As you are now the owner of this document which should have come to you for free, please consider making a donation of £1 or more for the upkeep of the (Radar) website which holds this document. I give my time for free, but it costs me around £300 a year to bring this document to you. You can donate here https://blunham.com/Radar, thank you.

Do not upload this copyright pdf document to any other website. Breaching copyright may result in a criminal conviction and large payment for Royalties.

This document was generated by me, Colin Hinson, from a document held at R.A.F. Henlow Signals Museum which is believed to be out of copyright or Crown Copyright. It is presented here (for free) under the Open Government Licence (O.G.L.) if under Crown Copyright and this version of the document is my copyright (along with the Crown Copyright) in much the same way as a photograph would be. It should be noted that most of the pages are identifiable as having been processed by me. If you believe the original document to be under copyright, please contact me.

The document should have been downloaded from my website https://blunham.com/Radar, or any mirror site named on that site. If you downloaded it from elsewhere, please let me know (particularly if you were charged for it). You can contact me via my Genuki email page: https://www.genuki.org.uk/big/eng/YKS/various?recipient=colin

You may not copy the file for onward transmission of the data nor attempt to make monetary gain by the use of these files. If you want someone else to have a copy of the file, point them at the website (https://blunham.com/Radar). **Please do not point them at the file itself as it may move or the site may be updated.**

I put a lot of time into producing these files which is why you are met with this page when you open the file.

In order to generate this file, I need to scan the pages, split the double pages and remove any edge marks such as punch holes, clean up the pages, set the relevant pages to be all the same size and alignment. I then run Omnipage (OCR) to generate the searchable text and then generate the pdf file.

Hopefully after all that, I end up with a presentable file. If you find missing pages, pages in the wrong order, anything else wrong with the file or simply want to make a comment, please drop me a line (see above).

If you find the file(s) of use to you, you might like to make a donation for the upkeep of the website – see https://blunham.com/Radar for a link to do so.

Colin Hinson

In the village of Blunham, Bedfordshire, UK.

Issued AUGUST 1988

Superseding

Dated

BR 8788

TELEPRINTER TGQ

THIS DOCUMENT IS THE PROPERTY OF HER BRITANNIC MAJESTY'S GOVERNMENT

By Command of the Defence Council

MINISTRY OF DEFENCE
SEA SYSTEMS CONTROLLERATE–DEPUTY CONTROLLER WARSHIP EQUIPMENT

Amdt.No.

TELEPRINTER, TGQ SERIES

CONTENTS

CATEGORY 1 - PURPOSE

Summary of Data

CATEGORY 2 - OPERATING INFORMATION

CATEGORY 2A - GENERAL DESCRIPTION

Chapter 1 - General Description, TGQ Teleprinters
Chapter 2 - General Description, Paper Tape Attachment (PTA)

CATEGORY 2B - OPERATING INSTRUCTIONS

Chapter 1 - Operating Instructions, TGQ Teleprinters
Annex 1A - Additional Features - TGQ4, TGQ6 and TGQ9
Chapter 2 - Operating Instructions, Paper Tape Attachment (PTA)

CATEGORY 3 - TECHNICAL DESCRIPTION

CATEGORY 3A - TECHNICAL DESCRIPTION, TGQ TELEPRINTERS

Chapter 1 - General Information
Chapter 2 - Principles of Operation
Chapter 3 - Printer Control Board
Chapter 4 - Interface Control Board
Chapter 5 - Message Edit & Memory Expansion Boards
Chapter 6 - Motherboard
Chapter 7 - RF Filter Boards
Chapter 8 - RF Box
Chapter 9 - Power Supply
Chapter 10 - Printer Assembly
Chapter 11 - Switch Panel Assembly
Chapter 12 - Keyboard

CATEGORY 3B - TECHNICAL DESCRIPTION, PAPER TAPE ATTACHMENT (PTA)

Chapter 1 - General Information
Chapter 2 - Principles of Operation
Chapter 3 - Controller Board
Chapter 4 - Transformer and Power Supply
Chapter 5 - RF Box
Chapter 6 - Filter Board
Chapter 7 - Tape Punch Assembly
Chapter 8 - Tape Reader Assembly
Chapter 9 - Brake Arm Assembly
Chapter 10 - Switch Panel Assembly

CATEGORY 4 - INSTALLATION AND ACCEPTANCE

CATEGORY 4A - INSTALLATION SPECIFICATION

CATEGORY 4B - PREPARATION FOR ACCEPTANCE

Summary of Data
Preparation for Use
Setting Up Procedure - Teleprinter
Setting Up Procedure - Paper Tape Attachment
Equipment Test Procedures
Annex A - Software Variations
Annex B - Mounting a TGQ5 Teleprinter onto an Anti-Shock/Vibration Tray

CATEGORY 5 - MAINTENANCE INSTRUCTIONS

CATEGORY 5A - DIAGNOSTIC MAINTENANCE

Chapter 1 - Diagnostic Maintenance, TGQ Teleprinters
Chapter 2 - Diagnostic Maintenance, Paper Tape Attachment (PTA)

CATEGORY 5B - CORRECTIVE MAINTENANCE

Chapter 1 - Corrective Maintenance, TGQ Teleprinters
Chapter 2 - Corrective Maintenance, Paper Tape Attachment (PTA)

CATEGORY 5C - PREVENTIVE MAINTENANCE

Chapter 1 - Preventive Maintenance, TGQ Teleprinters
Chapter 2 - Preventive Maintenance, Paper Tape Attachment (PTA)

CATEGORY 7 - PARTS CATALOGUE

Parts List, TGQ Outfits
Family Trees, TGQ Outfits
Parts List, Paper Tape Attachment (PTA)
Family Tree, Paper Tape Attachment

TELEPRINTER, TGQ SERIES

CATEGORY 1 - PURPOSE

CONTENTS

Paragraph

1 PURPOSE
2 NOMENCLATURE
3 SUMMARY OF DATA
3 PRINTER
3 KEYBOARD
3 PAPER TAPE ATTACHMENT

ILLUSTRATIONS

Figure — Page

1.1 TGQ2 Teleprinter (x)
1.2 Paper Tape Attachment (xi)/(xii)

BR 8788 (1)
Original



FIG 1.1

TGQ2 TELEPRINTER
5815-99-780-8817

(x)



PAPER TAPE ATTACHMENT
5815-99-780-8815

FIG 1.2

TELEPRINTER, TGQ SERIES

CATEGORY 1 - PURPOSE

PURPOSE

1 The TGQ Series Teleprinters are a family of high security machines based around the TGQ2 and its associated Paper Tape Attachment (PTA). All TGQ machines are capable of transmitting and/or receiving messages using ITA2 and ITA5 codes. All TGQ machines and the PTA meet HMG Tempest requirements in both static and rugged mobile environments.

NOMENCLATURE

2 Each TGQ outfit is briefly defined as follows:

TGQ1	(NSN 5815-99-780-8816)	Consists of TGQ2 Printer Unit only.
TGQ2	(NSN 5815-99-780-8817)	Printer Unit and 67-key Keyboard.
TGQ3	(NSN 5815-99-780-8818)	As TGQ2, plus PTA - see below.
TGQ4	(NSN 5815-99-780-8819)	As TGQ2, but has special Keyboard, Message Edit pec and special Interface Control pec.
TGQ5	(NSN TBA)	As TGQ2, plus special Interface Control pec, Mounting Plate (see Annex B), 56 Kbyte Buffer Board and special cables.
TGQ6	(NSN 5815-99-734-4248)	As TGQ4, but has modified Printer Control pec special Message Edit pec and special interface.
TGQ7	(NSN 5815-99-795-2039)	As TGQ1, but has special Printer Control pec, Interface Control pec and Printer mechanism. A special pin feed paper guide and tray is also included.
TGQ8	(NSN 5815-99-768-5518)	As TGQ1, but has low-profile paper roll holder and is supplied without cables.
TGQ9	(NSN 5815-99-730-2793)	As TGQ2, but has special Interface Control pec and Message Edit pec.
TGQ10	(NSN TBA)	Definition TBA.
TGQ11	(NSN 5815-99-795-2038)	As TGQ5 but without Mounting Plate.
PTA	(NSN 5815-99-780-8815)	Paper Tape Attachment for use with TGQ Series Teleprinters. Can also be used as a peripheral for other computer and communications equipment.

SUMMARY OF DATA

3 As all equipment in the TGQ Series is based on the TGQ2, the following hardware specifications refer to equipment supplied as part of this outfit. The specifications also include data for the PTA, as this is supplied as an integral part of certain TGQ outfits.

PRINTER

Print Head	- 9 wire, mounted vertically
Character Set	- 96 character ITA5 or ITA2. Customer defined character set available as an option.
Character Format	- 16 chars/in with 10 x 9 matrix - 12 chars/in with 10 x 9 matrix - 9.6 chars/in with 10 x 9 matrix - 8 chars/in with 20 x 9 matrix - 6 chars/in with 20 x 9 matrix - 4.8 chars/in with 20 x 9 matrix Set to 12 chars/in on initialisation
Character Size	- 1.75 mm (w) x 2.5 mm (h) with 10 x 9 matrix - 3.5 mm (w) x 2.5 mm (h) with 20 x 9 matrix
Print Speed	- 90 cps, bidirectional
Max No of Columns (Program Selectable)	- 127/96/76 with 10 x 9 matrix - 64/48/38 with 20 x 9 matrix
Line Spacing (Program Selectable)	- 3 or 6 lines/in
Standard Buffer Size	- 112 characters
Last Character Visible	- By head carriage movement
Ribbon Cartridge	- Standard snap-in cartridge
Paper	- One to five parts, plain or pin feed. Maximum thickness 0.5 mm.
Paper Feed	- Friction feed to 8.5 in wide - Pin feed to 9.5 in wide - Form set and form feed functions
Form Length	- 11 in
Interface	- V24/V28 (RS232C) or isolated 20 mA single current loop. Optional fibre-optic interface.
Code	- ITA5 (ASCII) or ITA2 (BAUDOT)

Parity	- Odd, even, or inhibited
Stop Bits	- 1, 1.5, or 2
Baud Rate	- 45.45 to 9600, selectable
Power Requirements	
Voltage	- 105, 120, 210, 220, 240 V ac (+/-10%)
Frequency	- 48 to 440 Hz
Consumption	- 120 VA max, 80 VA in standby
Reliability	
MTBF	- 3300 hours
MTTR	- 15 min (exchanging modules)
Print Head Life	- 90 million characters
Mounting	- Desk-top. Can be fitted with anti-shock/ anti-vibration mountings.
Dimensions	- 400 mm x 450 mm x 300 mm (w x d x h) - standard - 400 mm x 450 mm x 150 mm (w x d x h) - TGQ7 - 400 mm x 450 mm x 180 mm (w x d x h) - TGQ8
Weight	- 17 kg (excluding roll holder and paper roll)
Environment	
Operating	- Temperature -5° to $+55^{o}C$ - Humidity 5% to 80% non-condensing
Storage	- Temperature -40° to $+70^{o}C$ - Humidity 5% to 95% non-condensing

KEYBOARD

Number of Keys	- 67
Protection	- 2 key lockout
Dimensions	- 400 mm x 148 mm x 64 mm (w x d x h)
Weight	- 3 kg
Environment	
Operating	- Temperature -5° to $+55^{o}C$ - Humidity 5% to 80% non-condensing
Storage	- Temperature -40° to $+70^{o}C$ - Humidity 5% to 95% non-condensing

PAPER TAPE ATTACHMENT

Speed	
Punch	- 50 chars/s
Reader	- 160 chars/s
Tape Width	- 11/16 in (5 hole) for ITA2, 1 in (8 hole) for ITA5
Interface	- V24/V28 (RS232C)
Code	- ITA5 (ASCII) or ITA2
Parity	- Odd, even, mark or space
Stop Bits	
ITA5	- 1
ITA2	- 1.5
Baud Rate	- 75 to 4800, selectable
Power Requirements	
Voltage	- 105, 120, 210, 220, 240 Vac (+/-10%)
Frequency	- 48 to 440 Hz
Consumption	- 45 VA max, 20 VA in standby
Reliability	
Punch	
MTBF	- 10^8 characters
MTTR	- 15 min (exchanging modules)
Reader	
MTBF	- 2000 hours
MTTR	- 15 min (exchanging modules)
Head Life	- 1.5 x 10^8 characters (paper) - 5 x 10^7 characters (mylar)
Mounting	
Dimensions	- 255 mm x 580 mm x 150 mm (w x d x h)
Weight	- 12 kg

Environment

Operating	- Temperature -5° to $+55^{\circ}C$ - Humidity 5% to 80% non-condensing
Storage	- Temperature -40° to $+70^{\circ}C$ - Humidity 5% to 95% non-condensing

C2

TELEPRINTER, TGQ SERIES

CATEGORY 2 - OPERATING INFORMATION

CONTENTS

CATEGORY 2A - GENERAL DESCRIPTION

Chapter 1 - General Description, TGQ Teleprinters
Chapter 2 - General Description, Paper Tape Attachment (PTA)

CATEGORY 2B - OPERATING INSTRUCTIONS

Chapter 1 - Operating Instructions, TGQ Teleprinters
Annex 1A - Additional Features - TGQ4, TGQ6 and TGQ9
Chapter 2 - Operating Instructions, Paper Tape Attachment (PTA)

TELEPRINTER, TGQ SERIES

CATEGORY 2A - GENERAL DESCRIPTION

CONTENTS

Chapter 1 General Description, TGQ Teleprinters
Chapter 2 General Description, Paper Tape Attachment (PTA)

CHAPTER 1

GENERAL DESCRIPTION, TGQ TELEPRINTERS

CONTENTS

Paragraph		
1	INTRODUCTION	
2	NOMENCLATURE	
3	GENERAL DESCRIPTION	
3	CONSTRUCTION	
5	Printer Assembly	
7	Printer Control Board	
8	Interface Control Board	
9	Message Edit Board	
10	Memory Expansion Board	
11	Motherboard	
12	Filter Boards	
13	RF Box	
14	Mains Transformer and Power Supply Module	
15	Keyboard	
18	PRINCIPLE OF OPERATION	
18	TRANSMISSION	
21	RECEPTION	
24	OPERATING MODES	
25	On Line Mode	
26	Off Line Mode	

ILLUSTRATIONS

Figure		Page
2A.1.1	TGQ Series Teleprinter - Module Layout Diagram	1.5
2A.1.2	TGQ2 Teleprinter - Signal Flow Diagram	1.8

CHAPTER 1

GENERAL DESCRIPTION, TGQ TELEPRINTERS

INTRODUCTION

1 The TGQ Series Teleprinters are a family of machines based on the TGQ2. Each variant offers slightly different features fitted as standard, eg keyboard, message editing facilities, Paper Tape Attachment (PTA), etc. All TGQ Teleprinters are designed to operate in ITA5 or ITA2 mode. The "open" design philosophy used enables the TGQ Teleprinters to be connected to a wide range of communications equipment.

NOMENCLATURE

2 Each TGQ outfit is briefly defined as follows:

TGQ1	(NSN 5815-99-780-8816)	Consists of TGQ2 Printer Unit only.
TGQ2	(NSN 5815-99-780-8817)	Printer Unit and 67-key Keyboard.
TGQ3	(NSN 5815-99-780-8818)	As TGQ2, plus PTA - see below.
TGQ4	(NSN 5815-99-780-8819)	As TGQ2, but has special Keyboard, Message Edit pec and special Interface Control pec.
TGQ5	(NSN TBA)	As TGQ2, plus special Interface Control pec, Mounting Plate (see Annex B), 56 Kbyte Buffer Board and special cables.
TGQ6	(NSN 5815-99-734-4248)	As TGQ4, but has modified Printer Control pec special Message Edit pec and special interface.
TGQ7	(NSN 5815-99-795-2039)	As TGQ1, but has special Printer Control pec, Interface Control pec and printer mechanism. A special pin feed paper guide and tray is also included.
TGQ8	(NSN 5815-99-768-5518)	As TGQ1, but has low-profile paper roll holder and is supplied without cables.
TGQ9	(NSN 5815-99-730-2793)	As TGQ2, but has special Interface Control pec and Message Edit pec.
TGQ10	(NSN TBA)	Definition TBA.
TGQ11	(NSN 5815-99-795-2038)	As TGQ5 but without Mounting Plate.
PTA	(NSN 5815-99-780-8815)	Paper Tape Attachment for use with TGQ Series Teleprinters. Can also be used as a peripheral for other computer and communications equipment.

GENERAL DESCRIPTION Figure 2A.1.1

CONSTRUCTION

3 The TGQ Teleprinters are each made up of self-contained modules which can be replaced easily using only a cross-head and (in some cases) a blade screwdriver. Plug and socket connectors, screw terminals and spade connectors are used throughout, eliminating the need for soldered connections between modules.

4 The Teleprinter case is split into two compartments, both of which are screwed onto a baseplate. The Electronics Box contains the Electronic Circuit Panels (PECs) and power supply. The printer cover shields the complete Printer Assembly. Brief descriptions of the modules contained in the Teleprinter are given below.

Printer Assembly

5 This is a self-contained assembly which, if necessary, is replaced as a complete unit. It contains all the devices necessary to perform the following functions:

Head carriage driving
Ribbon driving
Head carriage position sensing
Paper advance
Out of paper detector

6 Printing is achieved via a 9 wire print head. This produces a standard character format of 12 chars/in with a 10 x 9 matrix (other character formats are available) at a speed of 90 cps. Plain or pin feed paper may be used in the Printer.

Printer Control Board

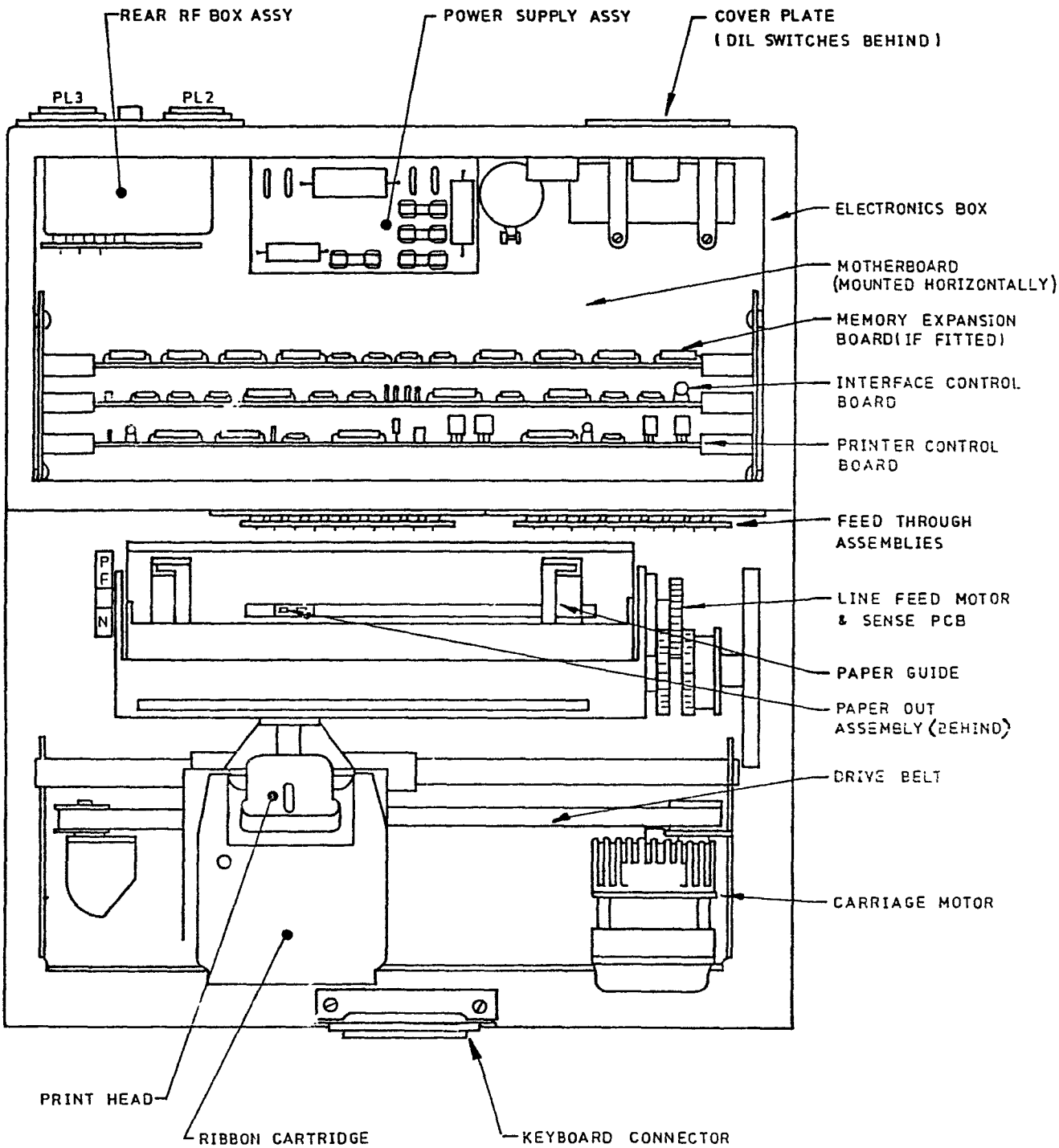
7 This board contains an Intel 8039 microprocessor which controls all the basic printer functions via various input/output circuits. Several versions of software can be fitted to this board to provide slightly different printer capabilities, depending on which TGQ Teleprinter is in use.

Interface Control Board

8 This board contains an Intel 8085 which controls communication between the Teleprinter and external equipment (including the PTA). It also controls the Keyboard, if one is fitted. As with the Printer Control Board, one of several versions of software may be fitted to meet different requirements.

Message Edit Board

9 This is only fitted to the TQG4, TGQ6 and TGQ9 variants, different software being used for each of these. The Message Edit Board contains non-volatile memory and a back-up battery which enables messages to be stored for future printing or transmission. If the Teleprinter is switched off, the messages are retained in memory and are not lost until they are deliberately deleted by the operator.



TGQ SERIES TELEPRINTER - MODULE LAYOUT DIAGRAM FIG 2A.1.1

Memory Expansion Board

10 This is only fitted to the TGQ5 and TGQ11 variants. The Memory Expansion Board contains 56 Kbytes of volatile Random Access Memory (RAM), which increases the size of the buffer from 112 characters to 55 Kbytes. The board can be fitted as an option to any other TGQ variant except TGQ4, TGQ6 and TGQ9 (see note) by fitting different software in the Interface Control Board and changing link settings.

NOTE The Message Edit Board and the Memory Expansion Board cannot both be used in the same Teleprinter as they occupy the same slot.

Motherboard

11 This contains three pec connectors for the above-mentioned pecs (some early models have four connectors), and two DIL switch blocks. The basic function of the motherboard is to route internal signals between the other pecs, the Printer and the communications line, and to provide power for the other pecs. The DIL switches enable various Teleprinter options to be invoked (eg line speed, character code, line spacing, etc).

Filter Boards

12 Two filter boards (right and left-hand) are fitted between the Electronics Box and the Printer Unit. These pass signals between the Motherboard and the Printer Unit and Keyboard. The signals are filtered via passive devices mounted on the two boards.

RF Box

13 This is mounted to the rear panel of the Teleprinter. It provides the following functions:

Mains on/off switch
Mains input filter
Signal input filter
Mains protection via an integral fuse
Mains input voltage selection via rear-mounted terminal blocks

Mains Transformer and Power Supply Module

14 These combine to produce the nominal dc voltages required by the Teleprinter. +24 V, +11 V and -11 V are all produced by full-wave rectification and capacitor smoothing. Two separately-regulated +5 V rails are derived from the same full-wave rectified secondary. One +5 V rail powers powers the Printer Control Board and the Message Edit Board (if fitted). The other +5 V rail provides power to the Interface Control Board and the spare pec connector. Both +5 V rails are over-voltage protected and all voltage rails are fused independently.

Keyboard

15 A keyboard is fitted as standard to all the TGQ Teleprinters except for TGQ1, TGQ7 and TGQ8. It connects to the front of the Teleprinter via a 25-way D-type connector and is held in place by a rigid support plate screwed to the underside.

16 The Keyboard consists of a matrix of column and row tracks. Pressing a key causes the encoded signal for that character to be transmitted to the Interface Control Board via the Right-Hand Filter Board. The signal is then passed to the Printer Control Board and then via the Left-Hand Filter Board to the print head. This forms the correct dot pattern to print the character on the paper.

17 The only electronic components in the Keyboard are the indicator LEDs for LOCK, CAPS LOCK, ON LINE, MSG and ERROR and their associated current limiting resistors.

PRINCIPLE OF OPERATION

Figure 2A.1.2

TRANSMISSION

18 Information received by the Teleprinter from the Keyboard is passed to the Interface Control Board via the RH Filter Board. The information is encoded into ITA5 or ITA2 and if the Teleprinter is on line, it is transmitted to the signal line via the RF Box. At the same time, the information is passed from the Interface Board to the Printer Control Board and then to the Printer Unit via the LH Filter Board.

19 If a PTA is being used (eg TGQ3), information fed to the Teleprinter from the Tape Reader is filtered by the RF Box before being passed to the Interface Control Board. From here it is encoded and passed to the signal line if the Teleprinter is on line.

NOTE Messages read by the Tape Reader will not be passed to the Printer unless the Teleprinter is off line.

20 Messages typed on the Keyboard can be punched onto paper tape provided that the Tape Punch is switched on and the Teleprinter is on line.

RECEPTION

21 All messages received from the serial line are recorded on the Printer and can be recorded onto paper tape if a PTA is connected.

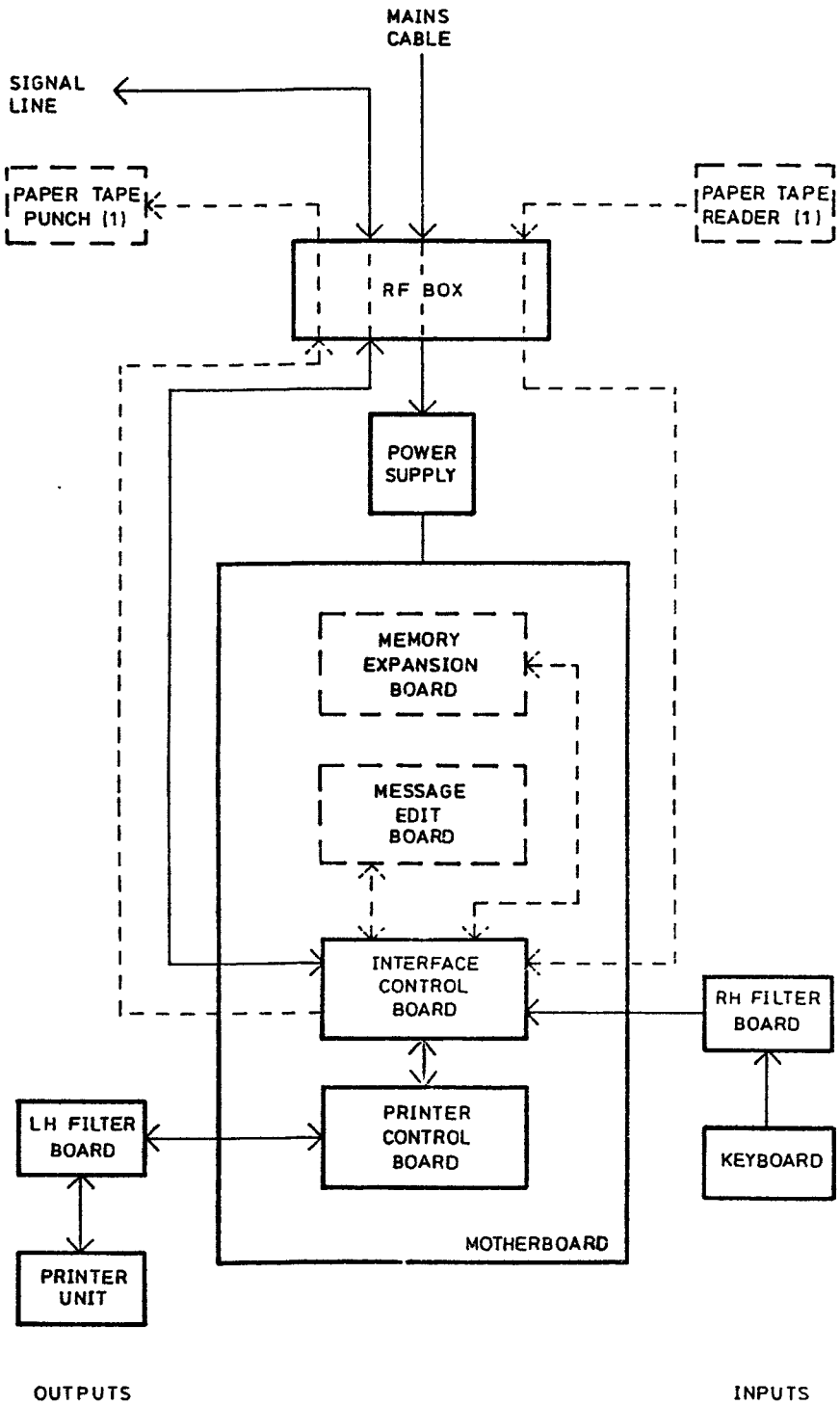
22 Incoming messages pass through the RF Box where the signals are filtered before they are passed to the Interface Control Board. The information is then decoded and passed to the Printer Control Board. This board ensures that the information is printed correctly by controlling the operation of the stepper motor, the linefeed motor, the print head, etc.

23 If the incoming message is to be punched, a copy is sent to the Tape Punch by the Interface Control Board.

OPERATING MODES

24 There are two distinct operating modes on the TGQ Teleprinters:

On line - ONLINE LED lit
Off line - ONLINE LED unlit



NOTES
(1) THE PAPER TAPE PUNCH AND READER SIGNALS ARE PHYSICALLY TRANSMITTED ALONG THE SAME CABLE
(2) "_ _ _" DENOTES OPTIONAL EQUIPMENT WHICH MAY BE STANDARD ON SOME TGQ VARIANTS

FIG 2A.1.2 TGQ2 TELEPRINTER - SIGNAL FLOW DIAGRAM

On Line Mode

25 This mode can be split between two operations - on line transmit and on line receive. Messages received whilst the Teleprinter is on line are printed automatically and also punched if a PTA is connected and the Punch is switched on. Messages to be transmitted which are input from either the Keyboard or the Tape Reader (if connected) may or may not be printed, depending on whether or not the Teleprinter is set up to operate in full or half duplex. If the Teleprinter is set up for half duplex, transmitted messages will also be printed. If the Teleprinter is set up for full duplex, messages will be transmitted but not printed.

NOTES (1) On all variants with a keyboard, if an incoming message is received whilst an outgoing message is being typed in, the printing of the typed-in message will be corrupted but the integrity of the message being transmitted will not be affected.

(2) If the remote equipment automatically echoes characters back down the line, transmitted messages will be printed when operating in full duplex.

Off Line Mode

26 When operating off line, characters input from the keyboard are printed and punched on the PTA (if connected). Messages fed to the Teleprinter from the Tape Reader are also printed. These features operate irrespective of whether the Teleprinter is in half duplex or full duplex.

CHAPTER 2

GENERAL DESCRIPTION,

PAPER TAPE ATTACHMENT (PTA)

CONTENTS

Paragraph		
1	INTRODUCTION	
2	GENERAL DESCRIPTION	
2	CONSTRUCTION	
4	Brake Arm Assembly	
5	Tape Punch Assembly	
7	Tape Reader Assembly	
8	Switch Panel Assembly	
9	RF Box	
10	Controller Board	
12	Mains Transformer	
13	Filter Board	
14	PRINCIPLE OF OPERATION	
14	PUNCHING DATA ON PAPER TAPE	
15	READING DATA FROM PAPER TAPE	

ILLUSTRATIONS

Figure		Page
2A.2.1	Paper Tape Attachment - Module Layout Diagram	2.4

CHAPTER 2

GENERAL DESCRIPTION,

PAPER TAPE ATTACHMENT (PTA)

INTRODUCTION

1 The PTA is a combined tape punch and reader unit which has been designed primarily for use with the TGQ Series Teleprinters. However, the flexibility of the design also enables it to be used as a stand-alone unit.

GENERAL DESCRIPTION Figure 2A.2.1

CONSTRUCTION

2 The PTA is made up of self-contained modules which can be replaced easily using only a cross-head screwdriver and (in some cases) a blade screwdriver. Plug and socket connectors, screw terminals and spade connectors are used throughout, eliminating the need for soldered connections.

3 The PTA case consists of three separate compartments:

Tape Reel Box
Electronics Box
Tape Punch/Reader Box

The Tape Reel Box is screwed onto the top of the Electronics Box whilst the other two compartments are individually screwed onto a single baseplate. Brief descriptions of each of the modules contained in the PTA are given below.

Brake Arm Assembly

4 This is mounted in the Tape Reel Box. Its function is to control the amount of paper tape being dispensed to the Tape Punch from the tape reel. An integral detector senses both "tape out" and "taut tape" conditions and signals the Controller Board to take the appropriate action.

Tape Punch Assembly

5 This consists of a separate Punch Motor and Punch Mechanism, linked together by a rubber drive belt. The punching of coded messages onto tape is achieved by punching needles which are driven through and withdrawn from the tape by an eccentric on the main shaft. Selection of each needle is controlled by an electromagnet. Feed holes are added to the tape when it is forced over a rotating sprocket wheel, which in turn causes more tape to be pulled through the mechanism.

6 The Punch Mechanism is equipped with a photo-electric timing generator. The output from this synchronises the data and tape feed input pulses with the angular position of the main shaft.

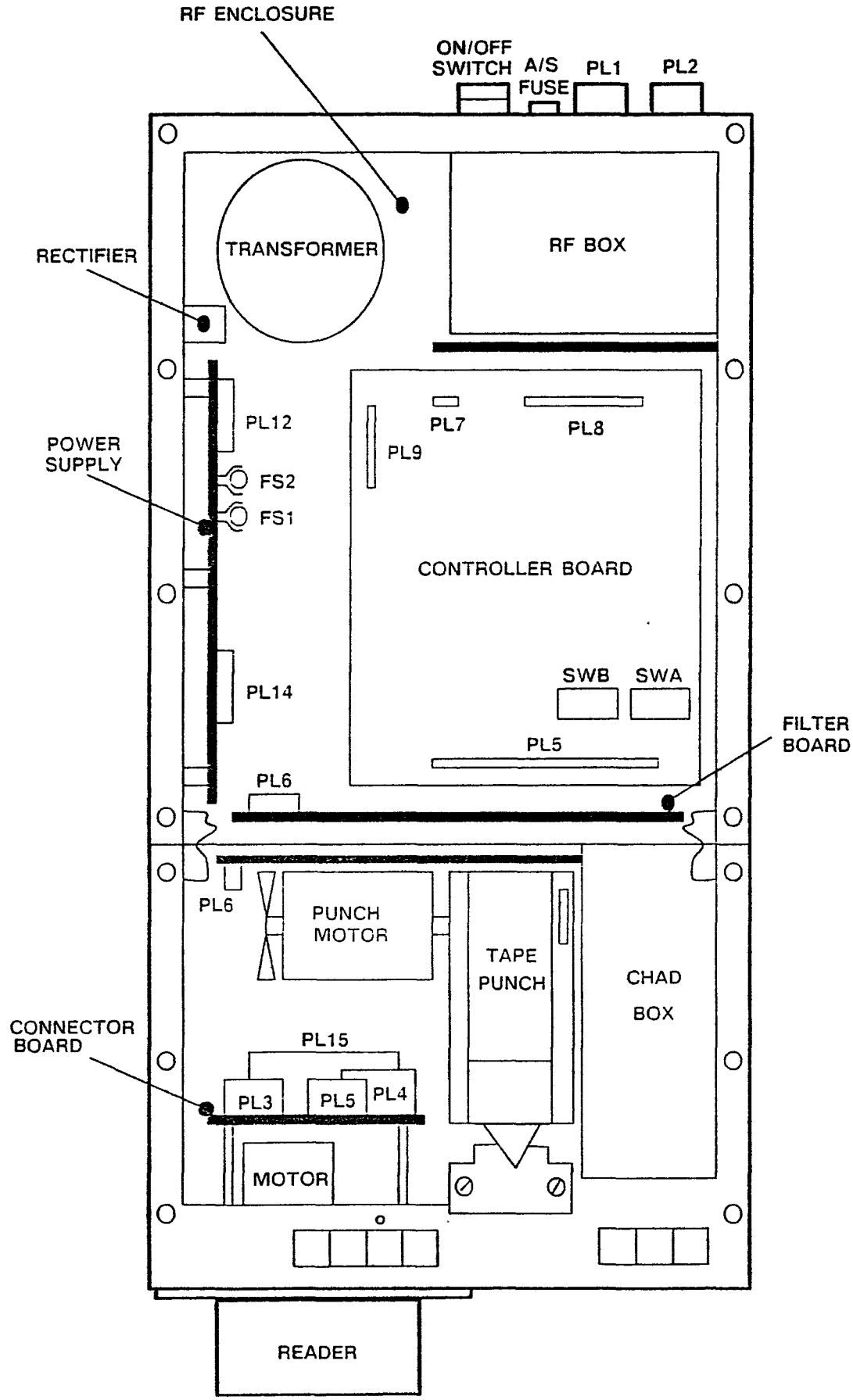


FIG 2A.2.1 PAPER TAPE ATTACHMENT - MODULE LAYOUT DIAGRAM

Tape Reader Assembly

7 This is a photo-electric paper tape reader which is capable of reading 5, 6 and 8-hole tapes. Tape width selection is by a simple 3-position switch which is mounted on the front of the assembly. The paper tape is fed through the Reader from right to left by a sprocket wheel which engages in the feed holes. An abrasion-proof read head mounted in the base of the unit reads the tape as it passes across it.

Switch Panel Assembly

8 This contains the function switches and indicators for the Reader and Punch. The switches are soldered to a single electronic circuit panel which is screwed to the underside of the top of the Punch/Reader Box.

RF Box

9 This is mounted to the rear panel of the PTA. It provides the following functions:

Mains on/off switch
Mains input filter
Signal input filter
Mains protection via an integral fuse
Mains input voltage selection via rear-mounted terminal blocks

Controller Board

10 The Controller Board is mounted to the floor of the Electronics Box. It performs the following functions:

Controls the keyswitches and LEDs
Controls the Reader stepper motor drive
Handles Reader data input
Controls the Punch motor drive
Handles Punch data output
Handles communication via V24/V28 serial port

11 At the heart of this board is an 8035-series microprocessor. Software for the PTA is contained in 2 Kbytes of Programmable Read Only Memory (PROM) on a 2716 device. A second microprocessor, an 8748 device, controls the Tape Punch. Two blocks of DIL switches are mounted on the board to enable various options to be invoked (eg line parity, interface speed, etc).

Mains Transformer and Power Supply Module

12 The power supply module includes a rectifier, reservoir capacitors and regulators. Power is supplied to the module via a toroidal mains transformer. The power supply produces nominal dc voltages of +5 V, +/- 9 V, +12 V and +/-20 V which power the equipment as follows:

+5 V	Controller Board, Switch Panel and photodiodes on Reader Unit
+9 V	Line drivers
-9 V	Interface Circuitry
+12 V	Punch Mechanism
+20 V	Reader photo-electric cells
-20 V	Punch motor

Filter Board

13 All power and signal lines between the Electronics Box and the Tape Reader and Punch pass through the Filter Board, which is mounted vertically between the two compartments. The board contains a bank of feed through capacitors and inductive circuits which slow the signal rise times, thus reducing RF radiation to a minimum.

PRINCIPLE OF OPERATION

PUNCHING DATA ON PAPER TAPE

14 Data from the TGQ Teleprinter (or other equipment) is received by an 8250 interface device which converts the serial data to parallel form. The data then passes to the punch control processor, an 8748 device, and then passes to the Punch Unit via drivers and the Filter Board. The punch feed mechanism is synchronised with the data by means of a photo-electric timing generator.

READING DATA FROM PAPER TAPE

15 A tape placed in the Reader Unit passes under photo-electric cells which are mounted in the reader flap. Hole positions are detected by photodiodes mounted in the baseplate. The signals then pass to an 8155 input/output port via the Filter Board. From here, they are processed and buffered by the 8039 processor before passing to the 8250 serial interface. This converts the data from parallel to serial form before transmitting it to the Teleprinter (or other equipment).

TELEPRINTER, TGQ SERIES

CATEGORY 2B - OPERATING INSTRUCTIONS

CONTENTS

Chapter 1 Operating Instructions, TGQ Teleprinters
Annex 1A Additional Features - TGQ4, TGQ6 and TGQ9
Chapter 2 Operating Instructions, Paper Tape Attachment (PTA)

CHAPTER 1

OPERATING INSTRUCTIONS, TGQ TELEPRINTERS

CONTENTS

Paragraph

1 APPLICABILITY OF INFORMATION
3 OPERATOR'S CONTROLS
3 GENERAL CONTROLS
3 ON/OFF Switch
4 Dual In-Line Switches
7 PRINTER CONTROLS
8 Buzzer Alarm
9 KEYBOARD CONTROLS
11 OPERATING INSTRUCTIONS
11 TGQ1, TGQ7 AND TGQ8 VARIANTS
12 ALL VARIANTS EXCEPT TGQ1, TGQ7 AND TGQ8
15 Operating in ITA5 (ASCII) Mode
17 Control Characters
18 Escape Sequences
19 Function Keys
20 Operating in ITA2 (BAUDOT) Mode
24 Control Characters
25 Escape Sequences
26 Function Keys
27 ERROR HANDLING
28 Parity Errors
29 Printer Failure
30 Buffer Overflow
31 Line Failure
32 Punch Failure
33 ROUTINE MAINTENANCE
34 Ribbon Cassette Removal and Replacement
35 Replacing Roll Paper
36 Replacing Pin Feed Paper
37 Replacing Full-Width Pin Feed Paper

TABLES

Number		Page
2B.1.1	Summary of Teleprinter DIL Switch Settings (New Outfits Except TGQ6, TGQ7 and TGQ9)	1.6
2B.1.2	Summary of Teleprinter DIL Switch Settings (Early Versions of TGQ1 to TGQ5 and all TGQ9 Outfits)	1.7
2B.1.3	Summary of Teleprinter DIL Switch Settings (TGQ6 Outfits Only)	1.8
2B.1.4	Summary of Teleprinter DIL Switch Settings (TGQ7 Outfits Only)	1.9
2B.1.5	Teleprinter Baud Rate Selection	1.10
2B.1.6	Printer Control Button Functions	1.10
2B.1.7	Keyboard Controls	1.12

CONTENTS (Contd)

TABLES (Contd)

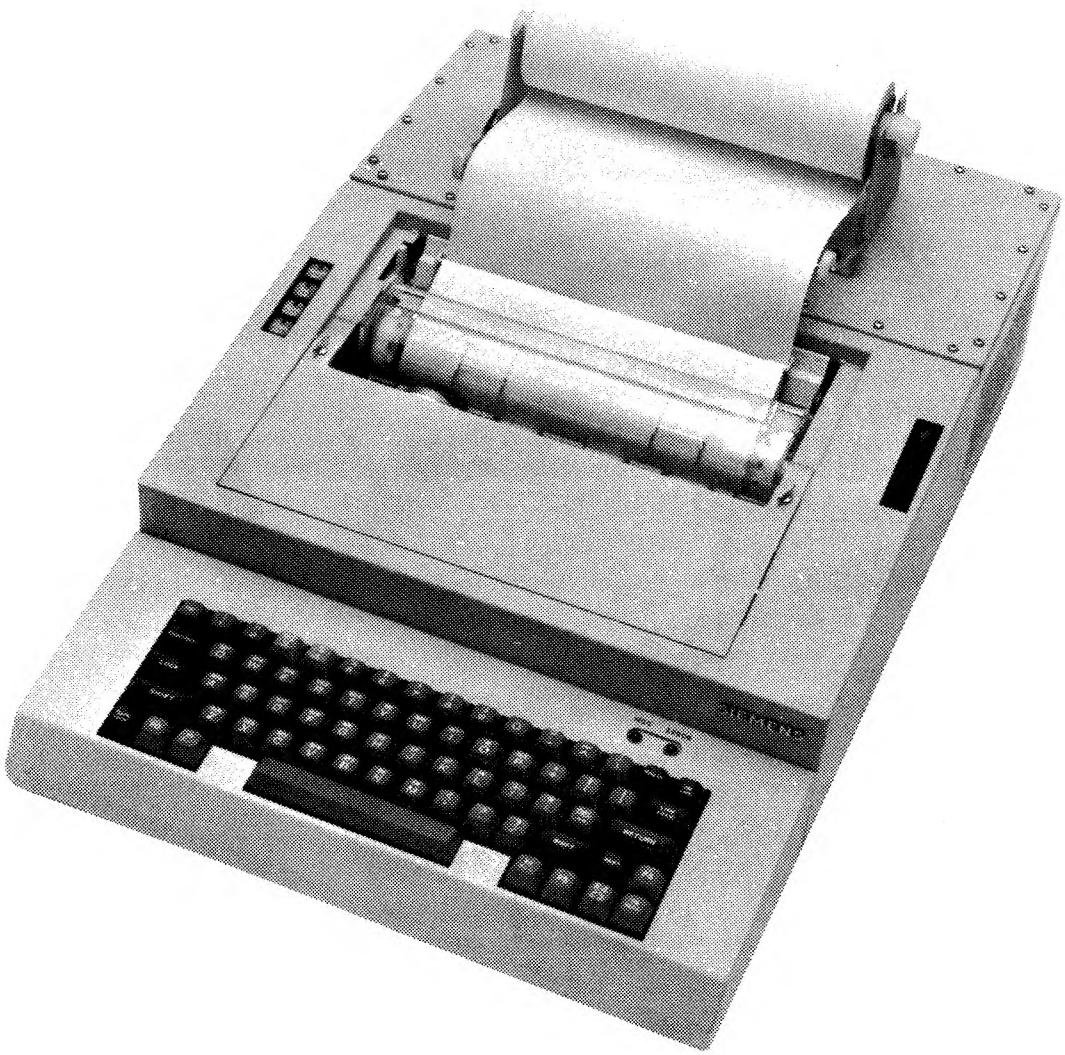
Number		Page
2B.1.8	ITA5 Character Set	1.14
2B.1.9	ITA5 Control Codes	1.15
2B.1.10	ITA5 Escape Sequences	1.16
2B.1.11	ITA2 Character Set	1.18
2B.1.12	ITA2 Control Codes	1.19

ILLUSTRATIONS

Figure		
2B.1.1	TGQ2 Teleprinter	1.3
2B.1.2	TGQ4 Teleprinter	1.4

ANNEX

Annex	
1A	Additional Features - TGQ4, TGQ6 and TGQ9



TGQ2 TELEPRINTER
5815-99-780-8817

FIG 2B.1.1



FIG 2B.1.2

TGQ4 TELEPRINTER
5815-99-780-8819

CHAPTER 1

OPERATING INSTRUCTIONS, TGQ TELEPRINTERS

APPLICABILITY OF INFORMATION

1 This category describes the operating instructions for all of the TGQ variants. Teleprinters TGQ4, TGQ6 and TGQ9 have additional "message editing" functions which are described in Annex A of this chapter. The operating instructions for the Paper Tape Attachment (PTA) supplied with TGQ3 are contained in Chapter 2.

2 The information contained here assumes that the equipment has been set up correctly, in accordance with the procedures given in Category 4.

OPERATOR'S CONTROLS

GENERAL CONTROLS

ON/OFF Switch

3 This is a "rocker" type switch. It is located on the right-hand side of the rear panel, below the signal line plug (PL3). Press the top part of the switch to switch on the Teleprinter and the bottom part to switch off. When the Teleprinter is switched on, the printing area is illuminated by small filament bulbs mounted beneath the printer visor and the Teleprinter prints the standard character set for two and a half lines. The print sequence may be inhibited by pressing the ON LINE button or any key on the keyboard (if fitted).

Dual In-Line Switches

4 There are two blocks of Dual In-Line (DIL) switches, mounted behind a removable plate on the rear left-hand side of the Teleprinter. The blocks are designated as block "A" and block "B". Block A is on the left and block B is on the right. Each block contains eight switches, numbered from the left. The purpose of these switches is to provide various options, which may differ slightly according to the variant used (see Tables 2B.1.1 to 2B.1.4).

5 The transmission speed (baud rate) of the Teleprinter is controlled by a combination of settings for switches A3, A4, A5, A6 and B1, regardless of which variant is in use. The speeds and settings possible are shown in Table 2B.1.5.

6 The DIL switch settings should not normally require adjustment as they are set up to meet requirements when the equipment is installed (see Category 4B for a full description).

TABLE 2B.1.1

SUMMARY OF TELEPRINTER DIL SWITCH SETTINGS

(APPLICABLE TO ALL NEW OUTFITS EXCEPT TGQ6, TGQ7 AND TGQ9)

Function	Switch Block A				Switch Block B						
	1	2	7	8	2	3	4	5	6	7	8
Power Up On Line Off Line	UP DOWN										
Symbol Selection Pound Symbol Hash Symbol		UP DOWN									
Character Code ITA2 (5-bit) ITA5 (6-bit) ITA5 (7-bit) ITA5 (8-bit)			UP UP DOWN DOWN	UP DOWN UP DOWN							
Half Duplex Full Duplex					UP DOWN						
Stop Bits 1 1.5 2						DOWN UP DOWN	UP DOWN DOWN				
Parity Odd Even Off								DOWN DOWN UP	UP DOWN —		
Auto Linefeed on RETURN On Off										UP DOWN	
Default Line Spacing 3 lines/inch 6 lines/inch											UP DOWN

TABLE 2B.1.2

SUMMARY OF TELEPRINTER DIL SWITCH SETTINGS

(APPLICABLE TO EARLY VERSIONS OF TGQ1 TO TGQ5 AND ALL TGQ9 OUTFITS)

Function	Switch Block A				Switch Block B						
	1	2	7	8	2	3	4	5	6	7	8
Power Up On Line Off Line	UP DOWN										
PTA Interface Speed 300 Baud 4800 Baud		UP DOWN									
Character Code ITA2 (5-bit) ITA5 (6-bit) ITA5 (7-bit) ITA5 (8-bit)			UP UP DOWN DOWN	UP DOWN UP DOWN							
Half Duplex Full Duplex					UP DOWN						
Stop Bits 1 1.5 2						DOWN UP DOWN	UP DOWN DOWN				
Parity Odd Even Off								DOWN DOWN UP	UP DOWN —		
Auto Linefeed on RETURN On Off										UP DOWN	
Default Line Spacing 3 lines/inch 6 lines/inch											UP DOWN

TABLE 2B.1.3

SUMMARY OF TELEPRINTER DIL SWITCH SETTINGS

(APPLICABLE TO TGQ6 OUTFITS ONLY)

Function	Switch Block A				Switch Block B						
	1	2	7	8	2	3	4	5	6	7	8
Characters/line 69 72	UP DOWN										
Symbol Selection Pound Symbol Hash Symbol		UP DOWN									
Character Code ITA2 (5-bit) ITA5 (6-bit) ITA5 (7-bit) ITA5 (8-bit)			UP UP DOWN DOWN	UP DOWN UP DOWN							
DTR Signal Normal Inverted					UP DOWN						
Stop Bits 1 1.5 2						DOWN UP DOWN	UP DOWN DOWN				
Parity Odd Even Off								DOWN DOWN UP	UP DOWN —		
Auto Linefeed on RETURN On Off										UP DOWN	
Default Line Spacing 3 lines/inch 6 lines/inch											UP DOWN

TABLE 2B.1.4

SUMMARY OF TELEPRINTER DIL SWITCH SETTINGS

(APPLICABLE TO TGQ7 OUTFITS ONLY)

Function	Switch Block A				Switch Block B						
	1	2	7	8	2	3	4	5	6	7	8
Power Up											
On Line	UP										
Off Line	DOWN										
PTA Interface Speed											
300 Baud		UP									
4800 Baud		DOWN									
Character Code											
ITA2 (5-bit)			UP	UP							
ITA5 (6-bit)			UP	DOWN							
ITA5 (7-bit)			DOWN	UP							
ITA5 (8-bit)			DOWN	DOWN							
Half Duplex					UP						
Full Duplex					DOWN						
Stop Bits											
1						DOWN	UP				
1.5						UP	DOWN				
2						DOWN	DOWN				
Parity											
Odd								DOWN	UP		
Even								DOWN	DOWN		
Off								UP	--		
Margin Bell											
Enable										UP	
Disable										DOWN	
Paper Type											
Roll											UP
Pin Feed											DOWN

TABLE 2B.1.5
TELEPRINTER BAUD RATE SELECTION

Baud Rate	DIL Switch				
	A3	A4	A5	A6	B1
45.45	UP	DOWN	UP	UP	UP
50	DOWN	UP	UP	UP	UP
75	DOWN	DOWN	UP	UP	UP
100	UP	DOWN	UP	DOWN	DOWN
110	DOWN	DOWN	DOWN	DOWN	UP
134.5	UP	UP	UP	DOWN	UP
150	DOWN	UP	DOWN	DOWN	UP
200	UP	DOWN	UP	DOWN	UP
220	UP	UP	UP	UP	UP
300	UP	DOWN	DOWN	DOWN	UP
600	DOWN	UP	UP	DOWN	UP
900	DOWN	UP	DOWN	UP	DOWN
1200	DOWN	DOWN	DOWN	UP	UP
1800	DOWN	UP	DOWN	UP	UP
2400	DOWN	DOWN	UP	DOWN	UP
4800	UP	DOWN	DOWN	UP	UP
9600	UP	UP	DOWN	UP	UP

PRINTER CONTROLS

7 Four printer control buttons are mounted on the left-hand side of the Printer unit. These operate as described in Table 2B.1.6 below.

TABLE 2B.1.6
PRINTER CONTROL BUTTON FUNCTIONS

Button	Function
POWER ON	This is a "dummy" button. A built-in LED illuminates when the Teleprinter is switched on (see Note (1)).
ON LINE	A built-in LED illuminates when the Printer is on line. Pressing the button switches the Printer to off line.
FORM FEED	Only operates off line. Pressing the button advances the paper to the next "top of form" and moves the carriage to the left. This button is also used to restart the Printer after the paper has been changed.
FORM SET	Only operates off line. Pressing the button sets the current line as the new "top of form". This button is also used to initiate a self-test (see Note (2)).

NOTES (1) Failure of internal dc voltage rails may cause the LED to extinguish whilst the equipment is still switched on.

(2) A self-test routine may be invoked by pressing the FORM SET button, switching on the Teleprinter and keeping the button depressed until the carriage stops moving. Releasing the button causes the self-test to start. This causes the full character set to be printed continuously until the Teleprinter is switched off.

Buzzer Alarm

8 If the Printer runs out of paper, printing will stop and the internal buzzer will start to "bleep" repeatedly every two seconds. Fit a new roll or box of paper (see paras 35 to 37) and then press FORM SET to cancel the buzzer.

NOTE During the first form feed after paper has been loaded the Printer may stop and the buzzer start to bleep. If this happens, switch off the Printer, wind the paper forward manually by turning the knurled paper feed wheel a couple of turns and then switch on again. The alarm should now be cleared.

KEYBOARD CONTROLS (All Variants Except TGQ1, TGQ7 and TGQ8)

9 The Teleprinter Keyboard operates in a similar manner to a standard typewriter keyboard (ie pressing an alphabetic or numeric key may produce one of two characters, depending on whether the SHIFT key is pressed). Additional features of the Teleprinter Keyboard are described in Table 2B.1.7.

NOTE The actual character generated when the SHIFT or CONTROL keys are used in conjunction with another key depends on whether the Teleprinter is operating in ITA5 or ITA2 mode (see paras 15 and 20).

10 Teleprinters TGQ4, TGQ6 and TGQ9 use a slightly modified keyboard which has additional functions printed on a strip above the top row of keys. These functions relate to message editing facilities and are described in detail in Annex 1A of this chapter.

OPERATING INSTRUCTIONS

TGQ1, TGQ7 and TGQ8 VARIANTS

11 As a keyboard is not fitted as standard on these Teleprinters, operating the equipment is limited to setting up the pagination using the FORM SET and FORM FEED keys (see Table 2B.1.6) and carrying out routine maintenance tasks (see para 33).

NOTE Ensure that the Teleprinter is left ON LINE to receive incoming messages.

TABLE 2B.1.7

KEYBOARD CONTROLS

Control	Function
LOCK	Pressing this key causes succeeding characters to be printed in upper or lower case. The built-in LED illuminates in LOCK mode, indicating that typed characters will be printed in upper case.
CAPS LOCK	Operates in a similar manner to LOCK, except that only alphabetical characters and the DELETE key are "shifted".
REPT	Pressing any key whilst this key is pressed causes that character to be printed continuously for as long as both keys are pressed (operates with both printing and non-printing keys).
BREAK	Only operates in ON LINE mode. Pressing this key causes the output serial line to be held "open" for approximately 200 ms.
F0 to F6	These keys have different functions, depending on whether the Teleprinter is in ITA5 or ITA2 mode (see paras 15 and 20).
CONTROL	This key modifies the code generated by other keys. Pressing any key after pressing and holding this key generates a non printing character. The character generated depends on whether the Teleprinter is in ITA5 or ITA2 mode.
ESC	Valid only in ITA5 mode. Pressing this key followed by one of the designated character keys changes a particular characteristic of the Teleprinter (see Table 2B.1.10).
ON LINE	Pressing this key toggles the Teleprinter between ON LINE and OFF LINE.
LINE FEED	Pressing this key advances the paper one line and transmits a "line feed" character. The carriage remains stationary.
RETURN	Pressing this key moves the carriage to the left and transmits a "return" character. The Teleprinter is usually set up such that pressing this key generates a line feed and return (see Note below), although only the return character is transmitted.
ERROR LED	Usually indicates a Printer failure when lit.
MSG LED	Only operates on TGQ4, TGQ6 and TGQ9. It illuminates when an incoming message has been stored in the internal buffer.

NOTE On all TGQ Teleprinters except TGQ7 the auto linefeed on RETURN option is switch-selectable by changing the position of DIL switch B7.

ALL VARIANTS EXCEPT TGQ1, TGQ7 AND TGQ8

12 Transmitting messages on these Teleprinters involves simply typing the message on the keyboard using the protocol appropriate to the application whilst the Teleprinter is ON LINE. Each character is transmitted immediately the key is pressed.

13 Characters typed whilst the Teleprinter is OFF LINE will not be transmitted.

14 It is possible that in full duplex mode an incoming message may be received whilst a message is being transmitted. If this happens, all variants except TGQ4, TGQ6 and TGQ9 will print out the received message immediately - but this will not interfere with the message being transmitted. In the case of TGQ4, TGQ6 and TGQ9, the incoming message will be stored in an internal buffer if it has a header and trailer; otherwise it will be printed immediately.

Operating in ITA5 (ASCII) Mode

15 When typing in messages in ITA5 mode, the keys operate as described in para 9 and Table 2B.1.7. Normal and shifted characters shown on the keys are printed and transmitted to line (and to the PTA in the case of TGQ3).

16 Table 2B.1.8 shows the normal and shifted characters printed and the corresponding codes which are transmitted in ITA5 mode.

Control Characters

17 Control characters are transmitted to line (and the PTA) but are not printed. Table 2B.1.9 lists the character codes generated when the CONTROL key is used.

NOTE Some of the control characters listed in Table 2B.1.9 control the operation of the printer. If these characters are used whilst the Teleprinter is ON LINE, the characters will be transmitted and this may result in an unanticipated response from the equipment connected to the other end of the line.

Escape Sequences

18 Pressing the ESC key followed by certain alphabetic or numeric keys (see Table 2B.1.10) enables certain Printer options which are normally set by the position of the DIL switches to be controlled from the keyboard. If the Teleprinter is switched off, the options selected from the keyboard will be lost and the Teleprinter will power up in default mode, as defined by the DIL switch settings.

NOTE Many of these escape sequences are invalid on early versions of the TGQ Teleprinters.

Function Keys

19 The six function keys F0 to F5 generate the character sequence "FN0" to "FN5" respectively. Function key F6 generates the "Here Is" identifier, currently set at eight nulls.

TABLE 2B.1.8

ITA5 CHARACTER SET

Most significant 3 bits (Hex)

Least significant 4 bits (Hex)	0	1	2	3	4	5	6	7
0	NUL	DLE	space	0	@	P	'	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	TAB	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	|
D	RET	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	-	o	^*

NOTE LINE FEED (code 0A) is also generated by CONTROL J
RETURN (code 0D) is also generated by CONTROL M

TABLE 2B.1.9

ITA5 CONTROL CODES

CONTROL & Key	Hex Code	Printer Response	CONTROL & Key	Hex Code	Printer Response
			P	10	
A	01		Q	11	PTA Reader ON*
B	02		R	12	PTA Punch ON*
C	03		S	13	PTA Reader OFF*
D	04		T	14	PTA Punch OFF*
E	05		U	15	
F	06		V	16	
G	07	BELL	W	17	
H	08		X	18	
I	09	TAB (see note)	X	19	
J	0A	LINE FEED	Y	1A	
K	0B		{	1B	Command String
L	0C	FORM FEED	\	1C	
M	0D	RETURN	}	1D	
N	0E		^	1E	
O	0F		-	1F	Toggles single/ double line feed

* If a PTA is connected (eg TGQ3), these codes are used to control it from the keyboard.

NOTE The TAB function moves the print head to the next tab position. The first tab position is at the ninth character, subsequent tab positions are at every eighth character (ie 17, 25, 33, 41, etc).

TABLE 2B.1.10

ITA5 ESCAPE SEQUENCES

Escape Sequence	Function
ESC A	Toggles character generator between standard and custom set (see Note 1)
ESC B	Start self-test mode (see Note 2)
ESC C	Reset (see Note 3)
ESC D	Select standard character set *
ESC E	Select custom character set (see Note 1)
ESC F RETURN	Select 3 lines/in *
ESC G RETURN	Select 6 lines/in *
ESC 1 RETURN	Select 16 chars/in *
ESC 2 RETURN	Select 12 chars/in *
ESC 3 RETURN	Select 9.6 chars/in *
ESC 4 RETURN	Select 8 chars/in *
ESC 5 RETURN	Select 6 chars/in *
ESC 6 RETURN	Select 4.8 chars/in *

* These escape sequences are not available on early versions.

NOTES (1) The custom character set is not available for TGQ Teleprinters.

(2) The full character set is printed until the Printer is turned off.

(3) The reset sequence will have the following effects:

Current line set as top of form
Character size set to 12 chars/in
Line spacing reset to default
Selects standard character set
Clears buffers (up to two lines of character may be lost)

Operating in ITA2 (BAUDOT) Mode

20 When typing in messages in ITA2 mode, not all keyboard characters are available. Furthermore, ITA2 code differs fundamentally from ITA5 code in that the same 5-bit character may be interpreted in two ways (ie as a letter or as a figure), depending on the state of the receiving system.

21 The switch between figures and letters is signalled by means of special "figure shift" and "letter shift" characters. Figure shift is generated by CONTROL N (or the "F1" key) and letter shift is generated by CONTROL O (or the "F2" key). Table 2B.1.11 shows the relationship between keys, printed characters and ITA2 codes.

22 In normal use, figure shift and letter shift characters are automatically inserted as required. However, a transmission to line or the PTA must begin with a letter shift or figure shift character in order to synchronise the receiving equipment.

23 In ITA2 mode the line length is restricted to 69 characters and the characters are printed at 9.6 columns per inch.

Control Characters

24 There are few control characters available in ITA2 mode, so most of the Printer control facilities are not available. The control characters which are available are listed in Table 2B.1.12.

Escape Sequences

25 As the ESC key is invalid in ITA2 mode, no escape sequences are available to users.

Function Keys

26 In ITA2 mode the six function keys generate the following:

F0 - No function
F1 - Figure shift
F2 - Letter shift
F3 - No function
F4 - No function
F5 - Null
F6 - "Here Is" (no message assigned)

TABLE 2B.1.11

ITA2 CHARACTER SET

Key		ITA2 Character		Key		ITA2 Character	
Lower	Upper	Unshifted	Shifted	Lower	Upper	Unshifted	Shifted
0	n/a	0 (16)	0 (16)	A	SOH	A (03)	A (03)
1	!	1 (17)	n/a	B	STX	B (19)	B (19)
2	"	2 (13)	n/a	C	ETX	C (0E)	C (0E)
3	#	3 (01)	n/a	D	EOT	D (09)	D (09)
4	$	4 (0A)	$ (14)	E	ENQ	E (01)	E (01)
5	%	5 (10)	% (0D)	F	ACK	F (0D)	F (0D)
6	&	6 (15)	n/a	G	BEL	G (1A)	G (1A)
7	.	7 (07)	' (05)	H	BS	H (14)	H (14)
8	(	8 (06)	((0F)	I	HT	I (06)	I (06)
9	)	9 (18)	) (12)	J	LF	J (0B)	J (0B)
:	*	: (0E)	n/a	K	VT	K (0F)	K (0F)
;	+	n/a	+ (11)	L	FF	L (12)	L (12)
,	<	, (0C)	n/a	M	CR	M (1C)	M (1C)
-	=	- (03)	= (1E)	N	SO	N (0C)	N (0C)
.	>	. (1C)	n/a	O	SI	O (18)	O (18)
/	?	/ (1D)	? (19)	P	DLE	P (16)	P (16)
@	'	@ (1A)	n/a	Q	DC1	Q (17)	Q (17)
[	{	n/a	n/a	R	DC2	R (0A)	R (0A)
]	}	n/a	n/a	S	DC3	S (05)	S (05)
^	~	n/a	n/a	T	DC4	T (10)	T (10)
_	DEL	n/a	n/a	U	NAK	U (07)	U (07)
SPACE	n/a	SPACE (04)	SPACE (04)	V	SYN	V (1E)	V (1E)
RETURN	n/a	RETURN (08)	RETURN(08)	W	ETB	W (13)	W (13)
LINE FEED	n/a	LINE FEED (02)	LINE FEED(02)	X	CAN	X (1D)	X (1D)
				Y	EM	Y (15)	Y (15)
				Z	SUB	Z (11)	Z (11)

TABLE 2B.1.12

ITA2 CONTROL CODES

CONTROL & Key	Hex Code	Printer Response
E	09	(see note)
G	1B0B	Bell (Buzzer)
J	02	LINE FEED
M	08	RETURN
N	1B	"Figure shift" transmitted
O	1F	"Letter shift" transmitted
@	00	NULL

NOTE The Printer at the other end of the serial line generates "Here Is" when this character is received.

ERROR HANDLING

27 The TGQ Teleprinters can identify certain error conditions, as outlined below. Hardware fault finding and fault correction is beyond the scope of this chapter. For information on this subject, refer to the relevant section of Category 5.

Parity Errors

28 If a character is received with a parity error, the character is discarded and the Teleprinter prints a "@" character in its place.

Printer Failure

29 If the Teleprinter is unable to accept characters from the keyboard, line or PTA for longer than a predetermined time, a fault condition is assumed and the ERROR LED illuminates.

Buffer Overflow

30 If a transmission to the Teleprinter causes the internal buffer to "overflow", the ERROR LED illuminates until the condition ceases and some data may be lost. The usual cause of this type of error is a failure of the control protocol, caused either by the Teleprinter or by the remote equipment.

Line Failure

31 If the Teleprinter is unable to transmit data for longer than a predetermined time, it prints the message "LINE TX FAIL". It then switches to OFF LINE and continues to operate in local mode.

Punch Failure

32 If, when a PTA is connected, the Teleprinter is unable to transmit data to it for longer than a predetermined time, it prints the message "PUNCH FAIL". The Teleprinter then stops further transmission to the PTA until the fault is corrected, at which time transmission is resumed automatically.

NOTE The PUNCH FAIL message is also printed if the PTA is connected to the Teleprinter but is not switched on.

ROUTINE MAINTENANCE

33 Routine maintenance on the TGQ Teleprinters is limited to replacing the ribbon cassette and replacing the paper (see below).

Ribbon Cassette Removal and Replacement

34 To replace a worn ribbon cassette, proceed as follows:

(1) Switch off the Teleprinter using the switch on the rear panel.

(2) Open the printer visor by undoing the two quick-release screws and then slide the head carriage along to the centre of the platen.

(3) Hold both sides of the ribbon cassette and lift upwards.

(4) Fit the new cassette onto its mounting pins and ensure that it is fully engaged in the retaining clip.

(5) Place the ribbon over the nose of the print head and turn the winder on the top of the cassette counter-clockwise to ensure that the ribbon sits flush against the head.

(6) Move the carriage to the left and right and check that the winder rotates counter-clockwise for both directions.

Replacing Roll Paper (All Variants Except TGQ7)

35 To fit a new roll of paper, proceed as follows:

(1) Lift the empty paper roll off the roll holder.

(2) Remove the wire spring-clip from the end of the plastic spindle by pressing the two looped ends together. Pull the cardboard roll off this end of the spindle.

(3) Push this end of the spindle through the new paper roll such that the loose end of the paper will be facing the rear of the Teleprinter when the spindle is fitted onto the roll holder. Refit the spring-clip into the inner groove on the end of the spindle and place the ends of the spindle onto the roll holder.

(4) Undo the quick-release screw on each side of the printer visor and lift the visor upwards. Move the print head to the left-hand margin and then check that the pressure feed lever to the left and rear of the platen is in the engaged position (pushed back). Lift the perspex tear-off strip (in front of the platen).

(5) Feed the paper forward, under the paper roll and over the tension bar, and then feed it down behind the platen and between the plastic paper edge guides. Turn the knurled paper feed wheel in the direction of the rear of the Teleprinter until the paper appears in front of the platen. Feed the paper behind the tear-off strip and then lower the strip.

(6) Release the pressure feed lever (pull forward) and align the paper manually. Move the lever to the engaged position, close the printer visor and secure it. Adjust the position of the paper edge guides as required so that they rest against the edges of the paper.

Replacing Pin Feed Paper (TGQ7 Only)

36 To load a new box of pin feed paper, proceed as follows:

(1) Unclip the grille from the sides of the paper tray.

(2) Undo the quick-release screw on each side of the printer visor and lift the visor upwards. Move the print head to the left-hand margin and then check that the pressure feed lever to the left and rear of the platen is in the engaged position (pushed back). Lift the perspex tear-off strip (in front of the platen).

(3) Place the new box of pin feed paper in a convenient place behind the Teleprinter, ensuring that any marker is on the right-hand side.

(4) Feed the paper through the bottom of the tray and then down behind the platen and between the two plastic paper edge guides. Ensure that the holes in the left hand edge of the paper locate correctly in the left-hand sprocket wheel pins.

(5) Turn the knurled paper feed wheel towards the rear of the Teleprinter until the paper appears in front of the platen. Direct the paper between the platen and the tear-off strip. Lower the strip.

(6) Release the pressure feed lever (pull forward) and align the paper manually. Close the printer visor and secure it. Adjust the position of the paper edge guides as required so that they rest against the edges of the paper.

(7) Clip the hooked ends of the grille into the locating holes in the sides of the paper tray and adjust the angle to that required.

(8) Ensure that the Teleprinter is OFF LINE. Advance the paper to the "top of form" using the paper feed wheel. Press FORM SET and then FORM FEED. The paper should feed through to the next top of form.

NOTE If the paper stops stops during the form feed and the Teleprinter starts to "bleep", switch off at the rear, manually wind on to the next top of form and switch on again.

Replacing Full-Width Pin Feed Paper

37 9.5 inch wide pin feed paper can be fitted to any TGQ Teleprinter. The procedure for fitting or replacing this type of paper is similar to that for pin feed paper for TGQ7, but note the following differences:

(1) The paper roll holder or paper tray must be removed as the paper lies flat on top of the Teleprinter.

(2) The paper must be located in the pins on both left and right-hand sprocket wheels when it is fed in behind the platen.

(3) The distance between the two sprocket wheels may require adjustment to accommodate the paper. If this is the case, turn the small adjuster wheel next to the right-hand sprocket wheel backwards or forwards to alter the distance between the two sprocket wheels until the pins fit into the holes.

ANNEX 1A

ADDITIONAL FEATURES - TGQ4, TGQ6 AND TGQ9

INTRODUCTION

1 The TGQ4, TGQ6 and TGQ9 Teleprinters differ from the other TGQ variants in that they have additional features which enable them to perform message editing functions.

TGQ4 MESSAGE EDIT SYSTEM

2 The TGQ4 message edit system enables up to 255 numbered messages to be stored in 44 Kbytes of internal battery-backed memory. Each message can be up to 4 Kbytes in length.

FACILITIES

3 The system provides the following facilities:

(1) Message composition and editing using a simple line-oriented text editor with the following features:

Print lines of a stored message.

Move forwards or backwards through a message by one line at a time.

Delete lines.

Insert lines of text.

Search for particular strings.

Exchange a string in the current line for another string.

On line help facility.

Quit edit facility to abandon erroneous edits.

(2) Receiving and transmitting messages via one of the Teleprinter's serial channels.

(3) Full status reporting of all messages held in store. This feature informs the user how a message arrived in the store and what has been done to it since it arrived.

(4) Deleting messages from store. Safeguards are incorporated to prevent an untransmitted message from being deleted accidentally.

(5) Total message store reset to delete all messages.

(6) Printing of any stored message. A print cancel facility is also provided to inhibit further printing.

(7) Editing of message headers and trailers.

OPERATING MODES

4 Four modes of operation are possible, depending on the functions selected and the system state. The modes available are listed below.

Local (Off Line) Mode

5 The equipment usually enters local keyboard mode when it is first switched on, although this is switch-selectable using DIL switch A1. In this mode it operates as a standard TGQ2 keyboard and printer. All characters entered are printed but not stored. The TGQ4 returns to this mode upon the completion of any message edit function whilst the Teleprinter remains off line.

On Line Mode

6 When the terminal is on line, anything typed on the keyboard or received from the PTA tape reader is transmitted, unless one of the message edit functions is selected. This enables the TGQ4 to emulate a standard TGQ2. In addition, anything received from the line that does not constitute part of a message (ie does not have a header or trailer) is printed automatically.

Edit Mode

7 The TGQ4 enters Edit Mode when either of the functions COMPOSE or EDIT is selected. It remains in this mode until the edit is complete.

Command Mode

8 The TGQ4 enters Command Mode whenever one of the message edit function keys is pressed. It remains in this mode until the command is complete or the user enters Edit Mode.

USING THE MESSAGE EDIT KEYS

9 The message edit system software, enables the printer to store messages received from the line, typed in by the operator, or entered from the PTA. Once a message is stored, it has a message number assigned to it so that it can be referenced directly. The line editor allows any stored messages of less than 4 Kbytes in length, whether received or composed, to be edited by the operator.

10 Stored messages may also be printed on the Printer, transmitted to the line, punched on paper tape, or deleted.

11 The additional facilities are actioned by the following keys:

CONTROL and 1	PRINT ENABLE/DISABLE
CONTROL and 2	PRINT CANCEL
CONTROL and 3	PRINT MESSAGE
CONTROL and 4	TRANSMIT MESSAGE
CONTROL and 5	DELETE MESSAGE
CONTROL and 6	RESET
CONTROL and 7	COMPOSE MESSAGE
CONTROL and 8	EDIT MESSAGE
CONTROL and 9	END INSERT
CONTROL and 0	EXIT

12 Reception of messages from the line is performed automatically when the Teleprinter is on line and a message header and trailer are identified.

13 As messages are created, they are allocated reference numbers. Messages initially received from the line are allocated numbers in the range 1 to 127. Messages created by the COMPOSE option are allocated numbers in the range 128 to 255. Message numbers are allocated sequentially within these ranges.

PRINT ENABLE/DISABLE Function

14 Selecting this function toggles the received message print switch. Initially, the state of this switch is PRINT ENABLE. First use of this option changes the state to PRINT DISABLE and any subsequent use alternates the states. Whenever the option is selected a message is printed giving the new state.

15 When the current state is PRINT ENABLE, any messages received are stored and printed with the message number automatically. Whenever the state is switched from PRINT DISABLE to PRINT ENABLE, any previously unprinted messages are printed. This includes any unprinted composed or edited messages. When the current state is PRINT DISABLE, any messages received are stored and a message is printed to indicate that a new message has been received.

NOTE This function is inoperative in Edit Mode. When Edit Mode is in use, the system temporarily enters PRINT DISABLE state. When Edit Mode is terminated, the system re-enters the last state selected.

PRINT CANCEL Function

16 Selecting this function terminates any active print requests or print request sequences. This function may also be used at any time to delete a message which is currently being edited (the original unedited message remains intact).

17 This function will not suppress data from the line that does not constitute a message. Neither will it prevent input from the PTA from being printed in Local Mode.

PRINT MESSAGE Function

18 This function causes the system to enter Command Mode and the following prompt is printed:

Print Message No.:

The system will then wait for the user to enter a response. Three options are possible:

Print a specific message.
Print all messages held in store.
Print the status of one, some, or all messages held in store.

NOTE If the response given is invalid, or if there is no message with that number, the Printer responds with:

??

and the system exits from Command Mode.

Print a Specific Message

19 If a specific message is to be printed, enter the message number (from 1 to 255) and then press the RETURN Key. If the message exists then the system will print all of it, unless printing is terminated by using the PRINT CANCEL option. Once the message has been printed ,the system exits from Command Mode and returns to the previously selected state.

Print All Messages Held in Store

20 If all the messages held in store are to be printed, enter "A" and then press the RETURN Key. The stored messages will then be printed, together with their message numbers. Printing can be terminated at any time by selecting the PRINT CANCEL option. Once printing is complete or if the PRINT CANCEL option has been selected, the system exits from Command Mode and returns to its previous state.

21 If there are no message held in store, the system will print the following message:

No Messages Stored

Print Message Status

22 The following commands enable the user to obtain the status of stored messages:

S Gives the status of all messages stored.

Snnn Gives the status of message number nnn only. "??" will be printed if the message does not exist.

Snnn+ Gives the status of all messages from message number nnn to message number 255.

The output from the message edit system in response to one of these commands will be something like:

Free Message Store = 45056 Bytes

Msg Status

Message number	**Status flags**
128	C P

23 The status flags have the following meanings:

C Message was composed
R Message was received
P Message has been printed since reception, composition, or edit
T Message has been transmitted

TRANSMIT MESSAGE Function

24 When this function is selected, the following prompt is printed:

Transmit Message No.:

Enter the number of the message to be transmitted (from 1 to 255) and then press the RETURN key.

25 The selected message will then be transmitted with the currently defined header and trailer. A message will be output on the Printer to indicate when the transmission is complete (see paras 44 and 47 for details of message header and trailer editing).

26 If the message number is invalid, or if there is no message with that number currently in the store, the Printer will respond with:

??

NOTES (1) The Printer must be on line for the TRANSMIT MESSAGE function to operate. If it is not, the message:

ERROR - Not Online

is displayed instead of the message number prompt.

(2) If a message is already being transmitted, the transmitter is unavailable for use and may not be referenced again until the previous transmission is complete. If this is attempted, the following message is output instead of the prompt:

Transmitter Busy

(3) If the transmitter is busy when the printer is taken off line, or if an error in transmission occurs, the following message will be displayed:

Transmission Error

DELETE MESSAGE Function

27 When this function is selected, the system enters Command Mode and requests the number of the message to be deleted by displaying the following prompt:

Delete Message No.:

Enter the number of the message to be deleted (from 1 to 255) and then press the RETURN key. If the number is valid and the message has been transmitted, the system requests confirmation that the message with that number is to be deleted:

Delete (Y/N)?

Enter "Y" and then press the RETURN key. Pressing any other alphabetic key cancels the command. The system confirms that the message has been deleted by printing:

Message Deleted

NOTE If the system is engaged in message store manipulation when a delete request is received, the request will be denied and the following message will be printed:

Message Store Busy

This is most likely to occur if the delete function is requested whilst the system is transmitting a message. Re-attempt the deletion later.

28 If the message number is invalid or if there is no message with that number, the printer responds with:

??

29 If the message number is valid but the selected message has not been printed previously, it is printed automatically. If the selected message has been composed or edited but not transmitted, the following message is printed to warn of this fact:

WARNING - Composed Message Not Transmitted Yet

RESET Function

30 Selecting this function causes the following message to be output:

RESET - Type A to clear Message Store Continuously,
Type R to reset to Initial Conditions

Type A <RETURN>

31 This causes all the RAM in the Teleprinter to be purged 1000 times. On completion of this task, the ERROR indicator illuminates and the system continues to purge the message store until power is removed. This feature is designed to enable TGQ4 Teleprinters to be removed from secure areas without jeopardising security.

Type R <RETURN>

32 This causes all the message edit store to be reset and all stored messages to be deleted. Message editing can then be started with a clear store.

NOTE The RESET function also causes the message headers and trailers to be reset to the default headers and trailers.

COMPOSE MESSAGE Function

33 When this function is selected, the system responds with the message:

Compose Message No.: nnn

where nnn is the next available compose message number (this will be in the range 128 to 255).

34 The edit prompt "=I" is then printed, indicating that the lines of the message can now be inserted. To terminate the insertion, select the END INSERT function.

NOTE All the Edit Mode commands (see para 56) are available whilst the text of a message is being inserted.

35 Select the EXIT function to terminate the composition and store the composed message in the message buffer. If an internal message store manipulation is in progress, or the composed message is too big to be moved into the message store, the new message will remain in the edit buffer until the system can incorporate it into the general store.

NOTE This will prevent further use of the COMPOSE MESSAGE and EDIT MESSAGE functions until the edit buffer is free.

36 If the edit buffer already contains a message which is waiting to be incorporated into the message store, the request to store the new message will be ignored and the following message will be printed:

Message Store Busy

37 If all the message numbers have already been allocated when the COMPOSE MESSAGE function is selected, the system prints the following message:

All Compose Message Numbers in use

and the request is cancelled. If this happens, at least one message whose number falls in the range 128 to 255 will have to be deleted before the COMPOSE MESSAGE can be used successfully.

EDIT MESSAGE Function

38 Selecting this function causes the system to print the message:

Edit Message No.:

Three options are available:

(1) Enter the number of the message to be edited (from 1 to 255) and then press the RETURN key - see para 43.

(2) Enter "H" and then press RETURN to edit the currently defined message header (only if the Teleprinter is off line) - see para 44.

(3) Enter "T" and then press RETURN to edit the currently defined message trailer (only if the Teleprinter is off line) - see para 47.

39 If the message number is invalid, or if there is no message with that number, the Teleprinter responds with:

??

and the system leaves Command Mode.

40 If the edit buffer already contains a message waiting to be incorporated into the message store, the request will be denied and the following message will be printed:

Message Store Busy

41 Entering "H" or "T" whilst the Teleprinter is on line results in the message:

Error - Online

42 If the message exceeds 4 Kbytes in length, the Teleprinter responds with:

Message Too Large to Edit

and exits from Command Mode.

NOTE Although it is not possible to create a message which exceeds 4 Kbytes in length, it is possible to receive one.

Entering Edit Mode

43 When the message number has been validated and the message to be edited has been copied into the edit buffer, the first line of the message is displayed, followed by the prompt "=". The prompt is redisplayed after executing each command. See para 52 for a full description of the Editor.

Editing the Message Header

44 Selecting this option results in the following message being printed:

```
Current Header = @@@@START
Enter Edit Command - Type E to Leave Header/Trailer Unchanged
                     Type D to Revert to Default
                     Type N to Enter New Header/Trailer
```

The current header will be either the default header or the last programmed one. In ITA2 mode, letter shifts and figure shifts are output as "l" and "f" respectively.

45 The default headers are as follows:

ITA5 - @@@@START

ITA2 - lllllZCZC

46 If option "N" is selected, the following text is output:

Enter up to 40 Characters. Terminate with EXIT key

Any characters typed will form the new header. Select the EXIT function to terminate input. The new header will be printed for verification and the options menu will be reprinted. Selecting EXIT again causes the following message to be displayed:

Composition/Edit Complete

The system then returns to Local Mode.

Editing the Message Trailer

47 Selecting this option results in the following message being printed:

Current Trailer = @@@@END
Enter Edit Command - Type E to Leave Header/Trailer Unchanged
Type D to Revert to Default
Type N to Enter New Header/Trailer

The current trailer will be either the default trailer or the last programmed one. In ITA2 mode, letter shifts and figure shifts are output as "l" and "f" respectively.

48 The default trailers are as follows:

ITA5 - @@@@END

ITA2 - "BT", 2 carriage returns, 8 linefeeds, "NNNN" and 12 letter shifts

49 If option "N" is selected, the following text is output:

Enter up to 40 Characters. Terminate with EXIT Key

Any characters typed will form the new trailer. Select the EXIT function to terminate input. The new trailer will be printed for verification and the options menu will be reprinted. Selecting EXIT again causes the following message to be displayed:

Composition/Edit Complete

The system then returns to Local Mode.

END INSERT Function

50 This function terminates Insert Mode whilst in the Editor. It has no other function. For further information see para 56.

EXIT Function

51 This function causes the system to exit from Edit Mode and to terminate the input of headers and trailers. It has no other function. For further information see paras 46, 49 and 56.

THE EDITOR

52 The Editor is accessed whenever the COMPOSE MESSAGE or EDIT MESSAGE functions are used. When typing in new messages, ie when using the COMPOSE MESSAGE function, the edit buffer is cleared, and the Editor is automatically put into Insert Mode. When entering Edit Mode, the message to be edited is copied into the edit buffer, the first line of the message is printed, and then the prompt "=" is printed.

53 Several of the commands listed below either work on, or relative to, the current line. eg A6 moves the line pointer forward six lines, thus making the new current line six lines after the present current line. The current line is always displayed after execution of a command.

54 A special case is when the line pointer is moved beyond the last line of the message. In this case, "(EOT)" is displayed as the current line. It is not possible to move the line pointer to before the first line of the message.

55 Editing is performed on two different levels:

(1) On stored text - This requires Edit Mode to be invoked and is achieved by using the edit commands described below.

(2) On input text - This edit function may be used at any time in ITA5 or ITA2 mode whilst a message edit function is active. It enables text on the current line to be corrected as it is typed in (ie before a carriage return is entered).

This is achieved by using the DELETE key. Each time the key is pressed, the last character on the line is deleted. Characters deleted are echoed on the Printer between backslashes. eg If

THE QUICK BROWN COW

is typed and the word COW should have typed as FOX, then by pressing the DELETE key three times the line appears as:

THE QUICK BROWN COW\WOC

When the correction is now made by typing FOX, the line appears as:

THE QUICK BROWN COW\WOC\FOX

NOTE (2) above cannot be used when a new header or trailer is being entered.

Editor Commands

56 The commands available for editing stored text are as follows:

Command	Function
Ax	Advance the line pointer by x lines and make the new line the current line. The new current line is then printed. x must be in the range 1 to 99. If x is omitted 1 is assumed.
RETURN	When carriage return is the only character entered in response to the prompt, it is equivalent to A1.
Bx	Move the line pointer up by x lines and make the new line the current line. The new current line is then printed. x must be in the range 1 to 99. If x is omitted 1 is assumed.
T	This causes the first line of the message to be made the current line. The new current line is then printed.
E	Advance to the end of the message. The line pointer is moved to beyond the last line of the message and (EOT) is printed.
I <CR>	Insert the following line or lines of the text before the current line. The insertion is terminated by using the END INSERT function. If the last line of an insert is not terminated by a carriage return before the END INSERT key is pressed, the line is appended to the start of the current line. A linefeed is automatically inserted after a carriage return.
Dx	Delete x lines from the current line onward. The current line is made the line after the last one deleted. x must be in the range 1 to 99. If x is omitted 1 is assumed.
Px	Print the current line and the following x-1 lines. The current line remains unaltered. x must be in the range 1 to 99. If x is omitted 1 is assumed.
H	This command prints the editor help text to aid the operator. The text is as follows: **Ax** - Advance x Lines **<CR>** - Advance 1 Line **Bx** - Back x Lines **T** - Top of Message **E** - End of Message **Px** - Print x Lines **Dx** - Delete x Lines **I** - Insert Following Lines (Terminate with End Insert Key) **S** - Search for String Between Delimiters **X** - Exchange Strings Between Delimiters **Q** - Quit Edit

Command	Function

S/String This command searches the text from the start of the current line to the end of the message for the first occurrence of the string specified between the delimiters. It makes the line where the string is found the current line.

The delimiters, in this case '/', may be any character as long as the character chosen does not appear in the character string being searched for and the delimiters before and after the search string are the same.

eg "S/Fred/" would attempt to locate "Fred" in the remainder of the message.

X/String1/ String2/ This command initiates a search for String1 and then replaces it with String2 when it is found.

NOTES (1) If string 2 is null, string 1 only is deleted from the line.

```
eg      THE QUICK BROWN FOX JUMPPPED
        =X/PP//
        THE QUICK BROWN FOX JUMPED
```

(2) A carriage return in the current line can be inserted, deleted or replaced in the current line by using the apostrophe (').

```
eg      =P2
        THE QUICK BROWN FOX JUMPED
        OVER THE LAZY DOG
        =X/'<LF>/<SPACE>/
        THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG
        =
```

To insert, delete or replace an apostrophe itself, use two apostrophes.

```
eg      =P
        WHY DON'T YOU
        =X/DON'T/CAN''T
        WHY CAN'T YOU
        =
```

(3) As linefeeds are automatically appended after carriage returns, it becomes impossible to overprint. This may be overcome by using the x command to delete the linefeed.

```
eg      THE TITLE
        = P2
        THE TITLE
        ---------
        =X/<LF>//
        THE TITLE
        =
```

Q — This command causes the edit to be abandoned. This can be useful if an error is made which would take too long to correct. The system requests confirmation that quit is really required by printing the message:

Quit Y/N?

Entering "Y" causes the edit to be abandoned and the message in store remains unchanged. In this case, the message:

Edit Abandoned

is printed. Any response other than "Y" results in the edit being resumed.

Exit — This command is used to finish an edit or compose session. The system then prints the message:

Composition/Edit Complete

The edited message is then transferred to the message store, provided that no messages are either being transmitted or received. If any messages are being transmitted or received then the edited message is held in the edit buffer until it can be incorporated in the message store. This prevents further use of the compose and edit functions until the edit buffer becomes free.

NOTE When Edit or Compose Mode is entered, the PRINT ENABLE/DISABLE state is automatically set to PRINT DISABLE so that any received message will not be printed during an edit or composition. When the edit or composition is completed (using the EXIT key) the state PRINT ENABLE/DISABLE reverts to its previous condition (before the edit). If this state is PRINT ENABLE, any messages received during the edit or composition will automatically be printed after the EXIT command has been processed.

57 If an edit command is entered incorrectly, the Teleprinter responds with:

```
??
=
```

Re-enter the command correctly.

RECEIVING MESSAGES

58 Messages are only received when the Teleprinter is on line (this function is performed automatically). The Teleprinter recognises the start of a message by a sequence of characters which match the programmed header exactly. Once the header is identified, all the following characters are stored up until an exact match is made with the programmed trailer.

NOTE If another match with the header is made whilst the message is being stored, the system assumes that the message trailer has been lost and therefore generates one automatically.

59 When a new message is received, it is allocated a number in the range 1 to 127. If all the numbers have been allocated, the following message is printed:

All Receive Message Numbers in use - Line Activity Suspended

One or more received messages currently stored must be deleted before line activity can resume.

60 Any received characters which are not identified as header, trailer, or the body of a message, are printed immediately regardless of the operating state. When a new message is complete, one of two possible actions is taken:

(1) If the system is set to PRINT DISABLE or if the Editor is currently being used, a message is output at some convenient point to inform the operator that message number xxx has been received ("xxx" being the number allocated by the Teleprinter).

(2) If the system is set to PRINT ENABLE and is not in the Editor, the received message is printed immediately, along with its allocated message number.

ERROR CONDITIONS

61 A number of error conditions may occur whilst the TGQ4 message edit system is in use. These are described below, together with remedial action.

Error Condition	Cause	Remedial Action
Bell sounds when a key or key sequence other than CONTROL G is pressed.	The key sequence is either: (1) Illegal in the currently selected code. (2) If it is a control numeric sequence then it is inappropriate.	Use the correct key or key sequence.
ERROR - Not Online	Attempting to transmit a message when the Printer is off line.	Switch the Printer to on line and repeat operation.
ERROR - Edit Buffer Full	A message has exceeded 4 Kbytes in length during editing.	Shorten message or split into two.
ERROR - Online	An attempt has been made to edit the message header or trailer whilst the Printer is on line.	Switch the Printer to off line.

Error Condition	Cause	Remedial Action
??	The command entered is invalid or unknown.	Enter the correct command.
Transmission Error	An error has occurred in transmission. Either the line has failed or the Printer was taken off line during transmission.	Retransmit the message.
MSG LED lit	Message buffer is nearly full.	No action required (warning only).
ERROR - Message Buffer Full	All available space in the message store has been used.	Delete some message to make space.
All Composed Message Numbers in use	All the available compose message numbers have been allocated.	Delete at least one message whose number lies in the range 128 to 255.
All Receive Message Numbers in use - Line Activity Suspended	All the message numbers in the range 1 to 127 have been allocated.	Delete at least one message with a number in the range 1 to 127.
Transmitter Busy	An attempt has been made to transmit a message whilst one is already being transmitted.	Wait until the previous transmission is complete, and then retry the operation.
Message Store Busy	An internal message store manipulation is in progress.	Retry later.
Message Too Large to Edit	An attempt has been made to edit a message larger than 4 Kbytes.	None possible. Messages exceeding 4 Kbytes cannot be edited.

PAPER TAPE INTERFACE

62 The TGQ4 Teleprinter can be used with a PTA to create messages from paper tape and to output messages to paper tape.

Creating Messages from Paper Tape

63 To create a message from paper tape or to insert information from a paper tape into a message, proceed as follows:

(1) Select the COMPOSE MESSAGE function, insert the paper tape into the Tape Reader and then press the RDR ON button on the PTA.

(2) When the tape has been read in, select the END INSERT function.

Transferring Messages to Paper Tape

64 To transfer a message to paper tape, proceed as follows:

(1) Load tape into the Punch and generate a leader by pressing FEED.

(2) Select the PRINT MESSAGE function, enter the number of the message to be punched but do not press the RETURN key yet.

(3) Press the PUNCH ON button on the PTA and then press the RETURN key.

(4) When the Punch stops, press FEED again before tearing off the tape.

NOTES (1) Null and delete codes received from the Reader are discarded.

(2) It is possible to copy a message direct to the PTA without selecting a message edit function.

TGQ6 MESSAGE EDIT SYSTEM

65 The TGQ6 message edit system differs considerably from the TGQ4 system. The basic operating features of this system are listed below:

APC127-standard default headers and trailers stored in non-volatile memory

Validity of headers and trailers for received messages not checked

Full duplex operation only

Automatic transmission of newly-created messages

Use of transmission sequence numbers (TIs) in message header

Always powers up on line (not switch-selectable)

DTR flow control inversion facility

TGQ6 MESSAGE EDIT CONTROL KEYS

66 The following keys control the operation of the message edit functions on the TGQ6 outfit:

CONTROL and 1	AUTO TX
CONTROL and 2	PRINT TI
CONTROL and 3	EDIT HD/TL
CONTROL and 4	EXIT
CONTROL and 5	EDIT TI
CONTROL and 6	CANCEL TX

Automatic Transmission Facility (AUTO TX)

67 A message to be transmitted can be keyed in on the Teleprinter whilst on on line and then transmitted by pressing the AUTO TX key. This causes the stored header to be transmitted, immediately followed by the message. The header includes a sequence number (TI), which is incremented automatically after the header has been transmitted.

NOTE It is not essential to terminate the message with a valid trailer.

68 If a PTA is being used with the TGQ6, a message stored on paper tape can be transmitted using the following procedure:

(1) Ensure that the Teleprinter is on line.

(2) Switch on the PTA and place the tape in the Tape Reader.

(3) Press the RDR ON button on the PTA.

(4) Press the AUTO TX button on the Teleprinter.

NOTES (1) The Tape Reader is disabled for transmission until the AUTO TX key is pressed. Once the key is pressed, the Reader remains enabled until one of the following events occurs:

A valid trailer is read from the tape.

The CANCEL facility is used (see para 80).

Off line is selected on the Teleprinter.

Nothing is received from the tape for ten seconds (this is to allow for a tape which does not have a valid trailer).

(2) When off line the Teleprinter and PTA can be used to produce local copy.

(3) When the AUTO TX button is pressed, the message is not printed on the TGQ6. This avoids the corruption of incoming messages which are being printed.

Print Last Transmission Sequence Number (PRINT TI)

69 Pressing this key causes the TI number of the last message sent to be printed. This function operates regardless of whether the Teleprinter is on or off line. The format of the message printed when this key is pressed is as follows:

```
**********************          **********************
*                    *          *                    *
* LAST TI = 416      *    or    * LAST TI = 2160     *
*                    *          *                    *
**********************          **********************
```

70 If this key is pressed whilst a message is being received, printing will be interrupted immediately, the above message will be output and printing will then resume. For this reason, this option should not be selected whilst messages are being received from the line.

Edit Header or Trailer (EDIT HD/TL)

71 This function is used to modify the stored header and trailer. The header is transmitted to line when AUTO TX is pressed. The trailer is compared with the input from the Keyboard or the Tape Reader to detect the end of message so that further input can be disabled until AUTO TX is next selected. The trailer is also used to form part of the ACP127 CANCEL trailer (see para 80).

72 The editing procedure for headers and trailers is similar to that used for the TGQ4 Teleprinter (see paras 44 to 49). The default header and trailer are as follows:

Header: 1111111111111111111VZCZCAAA

Trailer: 2 carriage returns, 8 linefeeds, NNNN111111111111

73 It is only possible to edit the header and trailer whilst the Teleprinter is off line. A warning message is printed if this option is selected whilst on line.

74 The header and trailer are stored in non-volatile memory and are not lost if the TGQ6 is switched off (provided that the battery switch on the Message Edit Board is set to on).

EXIT Function

75 Pressing this key terminates the character sequence keyed in when editing a header or trailer.

Editing the Transmission Sequence Number (EDIT TI)

76 This function enables the TI transmitted with the header to be modified. As with header/trailer editing, this can only be performed whilst the Teleprinter is off line and also the TI is stored in non-volatile memory.

77 Using this function enables the TI to be set to any value between zero and 9999. If a three-figure TI is required, three digits must be entered (eg 0 must be entered as 000). This also applies to four-figure numbers (eg enter 7 as 0007).

78 Once the Teleprinter is returned to on line, the next message transmitted will have the new TI. It will be incremented as normal when each message is transmitted, subject to the number of digits specified (ie 999 will be followed by 000, but 0999 will be followed by 1000). A transmitted TI is always preceded by a figure shift and followed by a letter shift.

79 The TI can be set to a default value of 001 (3 digits used) or 0001 (4 digits used) by typing "r" (or "R") instead of a number.

Cancel Transmission (CANCEL TX)

80 Pressing this key causes the transmission of a message to be aborted and results in the immediate transmission of an ACP127 CANCEL trailer. The Keyboard and Tape Reader (if a PTA is being used) are inhibited until the AUTO TX key is pressed. The format of the ACP127 trailer is as follows:

CR CR LF E␣E␣E␣E␣E␣E␣E␣E␣AR (where"␣" is a space character)

This is followed by a normal trailer.

NOTES (1) If the current transmission is cancelled, the TI of the next transmission is still incremented.

(2) When the Teleprinter is on line, pressing CANCEL TX always causes an ACP127 trailer to be transmitted, even if a message is not currently being transmitted.

(3) The ACP127 trailer cannot be edited.

DTR INVERSION FACILITY

81 The DTR line signal on a TGQ Teleprinter is usually taken low to inform the device connected to its line interface that it is unable to receive data for some reason (eg out of paper). However, the DTR signal on the TGQ6 can be inverted if necessary by changing the setting of DIL switch B2 as follows:

Normal DTR: Set B2 UP
Inverted DTR: Set B2 DOWN

The change will not take effect until the Teleprinter is switched off and then on again.

TGQ9 MESSAGE EDIT SYSTEM

82 The TGQ9 message edit system operates in a similar manner to the TGQ4 system. The basic modifications for TGQ9 are listed below:

The Edit buffer is limited to 360 characters.

The PTA (if connected) only operates in 5-bit ITA2 code. When the TGQ9 is set to operate in 8-bit ITA5 (ASCII) mode, automatic code conversion takes place between the Teleprinter and the PTA.

A revised paper tape interface is fitted. Tapes are automatically split on input into messages which do not exceed 360 characters in size.

REVISED PAPER TAPE INTERFACE

83 As the edit buffer in the TGQ9 is relatively small, the COMPOSE MESSAGE function controls the PTA in a different way to that described for TGQ4.

84 If the edit buffer gets close to full whilst text is being inserted from paper tape, the Tape Reader stops automatically at the next character and the Teleprinter then exits from the COMPOSE MESSAGE function with a suitable warning. When the COMPOSE MESSAGE is next requested, the Tape Reader starts again, inserting the remaining data from the tape into the message. This process continues until the tape runs out. The insertion is completed by selecting END INSERT and then EXIT. Thus, large paper tape messages can be split into blocks of 360 characters or less, ready for transmission.

OPERATING PROCEDURE FOR PAPER TAPE MESSAGES

85 To edit and transmit paper tape messages on the TGQ9, proceed as follows:

(1) Load the paper tape into the Tape Reader on the PTA.

(2) Select the COMPOSE MESSAGE function.

(3) Press the RDR ON button on the PTA. The tape will now be read into the message buffer until it runs out or until the edit buffer is close to full. If the tape runs out, proceed from step (7).

(4) When the edit buffer is close to full, the system exits from compose mode automatically and prints the message WARNING - Edit Buffer Full. The Tape Reader stops automatically at the next character.

(5) Select the COMPOSE MESSAGE function again. The Tape Reader will restart automatically.

(6) Continue operation from step (3).

(7) If the tape runs out and the edit buffer is only partially filled, select END INSERT and then EXIT to exit from compose mode. If the system has exited from compose mode automatically on the last character of the tape, no action is necessary.

(8) The messages created by this procedure are now stored in the TGQ9 and may be transmitted, edited, deleted, etc in the normal way.

MESSAGE TRANSMISSION

86 Message transmission on the TGQ9 has been modified in the following ways:

(1) When the TRANSMIT MESSAGE function is selected, a START_OF_TEXT (STX) character is sent immediately before the prompt for the message number is printed. If the message number entered is valid then the message is transmitted in the normal way.

(2) The default header is now "@@@" (three "at" symbols).

(3) The default trailer is now the END_OF_TEXT (ETX) character.

CODE CONVERSION

87 Tables 1A.1 and 1A.2 define the code conversion which takes place between the Teleprinter and the PTA when the TGQ9 is set to operate in ITA5 (ASCII) mode.

TABLE 1A.1

CODE CONVERSION TABLE ITA5 TO ITA2

ASCII code	ASCII character	ITA2 code (shift)	ITA2 character
00H	NULL	00H	NULL
01H	SOH	00H	NULL
02H	STX	00H	NULL
03H	ETX	00H	NULL
04H	EOT	00H	NULL
05H	ENQ	09H (F)	WRU
06H	ACK	00H	NULL
07H	BELL	0BH (F)	BELL
08H	BS	00H	NULL
09H	HT	00H	NULL
0AH	LF	02H	LF
0BH	VT	00H	NULL
0CH	FF	00H	NULL
0DH	CR	08H	CR
0EH	SO	00H	NULL
0FH	SI	00H	NULL
10H	DLE	00H	NULL
11H	DC1	00H	NULL
12H	DC2	00H	NULL
13H	DC3	00H	NULL
14H	DC4	00H	NULL
15H	NAK	00H	NULL
16H	SYN	00H	NULL
17H	ETB	00H	NULL
18H	CAN	00H	NULL
19H	EM	00H	NULL
1AH	SUB	00H	NULL
1BH	ESC	00H	NULL
1CH	FS	00H	NULL
1DH	GS	00H	NULL
1EH	RS	00H	NULL
1FH	US	00H	NULL
20H	SPACE	04H	SPACE
21H	!	00H	NULL
22H	"	00H	NULL
23H	#	00H	NULL
24H	$	14H (F)	$
25H	%	0DH (F)	%
26H	&	00H	NULL
27H	'	05H (F)	'

TABLE 1A.1 (Contd)

CODE CONVERSION TABLE ITA5 TO ITA2

ASCII code	ASCII character	ITA2 code (shift)	ITA2 character
28H	(	0FH (F)	(
29H	)	12H (F)	)
2AH	*	00H	NULL
2BH	+	11H (F)	+
2CH	,	0CH (F)	,
2DH	-	03H (F)	-
2EH	.	1CH (F)	.
2FH	/	1DH (F)	/
30H	0 (zero)	16H (F)	0
31H	1	17H (F)	1
32H	2	13H (F)	2
33H	3	01H (F)	3
34H	4	0AH (F)	4
35H	5	10H (F)	5
36H	6	15H (F)	6
37H	7	07H (F)	7
38H	8	06H (F)	8
39H	9	18H (F)	9
3AH	:	0EH (F)	:
3BH	;	00H	NULL
3CH	<	00H	NULL
3DH	=	1EH (F)	=
3EH	>	00H	NULL
3FH	?	19H (F)	?
40H	@	1AH (F)	@
41H	A	03H (L)	A
42H	B	19H (L)	B
43H	C	0EH (L)	C
44H	D	09H (L)	D
45H	E	01H (L)	E
46H	F	0DH (L)	F
47H	G	1AH (L)	G
48H	H	14H (L)	H
49H	I	06H (L)	I
4AH	J	0BH (L)	J
4BH	K	0FH (L)	K
4CH	L	12H (L)	L
4DH	M	1CH (L)	M
4EH	N	0CH (L)	N
4FH	O	18H (L)	O

TABLE 1A.1 (Contd)

CODE CONVERSION TABLE ITA5 TO ITA2

ASCII code	ASCII character	ITA2 code (shift)	ITA2 character
50H	P	04H (L)	P
51H	Q	00H (L)	Q
52H	R	00H (L)	R
53H	S	00H (L)	S
54H	T	14H (L)	T
55H	U	0DH (L)	U
56H	V	00H (L)	V
57H	W	05H (L)	W
58H	X	0FH (L)	X
59H	Y	12H (L)	Y
5AH	Z	00H (L)	Z
5BH	[	00H	NULL
5CH	\	00H	NULL
5DH	]	00H	NULL
5EH	^	00H	NULL
5FH		00H	NULL
60H	~	00H	NULL
61H	a	03H (L)	A
62H	b	19H (L)	B
63H	c	0EH (L)	C
64H	d	09H (L)	D
65H	e	01H (L)	E
66H	f	0DH (L)	F
67H	g	1AH (L)	G
68H	h	14H (L)	H
69H	i	06H (L)	I
6AH	j	0BH (L)	J
6BH	k	0FH (L)	K
6CH	l	12H (L)	L
6DH	m	1CH (L)	M
6EH	n	0CH (L)	N
6FH	o	18H (L)	O
70H	p	04H (L)	P
71H	q	00H (L)	Q
72H	r	00H (L)	R
73H	s	00H (L)	S
74H	t	14H (L)	T
75H	u	0DH (L)	U
76H	v	00H (L)	V
77H	w	05H (L)	W

TABLE 1A.1

CODE CONVERSION TABLE ITA5 TO ITA2

ASCII code	ASCII character	ITA2 code (shift)	ITA2 character
78H	x	0FH (L)	X
79H	y	12H (L)	Y
7AH	z	00H (L)	Z
7BH	{	0FH (F)	(
7CH	¦	00H	NULL
7DH	}	12H (F)	)
7EH	~	00H	NULL
7FH	DELETE	00H	NULL

TABLE 1A.2

CODE CONVERSION TABLE ITA2 TO ITA5

ITA2 code (shift)	ITA2 character	ITA5 code	ITA5 character
00H	NULL	00H	NULL
01H (F)	3	33H	3
(L)	E	45H	E
02H	LF	0AH	LF
03H (F)	-	2DH	-
(L)	A	41H	A
04H	SPACE	20H	SPACE
05H (F)	'	27H	'
(L)	S	53H	S
06H (F)	8	38H	8
(L)	I	49H	I
07H (F)	7	37H	7
(L)	U	55H	U
08H	CR	0DH	CR
09H (F)	WRU	05H	ENQ
(L)	D	44H	D
0AH (F)	4	34H	4
(L)	R	52H	R
0BH (F)	BELL	07H	BELL
(L)	J	4AH	J
0CH (F)	,	2CH	,
(L)	N	4EH	N
0DH (F)	%	25H	%
(L)	F	46H	F
0EH (F)	:	3AH	:
(L)	C	43H	C
0FH (F)	(	28H	(
(L)	K	4BH	K
10H (F)	5	35H	5
(L)	T	54H	T
11H (F)	+	2BH	+
(L)	Z	5AH	Z
12H (F)	)	29H	)
(L)	L	4CH	L
13H (F)	2	32H	2
(L)	W	57H	W
14H (F)	$	24H	$
(L)	H	48H	H
15H (F)	6	36H	6
(L)	Y	59H	Y

TABLE 1A.2 (Contd)

CODE CONVERSION TABLE ITA2 TO ITA5

ITA2 code (shift)	ITA2 character	ITA5 code	ITA5 character
16H (F)	0	30H	0
(L)	P	50H	P
17H (F)	1	31H	1
(L)	Q	51H	Q
18H (F)	9	39H	9
(L)	0	4FH	0
19H (F)	?	3FH	?
(L)	B	42H	B
1AH (F)	@	40H	@
(L)	G	47H	G
1BH	FIGURE SHIFT	-	
1CH (F)	.	2EH	.
(L)	M	4DH	M
1DH (F)	/	2FH	/
(L)	X	58H	X
1EH (F)	=	3DH	=
(L)	V	56H	V
1FH	LETTER SHIFT	-	

CHAPTER 2

OPERATING INSTRUCTIONS,
PAPER TAPE ATTACHMENT (PTA)

CONTENTS

Paragraph		
1	GENERAL	
2	OPERATOR'S CONTROLS	
2	ON/OFF Switch and POWER Button	
4	RDR ON Button	
6	STEP Button	
7	ERROR Button	
8	PUNCH ON Button	
9	BS Button	
10	FEED Button	
11	Tape Width Selector Switch	
12	OPERATING INSTRUCTIONS	
12	OPERATING IN ITA5 (ASCII) MODE	
13	Control Codes	
14	Initial Checks Prior to Use	
15	Operating the Tape Punch	
17	Operating the Tape Reader	
18	OPERATING IN ITA2 (BAUDOT) MODE	
19	Control Codes	
20	Initial Checks Prior to Use	
22	Operating the Tape Punch and Reader	
23	ROUTINE MAINTENANCE	
24	Cleaning	
25	Replacing a Paper Tape Reel	

ILLUSTRATIONS

Figure		Page
2B.2.1	Paper Tape Attachment	2.2
2B.2.2	PTA with Paper Tape Correctly Installed	2.9/10

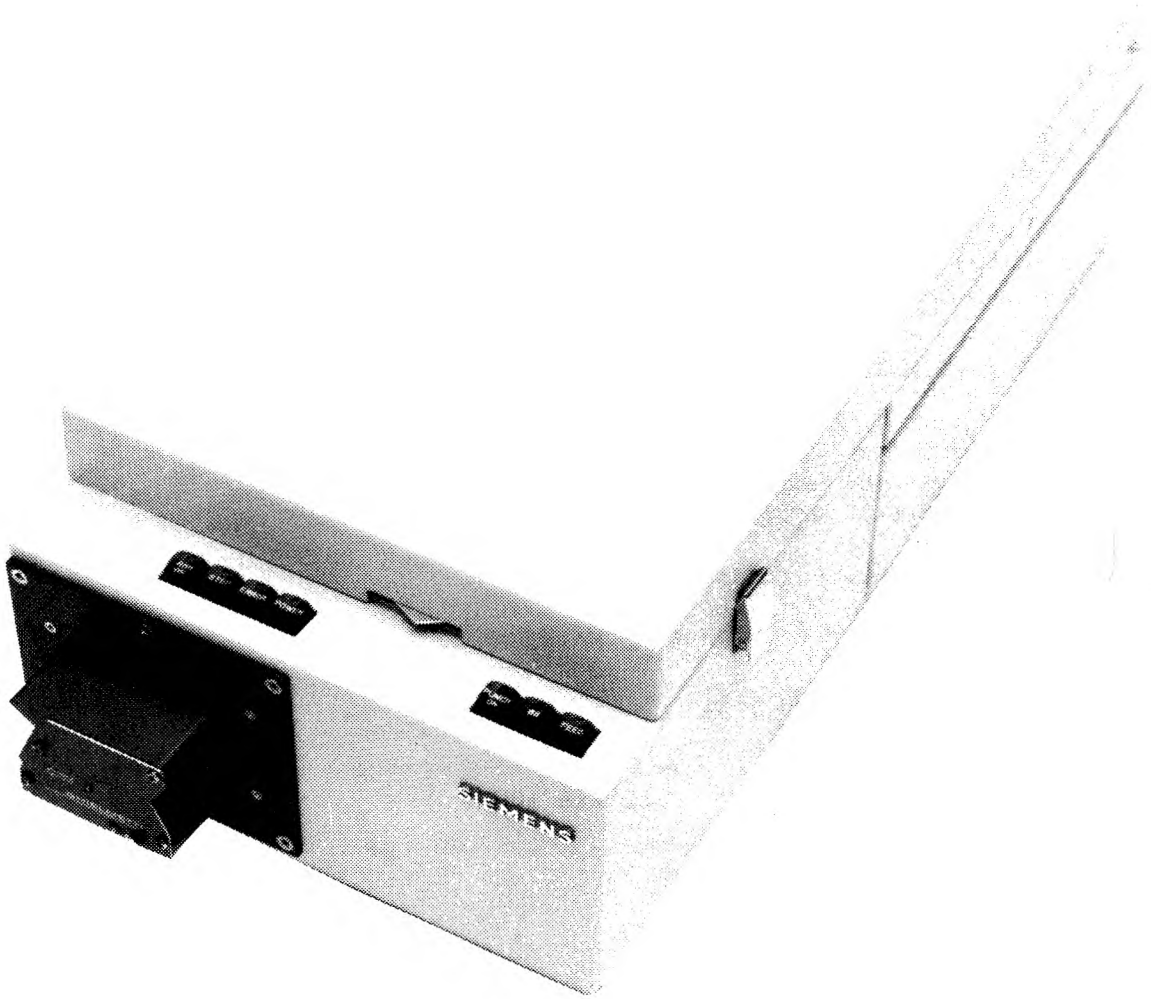


FIG 2B.2.1 PAPER TAPE ATTACHMENT
5815-99-780-8815

CHAPTER 2

OPERATING INSTRUCTIONS,

PAPER TAPE ATTACHMENT (PTA)

GENERAL

1 This chapter describes how to operate a PTA when it is used in conjunction with a TGQ Teleprinter. The information contained here assumes that the PTA has been set up correctly, in accordance with the installation instructions contained in Category 4B.

OPERATOR'S CONTROLS

ON/OFF Switch and POWER Button

2 The ON/OFF switch is a "rocker" type switch. It is located in the centre of the rear panel, to the left of the power cable (PTA viewed from the front). Press the upper part of the switch to switch on the PTA and the lower part to switch off.

3 When the PTA is switched on, this causes the small red LED in the POWER button to illuminate. Note that the POWER button is a "dummy" button and provides no other function.

CAUTION Failure of internal dc voltage may cause the POWER LED to extinguish when the PTA is still switched on. Always confirm that power has been removed by checking the position of the ON/OFF switch.

RDR ON Button

4 This button controls the Tape Reader. Provided that the necessary signals are present on the data cable and the tape has been inserted correctly into the Reader, pressing this button causes the tape to be read by the PTA and the information to be printed on the TGQ Teleprinter. Pressing the button again stops the tape and the red LED in the RDR ON button extinguishes. Running out of tape or opening the Reader flap also causes the RDR ON LED to extinguish and stops tape movement through the Reader.

5 The RDR ON button also has a second function. If the button is pressed and held whilst the PTA is switched on, this causes the LED to flash until the button is released. This procedure causes the PTA to power up in either ITA2 or ITA5 mode, depending on the mode set by the internal DIL switches (see note below). ie If the PTA has been set up via the DIL switches to operate in ITA5 mode, this procedure will switch the PTA to ITA2 mode and vice versa. The new mode remains operational until the PTA is switched off.

NOTE Access to the DIL switches requires the partial dismantling of the PTA's case. See Category 4B for the setting up procedure for these switches.

STEP Button

6 Pressing this button causes the paper tape in the Tape Reader to advance one position. The button incorporates an auto repeat facility which causes the tape to advance continuously whilst the button is pressed and held. Each character read is transmitted to the data line.

NOTE This button is inoperative when RDR ON is selected.

ERROR Button

7 This is a dummy button. The built-in LED will flash if an error condition occurs whilst the Tape Punch is operating, eg if the Punch runs out of paper or if the tape tension arm detects a tape jam. The LED will continue to flash until the fault is cleared.

PUNCH ON Button

8 Pressing this button switches on the Tape Punch, enabling it to punch characters received from the data line onto paper tape. The built-in LED illuminates when the Punch is switched on.

NOTE Control codes received by the PTA (see paras 13 and 19) may or may not be punched, depending on the setting of one of the DIL switches (see Category 4B for further details).

BS Button

9 Pressing this button causes the paper tape in the Punch to backspace one character position. This facility is inoperative if the Punch is switched on (ie if the PUNCH ON LED is lit).

FEED Button

10 Pressing this button causes the paper tape in the Punch to advance one character position, thus punching a sprocket hole in the tape. The button incorporates an auto repeat facility which causes the tape to advance continuously whilst the button is pressed and held. Pressing the button has no effect if the Punch is switched on.

Tape Width Selector Switch

11 This small switch is mounted on the front of the Tape Reader unit. It enables the Reader to be set for 5-hole (ITA2), 6-hole (not used), or 8-hole (ITA5) tape.

NOTE 8-hole tape (1 in wide) can also be used when operating in ITA2 mode (see para 21).

OPERATING INSTRUCTIONS

OPERATING IN ITA5 (ASCII) MODE

12 In ITA5 mode the PTA configures its serial communications device as follows:

1 start bit
7 data bits
Odd parity
1 stop bit

Seven data bits are punched. The eighth bit is not punched on some early PTAs and will be ignored by the Reader. On all other PTAs the eighth bit is punched according to the setting of internal DIL switches SWA7 and SWA8. All characters read from the tape will be transmitted, including nulls and rubouts. All characters received by the PTA can be punched. Control codes received (see para 13) may or may not be punched, depending on the setting of one of the internal DIL switches.

Control Codes

13 If the internal DIL switch is set such that control codes received are selected, they will not be punched but they will affect the operation of the PTA. The ITA5 control codes which affect the PTA are as follows:

<CONTROL>Q	(11H)	READER ON selected
<CONTROL>S	(13H)	READER ON deselected
<CONTROL>R	(12H)	PUNCH ON selected
<CONTROL>T	(14H)	PUNCH ON deselected

The RDR ON and PUNCH ON LEDs will indicate the state of the Reader and the Punch and the buttons will remain enabled.

Initial Checks Prior To Use

14 Before using the PTA in ITA5 mode, ensure that it is set up correctly:

(1) Check that 8-hole (1 in) tape is loaded into the Punch.

(2) Check that the tape width switch on the front of the Reader is set to "8".

(3) Check with the installation technician that the PTA has been set up for operation in ITA5 mode. If in doubt, load a known ITA5 tape into the Reader and transmit to the Teleprinter. If the message is not reproduced exactly, switch off the PTA and then switch on again whilst pressing the RDR ON button. Retransmit the message. If it still does not work, there is some other fault which must be investigated.

Operating the Tape Punch

15 Incoming messages are punched automatically when the PTA is switched on and the LED in the PUNCH ON button is illuminated. If the LED is unlit, press the PUNCH ON button.

16 When a message has been received, press the PUNCH ON LED to switch off the Punch. Press the FEED button for a second and then tear the tape off at the tear-off bar. Switch on the Punch to receive further messages.

NOTE If the ERROR LED illuminates whilst the Punch is operating, check the amount of tape left on the reel and replace as soon as possible (see para 25).

Operating the Tape Reader

17 To print punched messages on the Teleprinter, proceed as follows:

(1) Check that the Teleprinter is switched on and set to OFFLINE.

(2) Open the reader mechanism by lifting the left-hand side of the reader head.

(3) Slot the punched tape between the reader head and the baseplate with the tape lead-in pointing to the left (the tape moves through the Reader from right to left as it is being read).

(4) Position the sprocket holes in the tape over the sprocket wheel pins. Lower the reader head, thus trapping the tape in position.

(5) Press the RDR ON button. The Reader will read the tape and print out the message on the Teleprinter.

NOTE If the tape width does not match the setting on the front of the Reader, the tape will jam and cause the Reader to switch off.

OPERATING IN ITA2 (BAUDOT) MODE

18 In ITA2 mode the PTA configures its serial communications device as follows:

1 start bit
5 data bits
Odd parity
1.5 stop bits

The significance of ITA2 data depends on the most recent shift character received (figure shift 1BH, letter shift 1FH). Ensure that data sent to the PTA begins with a shift character, otherwise an ambiguity may arise.

Control Codes

19 As with ITA5, the same DIL switch determines whether or not control codes sent to the PTA are punched. However, only three control codes are recognised in ITA2:

CCCC READER ON selected
FFFF PUNCH ON selected
SSSS Reader and Punch both deselected

The RDR ON and PUNCH ON LEDs will indicate the state of the Reader and the Punch and the buttons will remain enabled.

Initial Checks Prior to Use

20 If 5-hole (11/16 in) tape is loaded in the PTA, it is almost certain that it is already set up to operate in ITA2 mode as 5-hole tape cannot be used in ITA5 mode. Check that the tape width switch on the front of the Reader is set to "5".

21 If 8-hole (1 in) tape is loaded in the PTA, this can be used to punch and read ITA2 tapes, provided the tape width switch is set to "8". In this case, the checking procedure is similar to that mentioned in para 14 (3). Once it has been established that the PTA is in ITA5 mode, it can be switched to ITA2 mode by switching off the PTA at the ON/OFF switch and then switching on again whilst pressing the RDR ON button.

NOTE Do not exchange a 1 in tape reel for an 11/16 in reel if the PTA is only going to be used temporarily in ITA2 mode. This is because the position of the tape guide in the Punch must be changed each time the width of tape used is changed. Access to the tape guide requires the partial dismantling of the Punch Unit, which should only be done by an installation or maintenance technician.

Operating the Tape Punch and Reader

22 The procedures for operating the Tape Punch and Reader in ITA2 mode are identical to those for operating in ITA5 mode (see paras 15 and 17 respectively).

ROUTINE MAINTENANCE

23 Routine maintenance on the PTA is restricted to cleaning and replacing a paper tape roll.

Cleaning

24 Cleaning of the PTA by an operator is restricted to the following tasks:

(1) Empty the chad box when it becomes half full. Remove any chad which may have accumulated on the floor of the chad box recess.

NOTE The chad box is held in place by a metal spring which forces it upwards against a lip on the left-hand side of the box. To remove the box, press it downwards and away from the Punch Unit. Replacement is a reversal of the removal

(2) Prise the silver magnetic strip off the top of the Punch Unit and remove any chad present.

(3) Lift the reader head and clean the baseplate with a soft cloth.

Replacing a Paper Tape Reel Figure 2B.2.2

25 To replace a paper tape reel, check that the new reel is of the correct width and then proceed as follows:

(1) Release the catch on each side of the Tape Reel Box and raise the lid until it locks in the raised position.

(2) Tear the tape where it feeds into the Punch Unit. Switch off the Punch and then press FEED to eject the tape from the Punch.

(3) Lift the old tape reel off the turntable and place the new reel on the turntable such that clockwise rotation will unwind the tape.

(4) Draw the end of the tape forward, twist it to the left such that it is horizontal and then feed it through the front roller from underneath.

(5) Pull the tape towards the rear of the PTA. Feed it through the roller on the end of the Brake Arm Assembly from underneath. Note that there is a black plastic bracket on this roller which must be pushed back before the tape can be fed through.

(6) Draw the tape forward and feed it into the slot at the rear of the Tape Punch.

(7) Press the small aluminium bar which is between the perspex window and the tear-off bar. The window will hinge upwards, enabling the tape to be fed over the punch sprocket wheel.

(8) Close the window (thus trapping the tape on the sprocket wheel) and then press FEED to ensure that the tape runs smoothly through the Punch.

(9) Unlatch the lid stay-rod and close the lid.



PTA WITH PAPER TAPE CORRECTLY INSTALLED FIG 2B.2.2

C3

TELEPRINTER, TGQ SERIES

CATEGORY 3 - TECHNICAL DESCRIPTION

CONTENTS

CATEGORY 3A - TECHNICAL DESCRIPTION, TGQ TELEPRINTERS

Chapter 1 - General Information
Chapter 2 - Principles of Operation
Chapter 3 - Printer Control Board
Chapter 4 - Interface Control Board
Chapter 5 - Message Edit & Memory Expansion Boards
Chapter 6 - Motherboard
Chapter 7 - RF Filter Boards
Chapter 8 - RF Box
Chapter 9 - Power Supply
Chapter 10 - Printer Assembly
Chapter 11 - Switch Panel Assembly
Chapter 12 - Keyboard

CATEGORY 3B - TECHNICAL DESCRIPTION, PAPER TAPE ATTACHMENT (PTA)

Chapter 1 - General Information
Chapter 2 - Principles of Operation
Chapter 3 - Controller Board
Chapter 4 - Transformer and Power Supply
Chapter 5 - RF Box
Chapter 6 - Filter Board
Chapter 7 - Tape Punch Assembly
Chapter 8 - Tape Reader Assembly
Chapter 9 - Brake Arm Assembly
Chapter 10 - Switch Panel Assembly

TELEPRINTER, TGO SERIES

CATEGORY 3A - TECHNICAL DESCRIPTION, TGO TELEPRINTERS

CONTENTS

Chapter 1 - General Information
Chapter 2 - Principles of Operation
Chapter 3 - Printer Control Board
Chapter 4 - Interface Control Board
Chapter 5 - Message Edit & Memory Expansion Boards
Chapter 6 - Motherboard
Chapter 7 - RF Filter Boards
Chapter 8 - RF Box
Chapter 9 - Power Supply
Chapter 10 - Printer Assembly
Chapter 11 - Switch Panel Assembly
Chapter 12 - Keyboard

C H A P T E R 1

G E N E R A L I N F O R M A T I O N

CONTENTS

Paragraph

1 INTRODUCTION
2 CONSTRUCTION
4 Printer Assembly
6 Switch Panel Assembly
7 Printer Control Board
8 Interface Control Board
9 Message Edit Board
10 Memory Expansion Board
11 Motherboard
12 Filter Boards
13 RF Box
14 Mains Transformer and Power Supply Module
15 Keyboard

ILLUSTRATIONS

Figure | Page

3A.1.1 TGQ Series Teleprinter - Module Layout Diagram 1.2

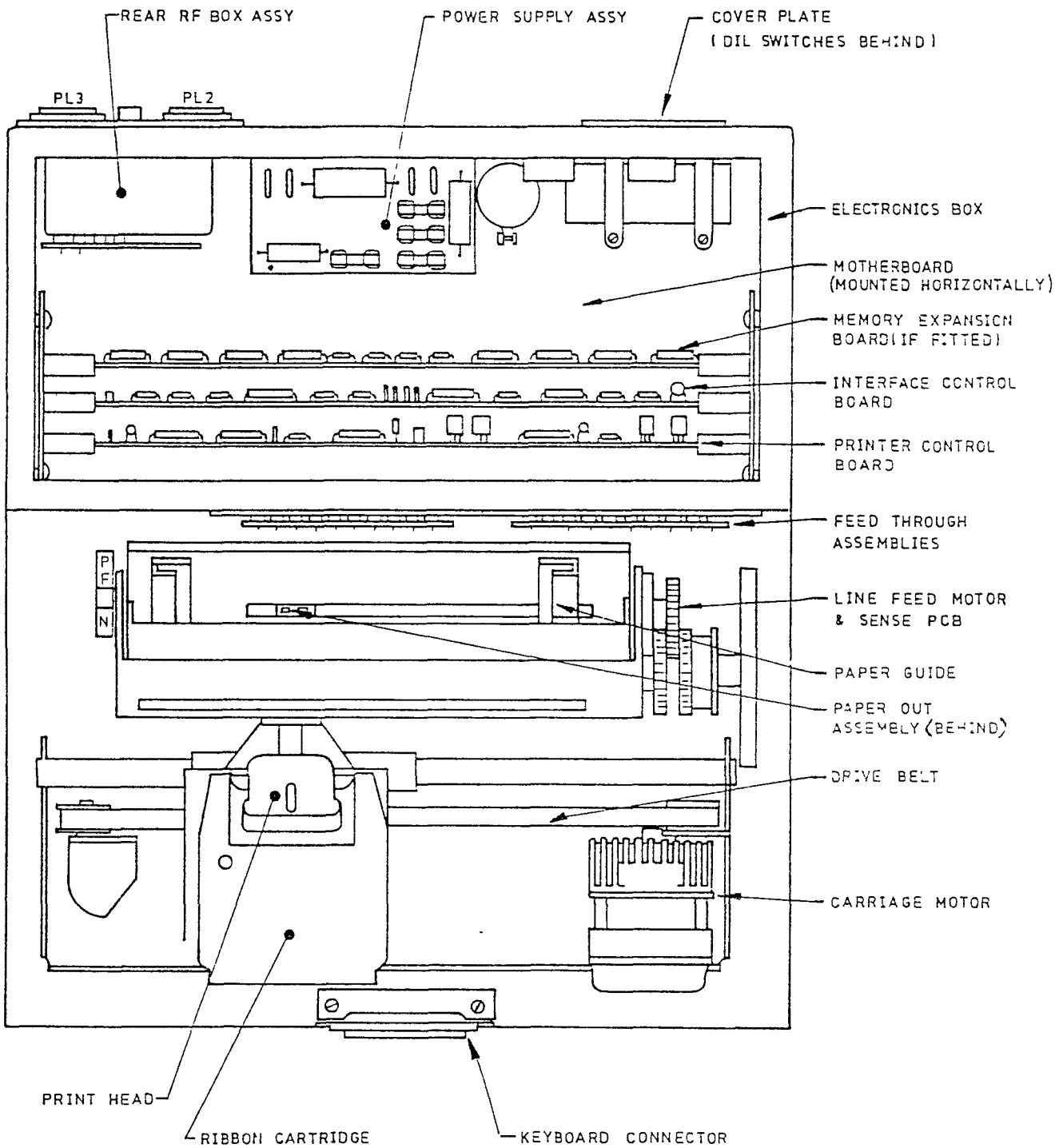


FIG 3A.1.1 TGQ SERIES TELEPRINTER - MODULE LAYOUT DIAGRAM

CHAPTER 1

GENERAL INFORMATION

INTRODUCTION

1 The TGQ Series Teleprinters are a family of machines based on the TGQ2. Each variant offers slightly different features fitted as standard, eg keyboard, message editing facilities, Paper Tape Attachment (PTA), etc. All TGQ Teleprinters are designed to operate in ITA5 or ITA2 mode. The "open" design philosophy used enables the TGQ Teleprinters to be connected to a wide range of communications equipment.

CONSTRUCTION

2 The body of the TGQ Teleprinter consists of two compartments. The Electronics Box contains the circuit boards and power supply and the Printer Cover shields the Printer Assembly. Both compartments are separately fixed to a rigid metal baseplate by screws. The Keyboard, wher fitted, connects to a 25-way D-type connector mounted on the front of the Printer. It is held in place by a small mounting plate which secures it to the baseplate.

3 The modules contained in the Electronics Box are accessed by removing the screws on the edge of the lid. Access to the Printer Assembly and Filter Boards is by removing the screws in the baseplate which hold the Printer Cover in place. All modules can be replaced easily using only a cross-head and (in some cases) a blade screwdriver. Plug and socket connectors, screw terminals and spade connectors are used throughout, eliminating the need for soldered connections between modules. Brief descriptions of the modules contained in the Teleprinter are given below.

NOTE RF suppression gaskets are fitted between some removable metal covers and the metal case. To maintain Tempest integrity, these gaskets must be in place and all screws tightened evenly on completion of maintenance work.

Printer Assembly

4 This is a self-contained assembly which, if necessary, is replaced as a complete unit. It contains all the devices necessary to perform the following functions:

Head carriage driving
Ribbon driving
Head carriage position sensing
Paper advance
Out of paper detector

5 Printing is achieved via a 9 wire print head. This produces a standard character format of 12 chars/in with a 10 x 9 matrix (other character formats are available) at a speed of 90 cps. Plain or pin feed paper may be used in the Printer.

Switch Panel Assembly

6 This is mounted on the left-hand side of the Printer Cover. It consists of a small circuit board which has four buttons mounted on it. These buttons provide indications for mains power and on/off line and controls for form set and form feed functions.

Printer Control Board

7 This board contains an Intel 8039 microprocessor which controls all the basic printer functions via various input/output circuits. Several versions of software can be fitted to this board to provide slightly different printer capabilities, depending on which TGQ Teleprinter is in use.

Interface Control Board

8 This board contains an Intel 8085 which controls communication between the Teleprinter and external equipment (including the PTA). It also controls the Keyboard, if one is fitted. As with the Printer Control Board, one of several versions of software may be fitted to meet different requirements.

Message Edit Board

9 This is only fitted to the TQG4, TGQ6 and TGQ9 variants, different software being used for each of these. The Message Edit Board contains non-volatile memory and a back-up battery which enables messages to be stored for future printing or transmission. If the Teleprinter is switched off, the messages are retained in memory and are not lost until they are deliberately deleted by the operator.

Memory Expansion Board

10 This is only fitted to the TGQ5 and TGQ11 variants. The Memory Expansion Board contains 56 Kbytes of volatile Random Access Memory (RAM), which increases the size of the buffer from 112 characters to 55 Kbytes. The board can be fitted as an option to any other TGQ variant except TGQ4, TGQ6 and TGQ9 (see note) by fitting different software in the Interface Control Board and changing link settings.

NOTE The Message Edit Board and the Memory Expansion Board cannot both be used in the same Teleprinter as they occupy the same slot.

Motherboard

11 This contains three pec connectors for the above-mentioned pecs (some early models have four connectors), and two DIL switch blocks. The basic function of the motherboard is to route internal signals between the other pecs, the Printer and the communications line, and to provide power for the other pecs. The DIL switches enable various Teleprinter options to be invoked (eg line speed, character code, line spacing, etc).

Filter Boards

12 Two filter boards (right and left-hand) are fitted between the Electronics Box and the Printer Unit. These pass signals between the Motherboard and the Printer Unit and Keyboard. The signals are filtered via passive devices mounted on the two boards.

RF Box

13 This is mounted to the rear panel of the Teleprinter. It provides the following functions:

Mains on/off switch
Mains input filter
Signal input filter
Mains protection via an integral fuse
Mains input voltage selection via rear-mounted terminal blocks

Mains Transformer and Power Supply Module

14 These combine to produce the nominal dc voltages required by the Teleprinter. +24 V, +10 V and -10 V are all produced by full-wave rectification and capacitor smoothing. Two separately-regulated +5 V rails are derived from the same full-wave rectified secondary. One +5 V rail powers powers the Printer Control Board and the Message Edit Board (if fitted). The other +5 V rail provides power to the Interface Control Board and the spare pec connector. Both +5 V rails are over-voltage protected and all voltage rails are fused independently.

Keyboard

15 A keyboard is fitted as standard to all the TGQ Teleprinters except for TGQ1, TGQ7 and TGQ8. It connects to the front of the Teleprinter via a 25-way D-type connector and is held in place by a rigid support plate screwed to the underside.

16 The Keyboard consists of a matrix of column and row tracks. Pressing a key causes the encoded signal for that character to be transmitted to the Interface Control Board via the Right-Hand Filter Board. The signal is then passed to the Printer Control Board and then via the Left-Hand Filter Board to the print head. This forms the correct dot pattern to print the character on the paper.

17 The only electronic components in the Keyboard are the indicator LEDs for LOCK, CAPS LOCK, ON LINE, MSG and ERROR and their associated current limiting resistors.

CHAPTER 2

PRINCIPLES OF OPERATION

CONTENTS

Paragraph

1 INTRODUCTION
2 TRANSMISSION
5 RECEPTION
8 OPERATING MODES
9 On Line Mode
10 Off Line Mode

ILLUSTRATIONS

Figure		Page
3A.2.1	TGQ2 Teleprinter - Signal Flow Diagram	2.5
3A.2.2	Block Diagram - Printer Control & Interface Control PECs	2.6
3A.2.3	TGQ2 Teleprinter Interconnection Diagram	2.7/8
3A.2.4	TGQ Series Teleprinters - Overall Schematic Diagram	2.9/10

CHAPTER 2

PRINCIPLES OF OPERATION

INTRODUCTION

1 This chapter describes how incoming and outgoing data is processed by the TGQ Teleprinter. Figure 3A.2.1 gives an overall view of how the data is routed through the Teleprinter. Figure 3A.2.2 shows how the data is handled internally by the Printer Control and Interface Control circuit boards. The interconnections between all the modules in the Teleprinter are shown in detail in Figure 3A.2.3.

TRANSMISSION (All Outfits Except TGQ1, TGQ7 and TGQ8)

2 Information received by the Teleprinter from the Keyboard is passed to the Interface Control Board via the RH Filter Board. The information is encoded into ITA5 or ITA2 and if the Teleprinter is on line, it is transmitted to the signal line via the RF Box. At the same time, the information is passed from the Interface Board to the Printer Control Board and then to the Printer Unit via the LH Filter Board.

3 If a PTA is being used (eg TGQ3), information fed to the Teleprinter from the Tape Reader is filtered by the RF Box before being passed to the Interface Control Board. From here it is encoded and passed to the signal line if the Teleprinter is on line.

NOTE Messages read by the Tape Reader will not be passed to the Printer unless the Teleprinter is off line.

4 Messages typed on the Keyboard can be punched onto paper tape provided that the Tape Punch is switched on and the Teleprinter is on line.

RECEPTION

5 All messages received from the serial line are recorded on the Printer and can be recorded onto paper tape if a PTA is connected.

6 Incoming messages pass through the RF Box where the signals are filtered before they are passed to the Interface Control Board. The information is then decoded and passed to the Printer Control Board. This board ensures that the information is printed correctly by controlling the operation of the stepper motor, the linefeed motor, the print head, etc.

7 If the incoming message is to be punched, a copy is sent to the Tape Punch by the Interface Control Board.

OPERATING MODES

8 There are two distinct operating modes on the TGQ Teleprinters:

On line - ONLINE LED lit
Off line - ONLINE LED unlit

On Line Mode

9 This mode can be split between two operations - on line transmit and on line receive. Messages received whilst the Teleprinter is on line are printed automatically and also punched if a PTA is connected and the Punch is switched on. Messages to be transmitted which are input from either the Keyboard or the Tape Reader (if connected) may or may not be printed, depending on whether or not the Teleprinter is set up to operate in full or half duplex. If the Teleprinter is set up for half duplex, transmitted messages will also be printed. If the Teleprinter is set up for full duplex, messages will be transmitted but not printed.

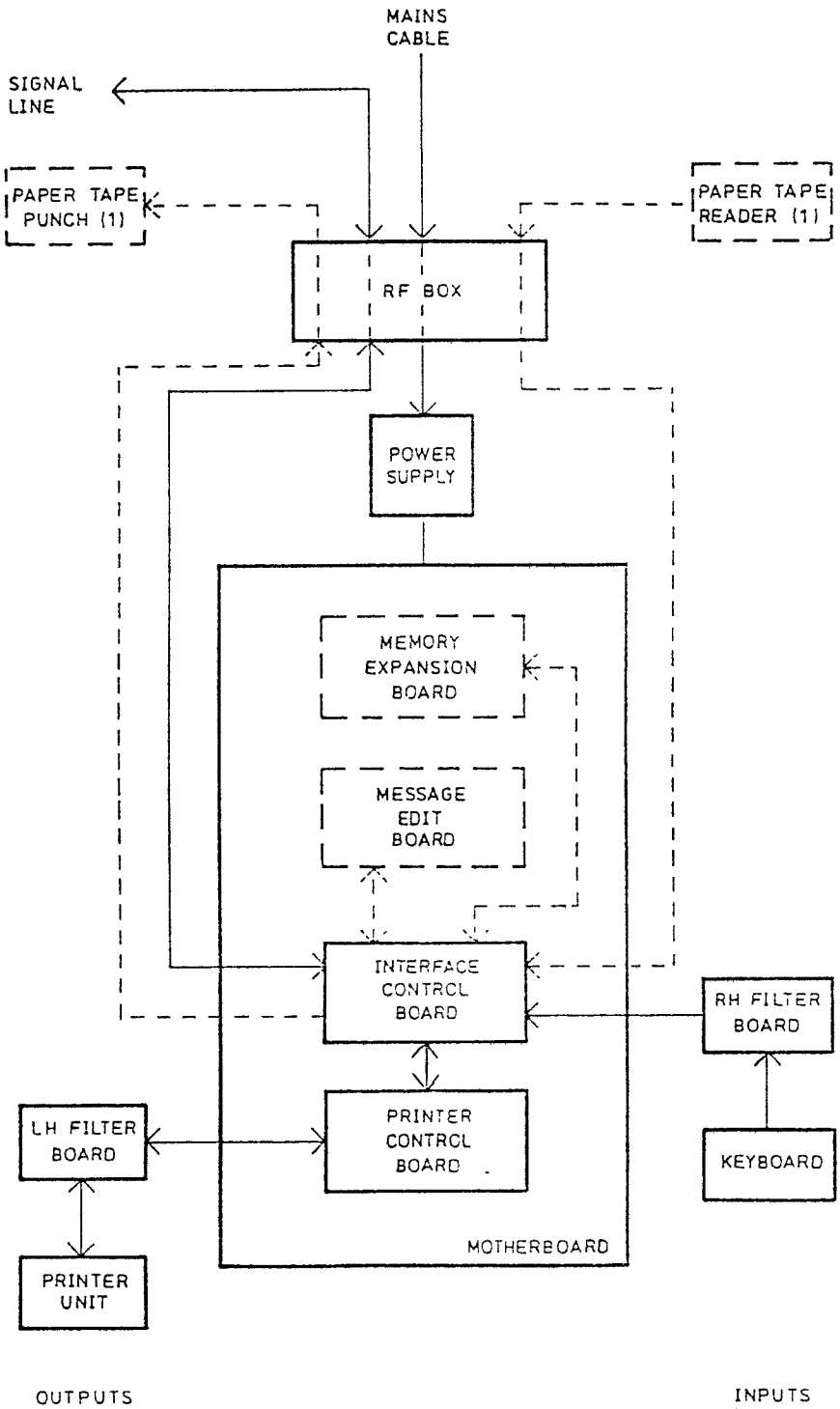
NOTES (1) On all variants with a keyboard, if an incoming message is received whilst an outgoing message is being typed in, the printing of the typed-in message will be corrupted but the integrity of the message being transmitted will not be affected.

(2) If the remote equipment automatically echoes characters back down the line, transmitted messages will be printed when operating in full duplex.

(3) Switching between full and half duplex is achieved by changing the position of DIL switch B2.

Off Line Mode

10 When operating off line, characters input from the keyboard are printed and punched on the PTA (if connected). Messages fed to the Teleprinter from the Tape Reader are also printed. These features operate irrespective of whether the Teleprinter is in half duplex or full duplex mode.



NOTES
(1) THE PAPER TAPE PUNCH AND READER SIGNALS ARE PHYSICALLY TRANSMITTED ALONG THE SAME CABLE
(2) "_ _ _" DENOTES OPTIONAL EQUIPMENT WHICH MAY BE STANDARD ON SOME TGQ VARIANTS

TGQ2 TELEPRINTER - SIGNAL FLOW DIAGRAM FIG 3A.2.1

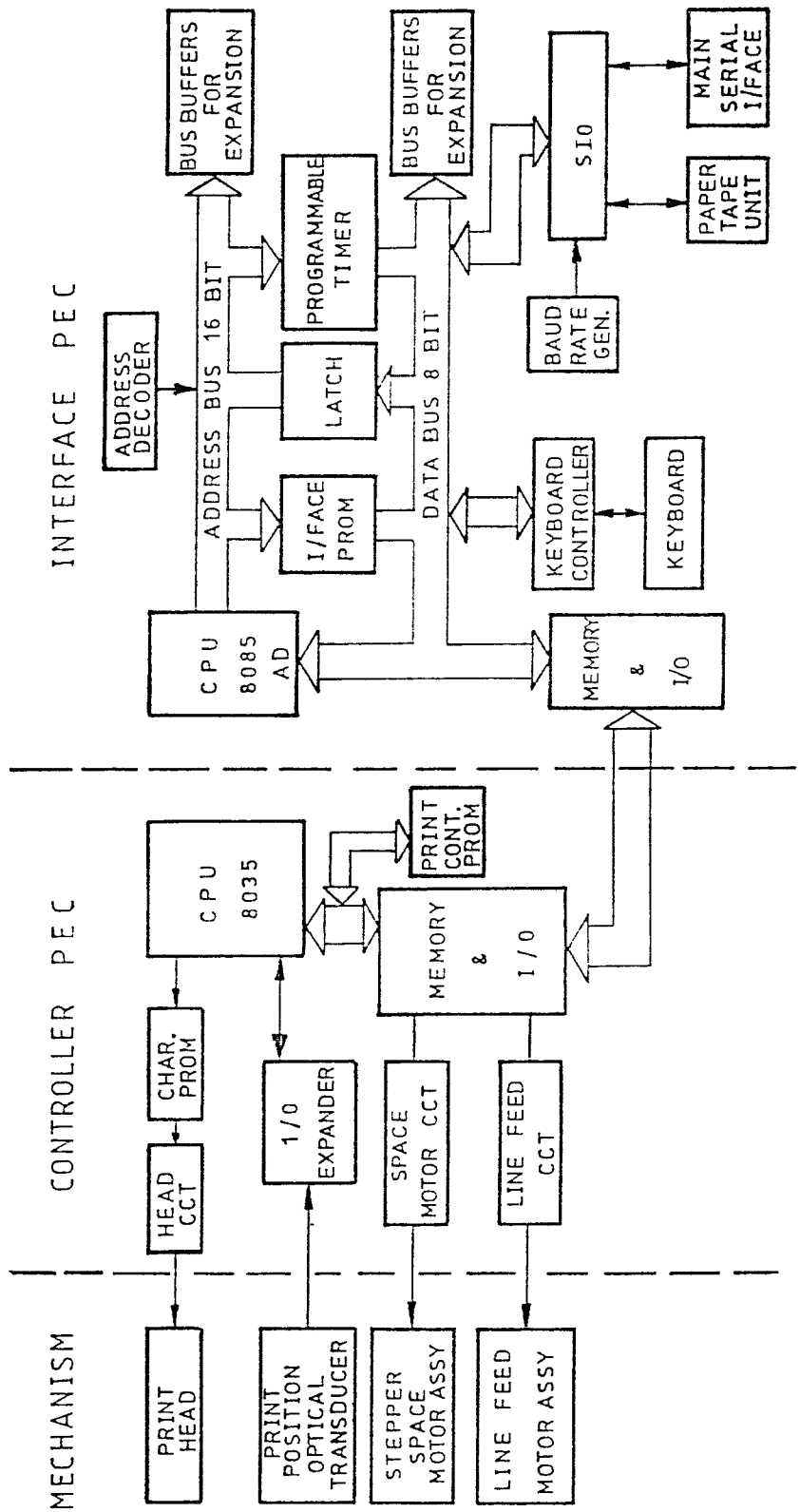
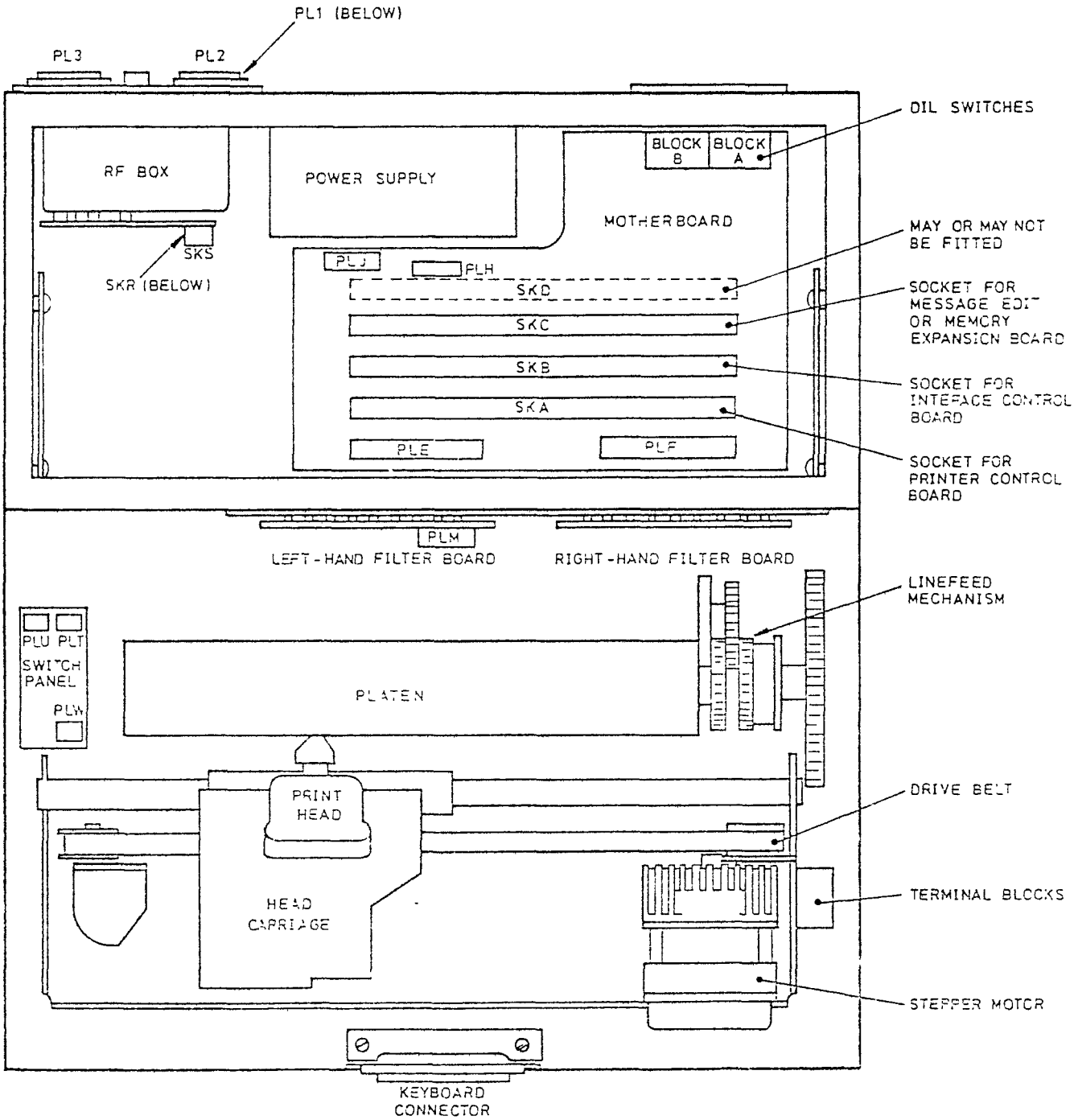
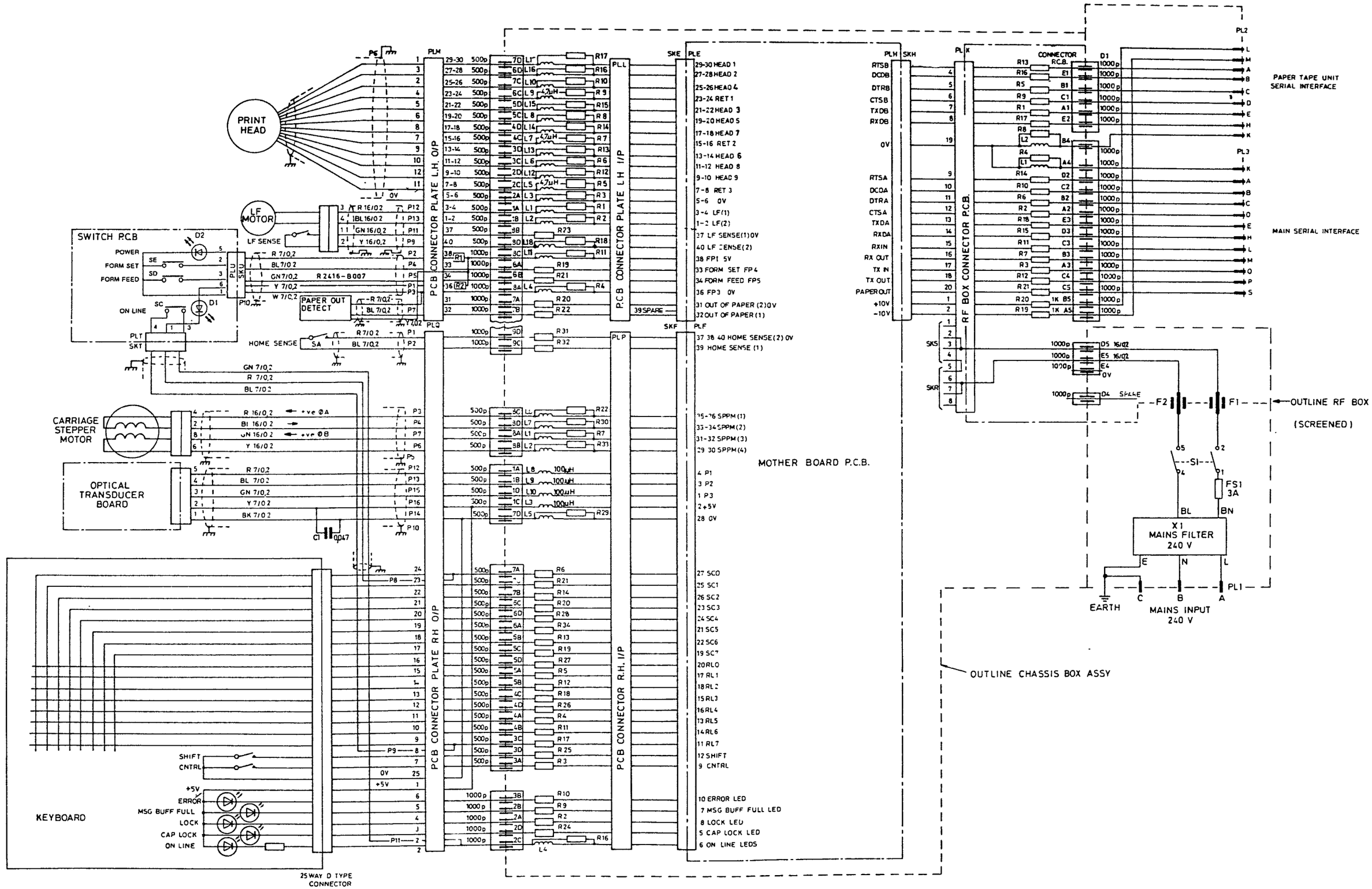


FIG 3A.2.2 BLOCK DIAGRAM - PRINTER CONTROL & INTERFACE CONTROL PECS



TGQ2 TELEPRINTER INTERCONNECTION DIAGRAM FIG 3A.2.3



TGQ SERIES TELEPRINTERS - OVERALL SCHEMATIC DIAGRAM FIG 3A.2.4

CHAPTER 3

PRINTER CONTROL BOARD

CONTENTS

Paragraph

1 GENERAL INFORMATION
2 Software
3 Modifications
4 FUNCTIONS
5 FAULT INVESTIGATION

TABLES

Number		Page
3A.3.1	Printer Control Board Software Variations	3.3

ILLUSTRATIONS

Figure		Page
3A.3.1	TGQ2 Printer Control Board	3.2
3A.3.2	Printer Control Board Schematic Diagram	3.5/6

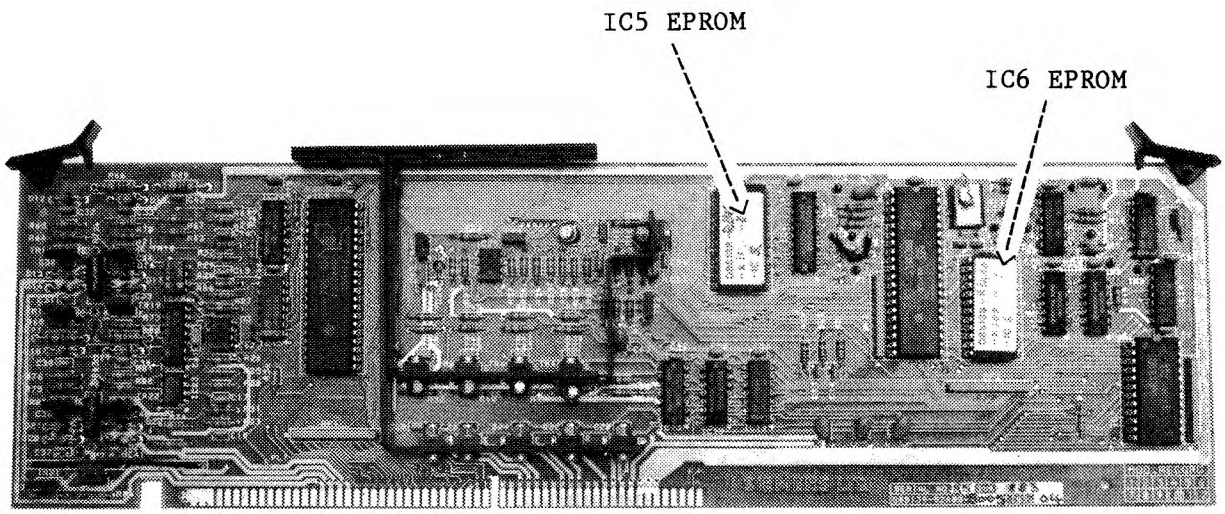


FIG 3A.3.1 TGQ2 PRINTER CONTROL BOARD
5815-99-780-8822

CHAPTER 3

PRINTER CONTROL BOARD

GENERAL INFORMATION

1 The Printer Control Board controls virtually all of the basic printer functions via its Intel 8039 microprocessor. The board itself is sufficient to provide the functions required for a Centronics-type line printer. Communication between the Printer Control Board and the Interface Board (see Chapter 4) is via an internal Centronics-type parallel interface. Communication with the Printer Assembly is via the two Filter Boards.

Software

2 Identical Printer Control Boards are fitted in all TGQ Teleprinters. However, the software contained in two EPROMS on the board (IC5 and IC6) may be different for some outfits. Table 3A.3.1 below shows which version of software is fitted in which outfit (labels on each EPROM aid identification).

TABLE 3A.3.1

PRINTER CONTROL BOARD SOFTWARE VARIATIONS

Outfit	Early Software	New Software (from)
TGQ1 to 5 & TGQ11	X100-n	X103-3
TGQ6	n/a	X111-1
TGQ7	X101-5	n/a
TGQ8	n/a	X103-3
TGQ9	X100-n	n/a
TGQ10	To be announced	

n = Issue number
n/a = Alternative software is not available

Modifications

3 Early software can be replaced by new software on TGQ1 to TGQ5 and TGQ11 outfits. If this is done, set DIL switch A2 to the DOWN position. In the case of TGQ3 (or any other outfit which has a PTA connected), change the line speed on the PTA to 4800 baud.

NOTE It is possible to use any version of software in the Printer Control Board (eg software from a TGQ6 can be fitted in a TGQ2). If this is done, the NSN number on the board MUST be changed accordingly. Upgrading early software to new software for the same outfit does not affect the NSN.

FUNCTIONS

4 The Printer Control Board provides the following facilities:

(1) Control of the receiving end of the Centronics interface.

(2) Character line buffering.

(3) Character dot matrix forming (contained within EPROM).

(4) Monitoring of optical transducer feedback (location of first print position).

(5) Stepper motor driving (controls head carriage movement).

(6) Line feed motor driving (controls paper advance).

(7) Timing and driving of the print head.

(8) Provides "out of paper" microswitch and "home sense" relay functions.

(9) Provides the FORM SET and FORM FEED functions.

(10) Provides for auto CR/LF function.

(11) Provides functions for local test.

The last item is particularly useful as it enables the basic printing functions to be checked by using the printer controls without having the Interface Control Board fitted.

FAULT INVESTIGATION

5 Should a fault be suspected on the Printer Control Board, it is advisable to replace it with a new board. However, if a replacement is not available, faults may be investigated by mounting the board on an extender card in a known working Teleprinter.

6 Prior to installing the suspect board, ensure that the fault is not caused by a short-circuit between power rails or between a power rail and ground. As a precautionary measure, it is advisable to disconnect the print head by unplugging the connector from beneath the head carriage. Once the board is installed, the various functions can be investigated using an oscilloscope whilst the board is being driven from the Interface Control Board via the internal Centronics interface.

PRINTER CONTROL BOARD SCHEMATIC DIAGRAM FIG 3A.3.2

CHAPTER 4

INTERFACE CONTROL BOARD

CONTENTS

Paragraph

1 GENERAL INFORMATION
2 Software
3 Modifications
5 FUNCTIONS
6 FAULT INVESTIGATION

TABLES

Number		Page
3A.4.1	Interface Control Board Software Variations	4.3
3A.4.2	Link Settings	4.4

ILLUSTRATIONS

Figure		Page
3A.4.1	TGQ2 Interface Control Board	4.2
3A.4.2	Interface Control Board Schematic Diagram (2 Sheets)	4.7

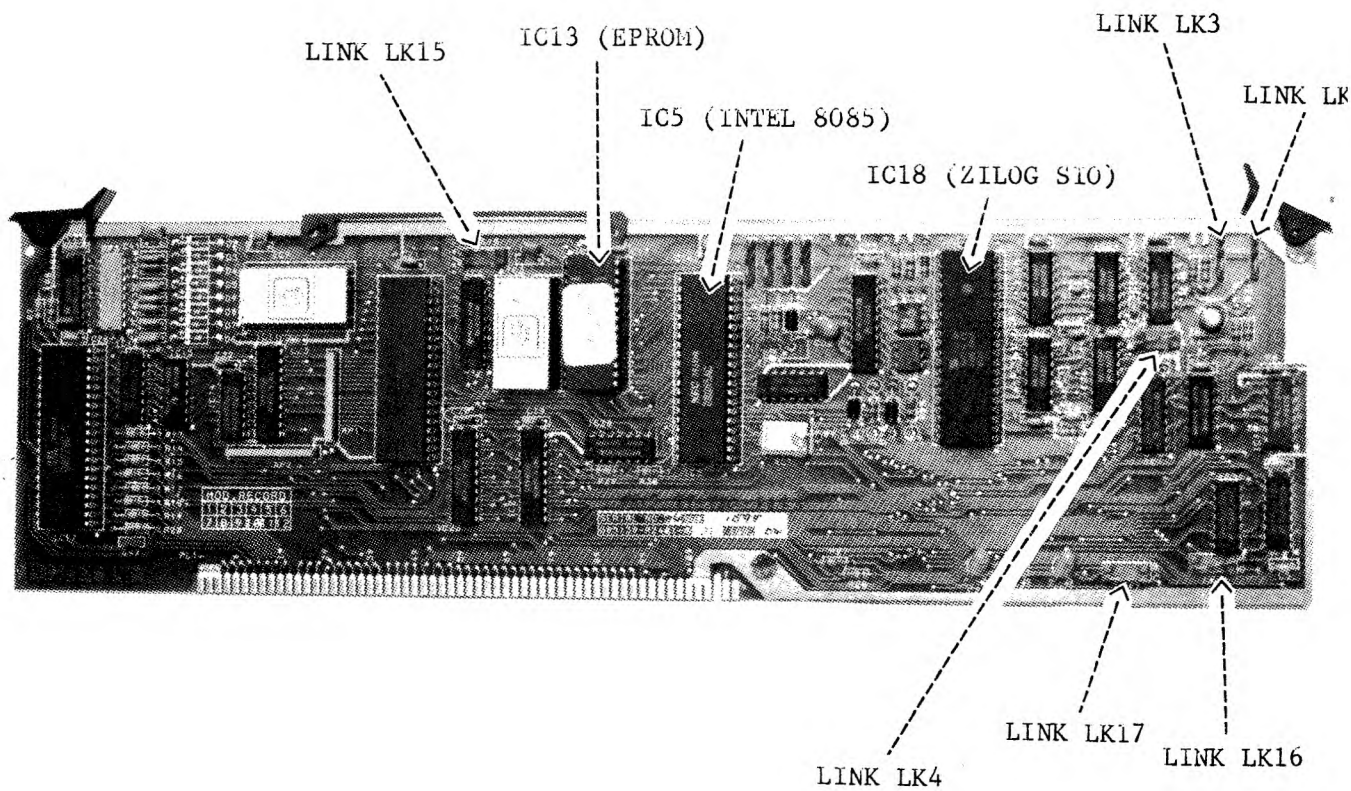


FIG 3A.4.1

TGQ2 INTERFACE CONTROL BOARD
5815-99-780-8823

CHAPTER 4

INTERFACE CONTROL BOARD

GENERAL INFORMATION

1 The Interface Control Board handles all the input and output functions, keyboard scanning and communication with the Printer Control Board (the latter being performed via an internal Centronics-type parallel interface). An Intel 8085 microprocessor (IC5) controls most functions, supported by a Zilog dual channel serial input/output IC (IC18). Communication with the Keyboard is via the right-hand Filter Board.

Software

2 Identical Interface Control Boards are fitted in all TGQ Teleprinters. However, the software contained in the EPROM on the board (IC13) will be different for some outfits. Table 3A.4.1 below shows which version of software is fitted in which outfit (a label on the EPROM aids identification).

TABLE 3A.4.1

INTERFACE CONTROL BOARD SOFTWARE VARIATIONS

Outfit	Early Software	New Software (from)
TGQ1 to 3	X101-1	X101-2
TGQ4	X110-2	X110-3
TGQ5 & 11	X103-1	X103-2
TGQ6	n/a	X111-3
TGQ7	X104-2	n/a
TGQ8	n/a	X101-2
TGQ9	X112-2	n/a
TGQ10	To be announced	

n/a = Alternative software is not available

Modifications

3 Early software can be replaced by new software on TGQ1 to TGQ5 and TGQ11 outfits. No further modifications to the outfits are necessary.

4 It is possible (though not advisable) to interchange Interface Control Boards between TGQ outfits. If this must be done, for example, to effect an emergency repair, not only must the EPROM be checked (and swapped if necessary), but the link settings on the replacement board must also be checked and changed if necessary to match those on the original board. Table 3A.4.2 below lists the links to be checked and their functions (the locations of the links are shown in Figure 3A.4.1).

NOTE If different software (excluding that referred to in para 3) is fitted to a board, the NSN of the board MUST be changed accordingly.

TABLE 3A.4.2

LINK SETTINGS

LINK	NORMAL FUNCTION	NORMAL SETTING	ALTERNATIVE FUNCTION	ALTERNATIVE SETTING
LK2	Polarity of TXDA & RXDA	CLOSED	Inverts polarity	OPEN
LK3	Polarity of RTSA & CTSA	CLOSED	Inverts polarity	OPEN
LK4	V24/V28 (RS232) interface	"B"	20 mA current loop interface (see note)	"C"
LK15) LK16)	Inhibit use of expansion slot SKC	"B" "C"	Enable use of SKC for Message Edit or 56 Kbyte Memory Expansion Board	"C" "B"
LK17	Provides high "paper out" signal	"B"	Inverts "paper out" signal	"C"

NOTE If LK4 is to be set to "C", the current limiting resistors R25 and R26 must be changed to give a current of 20 mA. The formula for calculating this is given below. It takes into account the 150 ohm resistors connected in series with each signal line:

$$R26 = R26 = \frac{\text{External Drive Voltage} - 1}{20 \times 10^{-3}} - 150$$

FUNCTIONS

5 The Interface Control Board provides the following facilities:

(1) Control of the transmitting end of the Centronics-type interface.

(2) Control of two V28 serial interface channels (line and PTA).

(3) Control of the 20 mA current loop interface.

(4) Scanning of the Keyboard.

(5) Variable baud rate generation via DIL switches on the Motherboard.

(6) Latching and drivers for the Keyboard LEDs.

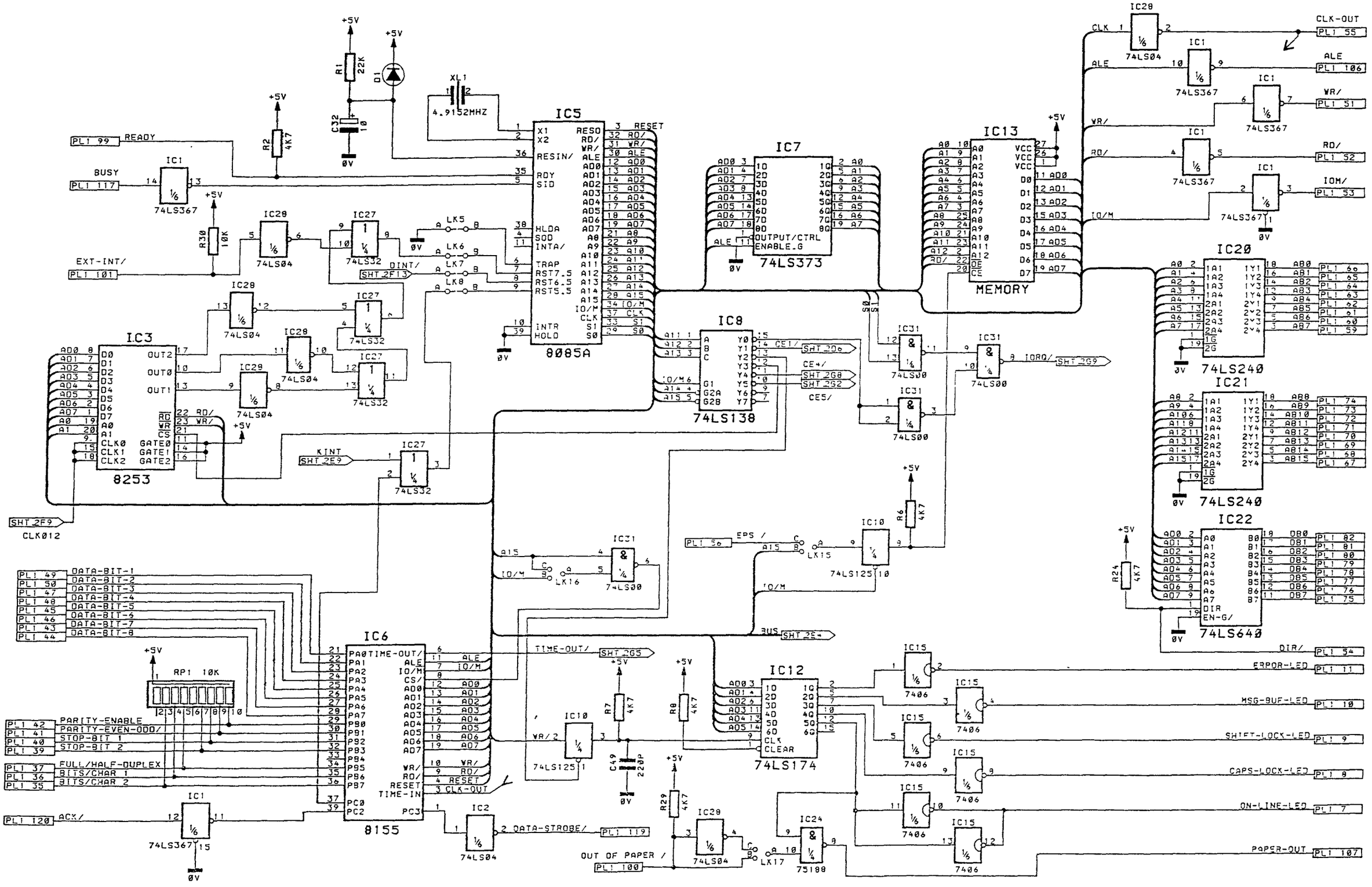
(7) Buffers for external bus connections.

(8) ITA5 and ITA2 code generation and decoding according to DIL switch settings.

FAULT INVESTIGATION

6 Should a fault be suspected on the Interface Control Board, it is advisable to replace it with a new board. However, if a replacement is not available, faults may be investigated by mounting the board on an extender card in a known working Teleprinter.

7 Prior to installing the suspect board, ensure that the fault is not caused by a short-circuit between power rails or between a power rail and ground. Once the board is installed, check the various functions using an oscilloscope whilst the board is driving the Printer Control Board via the internal Centronics-compatible interface. In particular, check that the bit length matches the character code selected via DIL switches A7 and A8 (7 or 8 bits for ITA5 and 5 bits for ITA2). Failure to do so can result in the characters being corrupted.



INTERFACE CONTROL BOARD SCHEMATIC DIAGRAM FIG 3A.4.2 (Sh 1)

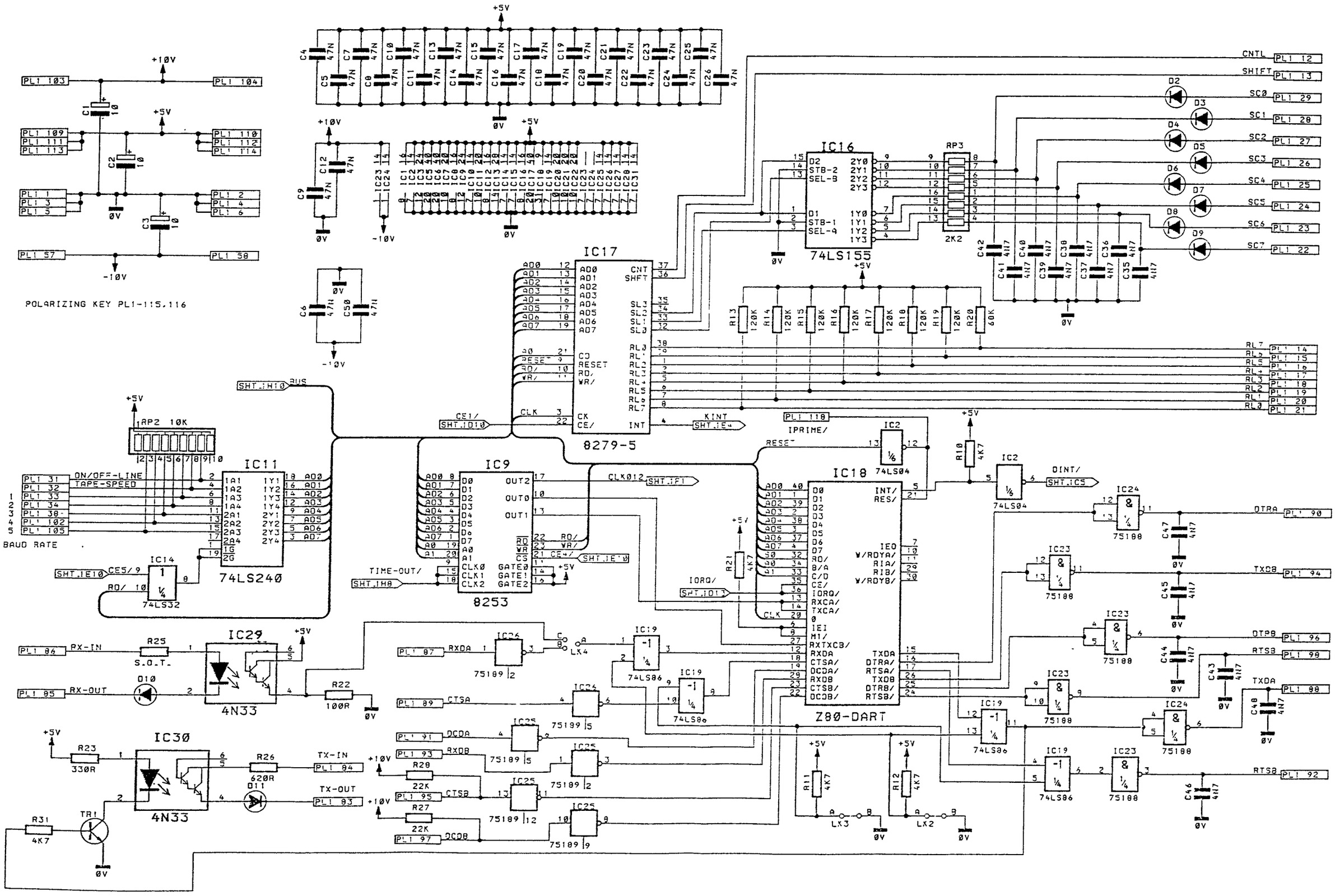


FIG 3A.4.2 (Sh2) INTERFACE CONTROL BOARD SCHEMATIC DIAGRAM

CHAPTER 5

MESSAGE EDIT & MEMORY EXPANSION BOARDS

CONTENTS

Paragraph

1 GENERAL INFORMATION
2 MESSAGE EDIT BOARDS
2 INTRODUCTION
3 Software
5 Memory
6 OPERATING FEATURES
6 TGQ4 Message Edit Board
7 TGQ6 Message Edit Board
8 TGQ9 Message Edit Board
9 INSTALLING A MESSAGE EDIT BOARD
11 MEMORY EXPANSION BOARD
11 INTRODUCTION
12 Software
13 Memory
14 INSTALLING A MEMORY EXPANSION BOARD

ILLUSTRATIONS

Figure		Page
3A.5.1	TGQ4 Message Edit Board	5.2
3A.5.2	TGQ5/TGQ11 Memory Expansion Board	5.2
3A.5.3	Message Edit/Memory Expansion Board Schematic Diagram	5.5/6

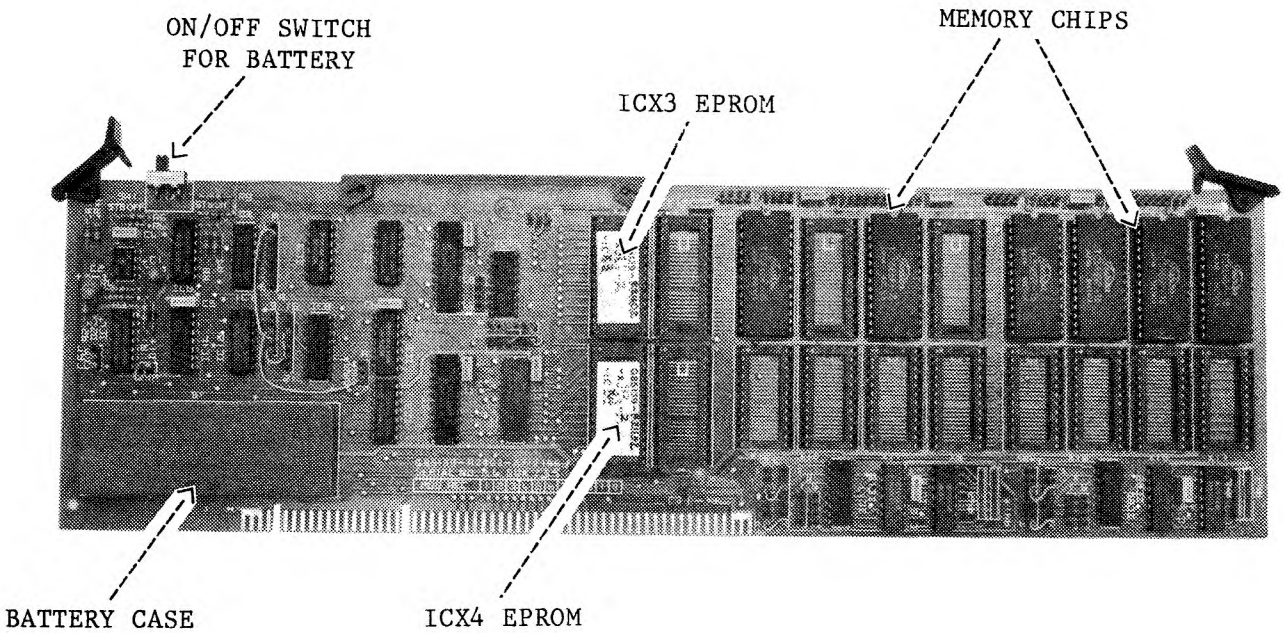


FIG 3A.5.1 TGQ4 MESSAGE EDIT BOARD
5815-99-795-2030

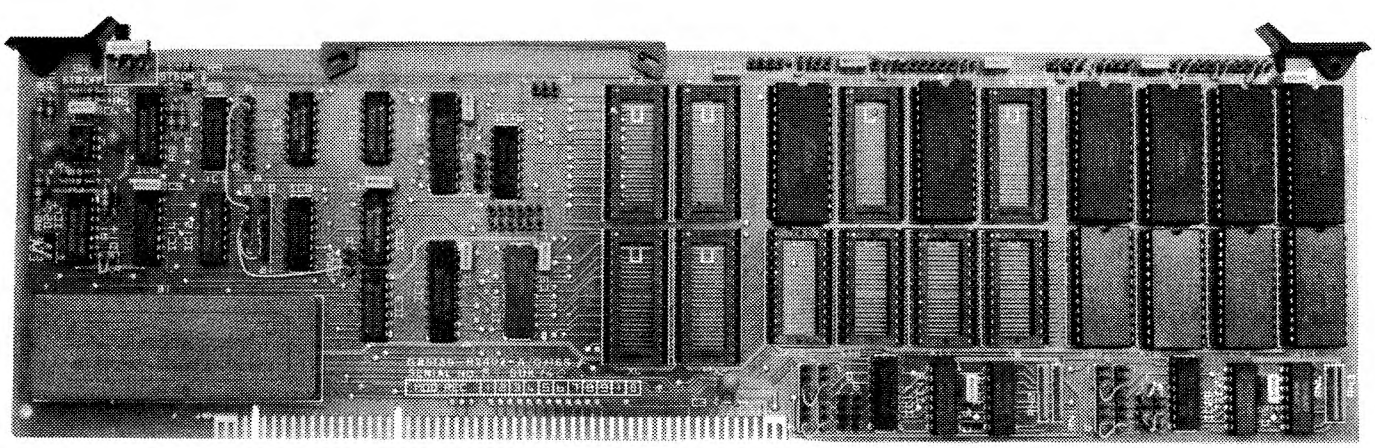


FIG 3A.5.2 TGQ5/TGQ11 MEMORY EXPANSION BOARD
5815-99-795-2035

CHAPTER 5

MESSAGE EDIT & MEMORY EXPANSION BOARDS

GENERAL INFORMATION

1 The Message Edit and Memory Expansion Boards both use the same basic circuit board and plug into the same socket (SKC) on the Motherboard. Differences between the two boards will become apparent from reading this chapter.

MESSAGE EDIT BOARDS

INTRODUCTION

2 Three versions of the Message Edit Board are available for the TGQ Teleprinters, a different version being fitted as standard in the TGQ4, the TGQ6 and the TGQ9. It is possible to fit any Message Edit Board in any other Teleprinter except TGQ5 and TGQ11 (see para 9).

Software

3 The three Message Edit Boards mentioned in para 2 are identical except that the software fitted is different. In the TGQ4 and TGQ9 outfits, the software is contained in two 4 Kbyte EPROMS which are located in positions ICX3 and ICX4 on the circuit board. The TGQ6 outfit uses only one 4 Kbyte EPROM, located in ICX3.

4 The software contained in each outfit is as follows:

TGQ4	R2402-X110
TGQ6	R2402-X111
TGQ9	R2402-X112

This software is complemented by special software contained in IC13 on the Interface Control Board for each outfit (see Chapter 4, Table 3A.4.1).

Memory

5 The memory for each Message Edit Board consists of 44 Kbytes of non volatile memory, contained in six CMOS memory chips located in ICX5, ICX6, ICX7, ICX8, ICX15 and ICX16. These chips are powered from an on-board battery when the Teleprinter is disconnected from the mains supply, thus preserving stored messages. An on/off switch is fitted to the top edge of the board to enable the battery to be connected or disconnected as required.

OPERATING FEATURES

TGQ4 Message Edit Board

6 This enables up to 255 numbered messages to be stored in the on-board 40 Kbyte message store. Each message can be up to 4 Kbytes in length (ie it has a 4 Kbyte edit buffer). The board provides the TGQ4 with the following facilities:

(1) Message composition and editing.

(2) Receiving and transmitting messages.

(3) Status reporting of messages held in store.

(4) Deleting messages held in store.

(5) Total message store reset.

(6) Printing of any stored message.

(7) Editing message headers and trailers.

TGQ6 Message Edit Board

7 This provides the TGQ6 with similar features to the TGQ4, but with the following differences:

(1) 36 Kbyte message store.

(2) 8 Kbyte buffer for editing stored messages.

(3) Full duplex operation only.

(4) Automatic transmission of newly-created messages.

(5) Transmission sequence numbers in message headers.

(6) DTR flow control inversion facility.

TGQ9 Message Edit Board

8 The differences between the TGQ9 and the TGQ4 are as follows:

(1) The edit buffer is restricted to 360 characters.

(2) If a PTA is connected, this will only operate in 5-bit ITA2 code. If the TGQ9 is set to operate in 8-bit ITA5 code, automatic code conversion takes place between the TGQ9 and the PTA.

(3) A revised paper tape interface is included. Tapes being read into the TGQ9 from the PTA are automatically split into messages not exceeding 360 characters in length.

MESSAGE EDIT/MEMORY EXPANSION BOARD SCHEMATIC DIAGRAM FIG 3A.5.3

INSTALLING A MESSAGE EDIT BOARD

9 Although it is possible to fit a Message Edit Board in any TGQ Teleprinter, in practice one will probably be fitted as an option only in a TGQ2, TGQ3 or TGQ10 outfit. This is because the TGQ1, TGQ7 and TGQ8 outfits do not have a keyboard fitted as standard, and the TGQ5 and TGQ11 outfits have a Memory Expansion Board fitted in the slot where the Message Edit Board resides.

10 To install a Message Edit Board, proceed as follows:

(1) Switch off the Teleprinter and remove the lid from the Electronics Box.

(2) Unplug the Interface Control Board from socket SKB. Replace the EPROM in IC13 with the correct EPROM for the Message Edit Board being installed (refer to Chapter 4, Table 3A.4.1 if in any doubt).

(3) Change the setting on link LK15 from A-B to A-C and change link LK16 from A-C to A-B.

(4) CHANGE THE NSN ON THE INTERFACE CONTROL BOARD TO REFLECT THE CHANGE IN SOFTWARE before refitting the board in its slot (component side facing the rear of the Teleprinter).

(5) Plug the Message Edit Board into socket SKC in the Motherboard (component side facing the rear of the Teleprinter). Check that the battery switch on the top right-hand side of the board is set to ON (switch to the left).

(6) Switch on the Teleprinter and carry out the normal installation checks for the Message Edit Board (see Category 4B).

(7) If the installation is satisfactory, CHANGE THE TGQ NUMBER ON THE BACK OF THE TELEPRINTER TO REFLECT THE CHANGE IN FACILITIES.

NOTE The on-board nickel-cadmium battery must be fully charged to ensure that data is retained in the message store when power is removed from the Teleprinter. To ensure this, leave the Teleprinter switched on for several hours after the Message Edit Board has been fitted.

SECURITY NOTE IF A MESSAGE EDIT BOARD IS TO BE REPLACED FOR ANY REASON, ENSURE THAT THE MEMORY HAS BEEN CLEARED BY USING THE MESSAGE EDIT RESET FUNCTION (SEE CATEGORY 2B, ANNEX 1A) BEFORE REMOVING THE BOARD FROM THE TELEPRINTER.

MEMORY EXPANSION BOARD

INTRODUCTION

11 The Memory Expansion Board is fitted as standard on the TGQ5 and TGQ11 outfits. It can be fitted as an option on all other non-message edit outfits. The board provides a 55 Kbyte buffer from the on-board memory. In use, the only difference which may be noticed between a Teleprinter with this board fitted and one without is that the former will have a greately improved reception speed.

Software

12 Unlike the Message Edit Board, on-board software is not required to control the board and therefore positions ICX3 and ICX4 are unoccupied. Access to the on-board RAM is controlled by the software contained in the EPROM in IC13 on the Interface Control Board (this EPROM must be changed if a Memory Expansion Board is fitted as an option).

Memory

13 The on-board memory consists of 56 Kbytes of volatile memory (approximately 55 Kbytes available for use), contained in ten chips, six of which occupy the same locations as those chips fitted to the Message Edit Boards (compare Figures 3A.5.1 and 3A.5.2). As the memory is volatile, a battery is not fitted to the board (although the empty battery case is).

INSTALLING A MEMORY EXPANSION BOARD

14 The procedure for installing the board is almost identical to that described for the Message Edit Boards, but note the following points:

(1) The EPROM in IC13 on the Interface Control Board must be replaced with software version X103-1 or X103-2.

(2) As a battery is not fitted, the position of the on/off switch is immaterial.

(3) Perform the startup tests described in Category 4B for the TGQ2, TGQ5 and TGQ11 outfits on completion of the installation.

CHAPTER 6

MOTHERBOARD

CONTENTS

Paragraph

1 GENERAL INFORMATION
3 GENERAL DESCRIPTION

ILLUSTRATIONS

Figure		Page
3A.6.1	Motherboard	6.2
3A.6.2	Motherboard Schematic Diagram	6.5/6

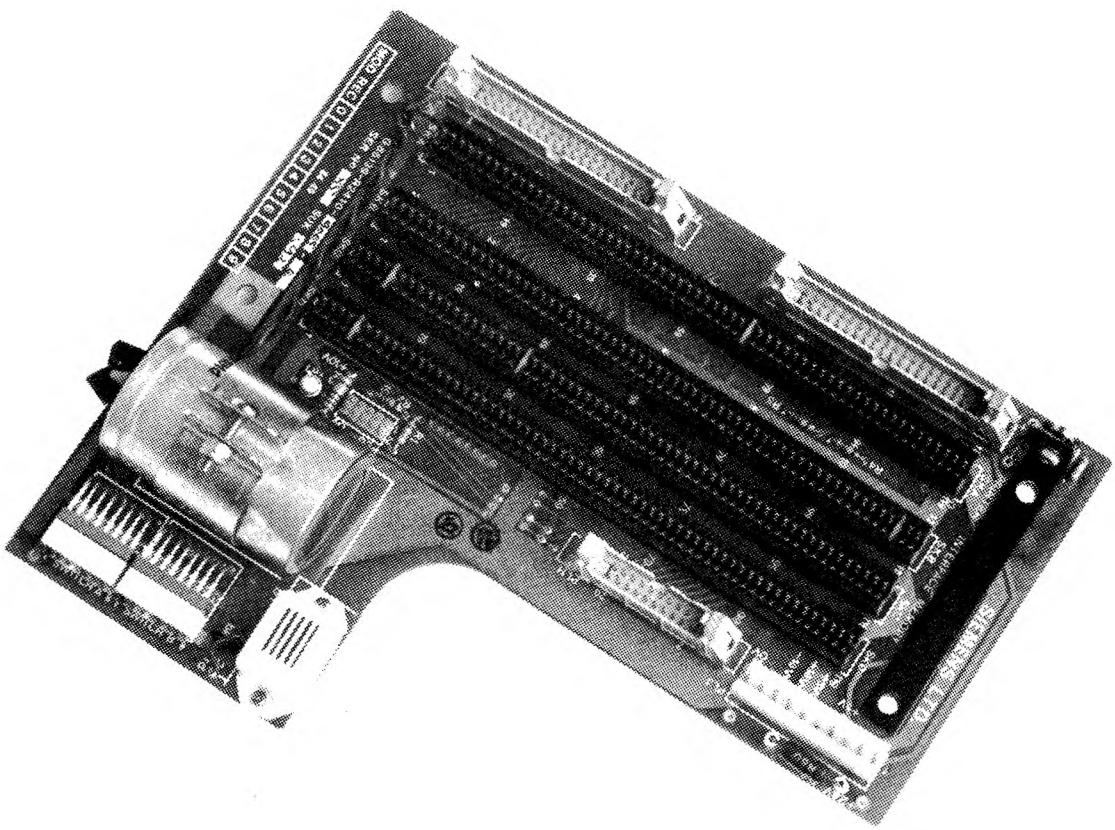


FIG 3A.6.1

MOTHERBOARD
5815-99-780-8825

CHAPTER 6

MOTHERBOARD

GENERAL INFORMATION

1 The Motherboard fitted to the TGQ Series Teleprinters may be one of two versions, depending on whether the Teleprinter is an earlier or later model. The only difference between the two versions is that socket SKD is not fitted on later versions.

2 The schematic diagram for the Motherboard (see Figure 5A.6.2) includes a fibre-optic circuit. This is a special option and is not available for the TGQ Series Teleprinters.

GENERAL DESCRIPTION

3 The Motherboard provides the interconnections between the Printer Control Board, the Interface Control Board and (where fitted) the Message Edit Board or the Memory Expansion Board. It also provides power to these boards from the Power Supply Module via plug PLJ. Information to and from the Printer Assembly is fed to and from the Printer Control and Interface Control Boards via plugs PLE and PLF at the front of the Motherboard. These connect to the Printer Assembly via the Left and Right-Hand Filter Boards respectively. Messages to and from the serial line are passed from and to the Interface Control Board via plug PLH at the rear of the Motherboard.

4 Two DIL switch blocks, "A" and "B", are fitted at the rear of the Motherboard. These control various options, some of which may differ slightly depending on which Printer Control and Interface Control Boards are fitted (see Category 2B, Chapter 1 for further details).

5 A small 12 V buzzer is mounted next to the DIL switch blocks. This is connected to the Printer Control Board via socket SKA and provides an audible warning should an error condition occur on the Printer.

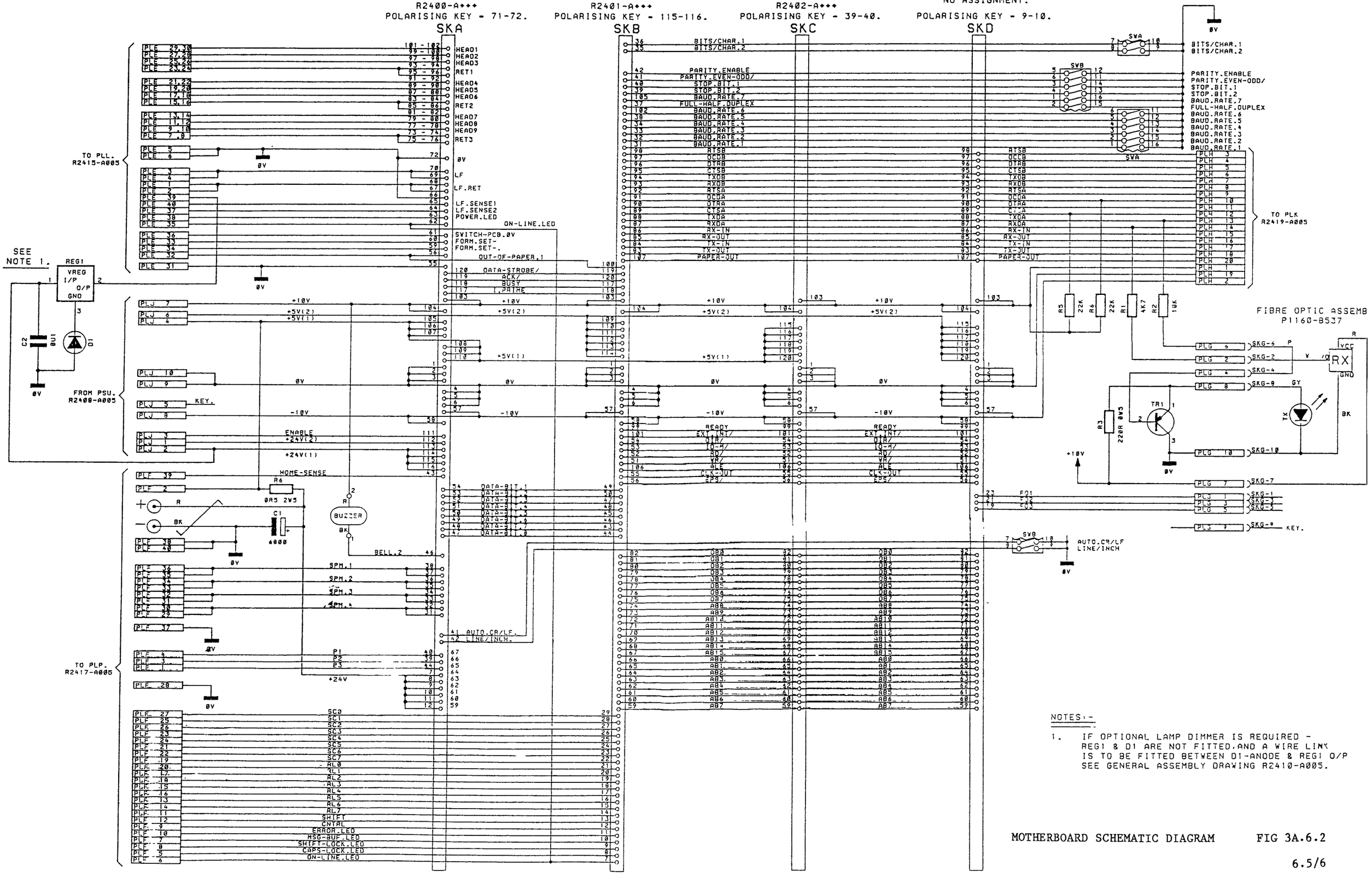
6 An on-board voltage regulator provides a regulated +24 V supply to the Printer illuminating lamps mounted on the underside of the Printer cover.

PRINTER CONTROL
R2400-A***
POLARISING KEY - 71-72.
SKA

INTERFACE CONTROL
R2401-A***
POLARISING KEY - 115-116.
SKB

MEMORY EXPANSION
R2402-A***
POLARISING KEY - 39-40.
SKC

NO ASSIGNMENT.
POLARISING KEY - 9-10.
SKD



NOTES:-

1. IF OPTIONAL LAMP DIMMER IS REQUIRED - REG1 & D1 ARE NOT FITTED, AND A WIRE LINK IS TO BE FITTED BETWEEN D1-ANODE & REG1 O/P SEE GENERAL ASSEMBLY DRAWING R2410-A005.

MOTHERBOARD SCHEMATIC DIAGRAM FIG 3A.6.2

CHAPTER 7

RF FILTER BOARDS

CONTENTS

Paragraph

1 GENERAL INFORMATION
2 GENERAL DESCRIPTION

ILLUSTRATIONS

Figure		Page
3A.7.1	Left-Hand Filter Board	7.2
3A.7.2	Right-Hand Filter Board	7.3/4
3A.7.3	RF Filter Boards Schematic Diagram	7.6

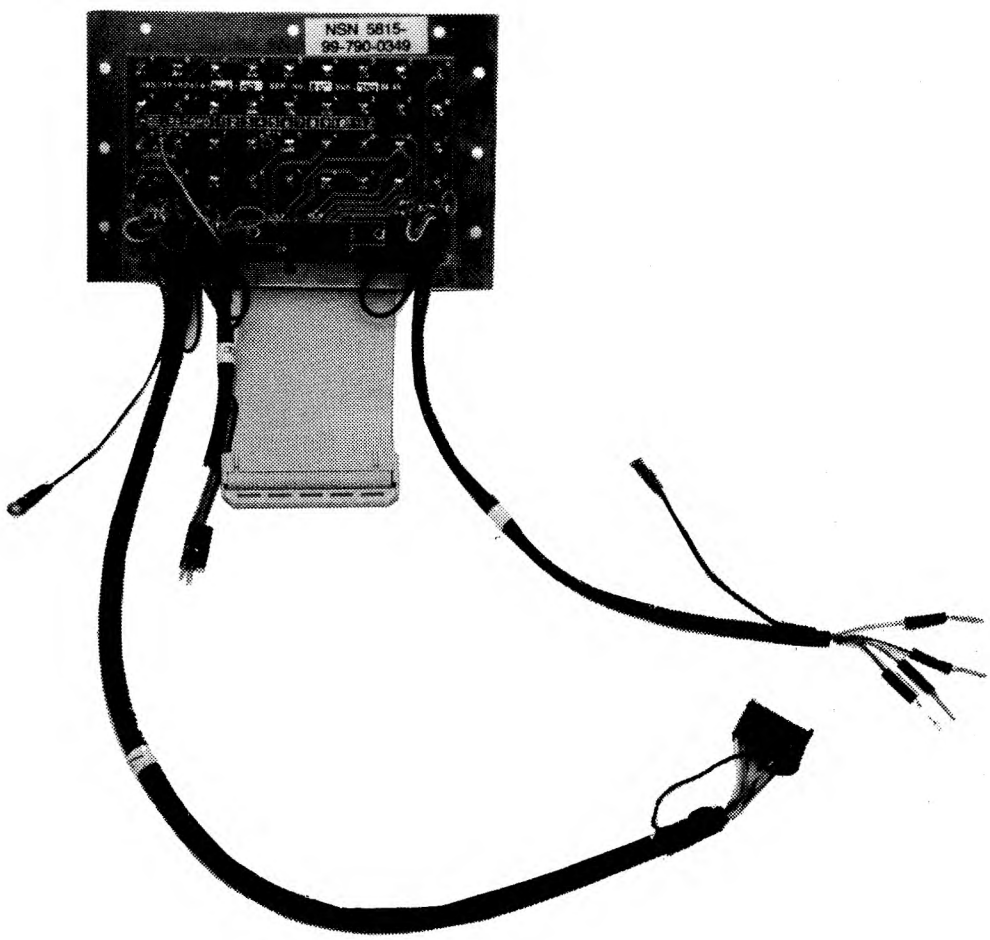


FIG 3A.7.1 LEFT-HAND FILTER BOARD
5815-99-790-0349



RIGHT-HAND FILTER BOARD
5815-99-790-0350

FIG 3A.7.2

C H A P T E R 7

R F F I L T E R B O A R D S

GENERAL INFORMATION

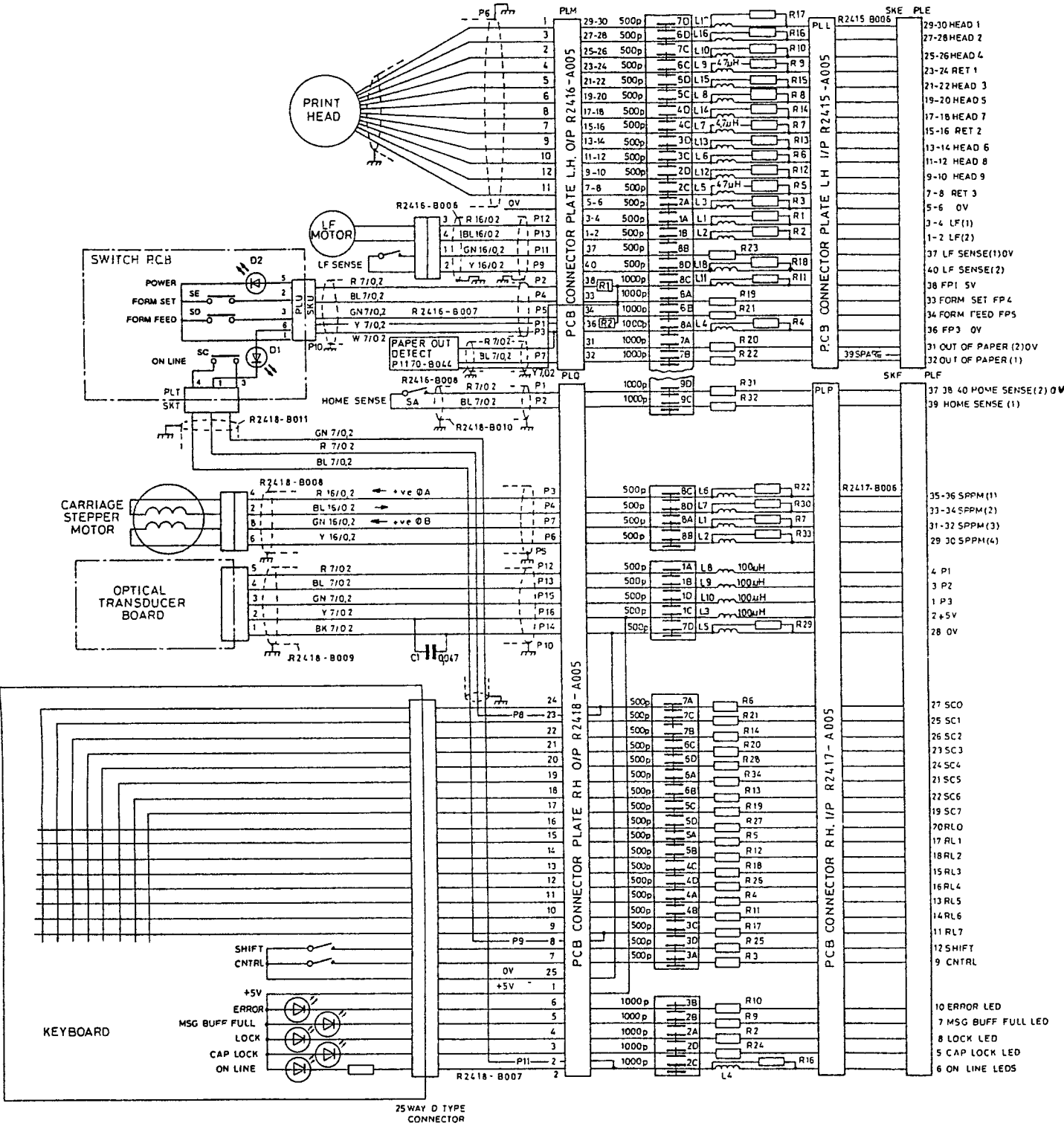
1 The Left and Right-Hand Filter Boards are mounted vertically and next to each other behind the Printer Assembly. Identical boards are fitted in all versions of the TGQ Teleprinters. Note that should it be necessary to replace one of the boards at some time, the replacement is supplied with the necessary cables already attached.

GENERAL DESCRIPTION

2 The function of the Filter Boards is to supress spurious RF emissions on the signal lines which pass between the Electronics Box and the Printer Assembly and Keyboard. Resistors, inductors and feed-through capacitors filter the signals passed between the Motherboard and the Printer and Keyboard, thus enabling the TGQ Series Teleprinters to meet HMG Tempest requirements.

3 The Filter Boards distribute signals and/or power from the Motherboard to the following equipment:

Left-Hand Filter Board	Right-Hand Filter Board
Print Head	Carriage Stepper Motor
Linefeed Motor	Optical Transducer
Paper Out Detector	ON LINE LED on Switch Panel
Switch Panel	Keyboard



NOTES
1 CABLE SCREENS CONNECTED TO METAL WORK AT BOTH ENDS.
2 ALL RESISTOR VALUES ARE 150 OHMS UNLESS OTHERWISE STATED.
3 ALL CHOKE VALUES ARE 10µH UNLESS OTHERWISE STATED

FIG 3A.7.3 RF FILTER BOARDS SCHEMATIC DIAGRAM

C H A P T E R 8

R F B O X

CONTENTS

Paragraph

1 GENERAL INFORMATION
2 GENERAL DESCRIPTION

ILLUSTRATIONS

Figure		Page
3A.8.1	RF Box Assembly	8.2
3A.8.2	RF Box Schematic Diagram	8.4

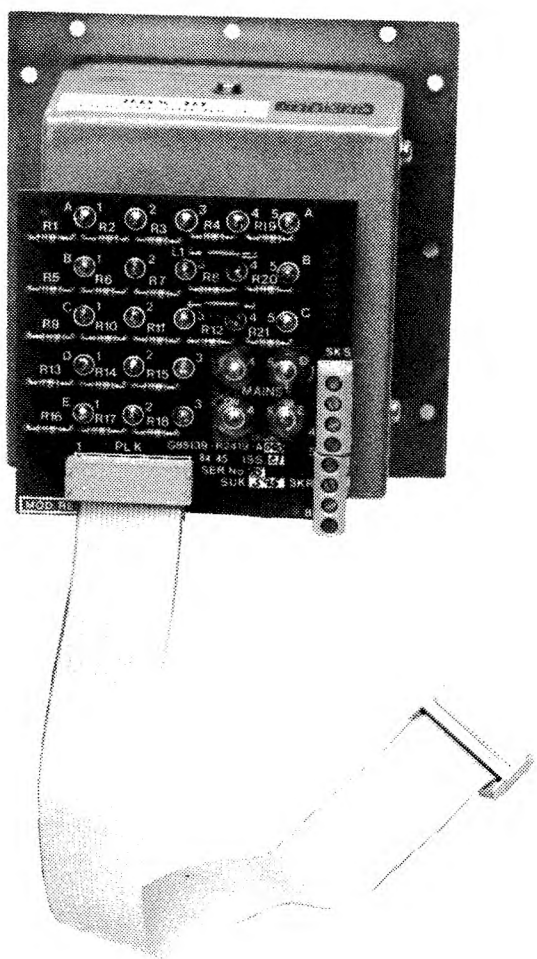


FIG 3A.8.1 RF BOX ASSEMBLY
5815-99-780-8821

CHAPTER 8

RF BOX

GENERAL INFORMATION

1 The RF Box is screwed to the rear panel of the Teleprinter. Only one version of the box is used for all TGQ Teleprinter outfits. Note that although the Resistor pec mounted on the rear of the RF Box is technically a separate assembly, a replacement RF Box is always supplied with this pec already fitted.

GENERAL DESCRIPTION

2 The RF Box consists of a sealed steel box with a Resistor pec mounted externally on the rear. The assembly, like the Filter Boards, uses resistors, inductors and feed-through capacitors to filter incoming and outgoing signals. These signals are passed to and from the RF Box via a ribbon cable which connects to PLH on the rear of the Motherboard.

3 Three sockets are provided on the front of the RF Box. PL1 is a 3-way connector for the mains supply cable. PL2 and PL3 are both 12-way connectors for the PTA and signal line respectively.

4 The mains supply to the Teleprinter passes through the RF Box and is filtered by an internal 240 V mains filter. The filtered mains supply passes via a 2 A anti-surge fuse and front-mounted on/off switch to two terminal blocks (SKR and SKS) on the Resistor pec. The way in which the transformer wires from the Power Supply Assembly are connected to these terminal blocks determines the operating voltage for the Teleprinter (see Chapter 9 for further details).

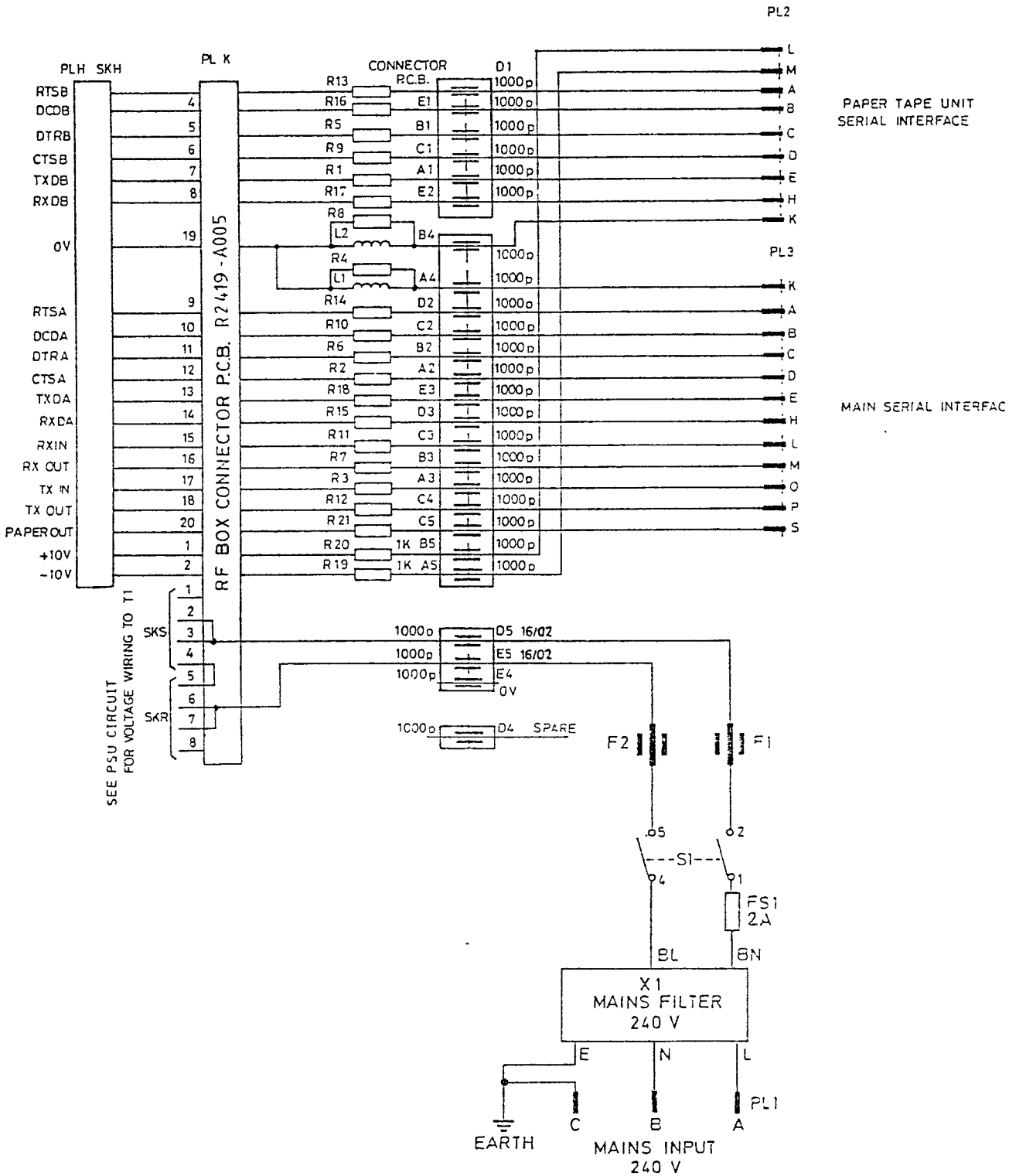


FIG 3A.8.2 RF BOX SCHEMATIC DIAGRAM

CHAPTER 9

POWER SUPPLY

CONTENTS

Paragraph

1 GENERAL INFORMATION
3 GENERAL DESCRIPTION

TABLES

Number		Page
3A.9.1	Mains Input Voltage Wiring	9.3

ILLUSTRATIONS

Figure		Page
3A.9.1	Power Supply Assembly	9.2
3A.9.2	Power Supply Schematic Diagram	9.5/6

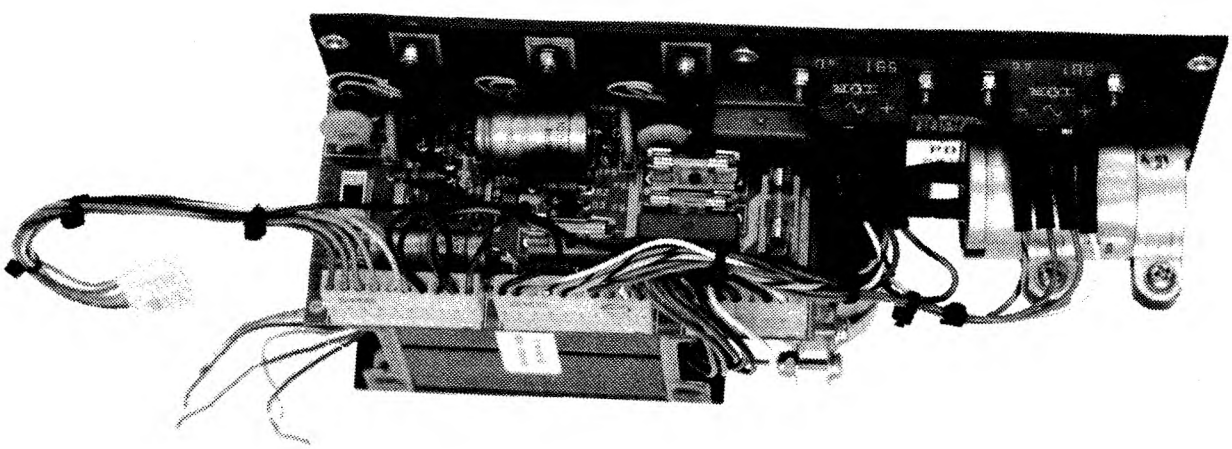


FIG 3A.9.1 POWER SUPPLY ASSEMBLY
5815-99-780-8824

CHAPTER 9

POWER SUPPLY

GENERAL INFORMATION

1 Identical Power Supply Assemblies are fitted to all the TGQ Teleprinter variants, regardless of their operating voltage. This is because the operating voltage is determined by the transformer wire connections to terminal blocks SKR and SKS on the rear of the RF Box. If the Power Supply Assembly has to be removed for any reason, note these connections before removing the assembly.

2 Table 3A.9.1 below shows the connections to terminal blocks SKR and SKS which are necessary to achieve the required operating voltage within the range 105 V to 240 V.

TABLE 3A.9.1

MAINS INPUT VOLTAGE WIRING

Voltage Required	"SKS"				"SKR"			
	1	2	3	4	5	6	7	8
105 V	Brown	Yellow	White	-	-	Orange	Blue	Red
120 V	Yellow	Brown	Red	-	-	Orange	Blue	White
210 V	Brown	Yellow	-	Orange	White	-	Blue	Red
220 V	Yellow	Brown	-	Orange	White	-	Blue	Red
240 V	Yellow	Brown	-	Orange	Red	-	Blue	White

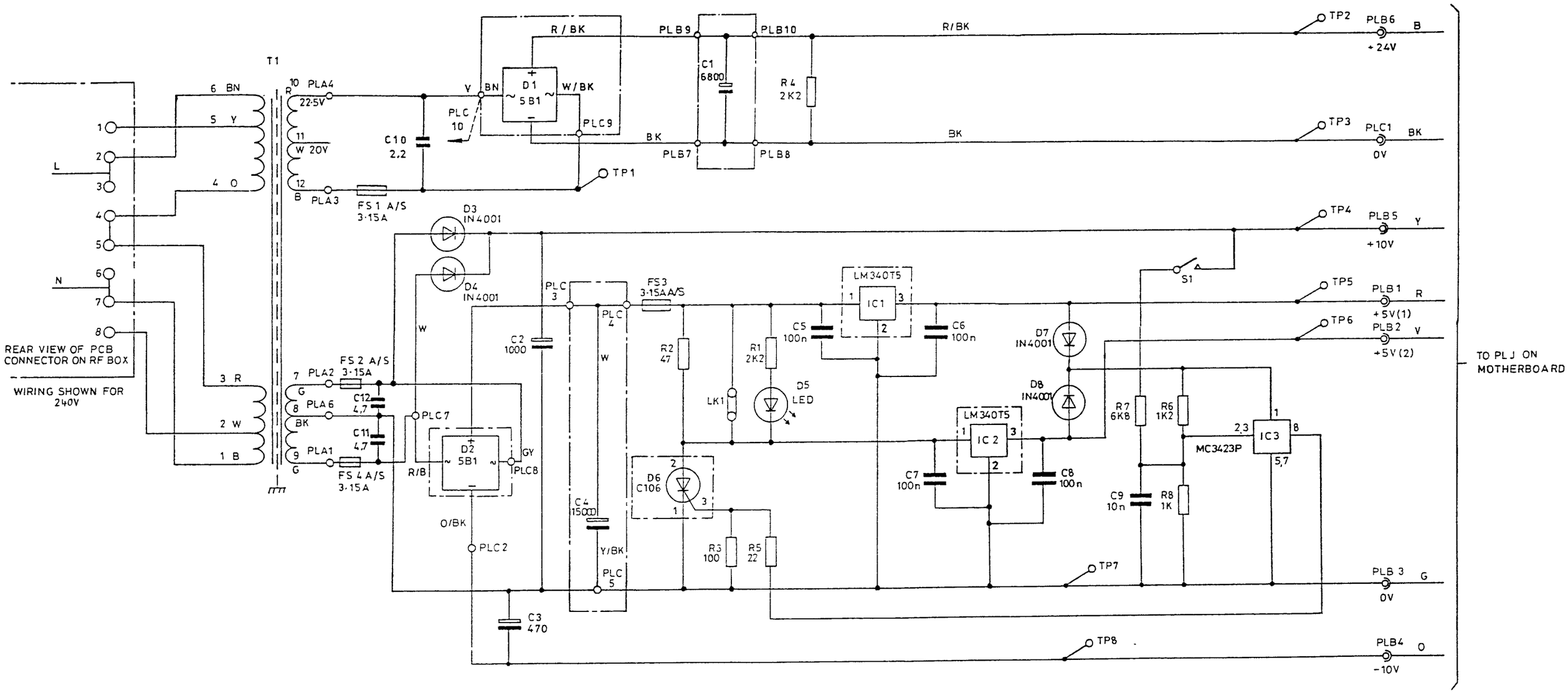
GENERAL DESCRIPTION

3 The Power Supply Assembly is a simple non-switching unit. It consists of a conventional transformer with two tapped primaries and its associated circuitry. The assembly produces nominal dc voltages of approximately +24 V, +/-10 V and +5 V. All the voltage rails are fused independently and all power is distributed to the rest of the equipment via PLJ on the Motherboard.

4 The +24 V supply is rectified by a bridge rectifier before being passed via the Motherboard, the Left-Hand Filter Board and the Switch Panel to the illumination lamps on the underside of the Printer cover.

5 There are two +5 V rails, which are both separately regulated before being passed to the Motherboard. One rail provides power to the Printer Control Board and, if fitted, the Message Edit or Memory Expansion Board. The other rail provides power to the Interface Control Board and socket SKD (if fitted). Both 5 V rails are over-voltage protected.

6 The +/-10 V rails are rectified before being passed from the Motherboard to the PTA serial port (PL2) via PLH.



NOTE:
COMPONENTS SHOWN BOXED ARE MOUNTED ON HEATSINK NOT ON BOARD.

POWER SUPPLY SCHEMATIC DIAGRAM FIG 3A.9.2

CHAPTER 10

PRINTER ASSEMBLY

CONTENTS

Paragraph

1 GENERAL INFORMATION
3 GENERAL DESCRIPTION
4 Head Carriage Drive
6 Ribbon Advance
7 Head Carriage Position Sensing
9 Print Head
10 Paper Advance
11 Out of Paper Detection
12 Printer Illumination

ILLUSTRATIONS

Figure		Page
3A.10.1	Printer Assembly	10.2
3A.10.2	Print Head	10.5
3A.10.3	Paper Out Detector	10.6
3A.10.4	Paper Out Detector (TGQ7 Only)	10.7/8
3A.10.5	Printer Illumination Circuit Diagram	10.9/10

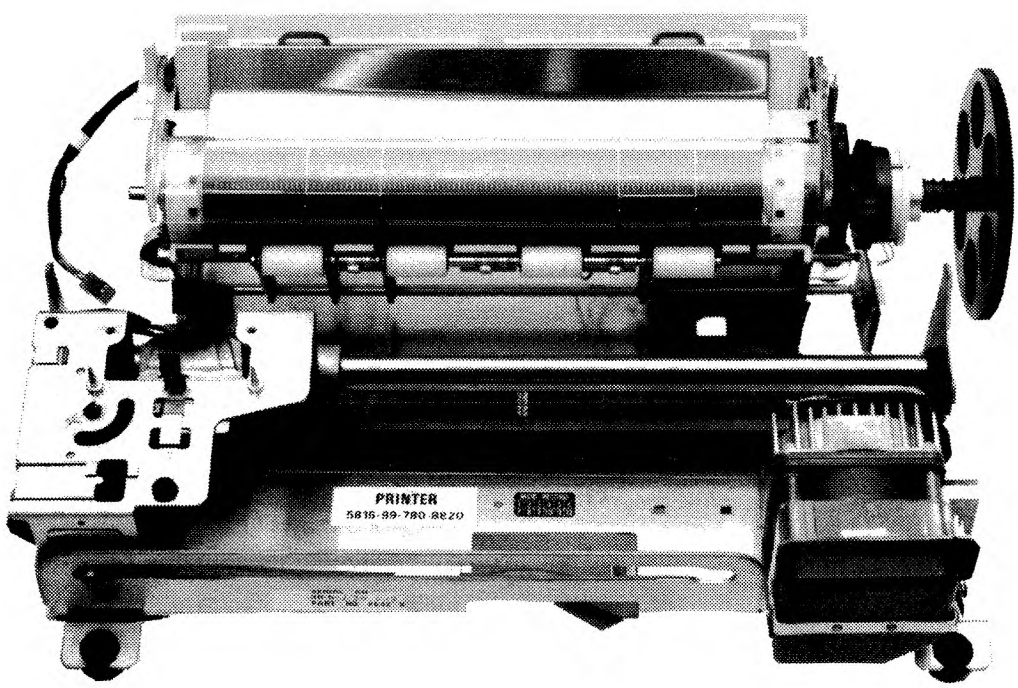


FIG 3A.10.1 PRINTER ASSEMBLY
5815-99-780-8820

CHAPTER 10

PRINTER ASSEMBLY

GENERAL INFORMATION

1 One of two Printer Assemblies is fitted to the TGQ Series Teleprinters. The TGQ7 Teleprinter uses an assembly which has a special combined Paper Out/Pagination Detector fitted behind the platen. A switch is mounted on the floor of the Printer chassis (in front of the platen) which enables the Paper Out/Pagination Detector to be toggled for either pin feed or roll paper. All other Teleprinters have only a Paper Out Detector fitted, therefore a toggle switch is not fitted to these outfits.

2 If the Printer Assembly develops a fault, it is usually replaced by a complete new assembly. However, certain components within the assembly can be replaced individually if they are known to be faulty. These components are as follows:

Linefeed Kit (NSN TBA)
Print Head (NSN 5815-99-795-2037)
Print Head Cable (NSN 5815-99-795-2041)
Print Head Ribbon Guide (NSN TBA)
Reed Relay PEC (NSN TBA)
String Assembly (NSN 5815-99-730-2790)

GENERAL DESCRIPTION

3 The Printer Assembly contains the equipment necessary to perform the following functions:

Head carriage driving
Ribbon driving
Head carriage position sensing
Printing
Paper advance
Out of paper detection

Head Carriage Drive

4 The head carriage drive moves the Print Head laterally in front of the paper and is driven by a stepper motor via a drive belt. The construction of the carriage enables the head to pivot away from the platen at the extremes of its travel. This makes it easy to change the ribbon and load paper.

5 The drive for the carriage is provided by a two phase stepping motor. This motor requires both phases to be energised to produce movement. The direction of rotation is dependent upon which phase is leading or lagging the other phase by 90°.

Ribbon Advance

6 A cord-driven clutch mechanism enables the ribbon to move from right to left across the nose of the Print Head when the carriage is moving. The ribbon moves in the same direction regardless of which way the carriage is moving.

Head Carriage Position Sensing

7 The printing position of the carriage is determined by the feedback produced by an optical transducer, which an integral part of the carriage motor assembly. This uses a slotted disc mounted on the motor shaft and a lamp and photo-voltaic cells to produce three pulse trains (P1, P2 and P3). These pulse trains provide accurate carriage position information for the printing of the individual character columns.

8 In addition to the optical transducer, there is a magnetically-operated relay which provides an approximate indication of when the carriage is near its home position. When a change of state of this relay is detected, accurate home positioning of the carriage is achieved by monitoring the optical transducer outputs.

Print Head

9 The Print Head contains nine pins, arranged in a vertical line in the centre of the ribbon guide. As the head moves across the face of the paper, the characters are formed by the impact of the pins on the ribbon.

Paper Advance

10 The paper is advanced by a dc motor which provides discrete individual line feeds in the forward direction only. The rotational position of the roller is sensed by magnets which are fitted on a wheel in the reduction gearing. As the wheel rotates, the magnets alternately pulse a magnetic relay on the Reed Relay pec. This generates signals which are passed back to the drive electronics, causing the motor to start or stop as required.

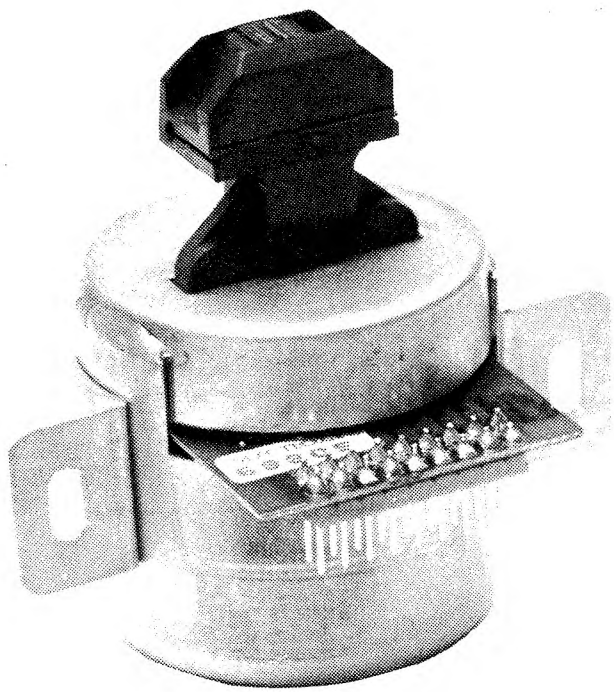
Out of Paper Detection

11 The presence of printing paper is detected by an optical sensor which is fitted behind the platen on the left-hand side. When printing is approximately one inch from the end of the paper, printing on subsequent lines is inhibited.

Printer Illumination

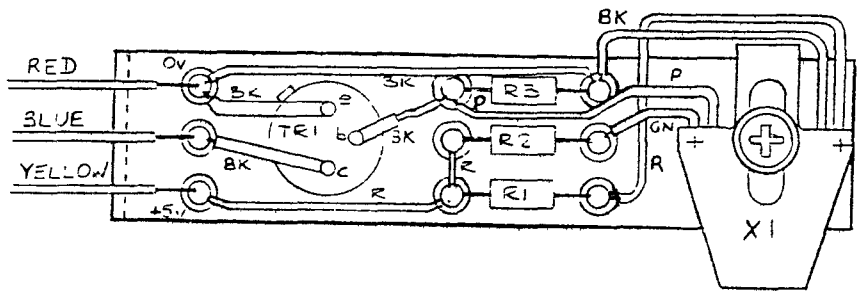
12 Illumination for the Printer is provided by four small lamps which are mounted on the underside of the Printer cover. Power for the lamps is provided from plug PLW on the Switch Panel Assembly, which provides +24 V.

13 This part of the equipment is not supplied as part of a replacement Printer Assembly. Replacement lamps are ordered individually.



PRINT HEAD

FIG 3A.10.2



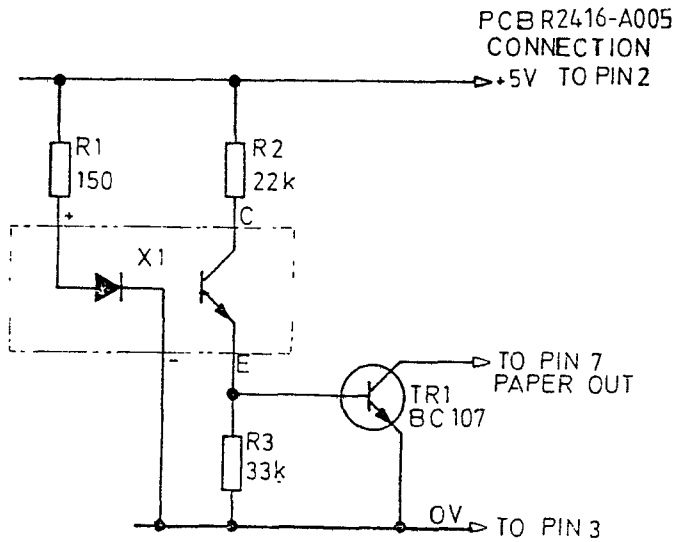
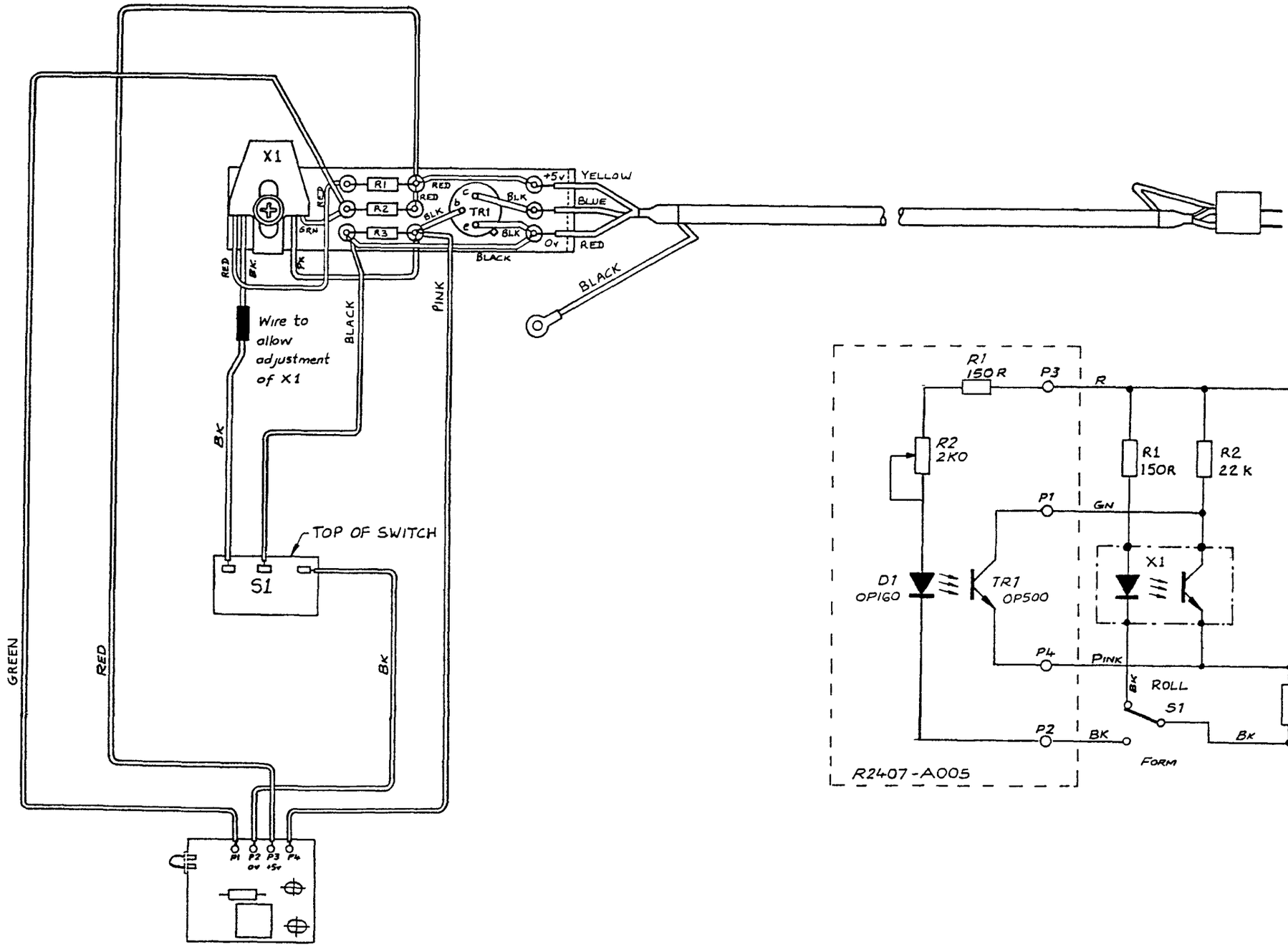
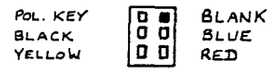
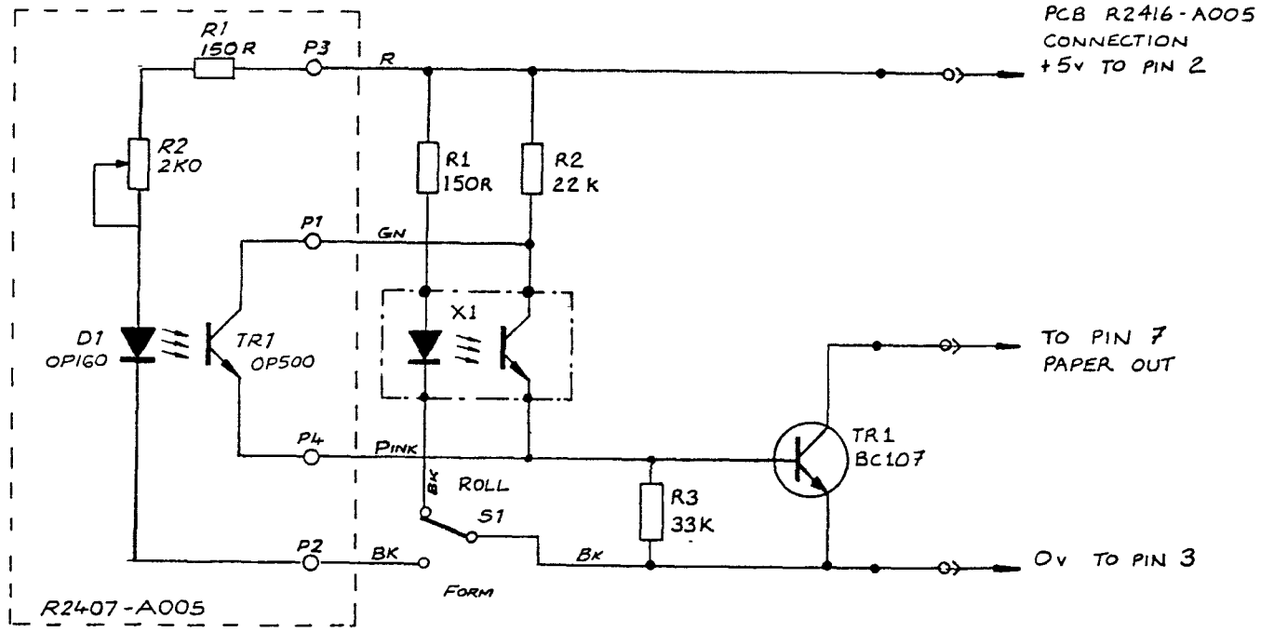


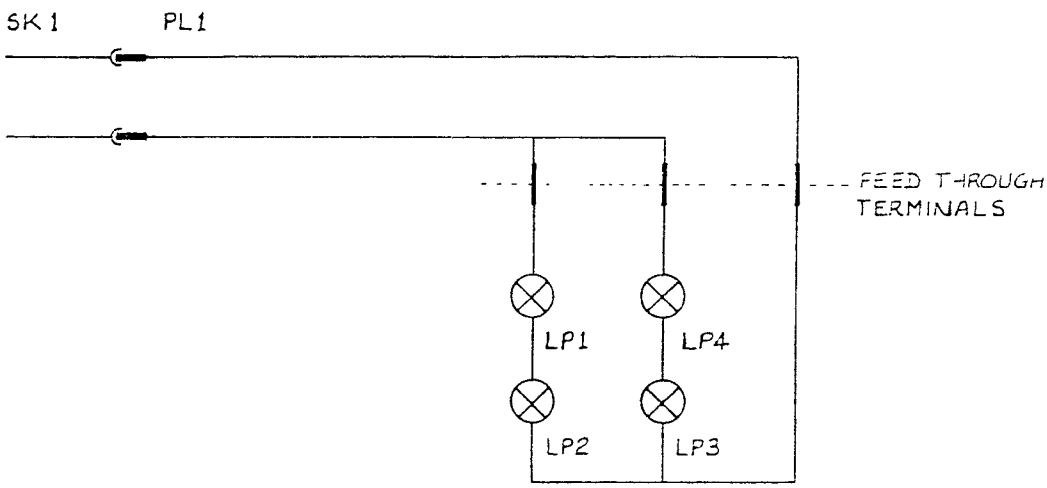
FIG 3A.10.3 PAPER OUT DETECTOR







PAPER OUT/PAGINATION DETECTOR (TGQ7 ONLY) FIG 3A.10.4



PRINTER ILLUMINATION CIRCUIT DIAGRAM FIG 3A.10.5

CHAPTER 11

SWITCH PANEL ASSEMBLY

CONTENTS

Paragraph

1 GENERAL INFORMATION
2 GENERAL DESCRIPTION

TABLES

Number		Page
3A.11.1	Mains Input Voltage Wiring	11.3

ILLUSTRATIONS

Figure		Page
3A.11.1	Switch Panel Assembly	11.2
3A.11.2	Switch Panel Assembly Schematic Diagram	11.4

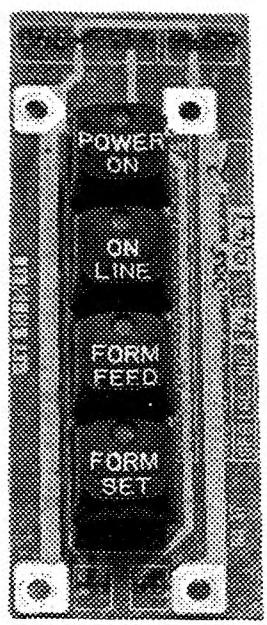


FIG 3A.11.1 SWITCH PANEL ASSEMBLY
5815-99-790-0348

CHAPTER 11

SWITCH PANEL ASSEMBLY

GENERAL INFORMATION

1 The Switch Panel is fixed to the underside of the Printer cover by four screws. Only one version of the panel is used for all TGQ Teleprinter outfits.

GENERAL DESCRIPTION

2 The Switch Panel consists of a small circuit board which has four buttons mounted on it. Each button has a built-in red LED. The function of the buttons is shown in Table 3A.11.1 below.

TABLE 3A.11.1

SWITCH PANEL BUTTON FUNCTIONS

Button	Function
POWER ON	This is a "dummy" button. Built-in LED illuminates when the Teleprinter is switched on.
ON LINE	Built-in LED illuminates when the Printer is on line. Pressing the button switches the Printer to off line.
FORM FEED	Only operates off line. Pressing the button advances the paper to the next "top of form" and moves the carriage to the left. This button is also used to restart the Printer after the paper has been changed.
FORM SET	Only operates off line. Pressing the button sets the current line as the new "top of form". This button is also used to initiate a self-test.

2 Four small plugs are fitted to the underside of the Switch Panel. These provide signals to and from the panel as follows:

Plug PLT - Signals on or off line request to Printer Control Board via Right-Hand Filter Board.

Plug PLU - Provides +5 V to power all built-in LEDs and +24 V to be passed to plug PLW. Passes FORM SET and FORM FEED signals to Printer Control Board via Left-Hand Filter Board.

Plug PLV - Not used.

Plug PLW - Supplies +24 V to Printer illumination lamps.

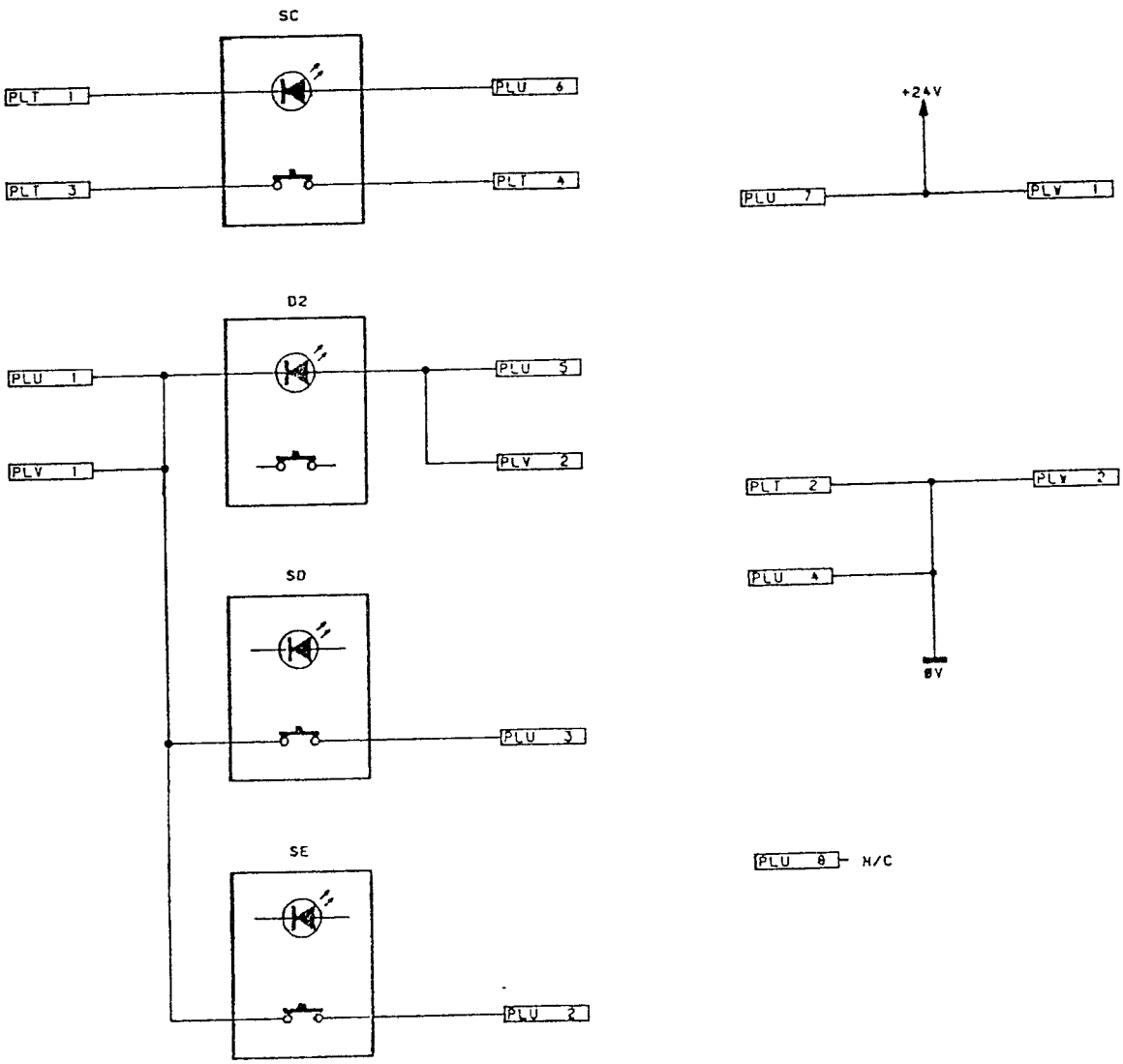


FIG 3A.11.2 SWITCH PANEL ASSEMBLY SCHEMATIC DIAGRAM

C H A P T E R 1 2

K E Y B O A R D

CONTENTS

Paragraph

1 GENERAL INFORMATION
2 GENERAL DESCRIPTION

ILLUSTRATIONS

Figure		Page
3A.12.1	TGQ2 Keyboard	12.2
3A.12.2	Keyboard Schematic Diagram	12.5/6



FIG 3A.12.1

TGQ2 KEYBOARD
5810-99-762-0239

CHAPTER 12

KEYBOARD

GENERAL INFORMATION

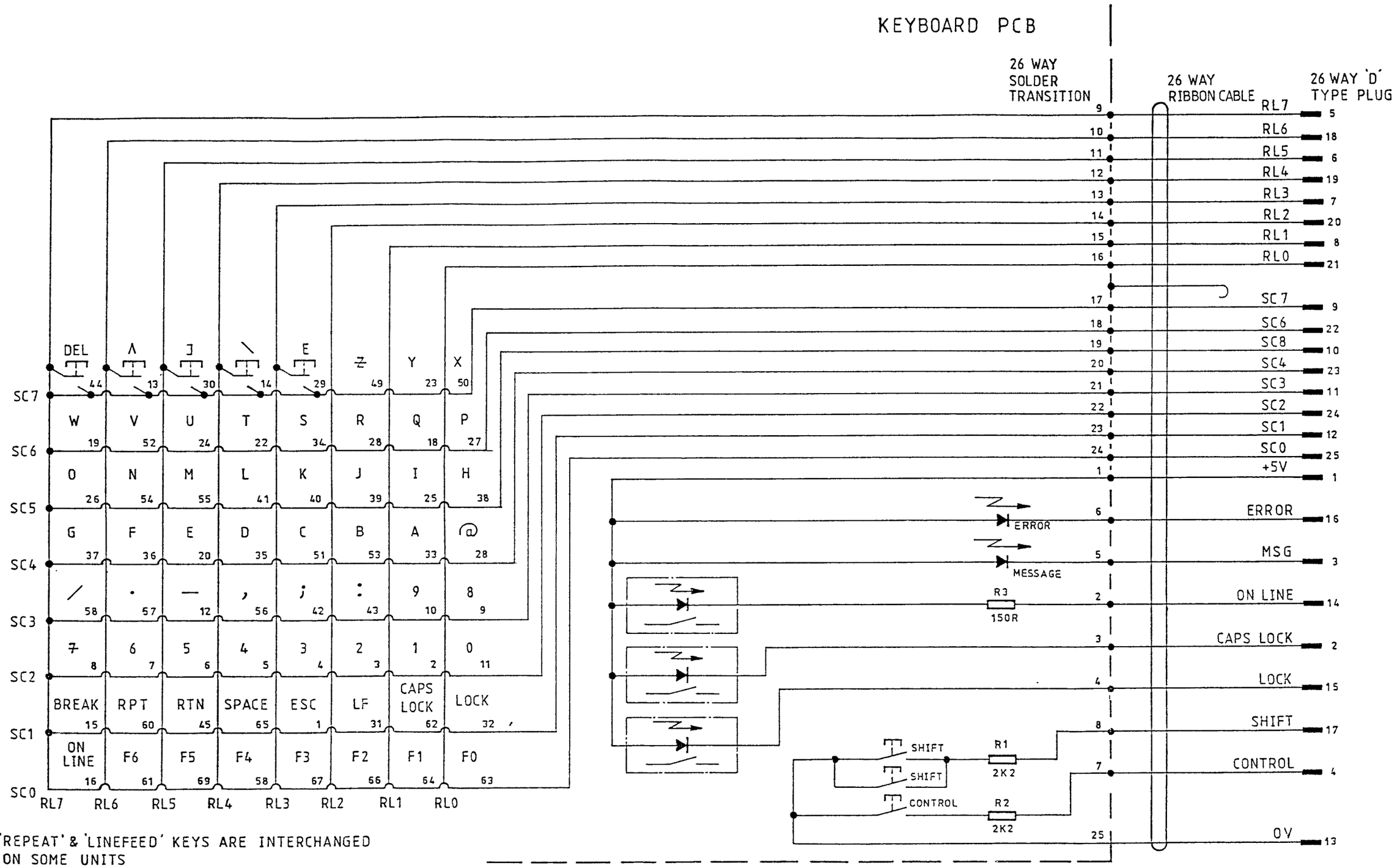
1 A Keyboard is fitted as standard on all TGQ Series Teleprinters except TGQ1, TGQ7 and TGQ8 (it can be fitted to these as an option). The Keyboard fitted to the TGQ4, TGQ6 and TGQ9 variants differs slightly from the standard Keyboard in that it has a plastic strip mounted above the top row of keys which shows the message edit functions available on those keys.

GENERAL DESCRIPTION

2 The Keyboard connects to the front of the Printer Unit via a 25-way D-type socket and is held in place by a metal plate which secures it to the base of the Teleprinter.

3 The Keyboard consists of a matrix of column and row tracks. Pressing a key causes the encoded signal for that character to be transmitted to the Interface Control Board via the Right-Hand Filter Board. The signal is then passed to the Printer Control Board and then via the Left-Hand Filter Board to the Print Head. This forms the correct dot pattern to print the character on the paper.

4 The only electronic components in the Keyboard are the indicator LEDs for LOCK, CAPS LOCK, ON LINE, MSG and ERROR and their associated current limiting resistors.



NOTE / 'REPEAT' & 'LINEFEED' KEYS ARE INTERCHANGED ON SOME UNITS

KEYBOARD SCHEMATIC DIAGRAM FIG 3A.12.2

TELEPRINTER, TGQ SERIES

CATEGORY 3B - TECHNICAL DESCRIPTION, PAPER TAPE ATTACHMENT (PTA)

CONTENTS

Chapter 1 - General Information
Chapter 2 - Principles of Operation
Chapter 3 - Controller Board
Chapter 4 - Transformer and Power Supply
Chapter 5 - RF Box
Chapter 6 - Filter Board
Chapter 7 - Tape Punch Assembly
Chapter 8 - Tape Reader Assembly
Chapter 9 - Brake Arm Assembly
Chapter 10 - Switch Panel Assembly

CHAPTER 1

GENERAL INFORMATION

CONTENTS

Paragraph

1 INTRODUCTION
2 CONSTRUCTION
4 Brake Arm Assembly
5 Tape Punch Assembly
7 Tape Reader Assembly
8 Switch Panel Assembly
9 RF Box
10 Controller Board
12 Mains Transformer
13 Filter Board

ILLUSTRATIONS

Figure		Page
3B.1.1	Paper Tape Attachment - Module Layout Diagram	1.2

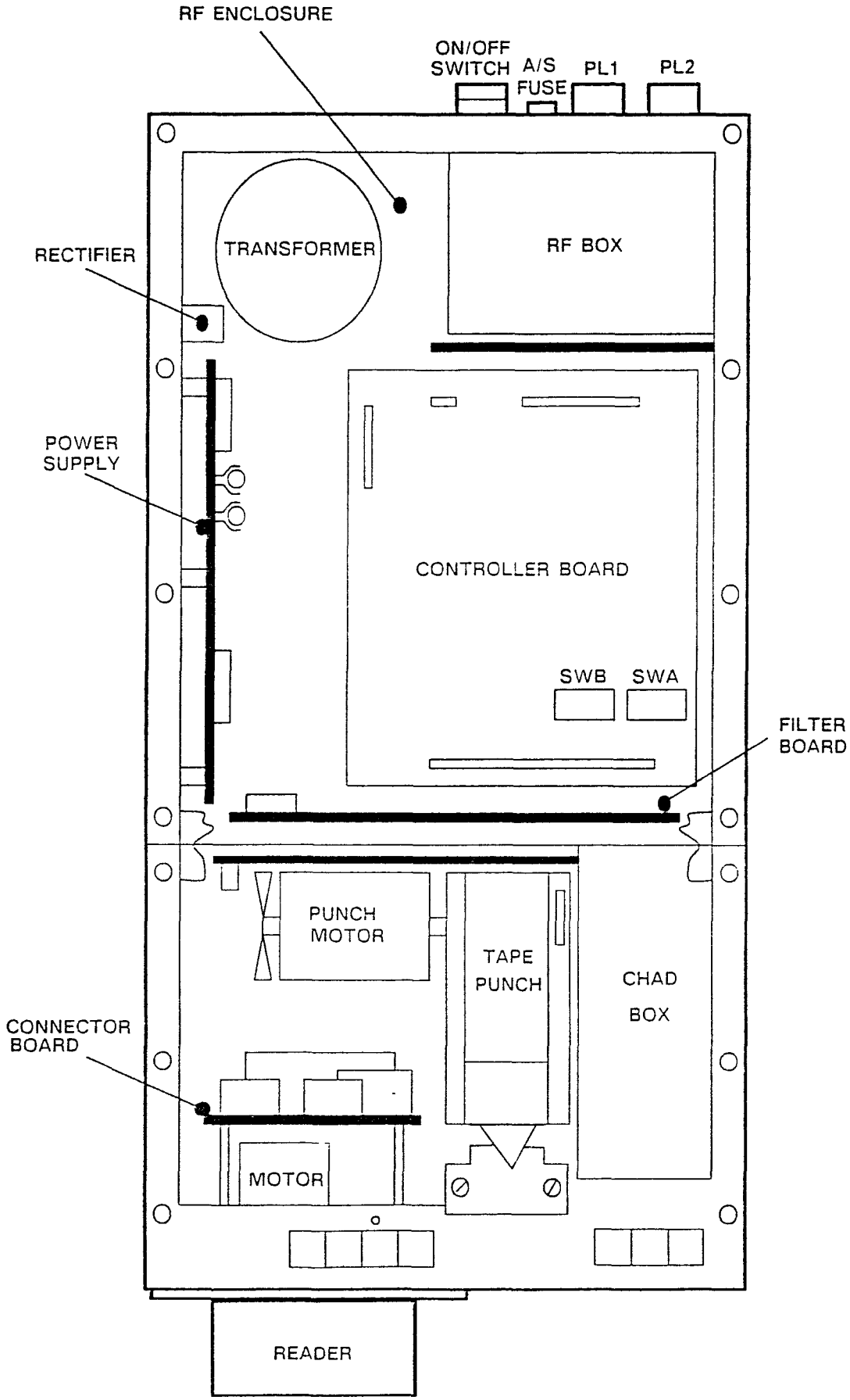


FIG 3B.1.1 PAPER TAPE ATTACHMENT - MODULE LAYOUT DIAGRAM

CHAPTER 1

GENERAL INFORMATION

INTRODUCTION

1 The PTA is a combined Tape Punch and Reader Unit which has been designed primarily for use with the TGQ Series Teleprinters. However, the flexibility of the design also enables it to be used as a stand-alone unit.

CONSTRUCTION

2 The PTA is made up of self-contained modules which can be replaced easily using only a cross-head screwdriver and (in some cases) a blade screwdriver. Plug and socket connectors, screw terminals and spade connectors are used throughout, eliminating the need for soldered connections.

3 The PTA case consists of three separate compartments:

Tape Reel Box
Electronics Box
Tape Punch/Reader Box

The Tape Reel Box is screwed onto the top of the Electronics Box whilst the other two compartments are individually screwed onto a single baseplate. Brief descriptions of each of the modules contained in the PTA are given below.

Brake Arm Assembly

4 This is mounted in the Tape Reel Box. Its function is to control the amount of paper tape being dispensed to the Tape Punch from the tape reel. An integral detector senses both "tape out" and "taut tape" conditions and signals the Controller Board to take the appropriate action.

Tape Punch Assembly

5 This consists of a separate Punch Motor and Punch Mechanism, linked together by a rubber drive belt. The punching of coded messages onto tape is achieved by punching needles which are driven through and withdrawn from the tape by an eccentric on the main shaft. Selection of each needle is controlled by an electromagnet. Feed holes are added to the tape when it is forced over a rotating sprocket wheel, which in turn causes more tape to be pulled through the mechanism.

6 The Punch Mechanism is equipped with a photo-electric timing generator. The output from this synchronises the data and tape feed input pulses with the angular position of the main shaft.

Tape Reader Assembly

7 This is a photo-electric paper tape reader which is capable of reading 5, 6 and 8-hole tapes. Tape width selection is by a simple 3-position switch which is mounted on the front of the assembly. The paper tape is fed through the Reader from right to left by a sprocket wheel which engages in the feed holes. An abrasion-proof read head mounted in the base of the unit reads the tape as it passes across it.

Switch Panel Assembly

8 This contains the function switches and indicators for the Reader and Punch. The switches are soldered to a single electronic circuit panel which is screwed to the underside of the top of the Punch/Reader Box.

RF Box

9 This is mounted to the rear panel of the PTA. It provides the following functions:

Mains on/off switch
Mains input filter
Signal input filter
Mains protection via an integral fuse
Mains input voltage selection via rear-mounted terminal blocks

Controller Board

10 The Controller Board is mounted to the floor of the Electronics Box. It performs the following functions:

Controls the keyswitches and LEDs
Controls the Reader stepper motor drive
Handles Reader data input
Controls the Punch motor drive
Handles Punch data output
Handles communication via V24/V28 serial port

11 At the heart of this board is an 8035-series microprocessor. Software for the PTA is contained in 2 Kbytes of Programmable Read Only Memory (PROM) on a 2716 device. A second microprocessor, an 8748 device, controls the Tape Punch. Two blocks of DIL switches are mounted on the board to enable various options to be invoked (eg line parity, interface speed, etc).

Mains Transformer and Power Supply Module

12 The power supply module includes a rectifier, reservoir capacitors and regulators. Power is supplied to the module via a toroidal mains transformer. The power supply produces nominal dc voltages of +5 V, +/- 9 V, +12 V and +/-20 V which power the equipment as follows:

+5 V	Controller Board, Switch Panel and photodiodes on Reader Unit
+9 V	Line drivers
-9 V	Interface Circuitry
+12 V	Punch Mechanism
+20 V	Reader photo-electric cells
-20 V	Punch motor

Filter Board

13 All power and signal lines between the Electronics Box and the Tape Reader and Punch pass through the Filter Board, which is mounted vertically between the two compartments. The board contains a bank of feed through capacitors and inductive circuits which slow the signal rise times, thus reducing RF radiation to a minimum.

CHAPTER 2

PRINCIPLES OF OPERATION

CONTENTS

Paragraph

1 INTRODUCTION
2 TRANSMISSION
3 RECEPTION
4 OPERATING MODES
4 ITA5 (ASCII) Mode
5 ITA2 (BAUDOT) Mode

ILLUSTRATIONS

Figure		Page
3B.2.1	PTA Signal Flow Diagram	2.5
3B.2.2	PTA Block Diagram	2.6
3B.2.3	Interconnection Diagram	2.7/8
3B.2.4	PTA Overall Schematic Diagram	2.9/10

CHAPTER 2

PRINCIPLES OF OPERATION

INTRODUCTION

1 This chapter describes how incoming and outgoing data is processed by the PTA. Figure 3B.2.1 gives an overall view of how the data is routed through the PTA. Figure 3B.2.2 shows how the data is handled internally by the Controller Board. The interconnections between the separate modules in the PTA are shown in detail in Figure 3B.2.3.

TRANSMISSION

2 A tape placed in the Reader Unit passes under photo-electric cells which are mounted in the Reader flap. Hole positions are detected by photodiodes mounted in the baseplate. The signals then pass to an 8155 input/output port via the Filter Board. From here, they are processed and buffered by the 8035-series processor before passing to the 8250 serial interface. This converts the data from parallel to serial form before transmitting it to the Teleprinter.

RECEPTION

3 Data from the Teleprinter is received by an 8250 interface device which converts the serial data to parallel form. The data then passes to the punch control processor, an 8748 device, and then to the Punch Unit via drivers and the Filter Board. The punch feed mechanism is synchronised with the data by means of a photo-electric timing generator.

OPERATING MODES

ITA5 (ASCII) Mode

4 In ITA5 mode the PTA configures its serial communications device as follows:

1 start bit
7 data bits
Odd parity
1 stop bit

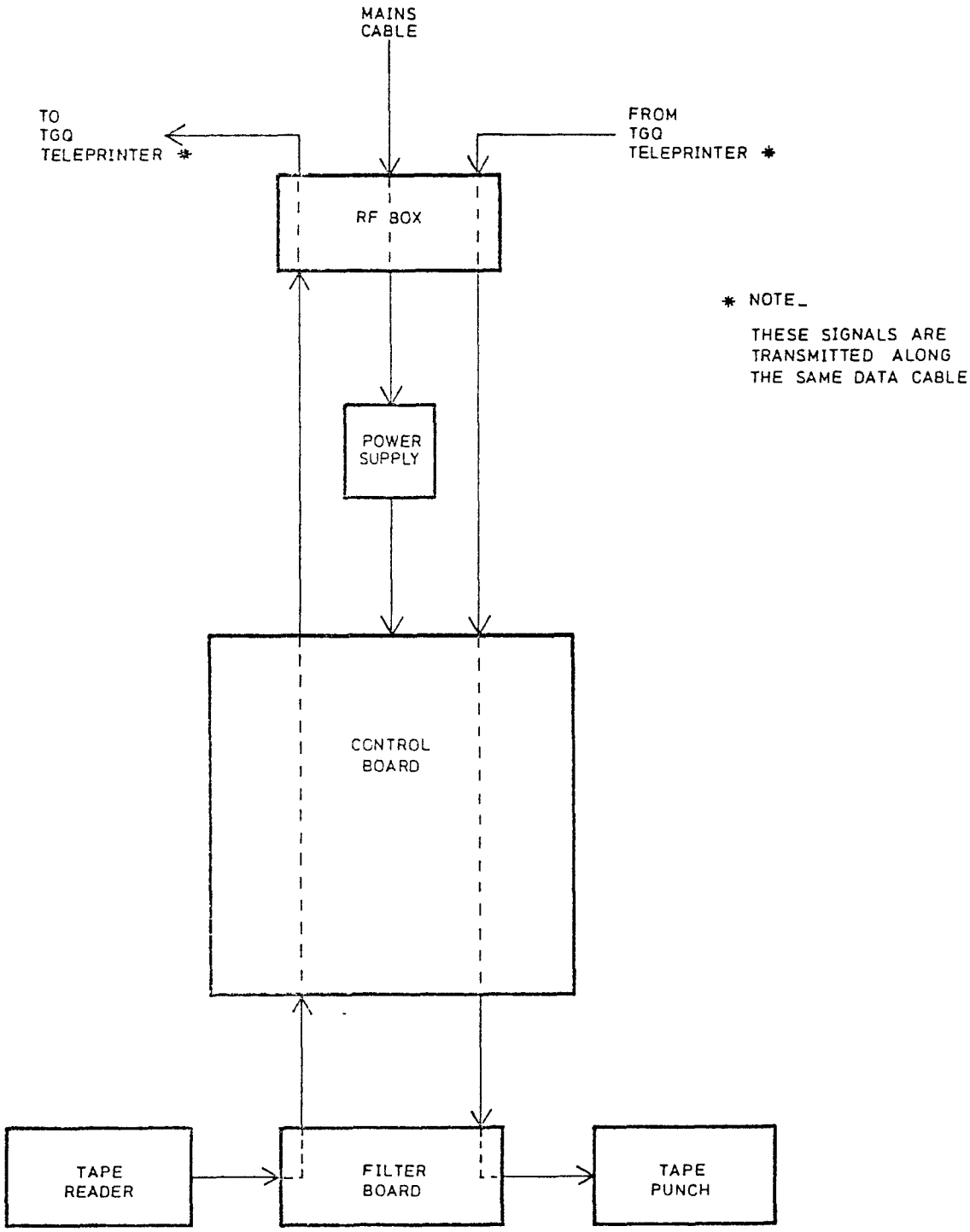
Seven data bits are punched. The eighth bit is not punched on some early PTAs and will be ignored by the Reader. On all other PTAs the eighth bit is punched according to the setting of internal DIL switches SWA7 and SWA8. All characters read from the tape will be transmitted, including nulls and rubouts. All characters received by the PTA can be punched. Control codes received may or may not be punched, depending on the setting of DIL switch SWB4.

ITA2 (BAUDOT) Mode

5 In ITA2 mode the PTA configures its serial communications device as follows:

1 start bit
5 data bits
Odd parity
1.5 stop bits

The significance of ITA2 data depends on the most recent shift character received (figure shift 1BH, letter shift 1FH). Data sent to the PTA in this mode must begin with a shift character, otherwise an ambiguity may arise.



PTA SIGNAL FLOW DIAGRAM

FIG 3B.2.1

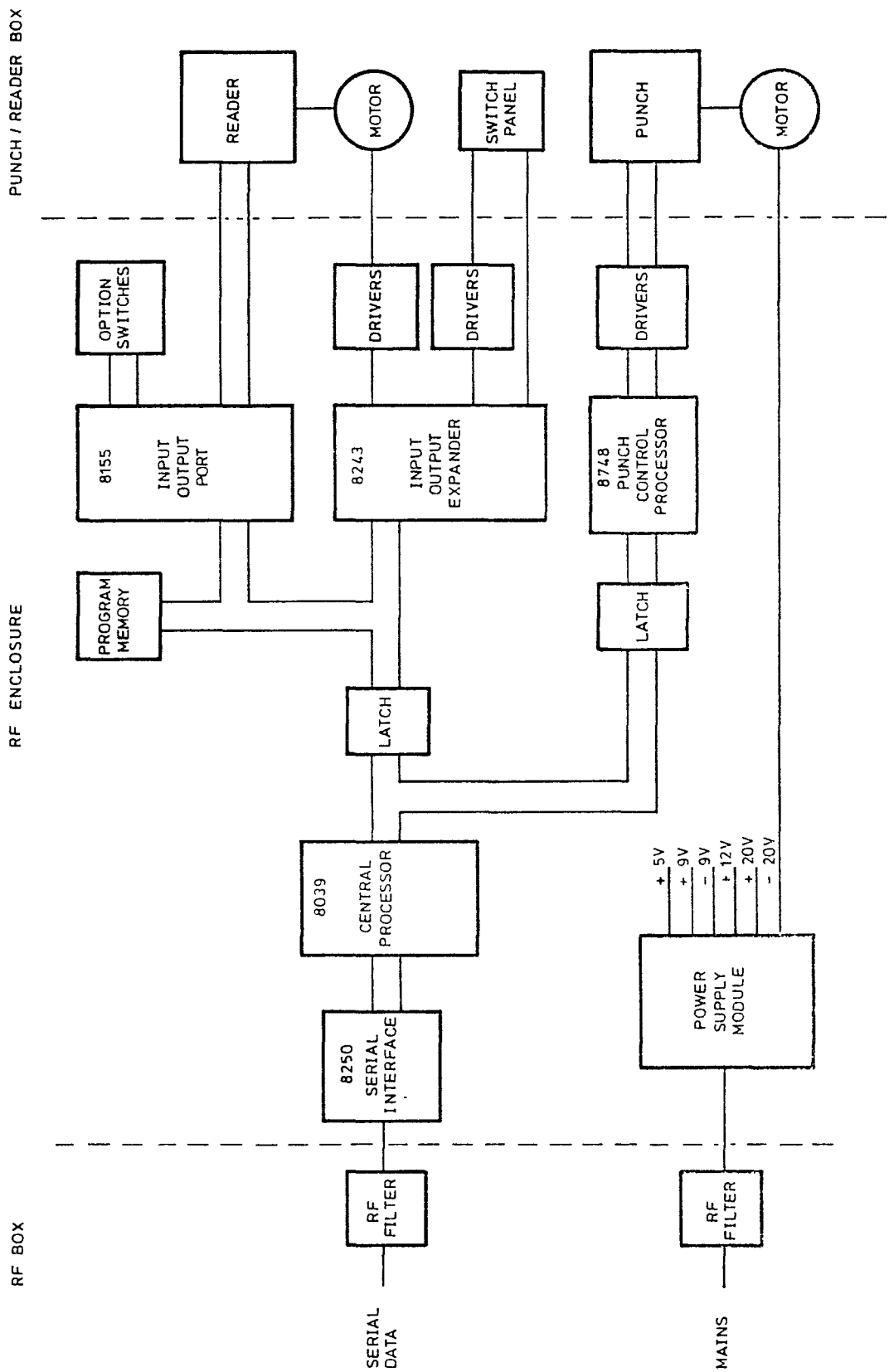
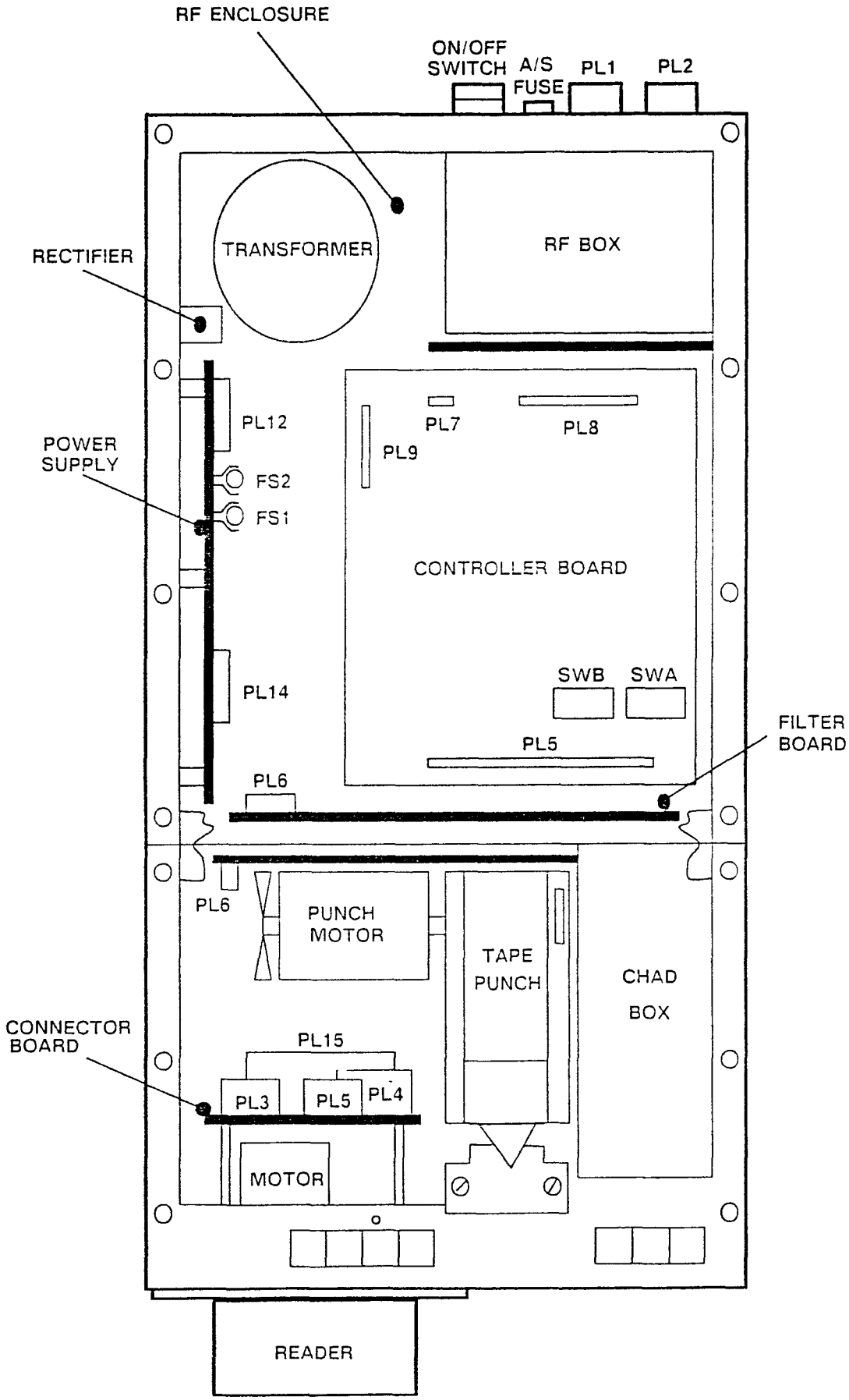
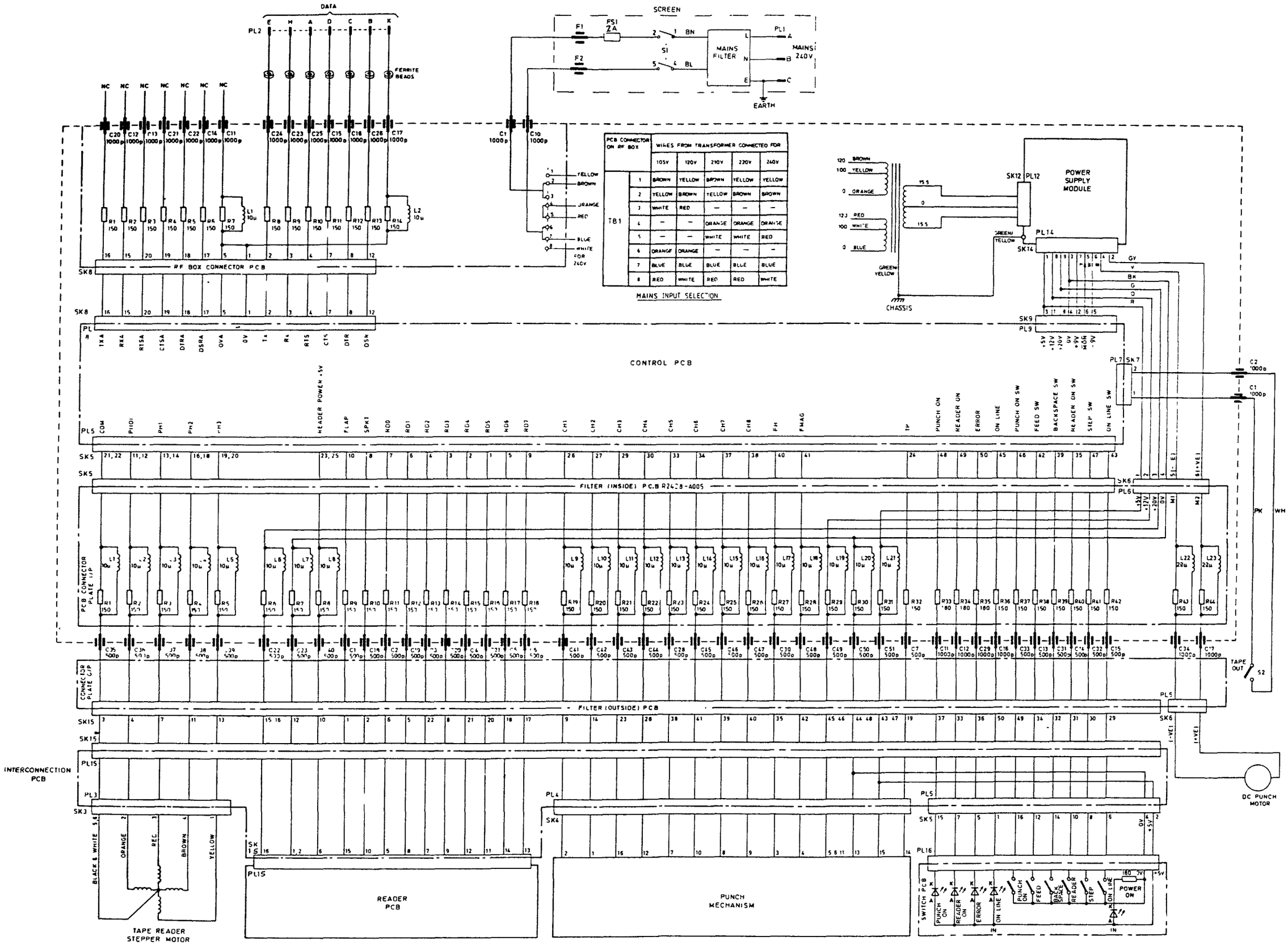


FIG 3B.2.2 PTA BLOCK DIAGRAM



INTERCONNECTION DIAGRAM

FIG 3B.2.3



PTA OVERALL SCHEMATIC DIAGRAM

FIG 3B.2.4

CHAPTER 3

CONTROLLER BOARD

CONTENTS

Paragraph

1 GENERAL INFORMATION
2 Software
4 Modifications
5 Microprocessor
6 GENERAL DESCRIPTION

TABLES

Number		Page
3B.3.1	PTA DIL Switch Settings	3.4

ILLUSTRATIONS

Figure		Page
3B.3.1	PTA Controller Board	3.2
3B.3.2	Controller Board Schematic Diagram	3.5/6

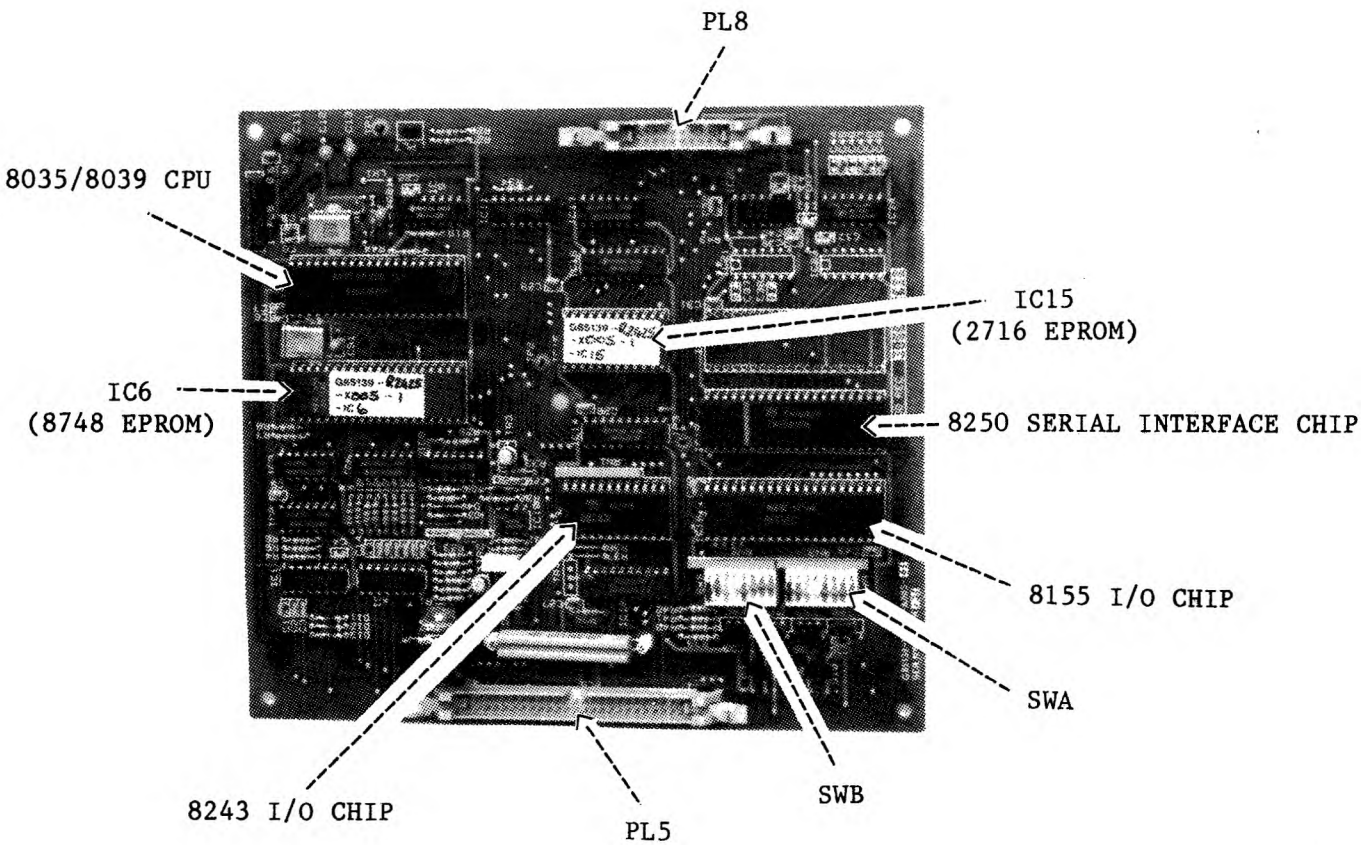


FIG 3B.3.1

PTA CONTROLLER BOARD
5815-99-790-0347

CHAPTER 3

CONTROLLER BOARD

GENERAL INFORMATION

1 The Controller Board controls all the functions provided by the PTA via its Intel 8035-series microprocessor. The main support chips on the board are an 8250 serial interface chip, an 8155 I/O chip for the Tape Reader, and an 8243 I/O chip for the Reader motor and Switch Panel.

Software

2 The software for the PTA is contained in two EPROMS. A 2716 24-pin EPROM (IC15) contains the program software for the microprocessor and an 8748 40-pin EPROM (IC6) contains the control software for the Tape Punch.

3 One of two slightly different versions of software may be fitted in the IC15 EPROM. Early PTAs which have software issued prior to X005-3 do not use DIL switch block SWA, whereas X005-3 and later software enables DIL switches SWA1, SWA7 and SWA8 to be used. In practice, this means that on early PTAs the line parity is set by DIL switches B5 and B6 on the TGQ Teleprinter, whereas on later PTAs the parity can either be set to match that on the Teleprinter (as for early PTAs) or can be set independently to odd, even, mark, or space/off (see Table 3B.3.1).

Modifications

4 If required, an updated version of software can be fitted to replace early software contained in IC15. Note that the Tape Punch control software contained in IC6 is not affected by changing the software in IC15 and therefore does not need to be replaced.

Microprocessor

5 The Intel 8035-series microprocessor fitted to the Controller Board may be either an 8039 or an 8035 chip. Whichever chip is fitted makes no practical difference to the operation of the PTA.

GENERAL DESCRIPTION

6 Incoming signals to the Controller Board are fed in to the 8250 serial interface chip via the RF Box and PL8. Here, the data is converted from serial to parallel form before being passed to the 8039 microprocessor. From here the data passes to the 8748 punch control processor via an 8-bit latch. It then passes through drivers, leaves the Controller Board via PL5, and is then filtered by the Filter Board before being relayed to the Tape Punch via PL15 and PL4 on the rear of the Reader Assembly.

7 Signals from the Tape Reader are fed in to the 8155 I/O port via PL5. The data then passes to the 8039 microprocessor via an 8-bit latch. The 8039 processes and buffers the data before passing it to the 8250 serial interface chip. This converts the data from parallel to serial form before passing it to the RF Box via PL8.

8 DIL switch blocks SWA and SWB on the Controller Board enable various options to be selected on the PTA. These are described in Table 3B.3.1. Note that switches SWA2 to SWA6 and SWB5 are not used (they have no internal connections) and are therefore not listed in the table.

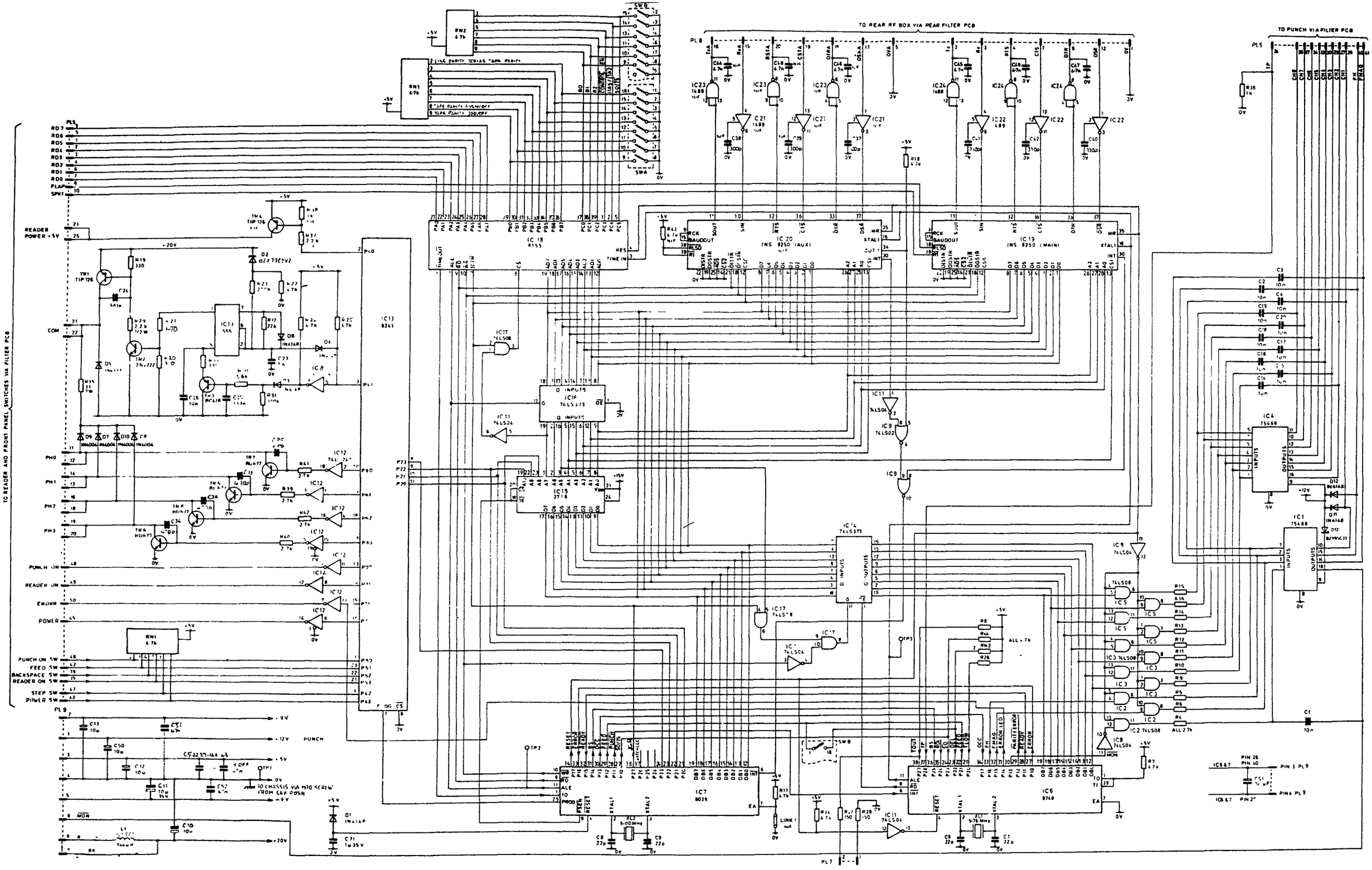
TABLE 3B.3.1

PTA DIL SWITCH SETTINGS

Function	Block SWA			Block SWB						
	1	7	8	1	2	3	4	6	7	8
Parity Set By: B5 & B6 on Teleprinter SWA7 & SWA8 on PTA	UP DOWN									
Parity: Odd Even Mark Space/off		DOWN UP UP DOWN	UP DOWN UP DOWN							
Punch Mechanism Control (see Note 1)				DOWN						
Punch Mechanism Type: (see Note 2) 75 chars/s 50 chars/s					UP DOWN					
Default Character Code: ITA2 ITA5						UP DOWN				
Control Codes: Disabled Enabled							UP DOWN			
Transmission Speed: 75 baud 100 baud 110 baud 150 baud 300 baud 600 baud 1200 baud 4800 baud								UP UP UP DOWN DOWN DOWN DOWN UP	UP DOWN DOWN UP UP DOWN DOWN UP	DOWN UP DOWN UP DOWN UP DOWN UP

NOTES (1) Switch SWB1 MUST be left in the DOWN position.

(2) The Punch Assembly fitted to all PTAs supplied to the Royal Navy operate at 50 chars/s.



CONTROLLER BOARD SCHEMATIC DIAGRAM

FIG 3B.3.2

CHAPTER 4

TRANSFORMER AND POWER SUPPLY

CONTENTS

Paragraph

1 GENERAL INFORMATION
3 GENERAL DESCRIPTION

TABLES

Number		Page
3B.4.1	Mains Input Voltage Wiring	4.3

ILLUSTRATIONS

Figure		Page
3B.4.1	Mains Transformer	4.2
3B.4.2	Power Supply Module	4.2
3B.4.3	Power Supply Schematic Diagram	4.5/6

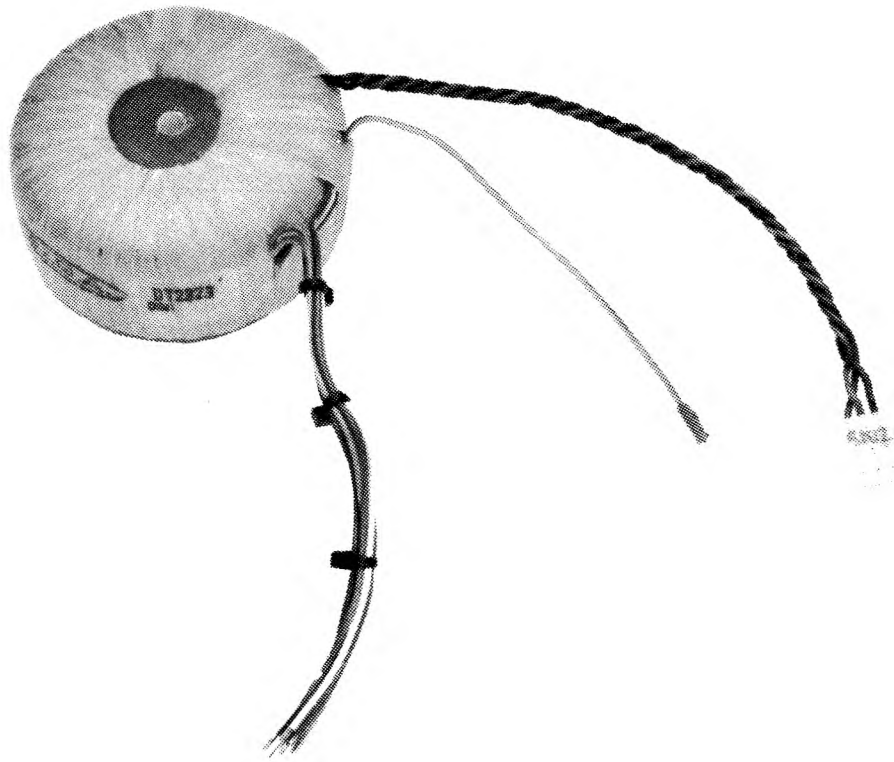


FIG 3B.4.1 MAINS TRANSFORMER
5950-99-795-2036

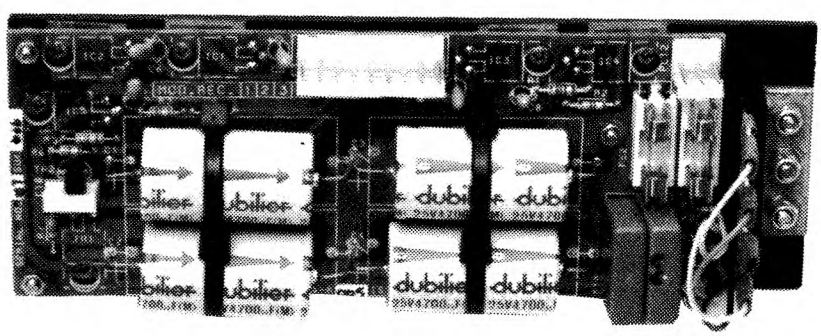


FIG 3B.4.2 POWER SUPPLY MODULE
5815-99-785-2546

CHAPTER 4

TRANSFORMER AND POWER SUPPLY

GENERAL INFORMATION

1 Unlike the TGQ Teleprinters, the PTA has a separate Transformer and Power Supply. However, in common with the TGQ Teleprinters, the operating voltage is determined by the Transformer wire connections to a terminal block (TB1) on the rear of the RF Box.

2 Table 3B.4.1 below shows the connections to TB1 which are necessary to achieve the required operating voltage within the range 105 V to 240 V.

TABLE 3B.4.1

MAINS INPUT VOLTAGE WIRING

Voltage Required	"TB1" Top 1	2	3	4	5	6	7	Bottom 8
105 V	Brown	Yellow	White	-	-	Orange	Blue	Red
120 V	Yellow	Brown	Red	-	-	Orange	Blue	White
210 V	Brown	Yellow	-	Orange	White	-	Blue	Red
220 V	Yellow	Brown	-	Orange	White	-	Blue	Red
240 V	Yellow	Brown	-	Orange	Red	-	Blue	White

GENERAL DESCRIPTION

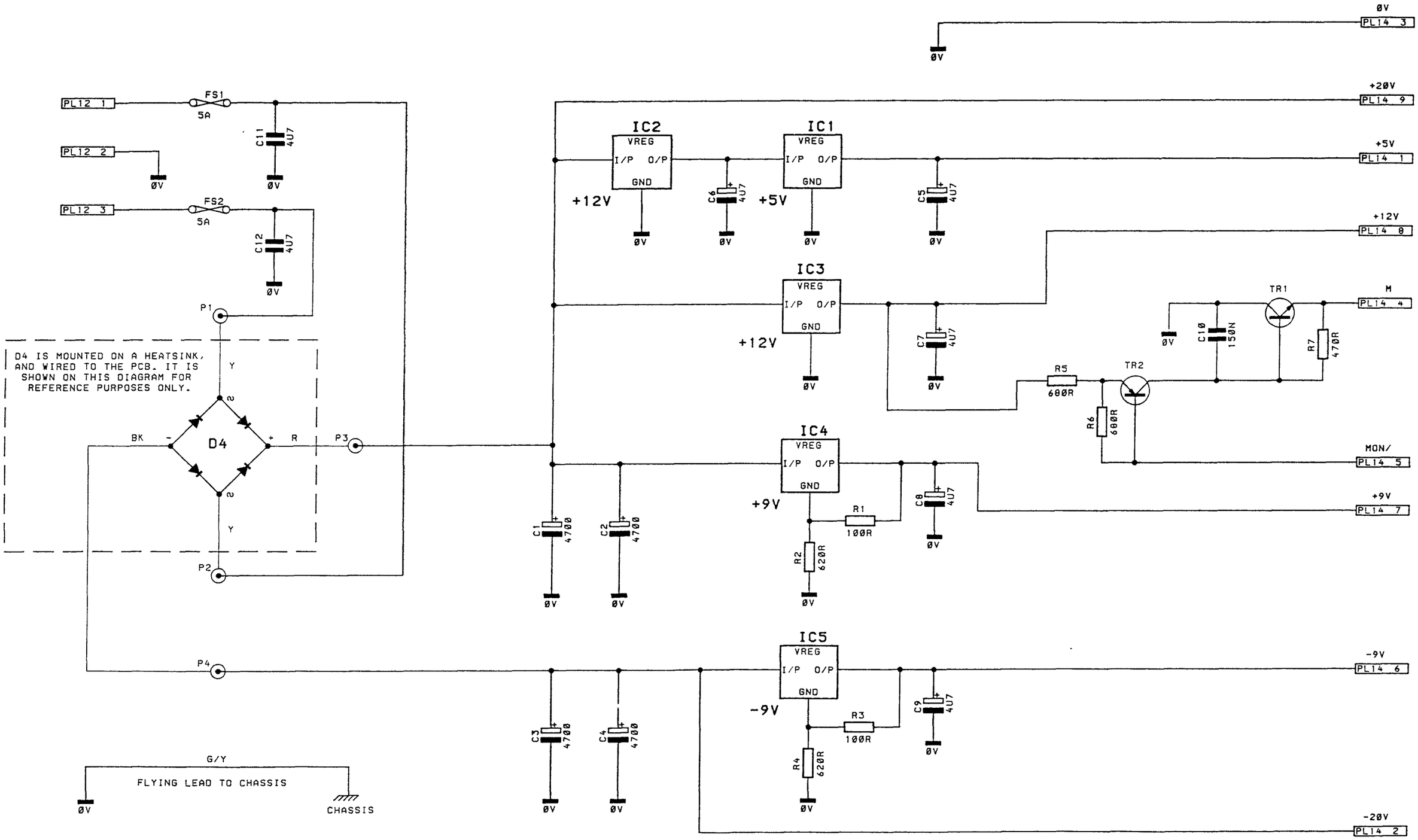
3 Incoming mains power is filtered by the RF Box before being passed to the toroidal Mains Transformer, which has two primary windings. A screen is provided between the primaries and secondaries to help reduce conducted signals back onto the mains. This is connected to the chassis and mains earth. The secondaries are connected to the Power Supply Module via PL12.

4 Each secondary incorporates a 5 A fuse (FS1 and FS2). A bridge rectifier provides two dc power supplies of approximately +20 V and -20 V. The positive supply, which powers the photo-electric cells on the Tape Reader, also provides inputs to IC2, IC3 and IC4. The negative supply is used to power the Punch motor and also provides an input to IC5.

5 Capacitors C3 and C4 smooth the input to IC5. These provides a regulated -9 V (approx) supply for the serial interface circuitry. Capacitors C1 and C2 smooth the input to IC4. This provides a regulated +9 V (approx) supply to power the line drivers.

6 IC2 and IC1 together provide a regulated +5 V supply for the Controller Board, Switch Panel, and the photodiodes in the Tape Reader. IC3 provides a regulated +12 V supply which is only used by the Tape Punch and its associated circuitry.

7 The Punch motor is controlled by TR1 and TR2. The input to TR2 is MON/, which is active low. This causes the Punch motor to switch on automatically when a message is to be punched and switches it off a few seconds after punching has finished.



POWER SUPPLY SCHEMATIC DIAGRAM

FIG 3B.4.3

C H A P T E R 5

R F B O X

CONTENTS

Paragraph

1 GENERAL INFORMATION
3 GENERAL DESCRIPTION

ILLUSTRATIONS

Figure		Page
3B.5.1	RF Box	5.2
3B.5.2	RF Box Schematic Diagram	5.5/6

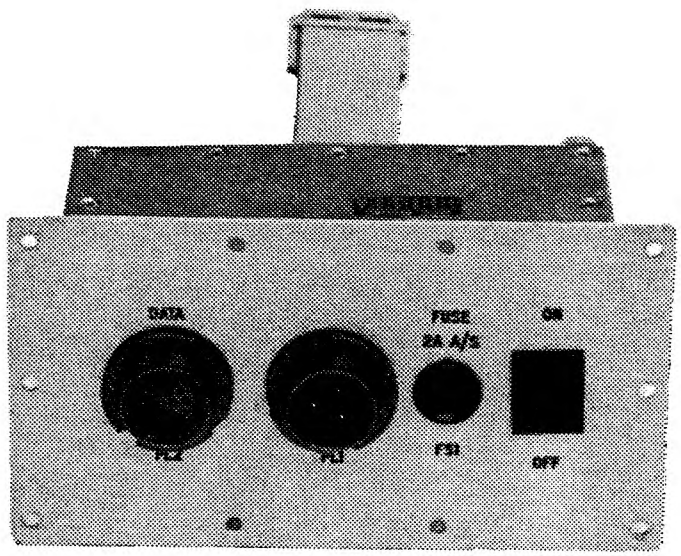


FIG 3B.5.1

RF BOX
6110-99-785-2541

CHAPTER 5

RF BOX

GENERAL INFORMATION

1 The RF Box is screwed to the rear panel of the PTA. Note that although the Resistor pec mounted on the rear of the RF Box is technically a separate assembly, a replacement RF Box is always supplied with this pec already fitted.

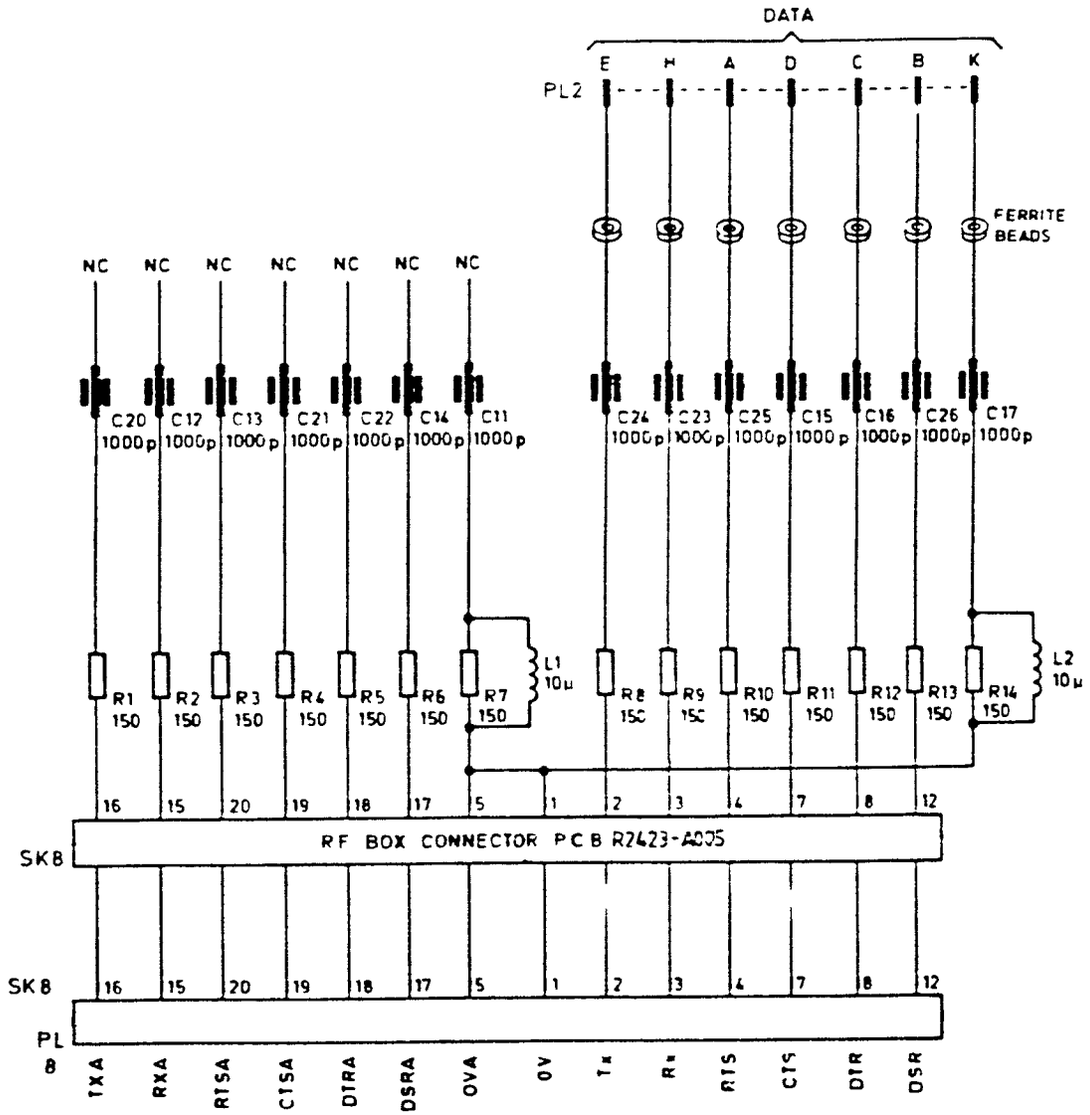
2 The RF Box has provision for two serial channels to be connected, although only one of these is used on the PTA.

GENERAL DESCRIPTION

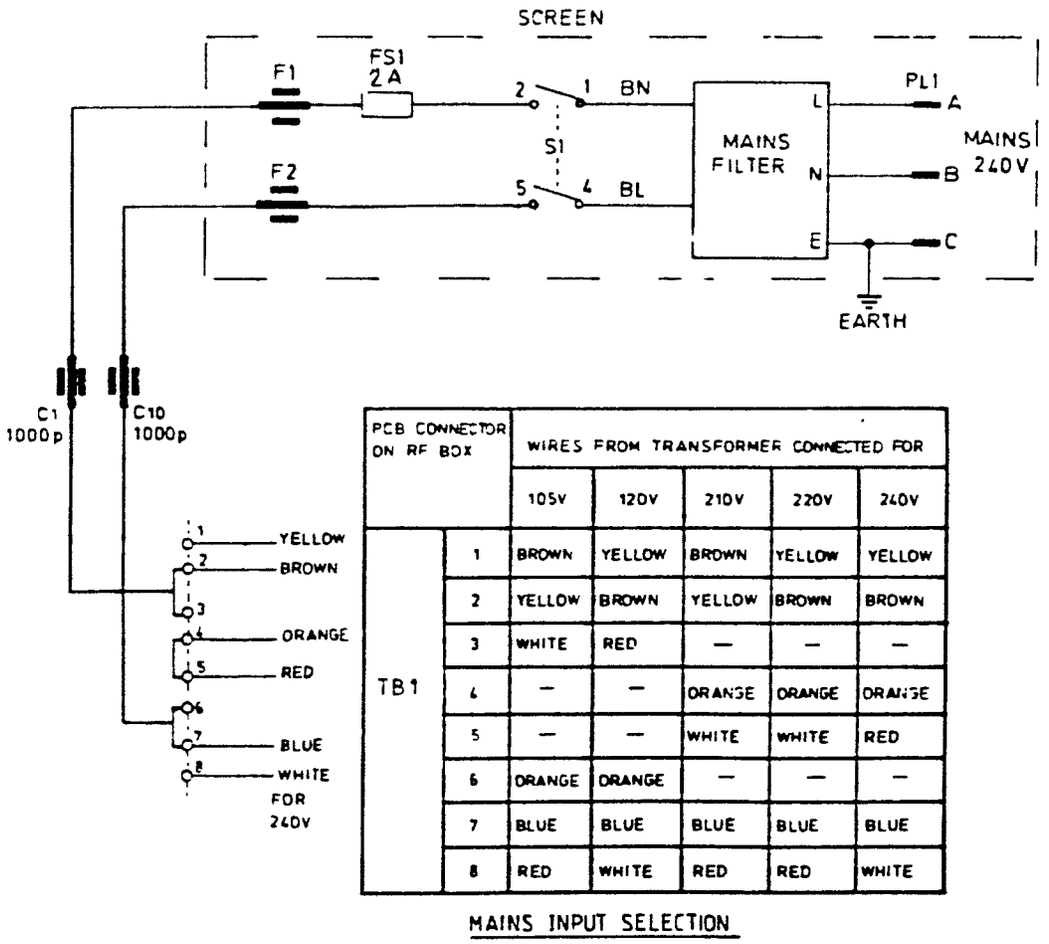
3 The RF Box consists of a sealed steel box with a Resistor pec mounted externally on the rear. The assembly uses resistors, inductors and feed-through capacitors to filter incoming and outgoing signals. These signals are passed to and from the RF Box via a ribbon cable which connects to PL8 on the Controller Board.

4 Two sockets are provided on the front of the RF Box. PL1 is a 3-way connector for the mains supply cable. PL2 is a 12-way connector for the signal line to the TGQ Teleprinter.

5 The mains supply to the PTA passes through the RF Box and is filtered by an internal 240 V mains filter. The filtered mains supply passes via a front-mounted on/off switch, a 2 A anti-surge fuse and two feed-through capacitors to terminal block TB1 on the Resistor pec. The way in which the wires from the Transformer are connected to this terminal block determines the operating voltage for the PTA (see Chapter 4 for further details).



R2425 - A005
CONTROL PCB



PCB CONNECTOR ON RF BOX		WIRES FROM TRANSFORMER CONNECTED FOR				
		105V	120V	210V	220V	240V
TB1	1	BROWN	YELLOW	BROWN	YELLOW	YELLOW
	2	YELLOW	BROWN	YELLOW	BROWN	BROWN
	3	WHITE	RED	—	—	—
	4	—	—	ORANGE	ORANGE	ORANGE
	5	—	—	WHITE	WHITE	RED
	6	ORANGE	ORANGE	—	—	—
	7	BLUE	BLUE	BLUE	BLUE	BLUE
	8	RED	WHITE	RED	RED	WHITE

MAINS INPUT SELECTION

RF BOX SCHEMATIC DIAGRAM

FIG 3B.5.2

C H A P T E R 6

F I L T E R B O A R D

CONTENTS

Paragraph

1 GENERAL INFORMATION
2 GENERAL DESCRIPTION

ILLUSTRATIONS

Figure		Page
3B.6.1	Filter Board	6.2
3B.6.2	Filter Board Schematic Diagram	6.5/6

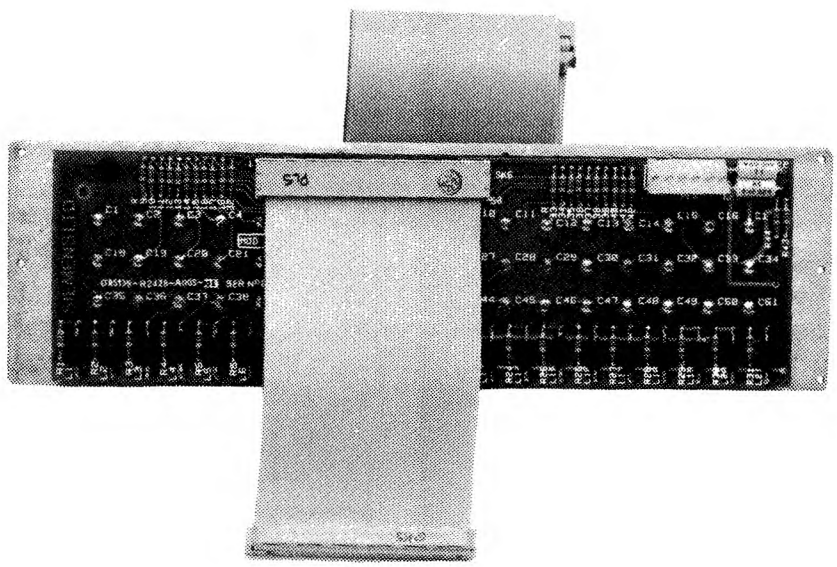


FIG 3B.6.1

FILTER BOARD
5815-99-785-2544

CHAPTER 6

FILTER BOARD

GENERAL INFORMATION

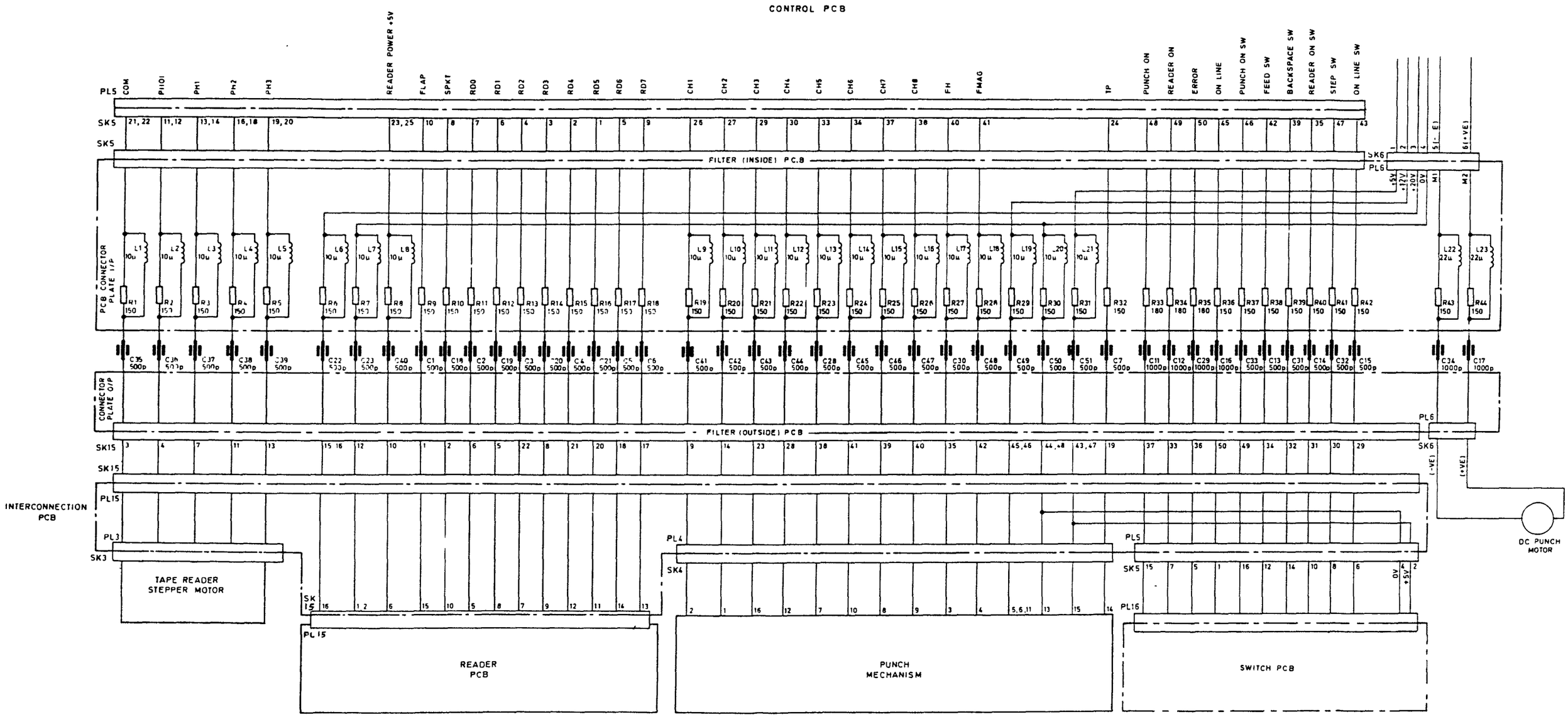
1 The Filter Board in the PTA is mounted vertically between the Electronics Box and the Punch/Reader Box. Note that should it be necessary to replace the Filter Board, the replacement is supplied with the necessary ribbon cables already attached.

GENERAL DESCRIPTION

2 The function of the Filter Board is supress spurious RF emissions on the signal lines which pass between the Electronics Box and the Tape Reader and Punch. The board is fitted with resistors, inductors and feed-through capacitors which perform the filtering by slowing the signal rise times. This is necessary to enable the PTA to meet HMG Tempest requirements.

3 The Filter Board receives signals from PL5 on the Controller Board via a ribbon cable. The filtered signals are then passed to PL15 on the rear of the Tape Reader via another ribbon cable. Signals destined for the Tape Punch are relayed from here via PL4. Signals for the Switch Panel are relayed via PL5.

4 Power for the Tape Reader, Punch and Switch Panel is supplied to PL6 on the Filter Board from PL14 on the Power Supply Module. -20 V for the Punch motor leaves the Filter Board from PL6 on the Punch/Reader Box side of the Filter Board. The other power lines are incorporated in the ribbon cable within the Filter Board.



FILTER BOARD SCHEMATIC DIAGRAM

FIG 3B.6.2

CHAPTER 7

TAPE PUNCH ASSEMBLY

CONTENTS

Paragraph

1 GENERAL INFORMATION
3 GENERAL DESCRIPTION

ILLUSTRATIONS

Figure		Page
3B.7.1	Tape Punch Assembly	7.2
3B.7.2	Punch Mechanism Circuit Diagram	7.4

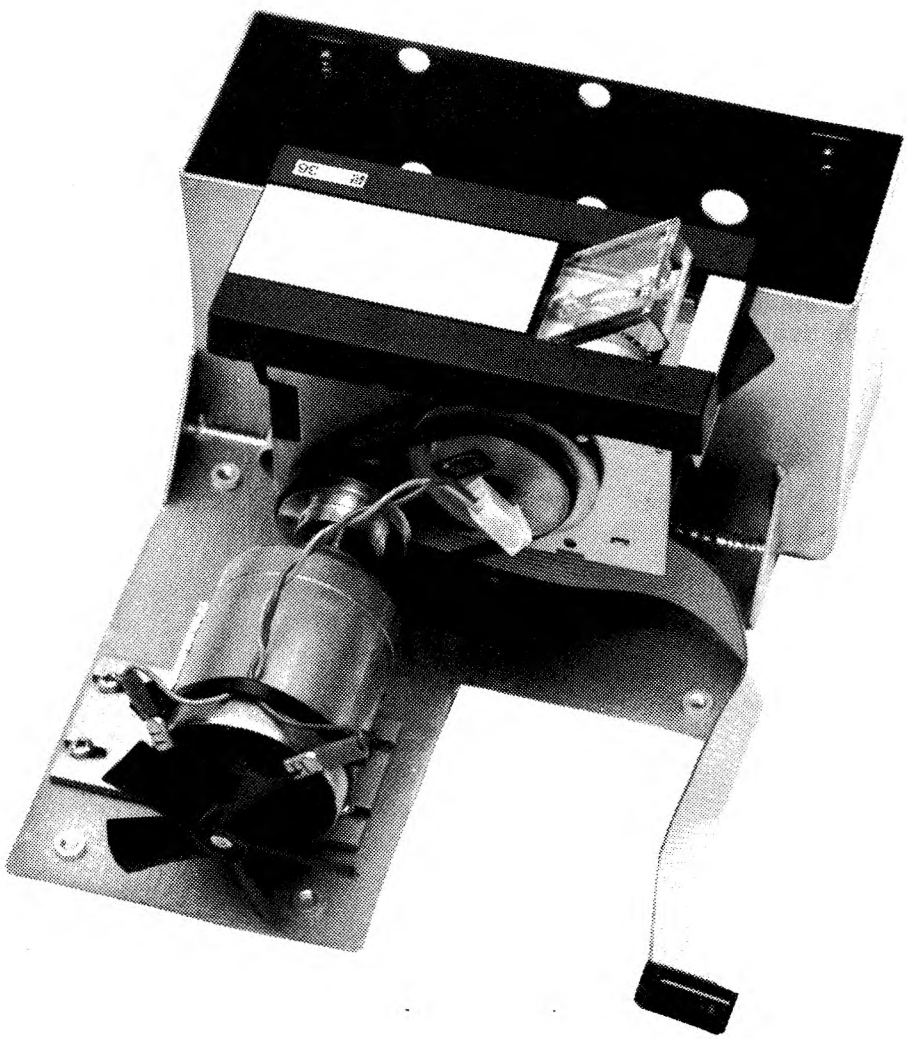


FIG 3B.7.1 TAPE PUNCH ASSEMBLY
5815-99-785-2542

CHAPTER 7

TAPE PUNCH ASSEMBLY

GENERAL INFORMATION

1 The Tape Punch Assembly consists of the following items:

Punch unit
Punch motor
Chassis, incorporating chad box holder
Chad box
16-way ribbon cable (to connect Punch to PL4 on rear of Tape Reader)
2-wire cable (to connect Punch motor to PL6 on Filter Board)

If a replacement assembly is required, the replacement will consist of these items, excluding the chad box, already mounted on the chassis (see Figure 3B.7.1). A replacement chad box must be ordered separately.

2 Although a drive belt is supplied as part of a replacement assembly, these are obviously prone to wear. Because of this, replacement drive belts may be obtained separately.

GENERAL DESCRIPTION

3 The Punch motor and Punch unit are connected together by a rubber drive belt which loops around two pulleys. When the PTA is switched on, incoming signals from the serial line cause the Punch motor to switch on. The pulley on the rear of the motor rotates, thus pulling the drive belt. This causes the other pulley to rotate, thus turning the tape sprocket wheel and causing tape to be drawn through the top of the Punch unit and over the punching needles.

4 The incoming data and power for the punching needles is fed to the unit via a 16-way ribbon cable from PL4 on the rear of the Tape Reader. The data activates electromagnets in the Punch which control the operation of the vertically-mounted punching needles. The needles move up and down, punching holes in the tape in accordance with the data received. Chad is ejected from the side of the Punch and is collected in the side-mounted chad box.

5 In order to synchronise the needle selector magnets and tape movement pulses, an LED/photo-transistor timing signal generator is included as an integral part of the Punch mechanism. The flywheel has special reflection and absorption sectors which ensure that precise synchronisation is maintained whilst the tape is being punched.

6 The width of tape used in the Punch may be either 5-hole (11/16 in) for ITA2 (BAUDOT) operation or 8-hole (1 in) for ITA5 (ASCII) operation.

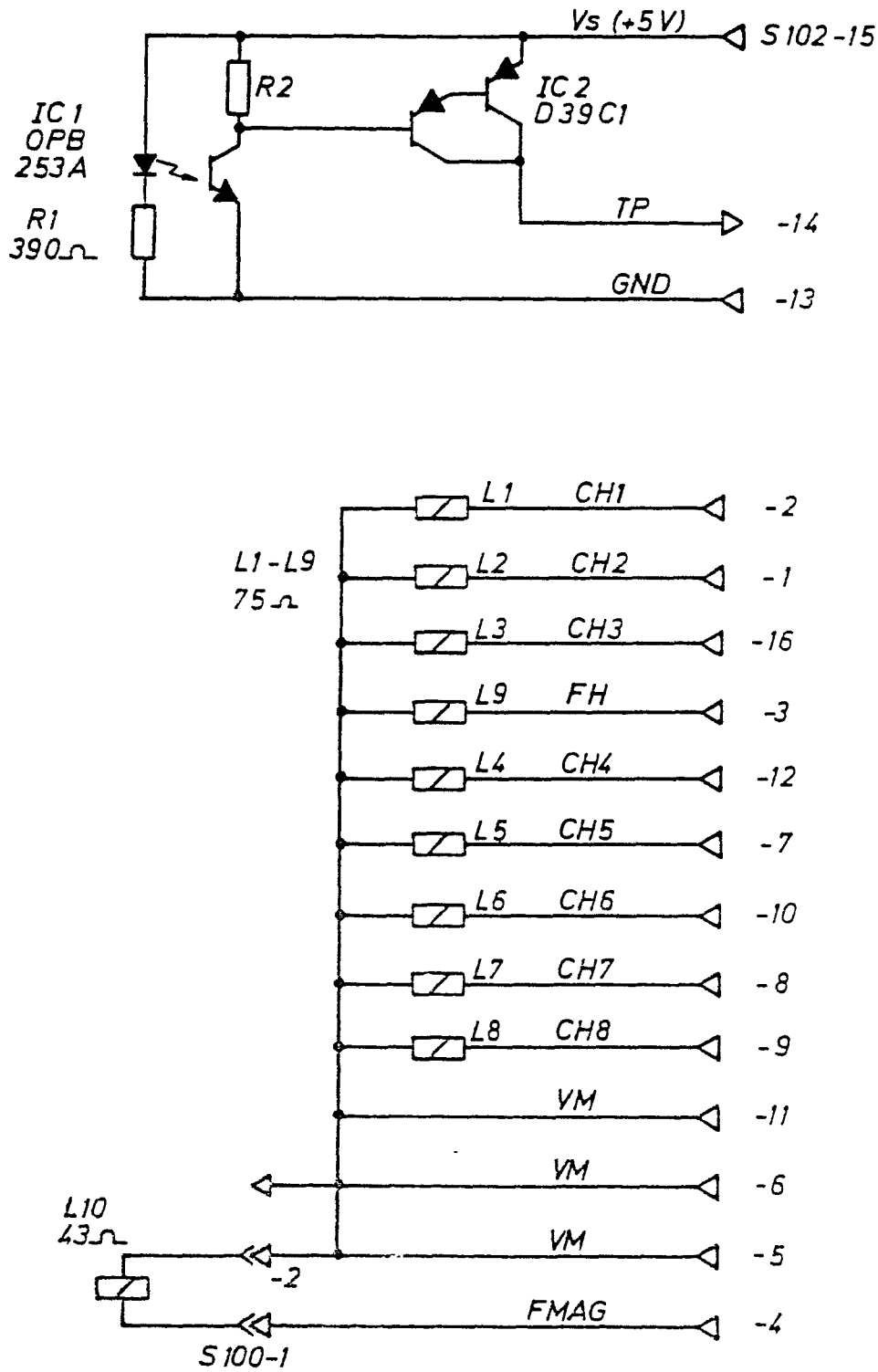


FIG 3B.7.2 PUNCH MECHANISM CIRCUIT DIAGRAM

CHAPTER 8

TAPE READER ASSEMBLY

CONTENTS

Paragraph

1 GENERAL INFORMATION
2 GENERAL DESCRIPTION

ILLUSTRATIONS

Figure		Page
3B.8.1	Tape Reader Assembly	8.2
3B.8.2	Tape Reader Optical Circuit	8.4

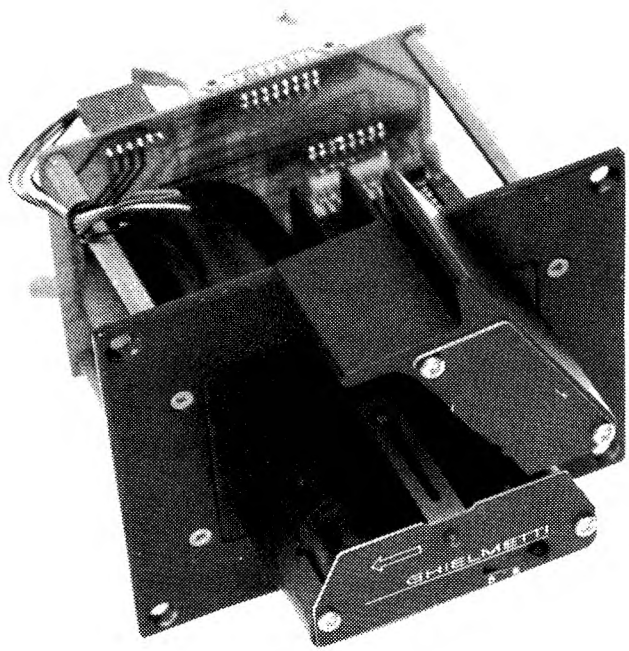


FIG 3B.8.1 TAPE READER ASSEMBLY
5815-99-785-2540

CHAPTER 8

TAPE READER ASSEMBLY

GENERAL INFORMATION

1 One of two slightly different Tape Readers may be fitted in the PTA. Early PTAs are fitted with Reader Assemblies which have a black front, whereas Reader Assemblies fitted on later PTAs have a silver front. There are no operational differences between these two Readers, ie the changes are purely cosmetic.

GENERAL DESCRIPTION

2 The Tape Reader is a photo-electric unit which is capable of reading 5-hole (ITA2), 6-hole (not used), or 8-hole (ITA5) paper tapes. Tape width selection is by a simple 3-way switch mounted on the front of the base. Any standard tape with opacity greater than 50% can be used.

3 A tape placed in the Reader Unit passes under photo-electric cells mounted in the flap. Hole positions are detected by photodiodes in the base. The Reader generates ten inputs to the Controller Board, comprising eight data lines, sprocket and flap. The sprocket input is low when a sprocket hole exists and the flap input is low when the flap is closed. Both of these inputs are read by the 8039 processor and are able to generate interrupts when changing state. The data lines are fed to the 8155 I/O port on the Controller Board before being passed to the 8250 serial interface via the 8039 processor.

4 The stepper motor used in the Tape Reader is a 4-phase device which has a common return. When no current flows in the windings, the motor is able to turn freely (eg when power is off). Current in one winding causes the rotor to align with the activated phase. Two adjacent windings are driven simultaneously to provide increased torque and reduce the "overshoot" when the next phase is selected. Each phase of the motor corresponds to one sprocket hole and one character on the tape. The motor is used in a "step on demand" mode to provide a "stop on character" response.

5 When the Reader is in a quiescent state, two motor windings remain energised to hold the tape firmly. However, full power is not used as this is unnecessary and would lead to excessive heat dissipation in the windings. A lower "standby" current is used by chopping the +20 V supply. When the motor is to be turned to the next position, full power is required and is applied for about 3 ms.

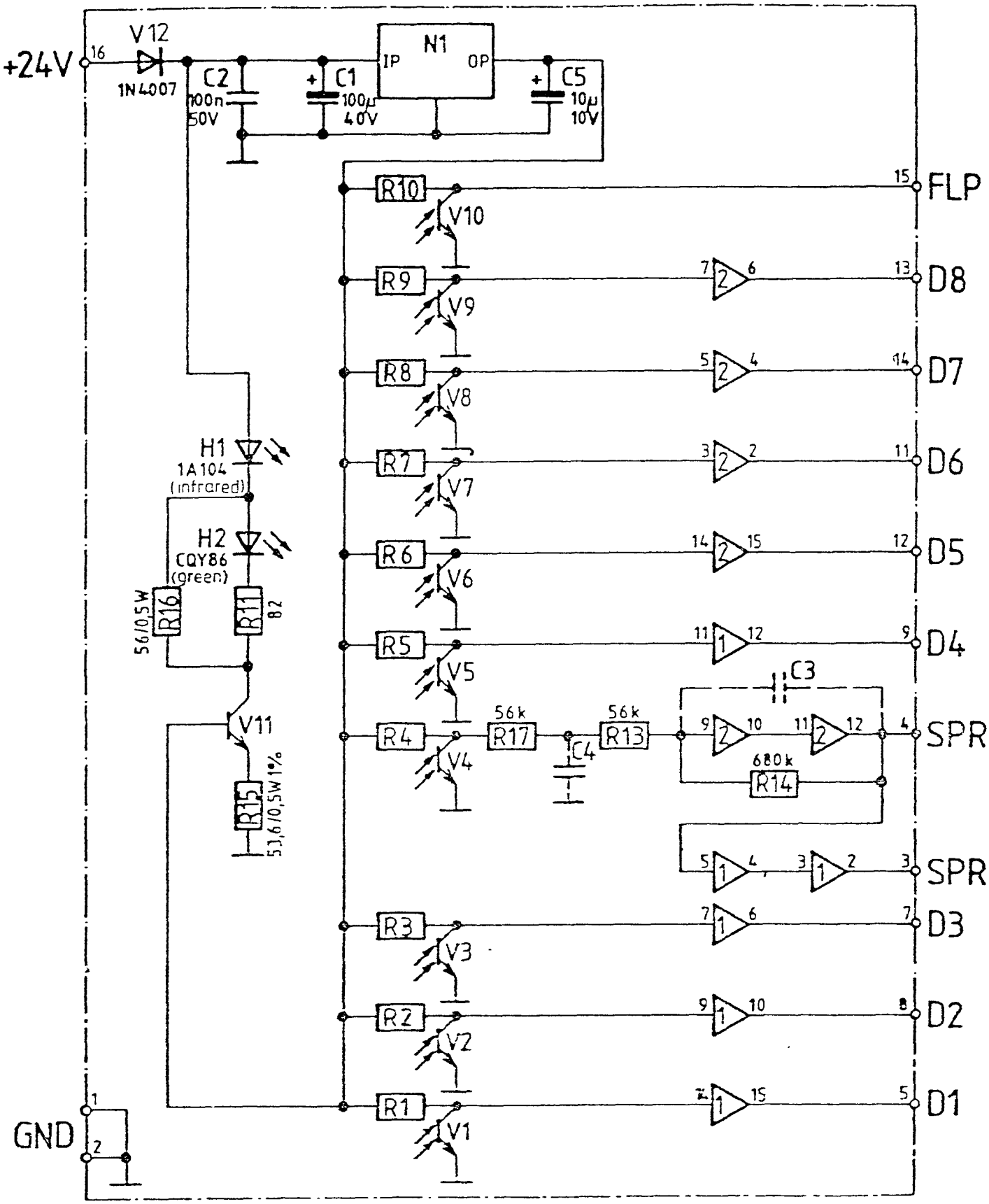


FIG 3B.8.2 TAPE READER OPTICAL CIRCUIT

CHAPTER 9

BRAKE ARM ASSEMBLY

CONTENTS

Paragraph

1 GENERAL DESCRIPTION

ILLUSTRATIONS

Figure		Page
3B.9.1	Brake Arm Assembly	9.2
3B.9.2	Underside View Showing Microswitch and Cam	9.2

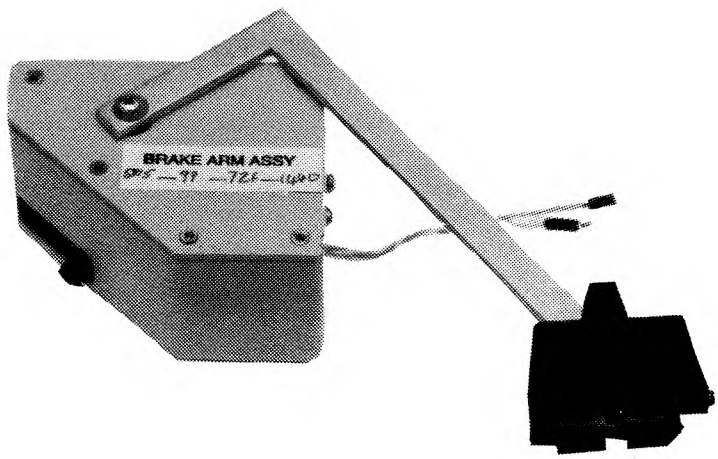


FIG 3B.9.1 BRAKE ARM ASSEMBLY
5815-99-726-1440

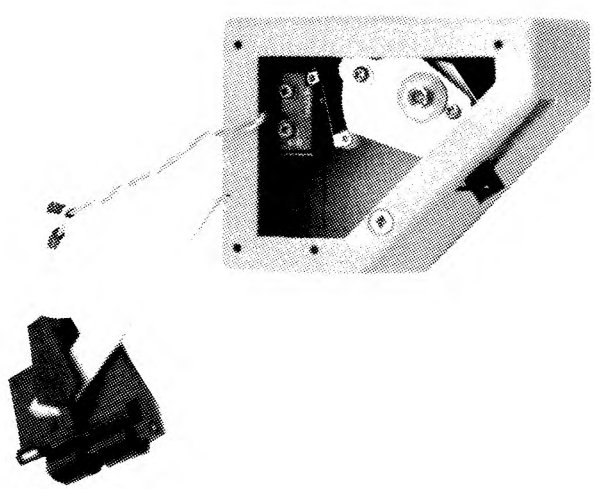


FIG 3B.9.2 UNDERSIDE VIEW SHOWING MICROSWITCH AND CAM

CHAPTER 9

BRAKE ARM ASSEMBLY

GENERAL DESCRIPTION

1 The purpose of the Brake Arm Assembly is to feed paper tape to the Tape Punch and detect tape feed error conditions, ie tape jam or end of tape. Should such a condition arise, a signal is passed to the Controller Board via PL7 and this causes the Punch to stop and the ERROR LED on the Switch Panel to illuminate.

2 The Brake Arm operates a microswitch at the two extremes of its travel. If the movement of the turntable is impeded or the tape jams, the pulling action of the Punch draws the Brake Arm forward, thus activating the microswitch. If the tape runs out, the slight tension on the arm is removed and it moves backwards slightly. This causes the microswitch cam to move the few degrees necessary to activate the microswitch.

3 The signals from the microswitch are filtered by 1000 pF feed-through capacitors and 150 ohm resistors before being passed to the Controller Board.

CHAPTER 10

SWITCH PANEL ASSEMBLY

CONTENTS

Paragraph

1 GENERAL DESCRIPTION

TABLES

Number		Page
3B.10.1	Switch Panel Keyswitch Functions	10.3

ILLUSTRATIONS

Figure		Page
3B.10.1	Switch Panel Assembly	10.2
3B.10.2	Switch Panel Schematic Diagram	10.4

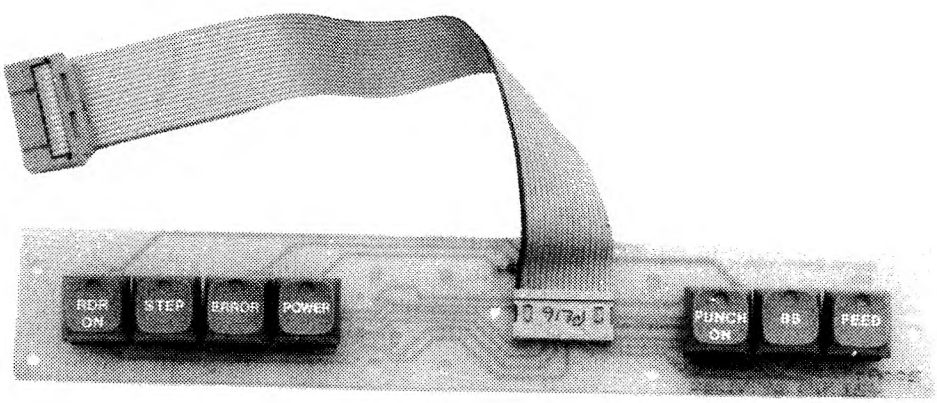


FIG 3B.10.1

SWITCH PANEL ASSEMBLY
5815-99-785-2543

CHAPTER 10

SWITCH PANEL ASSEMBLY

GENERAL DESCRIPTION

1 The Switch Panel Assembly consists of a small circuit board which has seven keyswitches mounted on it. The RDR ON, ERROR, POWER and PUNCH ON keyswitches each have an integral red LED. The function of each keyswitch is described in Table 3B.10.1 below.

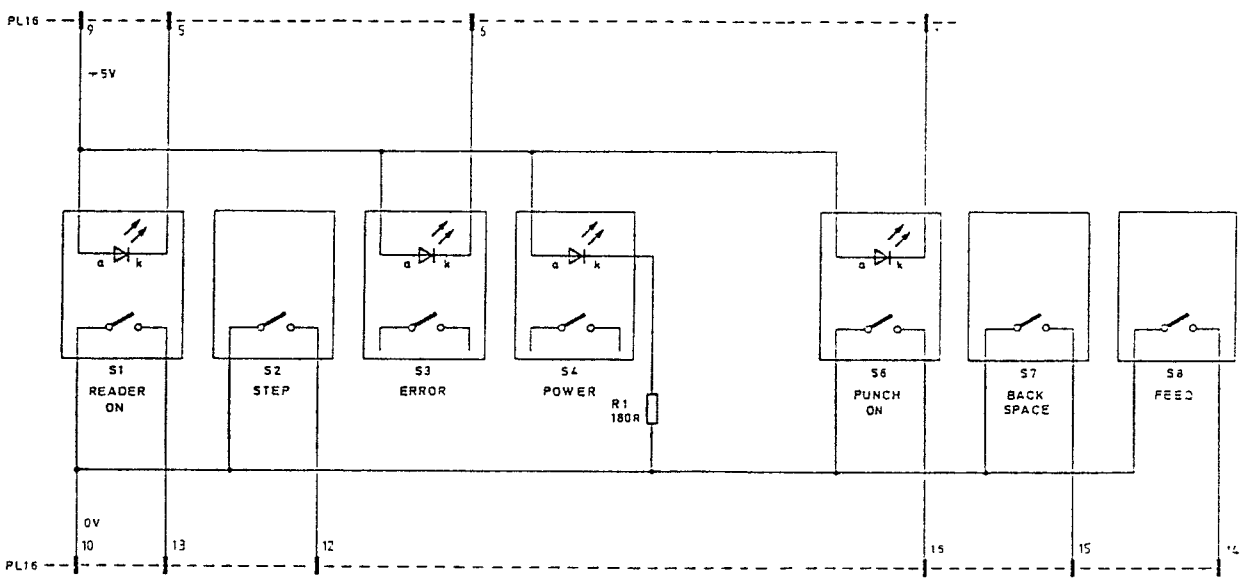
TABLE 3B.10.1

SWITCH PANEL KEYSWITCH FUNCTIONS

Keyswitch	Function
RDR ON	This performs two functions: (1) Switches on the Tape Reader (LED illuminates). (2) If pressed and held whilst PTA is switched on, causes the PTA to toggle between ITA2 and ITA5 mode (LED flashes).
STEP	Causes the tape in the Reader to advance one character.
ERROR	A "dummy" keyswitch. The LED flashes if an error is detected whilst the Punch is operating.
POWER	A "dummy" keyswitch. The LED illuminates when mains power is connected and the PTA is switched on.
PUNCH ON	Switches on the Tape Punch (LED illuminates).
BS	Backspace. Causes the tape in the Punch to move backwards one character. Inoperative if the Punch is switched on.
FEED	Causes the tape in the Punch to advance one character. Auto repeat causes the tape to advance continuously when the keyswitch is presse and held. Inoperative if the Punch is switched on.

2 The keyswitches are single pole, single throw and are normally open circuit. When pressed, the keyswitch lines are pulled down to 0 V by the switch, in series with a 150 ohm resistor on the Filter Board. The other keyswitches are pulled up to +5 V by a 4.7 k ohm resistor network and are read by the 8243 I/O chip on the Controller Board.

3 The LEDs are driven via port 7 of IC13 on the Controller Board. IC12, a 74LS20 inverter buffer, provides sufficient sink current to light each LED. 180 ohm series resistors are provided on the Filter Board.



NOTE - S5 ON LINE NOT FITTED

FIG 3B.10.2 SWITCH PANEL SCHEMATIC DIAGRAM

C4

TELEPRINTER, TGQ SERIES

CATEGORY 4 - INSTALLATION AND ACCEPTANCE

CONTENTS

CATEGORY 4A - INSTALLATION SPECIFICATION

CATEGORY 4B - PREPARATION FOR ACCEPTANCE

TELEPRINTER, TGQ SERIES

CATEGORY 4A - INSTALLATION SPECIFICATION

CONTENTS

Paragraph

1 INTRODUCTION
2 LOCATION
2 General
3 Environment
4 Space Requirements

TELEPRINTER, TGQ SERIES

CATEGORY 4A - INSTALLATION SPECIFICATION

INTRODUCTION

1 The basic requirements for siting a Teleprinter from the TGQ Series are listed below. These specifications also include information for siting the Paper Tape Attachment (PTA), which is supplied as part of the TGQ3 outfit, but which can also be used with any other TGQ outfit.

LOCATION

General

2 The site chosen for the Teleprinter and/or the PTA should be in close proximity to a suitable power source and a suitable communications line (ie V24/V28 or RS232C). Do not site the equipment near sources of heat or where condensation is likely to occur.

Environment

3 The operating environment for both the Teleprinter and the PTA should be as follows:

Temperature	-5° to $+55^{o}$C
Humidity	5% to 80% non-condensing

Space Requirements

4 The minimum operating space requirements for the Teleprinter are as follows:

Width	- 500 mm
Depth	- 510 mm (Printer only) - 660 mm (Printer plus Keyboard)
Height	- 350 mm (all outfits fitted with roll paper, excluding TGQ7 and TGQ8) - 230 mm (TGQ7 fitted with pin feed paper) - 215 mm (TGQ8 fitted with roll paper) - 170 mm (all outfits fitted with full-width pin feed paper)

5 The minimum operating space requirements for the PTA are as follows:

Width	- 355 mm
Depth	- 640 mm

Height - 165 mm (560 mm with lid raised)

6 The measurements listed in paras 4 and 5 include allowances for cable connections, air circulation, routine maintenance procedures, etc.

TELEPRINTER, TGQ SERIES

CATEGORY 4B - PREPARATION FOR ACCEPTANCE

CONTENTS

Paragraph

1 FUNCTION
2 NOMENCLATURE
3 SUMMARY OF DATA
3 Printer
3 Keyboard
3 Paper Tape Attachment
4 PREPARATION FOR USE
4 Unpacking
8 SETTING UP PROCEDURE - TELEPRINTER
9 Mains Input Voltage Selection
13 Interface Protocol
16 Line Interface Type Selection
19 Paper Out Sensor Signal Selection
20 Character Code Selection and Line Interface Format
24 Serial Line Interface Speed Selection
25 DIL Switch Variations
26 DIL Switch A1
28 DIL Switch A2
31 DIL Switch B2
33 DIL Switch B7
35 DIL Switch B8
37 External Power and Interface Connections
41 Attaching Paper Roll Holder and Paper Loading
46 Attaching Pin Feed Paper Tray and Paper Loading (TGQ7)
53 Attaching Paper Roll Holder and Paper Loading (TGQ8)
54 Loading Full-Width Pin Feed Paper (All Outfits)
55 SETTING UP PROCEDURE - PAPER TAPE ATTACHMENT
55 Mains Input Voltage Selection
60 Internal DIL Switch Settings
62 SWA1
63 SWA2, SWA3, SWA4, SWA5 AND SWA6
64 SWA7 AND SWA8
65 SWB1
66 SWB2
67 SWB3
68 SWB4
70 SWB5
71 Serial Line Interface Speed Selection
72 Typical DIL Switch Settings for a PTA Used with a TGQ Teleprinter
73 External Power and Interface Connections
75 Connecting the PTA to a TGQ Series Teleprinter
77 Loading Paper Tape
78 Tape Width Selection
80 Fitting a Paper Tape Reel

C O N T E N T S (Contd)

Paragraph

81 Loading Punched Tape into the Tape Reader
83 EQUIPMENT TEST PROCEDURES
85 TGQ1 and TGQ8 Outfits
86 TGQ2, TGQ5 and TGQ11 Outfits
87 TGQ3 Outfit
88 TGQ4 and TGQ9 Outfits
89 TGQ6 Outfit
90 TGQ7 Outfit
91 TGQ10 Outfit
92 Paper Tape Attachment

TABLES

Number Page

4B.1 Mains Input Voltage Selection 8
4B.2 Teleprinter Serial Line Interface Speed Selection 12
4B.3 Summary of Teleprinter DIL Switch Settings (New Outfits Except TGQ6, TGQ7 and TGQ9) 14
4B.4 Summary of Teleprinter DIL Switch Settings (Early Versions of TGQ1 to TGQ5 and All TGQ9 Outfits) 15
4B.5 Summary of Teleprinter DIL Switch Settings (TGQ6 Outfits Only) 16
4B.6 Summary of Teleprinter DIL Switch Settings (TGQ7 Outfits Only) 17
4B.7 Interface Connector Configuration 21
4B.8 Modem Controls on Line Interface 22
4B.9 PTA Mains Input Voltage Selection 28
4B.10 PTA Serial Line Interface Speed Selection 33
4B.11 Example of PTA DIL Switch Settings When Connected to a TGQ Teleprinter 33
4B.12 PTA Interface Connector Configuration 34
4B.13 Modem Controls (Reader) on PTA Serial Line Interface 34
4B.14 Modem Controls (Punch) on PTA Serial Line Interface 36
4B.15 Connections Between a PTA and a TGQ Series Teleprinter 36

ILLUSTRATIONS

Figure

4B.1 TGQ2 Teleprinter (xxxviii)
4B.2 TGQ4 Teleprinter (xxxix)
4B.3 Paper Tape Attachment (xl)
4B.4 Location of Terminal Blocks for Mains Input Voltage Selection 7
4B.5 TGQ2 Interface Control PEC 9
4B.6 Teleprinter DIL Switches (Cover Plate Removed) 11
4B.7 Teleprinter Rear Panel Showing Cables Correctly Connected 19
4B.8 Line Interface Connections 20
4B.9 Paper Roll Holder 24
4B.10 TGQ2 with Roll Paper Correctly Installed 24
4B.11 Pin Feed Paper Tray 25

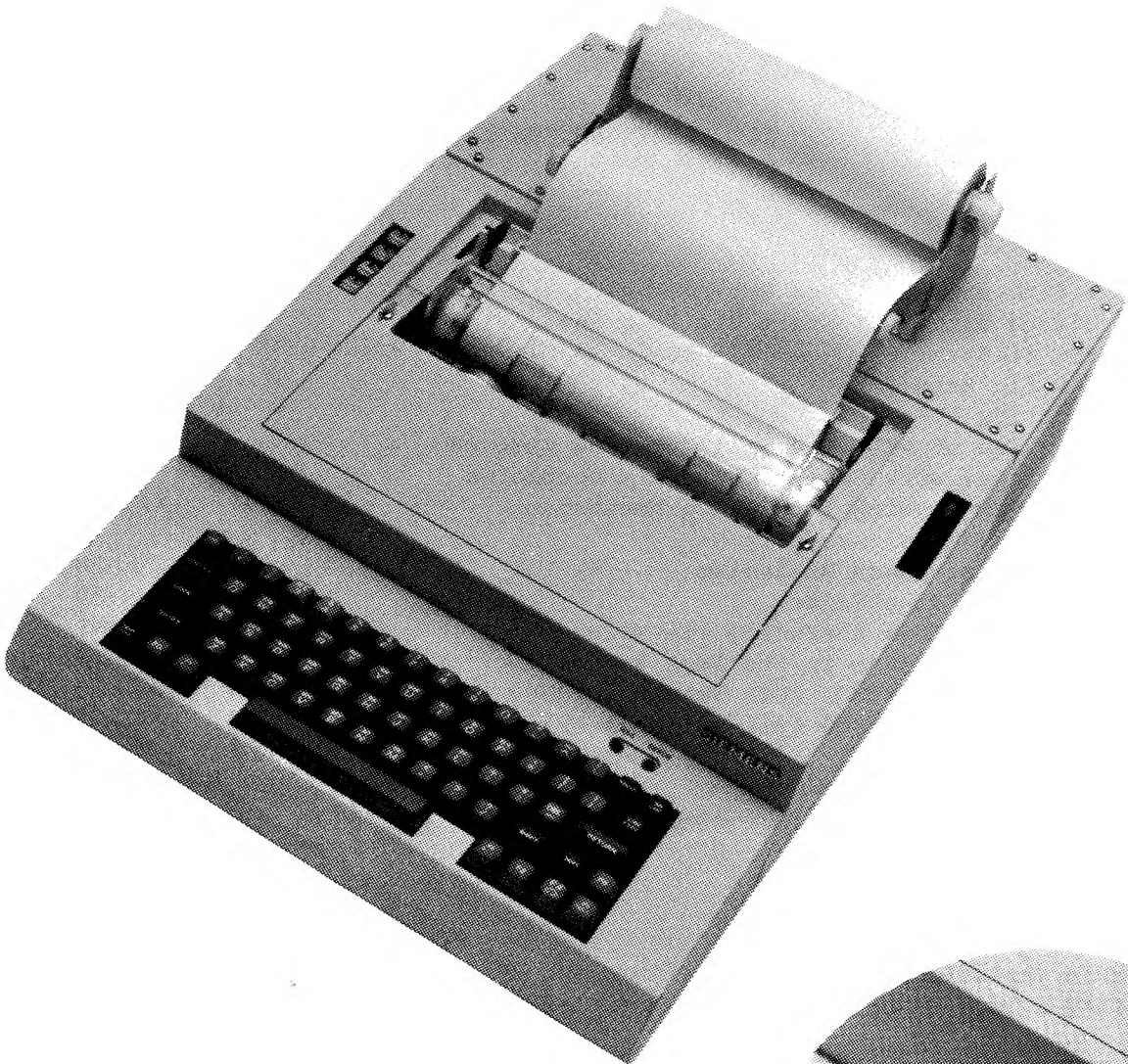
C O N T E N T S (Contd)

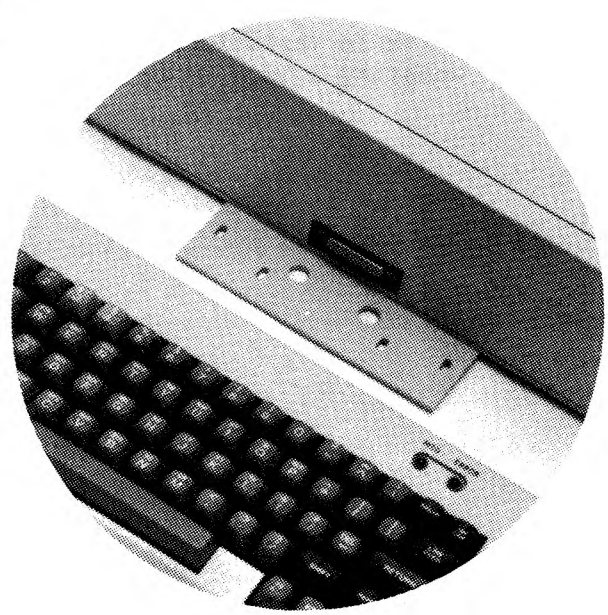
ILLUSTRATIONS (Contd)

Figure		Page
4B.12	TGQ7 Fitted with Pin Feed Paper Tray	25
4B.13	TGQ2 Fitted with Full-Width Pin Feed Paper	27
4B.14	Location of Sprocket Wheel Adjuster	27
4B.15	PTA with Lid Raised	29
4B.16	Disconnecting PL7	29
4B.17	Internal View of PTA with Tape Reel Box Removed	31
4B.18	PTA Rear Panel with Cables Correctly Connected	35
4B.19	Internal View Showing Tape Punch Mechanism	38
4B.20	Punch Mechanism Release Clip	38
4B.21	Removing Top of Punch Mechanism	39
4B.22	Removing Steel Tape Guide	39
4B.23	PTA with Paper Tape Correctly Installed	41
4B.24	Installing Paper Tape in the Tape Reader	41
4B.25	Startup Message on TGQ1 (DIL Switches DOWN)	42
4B.26	Startup Message on TGQ2 (DIL Switches UP)	43

ANNEXES

Annex	
A	Software Variations
B	Mounting a TGQ5 Teleprinter onto an Anti-Shock/Vibration Tray





CONNECTION BETWEEN
PRINTER UNIT AND KEYBOARD

FIG 4B.1

TGQ2 TELEPRINTER
5815-99-780-8817



TGQ4 TELEPRINTER
5815-99-780-8819

FIG 4B.2

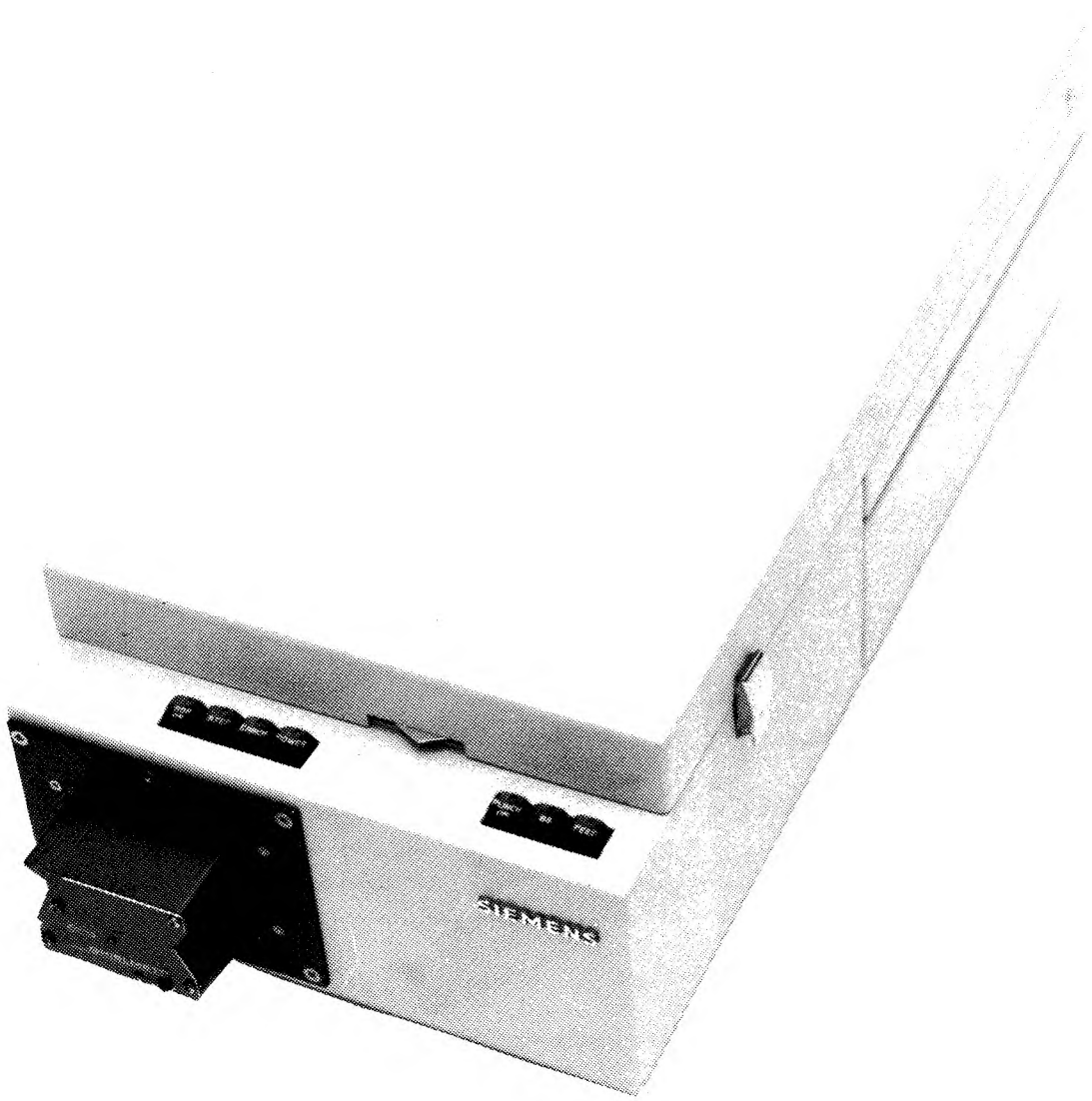


FIG 4B.3 PAPER TAPE ATTACHMENT
5815-99-780-8815

(x1)

TELEPRINTER, TGQ SERIES

CATEGORY 4B - PREPARATION FOR ACCEPTANCE

FUNCTION

1 The TGQ Series Teleprinters are a family of high security machines based around the TGQ2 and its associated Paper Tape Attachment (PTA). All TGQ machines are capable of transmitting and/or receiving messages using ITA2 and ITA5 codes. All TGQ machines and the PTA meet HMG Tempest requirements in both static and rugged mobile environments.

NOMENCLATURE

2 Each TGQ outfit is briefly defined as follows:

TGQ1	(NSN 5815-99-780-8816)	Consists of TGQ2 Printer unit only.
TGQ2	(NSN 5815-99-780-8817)	Printer unit and 67-key Keyboard.
TGQ3	(NSN 5815-99-780-8818)	As TGQ2, plus PTA - see below.
TGQ4	(NSN 5815-99-780-8819)	As TGQ2, but has special Keyboard, Message Edit pec and special Interface Control pec.
TGQ5	(NSN TBA)	As TGQ2, plus special Interface Control pec, Mounting Plate (see Annex B), 56 Kbyte Buffer Board and special cables.
TGQ6	(NSN 5815-99-734-4248)	As TGQ4, but has modified Printer Control pec special Message Edit pec and special interface.
TGQ7	(NSN 5815-99-795-2039)	As TGQ1, but has special Printer Control pec, Interface Control pec and printer mechanism. A special pin feed paper tray and box is also included.
TGQ8	(NSN 5815-99-768-5518)	As TGQ1, but has low-profile paper roll holder and is supplied without cables.
TGQ9	(NSN 5815-99-730-2793)	As TGQ2, but has special Interface Control pec and Message Edit pec.
TGQ10	(NSN TBA)	Definition TBA.
TGQ11	(NSN 5815-99-795-2038)	As TGQ5 but without Mounting Plate.
PTA	(NSN 5815-99-780-8815)	Paper Tape Attachment for use with TGQ Series Teleprinters. Can also be used as a peripheral for other computer and communications equipment.

SUMMARY OF DATA

3 As all equipment in the TGQ Series is based on the TGQ2, the following hardware specifications refer to equipment supplied as part of this outfit. The specifications also include data for the PTA, as this is supplied as an integral part of certain TGQ outfits.

Printer

Print Head	- 9 wire, mounted vertically
Character Set	- 96 character ITA5 (ASCII) or ITA2. Customer defined character set available as an option.
Character Format	- 16 chars/in with 10 x 9 matrix - 12 chars/in with 10 x 9 matrix - 9.6 chars/in with 10 x 9 matrix - 8 chars/in with 20 x 9 matrix - 6 chars/in with 20 x 9 matrix - 4.8 chars/in with 20 x 9 matrix Set to 12 chars/in on initialisation
Character Size	- 1.75 mm (w) x 2.5 mm (h) with 10 x 9 matrix - 3.5 mm (w) x 2.5 mm (h) with 20 x 9 matrix
Print Speed	- 90 cps, bidirectional
Max No of Columns (Program Selectable)	- 127/96/76 with 10 x 9 matrix - 64/48/38 with 20 x 9 matrix
Line Spacing (Program Selectable)	- 3 or 6 lines/in
Standard Buffer Size	- 112 characters
Last Character Visible	- By head carriage movement
Ribbon Cartridge	- Standard snap-in cartridge
Paper	- One to five parts, plain or pin feed. Maximum thickness 0.5 mm.
Paper Feed	- Friction feed to 8.5 in wide - Pin feed to 9.5 in wide - Form set and form feed functions
Form Length	- 11 in
Interface	- V24/V28 (RS232C) or isolated 20 mA single current loop. Optional fibre-optic interface.
Code	- ITA5 (ASCII) or ITA2

Parity	- Odd, even, or inhibited
Stop Bits	- 1, 1.5, or 2
Baud Rate	- 45.45 to 9600, selectable
Power Requirements	
Voltage	- 105, 120, 210, 220, 240 V ac (+/-10%)
Frequency	- 48 to 440 Hz
Consumption	- 120 VA max, 80 VA in standby
Reliability	
MTBF	- 3300 hours
MTTR	- 15 min (exchanging modules)
Print Head Life	- 90 million characters
Mounting	- Desk-top. Can be fitted with anti-shock/ anti-vibration mountings.
Dimensions	- 400 mm x 450 mm x 300 mm (w x d x h) - standard - 400 mm x 450 mm x 150 mm (w x d x h) - TGQ7 - 400 mm x 450 mm x 180 mm (w x d x h) - TGQ8
Weight	- 17 kg (excluding roll holder and paper roll)
Environment	
Operating	- Temperature -5° to +55°C - Humidity 5% to 80% non-condensing
Storage	- Temperature -40° to +70°C - Humidity 5% to 95% non-condensing

Keyboard

Number of Keys	- 67
Protection	- 2 key lockout
Dimensions	- 400 mm x 148 mm x 64 mm (w x d x h)
Weight	- 3 kg
Environment	
Operating	- Temperature -5° to +55°C - Humidity 5% to 80% non-condensing
Storage	- Temperature -40° to +70°C - Humidity 5% to 95% non-condensing

Paper Tape Attachment

Speed	
Punch	- 50 chars/s
Reader	- 160 chars/s
Tape Width	- 11/16 in (5 hole) for ITA2, 1 in (8 hole) for ITA5
Interface	- V24/V28 (RS232C)
Code	- ITA5 (ASCII) or ITA2
Parity	- Odd, even, mark or space
Stop Bits	
ITA5	- 1
ITA2	- 1.5
Baud Rate	- 75 to 4800, selectable
Power Requirements	
Voltage	- 105, 120, 210, 220, 240 Vac (+/-10%)
Frequency	- 48 to 440 Hz
Consumption	- 45 VA max, 20 VA in standby
Reliability	
Punch	
MTBF	- 10^8 characters
MTTR	- 15 min (exchanging modules)
Reader	
MTBF	- 2000 hours
MTTR	- 15 min (exchanging modules)
Head Life	- 1.5 x 10^8 characters (paper) - 5 x 10^7 characters (mylar)
Mounting	
Dimensions	- 255 mm x 580 mm x 150 mm (w x d x h)
Weight	- 12 kg

Environment

Operating	- Temperature -5° to $+55^{o}C$ - Humidity 5% to 80% non-condensing
Storage	- Temperature -40° to $+70^{o}C$ - Humidity 5% to 95% non-condensing

PREPARATION FOR USE

Unpacking

4 All TGQ Series equipment is supplied in packaging which consists of an outer box and an inner box. Where a PTA is included (eg TGQ3 and TGQ10), this is supplied in a separate box of the same design.

5 The procedure for unpacking the equipment consists of opening the outer box, opening the inner box and then removing the equipment. Where a Keyboard is supplied as part of the equipment (all units except TGQ1, TGQ7 and TGQ8), this is supplied already fitted to the Printer.

6 Check that all the necessary components have been supplied (see para 7). Inspect each item to ensure that it has not been damaged during transit.

7 Items included as part of each outfit should be as follows:

TGQ1
- Printer Unit
- Paper Roll Holder
- Ribbon Cartridge (already installed in Printer)
- Power Cable
- Signal Cable
- Plastic-Coated Installation and Operating Instruction Sheets

TGQ2 - As TGQ1 plus Keyboard (already attached to Printer unit)

TGQ3 - As TGQ2 plus PTA (separate box)

TGQ4 - As TGQ2

TGQ5 - As TGQ2 plus Mounting Plate (separate box), enabling it to be mounted on a TGN Series Teleprinter mounting rack - see Annex B. It also has special connecting cables.

TGQ6 - As TGQ2

TGQ7
- Printer Unit
- Fanfold Paper Tray
- Paper Guide Rack
- Ribbon Cartridge (already installed in Printer)
- Power Cable
- Signal Cable
- Plastic-Coated Installation and Operating Instruction Sheets

TGQ8 - As TGQ1, but power and signal cables are not supplied

TGQ9 - As TGQ2

TGQ10 - As TGQ3

TGQ11 - As TGQ2

PTA - Paper Tape Attachment Unit
- Power Cable
- Signal Cable
- Plastic-Coated Operating and Installation Instruction Sheet

SETTING UP PROCEDURE - TELEPRINTER

8 This setting up procedure applies to all TGQ Teleprinter outfits and is split into three parts - selecting the options appropriate to the required mode of operation, connecting the teleprinter cables, and then attaching the paper Roll Holder or pin feed Paper Tray. (TGQ5 also has an adapter plate which needs to be attached to enable it to be mounted on a TGN Teleprinter anti-shock/vibration assembly - see Annex B for mounting instructions.)

CAUTION RF suppression gaskets are fitted between some removable metal covers and the metal case. Ensure that these gaskets are in place and all screws are tightened evenly when a cover is refitted, otherwise Tempest integrity may be affected.

Mains Input Voltage Selection

Figure 4B.4

9 The operating supply voltage is factory-set and is marked on a plastic label on the rear of the Teleprinter. If a different operating voltage is required, carry out the following procedure.

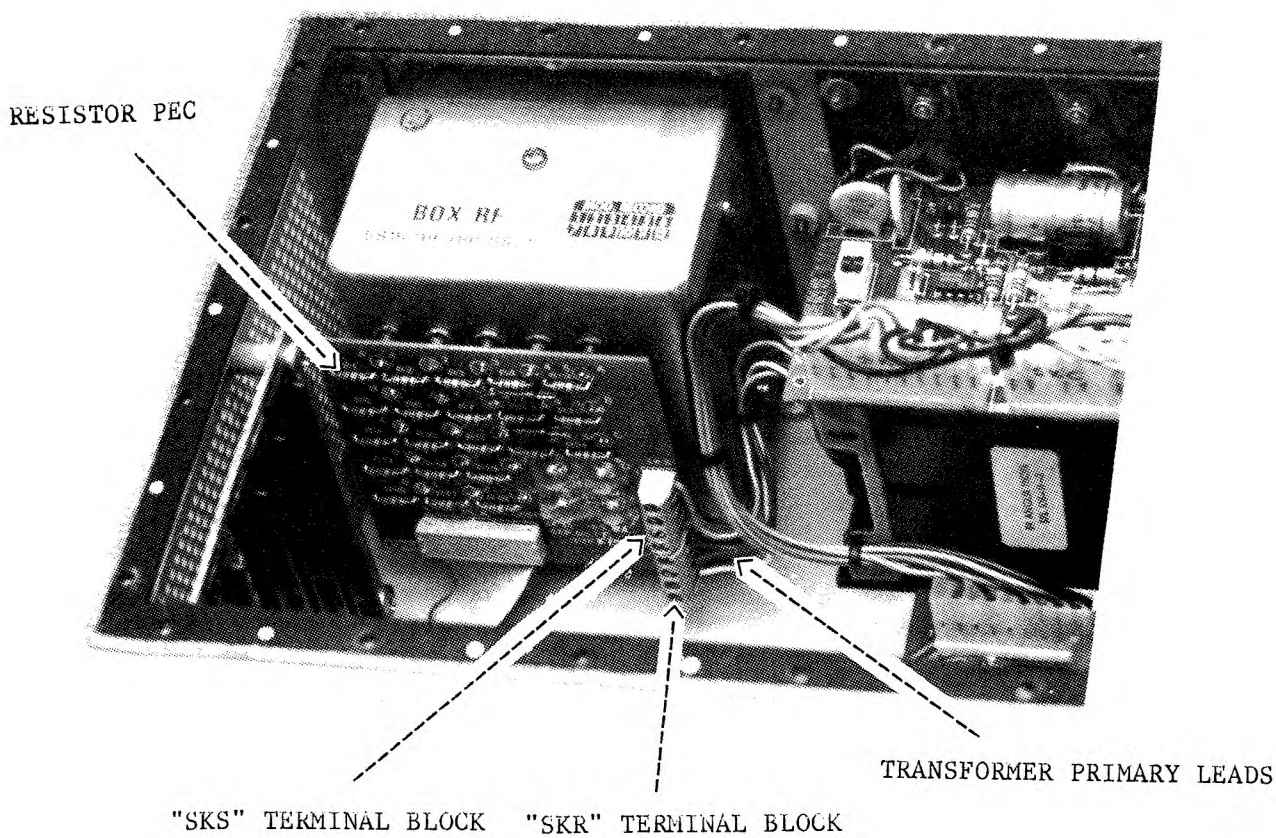
10 Remove the top cover of the Electronics Box by undoing the screws on the outer edge and identify the pec mounted vertically to the side of the RF box. On the right-hand side of this pec are two vertically-mounted block connectors, "SKS" and "SKR". Remove each of the vertically-mounted pecs in front of these connectors by lifting the black plastic clips at the top corners of each pec and then lifting the pec out of the box. The block connectors can now be accessed with a small blade screwdriver.

NOTES (1) When removing each pec, ensure that the small plastic locating lugs in each socket on the horizontally-mounted Motherboard are not accidentally dislodged.

(2) Before the Printer Control pec can be removed, two screws in the top of the black heat-sink will need to be removed.

11 Refer to Table 4B.1 and change the transformer primary lead connections to the terminal blocks to produce the required operating voltage.

12 Read paras 13 to 20 before replacing each pec in its correct slot and locking in position using the plastic clips. Refit the screws to the heat-sink on the top of the Printer Control pec. Ensure that the RF gasket is in place before refitting the metal cover plate. Finally, alter the marking on the plastic label to show the new operating voltage.



LOCATION OF TERMINAL BLOCKS FOR MAINS INPUT VOLTAGE SELECTION FIG 4B.4

TABLE 4B.1

MAINS INPUT VOLTAGE SELECTION

Voltage Required	"SKS"				"SKR"			
	1	2	3	4	5	6	7	8
105 V	Brown	Yellow	White	-	-	Orange	Blue	Red
120 V	Yellow	Brown	Red	-	-	Orange	Blue	White
210 V	Brown	Yellow	-	Orange	White	-	Blue	Red
220 V	Yellow	Brown	-	Orange	White	-	Blue	Red
240 V	Yellow	Brown	-	Orange	Red	-	Blue	White

Interface Protocol

Figure 4B.5

13 The interface protocol is handled by software contained in an EPROM (IC13) on the Interface Control pec (this is located in the second card slot from the front in the Electronics Box). Only one basic version of software is available for the TGQ Teleprinters. Variations of this basic version are described in detail in Annex A.

14 Refer to Table A1 in Annex A and check the labelling on the EPROM prior to installation of the machine to ensure that the correct EPROM has been fitted.

15 As an added safeguard, the Teleprinter performs a self-test routine on power-up which includes printing the version of software contained in the EPROM.

Line Interface Type Selection

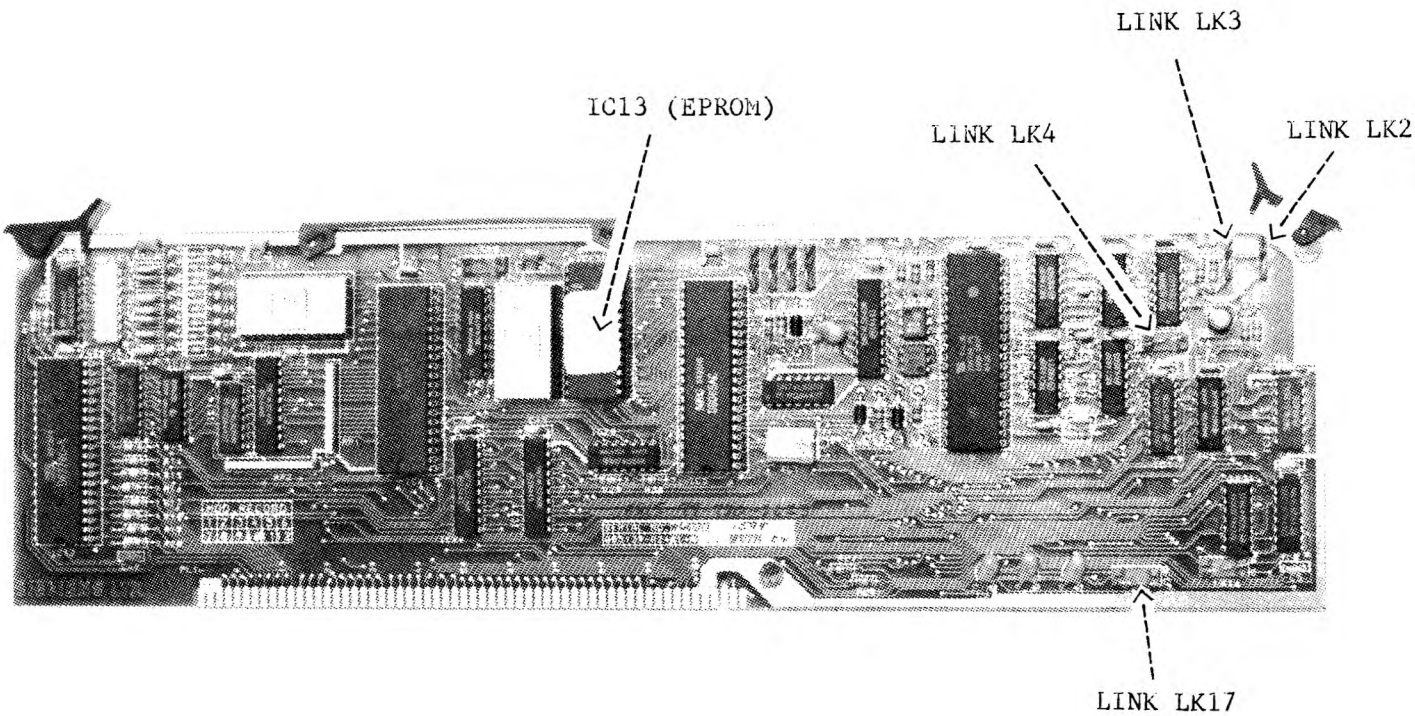
Figure 4B.5

16 The Teleprinter supplied to the Navy is set up to provide a V24/V28 (RS232) interface. However, by changing the position of link 4 (LK4) on the Interface Control pec, the line interface can be set to provide a 20 mA current loop:

V24/V28 (RS232) Interface — LK4 connected to "B"
20 mA Current Loop Interface — LK4 connected to "C"

17 If link 4 is changed from position "B" to "C", the appropriate current limiting resistors must be fitted to R25 and R26 to give a current of 20 mA. The formula for calculating the value of these resistors is as follows:

$$R25 = R26 = \frac{\text{External Drive Voltage} - 1}{20 \times 10^{-3}} - 150$$



TGQ2 INTERFACE CONTROL PEC
5815-99-780-8823

FIG 4B.5

NOTE The calculation takes into account the 150 ohm resistors connected in series with each signal line. (These resistors are shown on the Resistor pec in Figure 4B.3.)

18 If required, the polarity of TXDA and RXDA can be inverted by opening link 2 (LK2) on the Interface Control pec. Also, RTSA and CTSA may be inverted by opening link 3 (LK3).

Paper Out Sensor Signal Selection — Figure 4B.5

19 The "Paper Out" signal on PL3 is normally set to go high when the Teleprinter runs out of paper. If required, this can be inverted by changing the position of link 17 (LK17) on the Interface Control pec from "B" to "C".

Character Code Selection and Line Interface Format — Figure 4B.6

20 General. Character code ITA2 or ITA5 (ASCII) and the format of the character codes are selected by the position of Dual In-Line (DIL) switches. To access these switches, remove the small access plate on the left-hand side the rear panel of the Teleprinter. The switches are organised as two blocks of eight, with block "A" on the left and block "B" on the right. The switches are numbered 1 to 8, reading from left to right.

21 Character code and bits/character. The character code is selected implicitly by selecting the number of bits per character using switches A7 and A8:

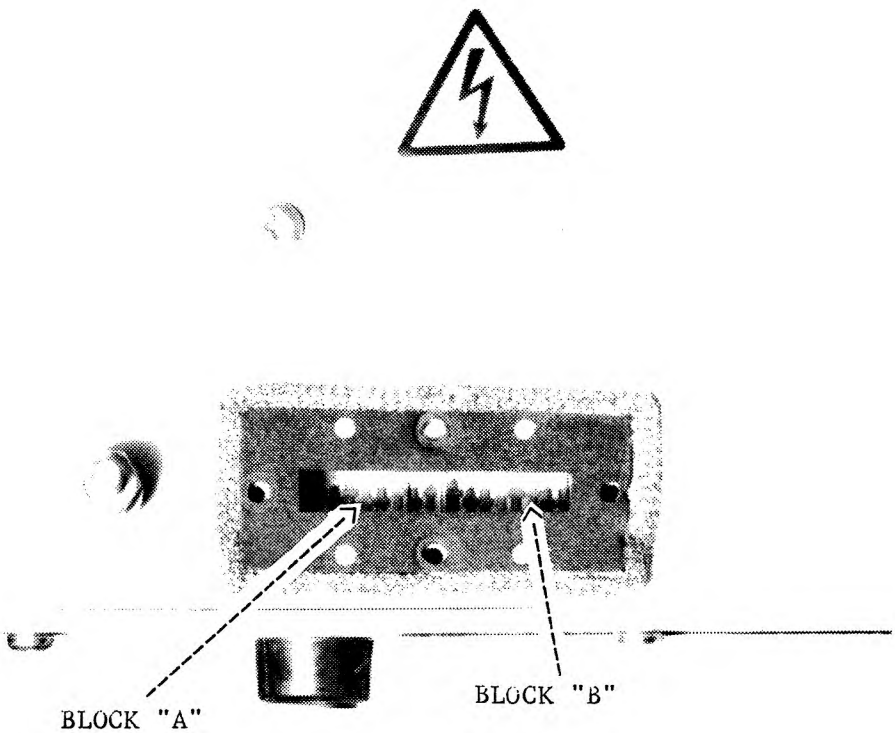
Code	Switch A7	Switch A8
ITA2 (5-bit)	UP	UP
ITA5 (6-bit)	UP	DOWN
ITA5 (7-bit)	DOWN	UP
ITA5 (8-bit)	DOWN	DOWN

22 Stop bits. The number of stop bits can be set to 1, 1.5, or 2 using switches B3 and B4:

Stop Bits	Switch B3	Switch B4
1	DOWN	UP
1.5	UP	DOWN
2	DOWN	DOWN

23 Parity. Parity can be set to odd, even, or off using B5 and B6:

Parity	Switch B5	Switch B6
Odd	DOWN	UP
Even	DOWN	DOWN
Off	UP	EITHER



TELEPRINTER DIL SWITCHES (COVER PLATE REMOVED) FIG 4B.6

Serial Line Interface Speed Selection

24 The transmission speed (baud rate) of the serial line interface is also selected using the DIL switches. To set the transmission speed to that required, set switches A3 to A6 and B1 in accordance with the settings shown in Table 4B.2.

TABLE 4B.2

TELEPRINTER SERIAL LINE INTERFACE SPEED SELECTION

Baud Rate	DIL Switch				
	A3	A4	A5	A6	B1
45.45	UP	DOWN	UP	UP	UP
50	DOWN	UP	UP	UP	UP
75	DOWN	DOWN	UP	UP	UP
100	UP	DOWN	UP	DOWN	DOWN
110	DOWN	DOWN	DOWN	DOWN	UP
134.5	UP	UP	UP	DOWN	UP
150	DOWN	UP	DOWN	DOWN	UP
200	UP	DOWN	UP	DOWN	UP
220	UP	UP	UP	UP	UP
300	UP	DOWN	DOWN	DOWN	UP
600	DOWN	UP	UP	DOWN	UP
900	DOWN	UP	DOWN	UP	DOWN
1200	DOWN	DOWN	DOWN	UP	UP
1800	DOWN	UP	DOWN	UP	UP
2400	DOWN	DOWN	UP	DOWN	UP
4800	UP	DOWN	DOWN	UP	UP
9600	UP	UP	DOWN	UP	UP

DIL Switch Variations

25 The following DIL switches have slightly different functions, according to which TGQ outfit is being installed and which version of software it has fitted. All these variations are summarised in Tables 4B.3 to 4B.6. A full list of issued software for all outfits is contained in Annex A.

DIL Switch A1

26 All outfits except TGQ6. This switch determines whether the Teleprinter powers up on line or off line:

On line - Set A1 UP
Off line - Set A1 DOWN

27 TGQ6 only. This outfit powers up on line and switch A1 selects the number of characters to be printed on each line:

69 characters/line - Set A1 UP
72 characters/line - Set A1 DOWN

DIL Switch A2

28 All new outfits except TGQ7 and TGQ9. This switch determines whether a pound symbol or a hash symbol is printed when the SHIFT 3 key is pressed:

Pound symbol - Set A2 UP
Hash symbol - Set A2 DOWN

29 Early versions of TGQ1 to TGQ5 and all versions of TGQ7 and TGQ9. These outfits have a slightly different version of software which gives a different function for switch A2. If a Keyboard is fitted to the Teleprinter, these outfits can be identified by having a pound symbol only in the SHIFT 3 position on the Keyboard.

30 The function of switch A2 on these outfits is to change the baud rate of the PTA interface (all outfits described in para 28 have their baud rate preset to 4800 baud):

300 baud - Set A2 UP
4800 baud - Set A2 DOWN

DIL Switch B2

31 All outfits except TGQ6. This switch determines whether the Teleprinter operates in half or full duplex:

Half Duplex - Set B2 UP
Full Duplex - Set B2 DOWN

32 TGQ6 only. This outfit operates in full duplex and switch B2 determines the setting of the DTR signal on the line interface:

DTR signal normal - Set B2 UP
DTR signal inverted - Set B2 DOWN

DIL Switch B7

33 All outfits except TGQ7. This switch determines whether or not there is auto linefeed on RETURN:

Auto linefeed on RETURN on - Set B7 UP
Auto linefeed on RETURN off - Set B7 DOWN

34 TGQ7 only. This outfit has the auto linefeed switched off and switch B7 determines whether or not the margin bell is enabled:

Margin bell enabled - Set B7 UP
Margin bell disabled - Set B7 DOWN

TABLE 4B.3

SUMMARY OF TELEPRINTER DIL SWITCH SETTINGS

(APPLICABLE TO ALL NEW OUTFITS EXCEPT TGQ6, TGQ7 AND TGQ9)

Function	Switch Block A				Switch Block B						
	1	2	7	8	2	3	4	5	6	7	8
Power Up On Line Off Line	UP DOWN										
Symbol Selection Pound Symbol Hash Symbol		UP DOWN									
Character Code ITA2 (5-bit) ITA5 (6-bit) ITA5 (7-bit) ITA5 (8-bit)			UP UP DOWN DOWN	UP DOWN UP DOWN							
Half Duplex Full Duplex					UP DOWN						
Stop Bits 1 1.5 2						DOWN UP DOWN	UP DOWN DOWN				
Parity Odd Even Off								DOWN DOWN UP	UP DOWN --		
Auto Linefeed on RETURN On Off										UP DOWN	
Default Line Spacing 3 lines/inch 6 lines/inch											UP DOWN

TABLE 4B.4

SUMMARY OF TELEPRINTER DIL SWITCH SETTINGS

(APPLICABLE TO EARLY VERSIONS OF TGQ1 TO TGQ5 AND ALL TGQ9 OUTFITS)

Function	Switch Block A				Switch Block B						
	1	2	7	8	2	3	4	5	6	7	8
Power Up On Line Off Line	UP DOWN										
PTA Interface Speed 300 Baud 4800 Baud		UP DOWN									
Character Code ITA2 (5-bit) ITA5 (6-bit) ITA5 (7-bit) ITA5 (8-bit)			UP UP DOWN DOWN	UP DOWN UP DOWN							
Half Duplex Full Duplex					UP DOWN						
Stop Bits 1 1.5 2						DOWN UP DOWN	UP DOWN DOWN				
Parity Odd Even Off								DOWN DOWN UP	UP DOWN —		
Auto Linefeed on RETURN On Off										UP DOWN	
Default Line Spacing 3 lines/inch 6 lines/inch											UP DOWN

TABLE 4B.5

SUMMARY OF TELEPRINTER DIL SWITCH SETTINGS

(APPLICABLE TO TGQ6 OUTFITS ONLY)

Function	Switch Block A				Switch Block B						
	1	2	7	8	2	3	4	5	6	7	8
Characters/line 69 72	UP DOWN										
Symbol Selection Pound Symbol Hash Symbol		UP DOWN									
Character Code ITA2 (5-bit) ITA5 (6-bit) ITA5 (7-bit) ITA5 (8-bit)			UP UP DOWN DOWN	UP DOWN UP DOWN							
DTR Signal Normal Inverted					UP DOWN						
Stop Bits 1 1.5 2						DOWN UP DOWN	UP DOWN DOWN				
Parity Odd Even Off								DOWN DOWN UP	UP DOWN --		
Auto Linefeed on RETURN On Off										UP DOWN	
Default Line Spacing 3 lines/inch 6 lines/inch											UP DOWN

TABLE 4B.6

SUMMARY OF TELEPRINTER DIL SWITCH SETTINGS

(APPLICABLE TO TGQ7 OUTFITS ONLY)

Function	Switch Block A				Switch Block B						
	1	2	7	8	2	3	4	5	6	7	8
Power Up											
On Line	UP										
Off Line	DOWN										
PTA Interface Speed											
300 Baud		UP									
4800 Baud		DOWN									
Character Code											
ITA2 (5-bit)			UP	UP							
ITA5 (6-bit)			UP	DOWN							
ITA5 (7-bit)			DOWN	UP							
ITA5 (8-bit)			DOWN	DOWN							
Half Duplex					UP						
Full Duplex					DOWN						
Stop Bits											
1						DOWN	UP				
1.5						UP	DOWN				
2						DOWN	DOWN				
Parity											
Odd								DOWN	UP		
Even								DOWN	DOWN		
Off								UP	--		
Margin Bell											
Enable										UP	
Disable										DOWN	
Paper Type											
Roll											UP
Pin Feed											DOWN

DIL Switch B8

35 All outfits except TGQ7. This switch determines the default line spacing:

3 lines/inch - Set B8 UP
6 lines/inch - Set B8 DOWN

36 TGQ7 only. This outfit has its line spacing set to 6 lines/inch. Switch B8 determines whether roll or pin feed paper is to be used:

Roll paper - Set B8 UP
Pin feed paper - Set B8 DOWN

External Power and Interface Connections — Figures 4B.7 and 4B.8

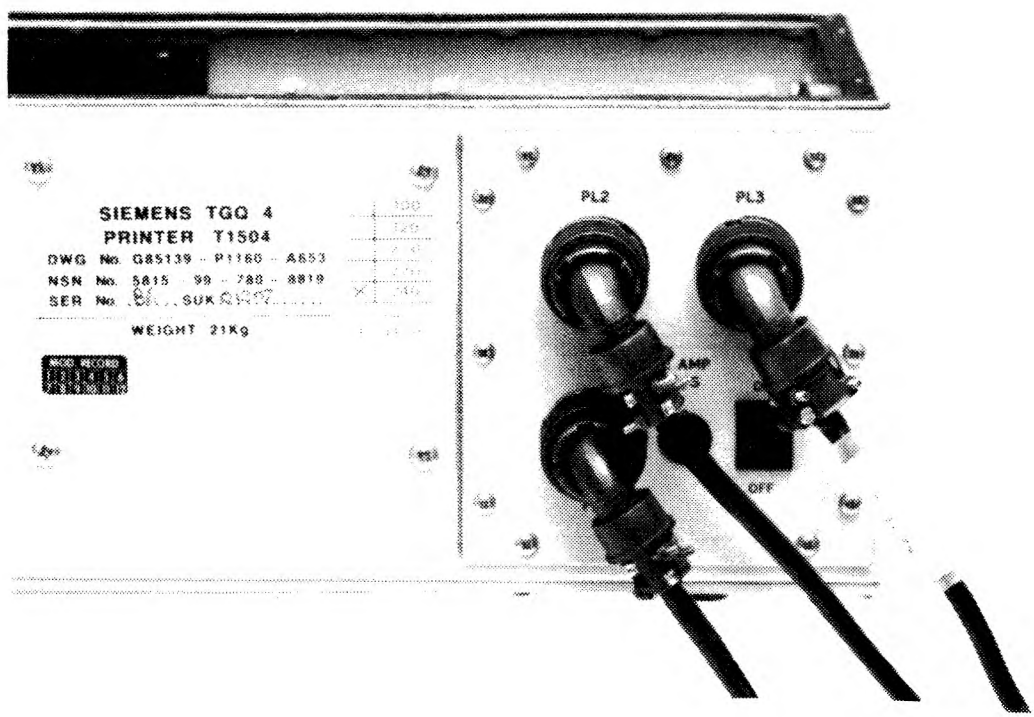
37 Power is supplied to the Teleprinter via PL1, a 3-pin pattern 104-type socket. A mating connector with screened cable is supplied for connection to the power source.

NOTE Ensure that the chassis earthing stud on the left-hand side of the rear panel is connected to a separate earth.

38 The interface connections to the signal line and the PTA are via two 12-pin pattern 104-type sockets (PL3 and PL2 respectively). The pin configuration of these sockets is shown in Table 4B.7 and the plug fitted to the line interface cable must be wired to match. The signal line and PTA interfaces are both wired for V24/V28 (RS232) operation. However, the signal line interface may be switched to provide a 20 mA current loop interface if required (see para 16).

39 Table 4B.8 provides a description of the modem controls on the line interface.

40 Connections to the Teleprinter in full duplex mode are shown in Figure 4B.8. Note that if either a low speed system without modem controls or the optional XON/XOFF protocol is being used, external wire links are required.



TELEPRINTER REAR PANEL SHOWING CABLES CORRECTLY CONNECTED FIG 4B.7

TABLE 4B.7

INTERFACE CONNECTOR CONFIGURATION

Pin	PL2 (PTA)	PL3 (Line)	Function
A	RTSB	RTSA (Yellow)	Request To Send
B	DCDB	DCDA (Green)	Data Carrier Detect
C	DTRB	DTRA (Blue)	Data Terminal Ready
D	CTSB	CTSA (Violet)	Clear To Send
E	TXDB	TXDA (Brown)	Serial Data Out
H	RXDB	RXDA (Red)	Serial Data In
K	0 V	0 V (Black)	Ground
L		RX In	)
M		RX Out	) Current loop data in)
O		TX In	)
P		TX Out	) Current loop data)
S		NO PAD	"Paper Out" signal

TABLE 4B.8

MODEM CONTROLS ON LINE INTERFACE

Signal	Function	Description
RTSA	Request To Send	In OFF LINE (local) mode, RTSA is always low. In ON LINE/FULL DUPLEX mode, RTSA is set high until the Printer is switched OFF LINE In ON LINE/HALF DUPLEX mode, RTSA is set high when the first character to be transmitted is loaded into the serial output device. RTSA is reset low when the serial output device has no further characters to transmit.
CTSA	Clear To Send	When the Printer CTSA is high, the Printer's serial output is enabled, such that any characters loaded into the serial output device are transmitted. When the CTSA signal goes low, the transmission of a character in progress is completed and further transmission inhibited.
DCDA	Data Carrier Detect	When the printer DCDA is high, the Printer's serial input is enabled. This line, therefore, is normally held permanently high. Note that this signal performs the same function as DSR on asynchronous modems and is normally connected to it.
DTRA	Data Terminal Ready	Serial data received by the Printer is loaded into a buffer, for which the availability of space is indicated by DTRA being driven high. When the data buffer is nearly full, the DTRA signal is driven low. If the DTRA signal is connected to the remote computer's CTS signal, the transmission of data to the Printer can be stopped, thereby preventing a buffer overflow and the consequential loss of data. DTRA is always low when the Printer is OFF LINE.

NOTES (1) DTRA is set low before the buffer is completely full to allow for the correct reception of characters already in transit (or for those which will be sent before the line direction can be reversed in half duplex).

(2) RTSA and CTSA may be inverted (see para 18).

Attaching Paper Roll Holder and Paper Loading Figures 4B.9 and 4B.10

41 Remove the six screws and washers from the centre of the Electronics Box lid. With the paper tension bar facing forward, align the holes in the roll holder base with the four outer screw holes in the lid and fit the screws and washers.

42 Remove the wire spring-clip from the end of the plastic spindle by pressing the two looped ends together. Push this end of the spindle through the paper roll such that the loose end of the paper will be facing the rear of the Teleprinter when the spindle is fitted onto the roll holder. Refit the spring-clip into the inner groove on the end of the spindle and place the ends of the spindle onto the roll holder.

43 Undo the quick-release screw on each side of the printer visor and lift the visor upwards. Move the print head to the left-hand margin and then check that the pressure feed lever to the left and rear of the platen is in the engaged position (pushed back). Lift the perspex tear-off strip (in front of the platen).

44 Feed the paper forward, under the paper roll and over the tension bar, and then feed it down behind the platen and between the plastic paper edge guides. Turn the knurled paper feed wheel in the direction of the rear of the Teleprinter until the paper appears in front of the platen. Feed the paper behind the tear-off strip and then lower the strip.

45 Release the pressure feed lever (pull forward) and align the paper manually. Move the lever to the engaged position, close the printer visor and secure it. Adjust the position of the paper edge guides as required so that they rest against the edges of the paper.

Attaching Pin Feed Paper Tray and Paper Loading (TGQ7) Figure 4B.11 and 4B.12

46 Remove the screws and washers from the centre of the Electronics Box lid, but do not remove the front and rear screw to the right of centre (ie remove four screws only). Align the two screw holes in the base of the paper tray with the front screw holes in the lid such that the angled edges of the tray are facing the Printer unit. Secure the tray using two of the screws previously removed. Note that the tray sits offset to the left of centre.

47 Undo the quick-release screw on each side of the printer visor and lift the visor upwards. Check that the floor-mounted switch in front of the platen is set for form feed paper (to the right). Move the print head to the left-hand margin and then check that the pressure feed lever to the left and rear of the platen is in the engaged position (pushed back). Lift the perspex tear-off strip (in front of the platen).

48 Place the box of pin feed paper in a convenient place behind the Teleprinter, ensuring that any marker is on the right-hand side. Feed the paper through the bottom of the tray and then down behind the platen and between the two plastic paper edge guides. Ensure that the holes in the left hand edge of the paper locate correctly in the left-hand sprocket wheel pins.

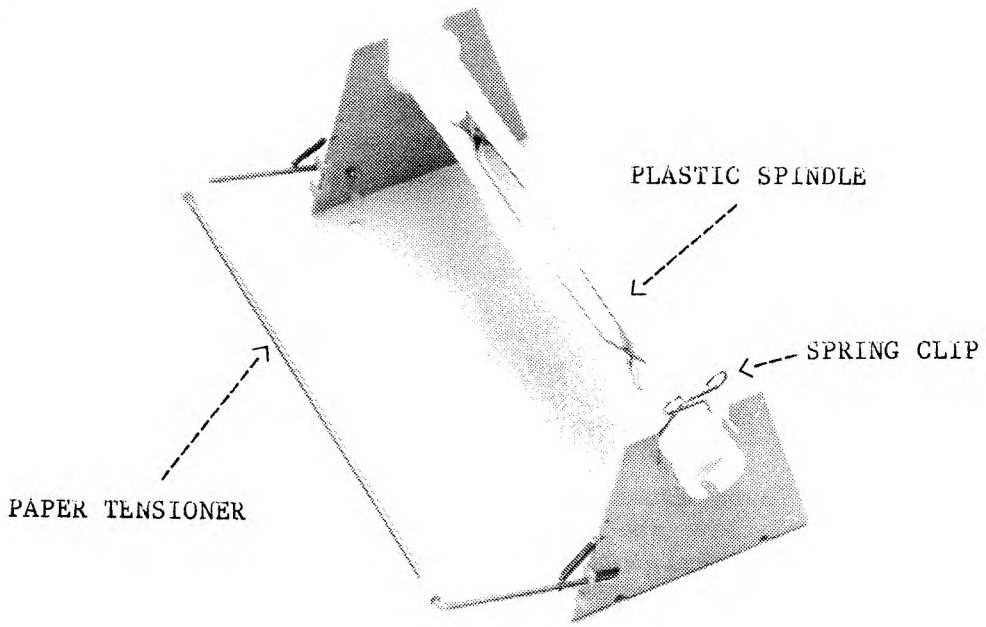


FIG 4B.9 PAPER ROLL HOLDER

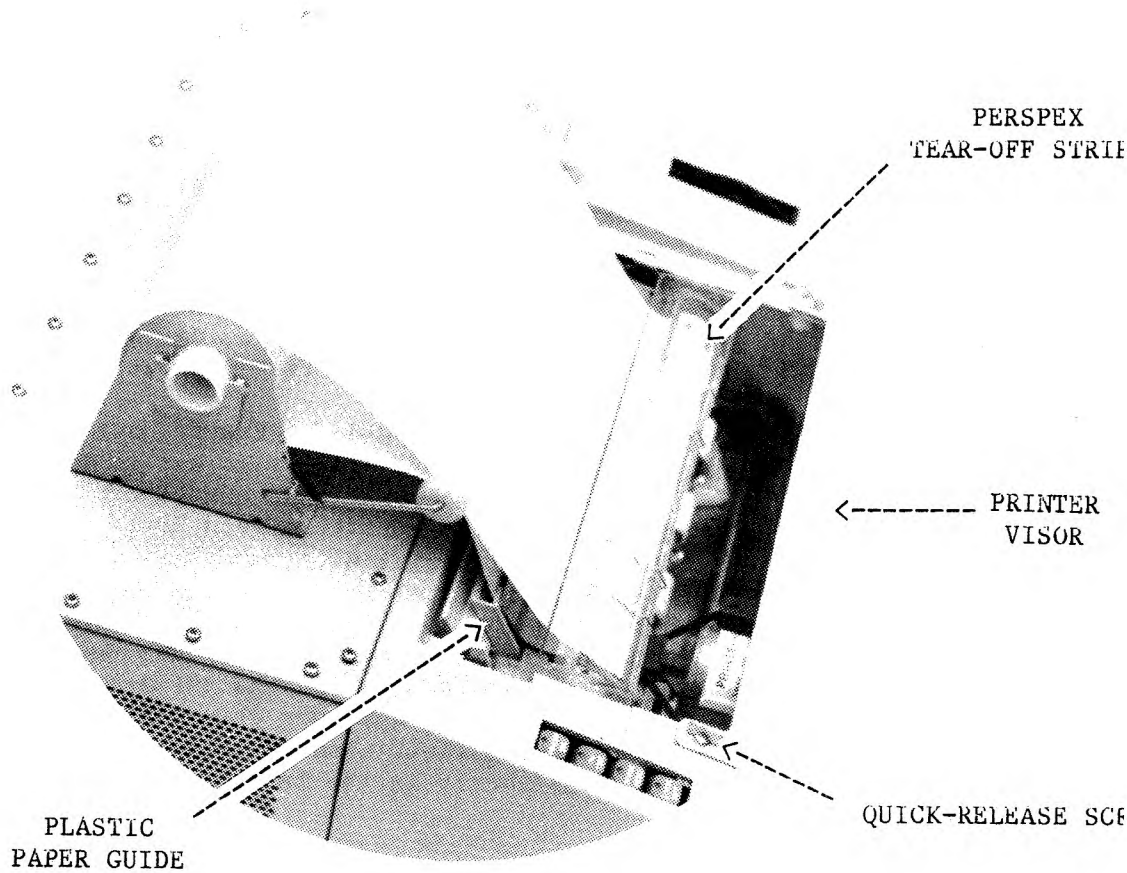
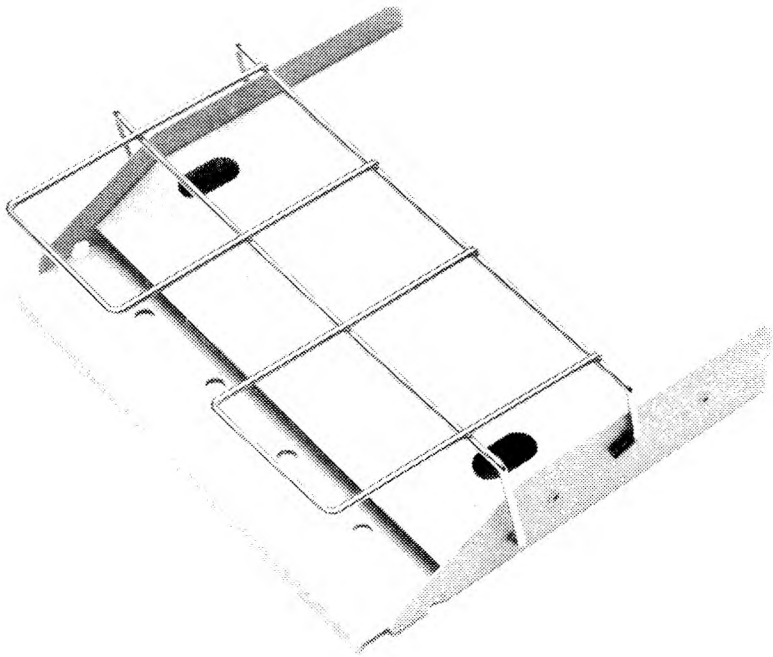
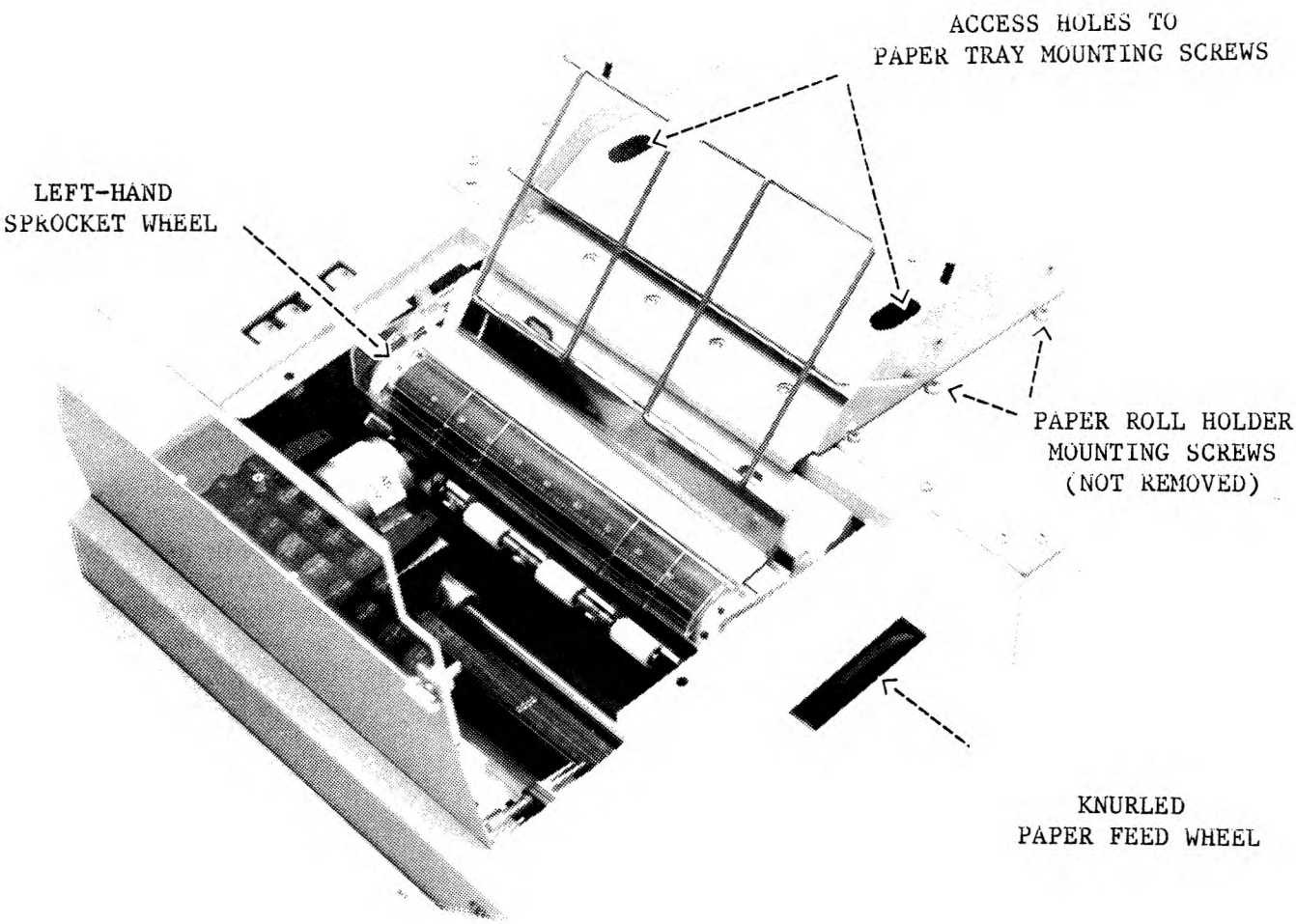


FIG 4B.10 TGQ2 WITH ROLL PAPER CORRECTLY INSTALLED



PIN FEED PAPER TRAY FIG 4B.11



TGQ7 FITTED WITH PIN FEED PAPER TRAY FIG 4B.12

49 Turn the knurled paper feed wheel towards the rear of the Teleprinter until the paper appears in front of the platen. Direct the paper between the platen and the tear-off strip. Lower the strip.

50 Release the pressure feed lever (pull forward) and align the paper manually. Close the printer visor and secure it. Adjust the position of the paper edge guides as required so that they rest against the edges of the paper.

51 Clip the hooked ends of the metal grille into the holes in the sides of the paper tray and adjust the angle to that required.

52 Ensure that the Teleprinter is OFF LINE. Advance the paper to the "top of form" using the paper feed wheel. Press FORM SET and then FORM FEED. The paper should feed through to the next top of form.

NOTE If the paper stops stops during the form feed and the Teleprinter starts to "bleep", switch off at the rear, manually wind on to the next top of form and switch on again.

Attaching Paper Roll Holder and Paper Loading (TGQ8)

53 This procedure is similar to the procedure described in paras 41 to 45. The only difference for this outfit is that there is a recess in the lid of the Electronics Box. This recess is required to accommodate the paper roll, which sits on a reduced-height roll holder bracket.

Loading Full-Width Pin Feed Paper (All Outfits) Figure 4B.13 and 4B.14

54 9.5 inch wide pin feed paper can be used with any of the TGQ outfits. The paper loading procedure is similar to that for loading TGQ7 pin feed paper, but note the following differences:

(1) A paper tray is not required as the paper lies flat on top of the Teleprinter.

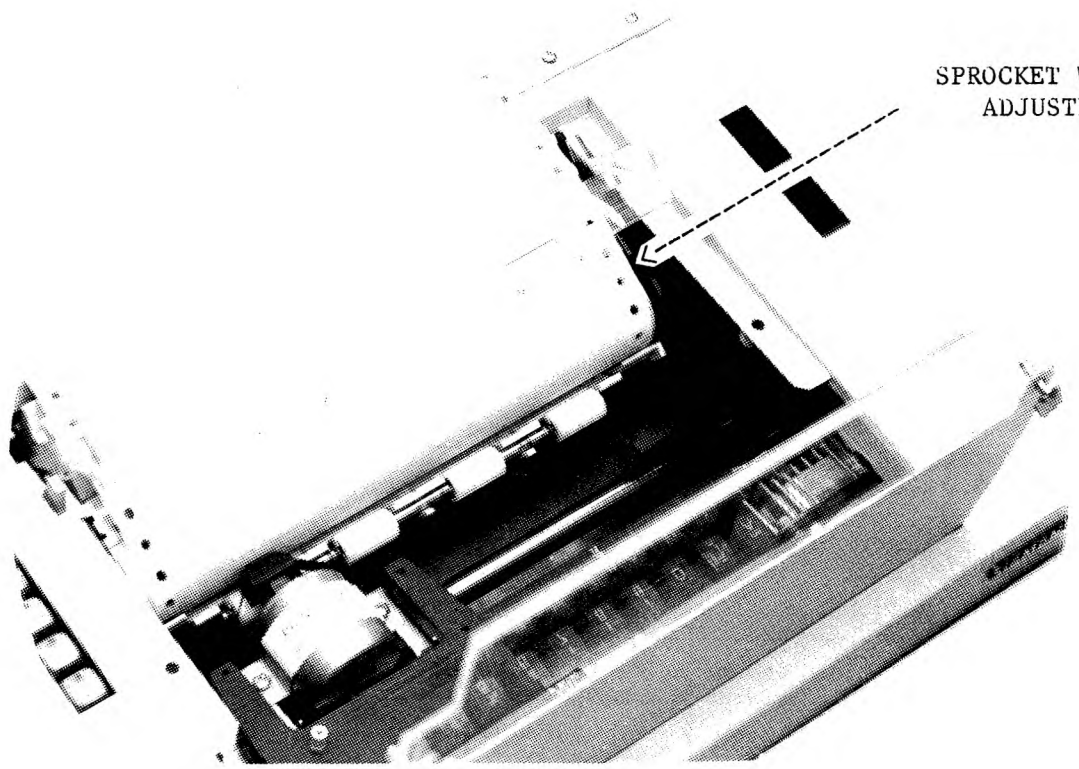
(2) The paper must be located in the pins on both left and right-hand sprocket wheels when it is fed in behind the platen.

(3) Only TGQ7 has a floor-mounted switch for pin feed or roll paper.

(4) Difficulty may be experienced in fitting the sprocket pins into the holes in the paper on both sides of the platen. If this is the case, move the adjuster wheel next to the right-hand sprocket wheel backwards or forwards to adjust the distance between the two sprocket wheels until the pins fit into the holes.



TGQ2 FITTED WITH FULL-WIDTH PIN FEED PAPER FIG 4B.13



LOCATION OF SPROCKET WHEEL ADJUSTER FIG 4B.14

SETTING UP PROCEDURE - PAPER TAPE ATTACHMENT

CAUTION RF suppression gaskets are fitted between some removable metal covers and the metal case. Ensure that these gaskets are in place and all all screws are tightened evenly when a cover is refitted, otherwise Tempest integrity may be affected.

Mains Input Voltage Selection

Figures 4B.15 and 4B.16

55 The operating supply voltage is factory-set and is marked on a plastic label on the rear of the PTA. If a different operating voltage is required, carry out the following procedure.

56 Remove the Tape Reel Box by undoing the two catches on the sides of the lid and then lift the lid until it locks in its raised position. Remove the nut and bolt which holds the lid stay-rod in position and then undo the 16 screws which secure the Tape Reel Box to the main assembly. Before the box can be lifted away, there are two wires connected to the underside of the box which must be freed by disconnecting the plug from PL7 on the main circuit board. When the box has been disconnected, ensure that no weight is placed on the two protruding pins underneath when the box is laid down.

57 Identify the pec mounted vertically to the side of the RF Box. On the left-hand side of this pec are two vertically-mounted block connectors which combine to form "TB1".

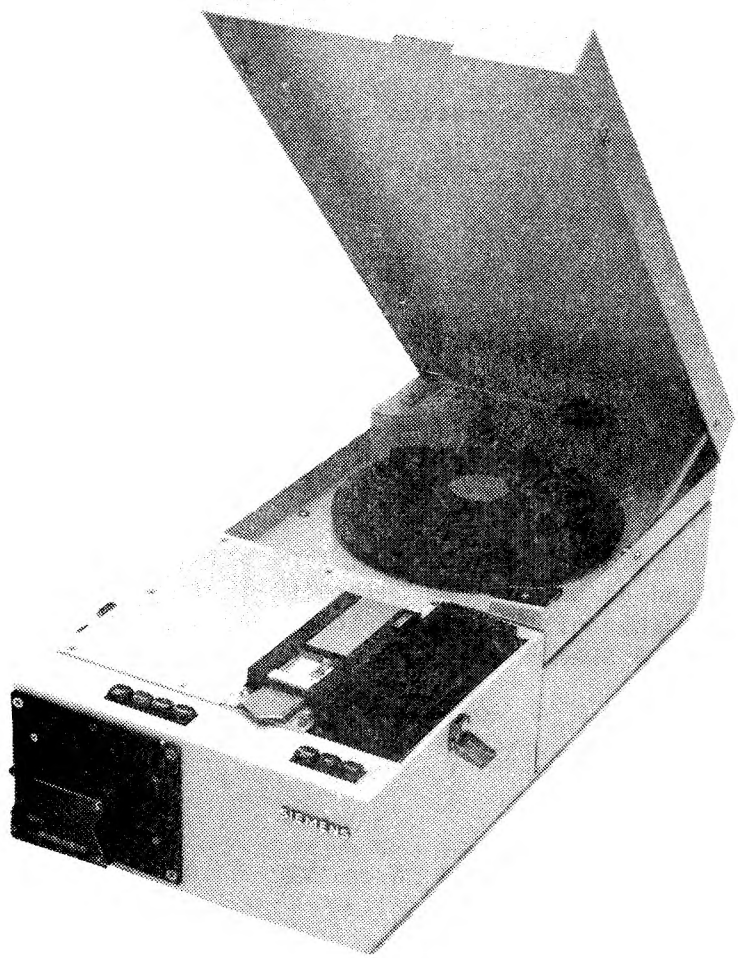
58 Refer to Table 4B.9 and change the transformer primary lead connections to the terminal blocks to produce the required operating voltage.

59 Alter the marking on the plastic label on the rear panel to show the new operating voltage. Check, and if necessary, adjust the internal DIL switch settings (see paras 60 to 71) before refitting the Tape Reel Box.

TABLE 4B.9

PTA MAINS INPUT VOLTAGE SELECTION

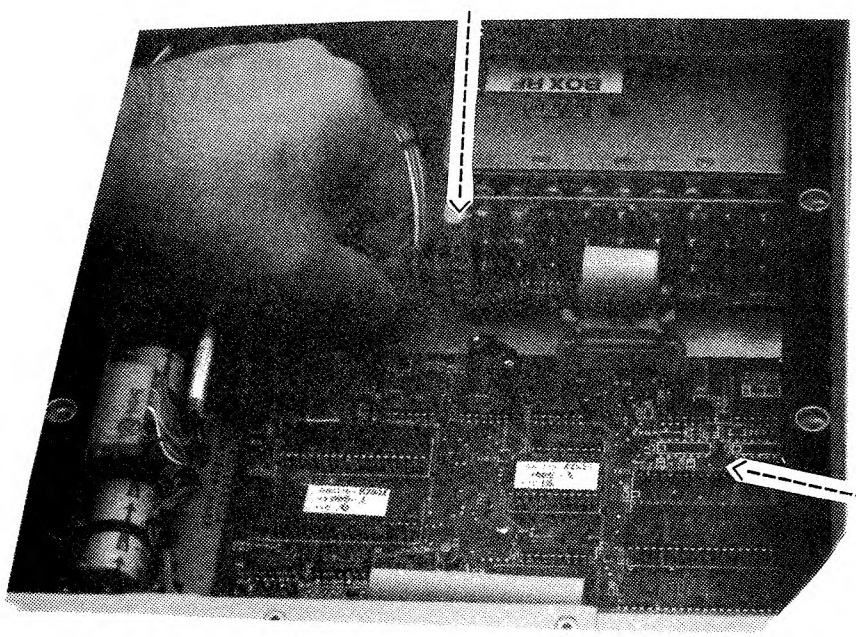
Voltage Required	"TB1" Top 1	2	3	4	5	6	7	Bottom 8
105 V	Brown	Yellow	White	-	-	Orange	Blue	Red
120 V	Yellow	Brown	Red	-	-	Orange	Blue	White
210 V	Brown	Yellow	-	Orange	White	-	Blue	Red
220 V	Yellow	Brown	-	Orange	White	-	Blue	Red
240 V	Yellow	Brown	-	Orange	Red	-	Blue	White



PTA WITH LID RAISED

FIG 4B.15

TERMINAL BLOCK "TB1"



DISCONNECTING PL7

FIG 4B.16

Internal DIL Switch Settings — Figure 4B.17

60 Various aspects of PTA operation are controlled by DIL switches which are mounted on the right-hand side of the PTA Controller pec. The switches are organised into two blocks, "SWA" (on the right) and "SWB" (on the left). Each block has eight switches.

NOTE Some early PTAs do not use SWA - see Annex A, paras 6 and 7.

61 In the following DIL switch descriptions, "UP" (switch closed) means that the switch is moved in the direction of the arrow on the switch (ie towards the number printed on the switch block). "DOWN" (switch open) means that the switch is moved in the opposite direction.

SWA1

62 This switch determines whether the line parity matches that set by DIL switches B5 and B6 on the TGQ Teleprinter or that of the Tape Punch. If the parity matches that of the Punch, it is set according to the position of DIL switches SWA7 and SWA8:

	SWA1 UP		SWA1 DOWN	
	ITA5	ITA2	ITA5	ITA2
Start bits	1	1	1	1
Data bits	7	5	7	5
Parity	Set by B5 & B6 on TGQ		Set by SWA7 & SWA8 on PTA	
Stop bits	1	1.5	1	1.5

NOTE Parity is normally odd on ITA5 and ITA2

SWA2, SWA3, SWA4, SWA5 and SWA6

63 These switches are not used and have no internal connections.

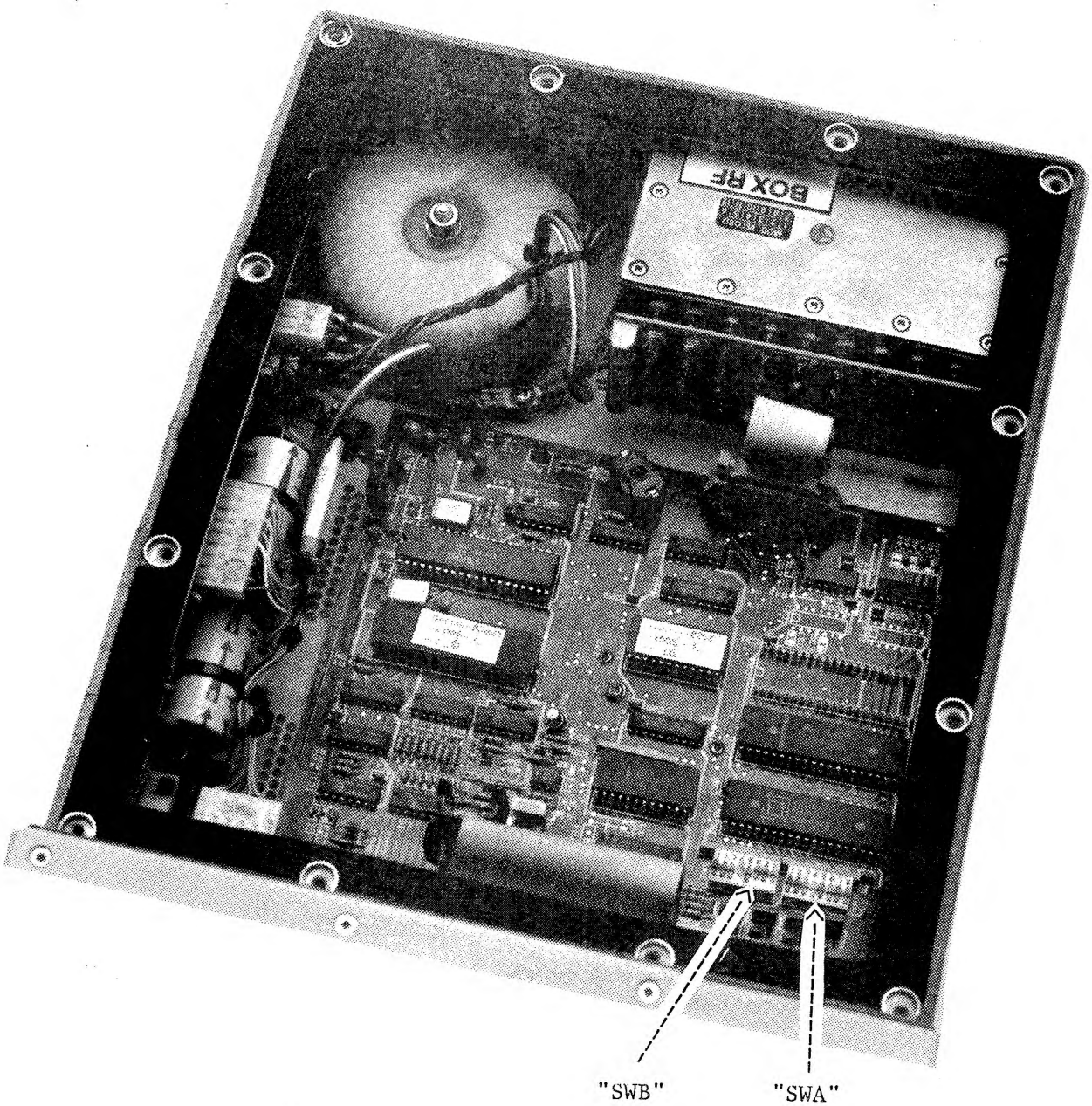
SWA7 and SWA8

64 These two switches combine to determine the parity of the Tape Punch:

	Switch	
Parity	SWA7	SWA8
Odd	DOWN	UP
Even	UP	DOWN
Mark	UP	UP
Space/off	DOWN	DOWN

SWB1

65 This switch affects the internal control of the Punch mechanism. It must be left in the DOWN position.



INTERNAL VIEW OF PTA WITH TAPE REEL BOX REMOVED FIG 4B.17

SWB2

66 This switch configures the Paper Tape Unit for either a 50 or 75 characters/second Punch mechanism:

75 chars/s - Set SWB2 UP
50 chars/s - Set SWB2 DOWN

NOTE The standard Tape Punch mechanisms fitted to PTAs supplied to the Navy operate at 50 characters/second. The version of Punch mechanism fitted is identified by having a "50" or a "75" printed on a label which is fixed to the side of the punch wheel.

SWB3

67 This switch determines the character code selected when the PTA is switched on:

ITA2 - Set SWB3 UP
ITA5 - Set SWB3 DOWN

SWB4

68 This switch is used to enable or disable the operation of control codes received from the serial line (normal state is disable):

Disable control codes - Set SWB4 UP
Enable control codes - Set SWB4 DOWN

69 Three codes are recognised by the PTA when in ITA2 mode and four codes are recognised in ITA5 mode:

ITA2 Control Codes

CCCC - READER ON is selected
FFFF - PUNCH ON is selected
SSSS - Reader and Punch both deselected

ITA5 Control Codes

<CONTROL>Q (11H) - READER ON is selected
<CONTROL>S (13H) - READER ON is deselected
<CONTROL>R (12H) - PUNCH ON is selected
<CONTROL>T (14H) - PUNCH ON is deselected

NOTE Control codes are not punched on the tape. The READER ON and PUNCH ON LEDs will indicate the state of the Reader and the Punch.

SWB5

70 This switch is not used and has no internal connections.

Serial Line Interface Speed Selection

71 The baud rate for the serial communications line is controlled by three DIL switches - SWB6, SWB7 and SWB8. Set these switches in accordance with Table 4B.10 to obtain the required transmission speed.

NOTE If the PTA is to be used with a TGQ Teleprinter (eg TGQ3), the baud rate should be set to 4800 baud.

TABLE 4B.10

PTA SERIAL LINE INTERFACE SPEED SELECTION

Baud Rate	DIL Switch		
	SWB6	SWB7	SWB8
75	UP	UP	DOWN
100	UP	DOWN	UP
110	UP	DOWN	DOWN
150	DOWN	UP	UP
300	DOWN	UP	DOWN
600	DOWN	DOWN	UP
1200	DOWN	DOWN	DOWN
4800	UP	UP	UP

Typical DIL Switch Settings for a PTA Used with a TGQ Teleprinter

72 Table 4B.11 shows typical DIL switch settings for a PTA fitted with new software and a 50 characters/second Punch mechanism when connected to a TGQ series Teleprinter using the ITA5 (ASCII) character code.

TABLE 4B.11

EXAMPLE OF PTA DIL SWITCH SETTINGS WHEN CONNECTED TO A TGQ TELEPRINTER

PTA DIL Switch	Setting	Option Selected
SWB1	DOWN	--
SWB2	DOWN	50 chars/s Punch
SWB3	DOWN	ITA5 (ASCII)
SWB4	UP	Control codes disabled
SWB5	EITHER	--
SWB6	UP	)
SWB7	UP	) Line speed set to 4800 baud
SWB8	UP	)
SWA1	DOWN	Line parity matches Teleprinter
SWA2	DOWN	--
SWA3	DOWN	--
SWA4	DOWN	--
SWA5	DOWN	--
SWA6	DOWN	--
SWA7	DOWN	)
SWA8	DOWN	) Tape Punch parity off

External Power and Interface Connections — Figure 4B.18

73 Power is supplied to the PTA via PL1, a 3-pin pattern 104-type socket. A mating connector with screened cable is supplied for connection to the power source. The equipment is normally supplied ready-wired for 240 V operation.

NOTE Ensure that the chassis earthing stud on the right-hand side of the rear panel is connected to a separate earth.

74 Connection to a V24/V28 (RS232) serial line is via a 12-pin pattern 104-type connector and the pin configuration is shown in Table 4B.12. Tables 4B.13 and 4B.14 describe the operation of the PTA under modem control.

TABLE 4B.12

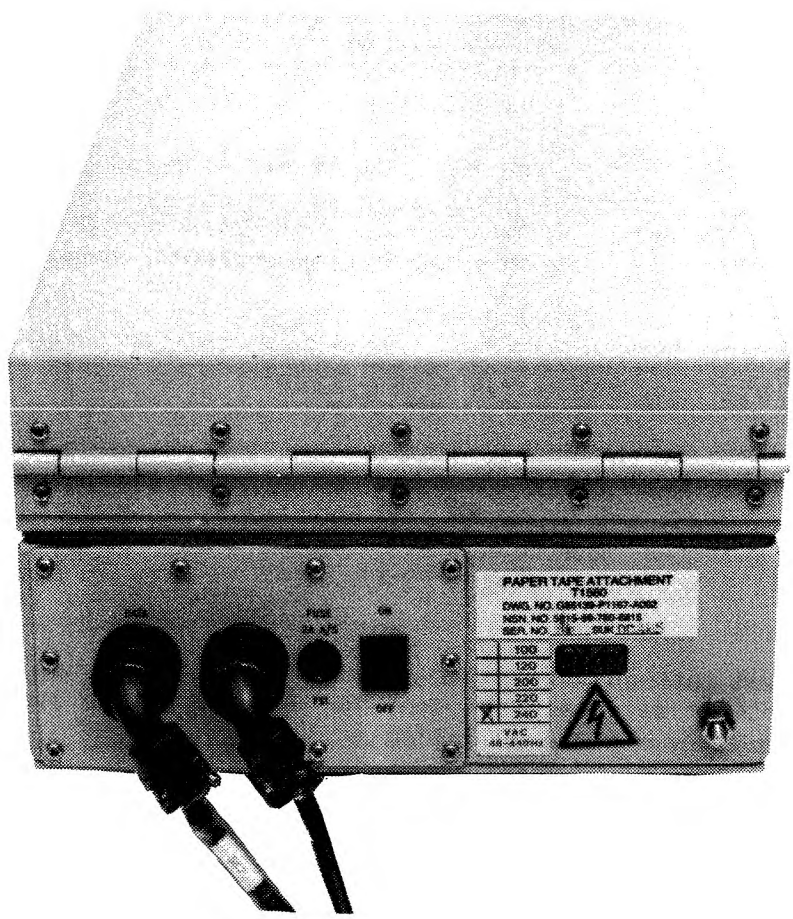
PTA INTERFACE CONNECTOR CONFIGURATION

Pin	PL2	Function
A	RTS	Request To Send
B	DSR	Data Set Ready
C	DTR	Data Terminal Ready
D	CTS	Clear To Send
E	TX	Serial data out
H	RX	Serial data in
K	0 V	Ground

TABLE 4B.13

MODEM CONTROLS (READER) ON PTA SERIAL LINE INTERFACE

Signal	Function	Description
RTS	Request To Send (output)	RTS is normally low. It goes high when READER ON is selected or the STEP key is pressed, indicating that the PTA wishes to transmit data. RTS goes low again when READER ON is deselected or the STEP key is released after all outstanding data has been transmitted.
CTS	Clear To Send (input)	When CTS is high the PTA's serial output line is enabled, allowing data from the Tape Reader to be transmitted. When CTS goes low, transmission of the character in progress is completed but further transmission is inhibited.



PTA REAR PANEL WITH CABLES CORRECTLY CONNECTED FIG 4B.18

TABLE 4B.14

MODEM CONTROLS (PUNCH) ON PTA SERIAL LINE INTERFACE

Signal	Function	Description
DTR	Data Terminal Ready (output)	This line is normally high, indicating that the PTA is switched on and is ready to receive serial data. If PUNCH ON is selected, all serial data is input to a buffer for punching. DTR goes low when the buffer is nearly full, thus preventing the remote device from sending more data. DTR goes high again when space is available in the buffer for more characters. After DTR goes low, four more characters can be accepted before the buffer overflows. If PUNCH ON is not selected, DTR remains high.
DSR	Data Set Ready (input)	This enables the PTA's serial input. It is normally held permanently high.

Connecting the PTA to a TGQ Series Teleprinter

75 Table 4B.15 shows the connections between the PTA and a TGQ Teleprinter. In normal use, both the PTA and the Teleprinter are switched on. If the PTA is not being used, it should be disconnected from the Teleprinter. If the Teleprinter is switched on with the PTA connected but not switched on, the Teleprinter will print the message "PUNCH FAIL" as part of its normal startup printout.

76 Set the baud rate on the PTA to 4800 baud and check that the baud rate on the Teleprinter matches this (some TGQ outfits have a 300 baud option for the PTA interface - see paras 29 and 30).

TABLE 4B.15

CONNECTIONS BETWEEN A PTA AND A TGQ SERIES TELEPRINTER

PTA PL2		Signal Direction	TGQ PL2	
Pin	Signal		Signal	Pin
B	DSR	<--	RTSB	A
A	RTS	-->	DCDB	B
D	CTS	<--	DTRB	C
C	DTR	-->	CTSB	D
H	RX	<--	TXDB	E
E	TX	-->	RXDB	H
K	0 V		0 V	K
SCREEN			SCREEN	

Loading Paper Tape

77 This is a two part operation. First of all, the Tape Punch and Reader must be set up for 5-hole tape (11/16 in wide) for ITA2 operation, or 8-hole tape (1 in wide) for ITA5 (ASCII) operation. Secondly, a tape reel of the correct width must be loaded into the PTA.

Tape Width Selection — Figures 4B.19 to 4B.22

78 To change the width of the Tape Punch mechanism for 11/16 in or 1 in wide tape, proceed as follows:

78.1 Remove the six screws from the top cover to the left of the Tape Punch mechanism and remove the cover.

78.2 Remove the two screws from the tear-off bar. Remove the bar and then remove the securing plate beneath the bar by removing the two screws revealed when the bar is removed.

78.3 Prise out the aluminium punch cover strip (held in place by a magnet). Remove any chad present and replace the cover strip.

78.4 Unclip the top of the Punch mechanism by lifting the metal clip at the rear. Hinge the sub-assembly forward and then lift clear.

78.5 On the rear face of the main assembly there is a small steel spring tape guide which is slotted into one of three grooves. The innermost groove is for 11/16 in wide tape and the outer groove is for 1 in tape. The middle groove is not used. If the tape guide is not in the correct groove, withdraw it and slot it into the correct groove.

78.6 Replacement of the top of the Punch mechanism is a reversal of the removal procedure. Refit the securing plate and tear-off bar and then refit the cover.

79 The procedure for adjusting the Tape Reader mechanism to match the width of tape being read is simply to move the selector switch on the front of the mechanism to either "5" for 11/16 in tape or "8" for 1 in tape. "6" is not used.

Fitting a Paper Tape Reel — Figure 4B.23

80 Release the catch on each side of the Tape Reel Box, raise the lid and proceed as follows:

80.1 Place the paper tape reel on the turntable such that clockwise rotation will unwind the tape.

80.2 Draw the end of the tape forward, twist it to the left and then feed it through the front roller from underneath.

80.3 Pull the tape towards the rear of the PTA. Feed it through the roller on the end of the Brake Arm Assembly from underneath. Note that there is a black plastic bracket on this roller which must be pushed back before the tape can be fed through.

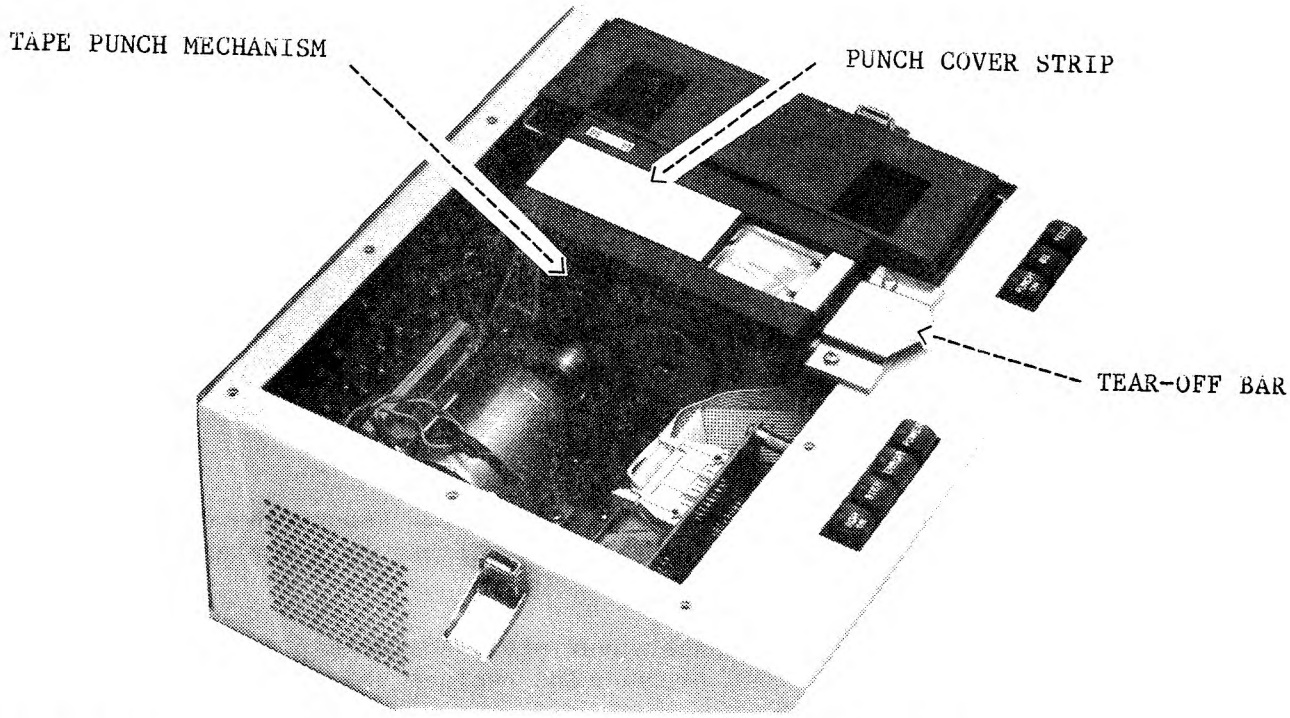


FIG 4B.19 INTERNAL VIEW SHOWING TAPE PUNCH MECHANISM

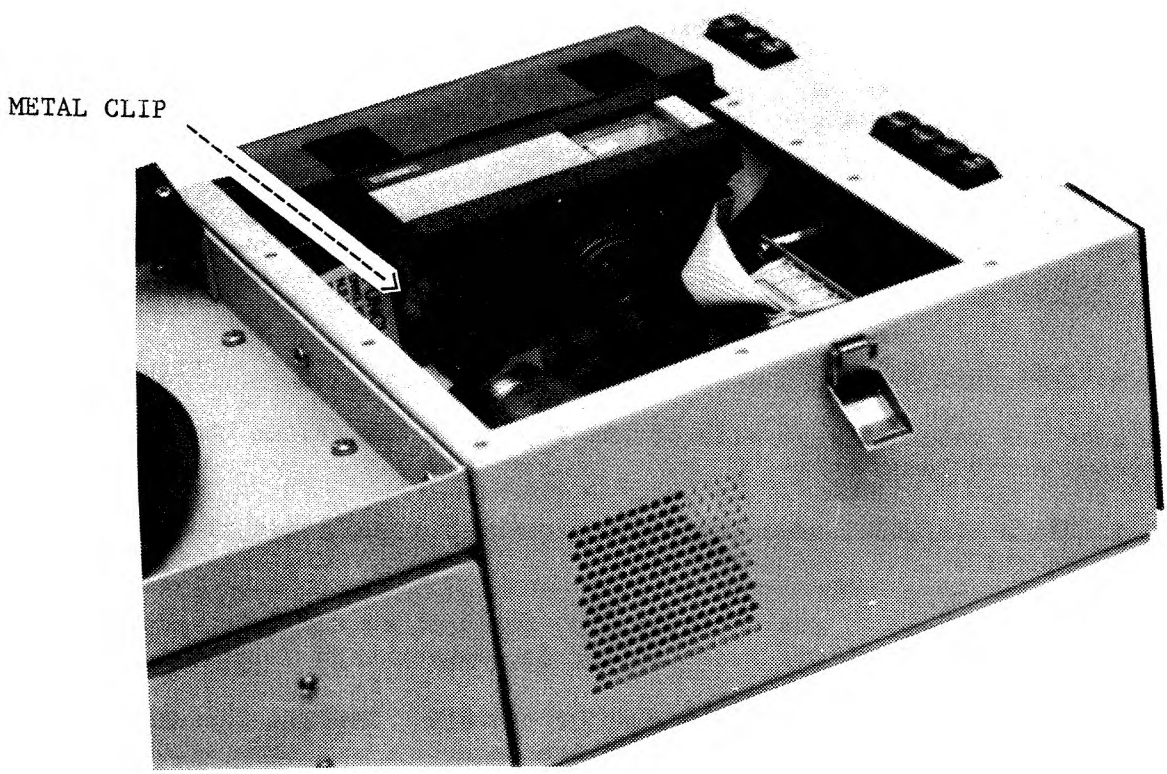
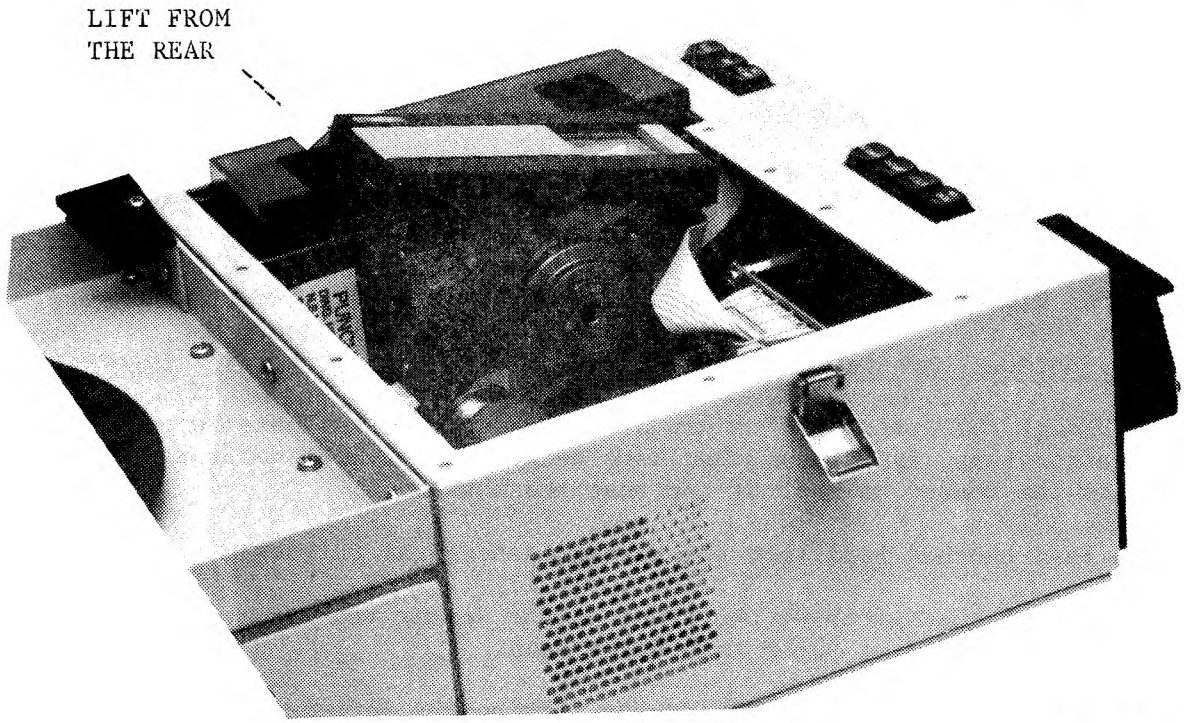
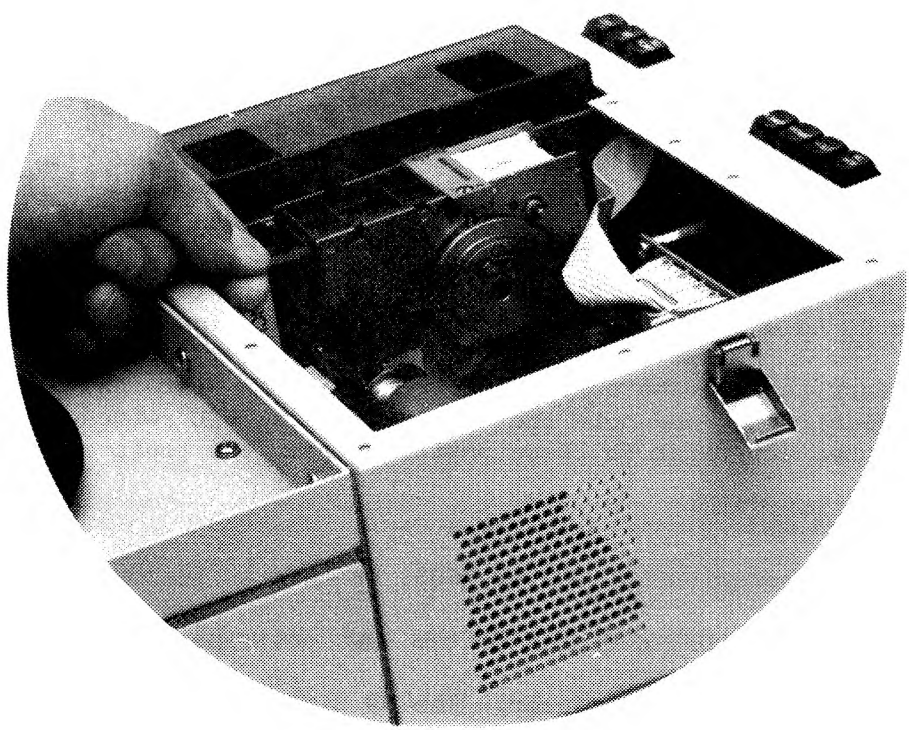


FIG 4B.20 PUNCH MECHANISM RELEASE CLIP



REMOVING TOP OF PUNCH MECHANISM FIG 4B.21



REMOVING STEEL TAPE GUIDE FIG 4B.22

80.4 Draw the tape forward and feed it into the slot at the rear of the Tape Punch mechanism.

80.5 Press the small aluminium bar which is between the perspex window and the tear-off bar. The window will hinge upwards, enabling the tape to be fed over the punch sprocket wheel.

80.6 Close the window. This will trap the tape on the sprocket wheel.

Loading Punched Tape into the Tape Reader — Figure 4B.24

81 Although this procedure is not strictly part of the installation instructions, it is described here because it will be necessary to load tape into the Reader as part of the test procedures.

82 To load punched tape into the Reader, proceed as follows:

82.1 Set the switch on the front of the Reader mechanism according to the width of paper tape being used.

82.2 Open the Reader mechanism by lifting the left-hand side of the Reader head.

82.3 Slot the tape between the reader head and the baseplate with the tape lead-in pointing to the left (the tape moves through the Reader from right to left as it is being read).

82.4 Position the sprocket holes in the tape onto the sprocket wheel pins and then lower the reader head, thus trapping the tape in position.

NOTE If the wrong size tape is loaded into the Reader, the tape will jam and cause the Reader to switch off.

EQUIPMENT TEST PROCEDURES

83 The following tests must be carried out on completion of the installation procedures to ensure that the equipment has been installed correctly.

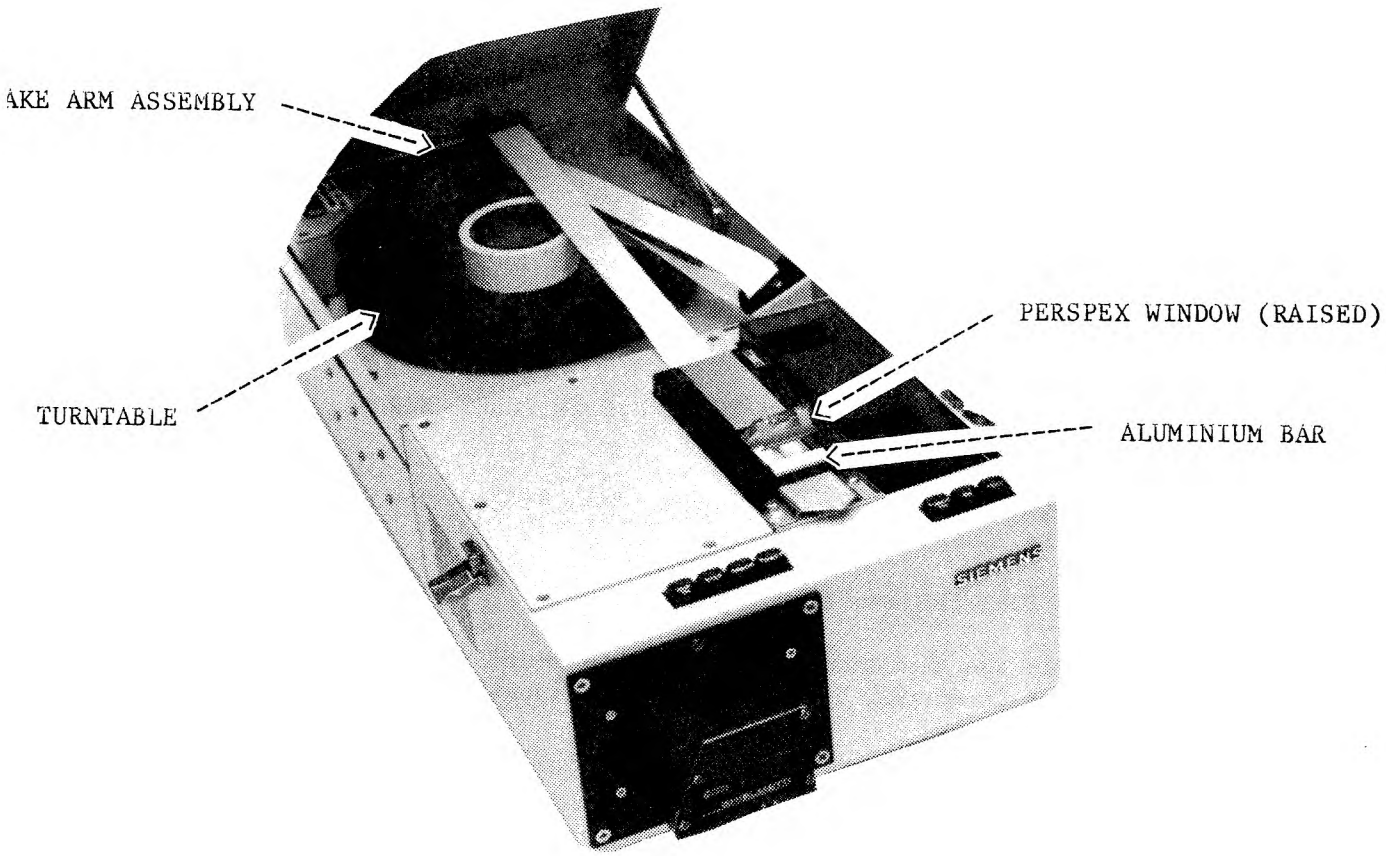
84 Before carrying out the tests, remove the access plate on the rear panel of the Teleprinter and note the settings of the DIL switches. Make sure that the switches are reset to these positions when the tests are completed.

TGQ1 and TGQ8 Outfits

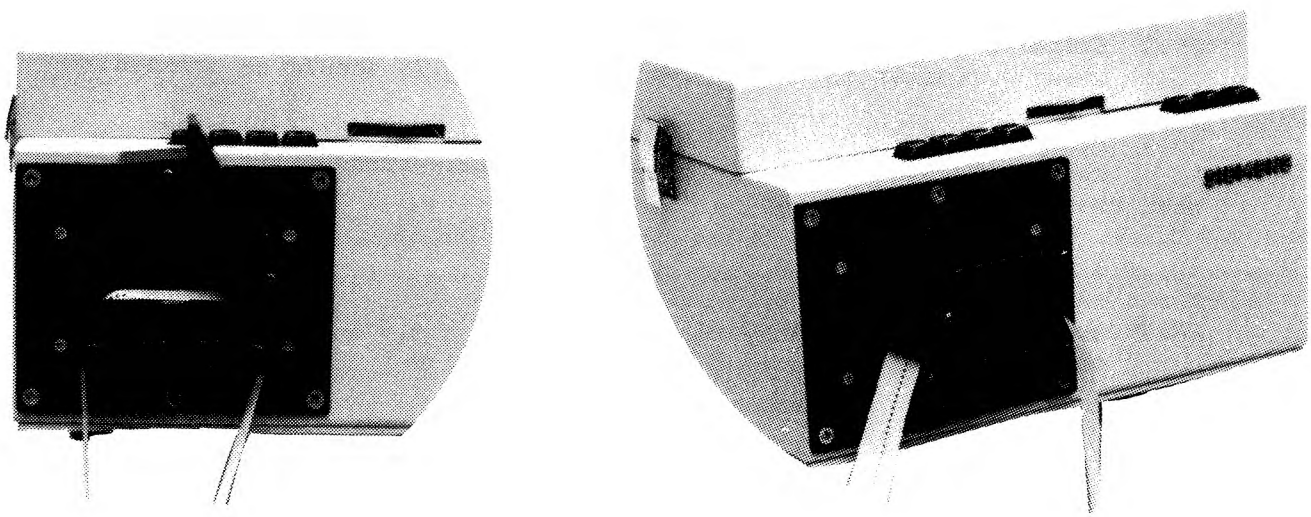
85 To test the operation of TGQ1 or TGQ8, proceed as follows:

85.1 Set all the DIL switches to the DOWN position.

85.2 Switch on the Teleprinter. The ON LINE LED should remain unlit and the startup message should be similar to that printed in Figure 4B.25.



PTA WITH PAPER TAPE CORRECTLY INSTALLED FIG 4B.23



INSTALLING PAPER TAPE IN THE TAPE READER FIG 4B.24

NOTE Early versions of TGQ1 will print a pound symbol instead of a hash symbol when the switches are set in this position.

```
T1500 Teleprinter
S/W Vers:      Interface        T1500/IF/53.5  - Modem
               Print Control    T1500/PC/X103-3 - Bi-Directional
 !"#$%&'( )*+,-./0123456789::(=)?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
 "#$%&'( )*+,-./0123456789:;(=)?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
 #$%&'( )*+,-./0123456789:;(=)?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`
```

FIG 4B.25 STARTUP MESSAGE ON TGQ1 (DIL SWITCHES DOWN)

85.3 Mark the paper where it emerges from behind the perspex tear-off strip.

85.4 Press FORM SET and then FORM FEED.

85.5 Measure the distance between the tear-off strip and the mark on the paper - it should be eleven inches (approximately).

85.6 Switch off the Teleprinter and reset the DIL switches to their original positions.

TGQ2, TGQ5 and TGQ11 Outfits

86 To test the operation of a TGQ2, TGQ5 or TGQ11 outfit, carry out the test procedures for a TGQ1 outfit (excluding 85.6) and then proceed as follows:

86.1 Press all the character keys on the Keyboard - they should all be printed.

86.2 Switch off the Teleprinter and set all the DIL switches to UP.

86.3 Switch on again. The ON LINE LED should light and a startup message similar to that shown in Figure 4B.26 should be printed.

86.4 Press all the character keys on the Keyboard - the following characters will not be printed and the Teleprinter will "bleep" when these keys are pressed:

! " # & * ; < > [\ ] ^ _ ` { ¦ } ~

86.5 Switch off the Teleprinter and reset the DIL switches to their original positions.

```
T1500 Teleprinter

S/W Vers:       Interface        T1500/IF/53.5  - Modem

                Print Control    T1500/PC/X103-3 - Bi-Directional


$%'( )+,-./0123456789:=?@ABCDEFGHIJKLMNOPQRSTUVWXYZ $%'( )+,-./01234567

89:=?@ABCDEFGHIJKLMNOPQRSTUVWXYZ $%'( )+,-./0123456789:=?@ABCDEFGHIJKL

MNOPQRSTUVWXYZ $%'( )+,-./0123456789:=?@ABCDEFGHIJKLMNOPQRSTUVWXYZ $%'

( )+,-./0123456789:=?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
```

STARTUP MESSAGE ON A TGQ2 (DIL SWITCHES UP) FIG 4B.26

TGQ3 Outfit

87 Perform the tests described for the TGQ2 outfit and then proceed as follows:

87.1 Connect the PTA to the Teleprinter, remove the Tape Reel Box and note the PTA's DIL switch settings. If necessary, alter the settings such that SWB4, SWB6, SWB7 and SWB8 are UP and all the other switches are in the DOWN position. Refit the Tape Reel Box and load 8-hole (1 in wide) tape into the Punch.

87.2 Switch on the PTA and press the PUNCH ON button - the LED should illuminate.

87.3 Switch on the TGQ3. The startup message should be printed on the Teleprinter and the character set should be echoed to the Tape Punch.

NOTE If the Punch fails to work, the baud rate on the PTA will need to be changed from 4800 baud to 300 baud. To do this, leave SWB4 and SWB7 in the UP position and set all the other switches to DOWN. Repeat steps 87.2 and 87.3 - the Punch should now work.

87.4 Check that the Teleprinter is set to OFFLINE (ONLINE LED unlit). Press the PUNCH ON button (LED off) and then press FEED. Remove the tape from the Punch and place in the Reader.

87.5 Press the RDR ON button on the PTA. The character set encoded on the punched tape should be read back to the Teleprinter.

87.6 Switch off the PTA and the Teleprinter and reset the DIL switches to their original positions.

TGQ4 and TGQ9 Outfits

88 Perform the tests specified for the TGQ2 Teleprinter and then carry out the following additional steps which are designed to check the Message Edit functions:

88.1 Switch off the Teleprinter, set all the DIL switches to the DOWN position and then switch on again.

88.2 Press <CONTROL> and 3. The Teleprinter should respond with:

Print Message No.:

88.3 Press the "s" key and then <RETURN>. The response should be:

Free Message Store = 40960 Bytes

Msg Status

No Messages Stored

NOTE If the Teleprinter has been used previously, it is possible that there may be messages stored in the non-volatile memory. If this is the case, reset the message store by pressing <CONTROL> and 6, followed by typing "A" <RETURN>.

88.4 Press <CONTROL> and 4. The response should be:

ERROR - Not Online

88.5 Press <CONTROL> and 6. The response should be:

RESET - Type A to Clear Message Store Continuously
Type R to Reset to Initial Conditions

88.6 Respond by typing "R" <RETURN>. The response should be:

Reset Complete

88.7 Switch the Teleprinter off. Set all the DIL switches to UP and switch on again. Repeat steps 88.2 to 88.4. The response to 88.4 should be:

Transmit Message No.:

88.8 Respond by typing "1" <RETURN>. The response should be:

??

88.9 Type "R" <RETURN> to reset the Teleprinter. Switch off and reset the DIL switches to their original positions.

TGQ6 Outfit

89 The procedure for testing the TGQ6 is identical to that for testing the TGQ2 (see para 86), except that there are three additional tests which need to be carried out after the DIL switches have been reset to their original positions:

89.1 Ensure the Teleprinter ON LINE LED is lit.

89.2 Press <CONTROL> and "5" (EDIT TI). The response should be:

ERROR - Online

89.3 Press <CONTROL> and "2" (PRINT TI). The response should be:

****
LAST TI = nnnn
****

Where nnnn may be any 4-digit number

89.4 Press <CONTROL> and "3" (EDIT HD/TL). The response should be:

Edit Header or Trailer (H/T):

89.5 Type "H" <RETURN>. The response should be:

Current Header = 1111111111111111111VZCZCAAA

Enter Edit Command - Type E to Leave Header Unchanged
Type D to Revert to Default
Type N to Enter New Header

89.6 Type "E" <RETURN>. The response should be:

Edit Complete

TGQ7 Outfit

90 The procedure for testing TGQ7 is similar to that for testing TGQ1. However, as this outfit normally uses pin feed paper, steps 85.3 to 85.5 are replaced by the following steps:

90.1 Turn the knurled paper feed wheel until the perforated edge between two sheets of paper is just visible above the edge of the perspex printer visor.

90.2 Ensure the Teleprinter is off line (ON LINE LED unlit). Press the FORM SET button and then the FORM FEED button.

90.3 Repeat 90.2 ten times. The paper should stop at the same place each time a form feed is completed.

TGQ10 Outfit

91 The procedure for testing TGQ10 has not yet been finalised.

Paper Tape Attachment

92 The following procedure is designed to test a stand-alone PTA (ie one which will not be used as part of a TGQ outfit):

92.1 Connect the power cable to the PTA. Do not load a tape reel.

92.2 Switch on the PTA. The POWER LED should illuminate and the ERROR LED should flash. The small green LED on the front of the Reader should illuminate.

92.3 Lift the lid of the Tape Reel Box. The Brake Arm should be resting against its backstop plate and the ERROR LED should start flashing. Move the arm forward towards the spindle. As the arm is moved, the ERROR LED should extinguish and then start to flash again as the arm reaches the spindle. Return the arm to its original position.

92.4 Load a tape reel (this will cause the ERROR LED to extinguish) and then press FEED. The tape should pass through the Punch mechanism and emerge with sprocket holes punched in it.

NOTE When the FEED button is released, the Punch motor will continue to run for a few seconds.

92.5 Press BS. The tape should move backwards one space only.

92.6 Tear off the tape and place it in the Reader. Press RDR ON - the tape should move forward one position and then the RDR ON LED should illuminate (this test cannot be repeated unless the PTA is switched off and then switched on again). Press RDR ON again - the LED should extinguish.

92.7 Switch off the PTA.

NOTE If the PTA is to be moved when the tests have been completed, empty the chad box first to avoid the possibility of chad being deposited in the Punch mechanism during transit.

ANNEX A

SOFTWARE VARIATIONS

TELEPRINTERS

1 The various TGQ Series Teleprinters contain basically the same hardware but have different software to suit different requirements. Also, new outfits currently being produced have a version of software fitted which is slightly different to that fitted in early models.

2 There are two ways to ascertain which versions of software are fitted in the Interface Control pec and the Printer Control pec. One way is to remove the lid of the Electronics Box, remove the relevant pec and look at the label on the EPROM. The other way is to look at the startup message printed when the Teleprinter is switched on.

Examples of Startup Messages

3 The startup message for a TGQ2 Teleprinter will begin with something like:

T1500 Teleprinter

S/W Vers: Interface T1500/IF/53.5 - Modem

Print Control T1500/PC/X103-3 - Bi-Directional

4 The startup message for a TGQ4 Teleprinter will begin with something like:

T1500 Message Editing Terminal

S/W Vers: Message Editor T1500/ME/4.6 - Modem

Print Control T1500/PC/X103-3 - Bi-Directional

5 In the two examples above, the same software is fitted in the Printer Control pecs (X103-3), but the software in the Interface Control pecs is different (53.5 and 4.6). All versions of software fitted in the TGQ Series Teleprinters are listed in Table A1.

PAPER TAPE ATTACHMENT

6 The only way to ascertain which version of software is fitted in the PTA is by removing the Tape Reel Box and examining the label on the EPROM fitted in the horizontally-mounted Controller pec.

7 New versions of software which utilise the DIL switches on SWA begin at issue X005-3. Versions of software issued prior to this only allow the DIL switches on SWB to be used.

TABLE A1

TGQ SERIES TELEPRINTER SOFTWARE VARIATIONS

Outfit	ID Method	Printer Control Pec		Interface Control Pec	
		Early s/w	New s/w (from)	Early s/w	New s/w (from)
TGQ1	EPROM Label Startup Message	X100-n 1.5 or 1.6	X103-3 X103-3	X101-1 53.5	X101-2 X101-2
TGQ2 & TGQ3	EPROM Label Startup Message	X100-n 1.5 or 1.6	X103-3 X103-3	X101-1 53.5	X101-2 X101-2
TGQ4	EPROM Label Startup Message	X100-n 1.5 or 1.6	X103-3 X103-3	X110-2 4.6	X110-3 X110-3
TGQ5 & TGQ11	EPROM Label Startup Message	X100-n 1.5 or 1.6	X103-3 X103-3	X103-1 55.6	X103-2 X103-2
TGQ6	EPROM Label Startup Message	n/a n/a	X111-1 X111-1	n/a n/a	X111-3 X111-3
TGQ7	EPROM Label Startup Message	X101-5 2.9	n/a n/a	X104-2 56.2	n/a n/a
TGQ8	EPROM Label Startup Message	n/a n/a	X103-3 X103-3	n/a n/a	X101-2 X101-2
TGQ9	EPROM Label Startup Message	X100-n 1.5 or 1.6	n/a n/a	X112-2 6.2	n/a n/a
TGQ10	EPROM Label Startup Message	To be announced			

n = Issue number
n/a = Not available (ie alternative versions of software do not exist)

ANNEX B

MOUNTING A TGQ5 TELEPRINTER ONTO AN ANTI-SHOCK/VIBRATION TRAY

INTRODUCTION

1 The TGQ5 is supplied with a Mounting Plate (NSN 5340-99-730-2791) and fixing screws. This plate enables the TGQ5 to be mounted onto an anti-shock/vibration tray (NSN 5815-99-543-1715) which was originally designed for TGN Series Teleprinters.

INSTALLATION INSTRUCTIONS

Figure B1

2 To install the TQG5 onto the tray, proceed as follows:

2.1 Remove the paper roll holder (if already fitted) and turn the Teleprinter upside-down. Remove the screws from the four feet on the Printer unit and the two front feet on the Keyboard. Replace the six feet over the screw holes.

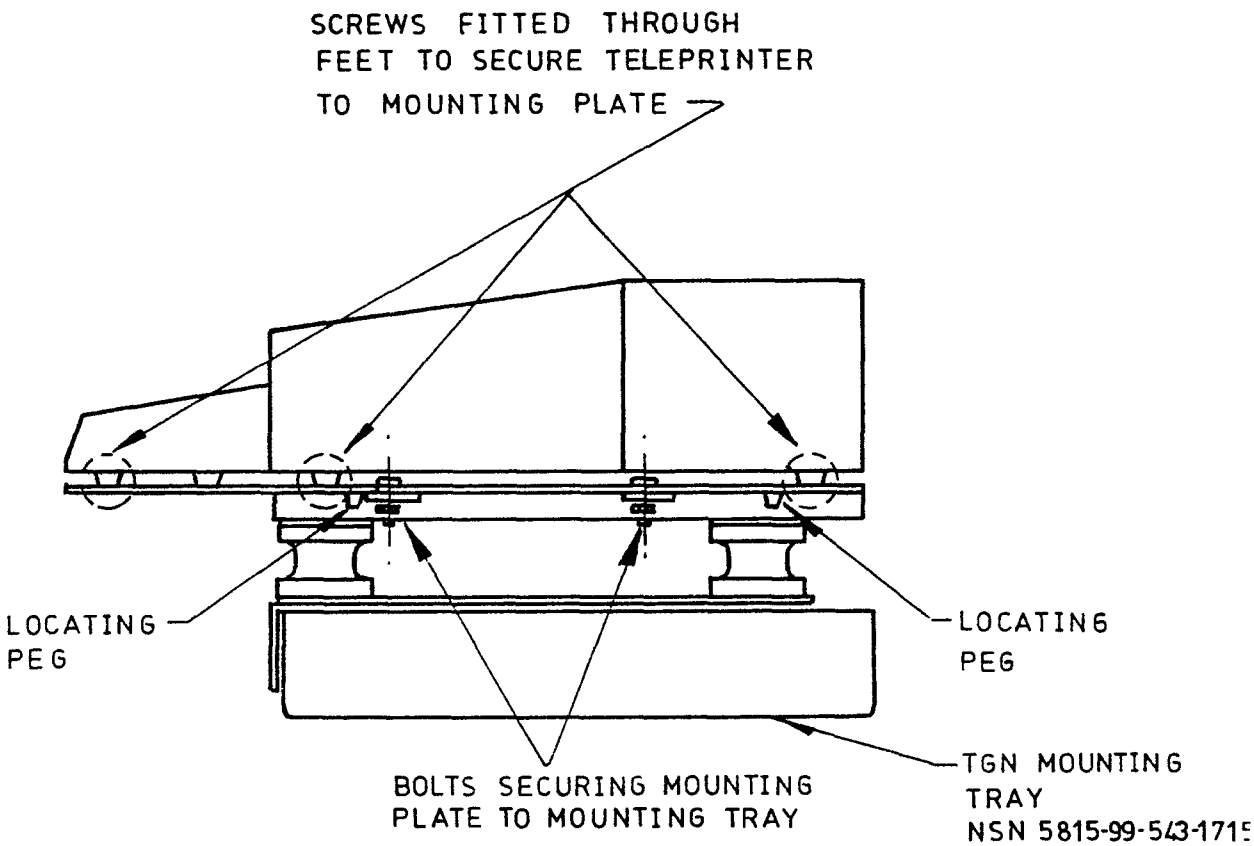
2.2 Apply loctite adhesive (type 242) to the leading 6 mm of each of the six replacement screws supplied with the mounting plate.

2.3 With the locating pegs on the mounting plate facing upwards, line up the screw holes in the plate with the holes in the base of the Teleprinter and fit the new screws.

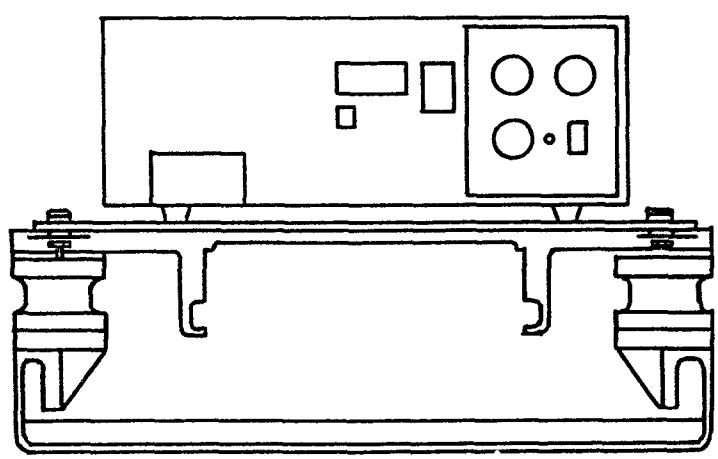
2.4 Turn the Teleprinter and mounting plate the right way up and place in position on the anti-shock/vibration tray, using the locating pegs as guides.

2.5 Using the two holes on the left and right-hand sides of the mounting plate as guides, drill four holes through the top of the tray using a 6.5 mm drill bit. Remove any sharp edges around the holes.

2.6 Secure the mounting plate to the tray using the four bolts, crinkle washers and nuts supplied.



SIDE VIEW



REAR VIEW

FIG B1 TGQ5 TELEPRINTER MOUNTING DETAILS

C5

TELEPRINTER, TGQ SERIES

CATEGORY 5 - MAINTENANCE INSTRUCTIONS

CONTENTS

CATEGORY 5A - DIAGNOSTIC MAINTENANCE

Chapter 1 - Diagnostic Maintenance, TGQ Teleprinters
Chapter 2 - Diagnostic Maintenance, Paper Tape Attachment (PTA)

CATEGORY 5B - CORRECTIVE MAINTENANCE

Chapter 1 - Corrective Maintenance, TGQ Teleprinters
Chapter 2 - Corrective Maintenance, Paper Tape Attachment (PTA)

CATEGORY 5C - PREVENTIVE MAINTENANCE

Chapter 1 - Preventive Maintenance, TGQ Teleprinters
Chapter 2 - Preventive Maintenance, Paper Tape Attachment (PTA)

TELEPRINTER, TGQ SERIES

CATEGORY 5A - DIAGNOSTIC MAINTENANCE

CONTENTS

Chapter 1 Diagnostic Maintenance, TGQ Teleprinters
Chapter 2 Diagnostic Maintenance, Paper Tape Attachment (PTA)

CHAPTER 1

DIAGNOSTIC MAINTENANCE, TGQ TELEPRINTERS

CONTENTS

Paragraph

1 GENERAL
3 PRECAUTIONS
5 Requirements
6 FAULT DIAGNOSIS FLOWCHARTS

ILLUSTRATIONS

Figure		Page
5A.1.1	TGQ Series Teleprinter - Module Layout Diagram	1.2
5A.1.2	Fault Diagnosis Flowcharts (12 Sheets)	1.5

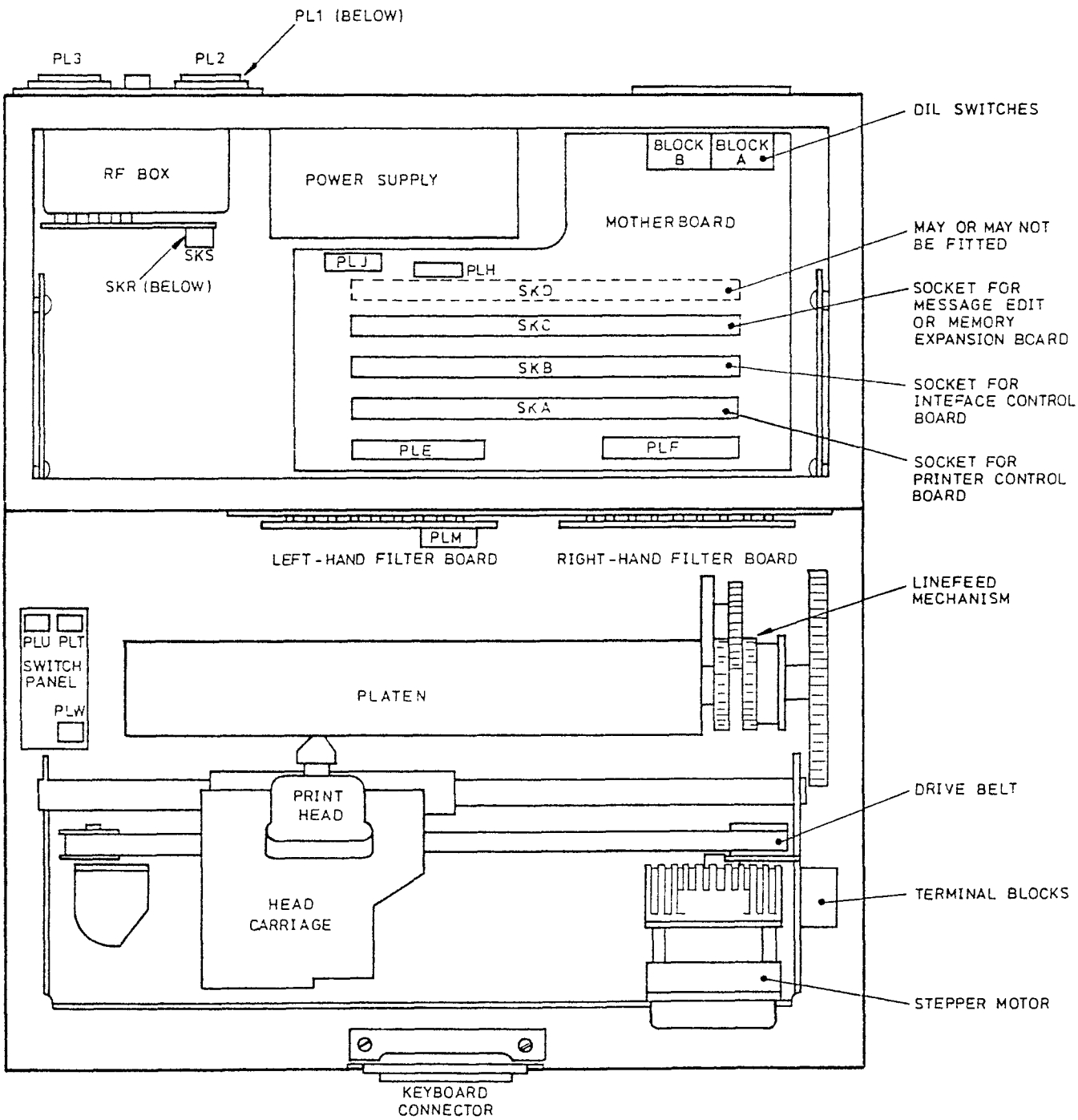


FIG 5A.1.1 TGQ SERIES TELEPRINTER - MODULE LAYOUT DIAGRAM

CHAPTER 1

DIAGNOSTIC MAINTENANCE, TGQ TELEPRINTERS

GENERAL

1 The repair policy for the TGQ Series Teleprinters is to replace defective modules only. The replacement modules normally require no setting up or realignment; they only need to be inserted into the Teleprinter and connected up to be immediately operational.

2 Diagnostic maintenance is carried out with the aid of flowcharts (Figure 5A.1.2) to locate the faulty module. As it is virtually impossible to cater for every eventuality, these flowcharts should only be used as a guide and need not be rigidly adhered to.

PRECAUTIONS

3 Some boards in the TGQ Teleprinters contain MOS devices which can be damaged by electrostatic potential differences at their pins. To avoid the possibility of damaging these devices, use a wrist earthing strap when removing any of the boards. If a board is to be transported, always wrap it in conductive foil or conductive foam.

4 Disconnect the power and signal cables before starting to dismantle any part of the Teleprinter.

Requirements

5 Before proceeding with the fault-finding checks, the Teleprinter should be set up with the power and signal cables connected and paper fitted. If a PTA is supplied with the Teleprinter (eg TGQ3), ensure that the power cable is connected, the signal cable is connected to the Teleprinter and paper tape is fitted into the Tape Punch mechanism.

FAULT DIAGNOSIS FLOWCHARTS — Figure 5A.1.2

6 The fault diagnosis flowcharts cover all TGQ Teleprinter variants and provide a means of rapidly identifying the most likely cause of failure within the Teleprinter. When using these flowcharts, note the following points:

(1) An "RO" unit is any TGQ Teleprinter which does not have a Keyboard connected (eg TGQ1).

(2) A "KSR" unit is any TGQ Teleprinter which has a Keyboard connected (eg TGQ2).

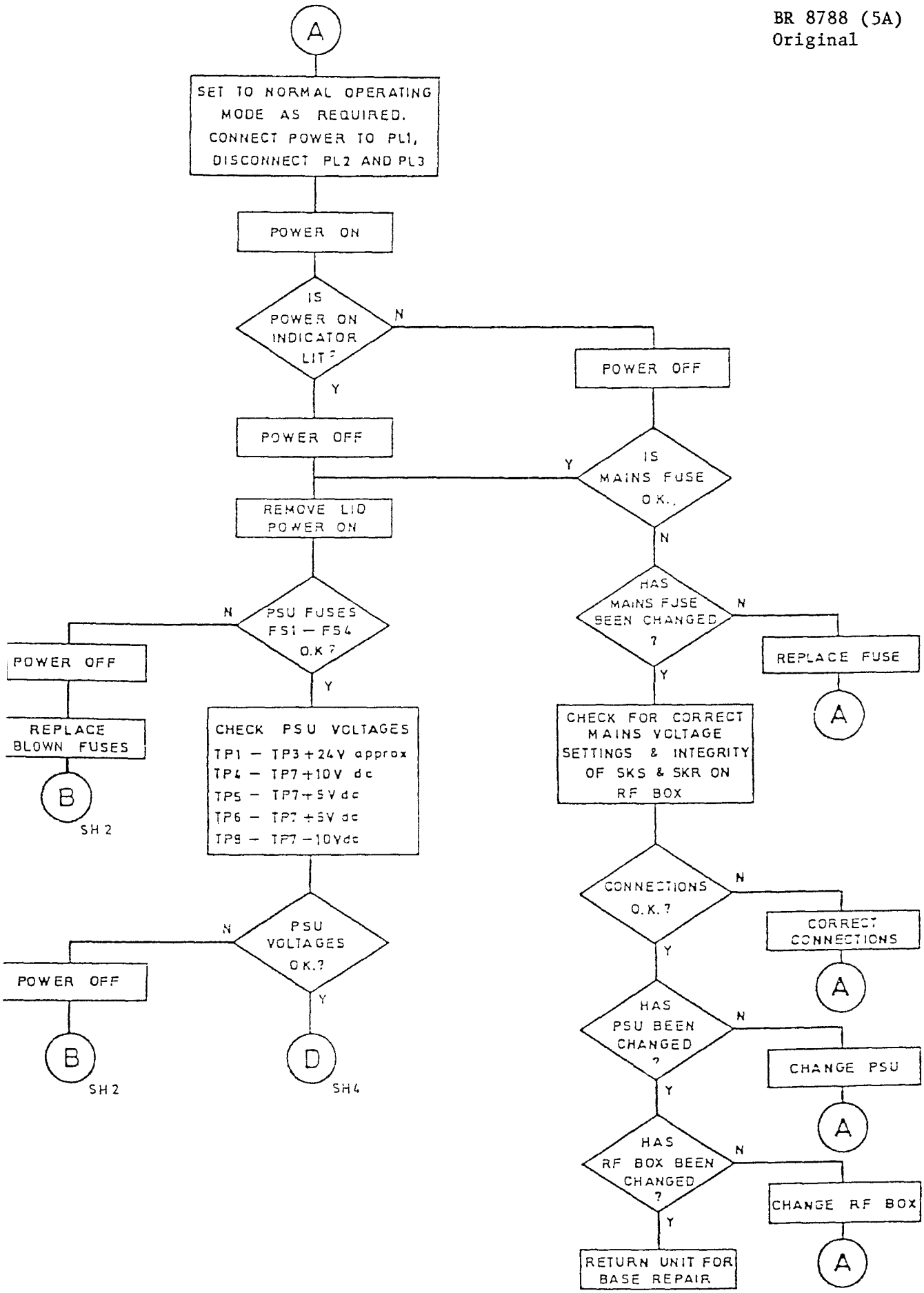
(3) An "ASR" unit is a KSR unit which is supplied with a PTA (eg TGQ3).

(4) Although references to fault-finding on the PTA are included in these flowcharts, these are by no means complete and reference should be made to Chapter 2 for detailed fault diagnosis on this unit.

(5) The replacement of suspect modules should not be attempted without first referring to Chapter 1 of Category 5B. This contains all the necessary information for replacing modules.

(6) Make a note of the normal operating mode DIL switch settings and mains input voltage wire connections if either of these are affected by the replacement of a module. Also, if an electronics board is to be replaced, check that the version of software fitted to the new board is the same as that fitted to the old board (or is an updated version - see Category 4B, Annex A) and that any wire links on the board are set to the same position as those on the old board.

(7) Once fault diagnosis and replacement of the suspect module has been carried out, perform the equipment test procedures given in Category 4B to ensure that the equipment is operating correctly.



FAULT DIAGNOSIS FLOWCHARTS
POWER ON

FIG 5A.1.2 (Sh 1)

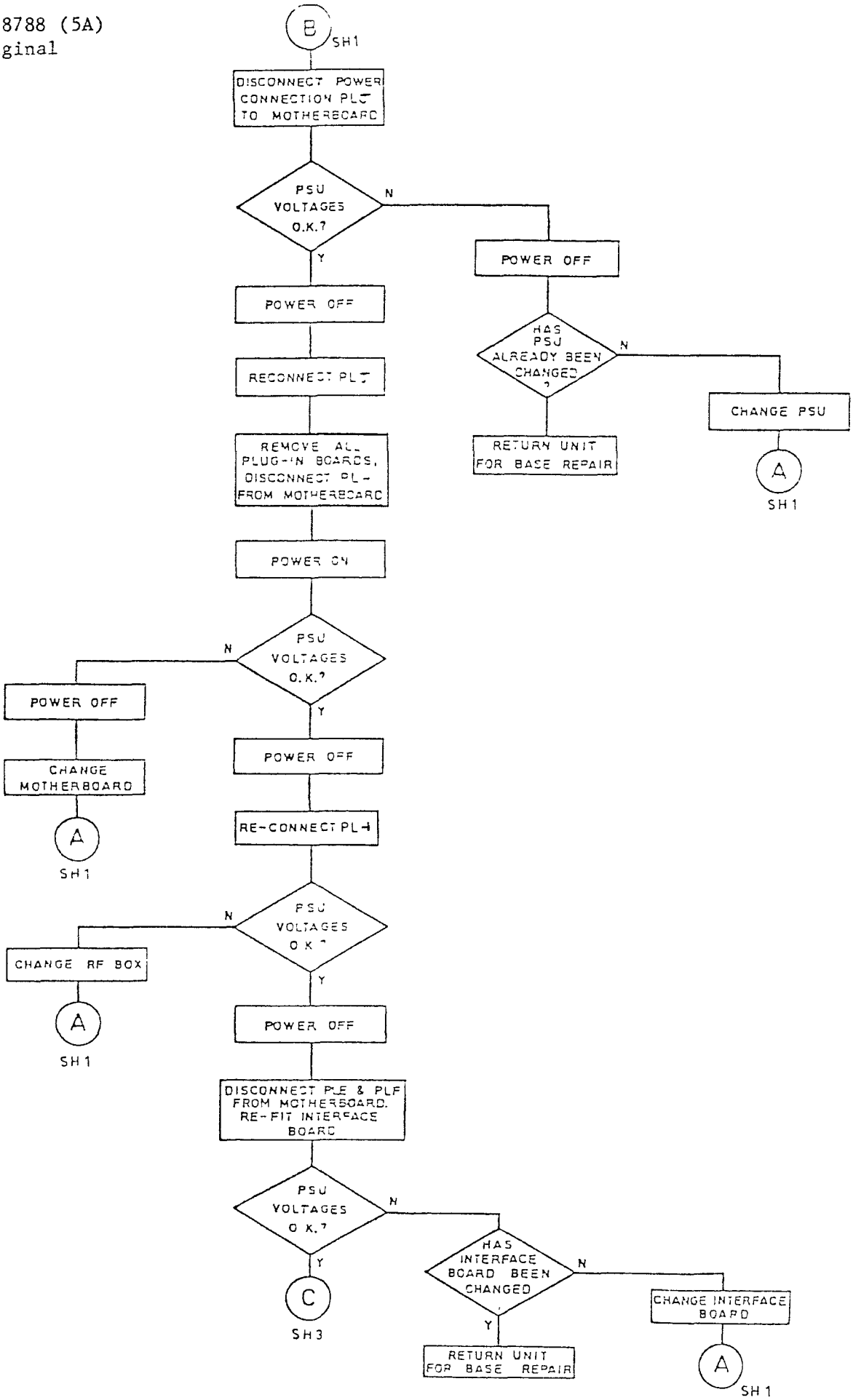
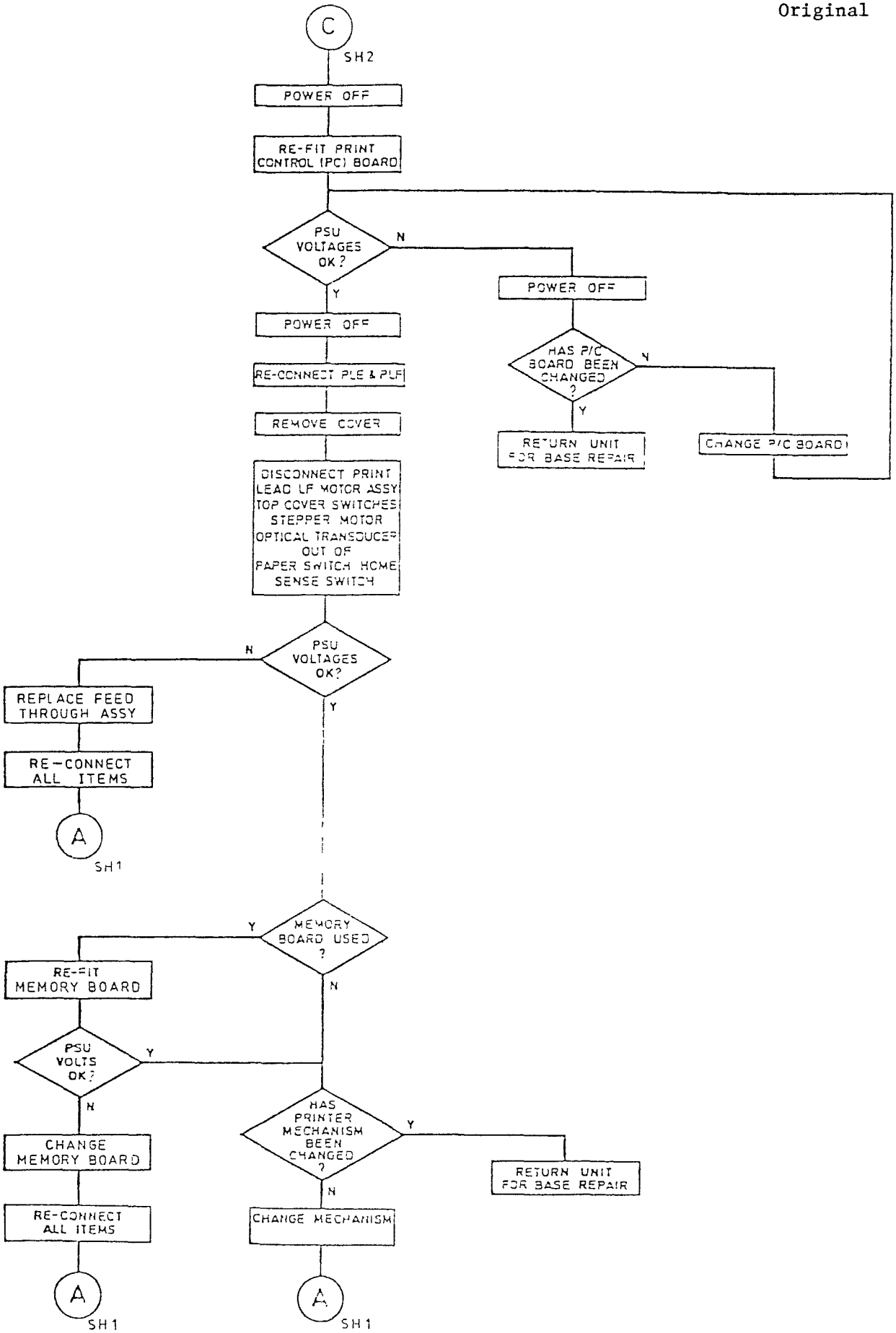
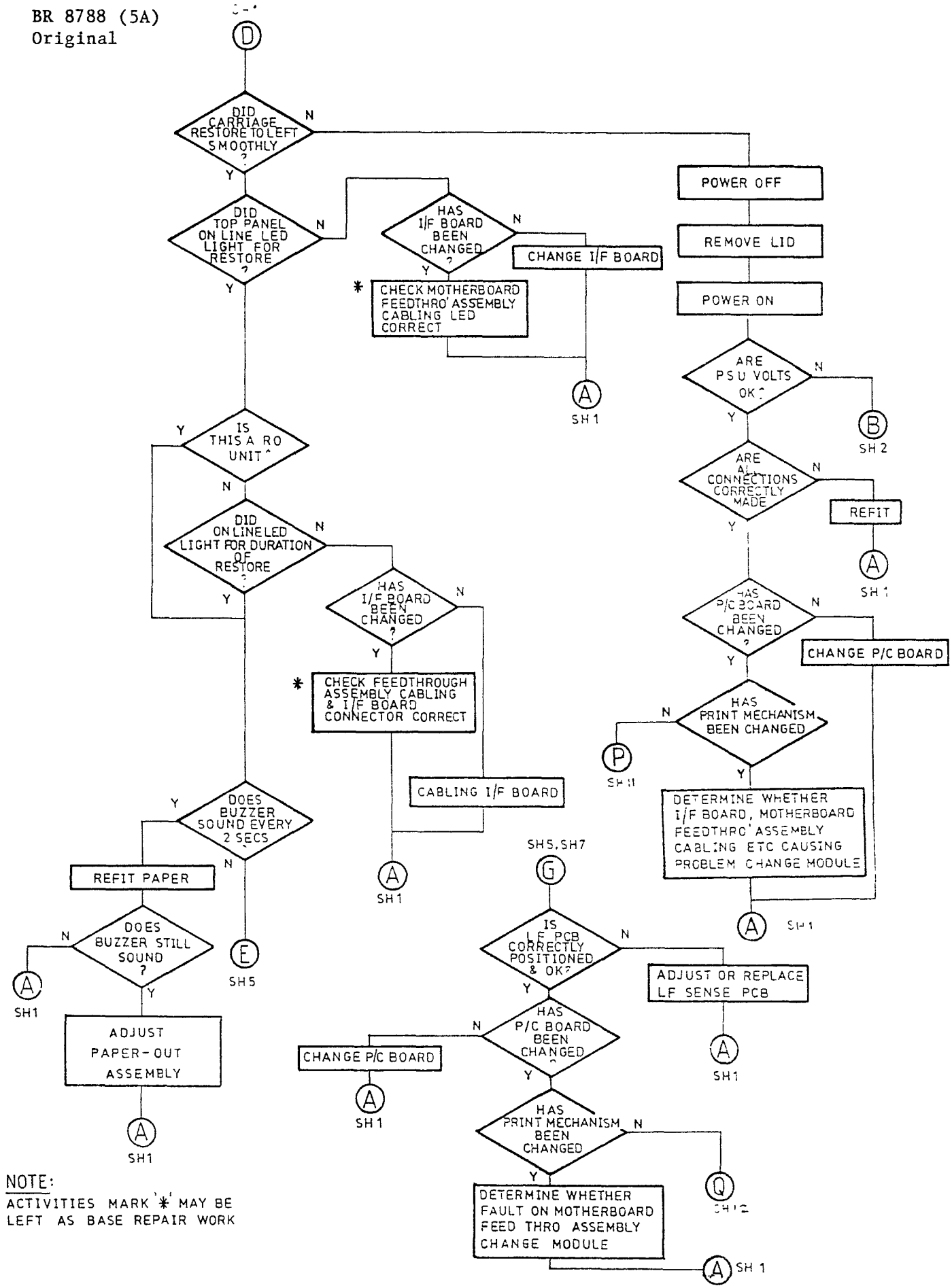


FIG 5A.1.2 (Sh 2) FAULT DIAGNOSIS FLOWCHARTS
POWER FAILURE



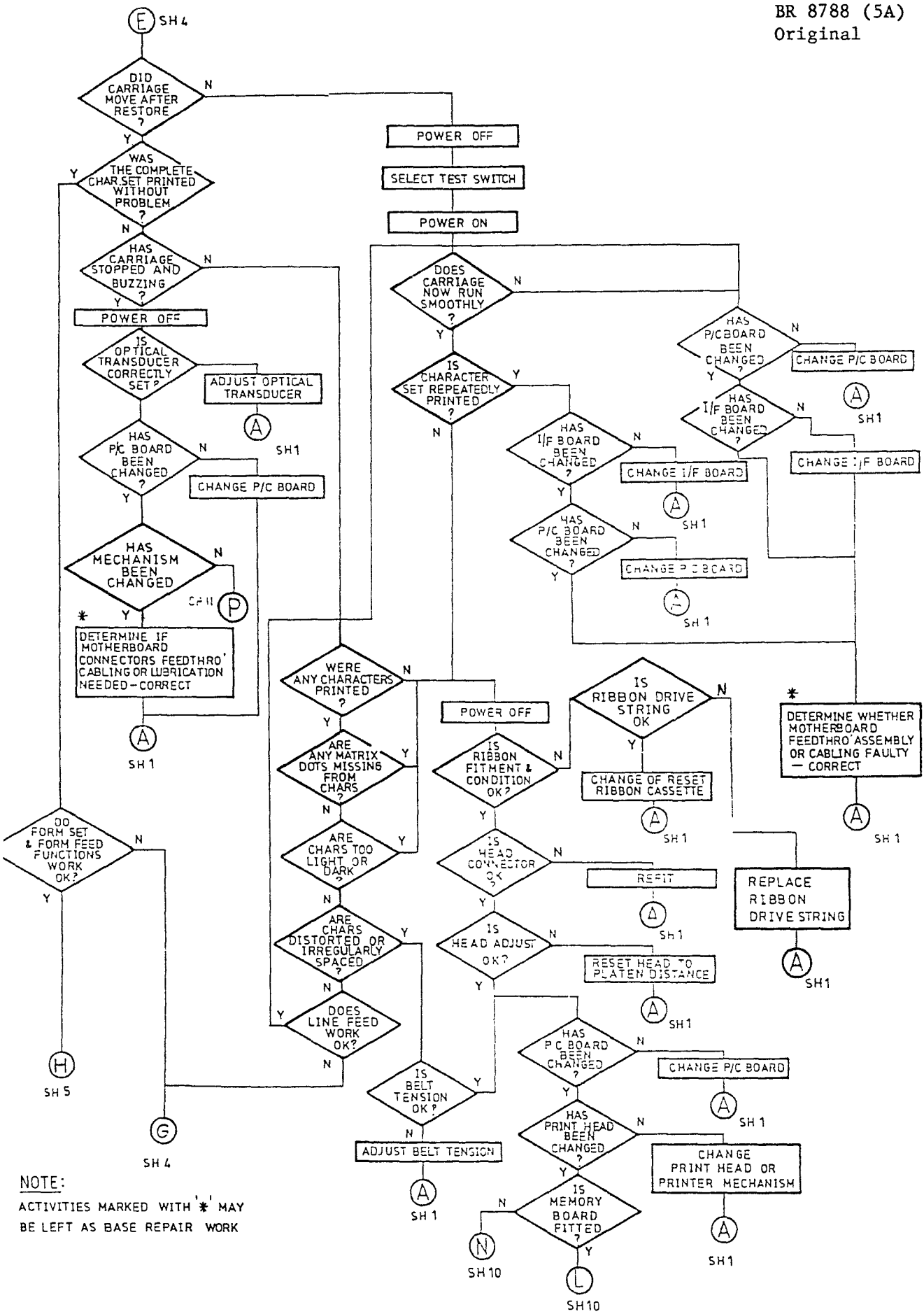
FAULT DIAGNOSIS FLOWCHARTS
POWER FAILURE

FIG 5A.1.2 (Sh 3)



NOTE:
ACTIVITIES MARK '*' MAY BE LEFT AS BASE REPAIR WORK

FIG 5A.1.2 (Sh 4) FAULT DIAGNOSIS FLOWCHARTS
CARRIAGE RESISTORS & LINE FEED



FAULT DIAGNOSIS FLOWCHARTS FIG 5A.1.2 (Sh 5)
AUTOMATIC POWER ON TEST, FORM SET & FORM FEED

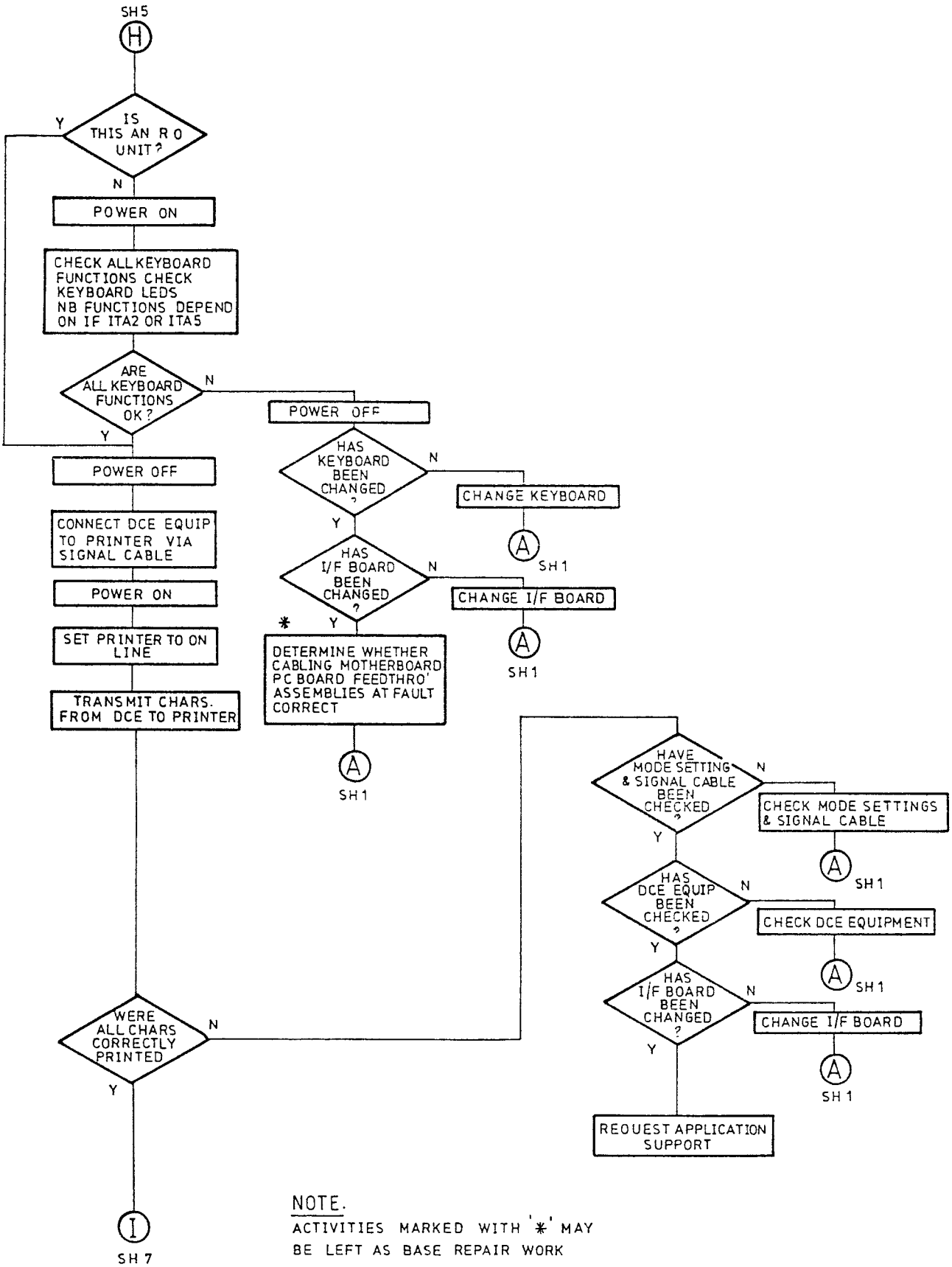
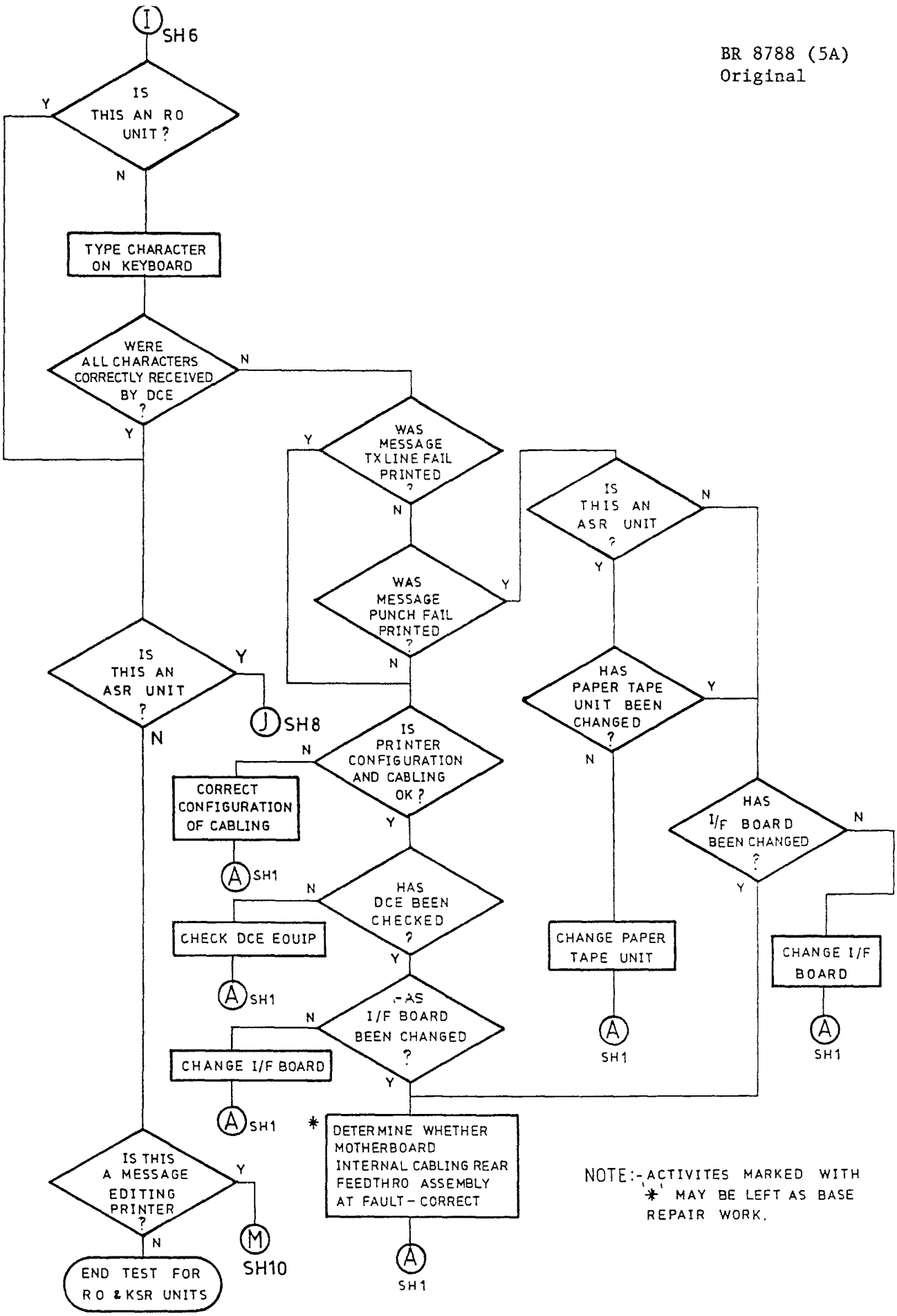
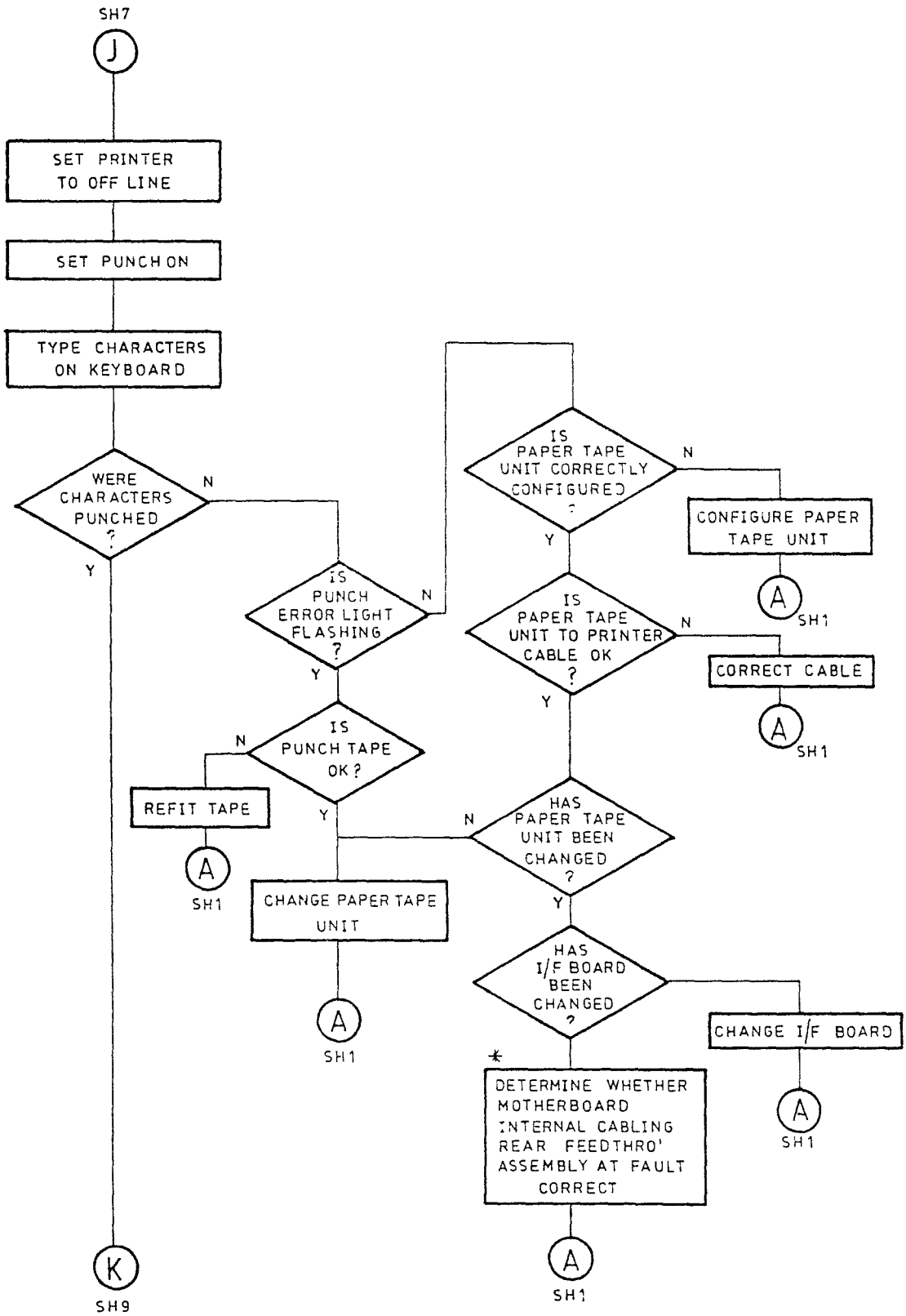


FIG 5.1.2 (Sh 6) FAULT DIAGNOSIS FLOWCHARTS
KEYBOARD TEST & RECEIVE PRINTING



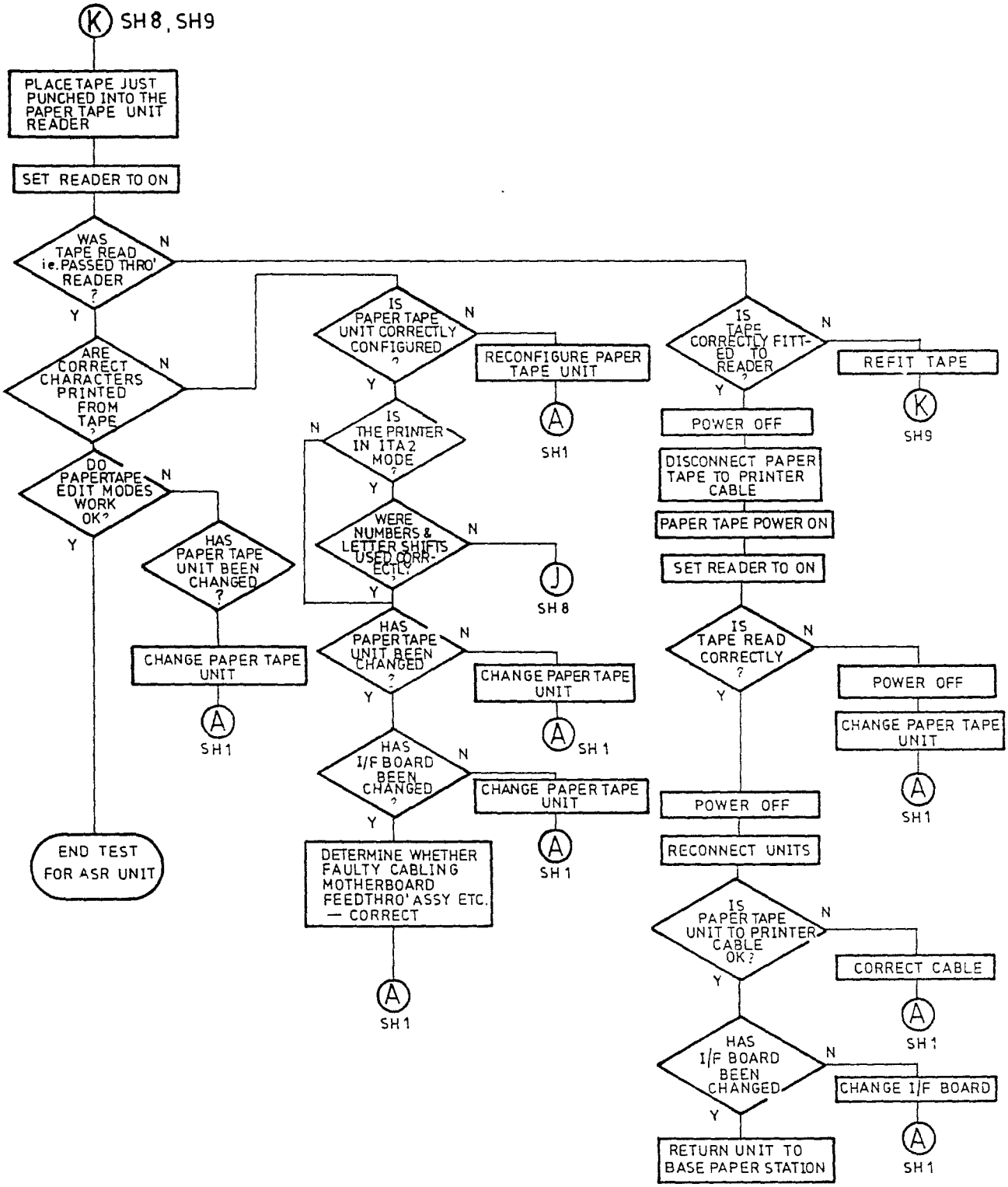
FAULT DIAGNOSIS FLOWCHARTS
CHARACTER TRANSMISSION

FIG 5A.1.2 (Sh 7)



NOTE:-ACTIVITIES MARKED WITH * MAY BE LEFT AS BASE REPAIR WORK

FIG 5A.1.2 (Sh 8) FAULT DIAGNOSIS FLOWCHARTS
PAPER TAPE PUNCH



FAULT DIAGNOSIS FLOWCHARTS
PAPER TAPE READER

FIG 5A.1.2 (Sh 9)

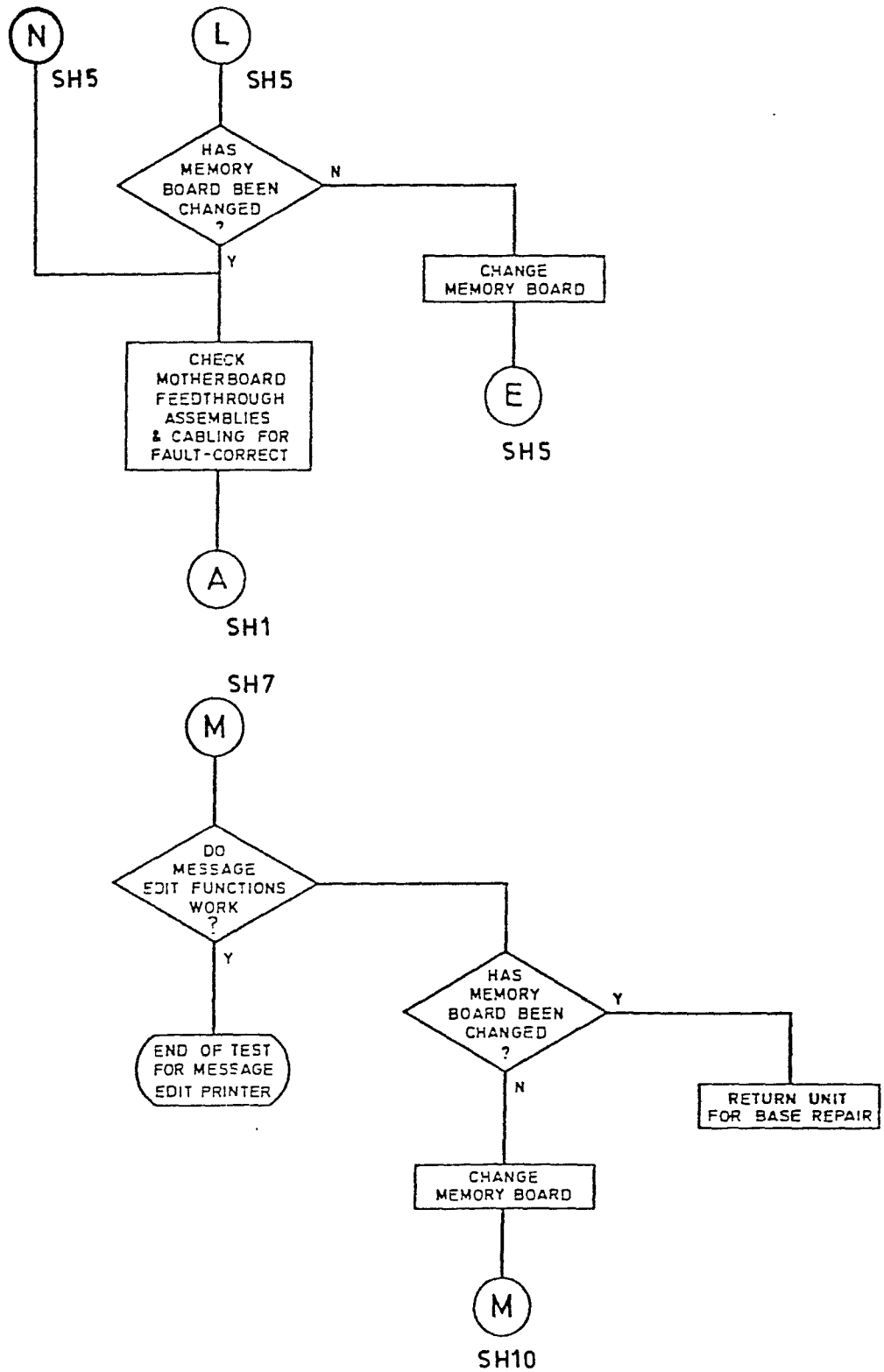
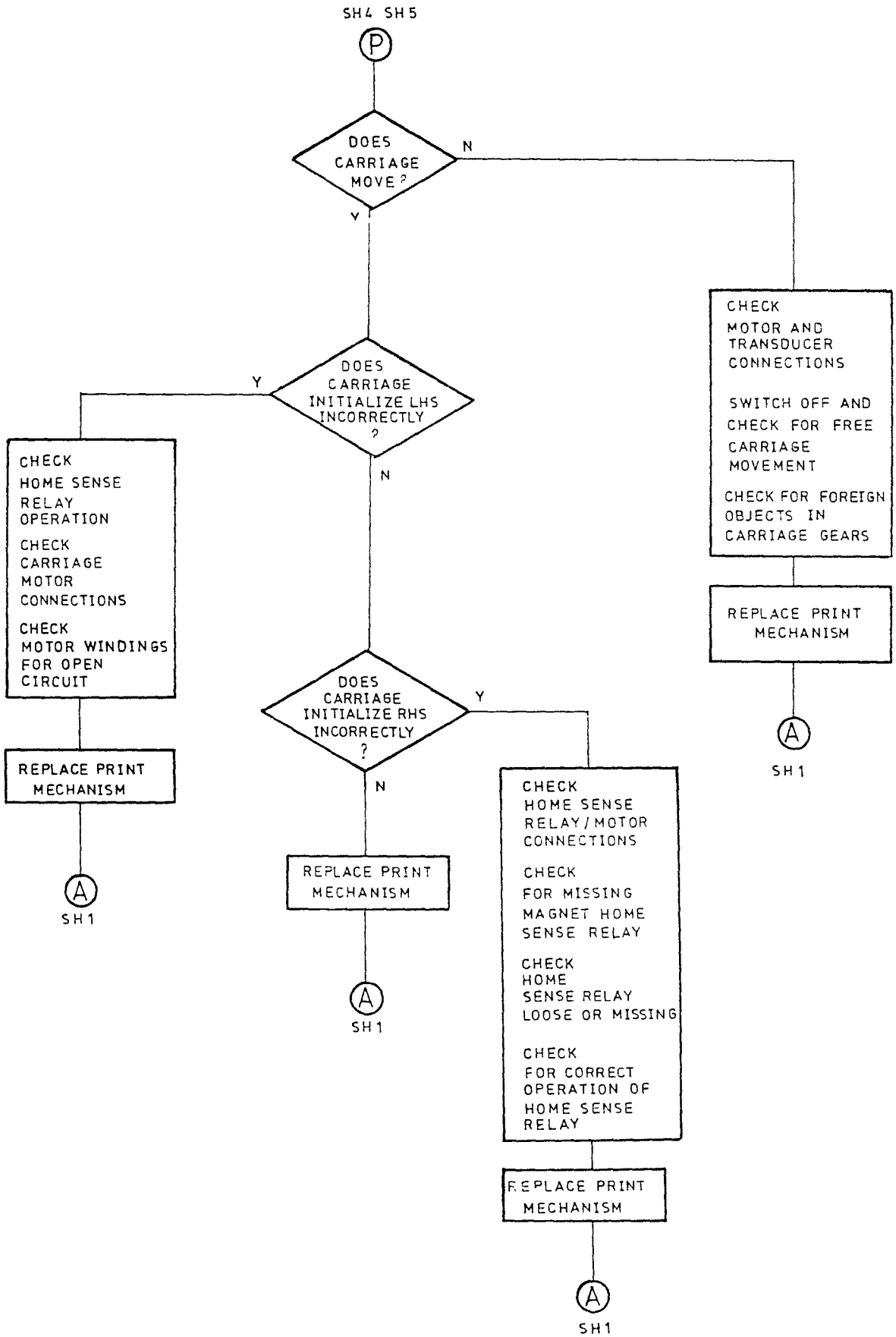


FIG 5A.1.2 (Sh 10) FAULT DIAGNOSIS FLOWCHARTS
MEMORY BOARD



FAULT DIAGNOSIS FLOWCHARTS
PRINTER MECHANISM

FIG 5A.1.2 (Sh 11)

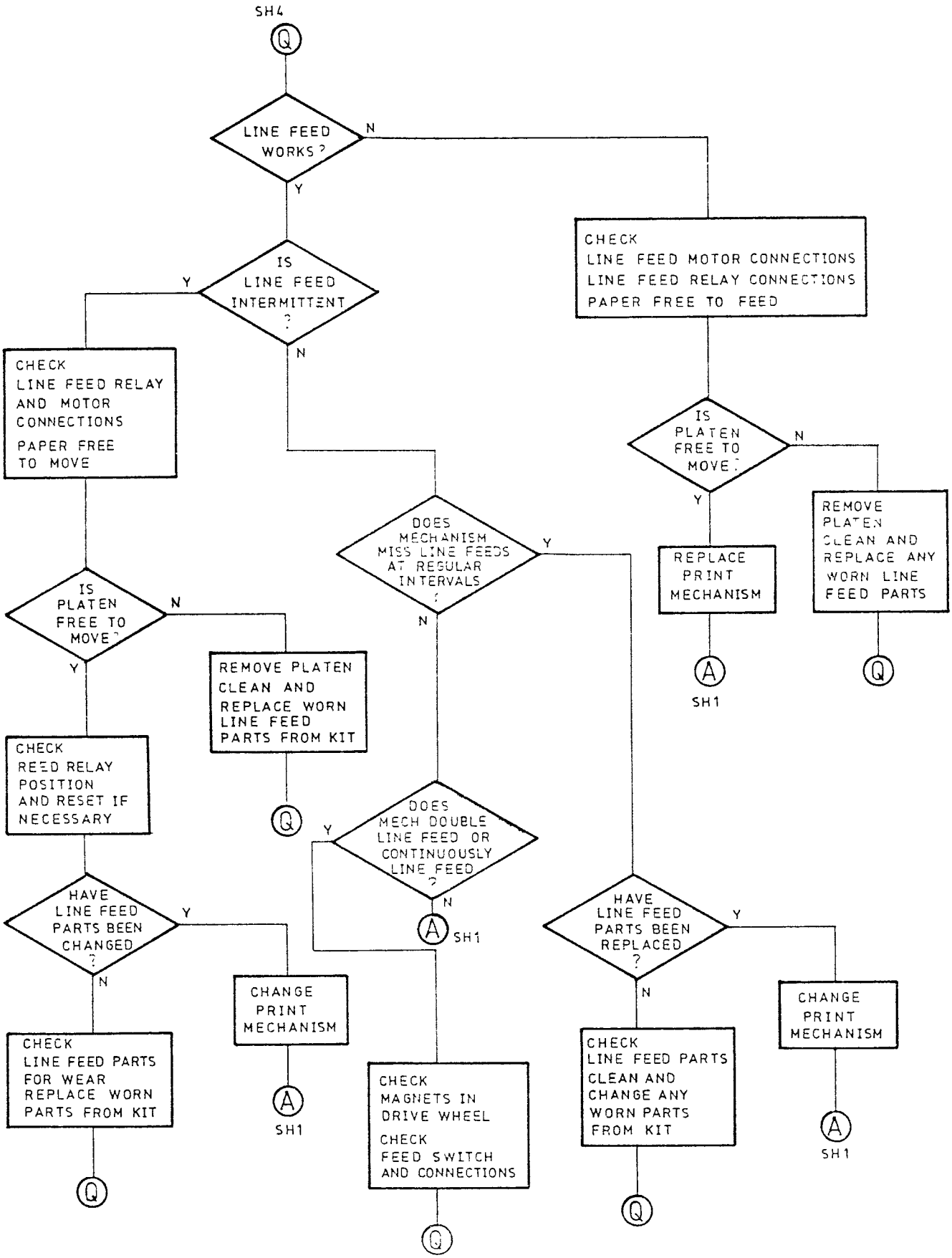


FIG 5A.1.2 (Sh 12) FAULT DIAGNOSIS FLOWCHARTS
1.16 PRINTER MECHANISM

CHAPTER 2

DIAGNOSTIC MAINTENANCE, PAPER TAPE ATTACHMENT (PTA)

CONTENTS

Paragraph

1 GENERAL
3 PRECAUTIONS
5 Requirements
6 FAULT DIAGNOSIS FLOWCHARTS

ILLUSTRATIONS

Figure		Page
5A.2.1	Paper Tape Attachment - Module Layout Diagram	2.2
5A.2.2	Fault Diagnosis Flowcharts (7 Sheets)	2.4

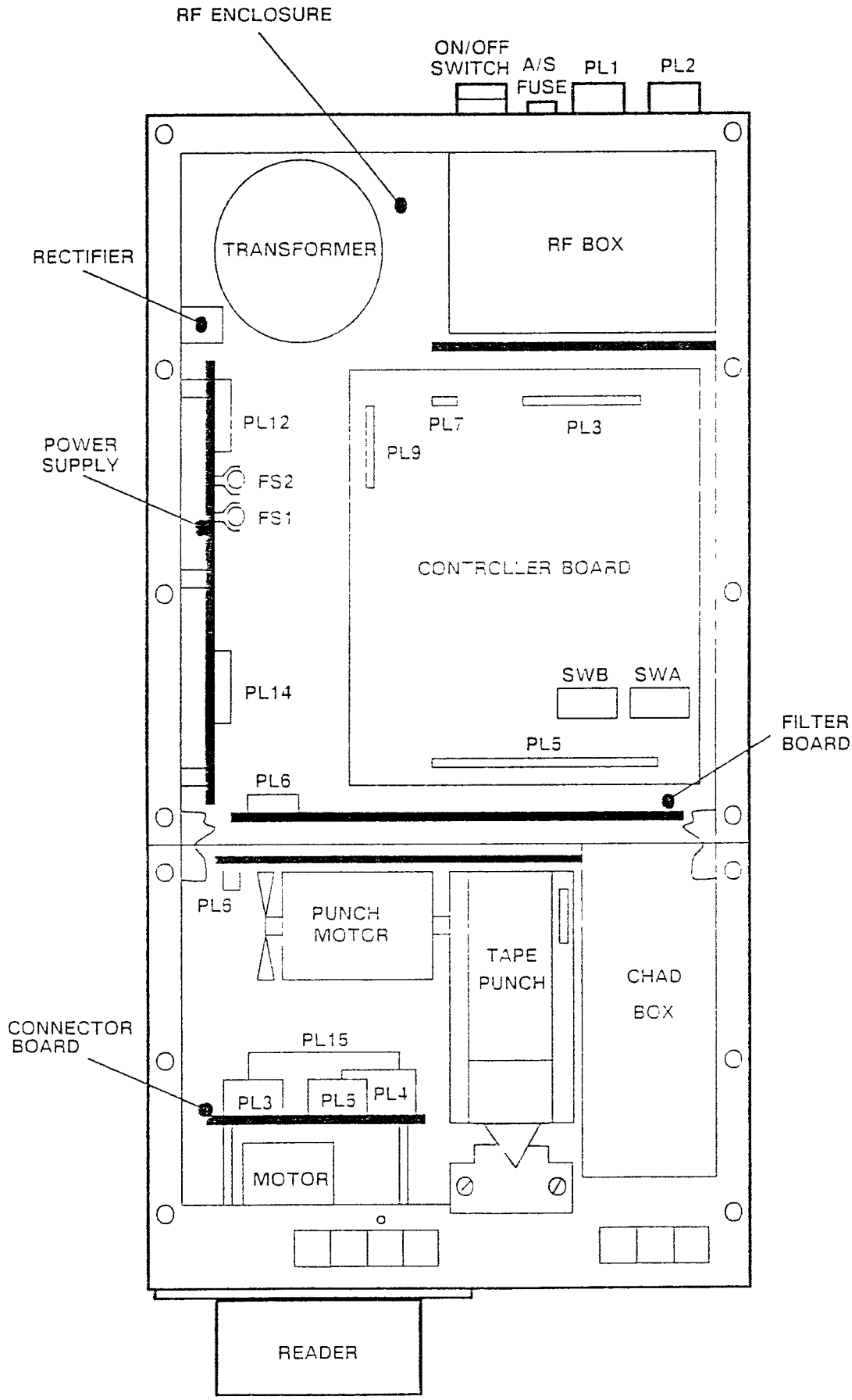


FIG 5A.2.1 PAPER TAPE ATTACHMENT - MODULE LAYOUT DIAGRAM

CHAPTER 2

DIAGNOSTIC MAINTENANCE, PAPER TAPE ATTACHMENT (PTA)

GENERAL

1 The repair policy for the PTA is the same as for the TGQ Teleprinters, ie to replace defective modules.

2 Diagnostic maintenance is aided by the use of flowcharts (Figure 5A.2.2), which enable the likely cause of the failure to be located rapidly.

PRECAUTIONS

3 The Controller board contains MOS devices which can be damaged by electrostatic potential differences at their pins. To avoid the possibility of damaging these devices, wear a wrist earthing strap when removing the board. If it is to be transported, wrap the board in conductive foil or conductive foam.

4 Disconnect the power and signal plugs before starting to dismantle any part of the PTA.

Requirements

5 Connect the power cable and connect the signal cable to a Teleprinter (not TGQ1, TGQ7 or TGQ8) which is known to be working correctly before proceeding with the fault finding checks. Ensure that paper tape is fitted into the Tape Punch mechanism.

FAULT DIAGNOSIS FLOWCHARTS

Figure 5A.2.2

6 The flowcharts which follow enable diagnostic maintenance to be carried out without the need for test equipment (except for the Power Supply, which requires a voltmeter). Detailed module checking is not required.

7 Refer to Chapter 2 of Category 5B before attempting to replace a suspect module.

8 If the Controller board is to be replaced, make a note of the DIL switch settings on SWA and SWB before removing the board. Also, check that the version of software fitted to the replacement board is the same as that fitted to the old board or is a later issue (see Category 4B, Annex A).

9 Once the fault has been traced and rectified, test the PTA using the test procedures given in Category 4B.

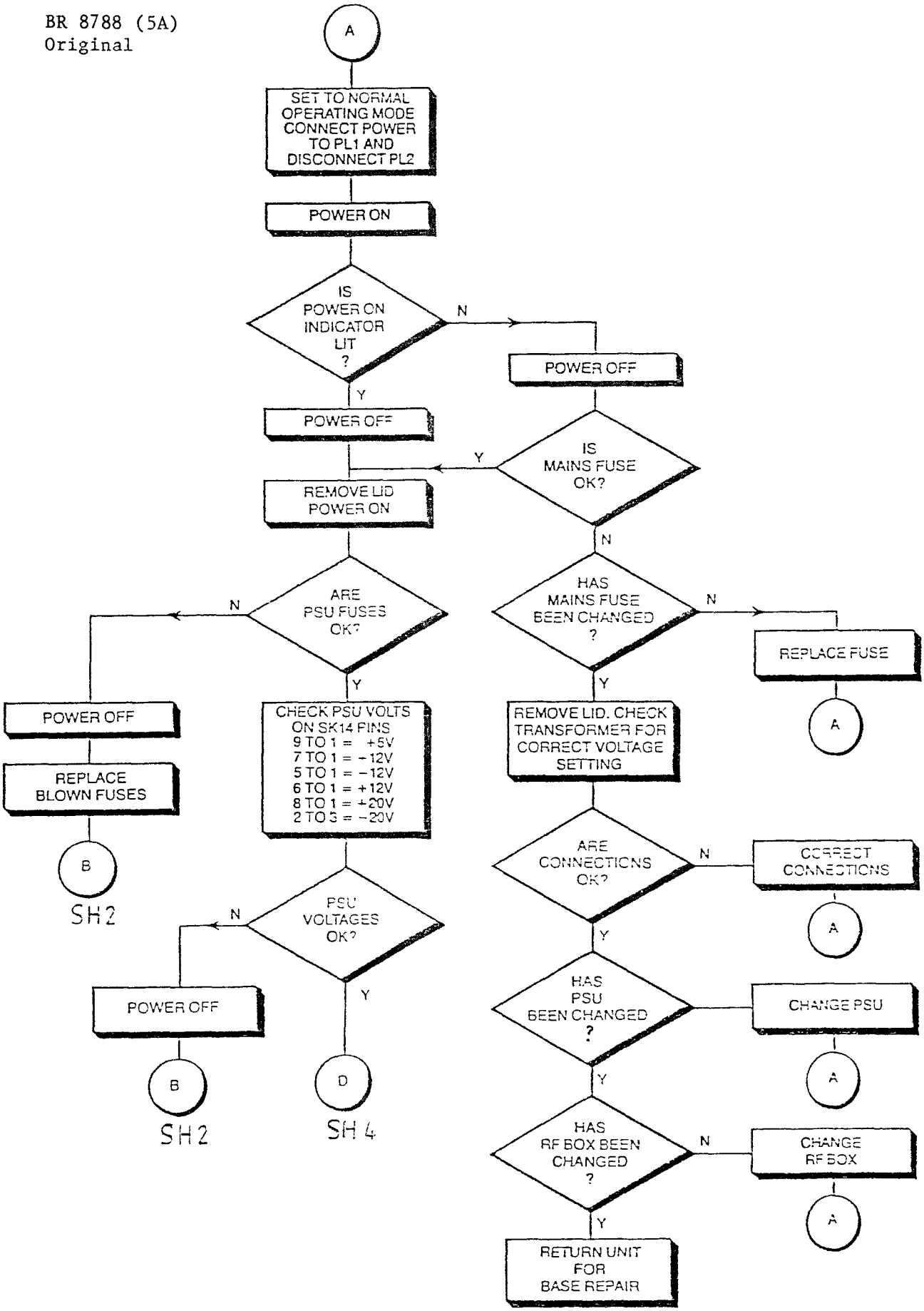
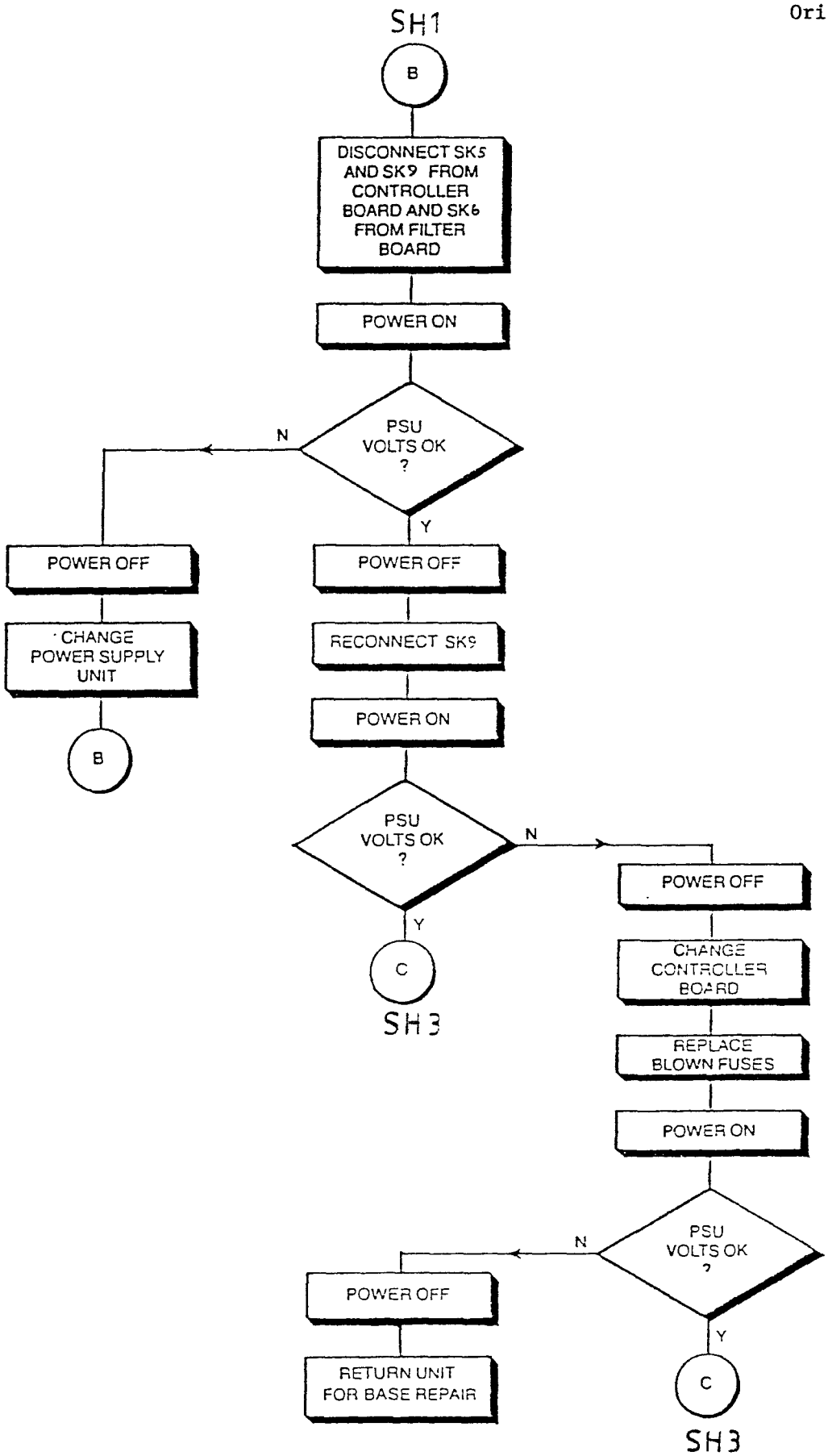


FIG 5A.2.2 FAULT DIAGNOSIS FLOWCHARTS (Sheet 1)



FAULT DIAGNOSIS FLOWCHARTS (Sheet 2) FIG 5A.2.2

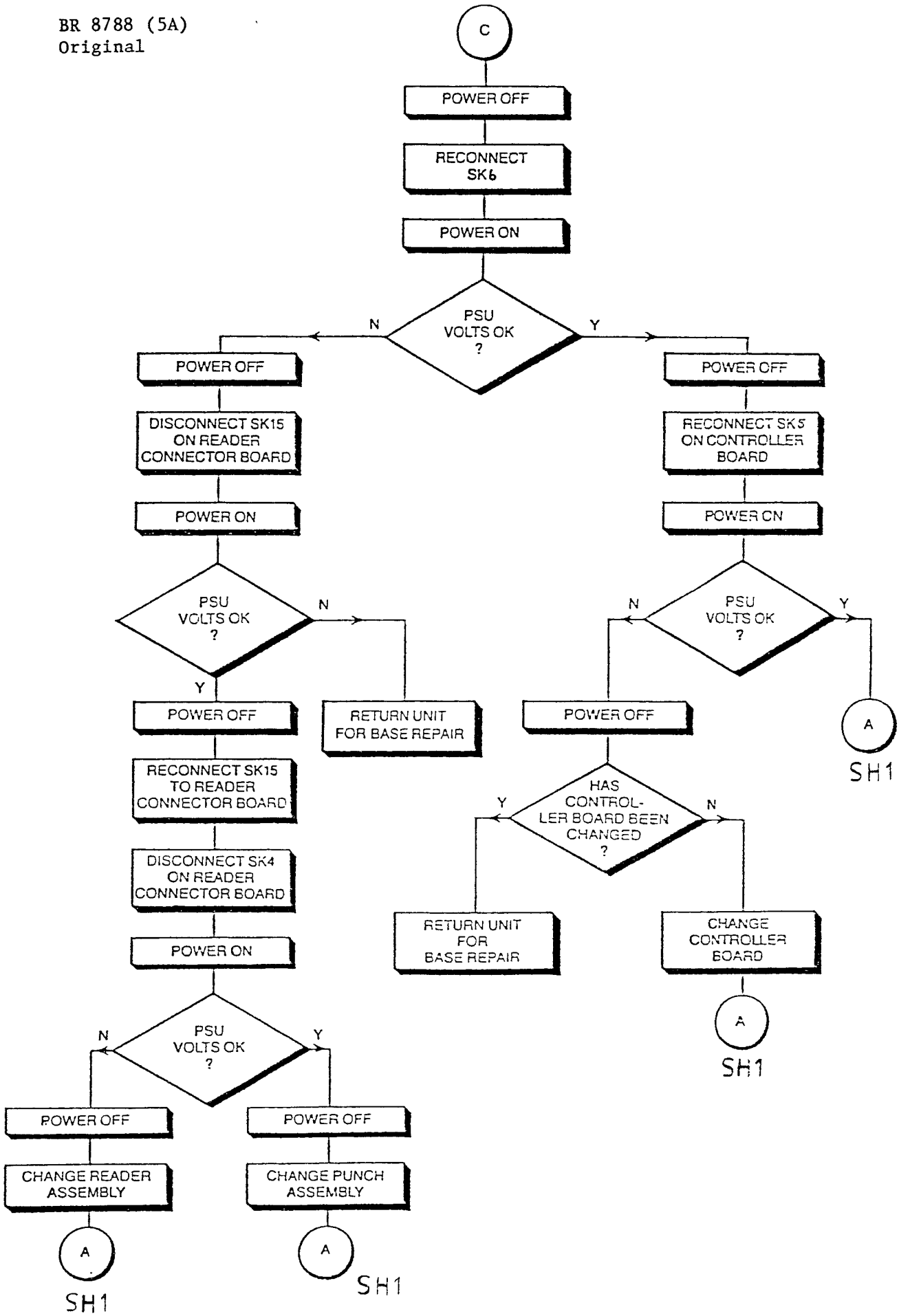
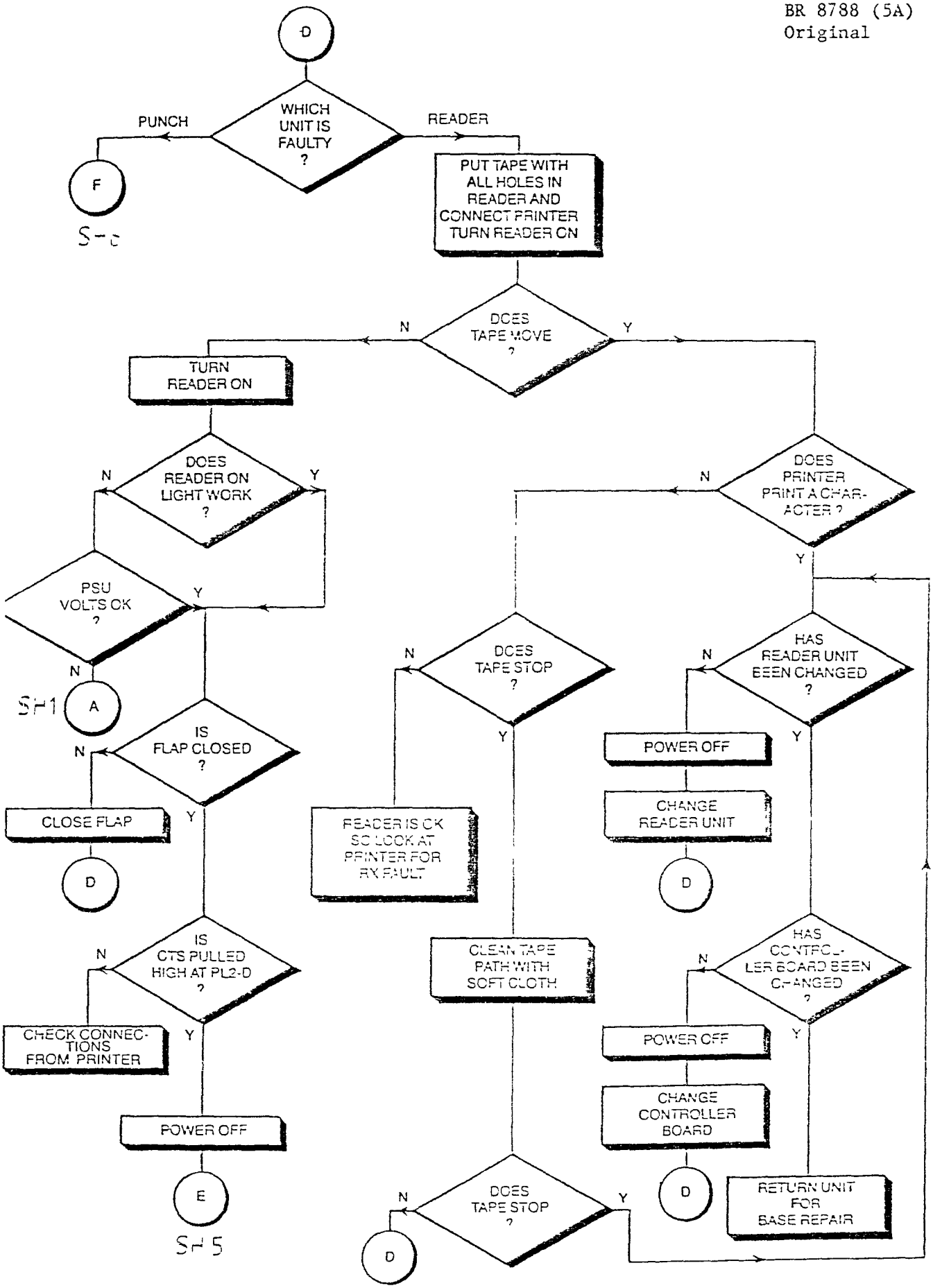


FIG 5A.2.2 FAULT DIAGNOSIS FLOWCHARTS (Sheet 3)



FAULT DIAGNOSIS FLOWCHARTS (Sheet 4) FIG 5A.2.2

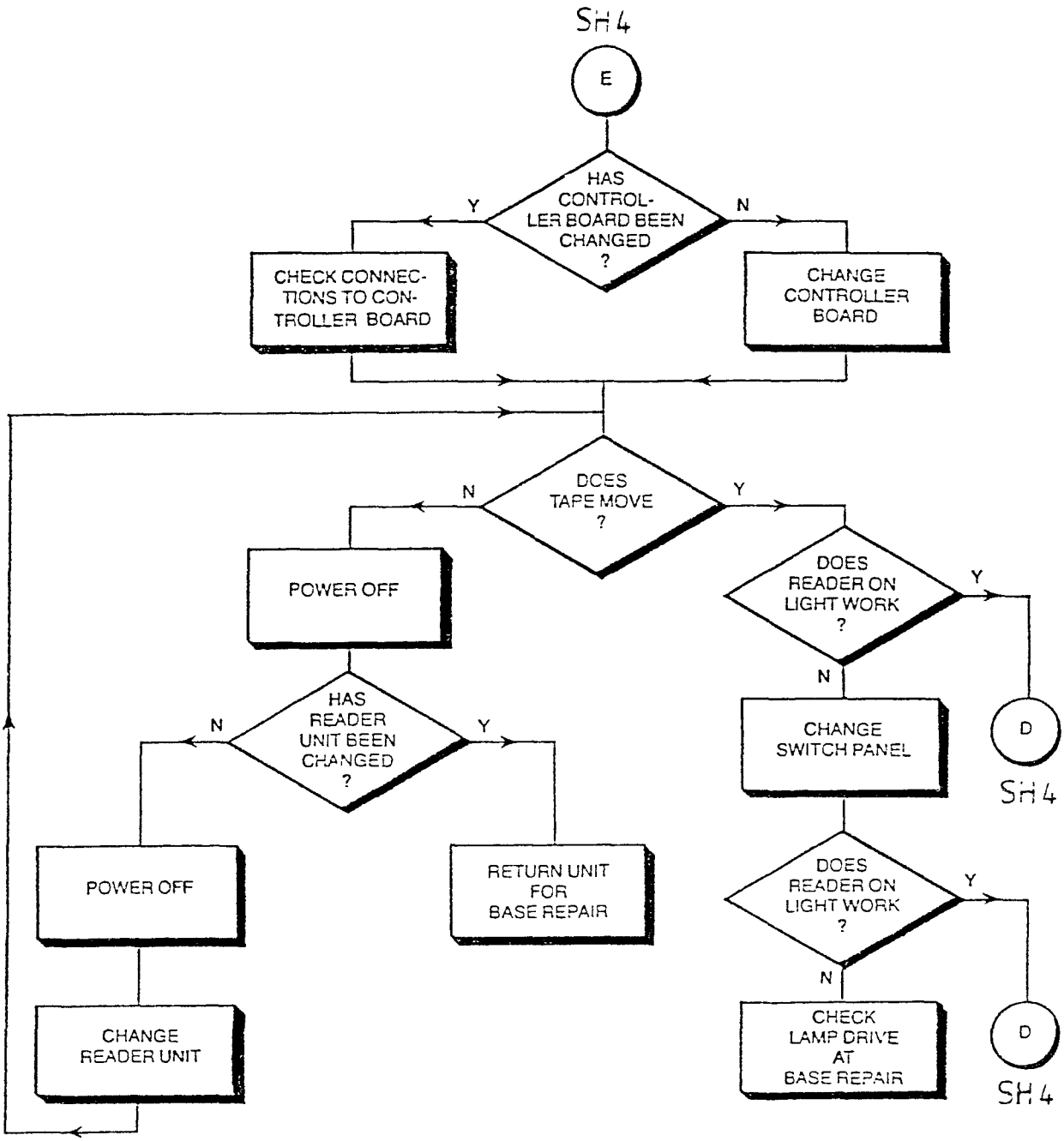
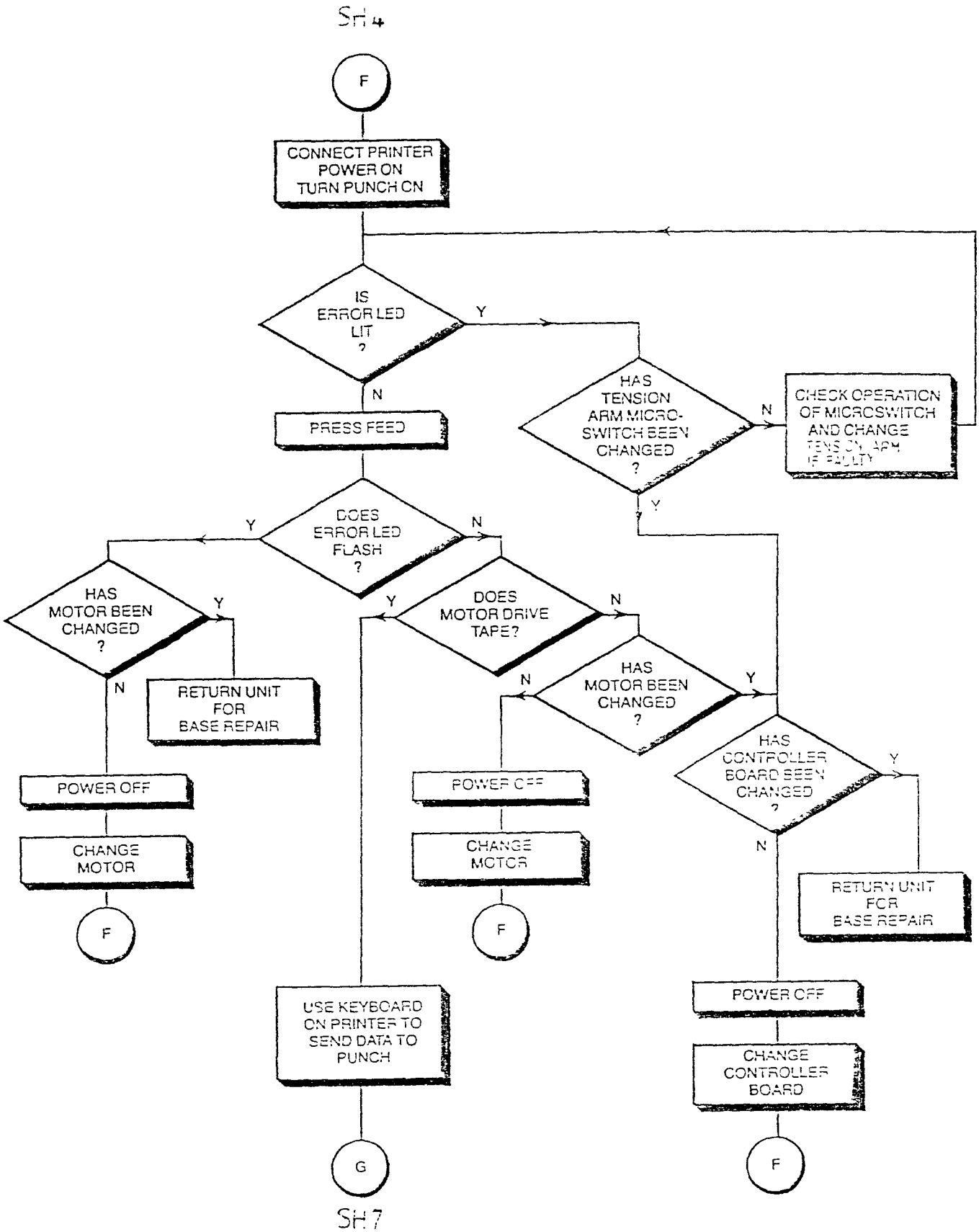


FIG 5A.2.2 FAULT DIAGNOSIS FLOWCHARTS (Sheet 5)



FAULT DIAGNOSIS FLOWCHARTS (Sheet 6) FIG 5A.2.2

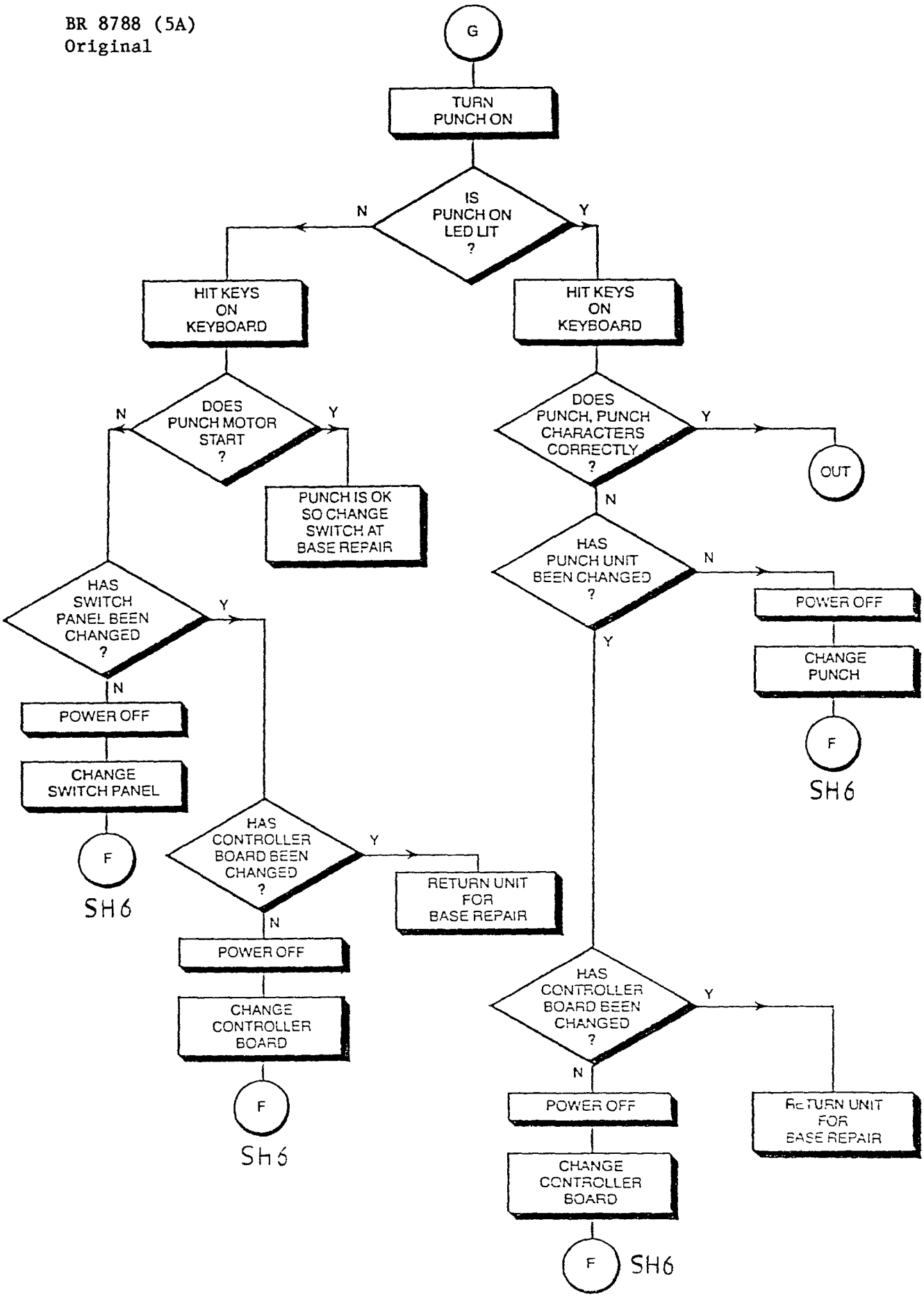


FIG 5A.2.2 FAULT DIAGNOSIS FLOWCHARTS (Sheet 7)

TELEPRINTER, TGQ SERIES

CATEGORY 5B - CORRECTIVE MAINTENANCE

CONTENTS

Chapter 1 Corrective Maintenance, TGQ Teleprinters
Chapter 2 Corrective Maintenance, Paper Tape Attachment (PTA)

CHAPTER 1

CORRECTIVE MAINTENANCE, TGQ TELEPRINTERS

CONTENTS

Paragraph

1 GENERAL
3 ELECTRONICS BOX MODULES - REMOVAL AND REPLACEMENT
3 Printer Control Board
5 Interface Control Board
6 Message Edit and Memory Expansion Boards
7 RF Box Assembly
9 Power Supply Assembly
11 Motherboard
13 PRINTER UNIT MODULES - REMOVAL AND REPLACEMENT
13 Keyboard
16 Switch Panel Assembly
18 Print Head Assembly
22 String Assembly
25 Linefeed Kit
30 Printer Assembly
32 Left and Right-Hand Filter Boards

ILLUSTRATIONS

Figure		Page
5B.1.1	Electronics Box - Internal View	1.4
5B.1.2	RF Box Removal	1.6
5B.1.3	Power Supply Removal	1.6
5B.1.4	Motherboard Removal	1.8
5B.1.5	Switch Panel Assembly Removal	1.10
5B.1.6	Print Head Realignment	1.12
5B.1.7	Detail Showing Correctly Wound Capstans	1.12
5B.1.8	Linefeed Mechanism	1.14
5B.1.9	Disconnecting Home Sense Relay Cables	1.16
5B.1.10	Disconnecting Paper Out Detector Cable	1.16
5B.1.11	Disconnecting Stepper Motor Wires	1.17
5B.1.12	Removing Reed Relay Pec	1.17
5B.1.13	Location of Printer Chassis Locating Posts	1.18
5B.1.14	Disconnecting Print Head Cable	1.19
5B.1.15	Complete Printer Assembly	1.20
5B.1.16	Left and Right-Hand Filter Boards	1.22

CHAPTER 1

CORRECTIVE MAINTENANCE, TGQ TELEPRINTERS

GENERAL

1 This section describes how to remove and replace defective modules within the TGQ Teleprinters, in accordance with the agreed maintenance policy. The only tools required to remove any of the field-replaceable modules are a cross-head screwdriver and, for some modules, a small blade screwdriver.

2 Observe the precautions for handling static-sensitive devices when removing or replacing any of the circuit boards.

ELECTRONICS BOX MODULES - REMOVAL AND REPLACEMENT

Printer Control Board

Figure 5B.1.1

3 The Printer Control board is mounted vertically in the Electronics Box, in the slot nearest to the Printer unit. To remove it, proceed as follows:

(1) Switch off the Teleprinter, remove the mains plug and then remove the roll or pin feed paper.

(2) Remove the 26 screws from the lid of the Electronics Box and lift the lid off.

(3) Undo the two screws at the top of the Printer Control board which secure the black heat-sink to the front edge of the Electronics Box.

(4) Lift the black plastic clips on the top corners of the board and then carefully lift the board out of the Electronics Box. Note that the component side of the board faces the rear of the Teleprinter.

4 Replacement is a reversal of the removal procedure, but note the following points:

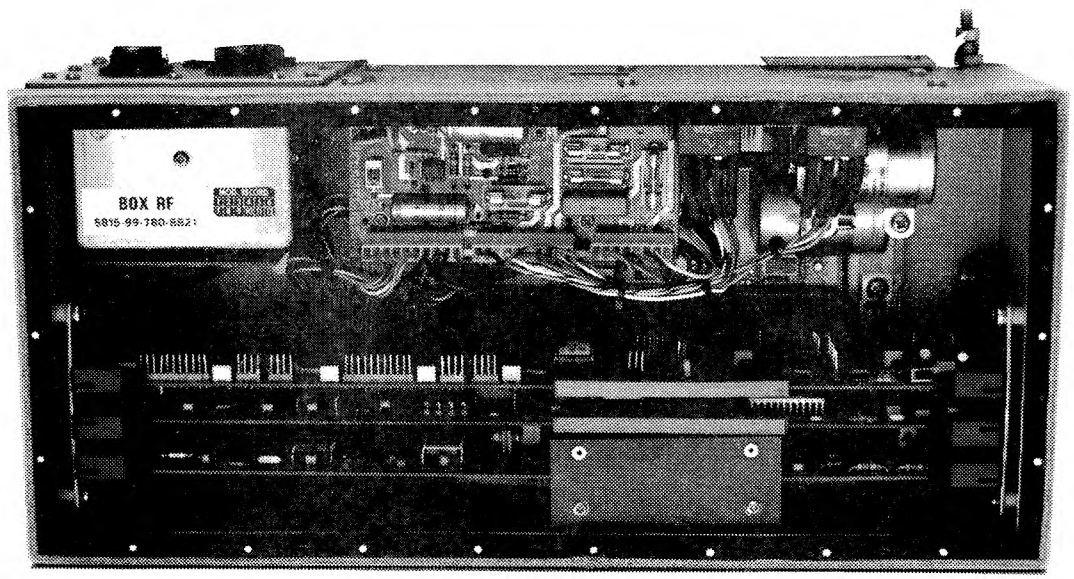
(1) Ensure that the small grey plastic locating lug is in place in the Motherboard socket before refitting the board.

(2) Fit the board into its socket by pressing down on the red plastic strip on the top edge until the corner clips lock in position.

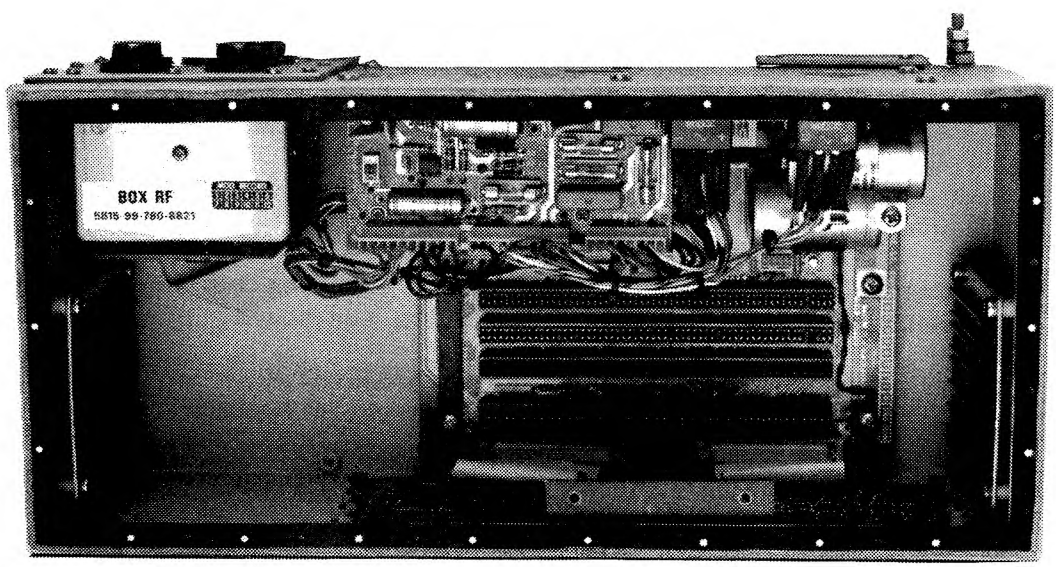
Interface Control Board

Figure 5B.1.1

5 The Interface Control board is mounted in the second slot in the Electronics Box, next to the Printer Control board. The removal and replacement procedures are as for the Printer Control board, except that there are no heat-sink screws to remove.



CIRCUIT BOARDS IN PLACE



CIRCUIT BOARDS REMOVED

FIG 5B.1.1 ELECTRONICS BOX - INTERNAL VIEW

Message Edit and Memory Expansion Boards — Figure 5B.1.1

6 In some TGQ variants, one or the other of these is mounted in the third slot in the Electronics Box. The removal and replacement procedure for either board is the same as for the Interface Control board.

NOTE There is a facility to fit an extra memory board in the fourth slot in the Motherboard. If a board is fitted here, it can be removed and replaced using the same procedure as for the Interface Control board.

RF Box Assembly — Figure 5B.1.2

7 The RF Box Assembly is mounted through the left-hand side of the rear panel of the Teleprinter (viewed from the front). To remove it, proceed as follows:

(1) Switch off the Teleprinter and remove the mains plug. Disconnect all the sockets at the rear of the Teleprinter. Remove the cable from the earth stud if the Teleprinter needs to be moved to access the RF Box screws on the rear panel.

(2) Remove the lid of the Electronics Box and disconnect SKH from PLH at the rear of the Motherboard.

(3) Working at the rear of the Teleprinter, undo the 12 screws which secure the RF Box to the rear panel. Withdraw the RF Box from the rear panel and turn it such that the terminal blocks on the Resistor pec can be accessed with a small blade screwdriver (see Figure 5B.1.2).

(4) Make a note of the terminal connections to SKR and SKS and then remove the wires. Lift the RF Box away from the Teleprinter.

8 Replacement is a reversal of the removal procedure.

Power Supply Assembly — Figure 5B.1.3

9 The Power Supply Assembly is mounted across the rear panel, inside the Electronics Box. To remove it, proceed as follows:

(1) Switch off the Teleprinter and remove the mains plug.

(2) Remove the lid of the Electronics Box.

(3) Disconnect socket SKJ from PLJ on the rear of the Motherboard.

(4) Remove the RF Box and disconnect the wires from terminal blocks SKR and SKS. (With care, it is possible to disconnect these wires with the RF Box in place, although this requires the removal of all the vertically-mounted circuit boards.)

(5) Remove the six screws on the outside of the rear panel which hold the Power Supply Assembly in place. Support the underside of the module as the screws are removed, otherwise it will drop onto the Motherboard. Lift the complete assembly out of the Electronics Box.

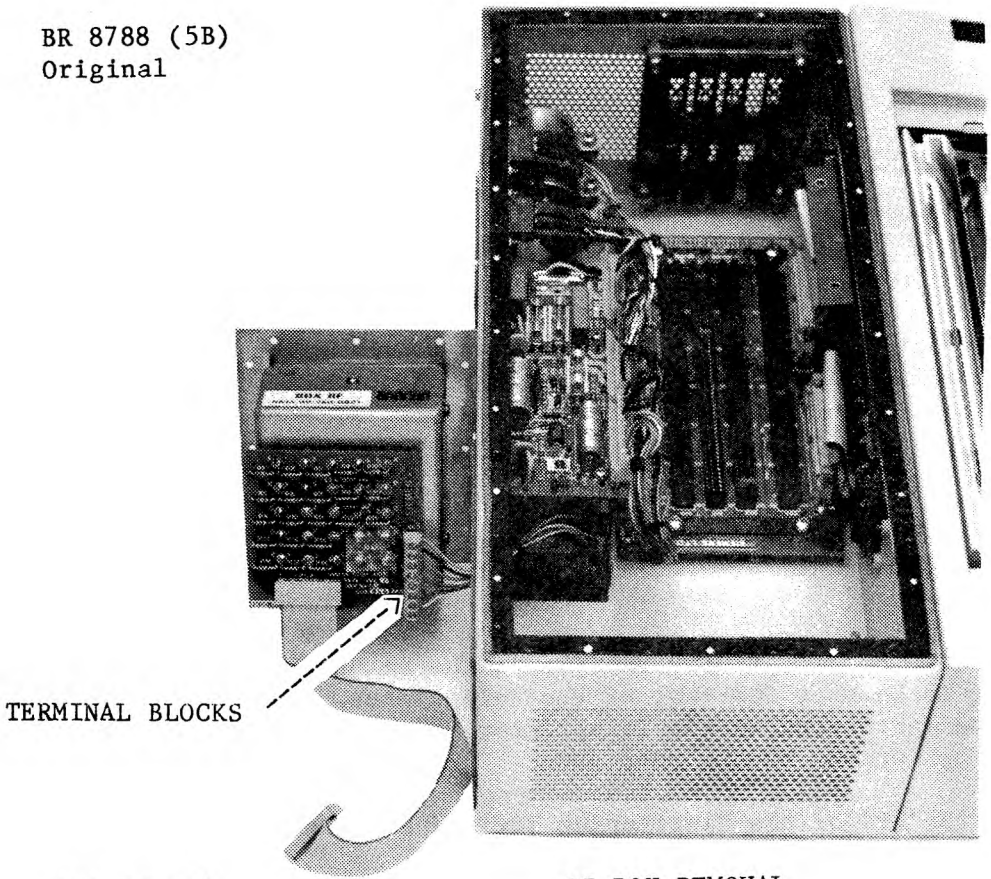


FIG 5B.1.2 RF BOX REMOVAL

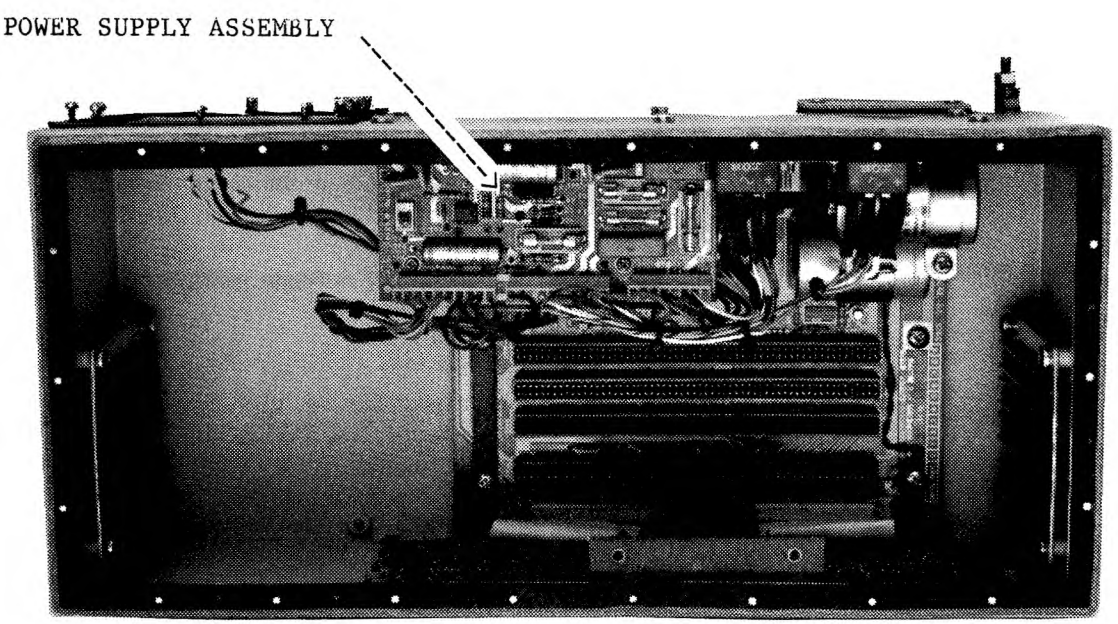


FIG 5B.1.3 POWER SUPPLY REMOVAL

10 Replacement is a reversal of the removal procedure.

Motherboard Figure 5B.1.4

11 The Motherboard is mounted horizontally on the floor of the Electronics Box. To remove it, proceed as follows:

(1) Switch off the Teleprinter and remove the mains plug.

(2) Remove the lid of the Electronics Box and then remove the Printer Control board, the Interface Control board and, if fitted, the Message Edit and/or Memory Expansion boards.

(3) Remove the Power Supply Assembly (the RF Box may be left in place if desired).

(4) Release the clips securing SKE and SKF to PLE and PLF on the front of the Motherboard. Do not attempt to separate the sockets from the plugs at this stage.

(5) Undo the four screws which secure the Motherboard to the floor of the Electronics Box. Lift the rear of the Motherboard and tilt it towards the Printer unit.

(6) Disconnect SKE and SKF from their respective plugs and lift the Motherboard out of the Electronics Box.

12 Replacement is a reversal of the removal procedure, but note that the two longer screws of the four which secure the Motherboard must be fitted on the right-hand side (when the Motherboard is viewed from the rear of the unit).

PRINTER UNIT MODULES - REMOVAL AND REPLACEMENT

Keyboard

13 The Keyboard (where fitted) connects to the front of the Printer unit via a 25-way D-type connector. A reinforcement plate beneath the Keyboard provides a rigid support.

14 To remove the Keyboard, simply switch off the Teleprinter, place it on its side, remove the four screws which secure the Keyboard to the reinforcement plate, and then pull the Keyboard forward.

15 Replacement is a reversal of the removal procedure, but note that the Keyboard should be plugged into its connector whilst the Printer is horizontal.

Switch Panel Assembly Figure 5B.1.5

16 The Switch Panel Assembly is mounted on the underside of the left-hand side of the Printer cover. To remove it, proceed as follows:

(1) Switch off the Teleprinter, remove the mains plug and disconnect the chassis earth lead.

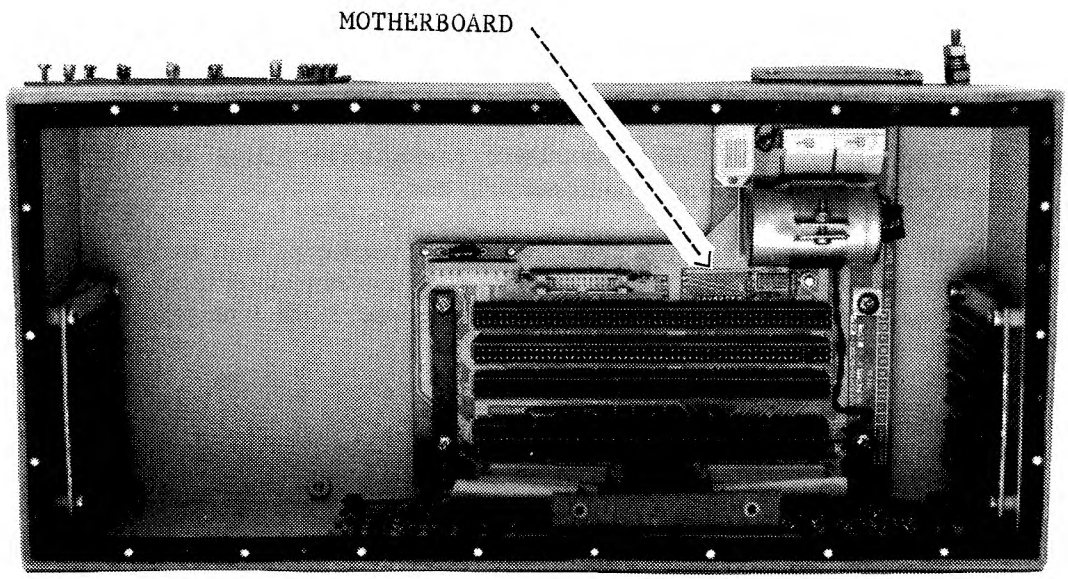


FIG 5B.1.4 MOTHERBOARD REMOVAL

(2) Remove paper from the Printer. Unclip the paper tension arm from the roll holder and remove the two small springs.

(3) Place the Teleprinter on its left side and remove the ten screws which secure the Printer cover to the baseplate.

(4) Remove the Keyboard (if fitted).

(5) Place the Teleprinter back on its feet and then lift the printer cover, tilting it slightly towards the rear to ease it off its mounting brackets. As the cover is lifted clear of the Printer, tilt it to the left and place it on its side next to the Printer (this avoids straining the cables which connect the switch panel to the rest of the Printer unit.

NOTE The soundproofing material on the inside of the cover may rub against the Printer mechanism, causing some resistance as the cover is lifted.

(6) Unplug the two cables (5 and 7) from the switch panel which connect it to the Printer unit and unplug the cable which provides internal illumination for the Printer.

(7) Undo the four screws which secure the switch panel to the printer cover and withdraw the switch panel.

17 Replacement is a reversal of the removal procedure, but remember to plug the Keyboard into the Printer unit whilst the Teleprinter is horizontal. Also, be careful not to trap the cables on the right-hand side of the Printer between the cover and the base.

Print Head Assembly — Figure 5B.1.6

18 The Print Head Assembly may be removed either with the printer cover removed or in place. In the latter case, the print head is accessed by undoing the two quick-release screws on the printer visor and lifting the visor forward.

19 To remove the print head, proceed as follows:

(1) Switch off the Teleprinter.

(2) Move the print head by hand to the centre of the platen and remove the ribbon cassette by lifting it off its mounting clips.

(3) Undo the two mounting screws, one on either side of the print head (note that two washers are fitted to each screw).

(4) Carefully lift the print head until it is possible to reach underneath to unplug it from its connecting cable. Once the print head is unplugged, lift it away from the Printer unit.

20 Replacement is a reversal of the removal procedure, but note the following points:

(1) Check that the ribbon cable underneath the print head is not fouling the String Assembly.

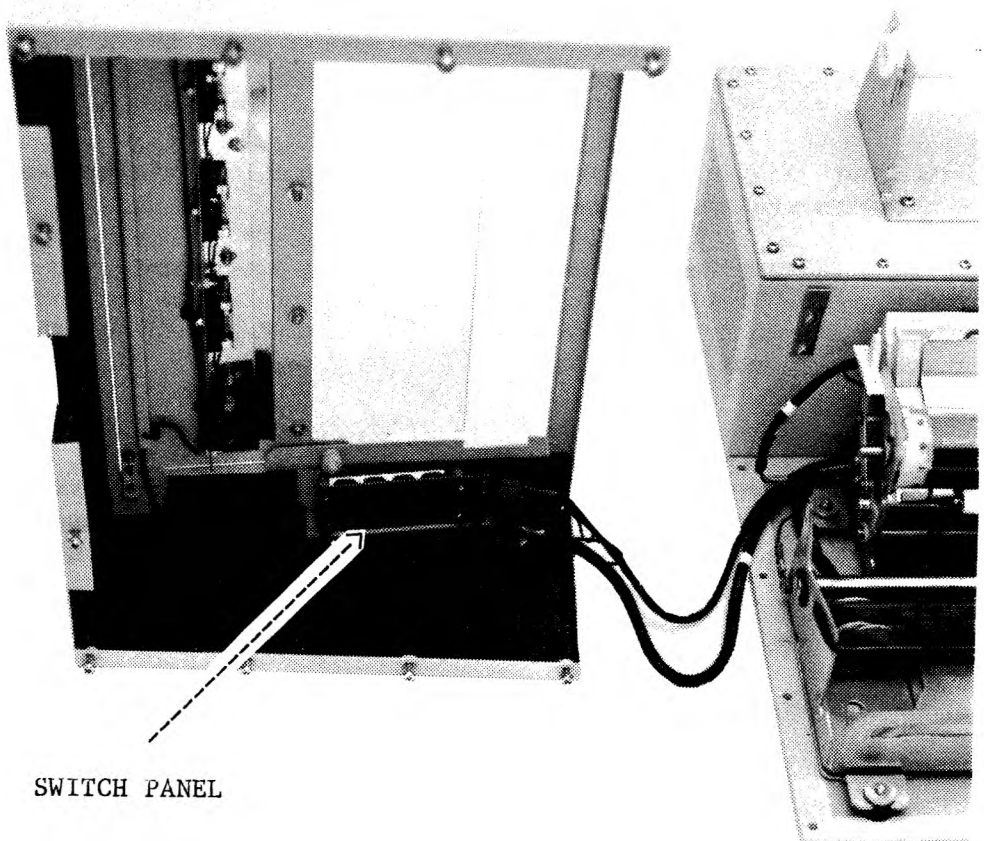


FIG 5B.1.5 SWITCH PANEL ASSEMBLY REMOVAL

(2) Realign the print head using the procedure outlined in para 21.

(3) Refit the ribbon cassette and check that the ribbon advances from right to left when the carriage is moved in either direction.

21 To realign the print head, refer to Figure 5B.1.6 and proceed as follows:

(1) Position the carriage (E) to a position where print head (B) is approximately 1/2 in. (12.7 mm) onto the platen surface from the left-hand pin feed wheel.

(2) Refit the print head and fit screws (D). Tighten the screws such that the print head can slide backwards and forwards.

(3) Insert a 0.031 in. (0.8 mm) feeler gauge between the print head nose (A) and the platen (C) and move the print head to obtain a sliding fit.

(4) Ensure that distances X and Y are equal to within 0.04 in. (1 mm) before tightening the mounting screws.

(5) Move the carriage to a position approximately 1/2 in. onto the platen from the right-hand pin feed wheel and check the measurements.

String Assembly — Figure 5B.1.7

22 The String Assembly is looped around a screw mounting post on the carriage stepper motor and then runs from left to right across the carriage, passing around the upper of two capstans mounted below the print head mounting bracket. At the left-hand side of the Printer Assembly, it loops around two grooves in the chassis before running back across the carriage, passing around the lower capstan, and connects to the right-hand side of the chassis via a spring.

23 To remove the String Assembly, proceed as follows:

(1) Switch off the Teleprinter and remove the mains plug.

(2) Remove the printer cover and ribbon cassette.

(3) Move the carriage to the centre of the platen. Unclip the spring which secures one end of the String Assembly from the right-hand side of the chassis and remove the spring from the metal eye.

(4) Press down on the upper capstan until the ribbon wind post is clear of the hole in the print head mounting bracket. Lift out the two capstans and wind post.

(5) Remove the string from the capstans and detach the fixed end from the screw mounting post on the stepper motor.

24 Replacement is a reversal of the removal procedure. Figure 5B.1.7 shows how the string should be wound around the capstans. Once the String Assembly has been refitted, move the carriage to the left and right and check that the wind post moves counter-clockwise in both cases.

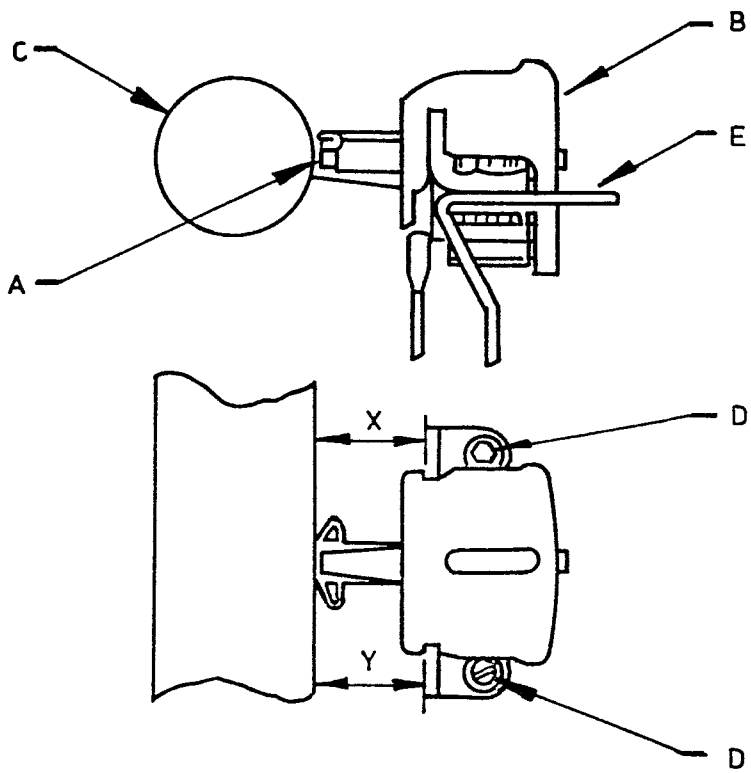


FIG 5B.1.6 PRINT HEAD REALIGNMENT

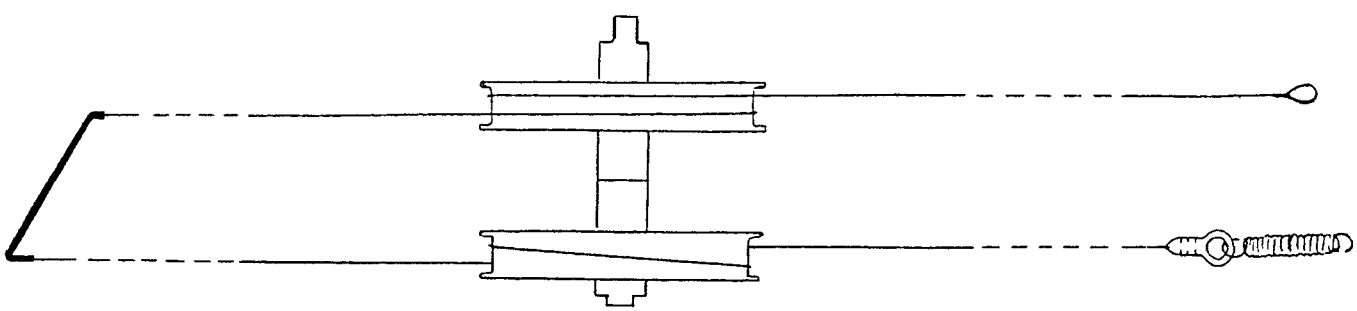


FIG 5B.1.7 DETAIL SHOWING CORRECTLY WOUND CAPSTANS

Linefeed Kit — Figure 5B.1.8

25 A replacement Linefeed Kit contains of the following components (the numbers in parentheses refer to the annotations in Figure 5B.1.8):

Description	Quantity
(1) Screw	1
(3) Compression spring	1
(4) Small screws	3
(5) Clutch	1
(6) Adjuster wheel	1
(7) Pin	1
(13) & (18) Circlips	4
(14) Sprocket wheel assembly	1
(15) Combined wheel	1
(16) Spring	1
(17) Spring	1
(19) Stabiliser	1
(20) & (22) Circlip	4

26 To remove the corresponding components from the TGQ Teleprinter, proceed as follows:

26.1 Remove the printer cover (see para 16).

26.2 Remove screw (1) from the centre of the paper feed wheel (2) and then pull off the paper feed wheel and compression spring (3).

26.3 Remove the three small screws (4) from the clutch (5).

26.4 Remove the clutch and the adjuster wheel (6).

26.5 Remove pin (7); this may need punching out.

26.6 Remove long screw (9) which holds the reed relay pec (10) in position. Take care not to lose the spacer (11) and, if fitted, star washer (12). Release the pec by moving it slightly to the right and lifting away from the chassis. Avoid straining the wires connected to the pec.

26.7 Remove circlip (13).

26.8 Remove the sprocket wheel assembly (14) and the combined wheel (15).

26.9 Remove springs (16) and (17).

26.10 Remove circlip (18).

26.11 Remove stabiliser (19).

26.12 Remove circlips (20) and (22) and bushes (21) and (23). Note the orientation of the bushes.

26.13 Remove the platen cover (24) by easing it out of the chassis. Do not use excessive force as this could cause damage to the chassis or cover.

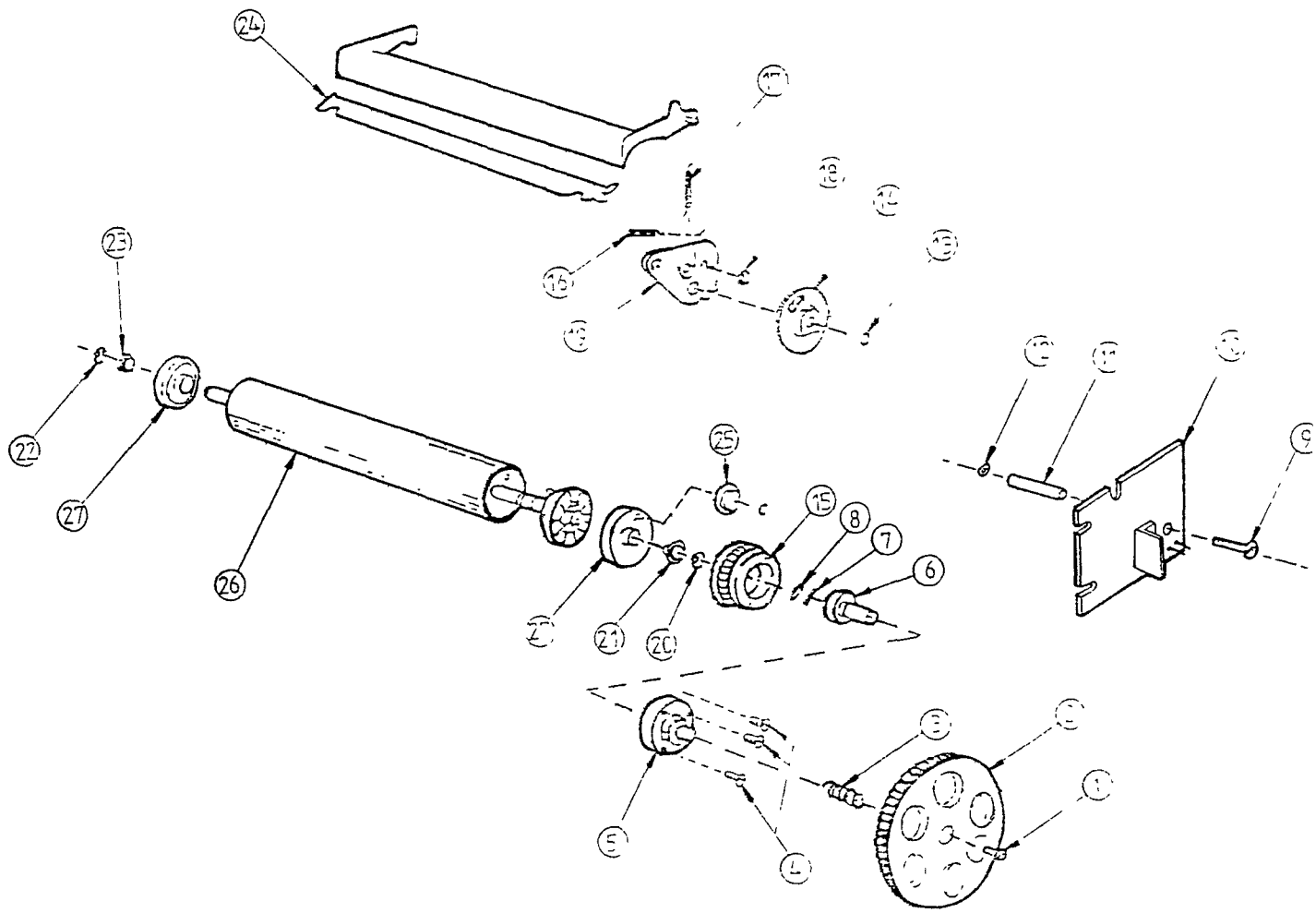


FIG 5B.1.8 LINEFEED MECHANISM

26.14 Move adjuster (25) so that the platen can be lifted out of the frame.

27 Clean all components with a dry cloth. Do not use a solvent as this may affect the plastic. Clean the sprocket wheel assemblies (27) using a compressed air line.

28 Reassembly is a reversal of the disassembly procedure. Refit the new components from the kit as the mechanism is being reassembled. Smear a small amount of silicon grease (NSN 0474-99-220-2421) to all plastic gear wheels and cams (do not apply too much grease as this will collect paper dust).

29 Ensure that all parts of the reassembled mechanism move freely. Note that if the platen is turned slowly, the sprocket wheel assemblies (27) will cause slight resistance. Turning the shaft will prove the free movement.

Printer Assembly — Figures 5B.1.9 to 5B.1.15

30 The Printer Assembly can be removed from the Teleprinter and exchanged as a complete unit. To remove it, proceed as follows:

(1) Remove the printer cover, as described in para 16 (1) to (6).

(2) Remove the Print Head Assembly, as described in para 19.

(3) Working on the left-hand side of the Printer, remove the earth lead on cable 4 (see Figure 5B.1.10).

(4) Disconnect the red and blue wires on cable 4 from the home sense relay (see Figure 5B.1.9). Note which colour wire connects to which terminal.

(5) Behind the Printer unit on the left-hand side, there is a small plug and socket on cable 8 (to the paper out detector). Disconnect the socket (see Figure 5B.1.10).

(6) Working on the right-hand side of the Printer, remove the tie-wrap which secures cables 2 and 3 to the chassis (see Figure 5B.1.11).

(7) Note the order of the five wires in cable 3 which are connected to the rear right-hand side of the stepper motor (Figure 5B.1.11). Unplug the wires and disconnect the separate earth lead.

(8) Unplug the four wires which terminate cable 2 from the two terminal blocks on the side of the stepper motor (Figure 5B.1.11). Each wire is identified by a number which corresponds to a number on the side of the terminal blocks. Disconnect the separate earth lead.

(9) Note the position of the four wires connected to the reed relay pec (Figure 5B.1.12) and then unplug them. Disconnect the separate earth lead. Remove the reed relay pec from the printer chassis by undoing the screw to the right of the terminal block. Take care not to lose the spacer and, if fitted, star washer from the other side of the pec. Slide the pec to the right and withdraw it carefully, taking care not to strain the wires still connected to it.

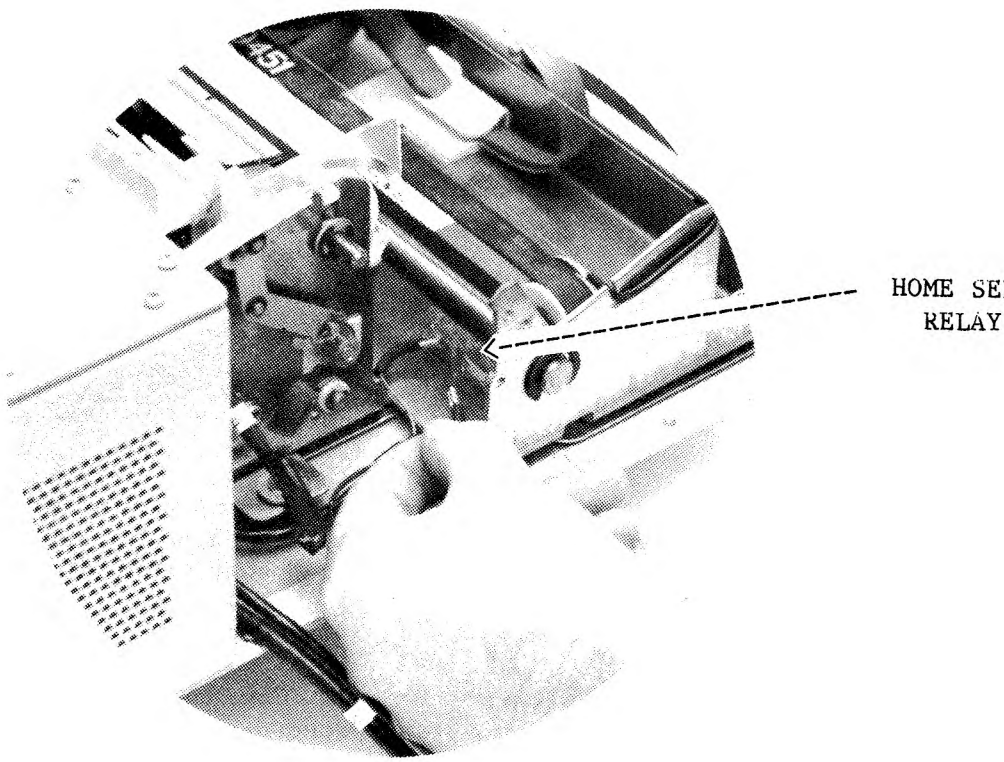


FIG 5B.1.9 DISCONNECTING HOME SENSE RELAY CABLES

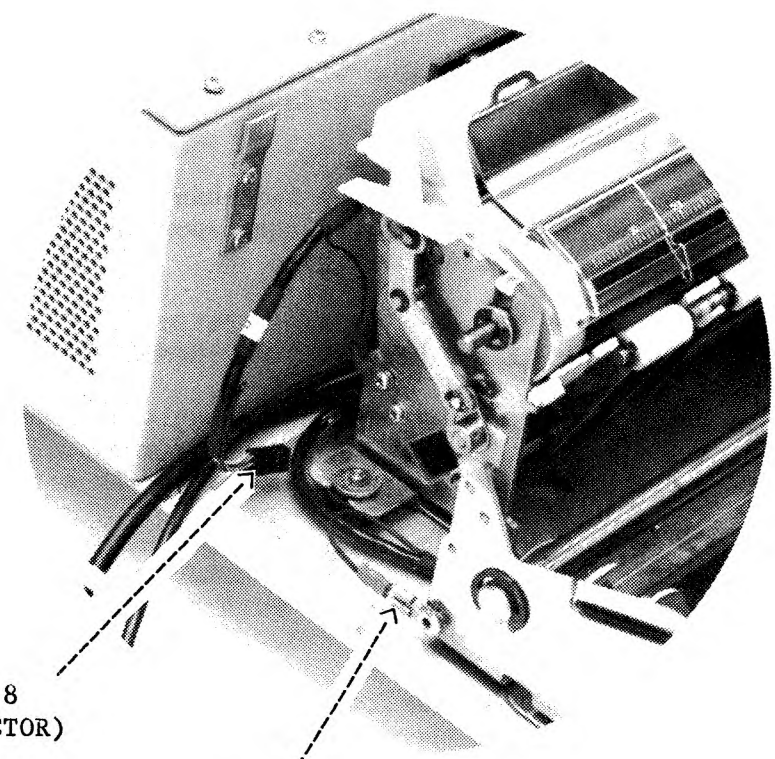
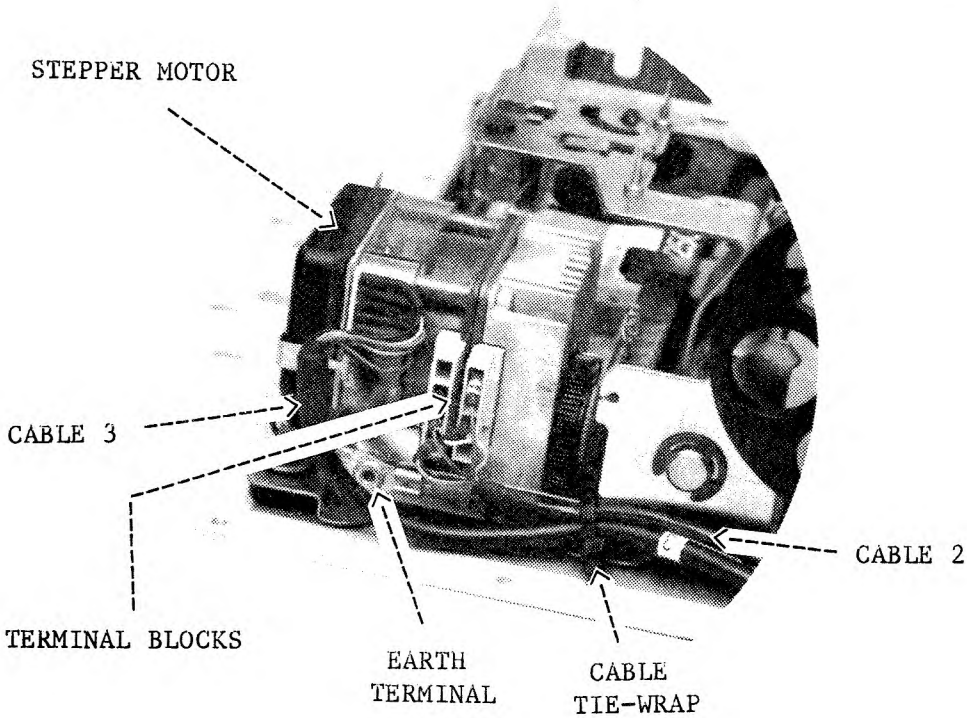
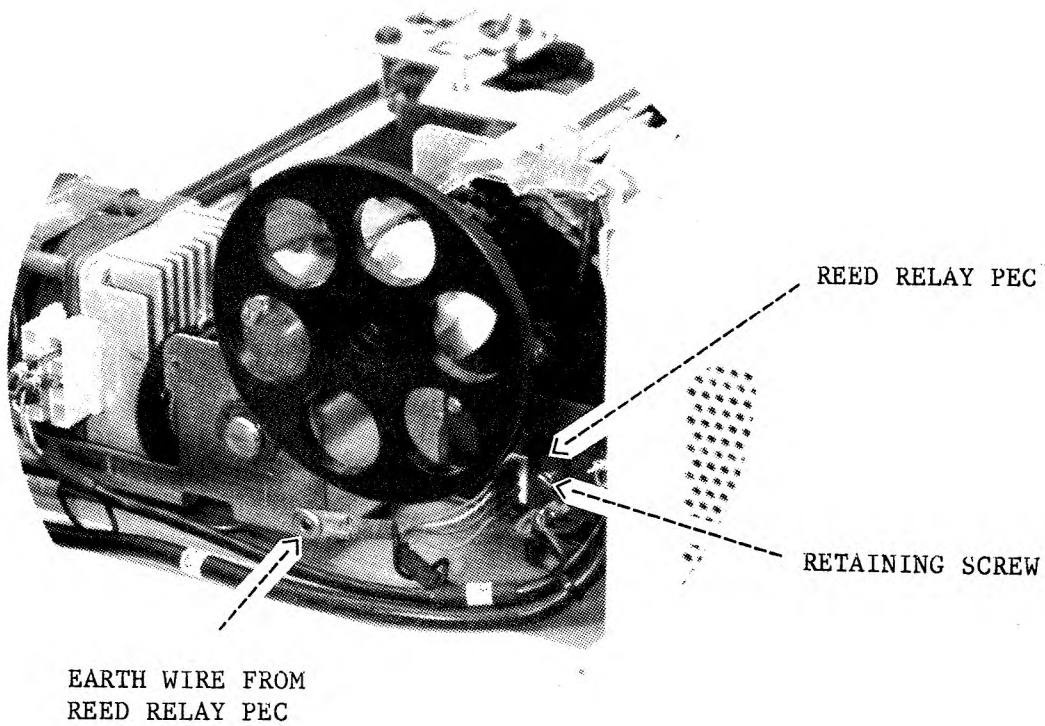


FIG 5B.1.10 DISCONNECTING PAPER OUT DETECTOR CABLE



DISCONNECTING STEPPER MOTOR WIRES FIG 5B.1.11



REMOVING REED RELAY PEC FIG 5B.1.12

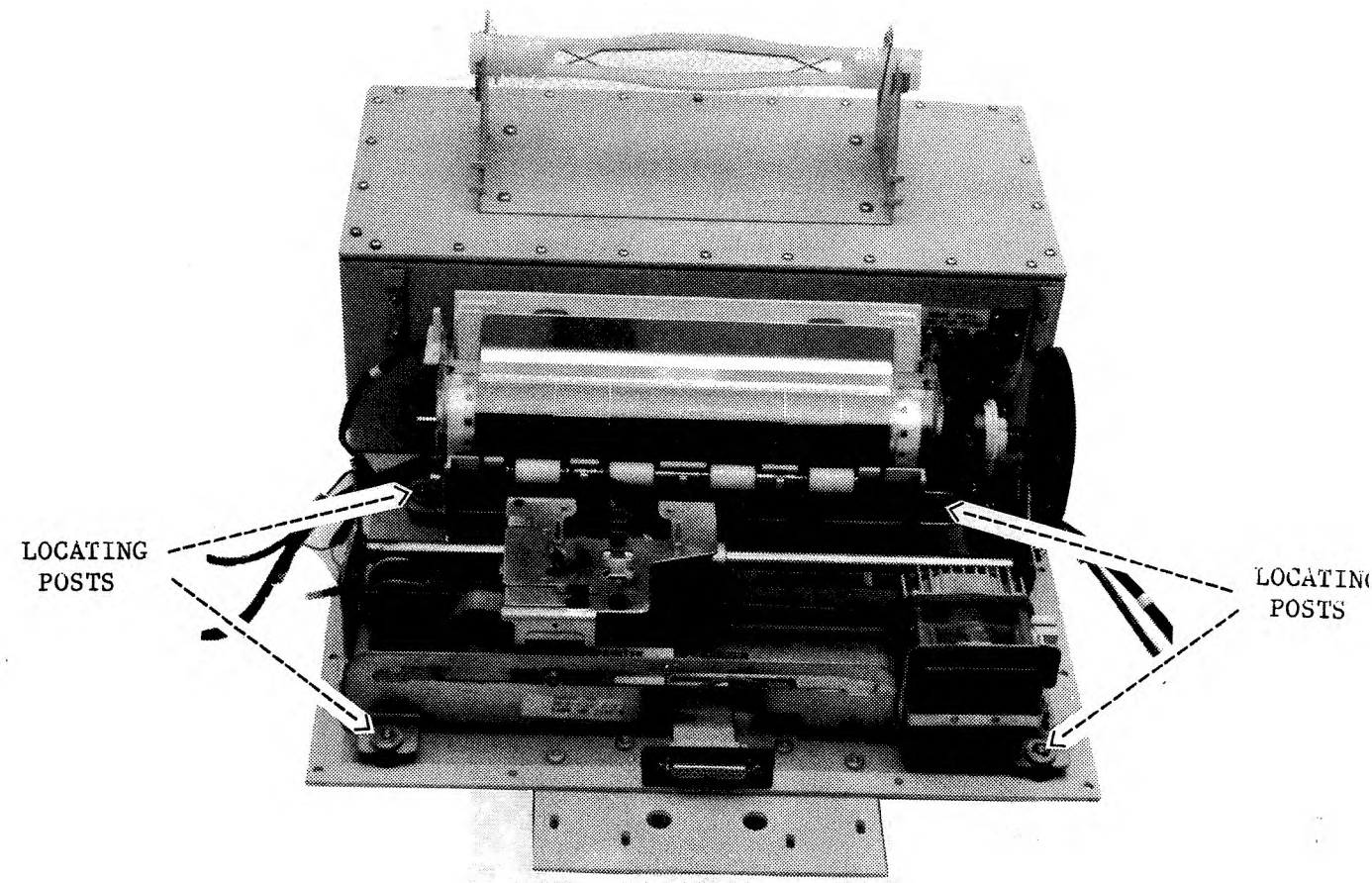
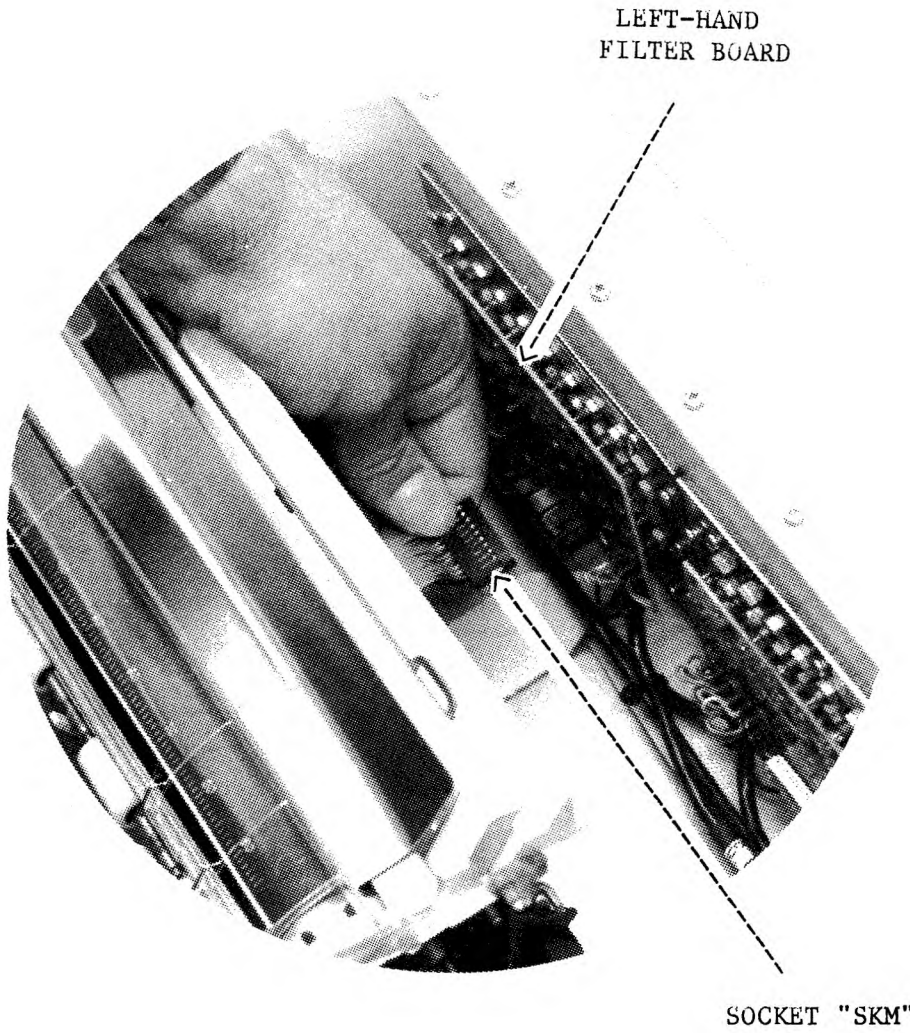


FIG 5B.1.13 LOCATION OF PRINTER CHASSIS LOCATING POSTS



DISCONNECTING PRINT HEAD CABLE

FIG 5B.1.14

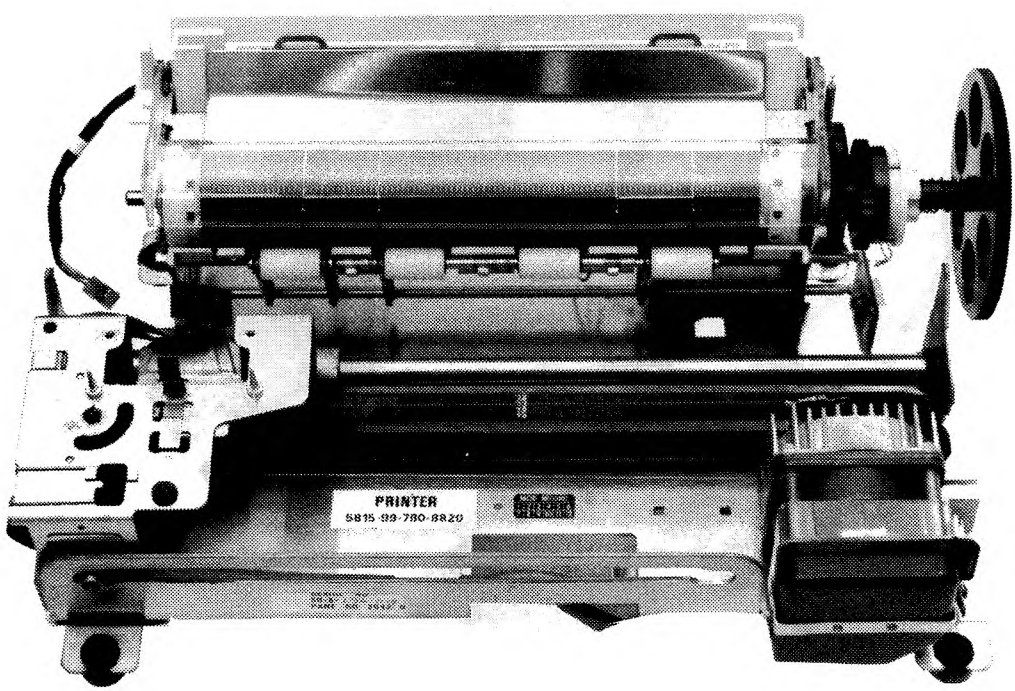


FIG 5B.1.15 COMPLETE PRINTER ASSEMBLY
5815-99-780-8820

(10) Remove the circlips from the printer chassis locating posts (see Figure 5B.1.13). Carefully lift the complete Printer Assembly off the posts. Reach behind the assembly and unplug socket SKM from the Left-Hand Filter Board (see Figure 5B.1.14) before lifting the complete Printer Assembly (Figure 5B.1.15) away from the baseplate.

31 Replacement is a reversal of the removal procedure. Ensure that the Linefeed Assembly on the replacement assembly is adequately greased (see para 28).

Left and Right-Hand Filter Boards — Figure 5B.1.16

32 The Left and Right-Hand Filter Boards are mounted vertically to the dividing plate which separates the Electronics Box from the Printer. If either board is to be replaced, follow the procedure outlined below:

(1) Remove the Printer Assembly (see para 30).

(2) Remove the lid of the Electronics Box and then remove the Printer Control pec (see para 3).

(3) Working inside the Electronics Box, cut the tie-wraps which hold the ribbon cables to the Filter Boards and then unplug the ribbon cables from plugs PLE and PLF in the Motherboard.

(4) Working on the Printer side, cut the tie-wraps on the cables associated with the Filter Board to be removed.

(5) If the Right-Hand Filter Board is to be removed, undo the screws which hold the Keyboard connecting socket in place at the front of the baseplate.

(6) Undo the twelve screws securing the suspect Filter Board to the dividing plate and remove the board and its attached cables (replacement Filter Boards are supplied with cables already fitted).

33 Replacement is a reversal of the removal procedure. Fit new tie-wraps to the printer cables (tape the cables together if tie-wraps are not available).

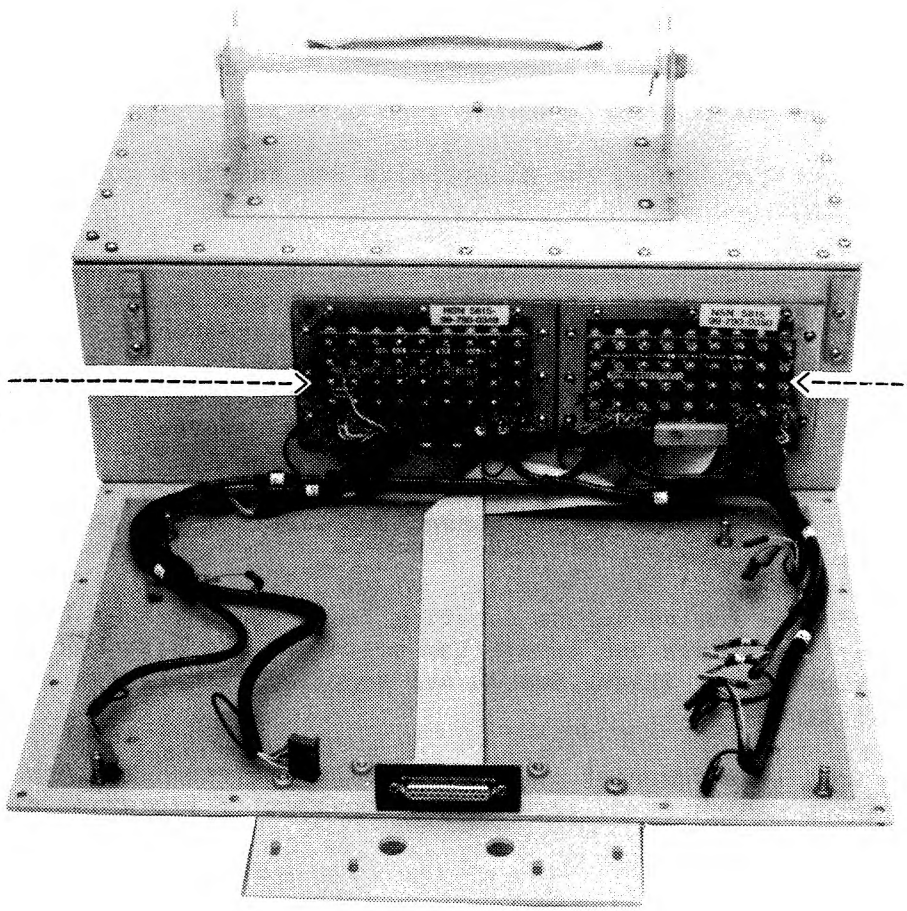


FIG 5B.1.16 LEFT AND RIGHT-HAND FILTER BOARDS

CHAPTER 2

CORRECTIVE MAINTENANCE,

PAPER TAPE ATTACHMENT (PTA)

CONTENTS

Paragraph

1 GENERAL
3 Brake Arm Assembly - Removal and Replacement
5 ELECTROMECHANICAL/MECHANICAL MODULES - REMOVAL AND REPLACEMENT
5 RF Box Assembly
7 Power Supply Assembly
9 Mains Transformer
11 Controller Board
13 TAPE PUNCH/READER BOX MODULES - REMOVAL AND REPLACEMENT
13 Tape Reader Assembly
15 Punch Assembly
17 Switch Panel Assembly
19 Filter Board

ILLUSTRATIONS

Figure		Page
5B.2.1	Location of Electronics Box Modules	2.4
5B.2.2	Removing the Tape Reader Assembly	2.7
5B.2.3	Removing the Tape Punch Assembly	2.8
5B.2.4	Removing the Switch Panel Assembly	2.10
5B.2.5	Accessing the Filter Board Retaining Screws	2.12

CHAPTER 2

CORRECTIVE MAINTENANCE,

PAPER TAPE ATTACHMENT (PTA)

GENERAL

1 This section describes how to remove and replace defective modules within the PTA, in accordance with the agreed maintenance policy. The only tools required to remove most modules are a cross-head screwdriver, a small blade screwdriver, and a 3 mm AF allen key. If the Brake Arm Assembly is to be removed, a soldering iron will also be required. If the Mains Transformer is to be removed, a 10 mm spanner will be required.

2 Observe the precautions for handling static-sensitive devices when handling the Controller board.

Brake Arm Assembly - Removal and Replacement

3 The Brake Arm Assembly is mounted inside the Tape Reel Box on the rear left-hand side. To remove it, proceed as follows:

(1) Switch off the PTA, switch off the mains power and remove the plug.

(2) Undo the catches on either side of the Tape Reel Box and lift the lid until it locks in the raised position.

(3) Remove the paper tape roll from inside the box.

(4) Remove the nut and bolt which hold the lid stay-rod in position and then undo the 16 screws which secure the Tape Reel Box to the Electronics Box. Raise the box high enough to access the two wires which connect between the underside of the box and the Controller board. Remove these wires by disconnecting the plug from PL7 on the Controller board. Lift the box away from the PTA and ensure that the weight of the box does not rest on the two protruding pins on the underside when it is laid down.

(5) Turn the Tape reel box on its side, support the Brake Arm Assembly whilst removing the four small cross-head screws from underneath.

(6) Lift the Brake Arm Assembly away from the box. Desolder the two wires which connect the assembly to the box at the terminal posts.

4 Replacement is a reversal of the removal procedure. Ensure that the bearing on the underside of the Brake Arm Assembly is located correctly in its cup before refitting the screws.

ELECTRONICS BOX MODULES - REMOVAL AND REPLACEMENT

Figure 5B.2.1

RF Box Assembly

5 The RF Box Assembly is located in the rear right-hand side of the Electronics Box. To remove it, proceed as follows:

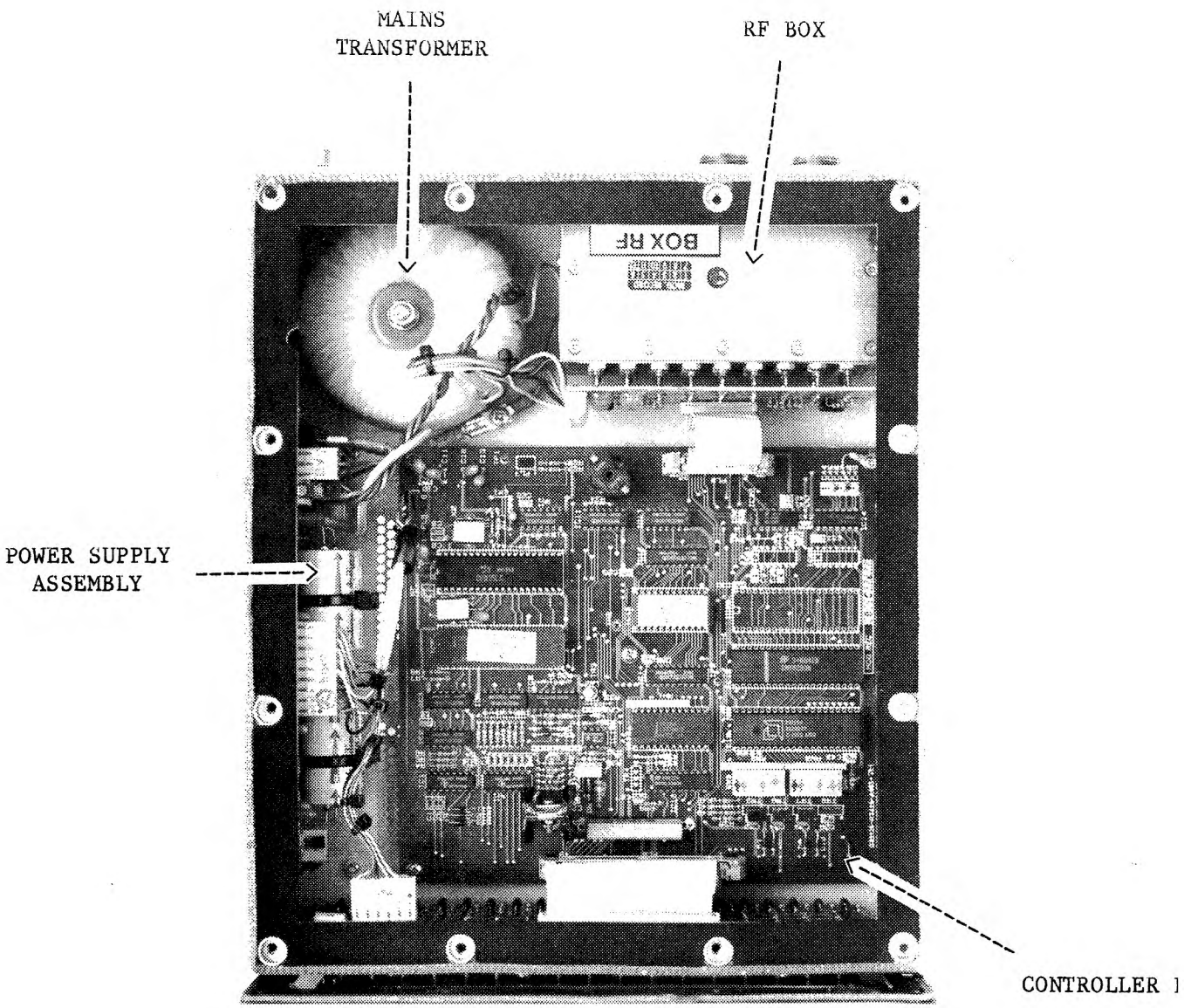


FIG 5B.2.1 LOCATION OF ELECTRONICS BOX MODULES

(1) Remove the Tape Reel Box (see para 3 (1) to (4)).

(2) Disconnect the power and data cables from the rear of the PTA.

(3) Disconnect SK8 from PL8 on the Controller Board.

(4) Make a note of the connections to TB1 (on the pec mounted vertically to the back of the RF Box) and then remove the wires.

(5) Remove the ten screws on the rear panel of the PTA which secure the RF Box in place. Withdraw the complete assembly.

6 Replacement is a reversal of the removal procedure. Ensure that the Transformer wires are reconnected correctly to TB1.

Power Supply Assembly

7 The Power Supply Assembly is mounted vertically to the left-hand side of the Electronics Box. To remove it, proceed as follows:

(1) Remove the Tape Reel Box (see para 3 (1) to (4)).

(2) Disconnect SK12 and SK14 from the Power Supply Board.

(3) Disconnect the earth lead to the Power Supply Board from the terminal post in front of the Mains Transformer.

(4) Remove the six screws on the outside of the Electronics Box which secure the Power Supply Assembly in place. Lift out the assembly.

8 Replacement is a reversal of the removal procedure.

Mains Transformer

9 The Mains Transformer is mounted in the rear left-hand side of the Electronics Box. To remove it, proceed as follows:

(1) Remove the Tape Reel Box (see para 3 (1) to (4)).

(2) Note the connections of the Transformer wires to terminal block TB1 and then disconnect the wires. Remove the Transformer earth lead from the terminal post.

(3) Disconnect SK12 from the Power Supply Board.

(4) Undo the centre nut on the top of the Transformer. Lift the Transformer out of the Electronics Box.

10 Replacement is a reversal of the removal procedure. Ensure that the Transformer wires are connected correctly to TB1.

Controller Board

11 The Controller Board is mounted horizontally to the floor of the Electronics Box. To remove it, proceed as follows:

(1) Remove the Tape Reel Box (see para 3 (1) to (4)).

(2) Disconnect SK5, SK8 and SK9 from their respective plugs on the Controller Board.

(3) Starting with the centre screw, undo the five screws which secure the Controller Board to the floor of the Electronics Box. Lift the Controller Board out of the Electronics Box.

12 Replacement is a reversal of the removal procedure, but note the following points:

(1) If a new board is to be fitted, set the DIL switches to match the settings on the old board.

(2) The spacers fitted between the Controller Board and the floor may come adrift when the board is removed. If this is the case, apply a light glue (eg paper glue) between the spacers and the floor to hold them in place whilst the board is replaced.

(3) Remember to reconnect the short lead from C48 on the board to the rear right-hand screw.

(4) Ensure that the plastic washer is refitted between the centre screw and the board.

TAPE PUNCH/READER BOX MODULES - REMOVAL AND REPLACEMENT

Tape Reader Assembly

Figure 5B.2.2

13 This is mounted on the front left-hand side of the PTA. To remove it, proceed as follows:

(1) Switch off the PTA, switch off the mains power and remove the plug.

(2) Release the two side catches and raise the PTA's lid until it locks in the raised position.

(3) Remove the access plate to the left of the Punch mechanism by undoing the six retaining screws.

(4) Reach inside the Punch/Reader Box and disconnect SK4, SK5 and SK15 from the vertically-mounted pec on the back of the Reader Assembly.

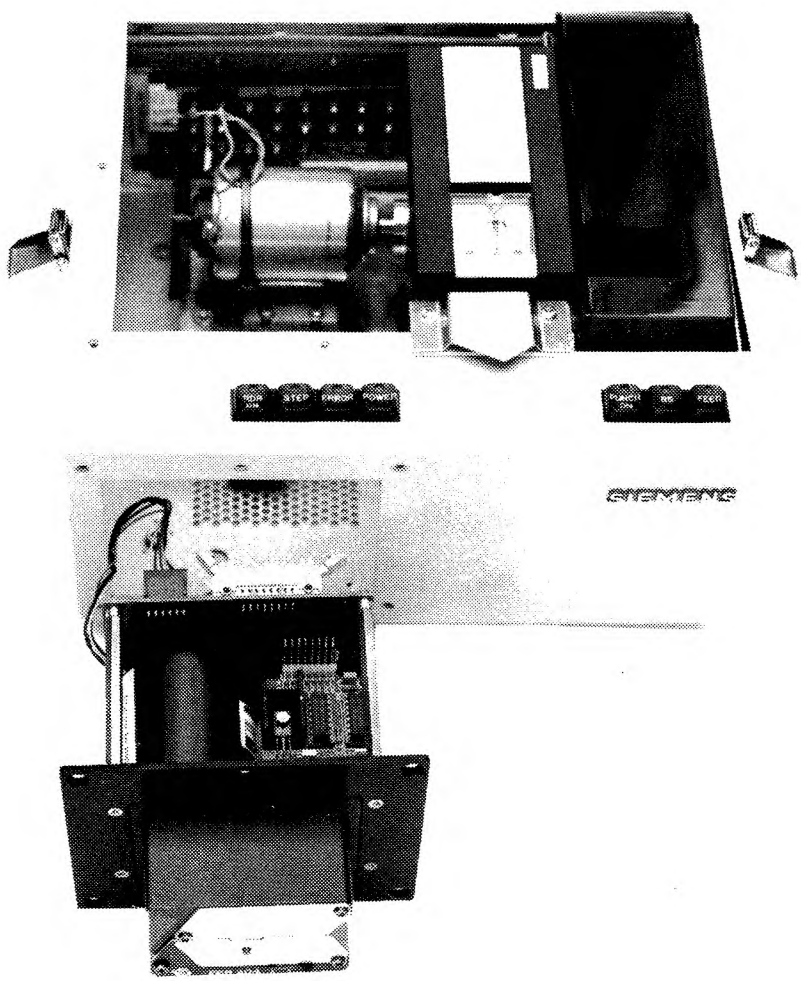
(5) Undo the six screws which secure the Reader Assembly to the front of the PTA and then withdraw the assembly.

14 Replacement is a reversal of the removal procedure. If a new Reader Assembly is being fitted, set the switch on the front of the assembly to match the setting on the old assembly.

Punch Assembly

Figures 5B.2.3

15 The Punch Assembly takes up most of the space in the Reader/Punch Box. It consists of the Punch mechanism, motor and chad box holder, all of which are mounted onto a single chassis. To remove the Punch Assembly, proceed as follows:



REMOVING THE TAPE READER ASSEMBLY FIG 5B.2.2

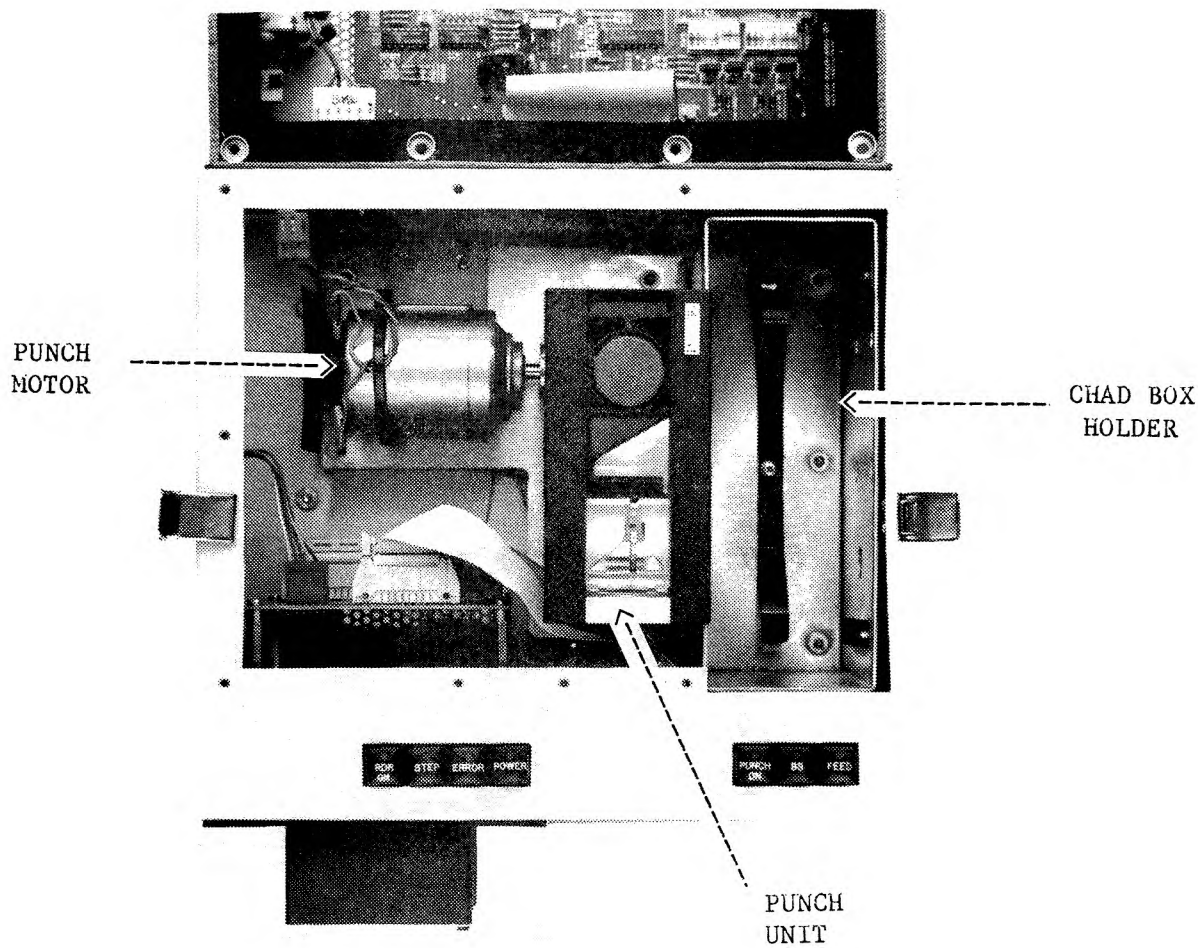


FIG 5B.2.3 REMOVING THE TAPE PUNCH ASSEMBLY

(1) Remove the Tape Reel Box (see para 3 (1) to (4)).

(2) Remove the access plate to the left of the Punch mechanism by undoing the six retaining screws.

(3) Unplug SK4 from the Tape Reader pec and unplug SK6 from PL6 on the Filter Board.

(4) Undo the two screws which secure the tear-off bar to its mounting plate and remove the bar. Remove the mounting plate.

(5) Lift out the chad box and remove the magnetic strip from the top of the Punch mechanism. Remove any chad present in the chad box holder or in the top of the Punch mechanism.

(6) Turn the PTA on its side. Remove the seven allen screws from underneath the Reader/Punch Box.

(7) Turn the PTA back on its feet and then lift out the complete assembly.

16 Replacement is almost a reversal of the removal procedure, but note the following points:

(1) If a new assembly is being fitted, check that the steel tape guide in the Punch mechanism is in the correct slot for the size of tape used.

(2) Check that the pulley on the Punch mechanism turns when the punch motor is turned by hand. Excessive slack in the drive belt is removed by slackening the four screws at the base of the motor, moving the motor back and then retightening the screws.

(3) Apply a screw-lock compound to each allen screw before refitting.

(4) Ensure that the ribbon cable which connects the Reader Assembly to the Filter Board is not directly over one of the screw holes when the allen screws are refitted.

(5) Reconnect all sockets in the Reader/Punch Box and refit the inspection cover before tightening the allen screws.

(6) Tighten the allen screws evenly until there is a gap between the lower edge of the top of the Punch mechanism and the top of the inspection cover of 0.020 in. (measure with a feeler gauge).

Switch Panel Assembly — Figure 5B.2.4

17 The Switch Panel Assembly is mounted to the underside of the top of the Reader/Punch Box. To remove it, proceed as follows:

(1) Remove the Tape Reel Box (see para 3 (1) to (4)).

(2) Remove the Reader Assembly (see para 13).

(3) Remove the Punch Assembly (see para 15).

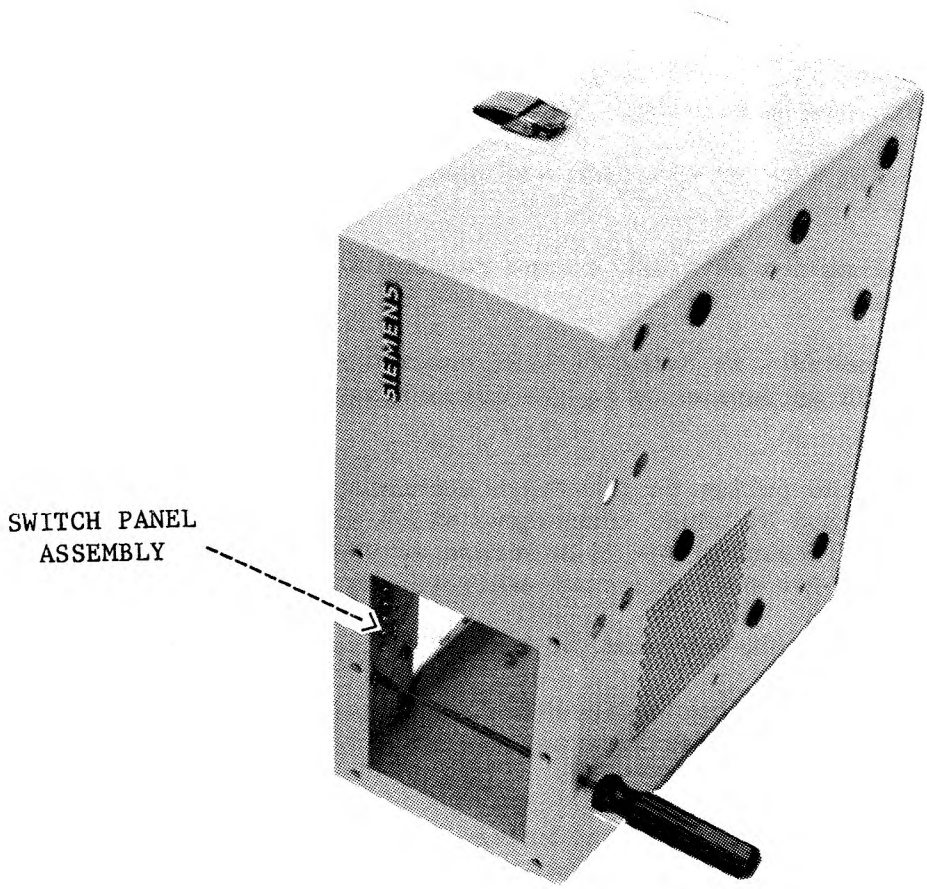


FIG 5B.2.4 REMOVING THE SWITCH PANEL ASSEMBLY

(4) Turn the PTA on its side and remove the seven screws which secure the Reader/Punch Box to the baseplate.

(5) Slacken the remaining eight screws in the baseplate which secure the Electronics Box in place.

(6) Lift the front edge of the Electronics Box away from the baseplate. Tilt the Reader/Punch Box back slightly and then slide it forward so that the lip on the rear bottom edge clears the bottom of the Filter Board and passes beneath the ribbon cable attached to the Filter Board.

(7) Turn the Reader/Punch Box on its side and undo the seven screws which hold the Switch Panel Assembly in place by inserting a suitable long screwdriver through the access holes in the base of the box (see Figure 5B.2.4). Lift out the assembly.

18 Replacement is a reversal of the removal procedure. Take care not to trap the ribbon cable when sliding the rear bottom lip of the Reader/Punch Box back behind the Filter Board.

Filter Board — Figure 5B.2.5

19 The Filter Board is mounted vertically between the Electronics Box and the Reader/Punch Box. To remove it, proceed as follows:

(1) Remove the Tape Reel Box (see para 3 (1) to (4)).

(2) Remove the Punch Assembly (see para 15).

(3) Disconnect SK15 from the back of the Reader Assembly.

(4) Turn the PTA on its side and remove the eight screws which secure the Electronics Box to the baseplate. Carefully separate the Electronics Box from the Reader/Punch Box and the baseplate.

(5) Unplug SK5 from the Controller Board and SK6 from the Filter Board.

(6) Undo the 14 screws which secure the Filter Board to the side of the Electronics Box and remove the board.

20 Replacement is a reversal of the removal procedure. Note that the ribbon cable which connects the Filter Board to SK15 on the back of the Reader Assembly passes underneath the Punch Assembly.

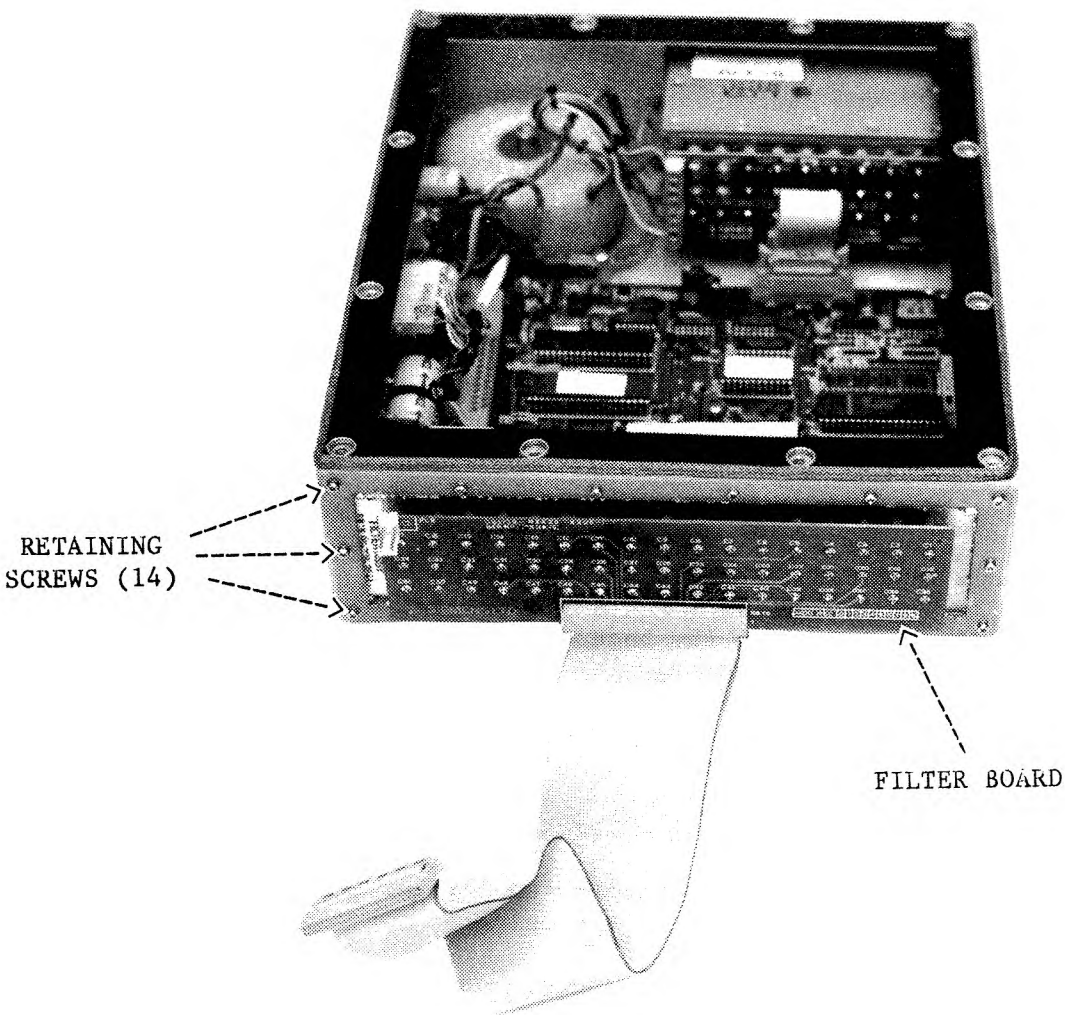


FIG 5B.2.5 ACCESSING THE FILTER BOARD RETAINING SCREWS

TELEPRINTER, TGQ SERIES

CATEGORY 5C - PREVENTIVE MAINTENANCE

CONTENTS

Chapter 1 Preventive Maintenance, TGQ Teleprinters
Chapter 2 Preventive Maintenance, Paper Tape Attachment (PTA)

CHAPTER 1

PREVENTIVE MAINTENANCE, TGO TELEPRINTERS

CONTENTS

Paragraph

1 MAINTENANCE INTERVALS
2 Consumables
3 MAINTENANCE CHECKS
3 Prerequisites
4 Printer Mechanism
5 Carriage Drive Belt Tension
6 Power Supply Voltages

ILLUSTRATIONS

Figure — Page

5C.1.1 Carriage Drive Belt Tension Adjustment — 1.5/6

CHAPTER 1

PREVENTIVE MAINTENANCE, TGQ TELEPRINTERS

MAINTENANCE INTERVALS

1 The maintenance checks described here must be carried out at the maximum service intervals given below. If the equipment is in regular heavy use, the checks should be made more frequently (eg at monthly intervals).

Every 3 months: Clean all paper dust out of the linefeed mechanism.
Check that all visible moving parts in the linefeed mechanism (pivots, circlips, roller, etc) have a small amount of lubricating grease.
Grease the relevant components in the linefeed mechanism.
Check/adjust the carriage drive belt tension.
Check the power supply voltages.

Consumables

2 Teleprinter consumables are defined as the ribbon cartridge and paper (either roll or pin feed). These should be checked on a daily basis and replaced as and when necessary.

MAINTENANCE CHECKS

Prerequisites

3 The following items will be required for preventive maintenance:

Silicone grease (NSN 0474-99-220-2421)
Corrosion preventive compound (NSN 0442-99-838-7789)
Light machine oil (NSN 9150-99-220-5735)
A suitable digital dc voltmeter

Printer Mechanism

4 Owing to the number of mechanical components present in the Printer mechanism, it is likely that this is where most faults will occur. To minimise the occurrence of faults, carry out the following procedure at the recommended maintenance intervals.

(1) Strip down the linefeed mechanism (see Category 5B, Chapter 1).

(2) Use a compressed air line to blow paper dust out of the sprocket holes on the sides of the platen.

(3) Lightly grease all plastic gears and reassemble the linefeed mechanism. Do not clean the mechanism with a chemical which is likely to affect the plastic components.

(4) Check the string assembly for wear - replace if necessary (see Category 5B, Chapter 1).

(5) Remove the ribbon cassette and add two drops of light machine oil to the sides of the ribbon advance pin. Move the carriage to the left and right to ensure even distribution of the lubricant.

(6) Check the print quality - replace or realign the print head if required (Category 5B, Chapter 1).

(7) Clean the head carriage support bar with corrosion preventive compound.

(8) Check and, if necessary, adjust the carriage drive belt tension (see para 5 below).

Carriage Drive Belt Tension — Figure 5C.1.1

5 To adjust the carriage drive belt tension, proceed as follows (letters in parentheses refer to Figure 5C.1.1):

(1) Move the carriage head (B) if necessary to access adjustment screw (C).

(2) Slacken screw (C).

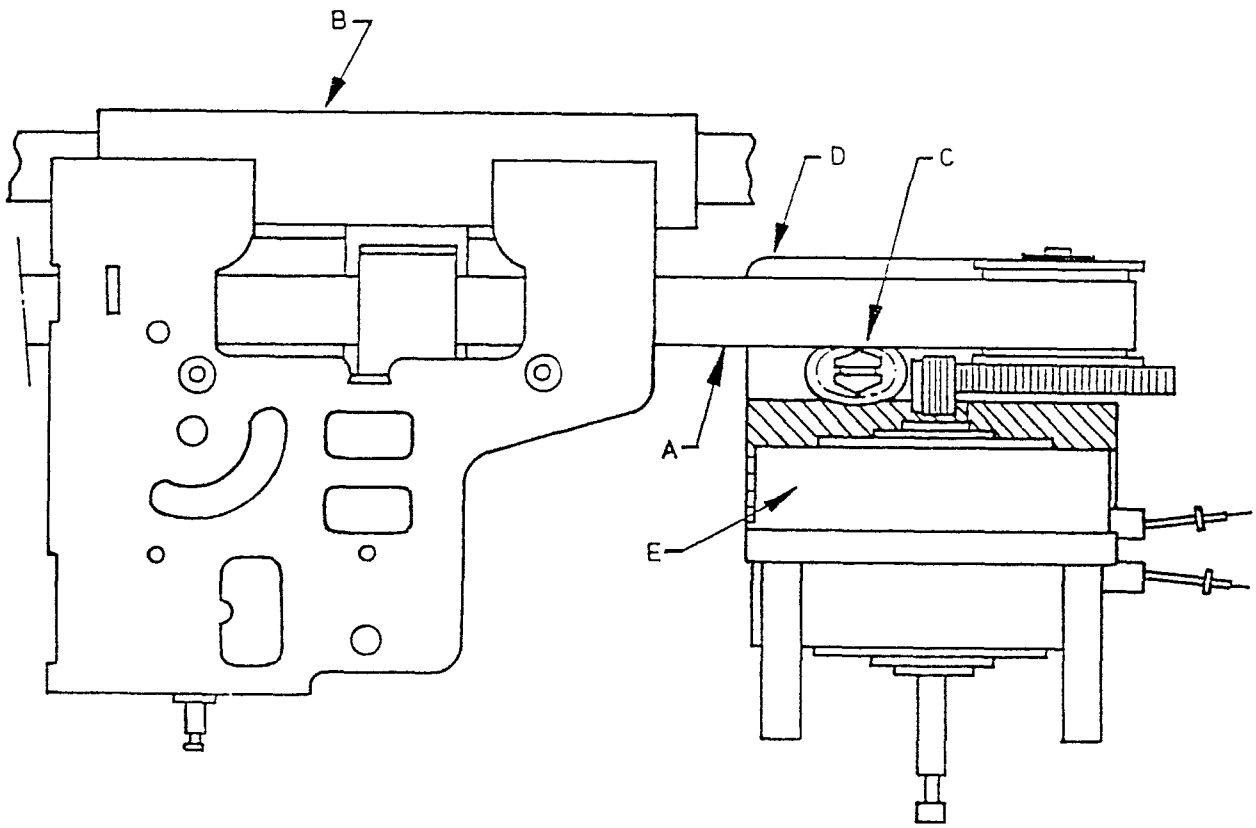
(3) Apply the necessary force to motor support (D) at point (E) and check the tension on drive belt (A).

(4) Tighten screw (C).

Power Supply Voltages

6 The power supply voltages can be tested by removing the lid of the Electronics Box and connecting a digital dc voltmeter between test points on the Power Supply board. Should the readings obtained not match those given below, replace the Power Supply board (see Category 5B, Chapter 1) and retest.

TP1 with respect to TP3: +24 V dc
TP4 with respect to TP7: +10 V dc
TP5 with respect to TP7: +5 V dc
TP6 with respect to TP7: +5 V dc
TP8 with respect to TP7: -10 V dc



CARRIAGE DRIVE BELT TENSION ADJUSTMENT FIG 5C.1.1

CHAPTER 2

PREVENTIVE MAINTENANCE, PAPER TAPE ATTACHMENT (PTA)

CONTENTS

Paragraph

1 MAINTENANCE INTERVALS
3 Consumables
4 MAINTENANCE PROCEDURES
4 Prerequisites
5 Tape Reader Mechanism
6 Tape Punch Mechanism
7 Chad Removal
8 Punch Motor Drive Belt
10 Power Supply Voltages

ILLUSTRATIONS

Figure | Page

5C.2.1 Tape Punch Assembly 2.4

CHAPTER 2

PREVENTIVE MAINTENANCE,

PAPER TAPE ATTACHMENT (PTA)

MAINTENANCE INTERVALS

1 The maintenance checks described here must be carried out at the maximum service intervals given below. If the equipment is in regular heavy use, the checks should be made more frequently (eg at monthly intervals).

Every 3 months:	Clean the Tape Reader Assembly Remove chad from the Punch mechanism and Reader/Punch Box Check the punch drive belt for wear and adjustment Check the power supply voltages
Every 6 months: (or after 100 1000 ft rolls of tape)	Lubricate the Punch mechanism

2 Providing these checks are performed regularly, the equipment should give long and trouble-free service.

Consumables

3 The only consumable for the PTA is paper tape, either 5-hole or 8-hole. The reel should be checked on a daily basis and replaced as and when required. The chad box should be emptied when it becomes half full.

MAINTENANCE PROCEDURES

Prerequisites

4 The only items required for routine maintenance are light machine oil (NSN 9150-99-220-5735) and a suitable digital voltmeter.

Tape Reader Mechanism

5 The only maintenance required on this is to clean the optic glass on both halves of the assembly with a soft cloth.

Tape Punch Mechanism

Figure 5C.2.1

6 To lubricate the Punch mechanism, proceed as follows:

(1) Remove the chad box from the PTA.

(2) Remove the magnetic strip from the top cover of the Punch mechanism and clean out any accumulated chad.

(3) Remove the Punch Assembly from the Reader/Punch Box (see Category 5B, Chapter 2).

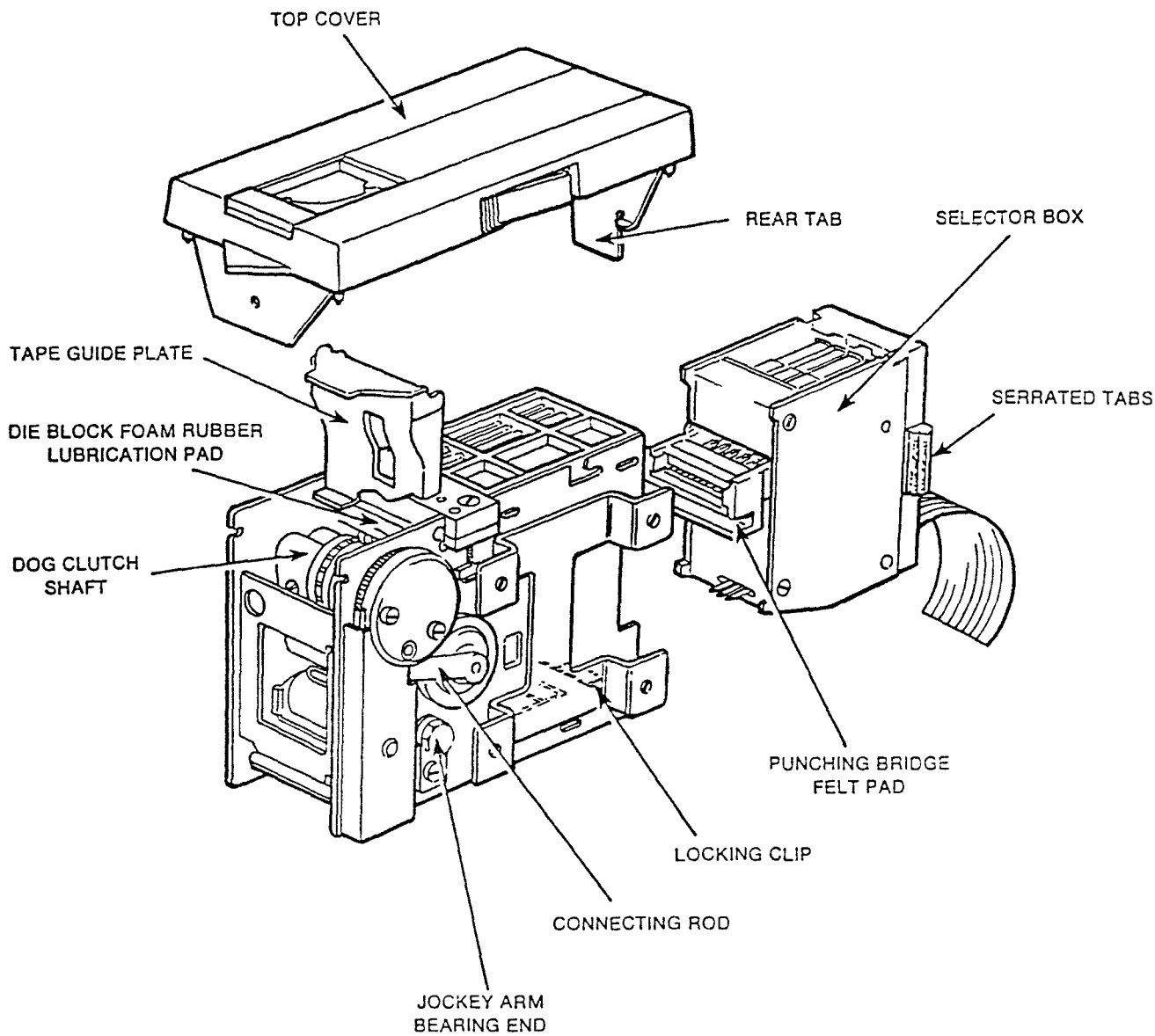


FIG 5C.2.1 TAPE PUNCH ASSEMBLY

(4) Slide the rubber drive belt off the pulley on the left-hand side of the Punch Assembly.

(5) Separate the Punch mechanism from the side of the chad box holder by removing the four retaining screws on the side plate.

(6) Remove the top cover from the mechanism by lifting the metal rear tab and hinging the cover forward.

(7) Separate the selector box from the main assembly by pressing down the metal locking clip beneath the ribbon cable and pulling on the plastic serrated tabs.

(8) Undo the two screws on top of the assembly which hold the die block in place and lift out the punch set.

(9) Lubricate the foam rubber lubrication pad on the die block, the felt pad on the punching bridge, both ends of the connecting rod, and both ends of the jockey arm.

(10) Lift the plastic tape guide plate and lubricate the tape feed wheel where it bears on the tubular axle (next to the dog clutch shaft).

Chad Removal

7 Remove the chad box and the reader/punch box cover plate. Use a suction hose to remove any chad from the inside of the box and the chad box holder. Prise the magnetic strip from the top of the Punch Assembly and remove any chad deposits present.

Punch Motor Drive Belt

8 Check the rubber drive belt for wear and adjustment. Should the belt need replacing, lift it off the two pulleys and slide it out from between the pulleys.

9 To adjust the tension of the drive belt, slacken the four cross-head screws which secure the punch motor to the base and move the motor backwards (to increase the tension) or forwards (to decrease the tension).

Power Supply Voltages

10 To check the power supply voltages, proceed as follows:

(1) Remove the Tape Reel Box.

(2) Unplug SK14 from the Power Supply board and switch on the PTA.

(3) Connect a voltmeter to the pins on PL14 as described below. Check that the voltages observed approximate to those given.

Pin 7 with respect to pin 1: +12 V
Pin 5 with respect to pin 1: -12 V
Pin 6 with respect to pin 1: +12 V
Pin 8 with respect to pin 1: +20 V
Pin 2 with respect to pin 3: -20 V

C7

TELEPRINTER, TGQ SERIES

CATEGORY 7 - PARTS CATALOGUE

PARTS LIST, TGQ OUTFITS

Outfit	NATO Stock Number
TGQ1 Teleprinter	5815-99-780-8816
TGQ2 Teleprinter	5815-99-780-8817
TGQ3 Teleprinter	5815-99-780-8818
TGQ4 Teleprinter	5815-99-780-8819
TGQ5 Teleprinter	TBA
TGQ6 Teleprinter	5815-99-734-4248
TGQ7 Teleprinter	5815-99-795-2039
TGQ8 Teleprinter	5815-99-768-5518
TGQ9 Teleprinter	5815-99-730-2793
TGQ10 Teleprinter	TBA
TGQ11 Teleprinter	5815-99-795-2038

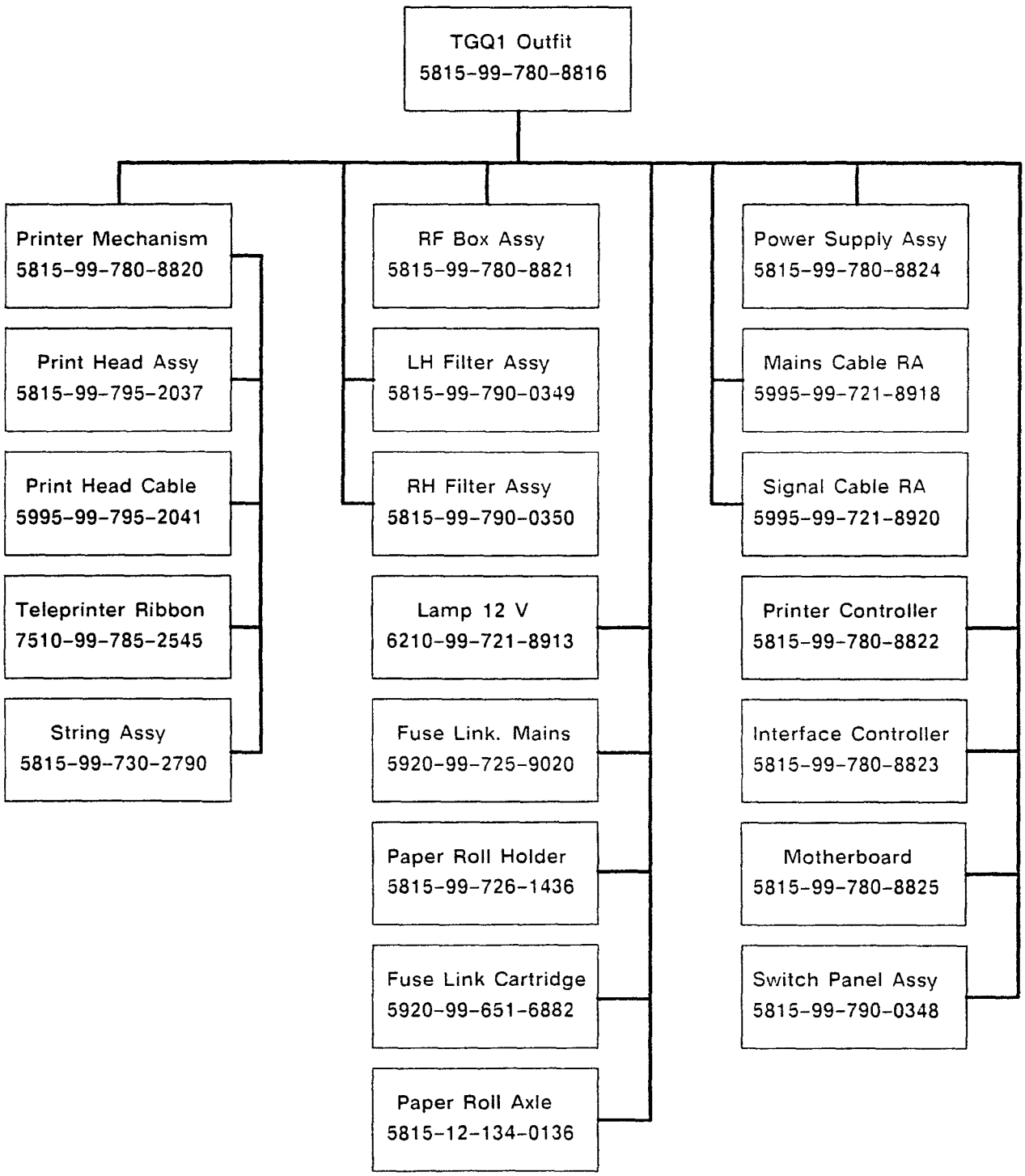
Replacement Modules

TGQ Teleprinter/TGN Teleprinter Adapter Plate	5340-99-730-2791
Paper Roll Retaining Spring	5360-99-730-2794
Keyboard	5810-99-762-0239
Paper Roll Axle	5815-12-134-0136
Paper Roll Holder Assy	5815-99-726-1436
Paper Holder Box Assy, TGQ7	5815-99-726-1437
Paper Tray Assy, TGQ7	5815-99-726-1438
Paper Roll Holder Assy, TGQ8	5815-99-726-1439
String Assembly	5815-99-730-2790
Message Edit Board, TGQ9	5815-99-730-2795
Message Edit Board, TGQ6	5815-99-734-4249
Interface Controller Board, TGQ6	5815-99-734-4250
Interface Controller Board, TGQ9	5815-99-735-0431
Printer Controller Board, TGQ6	5815-99-763-2037
Printer Mechanism	5815-99-780-8820
RF Box Assy	5815-99-780-8821
Printer Controller Board	5815-99-780-8822
Interface Controller Board	5815-99-780-8823
Power Supply Assy	5815-99-780-8824
Motherboard	5815-99-780-8825
Switch Panel Assy	5815-99-790-0348
Left-Hand Filter Board Assy	5815-99-790-0349
Right-Hand Filter Board Assy	5815-99-790-0350
Printer Mechanism, TGQ7	5815-99-795-1458
Message Edit Board, TGQ4	5815-99-795-2030
Printer Controller Board, TGQ7	5815-99-795-2031
Interface Controller Board, TGQ7	5815-99-795-2032
Interface Controller Board, TGQ4	5815-99-795-2033
56 Kbyte Memory Expansion Board	5815-99-795-2035

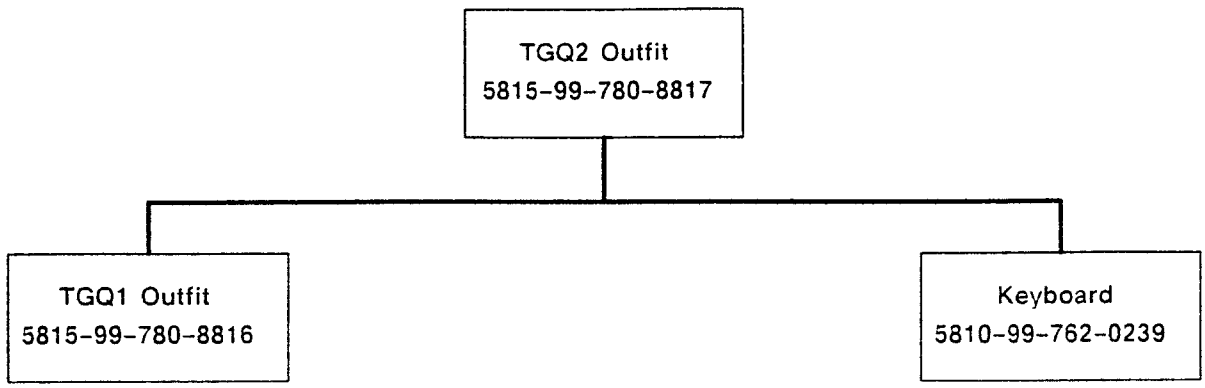
Replacement Modules	NATO Stock Number
Print Head Assy	5815-99-795-2037
Interface Controller Board, TGQ5 and TGQ11	5815-99-795-2040
Installation Kit, TGQ8	5820-99-722-4019
Fuse Link Cartridge 5x20 3.15 A	5920-99-651-6882
Fuse Link (Mains) 5x20 2 A (anti-surge)	5920-99-725-9020
Signal Line Cable (Straight)	5995-99-721-8915
Mains Cable (Rt Angle)	5995-99-721-8918
Mains Cable (Straight)	5995-99-721-8919
Signal Line Cable (Rt Angle)	5995-99-721-8920
Print Head Cable Assy	5995-99-795-2041
Lamp, 12 V 110 mA S2210	6210-99-721-8913
Teleprinter Ribbon	7510-99-785-2545
Linefeed Kit	TBA
Print Head Ribbon Guide	TBA
Reed Relay PEC	TBA

FAMILY TREES, TGQ OUTFITS

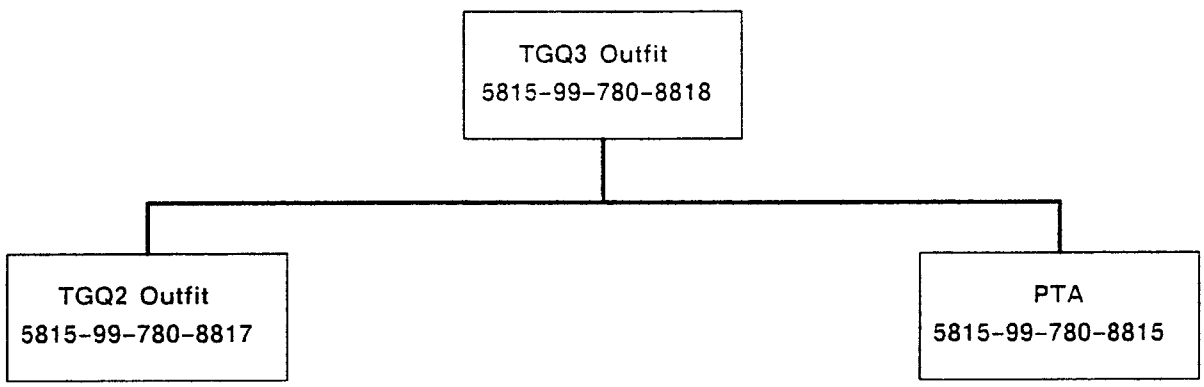
TGQ1 OUTFIT



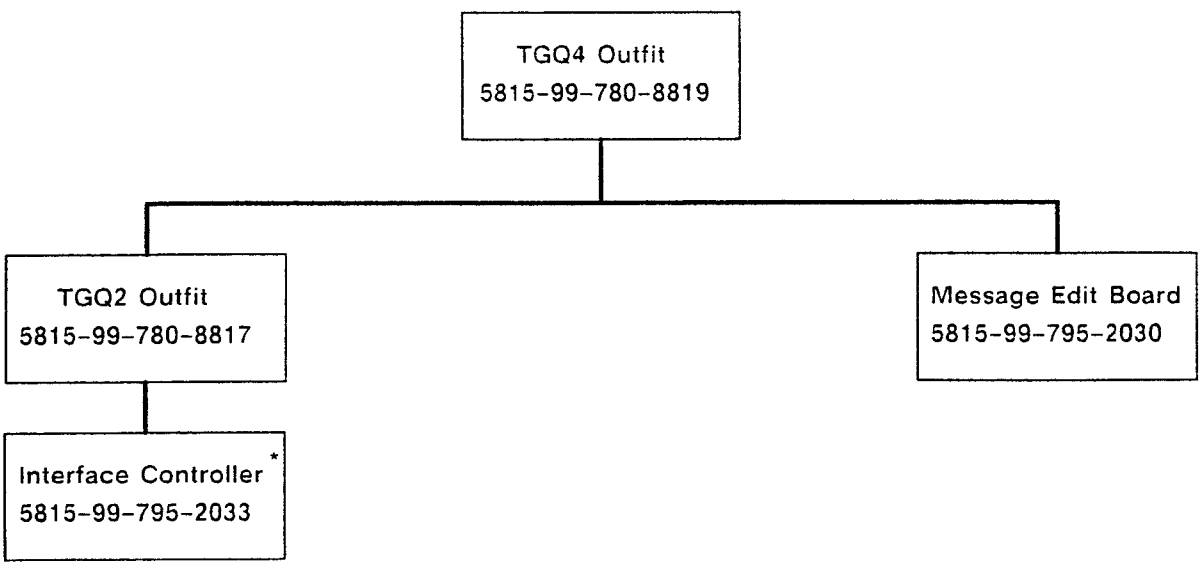
TGQ2 FAMILY TREE



TGQ3 FAMILY TREE

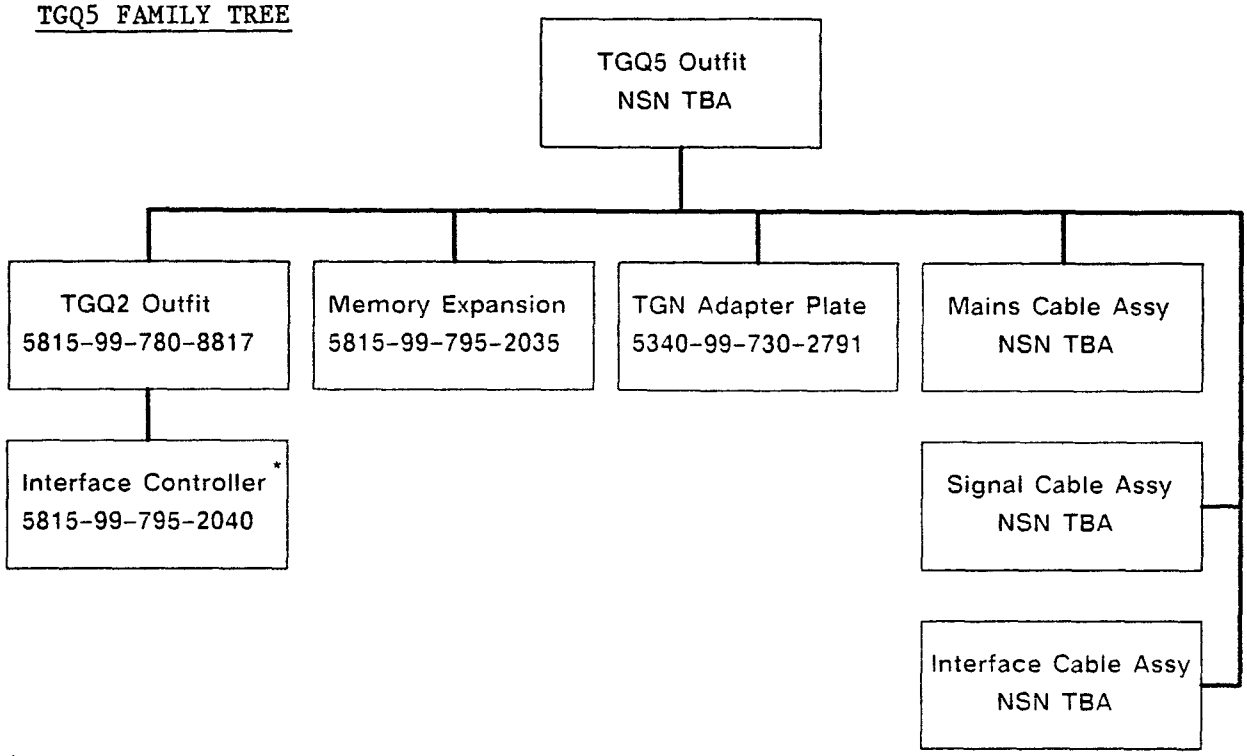


TGQ4 FAMILY TREE



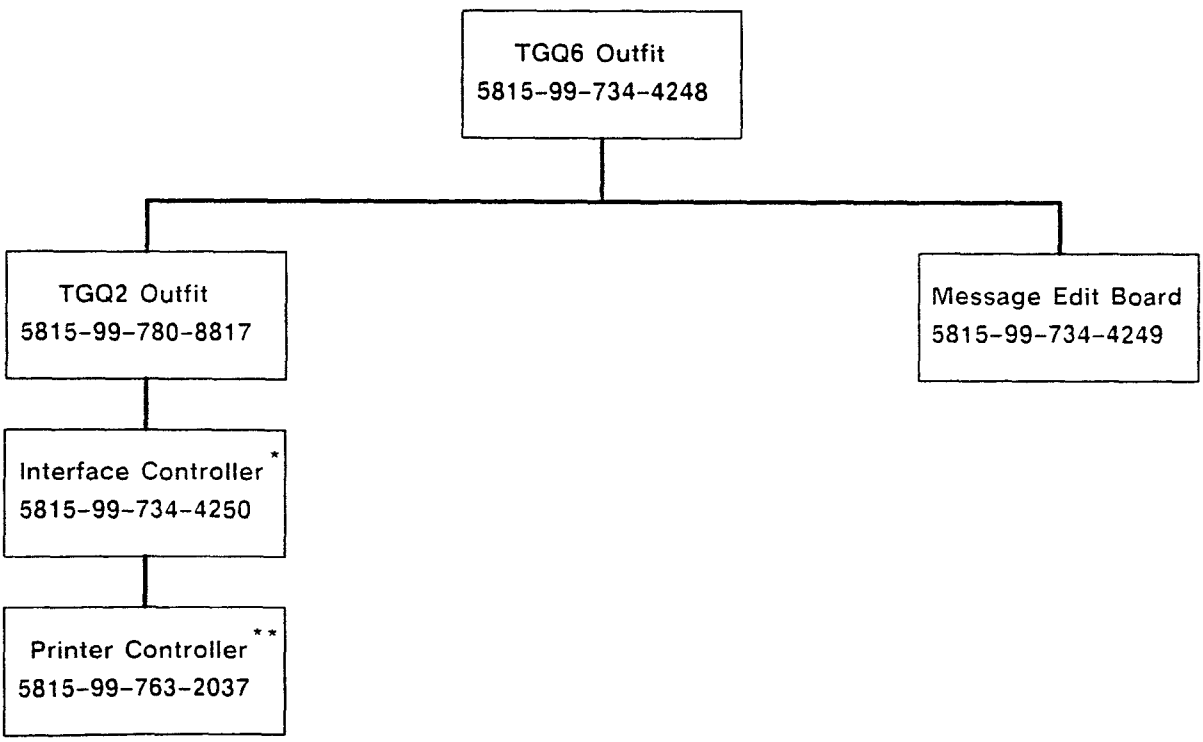
* Replaces Interface Controller 5815-99-780-8823

TGQ5 FAMILY TREE



* Replaces Interface Controller 5815-99-780-8823

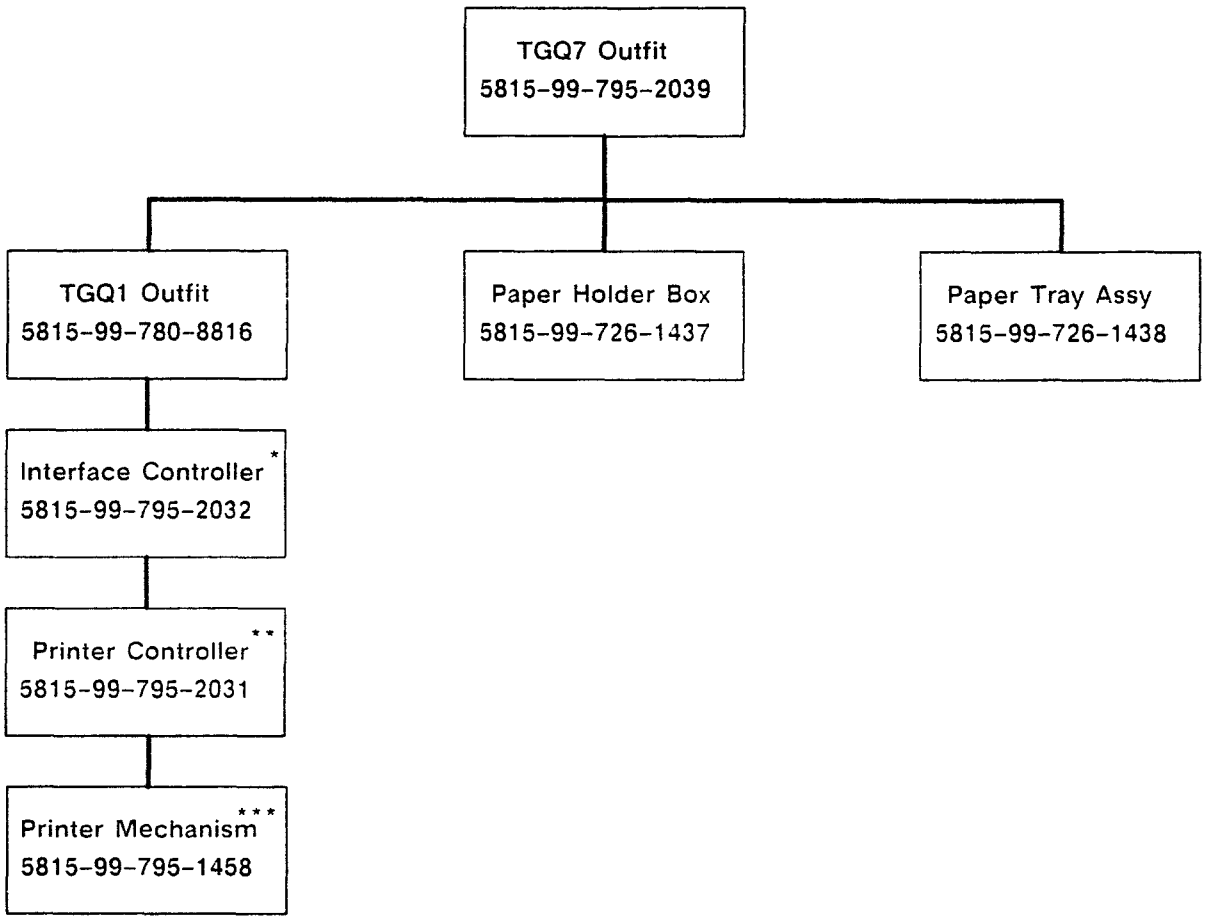
TGQ6 FAMILY TREE



* Replaces Interface Controller 5815-99-780-8823

** Replaces Printer Controller 5815-99-780-8822

TGQ7 FAMILY TREE

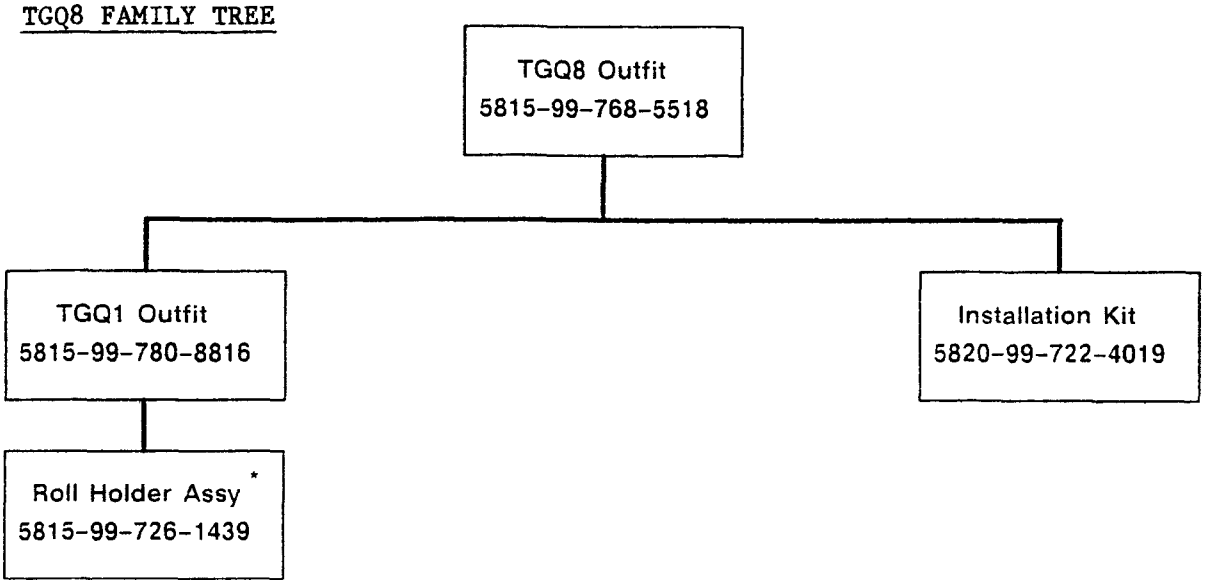


* Replaces Interface Controller 5815-99-780-8823

** Replaces Printer Controller 5815-99-780-8822

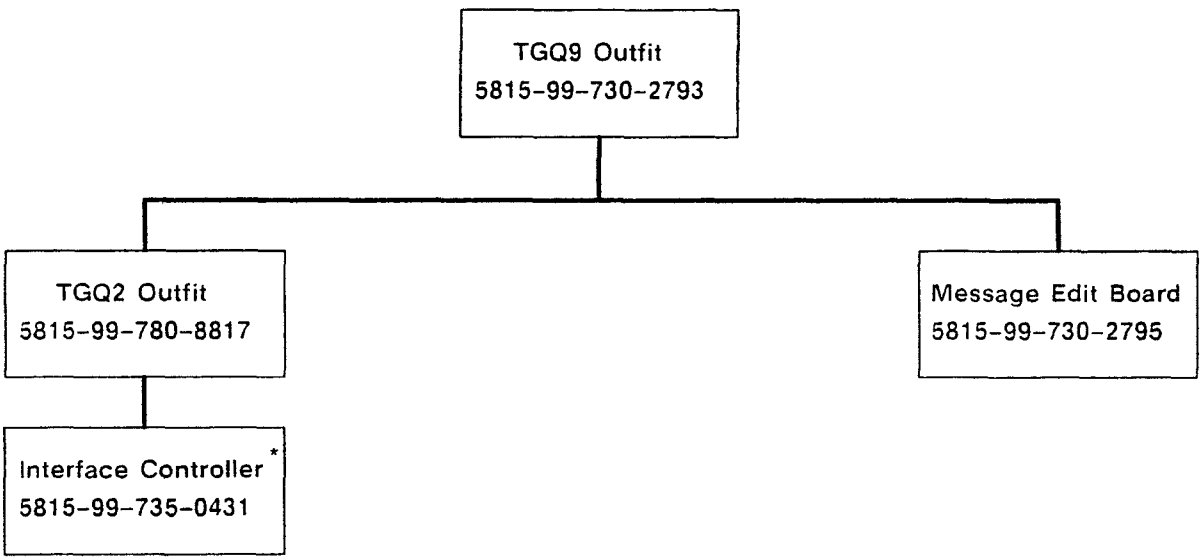
*** Replaces Printer Mechanism 5815-99-780-8820

TGQ8 FAMILY TREE



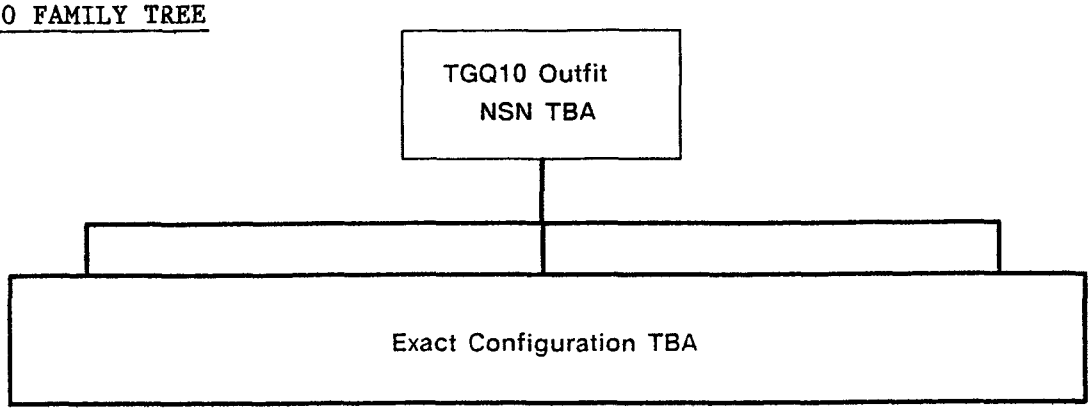
* Replaces Roll Holder Assy 5815-99-726-1436

TGQ9 FAMILY TREE

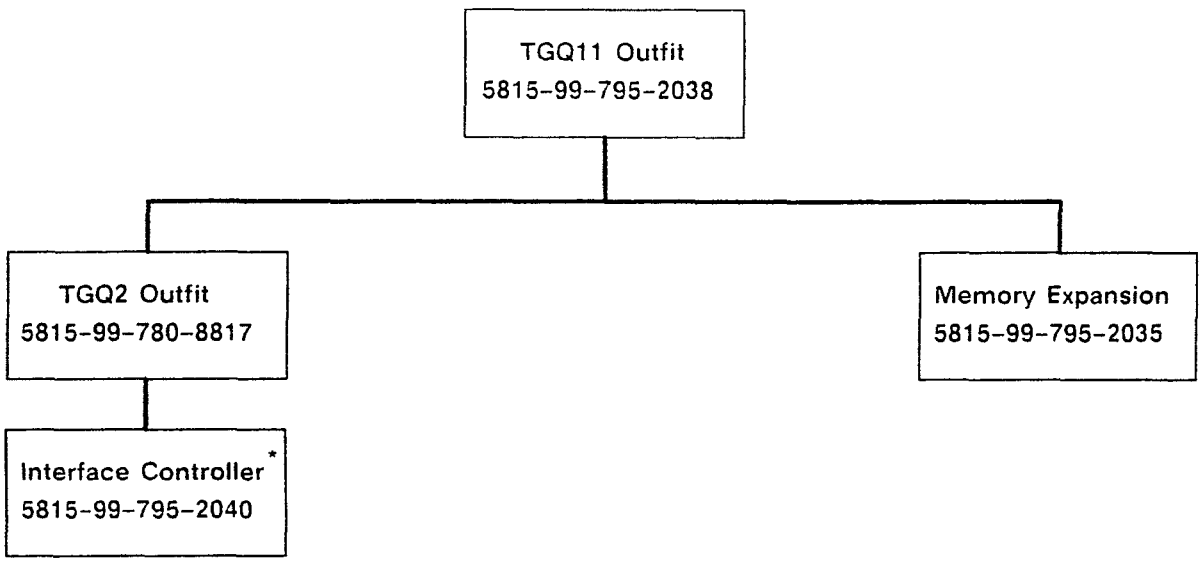


* Replaces Interface Controller 5815-99-780-8823

TGQ10 FAMILY TREE



TGQ11 FAMILY TREE



* Replaces Interface Controller 5815-99-780-8823

PARTS LIST, PAPER TAPE ATTACHMENT (PTA)

	NATO Stock Number
Paper Tape Attachment	5815-99-780-8815

Replacement Modules

Punch Drive Belt, size 228	5330-99-713-6150
Brake Arm Assy	5815-99-726-1440
Tape Reader Assy	5815-99-785-2540
Tape Punch Assy	5815-99-785-2542
Switch Panel Assy	5815-99-785-2543
Filter Board Assy	5815-99-785-2544
Power Supply Assy	5815-99-785-2546
Controller Board	5815-99-790-0347
Fuse Link Cartridge, 5x20 2 A (time lag)	5920-99-652-3833
Fuse Link Cartridge	5920-99-765-7573
Transformer Assy	5950-99-795-2036
Signal Cable (PTA to TGQ)	5995-99-721-8917
Mains Cable	5995-99-721-8918
Chad Box	5999-99-733-6649
RF Box Assy	6110-99-785-2541

FAMILY TREE, PAPER TAPE ATTACHMENT

