MASTER CLOCK SYSTEM 1A

HANDBOOK

7273

BRITISH TELECOMMUNICATIONS plc

LOCAL COMMUNICATION SERVICES HEADQUARTERS

MASTER CLOCK SYSTEM 1A

RPS 0355

HANDBOOK

1 HR B 239 PART 1 WHITE
24 HR B 240 " TURQ

2 GSBC DIRECT TO JACK. WHITE
3 1SBC DIRECT TO JACK. BLUE
1 30SBC " " " TURQ
30 min B 239 PART 2. BLUE

Authorised for issue by _____

Mr R. Smith AES 2.1.4. Date _____

CONTENTS

PAGE ISSUE STATE

This record must be updated when an amendment is incorporated in this manual. * signifies that the issue is published.

PAGE NO	PAGE ISSUE NUMBER									
	1	2	3	4	5	6	7	8	9	10
1	*									
2	*									
3	*									
4	*									
1.1	*									
2.1	*									
2.2	*									
2.3	*									
2.4	*									
2.5	*									
2.6	*									
2.7	*									
2.8	*									
3.1	*									
3.2	*									
3.3	*									
3.4	*									
3.5	*									
3.6	*									
3.7	*									
4.1	*									
4.2	*									
4.3	*									
4.4	*									
4.5	*									
4.6	*									
4.7	*									
4.8	*									
4.9	*									
5.1	*									
5.2	*									
5.3	*									
5.4	*									
5.5	*									
5.6	*									
5.7	*									
5.8	*									

AMENDMENT RECORD

This amendment record must be completed whenever an amendment is incorporated into this manual.

Date	Issue/Amendment	Issue no.
Sep 85	Initial Issue	1

SECTION 1 - INTRODUCTION

1.1. PURPOSE

The purpose of this handbook is to provide the information required for planning, installing and maintaining the Master Clock System 1A.

1.2. HISTORY

The need for an electronic alternative to the pendulum type of Exchange Master Clock had been known for some years. At the time the decision to develop the system was made resourses at THQ were being reduced. So the then Eastern Region development group in Colchester were given the Project. On completion of the project in 1983 full manufacturing documentation was available. However the usual range of specifications, AT/ATW Diagram, Diagram Notes and Work Specifications had not been produced. This handbook attempts to fill the gap left by these omissions in providing that information to area staff.

1.3. FORMAT

The remainder of this handbook is subdivided into the following sections;

Section 2 - System Description

> The System Description outlines the main features and functions of the Master Clock System 1A and gives details of each unit in the system.

Section 3 - Planning

> This section outlines the necessary considerations for planning the instalation of the Master Clock System 1A. The section deals with both the whole System and individual electronic clocks.

Section 4 - Instalation

> This section outlines the instalation instructions including mounting and wiring as well as setting up and testing the system.

Section 5 - Maintenance

> This section outlines the information needed to operate and maintain the system.

SECTION 2 - SYSTEM DESCRIPTION

SECTION 2 CONTENTS

2.1. INTRODUCTION

This section describes the features of the new Master Clock System 1A. It details the facilities required to replace the existing Exchange Pulse clocks and some new features which should enhance the System. This section also includes details of the features provided by each of the modules used in the System.

2.2. REPLACEMENT OF EXISTING CLOCK SUPPLIES

The Master Clock System can replace Exchange Clocks used to generate pulses. It will replace Clocks No 36, 46, 62A and 70A, and also the Clock unit GMT 34.

Details of the pulses provided to replace existing clocks are given in the following table.

No.	Pulses	Description	Relay Unit No. 33A Output	Use
1	30 sec clocks	A pulse approx 200ms every 30 sec. *	ETH — PE, PEA — o/p	Clock 36
2	30 sec equip.	A pulse approx 200ms every 30 sec.	ETH — PD — o/p	Clock 36
3	1 sec	A pulse approx 200ms every sec.	ETH — PB — o/p	Clocks 36 & 46
4	6 sec	A pulse approx 200ms every 6 sec.	ETH — PC — o/p	Clocks 36 & 46
5	3 x 1 sec	3 x 1 sec pulse followed by 3 sec gap	ETH — PA — o/p	Clock 46
6	S2	A pulse of 30 sec duration every 30 min on the Hour and Half Hour	ETH — PG, PGA — o/p	Clock 62A
7	S1	A pulse of 1 min duration every 30 min at 28.5 and 58.5 mins past the Hour	o/p — ETH — PF, PFA	Clock 62A
8	1 Hr	A pulse of 30 sec duration every hour on the hour	ETH — PH — o/p	Clock 62A
9	24 Hr	A pulse of 6 min duration starting at 12.57 pm.	ETH — PJ — o/p	Clock 70A

* **NOTE** This pulse is modified by the Advance/Retard key see paragraph 2.4.3.

2.3. ADDITIONAL FEATURES

The main aspects of the design of the Master Clock System 1A are the ease of maintenance and accuracy of timekeeping. The Clock is crystal and microprocessor controlled giving low operating power and high noise immunity. The Clock supplies in one unit all the basic clock pulses for Exchange Systems provided at the moment by Clocks 36, 46, 62A and 70A, as well as several additional functions not available with existing exchange clocks.

2.3.1. Tariff Changeovers

The System provides accurate S.T.D. tariff changeovers. Output pulses occur in relation to real time at the 30 second and 1 minute points.

2.3.2. Synchronisation

The Clock can be synchronised with the Speaking Clock. When available, a Speaking Clock feed can be connected to the System and the Clock put into a TIMLOCK mode. Should the Clock drift by more than 1/64th of a second, correction occurs automatically.

The Clock can also be operated in Manual Synchronisation Mode if a Speaking Clock feed is not available.

Time corrections to acheive synchronisation are made without affecting any dependent equipment by ensuring that pulse intervals and pulse lengths are not significantly altered. This is achieved by the RCA 1802 reading the time when a synchronising signal is received, calculating the error and applying a correction by altering its speed by a factor of 1 in 64 until the necessary adjustment has been made. An indicator on the front panel shows when this is taking place. In manual synchronisation mode this process can take a few minutes.

2.3.3. Advance/Retard

The Advance/Retard key provides for time correction of the wall clock circuits. The principle of not clipping output pulses is applied to the Advance/Retard key used in conjunction with the 30-second clock output. The Advance/Retard key is not connected to the 30-second output but is simply monitored by the processor shortly before each pulse is produced. It should be noted that the output is unaffected even if the key is moved while a pulse is present.

2.3.4. Winter and Summer Time Changes

The ability is provided to program the half-yearly change from GMT to BST or vice versa, so that all Clocks and other exchange equipment can be altered at the correct time without the need for maintenance staff to attend.

The automatic programming is acheived by means of a code keyed into the Clock System during the week preceding a time change, automatic advance or retard sequences are used to change from GMT or BST.

2.3.5. Call Revenue

The Clock can be used to provide increased call revenue when used in Group Switching Centres (GSCs). The S1 tariff changeover pulse can be delayed by 30 seconds when the tariff changes from a high to a low rate.

2.3.6. Slave Wall Clock Output

The System can supply 12 wall clock circuits with upto 15 clocks in each circuit, a total of 180 wall clocks.

2.3.7. Back Up Batteries

The back-up batteries if kept fully charged provide for 2 to 3 hours of back up running (clock only) in case of a failure of the -50v supply.

2.3.8. Data Clock

A data output is provided containing DAY, MONTH, HOURS, MINUTES and SECONDS information.

2.4. MODULE DESCRIPTION

The complete System comprises two Electronic Clocks, two Relay Units, one Control Unit and one Distribution Unit, all mounted on a Wallboard.

The System is modular and all units have to be ordered seperately. The complete System consists of 6 units described in the table below.

No. in System	Identification	RB Code
2	Clock Electronic No. 1A	314440
2	Relay Unit No. 33A	314437
1	Control Unit No. 64A	314439
1	Distribution Unit No. 5A	314438
1	Mounting, Clock System No. 1A	314442
1	Wallboard, Clock System No. 1A	314441

2.4.1. Clock Electronic No.1A.

The Clock is crystal controlled providing microprocessor controlled pulses. It has a large centrally placed liquid crystal display (LCD) which displays the time when in its normal running mode. When required this LCD will display the date or other information.

The various LEDs and buttons on the Clock are described below.

a) SELECT Controlled LEDs

There are 4 LEDs on the LHS of the central LCD which are controlled by the SELECT button. These LEDs light giving a visual indication of the features which are being set at the time.

i) TIME/SYNC - this is lit (yellow) in normal mode when the Clock is synchronised.

ii) TIME/SET - this lights (red) only when the time is being set.

iii) DATE/SET - this lights (red) only when the date is being set.

iv) MISC - this lights (red) only when miscellaneous functions are being set. eg. When the GMT/BST programming code or the Clock synchronisation mode is being changed.

b) Status Indicators

The status indicator on the top LHS has 3 red LEDs;

i) SYNC FAIL - In manual synchronisation mode this alarms after 10 days elapsed time between synchronisations. In TIMLOCK mode it alarms if synchronisation has failed.

ii) CORRECTION IN PROGRESS - this lights while correction is in progress and can be present for several minutes if the correction is manually initiated.

iii) AUTO GMT/BST CHANGE SET - this lights when the Clock has been programmed to change time. The Clock is programmed for GMT/BST changes by setting the appropriate code not more than 6 days before the time change.

c) 30 sec Output Indicators

The 30sec OUTPUT indicator on the bottom LHS also has 3 LEDs;

i) RETARD - lights (red) when the Clock is being retarded.

ii) NORMAL - lights (yellow) when the Clock is running normally.

ii) ADVANCE - lights (red) when the Clock is being advanced.

d) Control Buttons

The SELECT (blue), MODE (yellow) and STEP (red) buttons on the RHS are used to set or alter the settings of the Clock. The operation of these buttons is similar to setting a digital watch and precise details of operations can be found in the Installation and Maintenance Sections of this Handbook.

i) SELECT - is used to select the feature requiring alteration by pressing then releasing the button until the apprpriate LED lights.

ii) MODE - is used to identify the particular parameter to be changed. eg. The hours, minutes or seconds in the Time display. Each time the button is pressed and released the next section of the display will flash indicating that this can now be changed.

iii) STEP - this button is operated to step on the digits needing to be changed.

2.4.2. Relay Unit No 33A

The Relay Unit isolates and separates the Clock Unit from the noise prone pulse distributions. It also enables the provision of several isolated outputs for each pulse supply.

This unit is similar to the Clock Unit GMT 34. It has the same 6 outputs as the GMT 34 as well as an additional slave pulse. The clock outputs supplied via the Relay Unit are as listed below;

a) 6 sec Pulse - provides 4 outputs plus 1 slave output.

b) 1 sec Pulse - provides 4 outputs plus 1 slave output.

c) 30 sec Equipment Pulse - provides 4 outputs plus 1 slave output.

d) 30 sec Clock Pulse - provides 12 outputs plus 1 slave output.

e) 3 x 1 sec pulse - provides 3 outputs plus 1 slave output.

f) S1 - provides 6 outputs plus 1 slave output. The slave output can only be used to supply another relay. It cannot be used, as all other slave outputs can, to supply another pulse.

g) S2 - provides 3 outputs plus 1 slave output.

h) Hour Pulse - provides 3 outputs plus 1 slave output.

i) 24 Hour Pulse - provides 3 outputs plus 1 slave output.

The slave outputs can be used to provide extra pulse facilities by driving a slave relay or just on its own (with the exception of S1) if only one supply is required.

Each output from the Clock has an LED to provide a visual check on the relay operation. These LEDs are situated in a line across the top of the Relay Unit and are labelled individually. Each one will light when that pulse is on.

The relay numbers are printed on the covers for ease of identification and to maintain appearance when replacement is needed.

2.4.3. Control Unit 64A

The Control Unit 64A houses control keys, fuses and alarms for both Clocks. Each of the Clocks is fused separately. There is also a fuse for the System as a whole.

The control keys and other features are as detailed below.

a) Advance/Retard Key

The Advance/Retard key feature advances or retards all wall clock circuits by affecting the 30sec clock output. The Clocks are retarded by stopping the pulse output and advanced by stepping at the 1 sec rate. This process is controlled by the processor as described in the section describing Additional Features.

b) Receive Attention Key

A Receive Attention key for the RH and LH Clocks allows the audible alarms to be cancelled to prevent annoyance while faults are being attended to.

c) Alarms

There are 2 alarms as follows;

i) Prompt Alarm - this indicates a power failure and will alarm when power to the Clock is lost eg. when a fuse blows.

ii) Deferred Alarm - this indicates that the synchronisation has failed, or, when the the System is set in manual synchronisation mode, that 10 days has lapsed since the Clock was last synchronised.

d) Other features

i) SYNC FAIL - is a single warning light for both Clocks, and lights when synchronisation has failed.

ii) POWER LED indicates that the power is on.

iii) A lamp test facility provides a visual check that all LEDs are working.

iv) Two battery jacks one for the RHS and one for the LHS are provided.

2.4.4. Distribution Unit No 5A

The Distribution Unit No 5A has 3 main features as detailed below.

a) It provides termination for all external wiring. All cables are fed into the unit through the gap in the caseing on the top RHS of the Distribution Unit and terminate on a strip connection. All input/output wires terminate on the top, or "X" side, of the block whilst the underneath, or "Y" side, is used for all internal wiring terminations.

b) It provides control points for each of the wall clock distribution circuits. It has individual fuses for each of the 12 possible wall clock distribution circuits as well as a fuse for the whole System. Each wall clock circuit can be monitored by a rotary select switch and a LED displays the 30 sec pulse on the selected circuit. Each circuit can be advanced or retarded separately.

c) Each wall clock circuit requires a constant current drive. Adjustment of this current is achieved by fitting straps according to the number of clocks in the circuit.

2.4.5. Wallboard

The wallboard is approximately 1 metre square and is supplied pre-drilled and ready to be mounted on the wall. It has protruding screw heads for slotting the units into place. All the units have key hole slots for positioning and are secured by screws. Cable clips are provided in the appropriate positions for cable fixing. Stand off bushes are fitted on the back of the board. All the necessary screws are supplied with each unit.

2.4.6. Mounting

This is a metal plate which fixes to the Wallboard. Cables from each Relay Unit have a socket which fixes to the mounting. The cable from the Distribution Unit plugs into one of these sockets determining which Clock is in service. This arrangement also provides the changeover facility.

SECTION 3 - PLANNING

SECTION 3 CONTENTS

3.1. INTRODUCTION

This section provides information for the use of the Planning Duty when planning the instalation of the new Master Clock System 1A. Details of reqirements for replacement of a single Clock 36 for maintenance purposes are also included.

3.2. GENERAL

The Master Clock System 1A, which mounts on a special wallboard approximately 1 metre square, consists of two Electronic Master Clocks with a liquid crystal time display, each driving a relay interface unit. The Clocks are supplied via a Distribution Unit No. 5A and controled by a single Control Unit No. 64A which houses alarm lamps and keys, fuses and battery jacks for both Clocks.

Alarms are both prompt and deffered which can be connected to the exchange alarm scheme. The connection of the alarms to the floor alarm should be at the discretion of the exchange according to the requirements. The prompt alarm warns when a fuse has blown and it is therefore desirable that this is connected to the floor alarm. The deffered alarm should be connected to the floor alarm where the TIMLOCK mode is used but not necessarilly connected if the Clock is manually synchronised. The prompt alarm should be regarded as an essential alarm and should be connected to the exchanges own deffered alarm.

The Distribution Unit 5A provides cable termination facilities and also houses the constant current resistors for the pulse type wall clocks.

Full details for each installation will need to be determined locally.

3.2.1. Practices to Avoid

A complete System can be installed or a single Clock Electronic 1A can replace Clock 36 but the Relay Unit No 33A cannot simply replace a GMT 34. Replacing a GMT 34 with a Relay Unit No 33A would require the installation of the Control Unit and Distribution Unit as well which would amount to a "half system". No supporting documentation is available for a "half system".

3.3. COMPLETE SYSTEM INSTALLATION

The following table gives a list of items required for full installation.

R.B. Code	Description	E.T.No.	QTY.
31 4441	Wallboard, Clock System No. 1A	2650-00-04	1
31 4437	Relay Unit No. 33A	2651-00-01	2
31 4439	Control Unit No. 64A	2652-00-01	1
31 4438	Distribution Unit No. 5A	2653-00-01	1
31 4440	Clock Electronic No. 1A	2654-00-01	2
31 4442	Mounting, Clock System No. 1A	2650-00-05	1

The E.T.No. above refers to the Assembly Drawings copies of which can be obtained from A.C.D. Drawing Office.

The siting of the Wallboard, which is about 1 metre square, should be at a suitable height and preferably near fuses and a telephone (for checking time against the Speaking Clock). The cable runs required for feeds should also be considered.

3.3.1. Replacement of Existing Systems

The Master Clock System No. 1A replaces the existing clock system consisting of the following:-

CLOCK 36	1 sec., 6 sec., 30 sec.equip., 30 sec. clocks.
CLOCK 46	1 sec., 6 sec., 3x1 sec. (switchboard control)
CLOCK 62	S1, S2, pulses (30 min.)
CLOCK 70	1 hour, 24 hour (1pm.) pulses.
GMT 34	Exchange and wall clock pulse distribution.

It can also replace Pulse Generator No. 1013 and GMT35 if used in an exchange environment.

The pulse supplies available are as listed in the following table. There is also an additional output (slave) for use with remote relays.

Pulse Supplies

Relay	Pulse	No O/Ps	Description
PA	3 x 1 sec	3	Three 1 sec pulses followed by a 3 sec gap
PB	1 sec	4	200ms duration pulses each second
PC	6 sec	4	200ms duration pulse every 6 seconds
PD	30 sec equipment	4	200ms duration pulses every 30 seconds
PE PEA	30 sec clocks	12	200ms duration pulse every 30 seconds. Also advance (1 sec)/Retard (off) facility
PF PFA	S1 (BK)	6	1 min duration break pulse at 28.5 and 58.5 min past each hour. May be delayed to 29 and 59 min. (50 sec duration) with clock synchronized to the speaking clock (TIM), and with strap ST1 removed.
PG PGA	S2 (MK)	6	30 second duration pulse on the Hour and Half-Hour
PH	1 hour	3	30 second duration pulse on the Hour
PJ	24 hour	3	6 min duration pulse starting at 12.57 pm.

3.3.2. System Power Supplies

a) 50v Supply

A negative 50v supply to the Distribution Unit is required using cable size with 4mm gauge wire. The -50V supply should be as clean as possible and as near the main battery as possible.

b) Fusing

The TXE4A 10A end of suite fuse can be used. In most circumstances the current requirement would be about 5A and a 6A fuse would be adequate, but it is not recommended that it is fused any lower than 5A. A 44A 6A fuse (white) is recommended. A full System used to its capacity would require a 10A fuse with 1A pilot.

c) Earth

The earth lead should be a good earth capable of sinking a maximum of 10A.

d) TIM Feed

The Clock can be synchronised with the Speaking Clock. This requires a connection to the Speaking Clock (ATW 5968 Fig 7) at a level of approx -6dB peak. (To confirm this, use an oscilloscope to check that the "pips" are approximately one volt peak-to-peak). The TIM feed requires a screened cable.

e) Clock Circuit

Clock circuits are constant current and therefore the resistance needs to be adjusted up to a maximum of 15 clocks. This is achieved by strapping according to the number of clocks in the circuit.

f) Multi Phase Pulse Supply

In some exchanges the MPPS if fed from the 30sec clock supply instead of the 30 sec equipment supply. In this situation choose one of the clock circuits and strap A to F.

NOTE - Where the Master Clock System 1A is replacing an existing installation, consideration should be given to the mounting position in respect to the existing cable runs. Interruption to service affecting pulse suppliers should be minimised. The timing of tariff equipment should be checked at frequent intervals during the installation and changeover to the Master Clock System.

3.3.3. Wall Clocks

The wall clock loops are set up by strapping the appropriate tags on the Distribution Unit No. 5A. There is a maximum of 15 clocks in each circuit. Wall clock circuits may be used for M.P.P.S. equipment by strapping tags which removes all ballast resistors from the circuit. The CLT Fuse should be removed and any unnecessary wall clocks, previously used for monitor purposes, recovered.

Determine on an existing system, the most suitable method of reconnecting the existing cables. This may require an extension cable from a new or existing Strip Connection (SC) clock. Pulse supplies may be changed over one at a time or plug PLC removed and the new cabling connected in parallel to the existing system and switching of the old system at changeover.

3.3.4. Data Stream

This Data Stream is primarily to drive LCD Clocks as an alternative to the conventional wall clocks and will be available in the future.

The clocks will be capable of displaying time and date.

With appropriate decoding, the data stream will be able to perform other functions (e.g. Midnight time meter switching, a make pulse from 12.00 midnight to 6 a.m. At present supplied by timeswitch).

The data stream will also be capable of being transmitted over junctions.

Information regarding the data stream and uses may be obtained from Anglia Costal District LS38 Tel. 0206 46436.

3.3.5. Relay Unit No. 33A - Slave Outputs

These outputs may be used to provide one additional pulse source. However the primary use is to drive an extension relay or relay unit local to, or remote from, the Master Clock (in the case of the S1(BK) pulse, the slave contact has a MK action).

The additional relay unit may be a second Relay Unit No. 33A and existing GMT34 (modified, and labelled as such), or constructed locally to suit individual requirements.

In a large installation where a considerable number of additional remote pulse sources are required, it may be more suitable to provide a second Master Clock System 1A.

3.4. REPLACEMENT OF CLOCK 36

A single Clock Electronic 1A can replace Clock 36 but note that the Relay Unit No 33A cannot simply replace a GMT 34. Replacing a GMT 34 with a relay unit would require the installation of a "half system" for which there is no supporting documentation.

The Clock Electronic No. 1A can be used to replace Clock 36 with modifications to GMT 34 Relay Unit.

3.4.1. Items required

A list of items required for each Clock Electronic 1A to be installed is as follows;

a) 1 off Clock Electronic 1A
b) 1 off Cord Connection No.69A
c) 1 off Battery Ni-Cad PP3 8.4v 0.11Ah (e.g. Farnell Electronics GB1166)
d) 1 off Fuse No 44/0.25
e) 4 off Diodes CV8805

3.4.2. Replacement Options

Refer to ISIS TXA/MEP/A092 for details of replacement options for differing Telephone Exchange Equipment.

3.4.3. GMT 34 Relay Unit Convertion

The GMT 34 relays AR, BR, CR, DR need to be converted to battery backed operation, and diode quenching added to protect the transistor outputs of the Electronic Clock.

The items required are as follows;

a) 1 off Mounting F151/20 BH

b) 1 off Cover AR 25 13/32"

c) 1 off Rods Stiffening No. 3

d) 1 off Transformer 3/4 8A

e) 2 off Resistor 91 EG 470 R

f) 1 off Resistor 91 EG 1K 6

g) 1 off Resistor 91 EG 27K

h) 1 off Strip Connection 145 DN

Refer to ISIS TXA/MEP/A092 for modification details and diagrams.

SECTION 4 - INSTALLATION

SECTION 4 CONTENTS

4.1. INTRODUCTION

This section contains the information required to install the Master Clock System 1A, set up the Electronic Clocks and test the System. It also contains the information required to replace a Clock 36 with a single Clock Electronic 1A including reference to the associated GMT 34 modifications.

4.2. MOUNTING AND ASSEMBLY

a) The wallboard should be mounted in the allocated position using 8mm Rawlbolts.(4 OFF.)

b) Secure the Distribution Unit in position centrally at the top of the Wallboard using the 8 screws provided.

c) Fix the Mounting Plate in the centre of the Wallboard using the 4 screws provided.

d) Mount the first Clock Unit on the left side by fitting the key hole slots over the 2 screw heads on the Wallboard and secure the Clock at the top using the screw provided. Check that the battery is in it's compartment on the top of the Clock but do not connect it at this stage.

e) Mount the second Clock Unit on the right side in the same way, not forgetting to check that the battery is present.

f) Mount the first Relay Unit on left side of the Wallboard below the first Electronic Clock by fitting the key hole slots over the screw heads and securing it at the bottom with the screw provided.

g) Mount the Control Unit centrally below the Mounting Plate in the same way.

h) Mount the second Relay Unit on the right side below the second Electronic Clock in the same way.

4.3. SYSTEM CONNECTIONS

All units except the Clock Electronic 1A are supplied with one or more cords already attached.

4.3.1. Relay Units

Each Relay Unit has a thick and a thin cord attatched. The plug on the end of the thin cord from each of the Relay Units plugs into the socket beneath the Clock on the same side. The thick cord from each Relay Unit goes to the Mounting Plate on the corresponding side.

4.3.2. Control Unit

The single cord feed from the Contol Unit goes to the Distribution Unit and is terminated on side Y, the underneath, of the block. The following table gives details of the connections.

NOTE Also see Diagram ET2652-00-04

TBA	Wire terminated on Y side
1	Control Unit/Distribution Unit -50V
9	Control Unit Common Earth
10	Speaking Clock Pair Screen
12	Speaking Clock 1
13	Speaking Clock 2
15	Prompt Alarm
17	Deferred Alarm

The double cord from the Control Unit is used to connect to the Clocks. The socket marked L goes to the plug beneath the left Clock and the socket marked R goes to the plug beneath the right Clock.

NOTE It may be necessary to determine which wire is which from the diagram before terminating on the block.

4.3.3. Distribution Unit

All external cables are terminated on the side X (top) and internal feeds are terminated on the side Y (underneath).

4.3.4. Battery and Fusing Arrangements

Battery Ni-Cad PP3 8.4V 0.11AL should be fitted and now connected. The battery feed to each Clock Electronic 1A must be fused at 250mA using Fuse No 44/0.25 (light brown). The fuse should be sited in a suitable place near to the existing GMT fuses.

Power up the System and plug the cord from the Distribution Unit into the left socket on the Mounting Plate, set up the left Clock and test as described below. Change the plug to the right socket and set up and test the right Clock.

4.4. SETTING UP THE CLOCK

4.4.1. Setting the Time

Procedure to set the Clock	
Step	Operation
1	Set the Clock a few minutes fast, to allow time for completion of all setting up operations, before starting the Clock in synchronisation with the Speaking Clock.
2	Check that the "TIME/SET" LED is lit and that the hour digits are flashing with the seconds held at zero. If these conditions are not present use steps 2 a) and 2 b) to establish these conditions otherwise continue with step 3. a) Press and release the "SELECT" button (blue) several times until "TIME/SET" is selected and this LED is lit. b) Press the "MODE" button (yellow) once. This holds the seconds at zero and flashes the hour digits.
3	Use the "STEP" button (red) to set the hour required.
4	Press the "MODE" button (yellow) once. The hour digits stop flashing and the minute digits now flash.
5	Use the "STEP" button (red) to set the minute required, i.e. a few minutes ahead of the current time.
6	Press the "MODE" button (yellow) once. The minute digits stop flashing and the seconds (still held at zero) now flash.
7	Dial the Speaking Clock.
8	To start the Clock press the "STEP" button (red) when the actual time (third pip) coincides with the time shown on the liquid crystal display. The Clock will now run with the seconds incrementing normally. The "TIME/SET" LED is turned off and the "TIME/SYNC" LED is now on.

NOTE during the time-setting operations (i.e. when the "TIME/SET" LED is on and any pair of digits is flashing) the seconds are held at zero and no output pulses are produced.

4.4.2. Setting the Date, Month and Year

Procedure to set the Date, Month and Year	
Step	Operation
1	Press and release the "SELECT" button (blue) several times until "DATE/SET" is selected and this LED is lit.
2	Press the "MODE" button (yellow) once. The Date digits now flash.
3	Use the "STEP" button (red) to set the required date (day of the month).
4	Press the "MODE" button (yellow) once. The Date digits stop flashing and the Month digits now flash.
5	Use the "STEP" button (red) to set the required month number.
6	Press the "MODE" button (yellow) once. The Month digits stop flashing and the Year digits now flash.
7	Use the "STEP" button (red) to set the required year (tens and units only).
8	Press the "MODE" button (yellow) once. The "DATE/SET" LED should still be on and no digits should be flashing.
9	Press and release the "SELECT" button (blue) several times until the "TIME/SYNC" LED is lit.

NOTE The microprocessor program includes an automatic adjustment for leap years.

4.4.3. Setting the GMT/BST Code

Step	Operation
1	Press the "SELECT" button (blue) several times until "MISC" is selected and this LED is on.
2	Press the "MODE" button (yellow) once and use the "STEP" button (red) to set up the required code. The only four possible codes are; 00 - GMT this week and GMT next week 01 - GMT this week changing to BST next week 11 - BST this week and BST next week 10 - BST this week changing to GMT next week
3	Press and release the "SELECT" button (blue) until the "TIME/SYNC" LED is on.

4.5. TESTING

Verify that the Clock Electronic No. 1A can be set up according to the instructions contained in the the charts in paragraph 4.4. Note that the 9 Volt nickel cadmium battery used for standby purposes will probably require several hours charging, in the clock, before it is capable of running the display.

Verify that the Clock Electronic 1A runs after setting up. Check that all the facilities of the Clock will operate correctly. Check the oscillator frequency with an oscilloscope or frequency counter.

Check also the functions of the Relay Unit 33A, Control Unit 64A, and Distribution Unit 5A, verifying that the correct outputs appear on strip connector TBA in the Distribution Unit.

The plug on the Mounting must now be changed to the right socket and all the above tests repeated for the right half of the System.

4.6. BRINGING INTO SERVICE

To guard against any services being affected by early component failure ensure that the Master Clock System 1A is running for at least 24 hours before putting it into exchange use. It is necessary to repeat all tests before starting to changeover from the old clock system.

NOTE Care must be taken not to affect tariff equipment during re-wiring and change over to the Master Clock. Check tariff equipment frequently to ensure that no interuption occurs.

Record the Strip Connector TBA to exchange connection details (rack etc) for future reference, and send a photo-copy or list of outputs used to THQ/AES 2.1.4. This is required to help determine future requirements.

4.7. REPLACING EXISTING CLOCK 36

The Clock Electronic 1A should be mounted in the allocated position and Cord Connection 69A plugged into the socket underneath the Clock. Check that the battery is in it's compartment but do not connect it at this stage.

Follow the supplied instructions to modify the exchange wiring to replace the existing clock with the Clock Electronic 1A.

4.7.1. Cord Connection 69A

The following table gives details of the cable connections.

SKB Connection	Signal Name	Pulse No.	Colour	Comment
SKB2	Earth		Red	
SKB3	-50V		Black	
SKB4	6 sec pulse	P4	yellow/white	
SKB5	1 sec pulse	P3	orange/white	
SKB6	30 sec equipment pulse	P2	red/white	
SKB7	30 sec clocks pulse	P1	black/white	
SKB14	Data Clock leg A		grey	)twisted
SKB15	Data Clock leg B		orange	)pair

If the Data Clock facility is not required the orange and grey twisted pair should be cut back or terminated on spare tags.

4.7.2. GMT 34 Relay Unit Convertion

GMT 34 is converted by changing relays AR, BR, CR, DR to battery backed operation, and adding diode quenching to protect the transistor outputs of the Clock Electronic 1A.

Details of this conversion work is given in full in ISIS TXA/MEP/A092.

4.7.3. Advance/Retard Key

The Advance/Retard Key is provided on the Control Unit for the complete System and is not present when only the Clock Electronic 1A is used. This can be overcome by putting a 3 way switch into the 30 sec clock wire to the GMT. The first position on the switch disconnects the normal feed in order to Retard, the second position being that for normal operation ie. 30 sec supply and the third position switches to the 1 sec supply in order to Advance.

4.7.4. Setting up the Clock

Carry out the operations listed in paragraphs 4.4.1. and 4.4.2.

4.7.5. Testing

Carry out the tests listed in paragraph 4.5.

SECTION 5 - MAINTENANCE INFORMATION

SECTION 5 CONTENTS

5.1 INTRODUCTION

This section provides operating instructions and maintenance procedures required to run the Master Clock System 1A.

NOTE After completing any of these operations or procedures check that all Wall Clocks and other dependant equipment are correct and working.

5.2. OPERATION

The Master Clock System 1A derives the time signal from a free-running quartz crystal oscillator and is therefore subject to drift. The errors are expected to be less than plus or minus three seconds per week. However, if left uncorrected the drift could accumulate to give an unacceptably large error.

There are two fundamental synchronisation modes in which the Master Clock can be operated and these are known as TIMLOCK and Manual.

5.2.1. Manual Synchronization

If the Clock is not syschronized for ten days the Clock continues to run normally but the "SYNC FAIL" (a low-priority deferred alarm) LED is on. A new ten day period is restarted, and if relevant the alarm is cancelled, whenever the Clock is properly re-synchronized.

Manual synchronisation involves giving the Clock a manual signal on an exact minute. The microprocessor computes the time error and takes the appropriate action.

The following sequence assumes the Clock is within ±20 seconds of the correct time.

Procedure to manually resynchronise the Clock	
Step	Operation
1	Press and release the "SELECT" button (blue) several times until "TIME/SYNC" is selected and this LED is lit.
2	Press the "MODE" button (yellow) once. The seconds digits now flash.
3	Listen to the speaking clock and wait for an announcement referring to an exact minute. On the third pip of this announcement, press "STEP" button (red). The seconds display will stop flashing. The "TIME/SYNC" LED should remain lit.

If, at the time of the signal, the "seconds" display was between 00 and 20, the microprocessor assumes that the Clock was fast by this amount, and reduces the effective crystal frequency by one 64th for a given time to correct the error. (This means that a four second error will take about four minutes to correct). During this period the "CORRECTION IN PROGRESS" LED flashes slowly (once per second).

If the "seconds" display was greater than 40, the microprocessor assumes that the Clock was slow and increases the effective crystal frequency by one 64th. The "CORRECTION IN PROGRESS" LED flashes quickly (twice per second).

Note that the correction rate is the same in both cases.

If the display was between 20 and 40 seconds no corrective action would be taken automatically. It will be necessary to confirm that the stanby clock is correct, to changeover to the standby clock (paragraph 5.2.5.) and then reset the clock (paragraph 5.2.6.).

5.2.2. TIMLOCK Synchronization

When running normally, the "CORRECTION IN PROGRESS" LED should flash once every ten seconds, in time with the third pip. Synchronization errors of less than one 64th of a second are ignored, but if the error is greater than this, automatic corrective action is taken as described for manual correction.

When the speaking Clock is adjusted, the Clock mode is changed to "pip-search" (code 03 on the LCD, not programmable) if normal synchronisation is lost for one minute. If the "pip-search" is successful within one further minute the Clock re-synchronizes itself and reverts to normal. If unsuccessful, the "SYNC FAIL" LED lights.

The "SYNC FAIL" condition will also arise if the speaking clock feed is interrupted for more than two minutes.

Under "SYNC FAIL" conditions the Clock must be manually re-synchronised as described in paragraph 5.2.1.

5.2.3. Greenwich Mean Time/British Standard Time Changes

The Clock will carry out GMT/BST changes automatically. This is arranged by setting the Clock to one of 4 codes during the week preceeding the time change. TI E6 G0010 Twice Yearly Change of Time paragraph 15 also refers.

During normal Summer months the code should be left on "11" indicating BST for this week and next week.

When the change back to GMT is due, the code should be changed to "10". This may be done at any time during the 6 days before the actual change is due.

During normal Winter months the code should be left at "00".

When the change to BST is due, set the code to "01" at any time during the 6 days before the actual change is due.

Procedure to change the GMT/BST code	
Step	Operation
1	Press the "SELECT" button (blue) several times until "MISC" is selected and this LED is on.
2	Press the "MODE" button (yellow) once and use the "STEP" button (red) to set up the required code. The only four possible codes are; 00 - GMT this week and GMT next week 01 - GMT this week changing to BST next week 11 - BST this week and BST next week 10 - BST this week changing to GMT next week
3	Press and release the "SELECT" button (blue) until the "TIME/SYNC" LED is on.

If either "01" or "10" has been set, the "AUTO GMT/BST CHANGE SET" LED will be on. The actual changes occur on a Sunday morning as detailed below.

Code "01" - The Clock will "jump" from 00:59:59 (GMT) to 02:00:00 (BST). The GMT/BST code will be altered to "11" by the microprocessor, which will also generate 120 extra pulses on the 30-second clock output (if the advance/retard key has been left in the normal position). During this time the "NORMAL" LED flashes twice per second.

Code "10" - The time will change from 01:59:59 (BST) to 01:00:00 (GMT). The GMT/BST code will be altered to "00" and the 30-second clock output will be held off for one hour (if the A/R key is normal) during which time the "NORMAL" LED flashes twice per second.

The S2 and 1 hr outputs are also corrected automatically according to the code selected.

5.2.4. Advance or Retard

The usual Advance/Retard facilities for 30 second clock pulses are provided in the Control Unit 64A, but these are guarded by the microprocessor to prevent pulses being split or shortened. During Retard the red RETARD LED is lit and no pulses are produced. During Advance the red ADVANCE LED is lit and pulses are produced once per second.

When the automatic GMT/BST facility is used, an automatic Advance or Retard is initiated even though the Advance/Retard key is in the normal position. In these circumstances the "NORMAL" LED flashes twice per second. If the Advance/Retard key is operated during this procedure, the automatic advance or retard output is cancelled and the output is once more key-controlled. The Clock will still continue to show the correct time.

The facility to advance or retard individual wall clock circuits is built into the Distribution Unit 5A.

To retard an individual wall clock circuit remove the fuse for the required number of pulses.

To advance a particular circuit set the rotary select switch to the required circuit. Set the switch to 1 sec . This will cause all the clocks on that circuit to step at 1 sec rate. After the required number of pulses have been given then restore the switch to the 30 sec position.

The rotary switch can also be used to monitor pulses on any particular circuit.

5.2.5. Changeover

Pulse supply changeover is by means of the 71 way plug and sockets mounted between the two Clocks. Should it be necessary to change the output pulses from one Clock to the other move the plug (PLC), from one socket to the other.

Procedure to change the output pulses from one Clock to another	
Step	Operation
1	Ensure that the Clock to which you are changing is set to the correct time.
2	Avoid attempting changeover when other pulses are likely to occur eg. on 1/2 hours, hours, 1 pm and tariff changeover times. Imediately after a 30 sec pulse has occured is probably the best point at which to change the PLC plug from one socket to the other. (Try to changeover before the next 6 sec pulse occurs.)
3	Check that the pulse LEDs are still flashing and that all systems using the clock pulse are still correct eg. tariff equipment etc.

5.2.6. Resetting the Clock

Procedure to reset the Clock	
Step	Operation
1	Set the Clock a few minutes fast, to allow time for completion of all setting up operations, before starting the Clock in synchronisation with the Speaking Clock.
2	Press and release the "SELECT" button (blue) several times until "TIME/SET" is selected and this LED is lit.
3	Press the "MODE" button (yellow) once. This holds the seconds at zero and flashes the hour digits. (The Clock is initialised in this state when power is first applied).
4	Use the "STEP" button (red) to set the hour required.
5	Press the "MODE" button (yellow) once. The hour digits stop flashing and the minute digits now flash.
6	Use the "STEP" button (red) to set the minute required, i.e. a few minutes ahead of the current time.
7	Press the "MODE" button (yellow) once. The minute digits stop flashing and the seconds (still held at zero) now flash.
8	Dial the Speaking Clock.
9	To start the Clock press the "STEP" button (red) when the actual time (third pip) coincides with the time shown on the liquid crystal display. The Clock will now run with the seconds incrementing normally. The "TIME/SET" LED is turned off and the "TIME/SYNC" LED is now on.

NOTE during the time-setting operations (i.e. when the "TIME/SET" LED is on and any pair of digits is flashing) the seconds are held at zero and no output pulses are produced.

Procedure to set the Date, Month and Year	
Step	Operation
1	Press and release the "SELECT" button (blue) several times until "DATE/SET" is selected and this LED is lit.
2	Press the "MODE" button (yellow) once. The Date digits now flash.
3	Use the "STEP" button (red) to set the required date (day of the month).
4	Press the "MODE" button (yellow) once. The Date digits stop flashing and the Month digits now flash.
5	Use the "STEP" button (red) to set the required month number.
6	Press the "MODE" button (yellow) once. The Month digits stop flashing and the Year digits now flash.
7	Use the "STEP" button (red) to set the required year (tens and units only).
8	Press the "MODE" button (yellow) once. The "DATE/SET" LED should still be on and no digits should be flashing.
9	Press and release the "SELECT" button (blue) several times until the "TIME/SYNC" LED is lit.

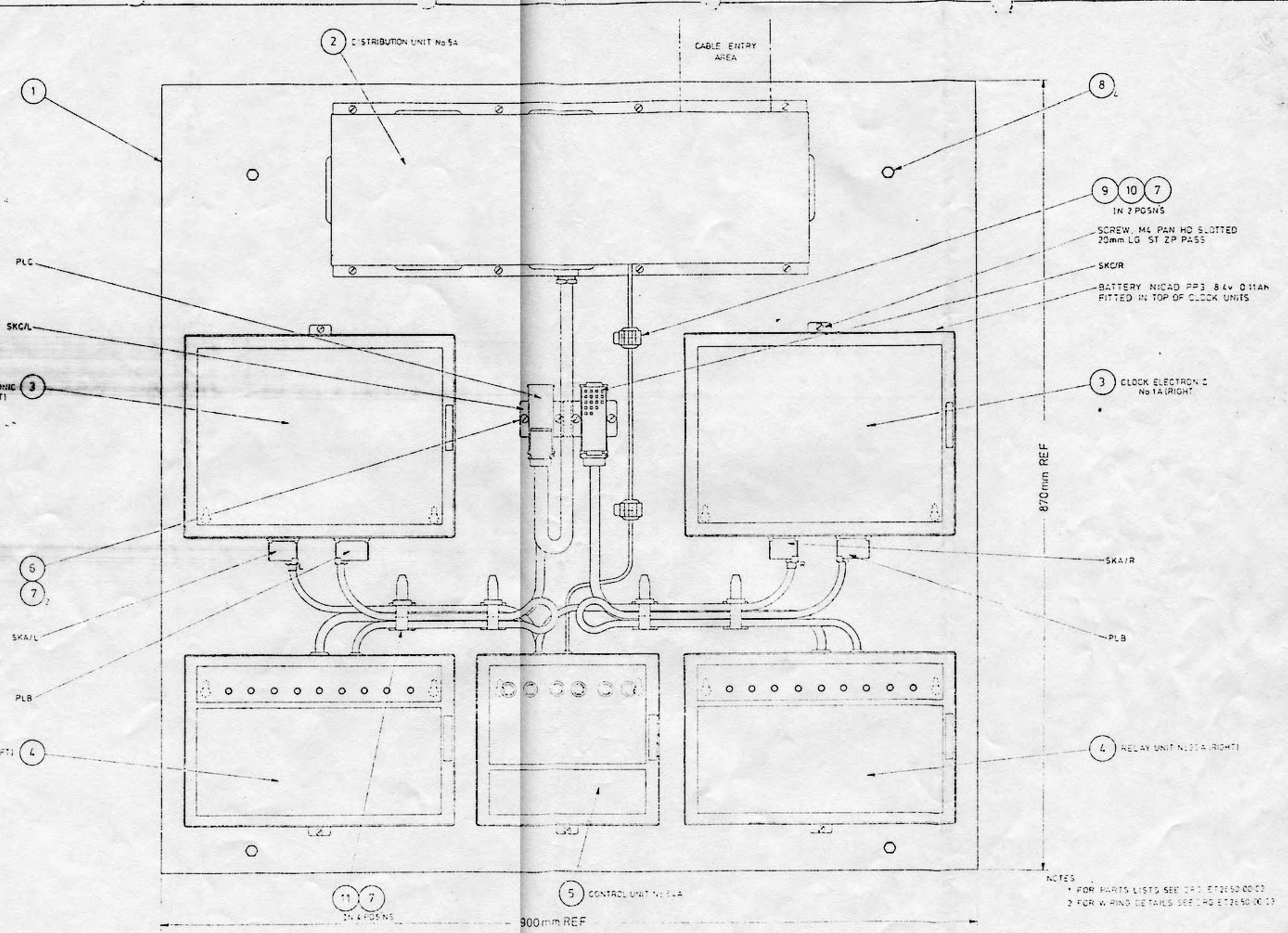
NOTE The microprocessor program includes an automatic adjustment for leap years.

THIRD ANGLE PROJECTION

SHEET OF

ET 2650-00-01

EXCHANGE



NOTES

1 FOR PARTS LISTS SEE CRD ET2650-00-02

2 FOR WIRING DETAILS SEE CRD ET2650-00-03

DO NOT SCALE ORIGINAL 1 : 2

DRN [illegible]			
CKD			
APPD			
DATE 22.6.82			

	AMENDMENT	APP	DATE
C	[illegible]	[illegible]	[illegible]
B	NEW 5 WAY END UNIT DESCR ADDN 1	[illegible]	[illegible]
A	[illegible]	[illegible]	[illegible]

ETB CHAIRMANS OFFICE

Master Clock System 1A

Master Clock System 1A Assembly

ET 2650 - 00 - 01

TBA	PLC SKC	FUNCTION	EXCHANGE SUPPLY / DISTRIBUTION (FOR EXCHANGE USE)
1	——	-50v IN	
2	——	NOT USED	
3	1 and 6	EARTH IN	
4	12 and 18	INTERNAL EARTHS	
5	25 and 33		
6	40 and 45		
7	49 and 54		
8	58 and 63		
9	——		
10	——		
11	——	NOT USED	
12	——	SPEAKING CLOCK INPUT 1	
13	——	SPEAKING CLOCK INPUT 2	
14	——	NOT USED	
15	——	PROMPT ALARM OUTPUT	
16	——	NOT USED	
17	——	DEFERRED ALARM OUTPUT	
18	——	NOT USED	
19	69	DATA CLOCK LEG 'A' OUTPUT	
20	71	DATA CLOCK LEG 'B' OUTPUT	
21	——	NOT USED	
22	——	NOT USED	
23	——	CLOCK'S CCT 1	
24	——	CLOCK'S CCT 1	
25	——	CLOCK'S CCT 2	
26	——	CLOCK'S CCT 2	
27	——	CLOCK'S CCT 3	
28	——	CLOCK'S CCT 3	
29	——	CLOCK'S CCT 4	
30	——	CLOCK'S CCT 4	
31	——	CLOCK'S CCT 5	
32	——	CLOCK'S CCT 5	
33	——	CLOCK'S CCT 6	
34	——	CLOCK'S CCT 6	
35	——	CLOCK'S CCT 7	
36	——	CLOCK'S CCT 7	
37	——	CLOCK'S CCT 8	
38	——	CLOCK'S CCT 8	
39	——	CLOCK'S CCT 9	
40	——	CLOCK'S CCT 9	
41	——	CLOCK'S CCT 10	
42	——	CLOCK'S CCT 10	
43	——	CLOCK'S CCT 11	
44	——	CLOCK'S CCT 11	
45	——	CLOCK'S CCT 12	
46	——	CLOCK'S CCT 12	
47	2	3 x 1 SEC PULSE OUTPUT 1	
48	3	3 x 1 SEC PULSE OUTPUT 2	
49	4	3 x 1 SEC PULSE OUTPUT 3	
50	5	3 x 1 SEC PULSE SLAVE OUTPUT	
51	7	1 SEC PULSE OUTPUT 1	
52	8	1 SEC PULSE OUTPUT 2	
53	9	1 SEC PULSE OUTPUT 3	
54	10	1 SEC PULSE OUTPUT 4	
55	11	1 SEC PULSE SLAVE OUTPUT	
56	13	6 SEC PULSE OUTPUT 1	
57	14	6 SEC PULSE OUTPUT 2	
58	15	6 SEC PULSE OUTPUT 3	
59	16	6 SEC PULSE OUTPUT 4	
60	17	6 SEC PULSE SLAVE OUTPUT	

Exchange Supply and Distribution

DRN. A.I.C.	CKD.	APP.	DATE 14-4-83
ISSUE A	ET 2650-00-03		Sh 1 of 2

TBA	PLC SKC	FUNCTION	EXCHANGE SUPPLY / DISTRIBUTION (FOR EXCHANGE USE)
61	19	30 SEC EQPT PULSE OUTPUT 1	
62	20	30 SEC EQPT PULSE OUTPUT 2	
63	21	30 SEC EQPT PULSE OUTPUT 3	
64	22	30 SEC EQPT PULSE OUTPUT 4	
65	23	30 SEC EQPT PULSE SLAVE OUTPUT	
66	32	30 SEC CLOCK'S SLAVE OUTPUT	
67	41	S1 PULSE OUTPUT 1	
68	42	S1 PULSE OUTPUT 2	
69	43	S1 PULSE OUTPUT 3	
70	44	S1 PULSE SLAVE OUTPUT	
71	46	S1 PULSE OUTPUT 4	
72	47	S1 PULSE OUTPUT 5	
73	48	S1 PULSE OUTPUT 6	
74	50	S2 PULSE OUTPUT 1	
75	51	S2 PULSE OUTPUT 2	
76	52	S2 PULSE OUTPUT 3	
77	53	S2 PULSE SLAVE OUTPUT	
78	55	S2 PULSE OUTPUT 4	
79	56	S2 PULSE OUTPUT 5	
80	57	S2 PULSE OUTPUT 6	
81	59	1 HR PULSE OUTPUT 1	
82	60	1 HR PULSE OUTPUT 2	
83	61	1 HR PULSE OUTPUT 3	
84	62	1 HR PULSE SLAVE OUTPUT	
85	64	24 HR PULSE OUTPUT 1	
86	65	24 HR PULSE OUTPUT 2	
87	66	24 HR PULSE OUTPUT 3	
88	67	24 HR PULSE SLAVE OUTPUT	
89		30 SEC CLK 1	
90		" " " 2	
91		" " " 3	
92		" " " 4	
93		" " " 5	
94		" " " 6	
95		" " " 7 — INTERCONNECTIONS	
96		" " " 8 — TO DISTRIBUTION	
97		" " " 9 — UNIT No. 5A	
98		" " " 10	
99		" " " 11	
100		" " " 12	

Exchange Supply and Distribution

PARTS LIST

A

ISSUE

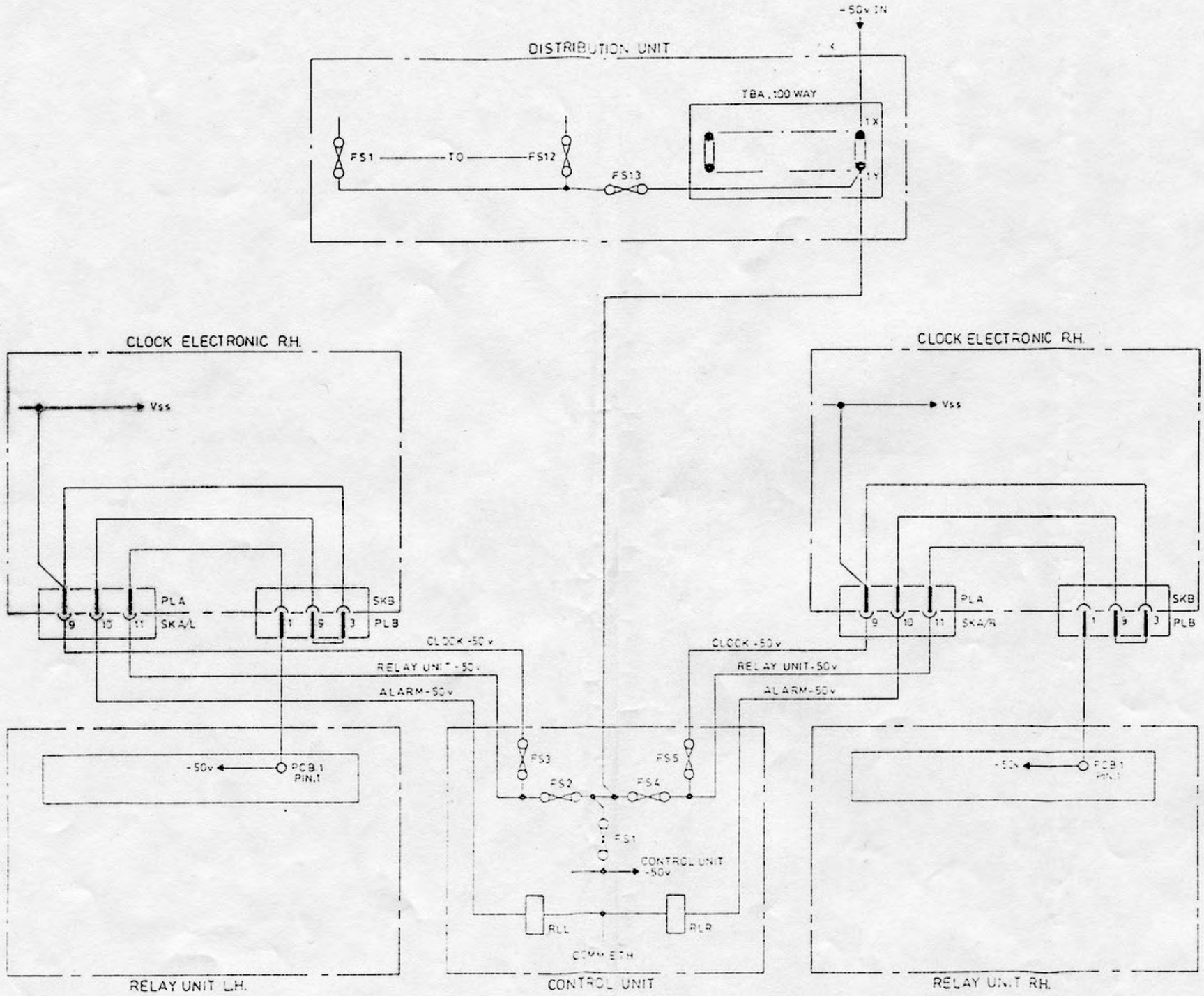
DRN A.I.C.	CKD	APP	DATE 15-4-83

ET 2650-00-03 Sh. 2

SHEET OF

ET 2650-00-06

EXCHANGE



DRN			
CKD			
APPD			
DATE	16-4-83.		

ISSUE	AMENDMENT	APP	DATE
A	INITIAL ISSUE		14.4.83

ETB HQ CHAIRMANS OFFICE

Master Clock System No 1A
Neg 50v Distribution

ET 2650-00-06

EARTH IN

DISTRIBUTION UNIT

TBA, 100 WAY

10

3

SIDE X

Y

CHASSIS ETH

SPEAKING CLOCK SCREEN

COMM ETH

12 RELAY EARTHS

CLOCK ELECTRONIC L.H.

Vpp

CASE ETH

PLA

SKA/L

SKB

PLB

5

6

2

CLOCK ELECTRONIC R.H.

Vpp

CASE ETH

PLA

SKA/R

SKB

PLB

5

6

2

PLC

SKC/L

SKC/R

CASE ETH

CHASSIS ETH

COMM ETH

P.C.B.1 PIN 50

CASE ETH

CASSIS ETH

CONTROL UNIT COMM ETH

CASE ETH

CHASSIS ETH

COMM ETH

P.C.B.1 PIN 50

RELAY UNIT L.H

CONTOL UNIT

RELAY UNIT RH

SHEET OF

ET 2650-00-07

EXCHANGE

DRN					
CKD					
APPD					
DATE					
		A	INITIAL ISSUE		21.7.83
		ISS	AMENDMENT	APP	DATE

Master Clock System No 1A
Earth Distribution

ET 2650-00-07

INTERCONNECTION DETAILS MASTER CLOCK SYSTEM 1A ISS. B

SIDE(Y)	TBA	SIDE(X)
30 SEC CLK PEA 6	100	INTERCONNECTIONS TO DISTRIBUTION UNIT No 5A
30 SEC CLK PEA 5	99	
30 SEC CLK PEA 4	98	
30 SEC CLK PEA 3	97	
30 SEC CLK PEA 2	96	
30 SEC CLK PEA 1	95	
30 SEC CLK PE 6	94	
30 SEC CLK PE 5	93	
30 SEC CLK PE 4	92	
30 SEC CLK PE 3	91	
30 SEC CLK PE 2	90	
30 SEC CLK PE 1	89	
24 HR PJ6	88	24 HR PULSE SLAVE OUTPUT
24 HR PJ3	87	24 HR PULSE OUTPUT 3
24 HR PJ2	86	24 HR PULSE OUTPUT 2
24 HR PJ1	85	24 HR PULSE OUTPUT 1
1 HR PH6	84	1 HR PULSE SLAVE OUTPUT
1 HR PH3	83	1 HR PULSE OUTPUT 3
1 HR PH2	82	1 HR PULSE OUTPUT 2
1 HR PH1	81	1 HR PULSE OUTPUT 1

SIDE(Y)	TBA	SIDE(X)
S2 MAKE PGA 3	80	S2 PULSE OUTPUT 6
S2 MAKE PGA 2	79	S2 PULSE OUTPUT 5
S2 MAKE PGA 1	78	S2 PULSE OUTPUT 4
S2 MAKE PG 6	77	S2 PULSE SLAVE OUTPUT
S2 MAKE PG 3	76	S2 PULSE OUTPUT 3
S2 MAKE PG 2	75	S2 PULSE OUTPUT 2
S2 MAKE PG 1	74	S2 PULSE OUTPUT 1
S1 BREAK PFA 3	73	S1 PULSE OUTPUT 6
S1 BREAK PFA 2	72	S1 PULSE OUTPUT 5
S1 BREAK PFA 1	71	S1 PULSE OUTPUT 4
S1 MAKE PF 6	70	S1 PULSE SLAVE OUTPUT
S1 BREAK PF 3	69	S1 PULSE OUTPUT 3
S1 BREAK PF 2	68	S1 PULSE OUTPUT 2
S1 BREAK PF 1	67	S1 PULSE OUTPUT 1
30 SEC CLK PE 8	66	30 SEC CLK SLAVE OUTPUT
30 SEC EQPT PD 6	65	30 SEC EQPT PULSE SLAVE OUTPUT
30 SEC EQPT PD 4	64	30 SEC EQPT PULSE OUTPUT 4
30 SEC EQPT PD 3	63	30 SEC EQPT PULSE OUTPUT 3
30 SEC EQPT PD 2	62	30 SEC EQPT PULSE OUTPUT 2
30 SEC EQPT PD 1	61	30 SEC EQPT PULSE OUTPUT 1

SIDE(Y)	TBA	SIDE(X)
6 SEC PC 6	60	6 SEC PULSE SLAVE OUTPUT
6 SEC PC 4	59	6 SEC PULSE OUTPUT 4
6 SEC PC3	58	6 SEC PULSE OUTPUT 3
6 SEC PC2	57	6 SEC PULSE OUTPUT 2
6 SEC PC1	56	6 SEC PULSE OUTPUT 1
1 SEC PB6	55	1 SEC PULSE SLAVE OUTPUT
1 SEC PB 4	54	1 SEC PULSE OUTPUT 4
1 SEC PB3	53	1 SEC PULSE OUTPUT 3
1 SEC PB2	52	1 SEC PULSE OUTPUT 2
1 SEC PB1	51	1 SEC PULSE OUTPUT 1
3×1 SEC PA6	50	3×1 SEC PULSE SLAVE OUTPUT
3×1 SEC PA3	49	3×1 SEC PULSE OUTPUT 3
3×1 SEC PA2	48	3×1 SEC PULSE OUTPUT 2
3×1 SEC PA1	47	3×1 SEC PULSE OUTPUT 1
CCT 12 FS 12	46	CLOCK'S CCT 12
CCT 12 TAG F	45	CLOCK'S CCT 12
CCT 11 FS 11	44	CLOCK'S CCT 11
CCT 11 TAG F	43	CLOCK'S CCT 11
CCT 10 FS 10	42	CLOCK'S CCT 10
CCT 10 TAG F	41	CLOCK'S CCT 10

SIDE(Y)	TBA	SIDE(X)
CCT 9 FS 9	40	CLOCK'S CCT 9
CCT 9 TAG F	39	CLOCK'S CCT 9
CCT 8 FS 8	38	CLOCK'S CCT 8
CCT 8 TAG F	37	CLOCK'S CCT 8
CCT 7 FS 7	36	CLOCK'S CCT 7
CCT 7 TAG F	35	CLOCK'S CCT 7
CCT 6 FS 6	34	CLOCK'S CCT 6
CCT 6 TAG F	33	CLOCK'S CCT 6
CCT 5 FS 5	32	CLOCK'S CCT 5
CCT 5 TAG F	31	CLOCK'S CCT 5
CCT 4 FS 4	30	CLOCK'S CCT 4
CCT 4 TAG F	29	CLOCK'S CCT 4
CCT 3 FS 3	28	CLOCK'S CCT 3
CCT 3 TAG F	27	CLOCK'S CCT 3
CCT 2 FS 2	26	CLOCK'S CCT 2
CCT 2 TAG F	25	CLOCK'S CCT 2
CCT 1 FS 1	24	CLOCK'S CCT 1
CCT 1 TAG F	23	CLOCK'S CCT 1
NOT USED	22	NOT USED
NOT USED	21	NOT USED

SIDE(Y)	TBA	SIDE(X)
DATA CLOCK 'B' LEG	20	DATA CLOCK 'B' LEG OUTPUT
DATA CLOCK 'A' LEG	19	DATA CLOCK 'A' LEG OUTPUT
NOT USED	18	NOT USED
DEFERRED ALARM	17	DEFERRED ALARM OUTPUT
NOT USED	16	NOT USED
PROMPT ALARM	15	PROMPT ALARM OUTPUT
NOT USED	14	NOT USED
SPK CLOCK 2 (BLUE)	13	SPK CLOCK INPUT
SPK CLOCK 1 (RED)	12	SPK CLOCK INPUT
NOT USED	11	NOT USED
SPK CLOCK PAIR SCREEN	10	
CONT UNIT COMM ETH	9	
PH, PJ ETH	8	
PG, PGA ETH	7	
PF, PFA ETH	6	
PE, PEA ETH	5	
PD, PC ETH	4	
PA, PB ETH CHASSIS	3	EARTH IN
NOT USED	2	NOT USED
CONT UNIT DIST UNIT	1	-50V IN

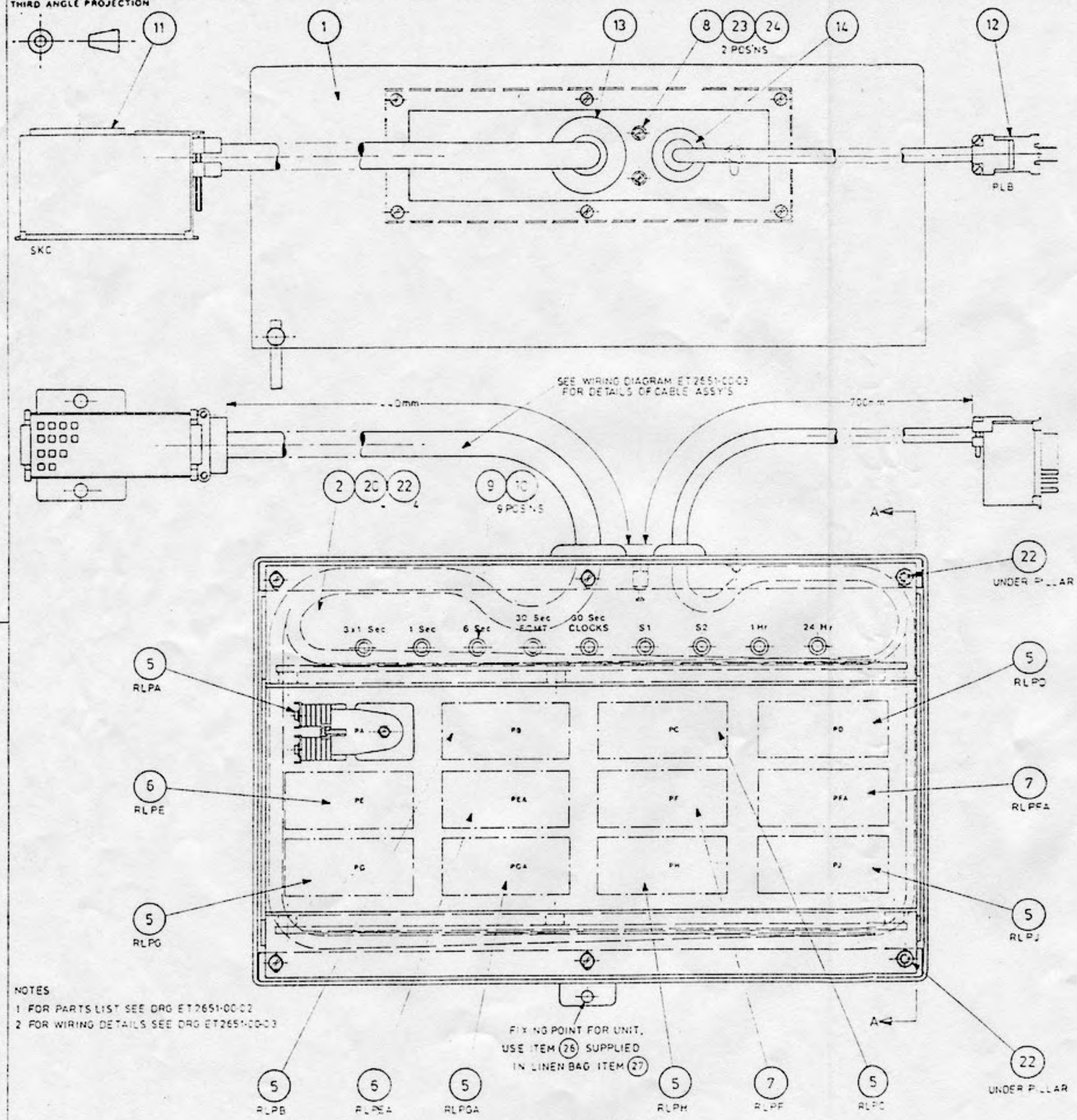
TBA CONNECTION DETAILS

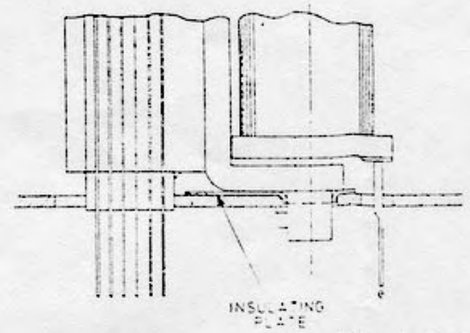
NOTE :- ALL EXCHANGE CONNECTIONS ARE MADE TO TBA (X) SIDE

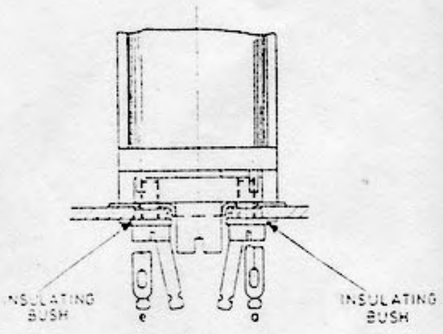
DRN	CKD	APP	DATE

ET 2650-00-09

THIRD ANGLE PROJECTION

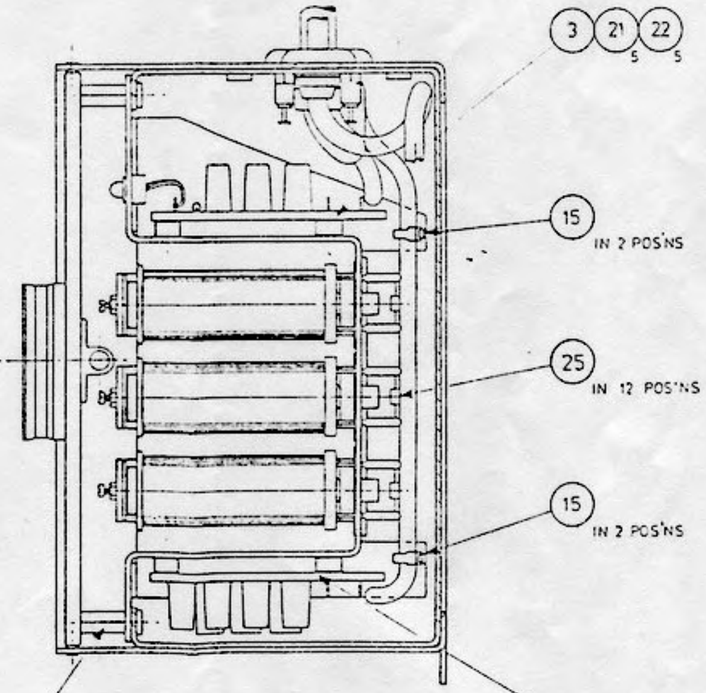






NOTE - INSULATING PLATE AND BUSHES ARE SUPPLIED WITH RELAY

RELAY MOUNTING DETAILS TYPICAL



SECTION ON A-A

NOTES
1 FOR PARTS LIST SEE DRG ET 2651-00-02
2 FOR WIRING DETAILS SEE DRG ET 2651-00-03

FRONT VIEW OF UNIT WITH DOOR REMOVED

DO NOT SCALE ORIGINAL 1:1

SHEET OF

ET. 2651 - 00 - 01

EXCHANGE

DRN		© BRITISH TELECOMMUNICATIONS 1983 E.T.B. CHAIRMANS OFFICE	Relay Unit No 33A Assembly
CKD			
APPD			Master Clock System 1A
DATE 21.6.85			ET2651-00-01

No.	AMENDMENT	BY	DATE

CASE CHASSIS

PLB 2 — 50 COMM ETH — 48 — 46 — 44

PA ETH 42 SKC 1 — PB ETH 33 SKC 4 — PC ETH 13 SKC 12 — PD ETH 6 SKC 18

DATA CLOCK LEG A — PLB 14 — TP1 — SKC 69

DATA CLOCK LEG B — PLB 15 — TP2 — SKC 71

PLB 3 — PLB 9

PLB 8 — 49 — RL PA 6 5000 — D4

PLB 1 — -50v — 1

PLB 5 — 47 — RL PB 5 5000 — D3

PLB 4 — 45 — RL PC 4 5000 — D2

PLB 6 — 43 — RL PD 3 5000 — D1

PA1 — 3+1 SEC 36 SKC 2 — C21
PA2 — 3+1 SEC 38 SKC 3 — C26
PA3 — 3+1 SEC 39 SKC 4 — C25
PA4 — DIS — C24
PA5 — 3+1 SEC SLAVE 40 SKC 5

PB1 — 1 SEC 29 SKC 7 — C20
PB2 — 1 SEC 30 SKC 8 — C19
PB3 — 1 SEC 31 SKC 9 — C18
PB4 — 1 SEC 34 SKC 10 — C23
PB6 — 1 SEC SLAVE 35 SKC 11 — C22

PC1 — 6 SEC 16 SKC 13 — C11
PC2 — 6 SEC 18 SKC 14 — C10
PC3 — 6 SEC 17 SKC 15 — C9
PC4 — 6 SEC 20 SKC 16 — C14
PC6 — 6 SEC SLAVE 21 SKC 17 — C13

PD1 — 30 SEC EOPT 2 SKC 19 — C3
PD2 — 30 SEC EOPT 3 SKC 20 — C2
PD3 — 30 SEC EOPT 4 SKC 21 — C1
PD4 — 30 SEC EOPT 7 SKC 22 — C9
PD6 — 30 SEC EOPT SLAVE 8 SKC 23 — C4

PA5 — 41 — PB5 — 37 — PC5 — 32 — PD5 — 27

10K R9 — LED 9 — C A
10K R8 — LED 8 — C A
10K R7 — LED 7 — C A
10K R6 — LED 6 — C A

PLB 7 — 88 — RL PE 8 5000 — D6

PE ETH 79 SKC 25 — PEA ETH 67 SKC 33 — PF ETH 28 SKC 40 — PFA ETH 14 SKC 45

PE1 — 30 SEC CLKS 73 SKC 26 — C45
PE2 — 30 SEC CLKS 74 SKC 27 — C46
PE3 — 30 SEC CLKS 75 SKC 28 — C47
PE4 — 30 SEC CLKS 76 SKC 29 — C48
PE5 — 30 SEC CLKS 77 SKC 30 — C49
PE6 — 30 SEC CLKS 78 SKC 31 — C50
PE8 — 30 SEC CLKS SLAVE 71 SKC 32 — C44
PE7 — 8

PEA1 — 30 SEC CLKS 51 SKC 34 — C35
PEA2 — 30 SEC CLKS 52 SKC 35 — C36
PEA3 — 30 SEC CLKS 53 SKC 36 — C37
PEA4 — 30 SEC CLKS 54 SKC 37 — C38
PEA5 — 30 SEC CLKS 55 SKC 38 — C39
PEA6 — 30 SEC CLKS 56 SKC 39 — C40
PEA8 — DIS
PEA7 — 8 — 23

RL PEA 8 5000 — RX2

10K R5 — LED 5 — C A

PLB 13 — 86 — RL PF 7 5000 — D5

PF1 — S1(BRK) 22 SKC 41 — C12
PF2 — S1(BRK) 24 SKC 42 — C17
PF3 — S1(BRK) 25 SKC 43 — C15
PF4 — DIS — C15
PF5 — DIS
PF6 — S1(MK) SLAVE 26 SKC 44 — C15

RL PFA 5 5000 — RX1

PFA1 — S1(BRK) 10 SKC 46 — C8
PFA2 — S1(BRK) 11 SKC 47 — C7
PFA3 — S1(BRK) 12 SKC 48 — C6
PFA4 — DIS
PFA5 — DIS
PFA6 — 18

10K R4 — LED 4 — C A

PLB 12 — 89 — RL PG 9 5000 — D9

PG ETH 84 SKC 49 — PH ETH 50 SKC 58 — PJ ETH 55 SKC 63

PG1 — S2(MK) 80 SKC 50 — C51
PG2 — S2(MK) 81 SKC 51 — C52
PG3 — S2(MK) 82 SKC 52 — C53
PG6 — S2(MK) SLAVE 83 SKC 53 — C54
PG4 — DIS
PG5 — 5

PGA1 — S2(MK) 68 SKC 54 — C41
PGA2 — S2(MK) 69 SKC 55 — C42
PGA3 — S2(MK) 70 SKC 57 — C43
PGA4 — DIS
PGA6 — DIS
PGA5 — 13

RL PGA 9 5000 — RX3

10K R3 — LED 3 — C A

PLB 11 — 87 — RL PH 6 5000 — D8

PH1 — 1 HR 56 SKC 59 — C31
PH2 — 1 HR 57 SKC 60 — C32
PH3 — 1 HR 58 SKC 61 — C33
PH4 — DIS
PH6 — 1 HR SLAVE 52 SKC 62 — C34
PH5 — 9

10K R2 — LED 2 — C A

PLB 10 — 85 — RL PJ 5 5000 — D7

PJ1 — 24 HR 51 SKC 64 — C27
PJ2 — 24 HR 52 SKC 65 — C28
PJ3 — 24 HR 53 SKC 66 — C29
PJ4 — DIS
PJ6 — 24 HR SLAVE 54 SKC 67 — C30
PJ5 — 5

10K R1 — LED 1 — C A

EXCHANGE

SHEET 6 OF

ET 2651 - 00 - 04

CAN	
CKO	
APPD	

5			
4	REV 2 SHT 2 ADDED DS1 REPRESENTN	AC	5.12.83
3	VARIOUS AMDTS		4.7.83
2	VARIOUS AMDTS	A	1.7.83
1	INITIAL ISSUE		
ISS. NO	AMENDMENT	CPN	DATE

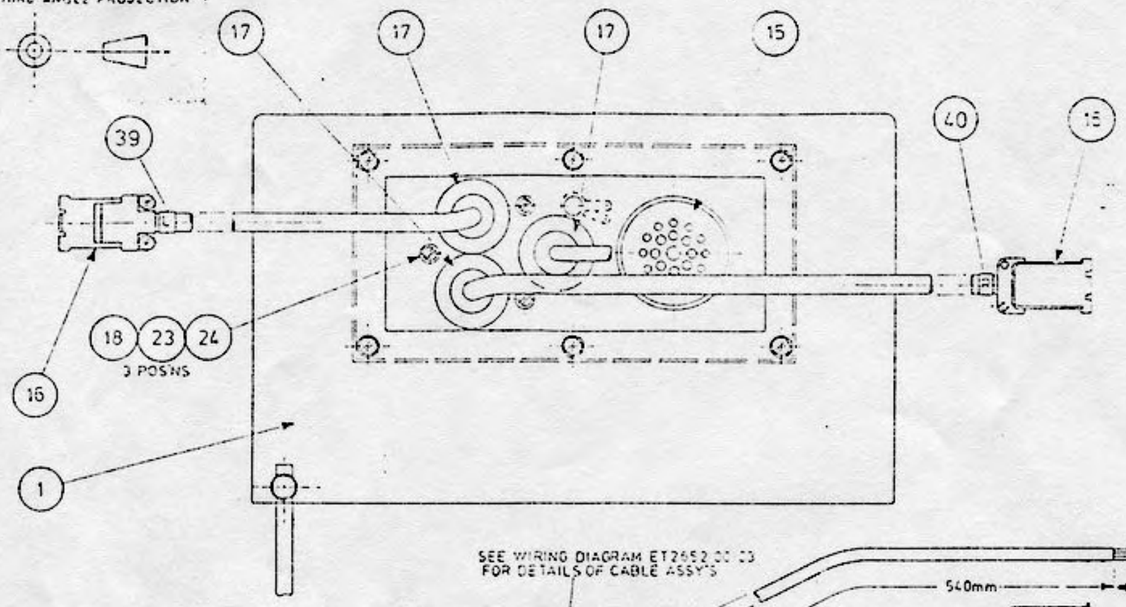
ETB HQ CHAIRMANS OFFICE

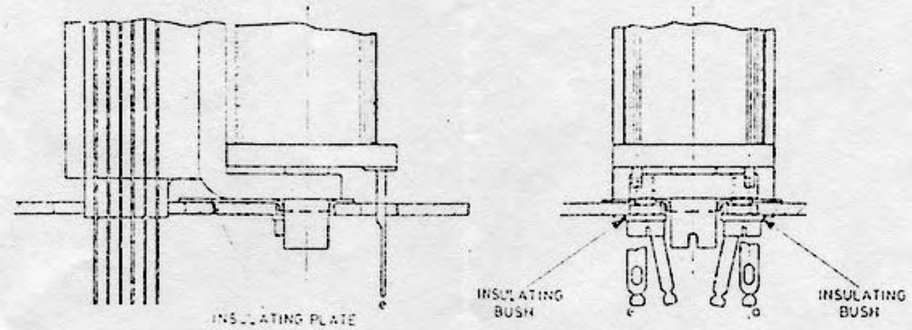
RELAY UNIT No. 33A
CIRCUIT DIAGRAM

Master Clock System 1A

ET 2651-00-04

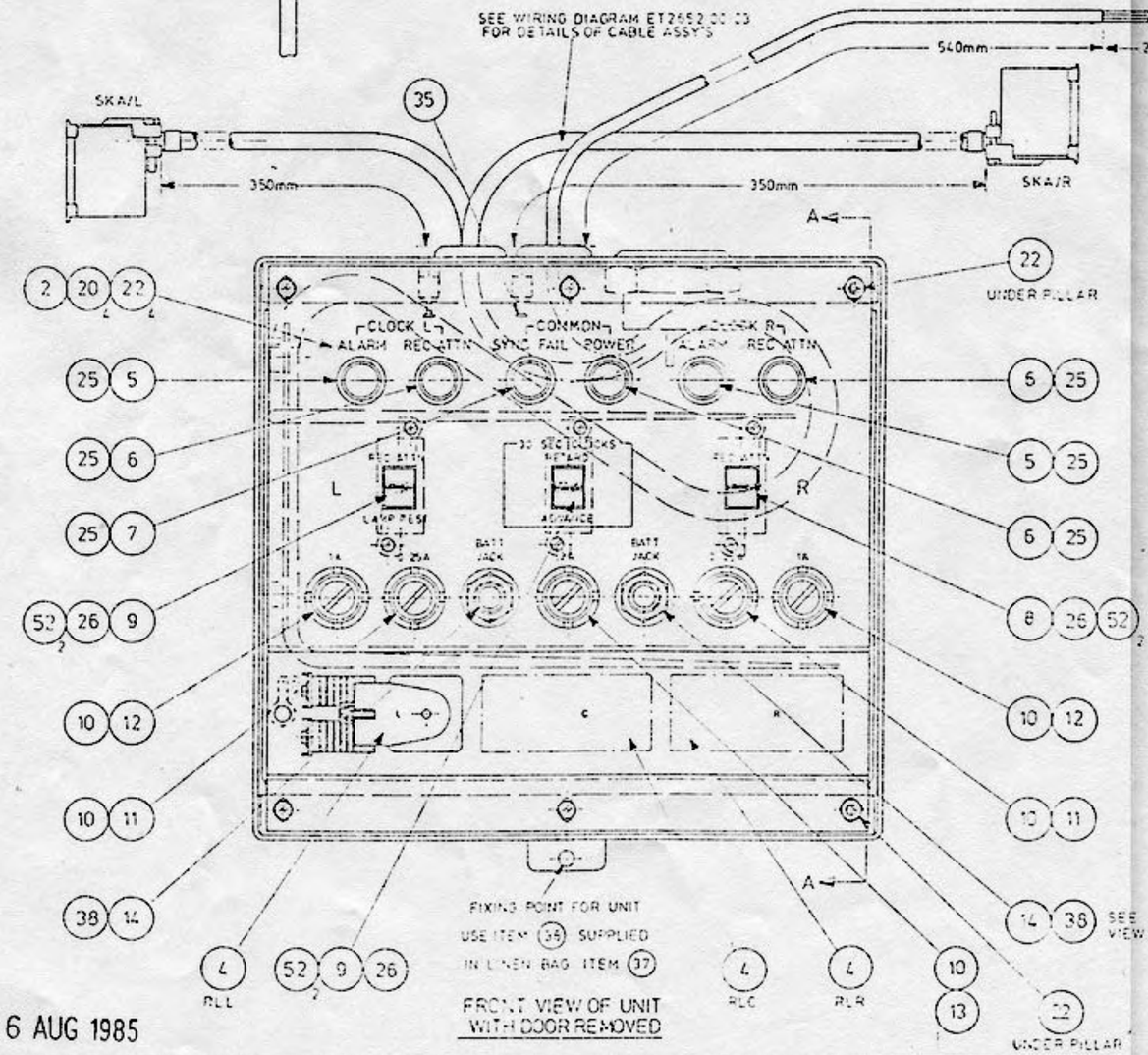
THIRD ANGLE PROJECTION

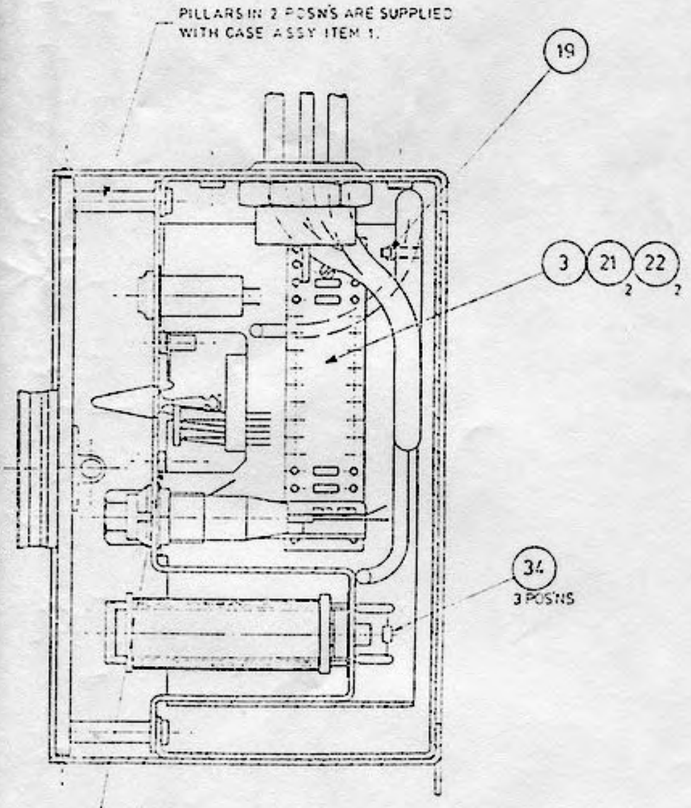




NOTE: INSULATING PLATE AND BUSHES ARE SUPPLIED WITH RELAY

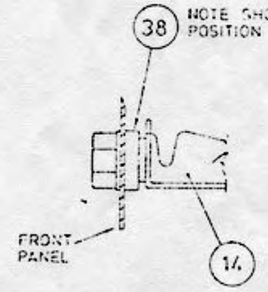
RELAY MOUNTING DETAILS TYPICAL Scale 2:1





SECTION ON A-A

TWO 6BA NUTS ITEM 52 FITTED BETWEEN BACK OF PANEL AND SWITCH ITEM 26 IN THREE POSITIONS



VIEW B

NOTES

1. FOR PARTS LIST SEE DRG ET2652-00-02
2. FOR WIRING DETAILS SEE DRG ET2652-00-03.

6 AUG 1985

DO NOT SCALE ORIGINAL 1:1

DRN
CHK
APPD

		B	AMENDMENTS
		C	AMENDMENTS
		D	AMENDMENTS
		E	AMENDMENTS

BRITISH TELECOMMUNICATIONS 1982
ETB-HG CHAIRMANS OFFICE

Control Unit No. 64A
ASSY DRG

Master Clock System 1A

ET2652-00-01

SHEET 01

EXCHANGE

TBA 9 COMM EARTH
TBA 17 DEFERRED ALARM
TBA 10 SCREEN
TBA 12 SPEAKING CLOCK 1
TBA 13 SPEAKING CLOCK 2
TBA 15 PROMPT ALARM
TBA 1 50v

TAG BLOCK DISTRIBUTION UNIT

CHASSIS CASE

TP1 R3 680Ω TP2

SPEAKING CLOCK 1 SKA 3
SPEAKING CLOCK 2 SKA 4
COMM EARTH SKA 5
SKA 6
SYNC FAIL L SKA 7

SKA 3 SPEAKING CLOCK
SKA 4
SKA 5 COMM EARTH
SKA 6
SKA 7 SYNC FAIL R

D3 RL 6500 $\frac{R}{2}$

FS1 2A

C2 23 22 21 DIS

RED ALARM LED 1 T36 R1 2K2 T18
GRN REC ATTN LED 2 T32 R2 2K2 T14
AMB SYNC FAIL LED 3 T12 R3 2K2 T30
GRN POWER LED 4 T5 R4 2K2 T23
RED ALARM LED 5 T29 R5 2K2 T11
GRN REC ATTN LED 6 T26 R6 2K2 T8

DIS 3 1 2 L1

KRL 1 DIS T15 D1 T33

KLT 1 T31 C1 DIS D2 T13

T27 T9 D4 KRR 1 DIS

DIS 3 1 2 R1

JK1 BATT JACK
JK2 BATT JACK

TO CLOCK L SKA

22 L2 21 23 KRL 2

T7 R8 LK7 T25 T24 R7 4K7 T6 KLT 2
AWD DIS

22 R2 21 23 KRR 2

TO CLOCK R SKA

RELAY SET - 50v SKA 11
CLOCK - 50v SKA 9
ALARM - 50v SKA 10

FS2 1A FS3 0·25A

D6 RL 6500 $\frac{L}{2}$

D5 RL 6500 $\frac{R}{2}$

FS4 1A FS5 0·25

SKA 11 RELAY SET - 50v
SKA 9 CLOCK - 50v
SKA 10 ALARM - 50v

ADVANCE / RETARD AR 1 SKA 1
AR 2 SKA 2

SKA 1 AR 1
SKA 2 AR 2 ADVANCE / RETARD

KAD 1 DIS KRE 1 DIS

KAD 2
KRE 2
} SPARE

REC ATT
KRL
KLT
LAMP TEST

RETARD
KRE
KAD
ADVANCE

REC ATT
KRR

SHEET OF

ET. 2652 - 00 - 04

EXCHANGE

DRN WS
CKD
APPD
DATE 21.6.82

E	[illegible] ERASED		
D	[illegible] UPRADE		
C	[illegible]		
B	[illegible]		
A	INITIAL ISSUE		
ISSUE	AMENDMENT		

ETB HO CHAIRMANS OFFICE

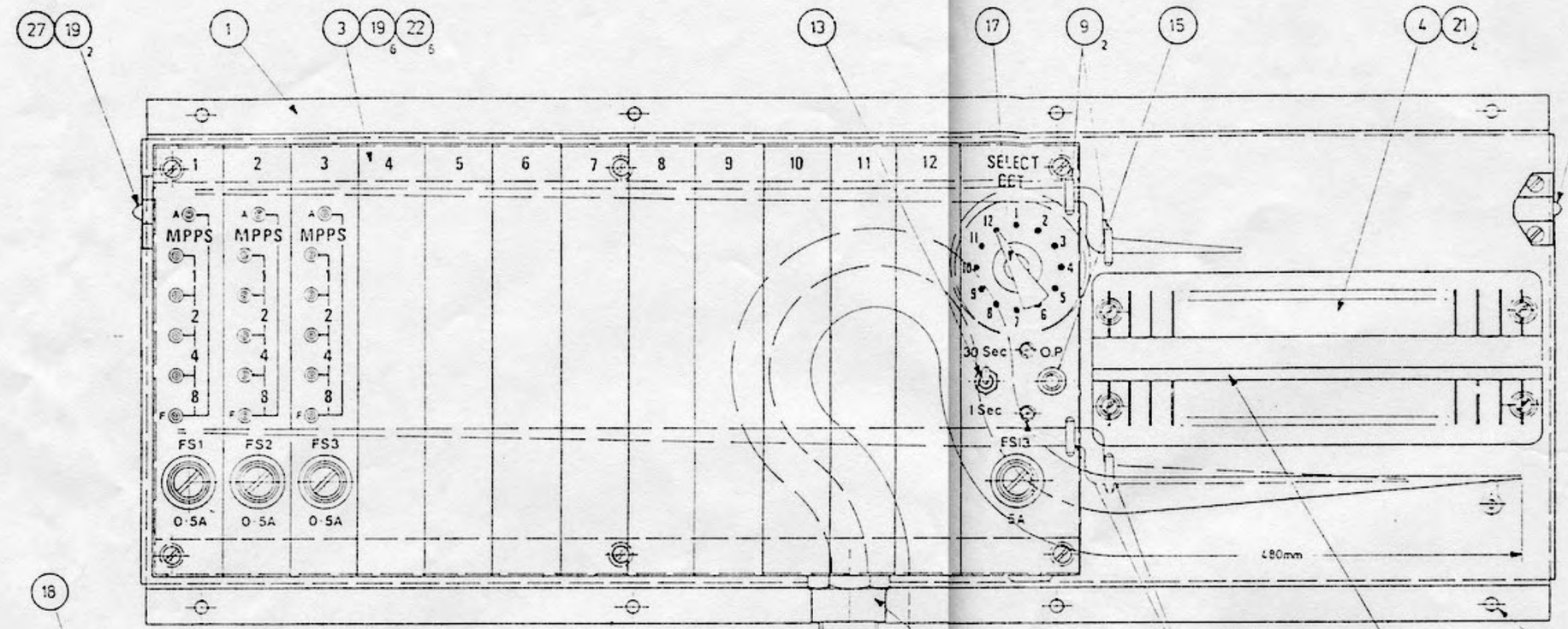
Control Unit No.64A
Circuit Diagram

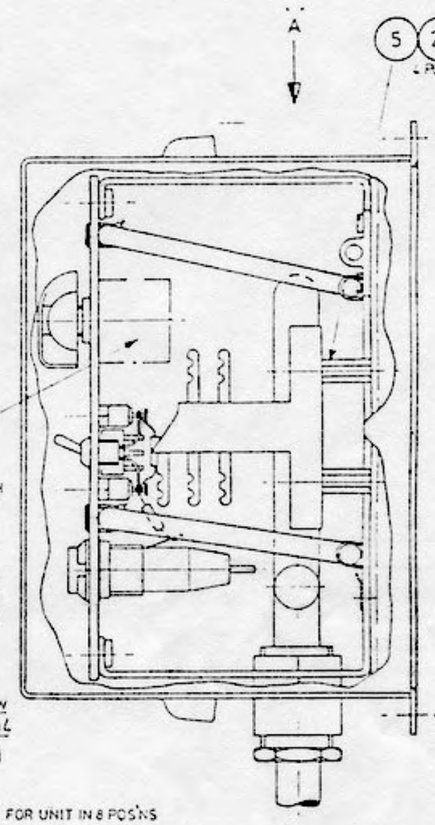
Master Clock System 'A'

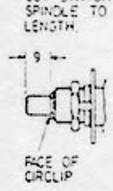
E.T. 2652 - 00 - 04

THIRD ANGLE PROJECTION

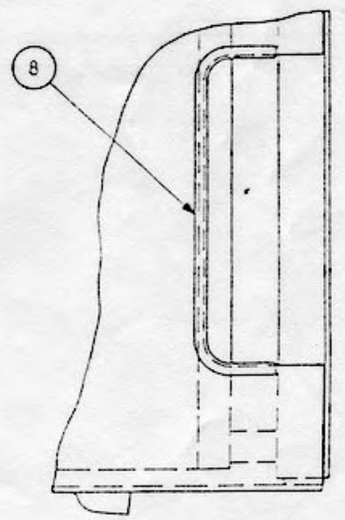
NOTES
1 FOR PARTS LIST SEE DRG ET 2653-00-01
2 FOR WIRING DETAILS SEE DRG ET 2653-00-03







Part View of Item 14
Scale 1·1



VIEW ON ARROW 'A'

DO NOT SCALE ORIGINAL 1:1

DRN		©BRITISH TELECOMMUNICATIONS 1982 ETB HQ CHAIRMANS OFFICE	Distribution Unit Nº 5A Assembly
CKD			
APPD		Master Clock System 1A	E.T. 2653-00-01
DATE			

	AMENDMENT	APP	DATE
C	VARIOUS AMENDS		
B	VARIOUS AMENDS		
A	INITIAL ISSUE		

SHEET 01
ET 2653-00-01
EXCHANGE

30 SEC INPUTS

PLC 26 PLC 27 PLC 28 PLC 29 PLC 30 PLC 31 PLC 34 PLC 35 PLC 36 PLC 37 PLC 38 PLC 39

TBA3 TBA89 TBA90 TBA91 TBA92 TBA93 TBA94 TBA95 TBA96 TBA97 TBA98 TBA99 TBA100

SW1

TB1 RED LED OP D1

SW2 1 SEC 30 SEC

PLC 11 TBA55 1 SEC (SLAVE)

TP2

R61 10K

CCT 1 OA CCT 2 OA CCT 3 OA CCT 4 OA CCT 5 OA CCT 6 OA CCT 7 OA CCT 8 OA CCT 9 OA CCT 10 OA CCT 11 OA CCT 12 OA

MPPS

R1 51R R2 10R R3 20R R4 39R R5 82R ST1 ST2 ST4 ST8

R6 R7 R8 R9 R10

R11 R12 R13 R14 R15

R16 R17 R18 R19 R20

R21 R22 R23 R24 R25

R26 R27 R28 R29 R30

R31 R32 R33 R34 R35

R36 R37 R38 R39 R40

R41 R42 R43 R44 R45

R46 R47 R48 R49 R50

R51 R52 R53 R54 R55

R56 R57 R58 R59 R60

TBA23 TBA25 TBA27 TBA29 TBA31 TBA33 TBA35 TBA37 TBA39 TBA41 TBA43 TBA45

1

15 MAX

TBA24 TBA26 TBA28 TBA30 TBA32 TBA34 TBA36 TBA38 TBA40 TBA42 TBA44 TBA46

0.5A

FS1 FS2 FS3 FS4 FS5 FS6 FS7 FS8 FS9 FS10 FS11 FS12

TBA1 -50v FS13 5A

DRN S.U			
CKD			
APPD			
DATE 8-4-83			

	AMENDMENT		

Distribution Unit No 5A
Circuit Diagram

Master Clock System 1A | ET 2653-00-04