If an error occurs and W Rty, W Err, R Rty, or R Err has reached the limit, the test fails.

Error Codes *None*

Program 28**Read FWD N Blocks**

Description Reads forward N formatted blocks while looking for status errors, with;

- speed as selected by program 11 or 12;
- N as set by program 13;
- failure limits as set by program 24 (front panel only);
- density as selected by programs 41 - 44.

Error Codes 01 SCSI (or CPI) board not detected, *or*
incompatible with Data Control firmware
02 IHER - status bytes will reveal the cause
03 ICER - status bytes will reveal the cause

Note After an error, press ' enter ' to display the density and speed

Program 29**Read Reverse N Blocks**

Description Reads N data blocks in reverse while looking for status errors with:

- low speed automatically selected;
- N as set by program 13;
- failure limits as set by program 24 (front panel only);
- density as selected by programs 41 - 44.

Error Codes 01 SCSI (or CPI) board not detected, *or*
incompatible with Data Control firmware
02 IHER - status bytes will reveal the cause
03 ICER - status bytes will reveal the cause

Note After an error, press ' enter ' to display the density and speed

Program 30**Rewind Tape**

Description Tape is rewound to BOT, may be used for positioning the tape prior to running other programs.

Error Codes *None*

Program 31**Write & Check Filemark**

Description Writes a file mark to tape in the current density format, checking that File Mark status is seen at the read heads as the tape passes.

Error Codes 01 Timeout expired while waiting for ' block true '
02 Timeout expired while waiting for ' block false '
03 No File Mark status.

89 No write ring
90 No write current

			7	6	5	4	3	2	1	0
bit										
table entry										
dec hex										
byte	0	00	SCSI Command							
byte	1	01	Completion Status							
byte	2	02	0	0	0	0	0	0	Initiator ID	
byte	3	03	0	0	0	0	0	0	Target ID	
byte	4	04	SCSI Sense Byte 0							
byte	5	05	SCSI Sense Byte 1							
byte	6	06	SCSI Sense Byte 2							
byte	7	07	SCSI Sense Byte 3							
byte	8	08	SCSI Sense Byte 4							
byte	9	09	SCSI Sense Byte 5							
byte	10	0A	SCSI Sense Byte 6							
byte	11	0B	SCSI Sense Byte 12							
byte	12	0C	SCSI Sense Byte 13							
byte	13	0D	9914 Status Validity (00 = valid)							
byte	14	0E	9914 Status Byte F5							
byte	15	0F	9914 Status Byte F6							
byte	16	10	9914 Status Byte F7							
byte	17	11	9914 Status Byte F8							
byte	18	12	9914 Status Byte F9							
byte	19	13	9914 Status Byte F10							
byte	20	14	9914 Status Byte F11							
byte	21	15	9914 Status Byte F12							
byte	22	16	9914 Status Byte F14							

TABLE 4.P35(b) LOG SENSE RETURNED DATA FORMAT

Program 35 Log Sense Data (via SCSI)

Note Program 35 is not provided with all firmware revisions, in which case ' No test ' is displayed when ' run/stop ' is pressed.

Description Allows the 9914's SCSI SENSE / LUN Status trace buffer, for the 8 most recent commands which completed with status other than Good, to be examined using the operator's display.

The displayed format is *M-NP QR*, interpreted as in Table 4.P35(a). The format of the data tables is set out in Table 4.P35(b).

Display	Meaning	Notes
M	M = table number	0 = most recent 1 = next previous; press ' tens ' to advance the table number
NP	NP = table entry (in hex)	press ' units ' to advance the table entry
QR	QR = contents of entry NP	

TABLE 4.P35(a) LOG SENSE DISPLAY FORMAT

Error Codes 01 SCSI board not detected, or incompatible with Data Control firmware.
02 No communication with the SCSI board.
98 Time-out elapsed while waiting for a response from the SCSI board.
99 Time-out elapsed while waiting for results from the SCSI board.

Program 41 SET 800 bpi
Program 42 SET 1600 bpi
Program 43 SET 3200 bpi
Program 44 SET 6250 bpi

Description Changes the data encoding circuits to handle the stated density. When non-diagnostic mode is restored, the density remains at this new setting.

Note When running diagnostic programs, it is recommended that the density is specifically set by these programs, rather than relying on a previous setting.

Error Codes 01 Selected density not available
02 DDP board fault.

Program 45 Sensors Check

Note Tape should not be loaded.
If it is at BOT, the program will unload, otherwise rewind the tape first.

Description Indicates the state of the sensors used during tape loading and operation. The display registers a letter which should be interpreted as in Table 4.P45.

Letter	C	R	B	E	W	L
Sensor	in-chute	reel located	BOT	EOT	write enable	tension limit
Meaning of letter	chute clear	flag detected	marker present	marker present	flag detected	not in limit

TABLE 4.P45 PROGRAM 45 DISPLAYED INFORMATION

The WT EN legend is lit when the flag is detected.

Additionally the operator may check the operation of the fan, loading door solenoid and hub lock solenoid drive circuits:

hub solenoid activation press ' tens ' ;
door solenoid activation press ' units ' ;
loading fan activation press ' enter ' .

Error Codes *None*

Program 46 File Protect Test

Note Tape should not be loaded.
If it is at BOT, the program will unload, otherwise rewind the tape first.

Description The operator is requested to remove the write enable ring, insert the tape reel, and then press the ' tens ' button. The program then checks that no ring has been detected.
The operator is next requested to fit the write ring and then press ' tens '. The program then checks that the ring has been detected.

Error Codes 01 Ring detected, but no ring fitted.
02 Ring not detected, but ring fitted.

Program 47 Tension Arm Position

Note Tape should not be tensioned for this test.

Description The display first indicates ' LIMIT XXX ', where XXX is a three-digit number related to the output from the tension arm position sensor.
As the arm is moved away from its rest end, the LIMIT part of the message should disappear (denoting that the arm is no longer at its travel limit) and the XXX number should increase until the far end limit is encountered, when LIMIT should re-appear.
This sequence verifies that the tension arm output and limit flags are visible to the servo microprocessor. Checking the orientation and absolute output of the tension arm is covered in the 9914 Servicing Manual.

Error Codes *None*

Program 48 Tension Arm Damping

Note Tape should be unloaded for this test.

Description Displays the fly time of the tension arm, between the limit flags, under the influence of the tension arm spring and the tension arm damper.

The operator moves the arm (against its spring) to its far end stop and allows the arm to fly unobstructed to its rest end stop. The time displayed is in milli-seconds.

The fly-time range of the tension arm is set out in the 9914 Servicing Manual.

Error Codes *None*

Program 49 Servo Settings Check

Warning Only a trained service engineer should run this program, after removing any tape from the machine, as described in the 9914 Servicing Manual.

Program 50 Step Forward (low speed)

Description The tape is stepped forward at low speed to EOT.
The size of the steps may be altered by holding the ' tens ' or ' units ' button.

Error Codes *None*

Program 51 Step Reverse (low speed)

Description The tape is stepped in reverse at low speed to BOT.
The size of the steps may be altered by holding the ' tens ' or ' units ' button.

Error Codes *None*

Program 52 Alternate Forward / Reverse (low speed)

Description The tape is run alternately forward / reverse, at the low speed.
The size of the steps may be altered by holding the ' tens ' or ' units ' button.

Error Codes *None*

Program 53 Step Forward (high speed)

Description The tape is stepped forward at high speed to EOT.
The size of the steps may be altered by holding the ' tens ' or ' units ' button.

Error Codes *None*

Program 54 Step Reverse (high speed)

Description The tape is stepped reverse at high speed to BOT.
The size of the steps may be altered by holding the ' tens ' or ' units ' button.

Error Codes *None*

Program 55 Alternate Forward / Reverse (high speed)

Description The tape is alternated at high speed.
The size of the steps may be altered by holding the ' tens ' or ' units ' button.

Error Codes *None*

Program 60 Erase to EOT & Rewind

Description The tape is erased to EOT at the speed selected by program 11 or 12. The tape is
rewound when EOT is reached.

Error Codes 89 No write ring
90 No head current.

Program 62 Write All Ones to EOT & Rewind

Description "All 1s" data is written to EOT, with:
- speed as selected by program 11 or 12;
- density as selected by programs 41 - 44;
The tape is rewound when EOT is detected.

Error Codes 89 No write ring
90 No head current.

Program 63 Read Forward to EOT (low speed)

Description The tape is run forward to EOT, with the read circuits enabled.

Error Codes *None*

Program 64 Read Forward to EOT (high speed)

Description The tape is run forward to EOT, with the read circuits enabled.

Error Codes *None*

Program 65	Read Reverse to BOT (low speed)
Description	The tape is run reverse at low speed to BOT, with the read circuits enabled.
Error Codes	<i>None</i>
Program 66	Read Reverse to BOT (high speed)
Description	The tape is run reverse at high speed to BOT, with the read circuits enabled.
Error Codes	<i>None</i>
Program 67	Examine / Modify Options
Description	Displays the Configuration Bytes, the presentation and full meanings of bytes 01 to 05 are described in Section 2. Bytes 01 to 05 are: Config byte 01 - duration of density display; Config byte 02 - door action at end of unloading; Config byte 03 - auto on-line after loading; Config byte 04 - auto-load, actuated by door closure; Config byte 05 - unit address. Config bytes 06 to 19 are displayed in hexadecimal notation, they are tabulated in Appendix A, and described in the 9914 Servicing Manual.
Warning	Changing bytes 06 to 19 may affect the response of the 9914 to the host, and / or the format of recorded data. Config bytes 06 to 19 are: Config byte 06 - host interface options A; Config byte 07 - host interface options B; Config byte 08 - host interface options C; Config byte 09 - host interface options D; Config byte 10 - conditions which set ' incomplete ' Config byte 11 - conditions which set ' reject ' Config byte 12 - write gap size; Config byte 13 - miscellaneous A; Config byte 14 - SCSI (or Cached Pertec) options A; Config byte 15 - SCSI (or Cached Pertec) options B; Config byte 16 - density configurations; Config byte 17 - SCSI (or Cached Pertec) options C; Config byte 18 - miscellaneous B; Config byte 19 - SCSI options D; Config byte 20 - miscellaneous C.
Error Codes	<i>None</i>

Program 68 Examine Full Status Bytes

Description Program 68 displays all the full status bytes by a method similar to program 67, the display indicates as follows at the various steps:

<i>SNS F01</i>	Indicated upon first entering diagnostic program 68, during this ' byte selection ' phase, the status byte number can be changed by using the ' tens ' and ' units ' buttons.
<i>SNS F05</i>	When the desired byte is displayed, press DIAG.
<i>11000100</i>	Typical indication after the desired byte has been selected, and DIAG has been pressed. This is the current setting of Status Byte F05 (left digit is most significant). Press DIAG again to return to the ' byte selection ' phase.
<i>SNS F05</i>	If no further bytes are to be examined, press ' run/stop ' to exit diagnostic program 68, otherwise repeat the procedure for the next byte.

Error Codes *None*

Program 69 Initialise Status Bytes

Description Clears most of the status bytes to zero, or (where otherwise applicable) presets them to the correct value.

All error logs are thereby cleared, ensuring that future status byte contents reflect only future operations.

Error Codes *None*

Program 70 Examine PROM Revisions

Description Displays the installed servo, data, and SCSI PROM revisions, in the form of a scrolled message. With earlier 9914's, the SCSI firmware revision must be obtained via the interface Inquiry command.

Error Codes *None (incompatibilities are indicated at power-up).*

Program 71 Examine / Modify Language

Note The language may have been previously set via the interface, which may subsequently over-ride any setting made with program 71.

Description The current language appears on the display. The language of the display messages may be changed by pressing:

- ' tens ' next available language;
- ' units ' previous language.

When the chosen language has been selected, press ' run/stop ' to exit program 71 with that language.

Error Codes *None*

Program 72 **Operator Display Check**
Description Causes all the legends and display segments on the control panel to illuminate in turn; the alpha-numeric display cycles through its character set.

Error Codes *None*

Program 73 **Internal Voltage Check**
Description Measures the internal regulated voltage lines to ensure that they are operational. This avoids having to probe inside the machine.

Error Codes 01 +12 V
 02 -12 V
 03 *reserved*
 04 -5 V
 05 +24 V

Prog. 74-84 *Reserved*
Description Allow the service engineer to set internal parameters of the 9914, as described in the 9914 Servicing Manual.

Program 93 **Examine Loop Count**
Description Displays the loop count (accumulated by program 18) in decimal.

Error Codes *None*

Program 94 **Clear Loop Counter**
Description Clears the loop counter (which was described in program 18).

Error Codes *None*

Program 95 *Reserved for servicing functions.*

Program 97 **Modify Operator Stack**
Note Program 97 should not be entered onto the stack.
Description Allows the operator to step through the existing stack by pressing the ' enter ' button.

 To substitute a program, select the new number (using the ' tens ' / ' units ' buttons) and then press ' enter '.

A program in the stack may be effectively deleted by changing it to program 00.

Error Codes *None*

Program 98 Clear Operator Stack

Description Program 98 clears the current program stack.

Error Codes *None*

Program 99 Run Operator Stack

Description When program 99 is called, the current program stack is run sequentially, starting at the first program entered.

If program 99 is entered onto the program stack it causes the stack to loop back to the first entry and repeat.

Error Codes See details of individual programs entered onto the stack.

4.4 Status Bytes

The 9914 compiles 17 status bytes, which may be accessed or cleared by the operator or the host; this group of 17 is referred to as the Full Status Byte Block. A Condensed Status Byte Block of 9 bytes is also available to the host, these contain less detail than the full block but are broadly compatible with the sense bytes of the 8900 / 9800 / 9900 family of *M4 Data* 9-track tape units.

The full and condensed status byte blocks are tabulated in Tables 4.4, full descriptions of their functions are set out in the 9914 Product Specification.

Diagnostic program 68 may be used to examine the full status bytes.

4.4.1 Status Byte Encoding

Byte F17 base models are encoded as follows:

bit 7	bit 6	bit 5	bit 4	Base model
0	0	0	0	9800
0	0	0	1	9903
0	0	1	0	8900
0	0	1	1	8924
0	1	0	0	<i>reserved</i>
0	1	0	1	9914

*This page has no technical content,
the status bytes begin on page 28.*

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
F01 WRITE ERROR LOG	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
F02 READ ERROR LOG	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
F03 DIAG PROG No	--	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
F04 DIAG ERR CODE	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
F05 TRACK IN ERR (PE)	TIE 7	TIE 6	TIE 5	TIE 4	TIE 3	TIE 2	TIE 1	TIE 0
F06 H ERR (PE/GCR)	0 (always)	IDENT FOUND	CER	VPE	SKEW	MTE	FALSE POSTAMBLE	FALSE PREAMBLE
F06 HARD ERR (NRZ)	1 (always)	--	--	--	--	LRCE	CRCE	VPE
F07 SUPP TO F06	REJECT	INCOMPLETE	EOT LIMIT	EARLY EOT	DENSITY ERROR	EOT	FILE MARK LAST BLOCK	INTERFACE WRT PARITY
F08	RWFAIL	RRD BOT	FSR BOT	BLANK TAPE	IFEN	DATA GLITCH NO BLOCK	GAP IN R-A-W DATA	NOT WRITING
F09	--	--	--	EOTLIM CMD	INV CMD	REV @ BOT	WRT FPTD	DENS CHG NOT @ BOT

TABLE 4.4(a) STATUS BYTES F01 TO F09

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
F10 EXP OF DENSITY	NO IDENT	NO ARA	NO ARA ID	--	IDENT WRT	ARA WRT	ARA ID WRT	CONFIG
F11 GCR STATUS 1	ACRC	CRC	UNCER	2-TRACK ERROR	1-TRACK ERROR	CRC GROUP ERROR	RCHAR ERROR	PCHAR ERROR
F12 GCR STATUS 2	--	--	--	--	FORMAT ERROR 1	FORMAT ERROR 2	NOT SYNCH	--
F13 <i>reserved</i>	--	--	--	--	--	--	--	--
F14	DENSITY SOURCE (see below)		--	--	--	--	DENSITY MISMATCH	--
F15 IDENT BYTE 1	DENSITY SELECTED (see below)		--	--	6250 bpi	800 bpi	3200 bpi	1600 bpi
					(densities available)			
F16 IDENT BYTE 2	BASE MODEL TYPE (see Section 4.4.1)				--	--	SCSI (or CPI) FITTED	<i>reserved</i>
F17 <i>reserved</i>	--	--	--	--	--	--	--	--

Byte F14 encoding:

bit 7	bit 6	
0	0	Analyse found known density
0	1	Default density, blank tape
1	0	Default density, alien format
1	1	No assigned meaning

Byte F15 encoding:

bit 7	bit 6	
0	0	1600 bpi PE
0	1	3200 bpi PE
1	0	800 bpi NRZ
1	1	6250 bpi GCR

TABLE 4.4(b) STATUS BYTES F10 TO F17

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
C1 WRITE ERR LOG	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
C2 READ ERR LOG	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
C3 DIAG PROG No	--	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
C4 DIAG ERR CODE	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
C5 TRACK IN ERR	TIE 7	TIE 6	TIE 5	TIE 4	TIE 3	TIE 2	TIE 1	TIE 0
C6 H ERR (PE/GCR)	0 (always)	IDENT FOUND	CER	VPE	SKEW	MTE	FALSE POSTAMBLE	FALSE PREAMBLE
C6 HARD ERR (NRZ)	1 (always)	--	--	--	--	LRCE	CRCE	VPE
C7 SUPP TO C6	RWFAIL	INCOMPLETE	REJECT TAPE	BLANK ERROR	DENSITY	EOT	FILE MARK LAST BLOCK	NOT WRITING
C8 EXTRA STATUS	DENSITY SOURCE (see byte F14)		--	DATA GLITCH NO BLOCK	GAP IN R-A-W DATA	--	DENSITY MISMATCH	INTERFACE WRT PARITY
C9 DENSITIES	DENSITY SELECTED (see byte F15)		EOT LIMIT	EARLY EOT	6250 bpi	800 bpi	3200 bpi	1600 bpi
						(densities available)		

TABLE 4.4(c) CONDENSED STATUS BYTES C1 TO C9

5.

Routine Cleaning

The 9914 requires no preventive maintenance, but routine cleaning is essential if low error rates are to be maintained.

5.1 Cleaning Intervals

At an installation where the 9914 has not previously been used, the cleaning schedule in Table 5.1 should be initiated. The tape path should be inspected at regular intervals, and the error rates monitored, until a less frequent schedule can be implemented.

The locations of the assemblies are shown in Figure 5.1.

Assembly	Cleaning Frequency	Suitable Cleaner
Warning: the edges of the sapphire tape cleaner are extremely sharp. Observe great care when cleaning.		
Heads, tape cleaner, fixed guides, rollers.	Daily if in continuous tape motion	' TexPads ' (IPA-moistened pads), or non-CFC equivalent
Tacho roller	As above	As above
Painted surfaces	As required	' Amberclens ' anti-static foaming cleaner, or non-CFC equivalent
Window in loading door	As required	' Ambersil ' glass cleaner or non-CFC equivalent

TABLE 5.1 CLEANING SCHEDULES AND MATERIALS

Note: avoid inhaling an excess of fumes from any cleaning fluid.

5.2 Cleaning Procedures

This section describes access to the tape path components, and sets out notes regarding the cleaning methods.

5.2.1. Access to the Tape Path

With desk-top models, the tape path is accessed by first releasing the latches on the top cover and raising it. Then release the three thumb-screw fasteners and raise the tape path cover to its fullest extent (almost vertical).

With rack-mounted models, the 9914 must be partially withdrawn from the rack. The user must first ensure that the rack will not topple forwards under the influence of the new centre of gravity.

Locate the retaining spring (via the leftmost air vent at the front of the 9914) and push it to the right; the unit may then be pulled out for access. Release the three thumb-screw fasteners and raise the tape path cover to its fullest extent (almost vertical).

Should it be required to open the loading door, first raise the tape path cover and then lift the door latch with a pointed instrument.

5.2.2. Tape Path Cleaning

The tape path components are shown in Figure 5.1

Warning: the edges of the sapphire tape cleaner are extremely sharp. Observe great care when cleaning.

1. Using the recommended cleaning pad, carefully wipe the surfaces of the head to remove all traces of dirt and oxide; in extreme cases it may be necessary to use a scrubbing action to remove hard oxide deposits.
2. Using the recommended cleaning pad, wipe the tape cleaner, particularly the front edge where debris may have accumulated.
3. Inspect the remaining tape path components and, if necessary, wipe clean the tape contact surfaces of the fixed guides (bollards), front and rear rollers, tension arm roller, and the surface of the tachometer roller.

Cautions:

- a. Do not use alcohol-based fluid (eg IPA) or any other solvents on plastic or painted parts.
- b. Do not allow cleaning fluid to enter pre-greased roller bearings.
- c. Clean any dirt or oxide which may have gathered around the take-up and supply reel areas.
- d. Close the tape path cover.

5.2.3. Other Cleaning

1. Use anti-static cleaner and cloth on the tape path cover.
2. Wipe the facia and painted surfaces, avoid using an excess of cleaning fluid.

FIGURE 5.1 TAPE PATH COMPONENTS

This page has no technical content

6.

Pertec Interface

The unbuffered Pertec command and data input/output are connected via connectors, which are part of the 9914's motherboard, at the rear of the 9914.

The buffered Pertec Cache Interface signals are via connectors mounted on an extension at the rear of the 9914, or exceptionally to the top of the CPI board.

All three connection methods use the familiar Pertec layout - two dual 25-way printed edge connectors P1 and P2, both numbered 1 to 50. Pin assignments are listed in Tables 6.1 and 6.2. Pertec Command codings are listed in Table 6.3.

Plug	Pin	Mnemonic	Signal name
1	4 (3)	ILWD	Last word
1	6 (5)	IWD4	Write Data 4
1	8 (7)	IGO	Initiate Command
1	10 (9)	IWD0	Write Data 0
1	12 (11)	IWD1	Write Data 1
1	14 (13)	--	<i>Reserved</i>
1	18 (17)	IREV	Reverse/Forward
1	20 (19)	IREW	Rewind
1	22 (21)	IWDP	Write Data Parity
1	24 (23)	IWD7	Write Data 7
1	26 (25)	IWD3	Write Data 3
1	28 (27)	IWD6	Write Data 6
1	30 (29)	IWD2	Write Data 2
1	32 (31)	IWD5	Write Data 5
1	34 (33)	IWRT	Write/Read
1	36 (35)	--	<i>Reserved</i>
1	38 (37)	IEDIT	Edit
1	40 (39)	IERASE	Erase
1	42 (41)	IWFM	Write File Mark
1	46 (45)	ITADO	Transport Address 0
2	18 (17)	IFEN	Formatter Enable
2	24 (23)	IOFL	Off-line
2	46 (45)	ITAD1	Transport Address 1
2	48 (47)	IFAD	Formatter Address
2	50 (49)	IHISP	High Speed Select

Notes:

1. The ground pin associated with each signal pin is in brackets.
2. For compatibility with similar 'Pertec' interfaces, PL1 pin 36 and PL2 pin 50 can be transposed by implementation of a configuration option. See Appendix A.

TABLE 6.1 PERTEC INPUT PIN ASSIGNMENTS

There is a Cached Pertec Interface Product Description, which gives details of its signal functions and various operating modes.

Note: the SCSI bus I/O is connected via a single 50-way connector, usually at the rear of the 9914. Its pin assignments differ greatly from Pertec and are listed the SCSI user manuals.

Plug	Pin	Mnemonic	Signal name
1	2 (1)	IFBY	Formatter Busy
1	44 (43)		Reserved
1	48 (47)	IRD2	Read Data 2
1	50 (49)	IRD3	Read Data 3
2	1 (--)	IRDP	Read Data Parity
2	2 (--)	IRD0	Read Data 0
2	3 (--)	IRD1	Read Data 1
2	4 (--)	ILD P	Load Point
2	6 (5)	IRD4	Read Data 4
2	8 (7)	IRD7	Read Data 7
2	10 (9)	IRD6	Read Data 6
2	12 (11)	IHER	Hard Error
2	14 (13)	IFMK	File Mark
2	16 (15)	IIDENT	PE Identification
2	20 (19)	IRD5	Read Data 5
2	22 (21)	IEOT	End of Tape
2	26 (25)	INRZ	NRZ Selected
2	28 (27)	IRDY	Ready
2	30 (29)	IRWD	Rewinding
2	32 (31)	IFPT	File Protect
2	34 (33)	IRSTR	Read Strobe
2	36 (35)	IWSTR	Write Strobe
2	38 (37)	IDBY	Data Busy
2	40 (39)	ISPEED	Hi Speed Selected
2	42 (41)	ICER	Corrected Error
2	44 (43)	IONL	On Line

Notes:

1. The ground pin associated with each signal pin is in brackets.
2. For compatibility with similar ' Pertec ' interfaces, PL1 pin 36 and PL2 pin 50 can be transposed by implementation of a configuration option. See Appendix A.
3. ISPEED is asserted at 62 ips, because this is a higher speed than 42 ips.

TABLE 6.2 PERTEC OUTPUT PIN ASSIGNMENTS

Command	Encoded command lines				
	IREV	IWRITE	IWFM	IEDIT	IERASE
Read Forward	0	0	0	0	0
Space Forward	0	0	0	0	1
File Search Forward	0	0	1	0	0
File Search Forward (<i>Ignore Data</i>)	0	0	1	0	1
Write	0	1	0	0	0
Erase (Variable Length)	0	1	0	0	1
Reserved	0	1	0	1	0
Write File Mark	0	1	1	0	0
Erase (Fixed Length)	0	1	1	0	1
Reserved	0	1	1	1	0
Security Erase (To EOT)	0	1	1	1	1
Read Reverse (Normal)	1	0	0	0	0
Space Reverse	1	0	0	0	1
Reserved	1	0	0	1	0
File Search Reverse	1	0	1	0	0
File Search Reverse (<i>Ignore Data</i>)	1	0	1	0	1
Access Condensed Sense Bytes	1	1	0	1	1
Access Full Sense Bytes	1	1	0	1	0
Dedicated Diagnostic Test	1	1	1	1	0
Set Density to 800 bpi NRZ	1	1	0	0	1
Set Density to 1600 bpi PE	0	0	1	1	1
Set Density to 3200 bpi PE ^{note 1}	1	0	1	1	1
Set Density to 6250 bpi GCR	1	1	0	0	0
Diagnostic Stack Entry	1	1	1	1	1

Notes:

1. If bit 4 of Configuration Byte 16 is set, this code changes from 'select 3200' to 'select 6250', 3200 bpi is then not available.
2. When the Pertec Cache Interface is used, there are additional cache-specific commands which are set out in the Cached Pertec Interface Product Description.

TABLE 6.3 PERTEC COMMAND CODING

A.

Basic Configuration Options

This appendix tabulates the basic 9914 configuration options, which are present in every 9914 whether unbuffered Pertec, ' standard ' SCSI ', cached Pertec, or Super SCSI.

Other appendices tabulate the options which are specific to the special interfaces mentioned above.

Byte	Option
01	DnsDis-1 = Density displayed until ' run/stop ' or ' tens ' pressed DnsDis-0 = Density displayed for 5 seconds only
02	Auto Open = Door opens automatically after unloading Man Open = Door opens only after ' reset ' is pressed
03	Auto ONL = 9914V automatically goes on-line after threading has completed Man ONL = 9914V is on-line only after ' LD/ONL ' is pressed
04	AutoLoad = 9914V automatically loads tape to BOT on closing the door Man Load = 9914V loads tape when ' LD/ONL ' button is pressed
05	Unit XX = Where XX is the current unit address (valid in the range 0 to 7) Note: this is also the SCSI's LUN address

TABLE A.1(a) BASIC CONFIGURATION BYTES, 01 TO 05

	bit 7 (msb)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (lsb)
06 HOST I/F A	EOT LATCHED	OFFLINE, NO REWIND	REJECT FWD AT EOT LIMIT	IWDP CHECKED, IHER IF ERROR	PE/NRZ IWDP WRITTEN	ANALYSE INHIBITED	INRZ SET IF GCR ACTIVE	WRITE AT NEW DENSITY
07 HOST I/F B	GCR	PE	DPE	NRZ	NRZ LRC & CRC, WITH STROBES	GCR ICER IF 2-TRK ERR	IRSTRs AFTER PE ERROR	AGC ON WRITE
	FM GAP IS NORMAL IBG							
08 HOST I/F C	PE/GCR CERs FLAG AS HERs	IFBY CLEARS EARLY	LDG EDGE IGO SETS IFBY	IFEN HIGH RESETS CMD	SET IHER IF LONG BLOCK	msb	UNIT ADDRESS	
09 HOST I/F D	3200 IDENT NOT READ	3200 IDENT NOT WRITTEN	IHER & ICER PULSED	BOT IDENT ERR IGNORED	INV CMD CYCLES IDBY & IFBY	3200 bpi READ ONLY	DEN MISMATCH SETS IHER	NO IDENT ASSUMES 3200
10 'INCOMPLETE'	NO R-A-W DATA	BOT DURING READ REV	BOT DURING FILE SCH REV	BLANK TAPE DURING READ	IFEN ASSERTED DURING CMD	DATA GLITCH NO BLOCK	GAP IN R-A-W DATA	NO ERASE CURRENT
11 'REJECT'	--	--	--	FWD CMD AT EOT LIMIT	INVALID COMMAND	REV CMD AT BOT	WRITE TO FP TAPE	SET DEN AWAY FROM BOT
12 IBG SIZE	GCR				PE/NRZ			
Detailed in the 9914 Servicing Manual								

Note: functions are as stated when the bit is set to '1'.

TABLE A.1(b) BASIC CONFIGURATION BYTES, 06 TO 12

	bit 7 (msb)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (lsb)
13 MISC A	REWIND AT SLOWER SPEED	BUFF I/F CONFIGURED	customer option	BUFF OPTIONS FROM NVR	SPEED SELECT VIA OP PANEL	HIGH SPEED AT POWER-ON	customer option	customer option
14, 15 & 17 SCSI/PCI	See other appendices							
16 DENSITY	POWER-UP DEFAULT see tables below			HOST INTERFACE SELECTION			HOST I/F CHANGE ENABLED	FRONT PANEL
18 MISC B	--	--	HIGH DISABLE ON-LINE SPEEDS	LOW	6250 bpi	3200 bpi	1600 bpi	800 bpi
19 SCSI	Customer options, not provided with earlier PROM revisions							
20 MISC C	LOWER VALUE WR CURRENTS	--	--	--	--	INHIB PROG 19 IN PROG 01	READING STICTION TEST ENABLED	WRITING

Note: functions are as stated when the bit is set to '1'.

Power-up default:

b7	b6	b5	
0	0	x	800 bpi NRZ
0	1	x	1600 bpi PE
1	0	x	3200 bpi DPE
1	1	x	6250 bpi GCR

Host interface selection:

b4	b3	b2	
x	0	x	Standard encoded commands
x	1	x	Option A encoded commands
x	x	0	IHISP PL2-50, IHIDEN PL1-36
x	x	1	IHISP/IHIDEN exchanged
1	x	x	Pertec code 10111 = select 6250, not 3200

TABLE A.1(c) BASIC CONFIGURATION BYTES, 13 TO 20

B.

Preparing for I.T. Mains Connection

This appendix applies only to 9914s which have been manufactured for connection to I.T. mains systems. The labels which are attached to an I.T. mains unit are shown in Figure B.0.

If the 9914 has only one fuse (FS1) on the rating label near the mains input socket, follow the procedures of Section 2 and ignore this appendix.

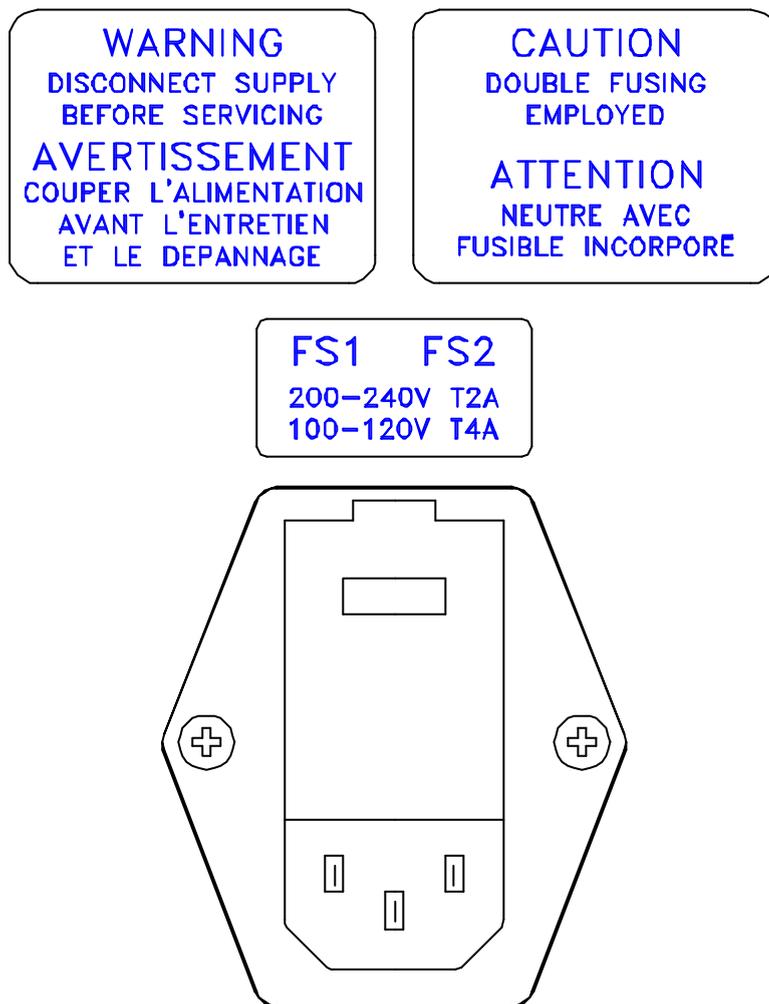


FIGURE B.0 I.T. MAINS LABELS

B.1 Checking the Supply Setting

B.1.1 Supply Voltage Check

The 9914 should be checked for supply setting, which is printed on a label at the rear of the machine. The actual setting, which is visible on the mains input socket (see Figure B.1.2) must match this, otherwise the setting must be changed and the fuse ratings checked.

B.1.2 Supply Voltage Resetting

Follow this procedure only if the input voltage selection setting is incompatible with the site supply voltage; otherwise go to 'Wiring the Supply Plug'. Four ac settings are possible, 100/120 V or 220/240 V, the input frequency may be between 48 and 62 Hz.

Note: when it is proposed to use the 9914 on the 120 V setting, but the supply is known to be consistently below 110 V, the input voltage setting should be changed to 100 V.

a. Changing the Voltage Setting

- i. Disconnect the supply lead from the input socket;
- ii. insert a 5 mm flat-bladed screwdriver where illustrated (in Figure B.1.2) and hinge the panel open;
- iii. withdraw the barrel-shaped voltage selector mechanism and re-insert with the new voltage facing outwards, do not attempt to rotate the selector barrel in-situ;
- iv. withdraw each fuse holder and install the new fuse (referring to (b) below to ensure the correct ratings).

b. Supply Fuse Ratings (Littelfuse type 313 is suitable)

- For 100/120 V settings, FS1 and FS2 are 1.25", 4 A, slow-blow;
- For 220/240 V settings, FS1 and FS2 are 1.25", 2 A, slow-blow.

B.1.3 Wiring the Supply Plug

Warning - the 9914 must be earthed

The moulded IEC socket on the supply lead fits a chassis-mounted plug located at the rear of the 9914. When the other end of the supply lead is unterminated, a suitable plug must be attached.

As the colours of the cores in the 9914 mains lead may not correspond with the coloured markings identifying the terminals in your plug, the following sections relate core colour to pin identification.

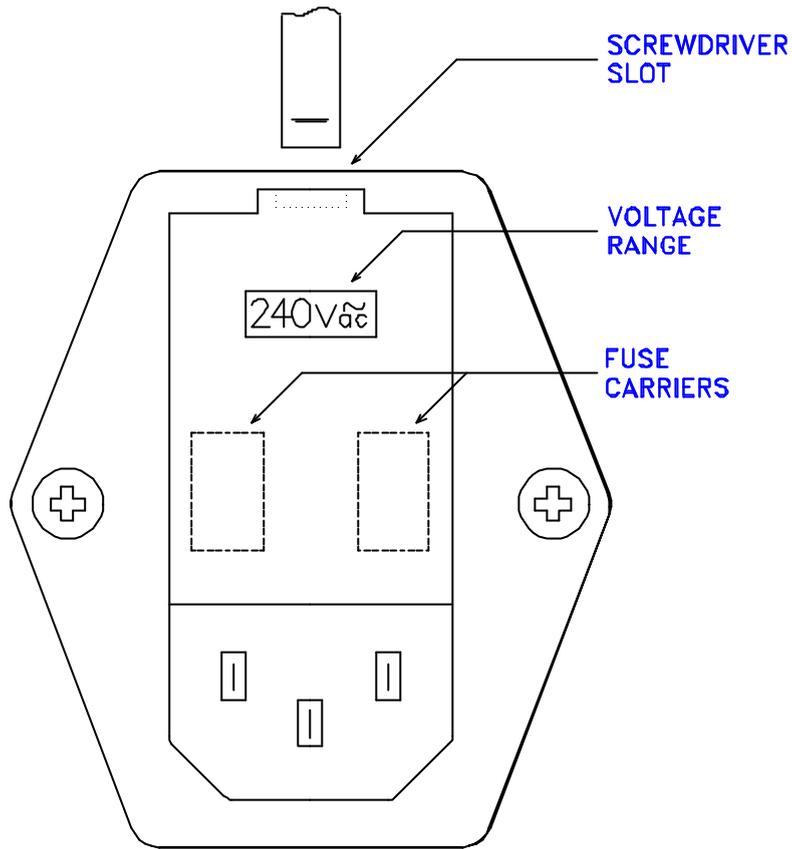


FIGURE B.1.2 VOLTAGE SETTING (I.T. MAINS)

B.1.4 Outside the USA

Connect the cores as tabulated in Table B.1.4

Core which is coloured:	Must be connected to the terminal in the plug which is:
green and yellow	marked with the letter E, or coloured green and yellow, or marked with the earth symbol 
blue	marked with the letter N, or coloured black
brown	marked with the letter L, or coloured red

TABLE B.1.4 PLUG WIRING - OUTSIDE THE USA

Note: 2-pin plugs are not suitable. The earth wire must be 'grounded' for safety reasons.

The following translations of pin functions and colours is given.

English	Francais	Deutsch
LIVE (brown)	LIGNE (Brun)	POSITIV (Braun)
NEUTRAL (Blue)	NEUTRE (Bleu)	NEGATIV (Blau)
EARTH (Green/ Yellow)	TERRE (Vert/ Jaune)	ERDE (Gelb/ Grün)

B.1.5 Within the USA

Connect the cores as tabulated in Table B.1.5.

Core which is coloured:	Must be connected to the terminal in the plug which is:
green and yellow, <i>or</i> green (US-style lead)	half-round gold (ie the earth)
blue, <i>or</i> white (US-style lead)	flat silver (ie the neutral)
brown, <i>or</i> black (US-style lead)	flat gold (ie the live)

TABLE B.1.5 PLUG WIRING - WITHIN THE USA

C.

SCSI Options

This appendix tabulates the ' standard ' SCSI options. Detailed descriptions of the options (and of the command set) are set out in the SCSI User Manual.

Note that the SCSI interface described in this appendix differs from the Super SCSI, which uses a different board and has a faster specification.

Within this appendix, an NVR bit set to ' 1 ' usually corresponds to an on-board switch set to ' off '. The exceptions are the SCSI ID bits, where 1 = on.

	bit 7 (msb)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (lsb)
13 MISC A	*	BUFFERED I/F CONFIGURED	*	BUFF I/F OPT FROM NVR	*	*	*	*
14 SCSI A	PARITY CHECKED	DISCONNECT ENABLED	ATTENTION REPORTING	RECOVD ERR REPORTING	HIGH SPEED BURST MODE	REM DENSITY SELECTION	ENGINEERING TOOL	NOT ISS A OF 12197X SERIES
15 SCSI B	REM SPEED SELECTION	CC ON RD/SP INTO EOT	--	--	LOOK-AHEAD READ	msb	SCSI ID lsb	
16	*	*	*	*	*	*	*	*
17 SCSI C	--	--	--	--	LOOK-AHEAD READ TERMINATION consecutive file marks, see below			
18	*	*	*	*	*	*	*	*

Note 1: functions are as stated when the bit is set to '1'.

Note 2: byte 15 bit 6, function introduced at revision 09.

Note 3: '*' means those bits are not specific to SCSI operation.

Look-Ahead Read termination:

b3	b2	b1	b0	
0	0	0	0	255 file marks
0	0	0	1	1 file mark
0	0	1	0	2 file marks
.	.	.	.	and so on
1	1	1	1	15 file marks

TABLE C.1(a) SCSI OPTIONS, PROM 123107 prior to revision 11

	bit 7 (msb)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (lsb)
13 MISC A	*	BUFFERED I/F CONFIGURED	*	BUFF I/F OPT FROM NVR	*	*	*	*
14 SCSI A	PARITY CHECKED	DISCONNECT ENABLED	ATTENTION REPORTING	RECOVD ERR REPORTING	HIGH SPEED BURST MODE	REM DEN, SP OR BUFFER'D	ENGINEERING TOOL	NOT ISS A OF 12197X SERIES
15 SCSI B	FM STATUS WR/RD/SP	CC ON RD/SP INTO EOT	WR FAIL STOP BOT SIDE	--	LOOK-AHEAD READ	msb	SCSI ID	lsb
16	*	*	*	*	*	*	*	*
17 SCSI C	--	--	--	--	LOOK-AHEAD READ TERMINATION consecutive file marks, see Table C.1(a)			
18	*	*	*	*	*	*	*	*

Note 1: functions are as stated when the bit is set to '1'.

Note 2: '*' means those bits are not specific to SCSI operation.

TABLE C.1(b) SCSI OPTIONS, PROM 123107 revisions 11 & 12

	bit 7 (msb)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (lsb)
13 MISC A	*	BUFFERED I/F CONFIGURED	*	SCSI OPTIONS FROM NVR	*	*	*	*
14 SCSI A	PARITY CHECKED	DISCONNECT ENABLED	ATTENTION REPORTING	RECOVD ERR REPORTING	HIGH SPEED BURST MODE	REM DEN, SP OR BUFFER'D	CODE COMPATIBILITY (with B15 b4)	
15 SCSI B	FM STATUS WR/RD/SP	CC ON RD/SP INTO EOT	WR FAIL STOP BOT SIDE	CODE COMPATIBILITY	LOOK-AHEAD READ	msb	SCSI ID	lsb
16	*	*	*	*	*	*	*	*
17 SCSI C	--	--	--	--	LOOK-AHEAD READ TERMINATION consecutive file marks, see Table C.1(a)			
18	*	*	*	*	*	*	*	*

Note 1: functions are as stated when the bit is set to '1'.

Note 2: '*' means those bits are not specific to SCSI operation.

Code Compatibility (3-bit):

B15 b4 B14 b1 B14 b0

1	0	1	<i>M4 Data std</i>
1	1	0	<i>STK std</i>
x	x	x	<i>reserved</i>

TABLE C.1(c) SCSI OPTIONS, PROM 123107 revision 14
& PROM 123996 revision 01

	bit 7 (msb)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (lsb)
13 MISC A	*	BUFFERED I/F CONFIGURED	*	BUFF I/F OPT FROM NVR	*	*	*	*
14 SCSI A	PARITY CHECKED	DISCONNECT ENABLED	ATTENTION REPORTING	RECOVD ERR REPORTING	HIGH SPEED BURST MODE	CODE COMPATIBILITY (with B15 b4)		
15 SCSI B	FM STATUS WR/RD/SP	CC ON RD/SP INTO EOT	WR FAIL STOP BOT SIDE	CODE COMPATIBILITY	WR EOM IN EW AREA	msb	SCSI ID	lsb
16	*	*	*	*	*	*	*	*
17 SCSI C	--	--	--	--	LOOK-AHEAD READ TERMINATION consecutive file marks, see Table C.1(a)			
18	*	*	*	*	*	*	*	*

Note 1: functions are as stated when the bit is set to '1'.

Note 2: '*' means those bits are not specific to SCSI operation.

Code Compatibility (4-bit):

B15 b4	B14 b2	B14 b1	B14 b0	
1	1	0	1	<i>M4 Data std</i>
1	1	1	0	<i>STK std</i>
x	x	x	x	<i>reserved</i>

TABLE C.1(d) SCSI OPTIONS, PROM 123996 revisions 02 & 03
& PROM 124180 revision 01

	bit 7 (msb)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (lsb)
13 MISC A	*	BUFFERED I/F CONFIGURED	*	BUFF I/F OPT FROM NVR	*	*	*	*
14 SCSI A	PARITY CHECKED	DISCONNECT ENABLED	ATTENTION REPORTING	RECOVD ERR REPORTING	HIGH SPEED BURST MODE	CODE COMPATIBILITY (with B15 b4)		
15 SCSI B	FM STATUS WR/RD/SP	CC ON RD/SP INTO EOT	WR FAIL STOP BOT SIDE	CODE COMPATIBILITY	WR EOM IN EW AREA	msb	SCSI ID	lsb
16	*	*	*	*	*	*	*	*
17 SCSI C	--	--	--	--	LOOK-AHEAD READ TERMINATION consecutive file marks, see Table C.1(a)			
18	*	*	*	*	*	*	*	*
19 SCSI D	--	--	--	--	--	FIXED MODE POWER-UP DEFAULT conditional, see below		

Note 1: functions are as stated when the bit is set to '1'.

Note 2: '*' means those bits are not specific to SCSI operation.

Code Compatibility (4-bit):

B15 b4	B14 b2	B14 b1	B14 b0	
1	1	0	1	<i>M4 Data</i> std
1	1	1	0	STK std
x	x	x	x	<i>reserved</i>

Fixed Mode power-up:#

B19 b2	B19 b1	B19 b0	
0	0	0	Variable Mode
0	0	1	Variable Mode
0	1	0	Fixed Mode, 256 bytes
0	1	1	Fixed Mode, 512 bytes
1	0	0	Fixed Mode, 1K bytes
1	0	1	Fixed Mode, 4K bytes
1	1	0	Fixed Mode, 16K bytes
1	1	1	Fixed Mode, 32K bytes

Note: only certain compatibilities power-up
with bits 2-0 of byte 19 effective

TABLE C.1(e) SCSI OPTIONS, PROM 123996 revision 04

	bit 7 (msb)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (lsb)
13 MISC A	*	BUFFERED I/F CONFIGURED	*	BUFF I/F OPT FROM NVR	*	*	*	*
14 SCSI A	PARITY CHECKED	DISCONNECT ENABLED	ATTENTION REPORTING	RECOVD ERR REPORTING	HIGH SPEED BURST MODE	CODE COMPATIBILITY (with B15 b4)		
15 SCSI B	FM STATUS WR/RD/SP	CC ON RD/SP INTO EOT	WR FAIL STOP BOT SIDE	CODE COMPATIBILITY	WR EOM IN EW AREA	msb	SCSI ID	lsb
16	*	*	*	*	*	*	*	*
17 SCSI C	--	--	--	--	LOOK-AHEAD READ TERMINATION consecutive file marks, see Table C.1(a)			
18	*	*	*	*	*	*	*	*
19 SCSI D	--	--	--	--	--	FIXED MODE POWER-UP DEFAULT conditional, see below		

Note 1: functions are as stated when the bit is set to '1'.

Note 2: '*' means those bits are not specific to SCSI operation.

Code Compatibility (4-bit):

B15 b4	B14 b2	B14 b1	B14 b0	
1	1	0	1	<i>M4 Data std</i>
1	1	1	0	<i>STK std</i>
1	1	1	1	<i>RS/6000</i>
x	x	x	x	<i>reserved</i>

Fixed Mode power-up:#

B19 b2	B19 b1	B19 b0	
0	0	0	Variable Mode
0	0	1	Variable Mode
0	1	0	Fixed Mode, 256 bytes
0	1	1	Fixed Mode, 512 bytes
1	0	0	Fixed Mode, 1K bytes
1	0	1	Fixed Mode, 4K bytes
1	1	0	Fixed Mode, 16K bytes
1	1	1	Fixed Mode, 32K bytes

Note: only certain compatibilities power-up
with bits 2-0 of byte 19 effective

TABLE C.1(f) SCSI OPTIONS, PROM 123996 revisions 05 & 06

	bit 7 (msb)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (lsb)
13 MISC A	*	BUFFERED I/F CONFIGURED	*	BUFF I/F OPT FROM NVR	*	*	*	*
14 SCSI A	PARITY CHECKED	DISCONNECT ENABLED	ATTENTION REPORTING	RECOVD ERR REPORTING	HIGH SPEED BURST MODE	CODE COMPATIBILITY (with B15 b4)		
15 SCSI B	FM STATUS WR/RD/SP	CC ON RD/SP INTO EOT	WR FAIL STOP BOT SIDE	CODE COMPATIBILITY	WR EOM IN EW AREA	msb	lsb SCSI ID	
16	*	*	*	*	*	*	*	*
17 SCSI C	SILI FORCED IN CDB	DATA TRANS IF HER	LBR IF LONG BL DETECTED	--	LOOK-AHEAD READ TERMINATION consecutive file marks, see Table C.1(a)			
18	*	*	*	*	*	*	*	*
19 SCSI D	--	--	--	--	--	FIXED MODE POWER-UP DEFAULT see below		
20	*	*	*	*	*	*	*	*

Note 1: functions are as stated when the bit is set to '1'.

Note 2: '*' means those bits are not specific to SCSI operation.

Code Compatibility (4-bit):

B15 b4	B14 b2	B14 b1	B14 b0	
1	1	0	1	<i>M4 Data std</i>
1	1	1	0	<i>STK std</i>
1	1	1	1	<i>RS/6000</i>
x	x	x	x	<i>reserved</i>

Fixed Mode power-up:

B19 b2	B19 b1	B19 b0	
0	0	0	Variable Mode
0	0	1	Variable Mode
0	1	0	Fixed Mode, 256 bytes
0	1	1	Fixed Mode, 512 bytes
1	0	0	Fixed Mode, 1K bytes
1	0	1	Fixed Mode, 4K bytes
1	1	0	Fixed Mode, 16K bytes
1	1	1	Fixed Mode, 32K bytes

TABLE C.1(g) SCSI OPTIONS, PROM 123996 revisions 07 to 12

Code Bit Settings				Application	Operational Notes
B15 b4	B14 b2	B14 b1	B14 b0		
1	1	1	1	(1) IBM 9348	Interfaces with RS/6000 systems
1	1	1	0	(2) STK std	If synchronous working is available, SDTR is initiated If a command is sent to a non-existent LUN, Check Condition will be sent with sense key 05 (Illegal Request) Unit Attention is set after power-up and after 9914 comes ready for the first time
1	1	0	1	(3) <i>M4 Data</i> std	As per <i>M4 Data's</i> SCSI User Manual
1	0	1	0	(6) <i>M4 Data</i> old std	As (3), except Inquiry data contains the on-board PROM part number
0	1	1	1	(9) HP 9000	Interfaces with the HP 9000-series
0	1	1	0	(10) HP Mode A	As (2), except: - accepts all motion commands and holds Disconnects if LUN is rewinding ((2) sets CC/Not Ready) - Test Unit Ready returns Good Status immediately if LUN is online and rewinding - The HP Read Log command is enabled - Front panel selection of variable/fixed mode is enabled (via Config Byte 19) as follows:
					B19 b2 B19 b1 B19 b0
					0 0 0 Variable Mode
					0 0 1 Variable Mode
					0 1 0 Fixed Mode, 256 bytes
					0 1 1 Fixed Mode, 512 bytes
					1 0 0 Fixed Mode, 1K bytes
					1 0 1 Fixed Mode, 4K bytes
					1 1 0 Fixed Mode, 16K bytes
					1 1 1 Fixed Mode, 32K bytes
0	0	1	1	(13) Kennedy	As (3), except Inquiry data contains Kennedy-style product information
0	0	0	1	(15) HP Mode C	Interfaces with Sun workstations
x	x	x	x	<i>reserved</i>	Use only if specifically informed
Important: the IBM, HP, and Kennedy drives are not exactly emulated					

TABLE C.2 SCSI 4-BIT CODE COMPATIBILITIES

D.

CPI Options

This appendix tabulates the Cached Pertec Interface (CPI) options. Detailed descriptions of the options (and of the operating modes) are set out in the CPI Product Description.

Within this appendix, an NVR bit set to ' 1 ' corresponds to an on-board switch set to ' on '.

	bit 7 (msb)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (lsb)
13 MISC A	*	BUFFERED I/F CONFIGURED	*	BUFF I/F OPT FROM NVR	*	*	*	*
14 CACHE A	LOWER HOST DATA RATES	LDG EDGE IGO SETS IFBY	PARITY NOT CHECKED	IEOT WHEN MARKER SEEN	RETRY COUNT		CACHE MODE CONTROL	
15 CACHE B	--	CODE COMPATIBILITY		ELECTRONIC RAMP DELAY		HOST DATA RATE		
16	*	*	*	*	*	*	*	*
17 CACHE C	--	--	--	--	LOOK-AHEAD READ TERMINATION consecutive file marks, see Table D.1(c)			
18	*	*	*	*	*	*	*	*

Note 1: function is as stated when the bit is set to '1'.

Note 2: '*' means those bits are not specific to cache operation.

TABLE D.1(a) PERTEC CACHE OPTIONS, PROM 123707 revision 04

	bit 7 (msb)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (lsb)
13 MISC A	*	BUFF I/F INTENDED	*	BUFF I/F OPT FROM NVR	*	*	*	*
14 CACHE A	LOWER HOST DATA RATES	LDG EDGE IGO SETS IFBY	PARITY NOT CHECKED	IEOT WHEN MARKER SEEN	RETRY COUNT		CACHE MODE CONTROL	
15 CACHE B	CODE COMPATIBILITY			ELECTRONIC RAMP DELAY		HOST DATA RATE		
16	*	*	*	*	*	*	*	*
17 CACHE C	--	--	--	--	LOOK-AHEAD READ TERMINATION consecutive file marks, see Table D.1(c)			
18	*	*	*	*	*	*	*	*

Note 1: function is as stated when the bit is set to '1'.

Note 2: '*' means those bits are not specific to cache operation.

TABLE D.1(b) PERTEC CACHE OPTIONS, PROM 123707 revisions 05 to 08

Retry count:			Cache mode control:			2-bit code compatibility:					
b3	b2		b1	b0		b6	b5				
0	0	0 write/ 4 read	0	0	Normal cache (2)	0	0	<i>M4 Data</i> std emulation			
0	1	16 write/ 4 read	0	1	Non-cache (1)	0	1	STK 2920 emulation			
1	0	32 write/ 8 read	1	0	<i>Reserved</i> (3)	1	0	QT 14			
1	1	48 write/12 read	1	1	Non-cache, long block (4)	1	1	9905 emulation			
Electronic ramp delay:			Host Data Rate (kB/s):			Look-Ahead Read termination:					
b4	b3		b2	b1	b0	Lo/Hi	b3	b2	b1	b0	
0	0	0 ms	0	0	0	10/ 278	0	0	0	0	255 file marks
0	1	2 ms	0	0	1	30/ 312	0	0	0	1	1 file mark
1	0	4 ms	0	1	0	50/ 357	0	0	1	0	2 file marks
1	1	8 ms read	0	1	1	72/ 416	and so on
		120 ms write	1	0	0	100/ 500	1	1	1	1	15 file marks
			1	0	1	120/ 625					
			1	1	0	156/ 833					
			1	1	1	193/1250					
							3-bit code compatibility:				
							b7	b6	b5		
							0	0	0	<i>M4 Data</i> std emulation	
							0	0	1	STK 2920 emulation	
							0	1	0	QT 14	
							0	1	1	9905 emulation	

TABLE D.1(c) PERTEC CACHE OPTIONS, ENCODING

E.

Super SCSI Options

This appendix tabulates the Super SCSI options. Detailed descriptions of the options (and of the command set) are set out in the Super SCSI User Manual.

Note that this feature differs from the older 'standard' SCSI, which uses a different board, has a previous specification, and a specific manual.

Within this appendix, an NVR bit set to '1' usually corresponds to an on-board switch set to 'off'. The exceptions are the SCSI ID bits, where 1 = on.

	bit 7 (msb)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (lsb)
13 MISC A	*	BUFFERED I/F CONFIGURED	*	BUFF I/F OPT FROM NVR	*	*	*	*
14 SCSI A	SINGLE-ENDED ENABLED	DISCONNECT ENABLED	ATTENTION REPORTING	RECOVD ERR REPORTING	FAST SCSI	CODE COMPATIBILITY (with B15 b4, see Table E.1(b))		
15 SCSI B	FM STATUS WR/RD/SP	CC ON RD/SP INTO EOT	WR FAIL STOP BOT SIDE	CODE COMPATIBILITY	WR EOM IN EW AREA #3	msb	SCSI ID	lsb
16	*	*	*	*	*	*	*	*
17 SCSI C	--	--	--	--	LOOK-AHEAD READ TERMINATION consecutive file marks, see C.1(a)			
18	*	*	*	*	*	*	*	*
19 SCSI D	--	--	--	--	--	FIXED MODE POWER-UP DEFAULT ^{#4} conditional, see below		

Note 1: function is as stated when the bit is set to '1'.

Note 2: '*' means those bits are not specific to Super SCSI operation.

Note 3: if RS/6000 compatibility is set, B15 b3 = 0 enables synchronous data transfers.

Note 4: only certain code compatibilities power-up with bits 2-0 of B19 active.

Look-Ahead Read termination:

b3	b2	b1	b0	
0	0	0	0	255 file marks
0	0	0	1	1 file mark
0	0	1	0	2 file marks
... and so on ...				
1	1	1	1	15 file marks

TABLE E.1(a) SUPER SCSI OPTIONS, PROM 124610 revision 01

	bit 7 (msb)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (lsb)
13 MISC A	*	BUFFERED I/F CONFIGURED	*	BUFF I/F OPT FROM NVR	*	*	*	*
14 SCSI A	SINGLE-ENDED ENABLED	DISCONNECT ENABLED	ATTENTION REPORTING	RECOVD ERR REPORTING	FAST SCSI	CODE COMPATIBILITY (with B15 b4)		
15 SCSI B	FM STATUS WR/RD/SP	CC ON RD/SP INTO EOT	WR FAIL STOP BOT SIDE	CODE COMPATIBILITY	WR EOM IN EW AREA #3	msb	lsb SCSI ID	
16	*	*	*	*	*	*	*	*
17 SCSI C	SILI FORCED IN CDB	--	--	--	LOOK-AHEAD READ TERMINATION consecutive file marks, see Table C.1(a)			
18	*	*	*	*	*	*	*	*
19 SCSI D	--	--	--	--	--	FIXED MODE POWER-UP DEFAULT #4 see below		
20	--	--	--	--	--	*	*	*

Note 1: function is as stated when the bit is set to '1'.

Note 2: '*' means those bits are not specific to Super SCSI operation.

Note 3: if RS/6000 compatibility is set, B15 b3 = 0 enables synch data transfers.

Note 4: rev 02 code enabled all code compatibilities to power-up with bits 2-0 of B19 active.

Code Compatibility (4-bit):

B15 b4	B14 b2	B14 b1	B14 b0	
1	1	0	1	M4 Data std
1	1	1	0	STK std
1	1	1	1	RS/6000 #3
x	x	x	x	reserved

Fixed Mode power-up:

B19 b2	B19 b1	B19 b0	
0	0	0	Variable Mode
0	0	1	Variable Mode
0	1	0	Fixed Mode, 256 bytes
0	1	1	Fixed Mode, 512 bytes
1	0	0	Fixed Mode, 1K bytes
1	0	1	Fixed Mode, 4K bytes
1	1	0	Fixed Mode, 16K bytes
1	1	1	Fixed Mode, 32K bytes

TABLE E.1(b) SUPER SCSI OPTIONS, PROM 124610 revision 02

	bit 7 (msb)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (lsb)
13 MISC A	*	BUFFERED I/F CONFIGURED	*	BUFF I/F OPT FROM NVR	*	*	*	*
14 SCSI A	SINGLE-ENDED ENABLED	DISCONNECT ENABLED	ATTENTION REPORTING	RECOVD ERR REPORTING	FAST SCSI	CODE COMPATIBILITY (with B15 b4)		
15 SCSI B	FM STATUS WR/RD/SP	CC ON RD/SP INTO EOT	WR FAIL STOP BOT SIDE	CODE COMPATIBILITY	WR EOM IN EW AREA #3	msb	lsb SCSI ID	
16	*	*	*	*	*	*	*	*
17 SCSI C	SILI FORCED IN CDB	DATA TRANS IF HER	LBR IF LONG BL DETECTED	--	LOOK-AHEAD READ TERMINATION consecutive file marks, see Table C.1(a)			
18	*	*	*	*	*	*	*	*
19 SCSI D	--	--	--	--	--	FIXED MODE POWER-UP DEFAULT see below		
20	--	--	--	--	--	*	*	*

Note 1: function is as stated when the bit is set to '1'.

Note 3: if RS/6000 compatibility is set, B15 b3 = 0 enables synch data transfers

Note 2: '*' means those bits are not specific to Super SCSI operation.

Code Compatibility (4-bit):

B15 b4	B14 b2	B14 b1	B14 b0	
1	1	0	1	<i>M4 Data std</i>
1	1	1	0	<i>STK std</i>
1	1	1	1	<i>RS/6000 #3</i>
x	x	x	x	<i>reserved</i>

Fixed Mode power-up:

B19 b2	B19 b1	B19 b0	
0	0	0	Variable Mode
0	0	1	Variable Mode
0	1	0	Fixed Mode, 256 bytes
0	1	1	Fixed Mode, 512 bytes
1	0	0	Fixed Mode, 1K bytes
1	0	1	Fixed Mode, 4K bytes
1	1	0	Fixed Mode, 16K bytes
1	1	1	Fixed Mode, 32K bytes

TABLE E.1(c) SUPER SCSI OPTIONS, PROM 124610 revisions 03 to 06

	bit 7 (msb)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (lsb)
13 MISC A	*	BUFFERED I/F CONFIGURED	*	BUFF I/F OPT FROM NVR	*	*	*	*
14 SCSI A	SINGLE-ENDED ENABLED	SEISMIC READ ENABLED	ATTENTION REPORTING	RECOVD ERR REPORTING	FAST SCSI	CODE COMPATIBILITY (with B15 b4)		
15 SCSI B	FM STATUS WR/RD/SP	CC ON RD/SP INTO EOT	WR FAIL STOP BOT SIDE	CODE COMPATIBILITY	WR EOM IN EW AREA #3	msb	SCSI ID	lsb
16	*	*	*	*	*	*	*	*
17 SCSI C	SILI FORCED IN CDB	DATA TRANS IF HER	LBR IF LONG BL DETECTED	--	LOOK-AHEAD READ TERMINATION consecutive file marks, see Table C.1(a)			
18	*	*	*	*	*	*	*	*
19 SCSI D	--	--	--	--	--	FIXED MODE POWER-UP DEFAULT see below		
20	--	--	--	--	--	*	*	*

Note 1: function is as stated when the bit is set to '1'.

Note 3: if RS/6000 compatibility is set, B15 b3 = 0 enables synch data transfers

Note 2: '*' means those bits are not specific to Super SCSI operation.

Code Compatibility (4-bit):

B15 b4	B14 b2	B14 b1	B14 b0	
1	1	0	1	M4 Data std
1	1	1	0	STK std
1	1	1	1	RS/6000 #3
x	x	x	x	reserved

Fixed Mode power-up:

B19 b2	B19 b1	B19 b0	
0	0	0	Variable Mode
0	0	1	Variable Mode
0	1	0	Fixed Mode, 256 bytes
0	1	1	Fixed Mode, 512 bytes
1	0	0	Fixed Mode, 1K bytes
1	0	1	Fixed Mode, 4K bytes
1	1	0	Fixed Mode, 16K bytes
1	1	1	Fixed Mode, 32K bytes

TABLE E.1(d) SUPER SCSI OPTIONS, PROM 124610 revision 07

Code Bit Settings				Application	Operational Notes																																				
B15 b4	B14 b2	B14 b1	B14 b0																																						
1	1	1	1	(1) IBM 9348	Interfaces with RS/6000 systems																																				
1	1	1	0	(2) STK std	If synchronous working is available, SDTR is initiated If a command is sent to a non-existent LUN, Check Condition will be sent with sense key 05 (Illegal Request) Unit Attention is set after power-up and after 9914V comes ready for the first time																																				
1	1	0	1	(3) <i>M4 Data</i> std	As per <i>M4 Data's</i> Super SCSI User Manual																																				
1	0	1	0	(6) <i>M4 Data</i> old std	As (3), except Inquiry data contains the on-board PROM part number																																				
0	1	1	1	(9) HP 9000	Interfaces with the HP 9000-series																																				
0	1	1	0	(10) HP Mode A	As (2), except: - accepts all motion commands and holds Disconnects if LUN is rewinding ((2) sets CC/Not Ready) - Test Unit Ready returns Good Status immediately if LUN is online and rewinding - The HP Read Log command is enabled - Front panel selection of variable/fixed mode is enabled (via Config Byte 19) as follows: <table border="0" style="margin-left: 40px;"> <tr> <td>B19 b2</td> <td>B19 b1</td> <td>B19 b0</td> <td></td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>Variable Mode</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>Variable Mode</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>Fixed Mode, 256 bytes</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>Fixed Mode, 512 bytes</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>Fixed Mode, 1K bytes</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>Fixed Mode, 4K bytes</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td>Fixed Mode, 16K bytes</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td>Fixed Mode, 32K bytes</td> </tr> </table>	B19 b2	B19 b1	B19 b0		0	0	0	Variable Mode	0	0	1	Variable Mode	0	1	0	Fixed Mode, 256 bytes	0	1	1	Fixed Mode, 512 bytes	1	0	0	Fixed Mode, 1K bytes	1	0	1	Fixed Mode, 4K bytes	1	1	0	Fixed Mode, 16K bytes	1	1	1	Fixed Mode, 32K bytes
B19 b2	B19 b1	B19 b0																																							
0	0	0	Variable Mode																																						
0	0	1	Variable Mode																																						
0	1	0	Fixed Mode, 256 bytes																																						
0	1	1	Fixed Mode, 512 bytes																																						
1	0	0	Fixed Mode, 1K bytes																																						
1	0	1	Fixed Mode, 4K bytes																																						
1	1	0	Fixed Mode, 16K bytes																																						
1	1	1	Fixed Mode, 32K bytes																																						
0	0	1	1	(13) Kennedy	As (3), except Inquiry data contains Kennedy-style product information																																				
0	0	0	1	(15) HP Mode C	Interfaces with Sun workstations																																				
x	x	x	x	<i>reserved</i>	Use only if specifically informed																																				
Important: the IBM, HP, and Kennedy drives are not exactly emulated																																									

TABLE E.1(d) SUPER SCSI 4-BIT CODE COMPATIBILITIES

Reader's Comment

Reader Date
.....

Company Tel
.....

Comment (please reference by section and page number):

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