Merlin

British Telecom Business Systems

# MERLIN DATELMUX 5500

## USER GUIDE

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# MERLIN DATELMUX 5500

## USER GUIDE

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# SECTION 1

# INTRODUCTION

## 1.1 THE DATELMUX 5500

The BT MERLIN DATELMUX 5500 INTELLIGENT MULTIPLEXER uses a character-interleaved statistical time-division technique for multiplexing up to 240 "low-speed" synchronous and asynchronous channels on to maximum 12 composite links. It is a member of the DATELMUX 5500 family and is compatible with all other DATELMUX models.

The microprocessor-controlled dynamic bandwidth allocation technique provides considerable concentration of data, and block transmission with automatic retransmission on error ensures error-free communication.

A range of features with selectable options ensures full compatibility with a wide variety of computers and terminals. The 5500 is fully transparent. It can handle "low-speed" channels with practically any combination of speeds and codes from 50 to 9600 bps, and data rates of up to 2400 bps can be established automatically by the terminal.

Modular construction makes configuration and maintenance a simple and straightforward task. Extensive monitoring facilities indicate erroneous operation and diagnostic routines permit rapid fault isolation.

A unique feature of the DATELMUX 5500 is the message routing and network reconfiguration facility. In case of a line or modem failure, the operator at the central site can re-route the affected low-speed channels via alternative links which have spare capacity. The 5500 stores in its memory two alternative network maps. The operator can inspect, edit or reconfigure one network map while the other is in use; generate a machine-readable copy of either map; monitor the traffic; print out statistics, and test a selected channel. The switching facilities are similar to those of a manual telephone exchange: the operator can connect any subscriber in the network to any other subscriber.

The execution of such complex tasks from a simple keypad is made possible by the use of microprocessors which control and execute all major functions and add a great deal of flexibility to the design.

## 1.2 SCOPE OF GUIDE

The purpose of this guide is to provide full information to enable users to operate 5500 multiplexers, to construct and change system configuration maps, to understand the reporting system for both correct and erroneous working, and to carry out procedures to establish the cause of errors in the system.

A section is included to enable those users Who wish to do so, to configure and install 5500 multiplexers themselves. Another section describing the functional aspects of the 5500 is included to provide a full understanding of its operation.

Two types of composite link module are described in this guide: ARQ1 (the standard ARQ module), ARQ2 (the high speed ARQ module).

Two types of buffer module are also described: BUF2 (16 kbytes) and BUF3 (64 kbytes).

Different types of Low Speed Channel card may be used. They are described in Separate Sections.

## 1.3 SPECIFICATION SUMMARY

### 1.3.1 THE 5500 UNIT

| | |
|---|---|
| Multiplexing technique | Character-interleaved, time-division, statistical |
| Link capacity | 12 maximum |
| Max aggregate link data rate | 388,800 bps |
| Link modules | ARQ1, ARQ2, SER |
| Channel capacity | 240 maximum |
| Maximum aggregate channel input | 2,304,000 bps (with flow control enabled) |
| Buffer modules | BUF2, BUF3 |
| Channel modules, Async | LSC1, LSC3, LSC3A, LSC4 |
| Channel modules, Sync | LSC5 |
| Operator facilities | Create and edit maps,<br>Load, print and dump maps to an external device,<br>Control from local or remote,<br>Interrogate or monitor a channel,<br>Set and clear loopbacks,<br>Validate a channel,<br>Access link statistics |
| Power requirements | 240 VAC +10%, 50 Hz,<br>(115 VAC +10%, 60 Hz optional)<br>500 VA max |
| Dimensions | |
| Standard 19 inch rack-mounting frame | Depth:525 mm (20.7 inches)<br>Height:267 mm (10.5 inches, 6U) |
| Alternative desk-top enclosure | Width:500 mm (20 inches)<br>Depth:542 mm (21.5 inches)<br>Height:320 mm (12.5 inches) |
| Environment | |
| Ambient temperature | Operating: $0^{o}$ C to $+45^{o}$C<br>Storage: $-20^{o}$C to $+85^{o}$C |
| Relative humidity | Up to 95% at $+40^{o}$C |

### 1.3.2 THE ARQ1 MODULE

| | |
|---|---|
| Interface | CCITT V24/V28, EIA RS-232C, Synchronous |
| Transmission | Based on HDLC protocol as defined in CCITT X25 Level 2 |
| Data rates<br>Internal clock | 1200, 2400, 3600, 4800, 7200, 9600, 14400 or 19200 bps |
| External clock | Any rate up to 19200 bps |
| Error protection | Automatic repeat on request using cyclic redundancy check to CCITT V41 |
| Satellite working | Single hop satellite link |

### 1.3.3 THE ARQ2 MODULE

| | |
|---|---|
| Maximum quantity | 3 |
| Interface | Three synchronous interfaces:<br>CCITT V24/V28, EIA RS-232C<br>CCITT V35<br>CCITT X21/V11, EIA RS-422 |
| Transmission | Based on HDLC protocol as defined in CCITT X25 Level 2<br>Optional Extended Window operating mode |
| Data rates<br>Internal clock | 80,000 bps (V11 only) |
| External clock | Any rate up to 72,000 bps |
| Error protection | Automatic repeat on request using cyclic redundancy check to CCITT V24 |
| Satellite working | Single hop satellite link at 72,000 bps, double hop satellite link at 19,200 bps or less |
| Link protocol compatibility | Standard operating mode:<br>ARQ1 Issue 7 onwards<br>5100 Issue 5 onwards<br>5100SE Issue 1 onwards<br>5141/2 Issue 1 onwards<br>5300 CLP Issue 1 onwards<br>5300 OLP Issue 2 onwards<br>Extended Window operating mode:<br>ARQ2 only |

### 1.3.4 THE BUF MODULES

| | |
|---|---|
| Data capacity | BUF2: 16 kilobytes<br>BUF3: 64 kilobytes |
| Channel capacity | Up to 64 full-duplex channels |
| Max buffer capacity<br>(16 BUF per node) | BUF2: 256 kilobytes<br>BUF3: 1 megabyte |

## 1.4 THE 5500 IN DATELMUX NETWORKS

The 5500 is a powerful and versatile member of the BT MERLIN DATELMUX family, whose use in a network brings a number of benefits. Some of these are illustrated in the example networks shown in Figures 1-1 to 1-4.

The simple multi-node network in Figure 1-1 shows its ability to re-route links. Under normal operating conditions the terminals at sites A and B access the computer through links AC and BC respectively. However in the event of a line or modem fault in the AC link, the configuration would be re-routed so that the terminals at site A take a route through links AB and BC. This could be done easily and quickly, as alternative "maps" could be stored for such an eventuality.

Figure 1-1 also shows the 5500's ability, shared by other members of the family, to have terminals connected either directly or by modem link ("onward linking"), as at site D.

The configuration shown in Figure 1-2 illustrates the use of a "mid-point" multiplexer to save line costs, in a network which includes various members of the DATELMUX family. The 5500 in London has no low speed lines of its own, but acts as mid-point between the host computer in Glasgow and the terminal clusters in Reading, Rochester and Brighton. Thus only one line is required between London and Glasgow.

The main computer of the network in Figure 1-3 is located at the user's headquarters in Felixstowe with a large number of terminals scattered over the British Isles. Local DATELMUX 5300 and 5100 multiplexers handle numbers of terminals at the various centres.

Figure 1-4 shows the outlines of a more complex network. Each site has a dual computer system for maximum reliability. If one computer breaks down the second computer takes over. When both are operational again, the files of the one which failed can be restored by the intact computer via the 5500. Each site has a Mapping and Test Panel and can take over the network control and reconfiguration duties, so that in case of a composite link fault the terminals can access the remote computers by alternative routes.

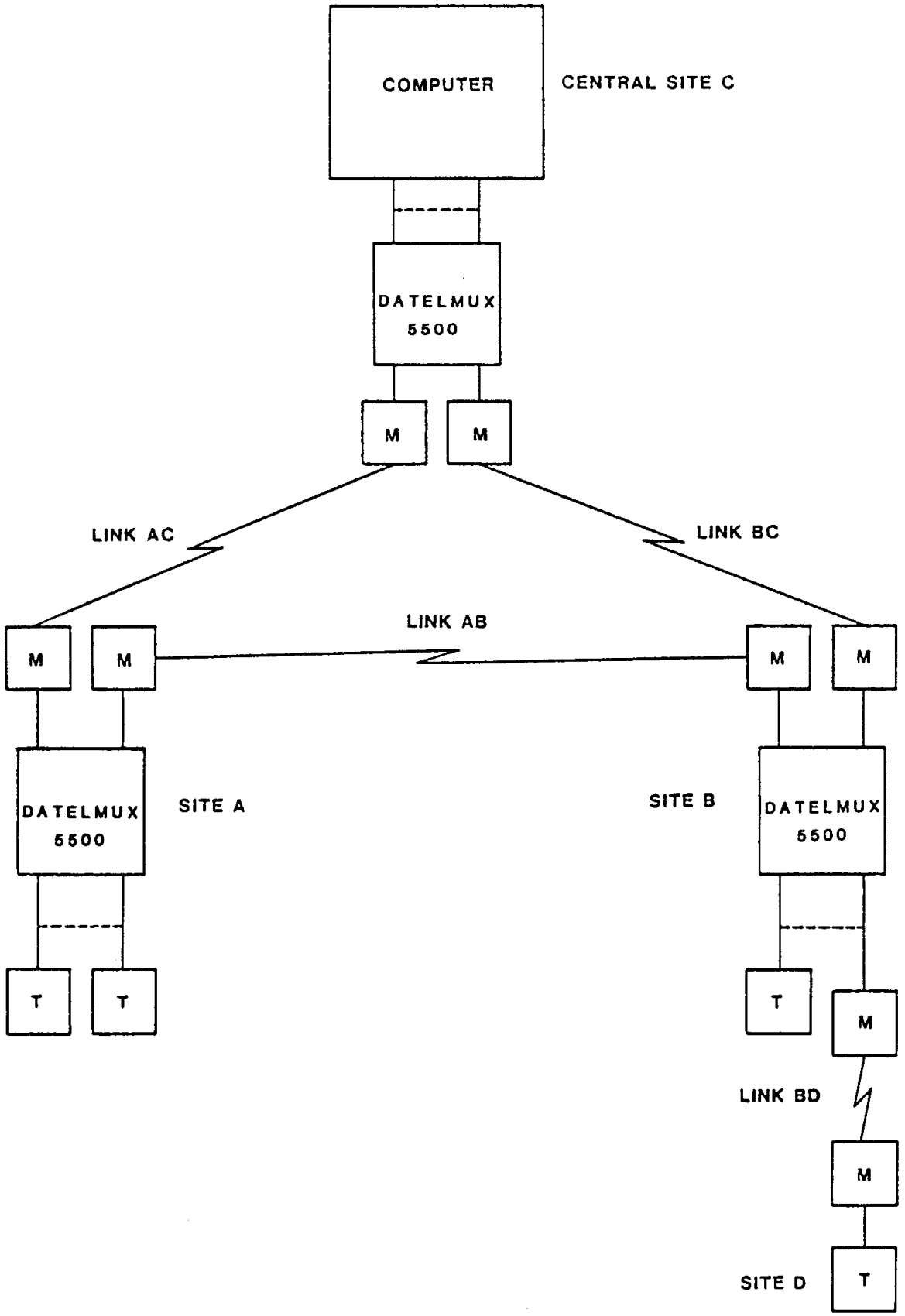



FIGURE 1-1

SIMPLE MULTI-NODE MULTI-ACCESS NETWORK

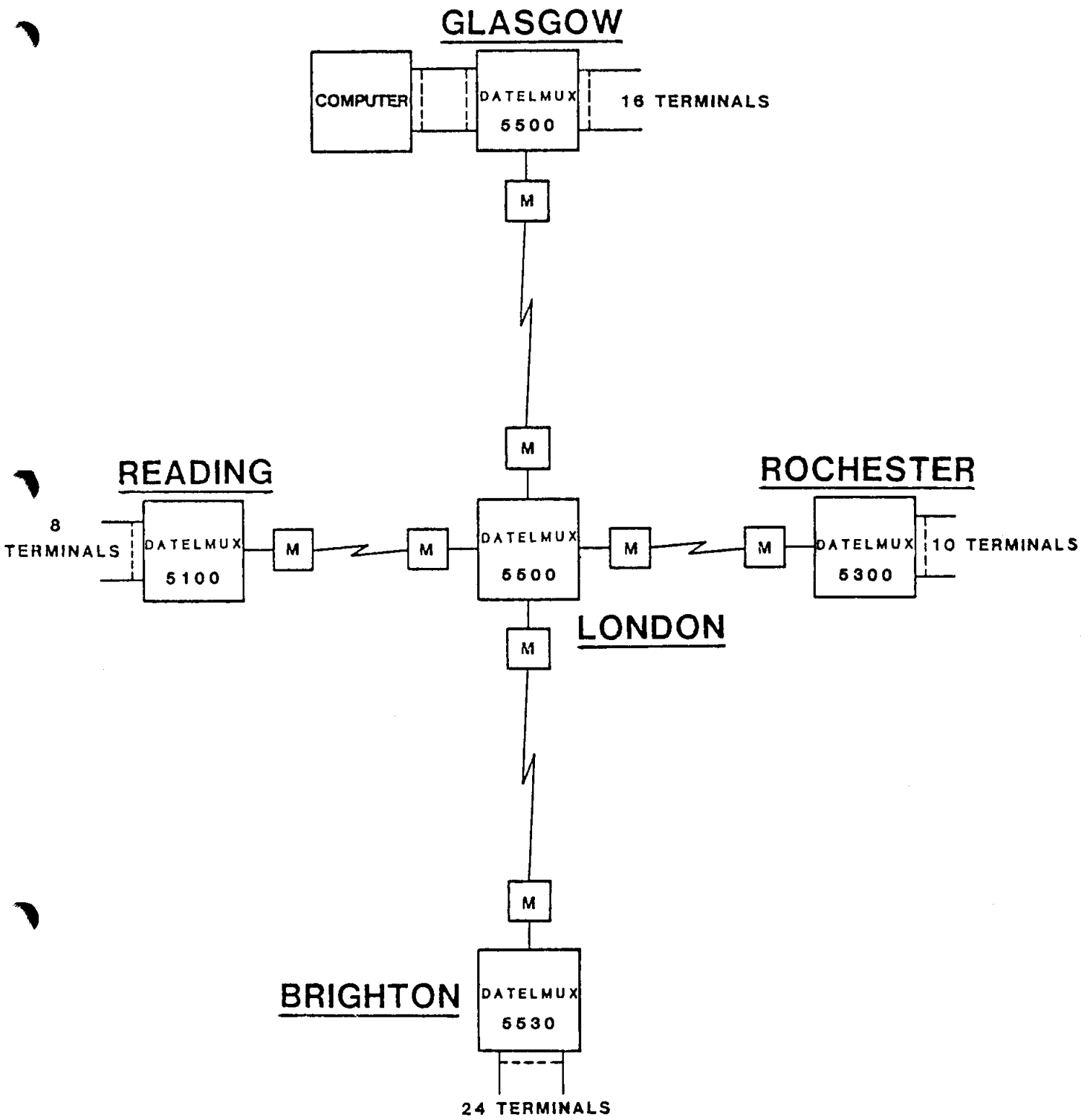



FIGURE 1-2
EXAMPLE MID-POINT CONFIGURATION

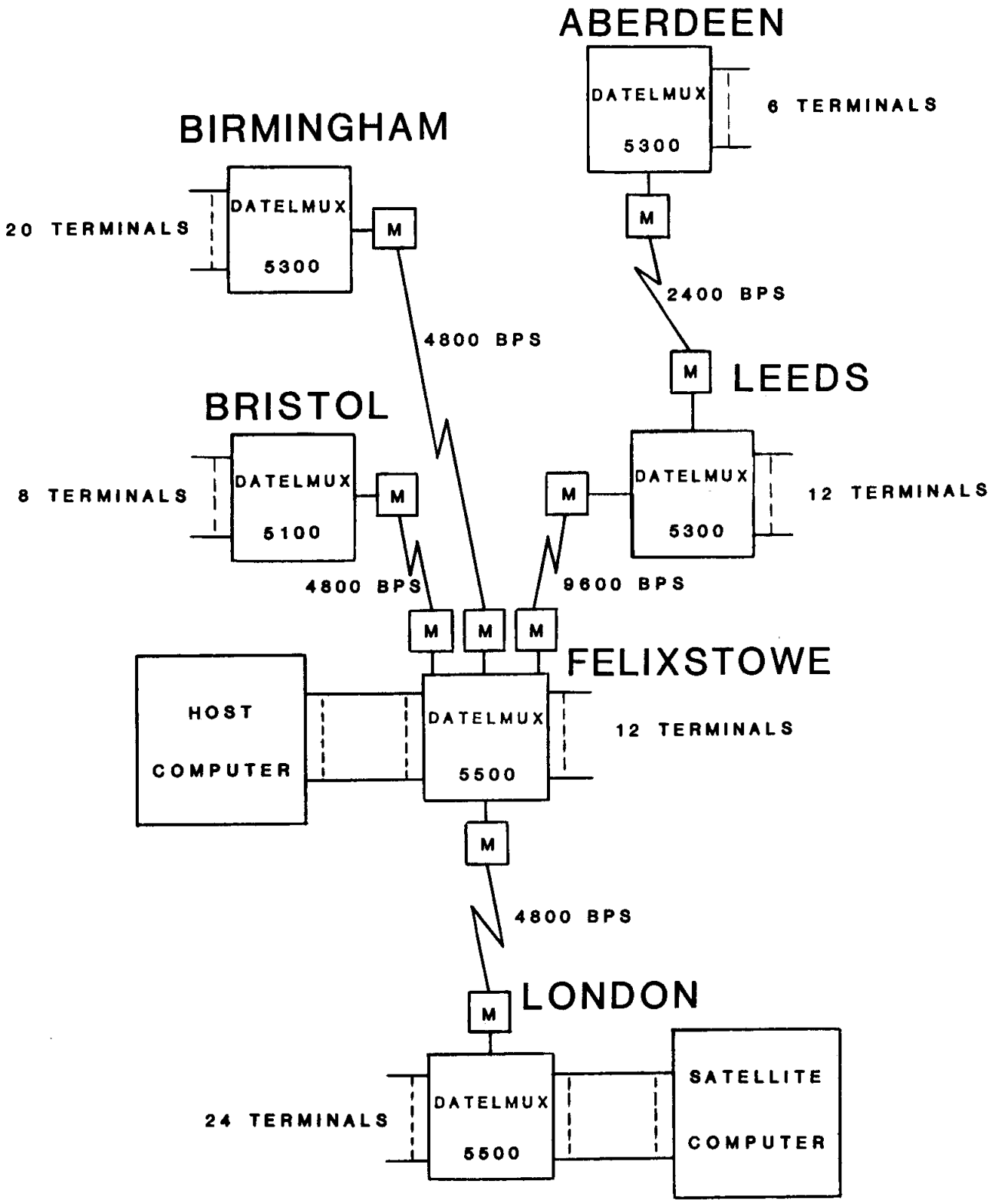



FIGURE 1-3

EXAMPLE MULTI-NODE DATELMUX NETWORK

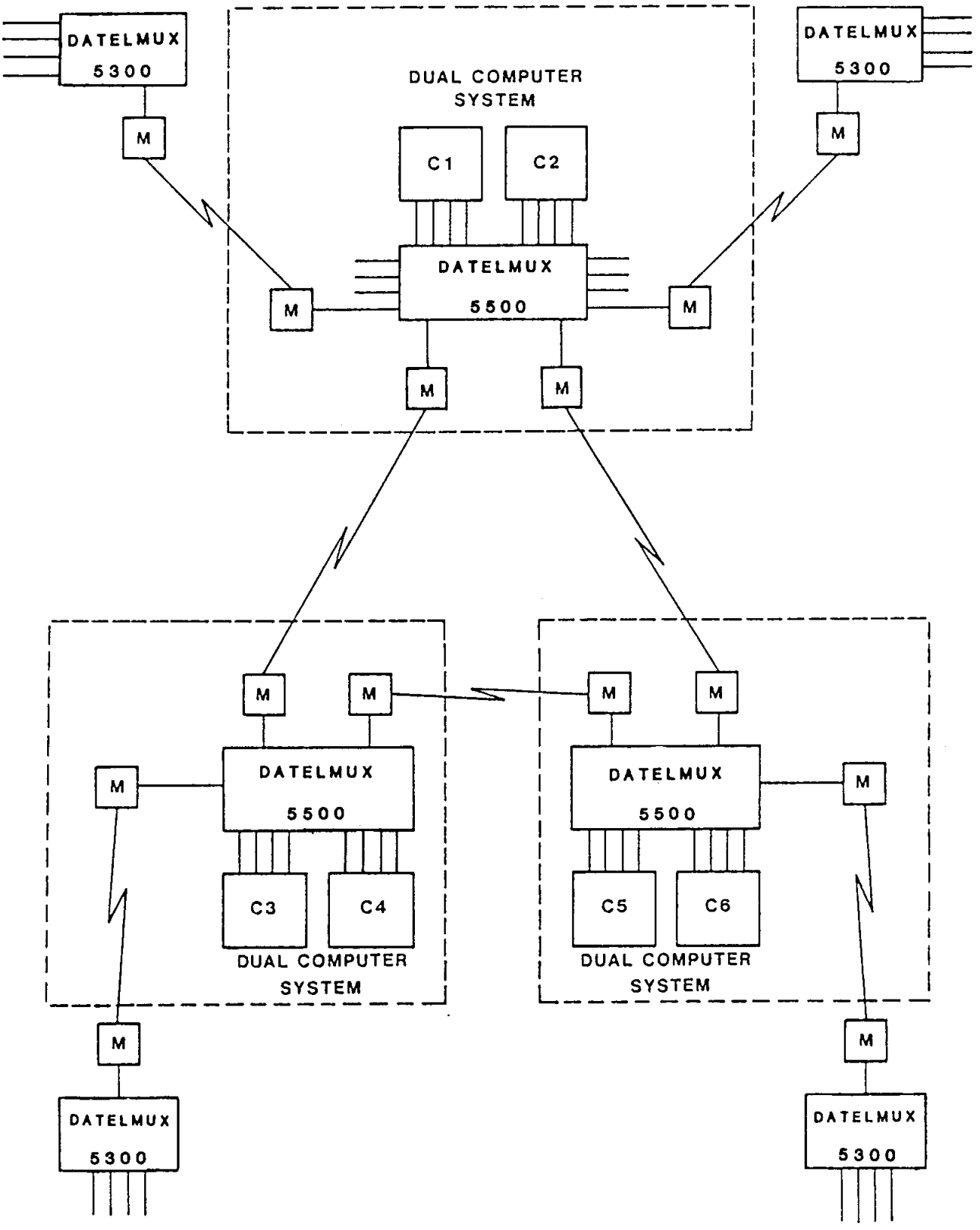



FIGURE 1-4
HIGH SECURITY COMMUNICATION SYSTEM

# SECTION 2

# FUNCTIONAL DESCRIPTION

## 2.1 THE 5500 MULTIPLEXER

The upper diagram of Figure 2-1 shows the main functional components of the 5500.

The low speed channel circuits provide the V24 interfaces (ports) to which the computers and terminals (DTEs) are connected. Each circuit is configured to match the characteristics of the DTE, e.g. number of data bits per character number of stop bits, transmission rate. The ports may be connected to the DTEs either directly by cable, or over modem links ("onward linking").

The data characters from each of these channels are fed into the buffer for storage. They are then removed and formatted into a frame for transmission over one of the composite links to the remote DATELMUX.

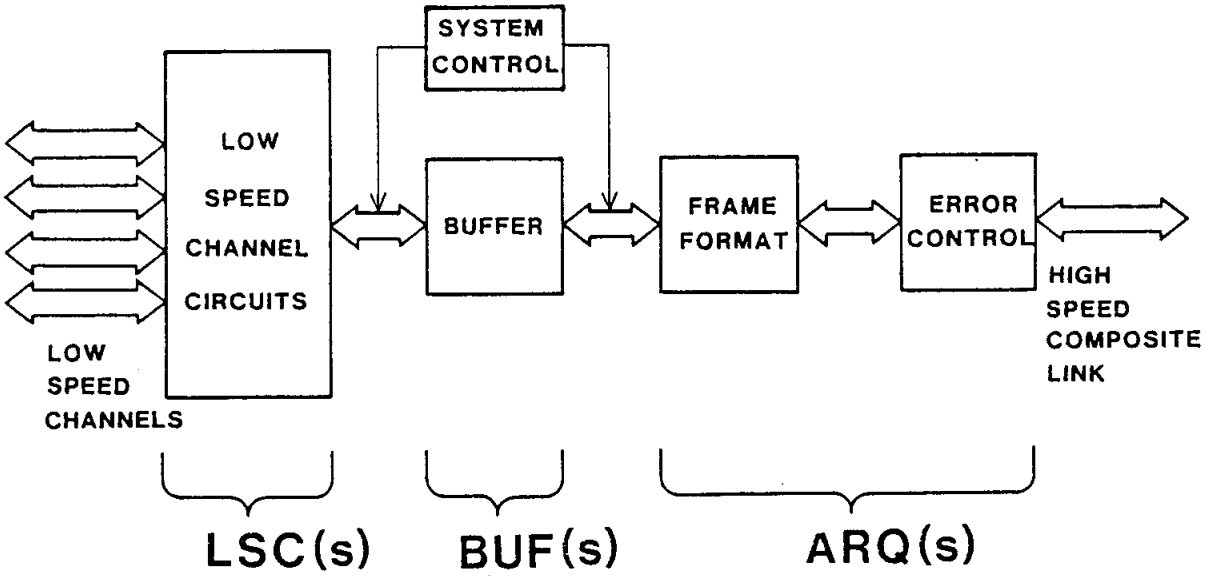
On receipt the frames are checked for correct transmission. If errors are found, the receiving end requests retransmission until a correct frame is received. The data characters are then dismantled from the frame and stored in the buffer until sent to their respective low-speed channel circuits.

The same procedure operates in the reverse direction at the same time, providing continuous full-duplex transmission.

The 5500 has the ability to interconnect channels between low speed ports and composite links (and between one composite link and another) in accordance with instructions entered by the operator. This is achieved by means of "Configuration Maps". In essence these are lists of interconnections held in memory in the 5500. They are constructed by the operator, and used by the 5500 as a reference for routing data. The 5500 contains two Configuration Maps, one of which is in use ("Active") at a time. The other ("non-Active" or "Edit") can hold a list of alternative routes, and can be reconstructed by the operator without interfering with normal operation of the network.

Upon request, changing from Map 1 to Map 2 takes place immediately. Data in the system for channels whose mapping is unchanged will not be affected. Each Configuration Map contains a "Device Map" and a "Channel Map".

## FUNCTION




## CONSTRUCTION

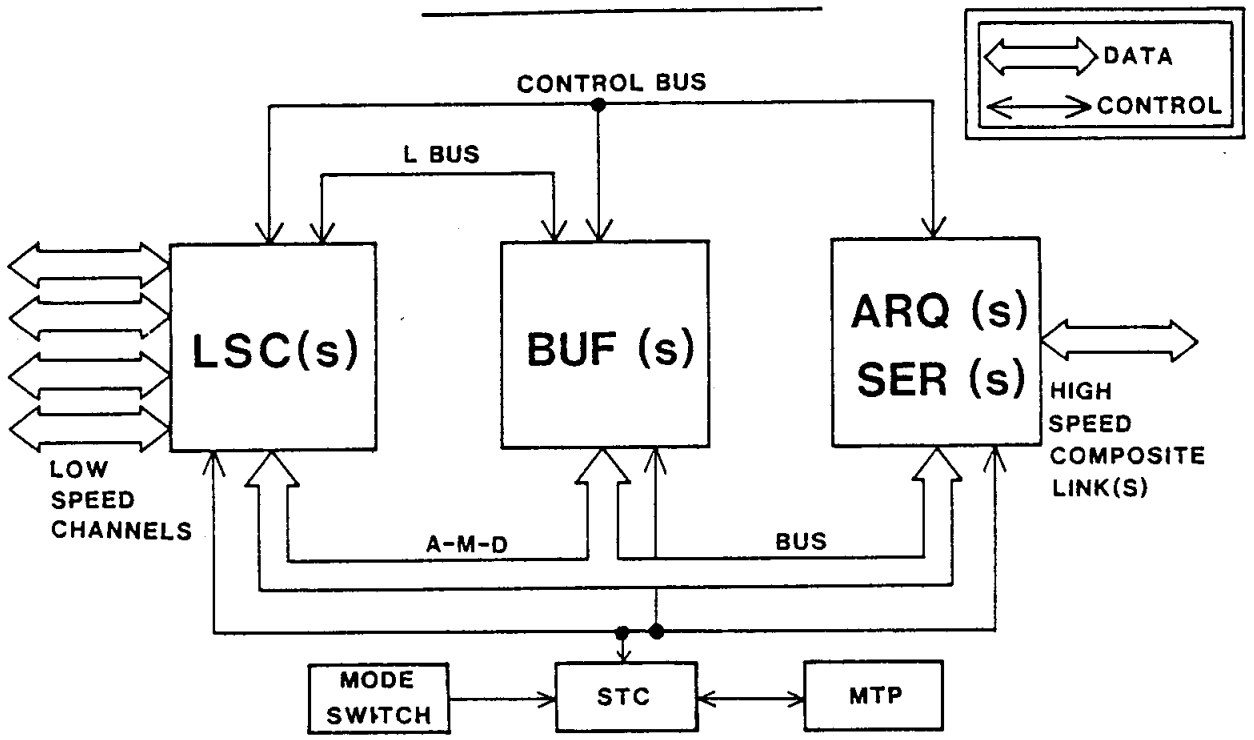



FIGURE 2-1
5500 SIMPLIFIED BLOCK DIAGRAMS

Operator control of the 5500 (and when required of the whole system) is by the keyboard and its indicators. Operations that can be carried out include: setting up and changing channel interconnections by means of the maps, testing channels in normal and loopback modes with test data, obtaining utilisation and error statistics from the high speed links, storing maps on external media, and printing information. (The external media units and printer are not part of the DATELMUX assembly.)

The lower diagram of Figure 2-1 shows the physical modules which compose the 5500. As can be seen, these relate directly to the functional modules, and can therefore conveniently be used as a basis for describing the functional operation in more detail.

An 5500 will include some or all of the following functional modules:-

| Name | Card Mnemonic | Qty per 5500 |
|---|---|---|
| Low Speed Channels | LSC | up to 60 |
| Buffer | BUF | up to 16 |
| Automatic Repeat on Request | ARQ | ) up to 12 total |
| System Test and Control | STC | 1 |
| Mapping and Test Panel | MTP | 1 |
| Mode Switch - | - | 1 |
| Bus Extension Module | BEM | ) 1 pair per |
| Bus Termination Module | BTM | ) extension frame |

The main communication path between these modules is the A-M-D Bus, which carries both address and data signals multiplexed on a common bus. In addition there is a Control Bus carrying various timing and control signals, and an L Bus which carries the addresses for the low speed channels.

The high speed composite links are normally connected to other Datelmux, in which case ARQ modules are used.

## 2.2 LSC MODULES (FIGURE 2-2)

Low Speed Channel modules interface terminals or computer ports to the DATELMUX. There are different types of LSC module for either synchronous or asynchronous working, and most can provide up to four ports. They are described in their own Sections. Figure 2-2 shows a generalised LSC block diagram.

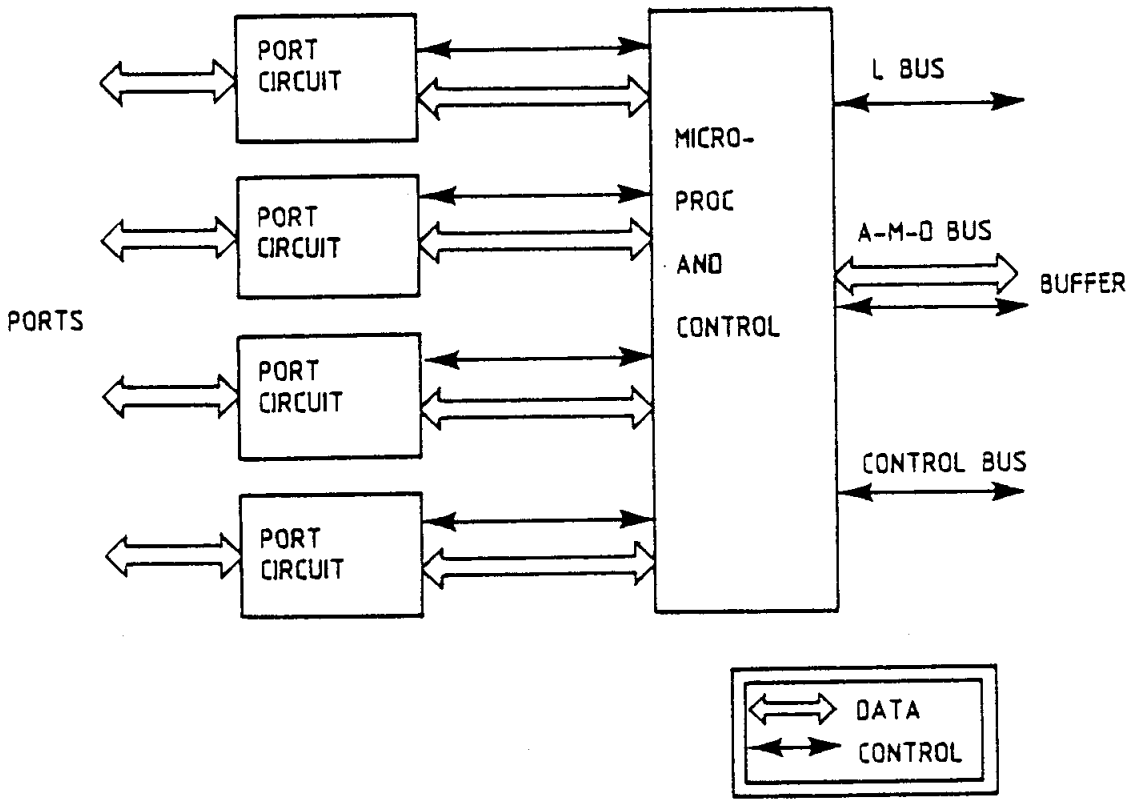



**FIGURE 2-2**
**LSC GENERALISED BLOCK DIAGRAM**

## 2.3 BUFFER (BUF) MODULES (FIGURE 2-3)

There are two types of buffer module to provide the most suitable size of buffer for any application:

| | |
|---|---|
| BUF2 | 16 kbytes |
| BUF3 | 64 kbytes |

They are functionally similar. If necessary, more than one BUF module will be used per 5500.

The BUF module(s) contains the multiplexer's main storage area holding all data in transit from ports to high speed composite link, and in transit from high speed composite link to ports.

The available storage in the memory is allocated dynamically to those channels that require it at any particular time, thus effectively providing large storage capacity for each channel.

Each module incorporates a microprocessor which is used for the management of the memory system. It carries out a test of the buffer memory as a background routine when the 5500 is running.

All characters have a parity bit added on entry to the memory (additional to any parity bit that may already be part of the character). These are checked (and removed) when the characters leave the memory, and any error is reported.

The buffer module notifies the rest of the system when the data store reaches 75% of capacity, and when it reduces to 50% of capacity.

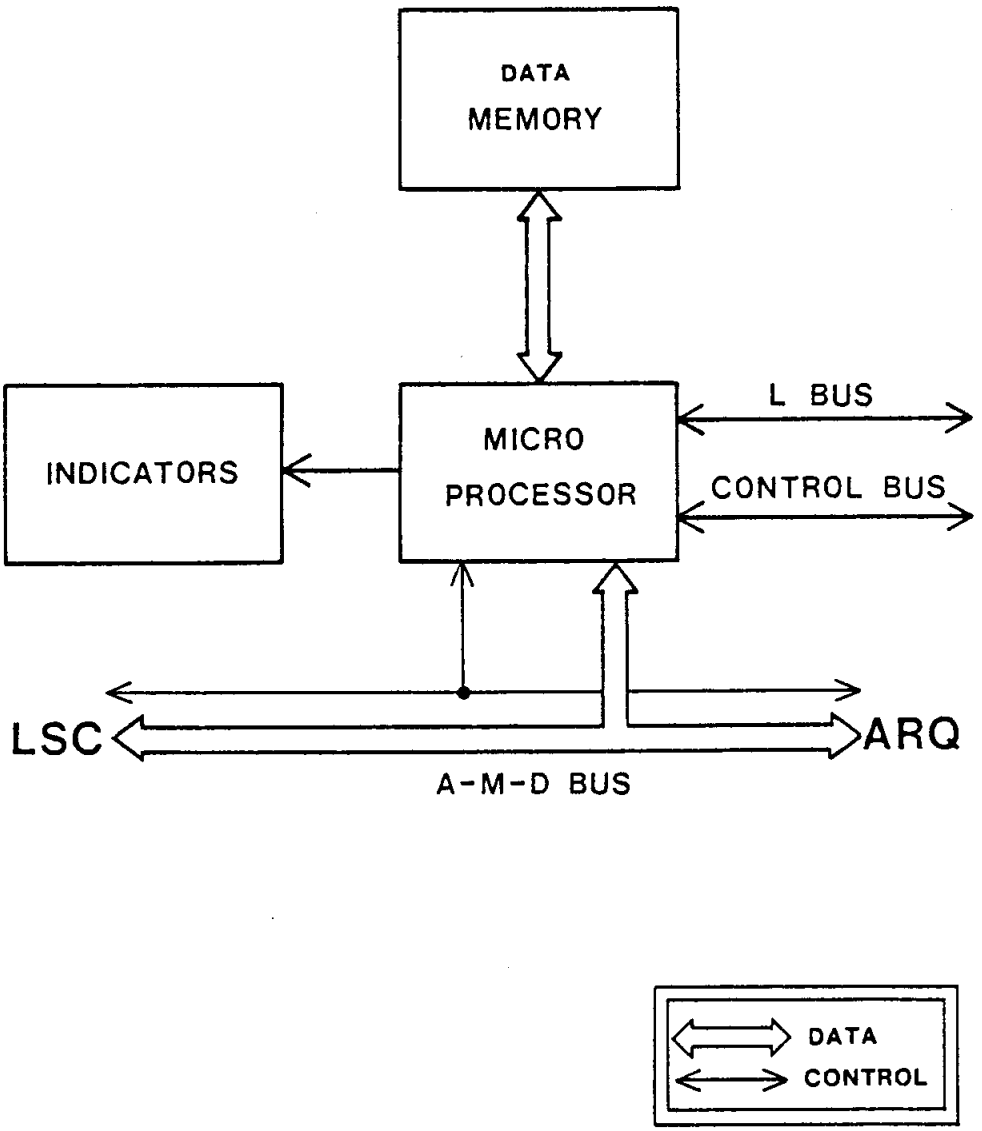



FIGURE 2-3
BUF BUFFER SIMPLIFIED BLOCK DIAGRAM

## 2.4 ARQ MODULES

### 2.4.1 ARQ1 (STANDARD) (FIGURE 2-4)

The ARQ1 module operates in full-duplex mode and performs two separate functions. The first is the assembly and dismantling of low speed channel data into frames for transmission over the high speed link. This is done by a microprocessor, which also controls the overall operation of the module. The frame is constructed to the High-Level Data Link Control (HDLC) format of CCITT recommendation X25, in which each frame includes a frame check sequence (FCS) of 16 bits.

The second function is error control of these frames being transmitted over the high speed link, using Automatic Repeat on Request (ARQ) "go back to N" error control procedures, following CCITT recommendation V41.

The ARQ1 module contains a 1K character memory which stores the last eight frames transmitted, for retransmission in event of error (this is additional to the main memory in the BUF module).

During normal operation each DATELMUX is sending frames to the other. Each transmitted frame includes its frame number, data, the FCS, and an acknowledgement of the last received frame. The receiving end recomputes the FCS and, if correct, sends positive acknowledgement back to the transmitting end. However if it detects an error (for example in frame N), it sends a negative acknowledgement. This causes the transmitting end to retransmit frame N and all subsequent frames.

The ARQ1 module has one option that can be selected by the user: its timing may be taken either from a crystal oscillator on the ARQ1 card (internal) or from the modem (external). The clock going to the modem may be either enabled or inhibited.

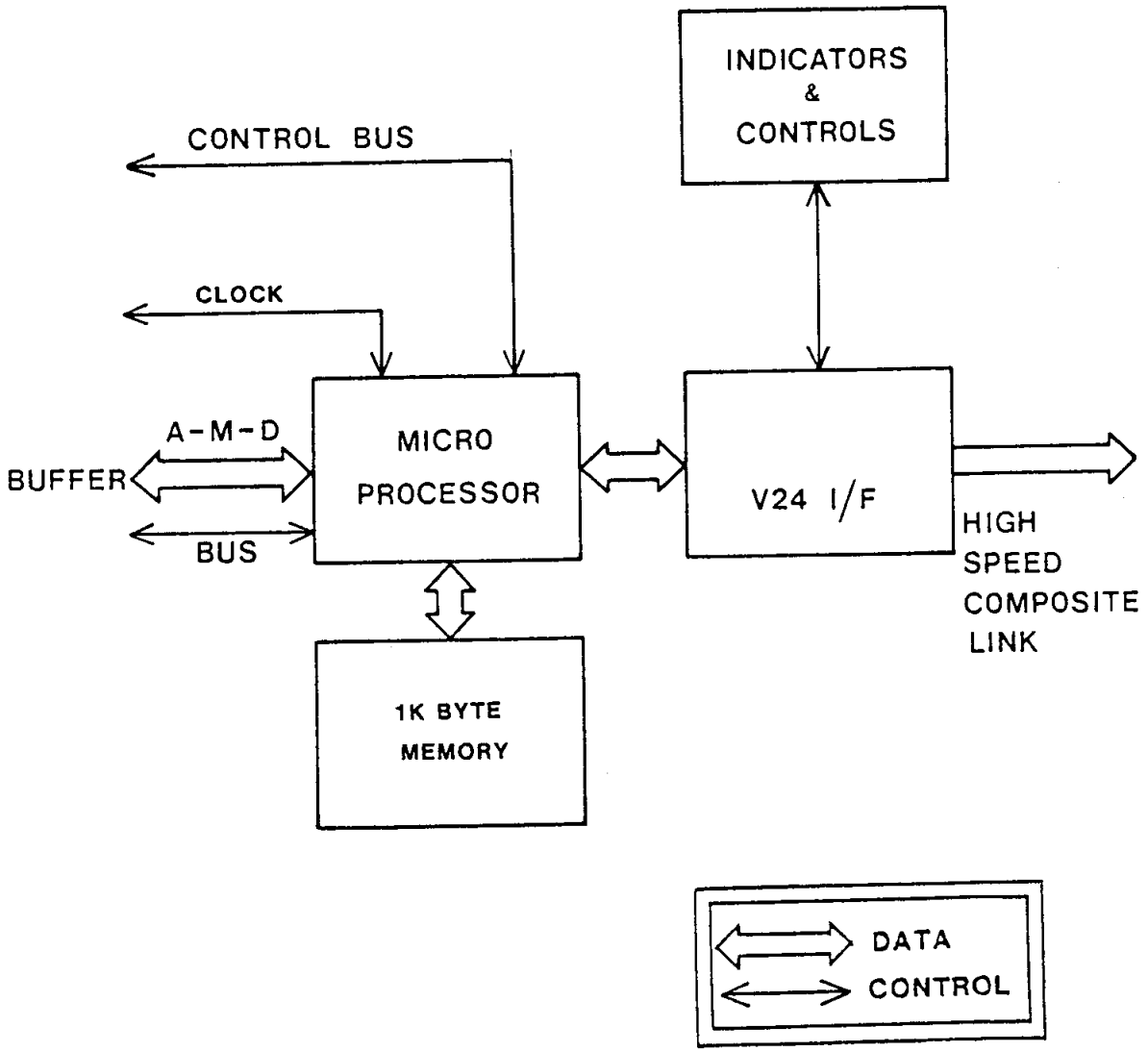



FIGURE 2-4

ARQ1 MODULE SIMPLIFIED BLOCK DIAGRAM

### 2.4.2 ARQ2 (HIGH SPEED) (FIGURE 2-5)

The ARQ2 is basically similar to the ARQ1, and can in fact be configured to be functionally identical, but it contains additional selectable features. It also contains a 12K character memory, of which 1K Stores the last eight (or optionally 8K stores the last sixty-four) frames transmitted, for retransmission in event of error. It requires the presence of an ARQ1 or a TAC (Timing and Control) module in slot 16.

The ARQ2 module has four options that can be selected by the user.

Clock Source

Normally ARQ2 timing is derived from the modem (external clock). Alternatively a single, fixed speed internal clock at V11 electrical levels may be selected for "back-to-back" connections or test purposes.

Interface Type

Three different standard interfaces are provided: V35, X21/V11 and V24/V28 (RS-232C)

Transmission Mode

The standard mode is used for interworking with standard ARQ1s or ARQ2s over low delay circuits. An Extended Window mode is available which maintains full performance over long delay (satellite) links.

Priority

This option allows certain low speed channels to be given priority, as required, over others within the ARQ2.

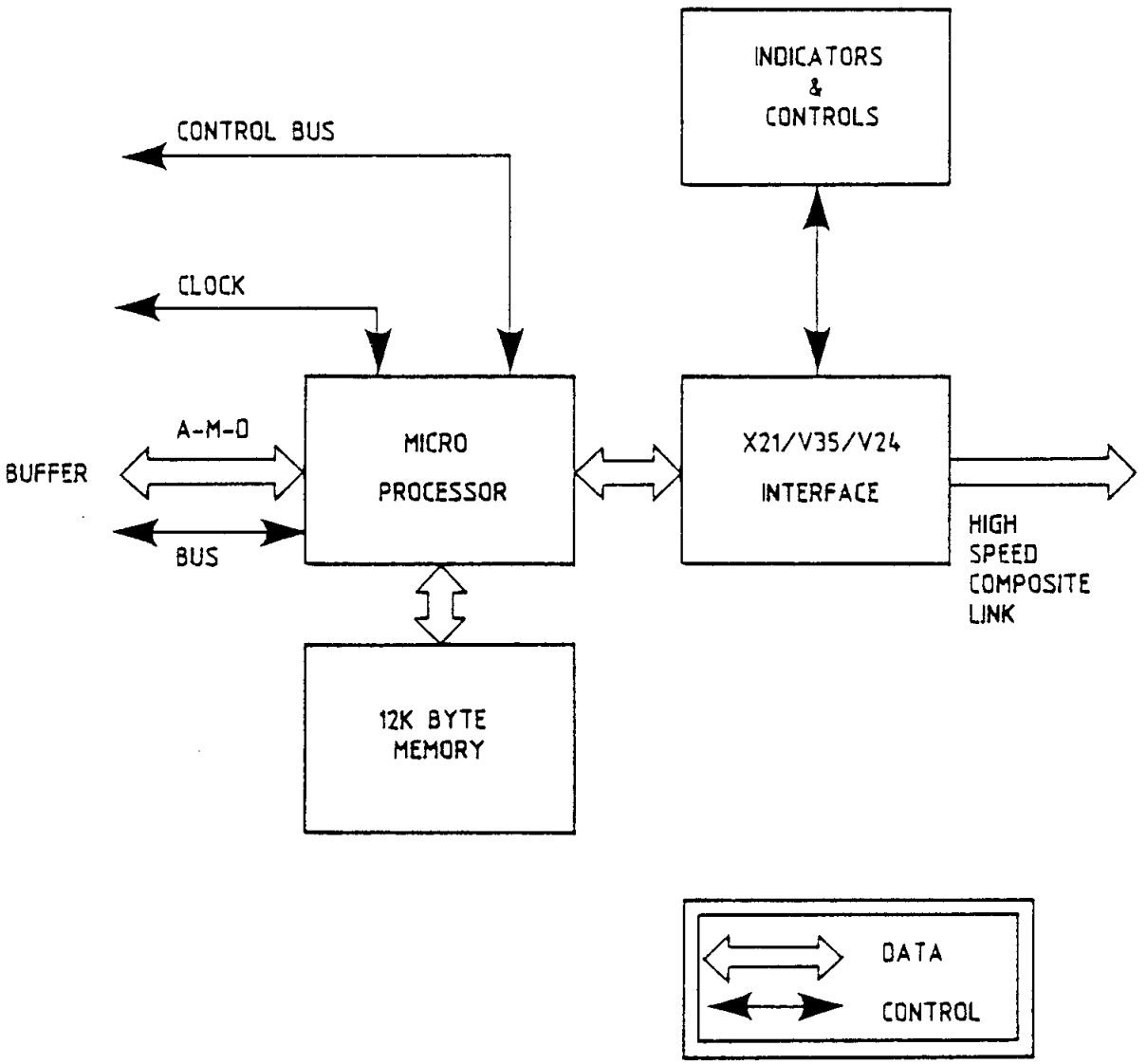



FIGURE 2-5

ARQ2 MODULE SIMPLIFIED BLOCK DIAGRAM

## 2.5 STC, MTP AND MODE KEYSWITCH (FIGURE 2-7)

The Mode Switch determines which multiplexer the MTP will control (Local, or Master/Slave operation).

The MTP is the operator interface. It contains keyswitches and indicators.

The STC contains the logic and Configuration Maps. It also has its own special port, which is used for connecting a printer, VDU, paper tape unit or magnetic tape/disc unit (and, in a Slave unit, is used when setting up Master/Slave configurations).

### 2.5.1 MODE KEYSWITCH

Functionally, each 5500 operates as if it comprised two sub-units: an MTP and a Multiplexer. Normally, the MTP controls its own Multiplexer as in Figure 2-8A, which is called Local operation. However the MTP of one 5500 (Master) may be connected to another 5500 (Slave) to take over control of it, as shown in Figure 2-8B. The Slave MTP and the controls on the Slave plug-in cards are then inoperative. When switched to Master, the local MTP takes over all test and diagnostic functions of the remote Slave multiplexer.

Note that the Mode keyswitch may alternatively be referred to as the "Arm" keyswitch (the name of the equivalent switch in the DATELMUX 5530). In the Slave position it disarms the controls of its local multiplexer.

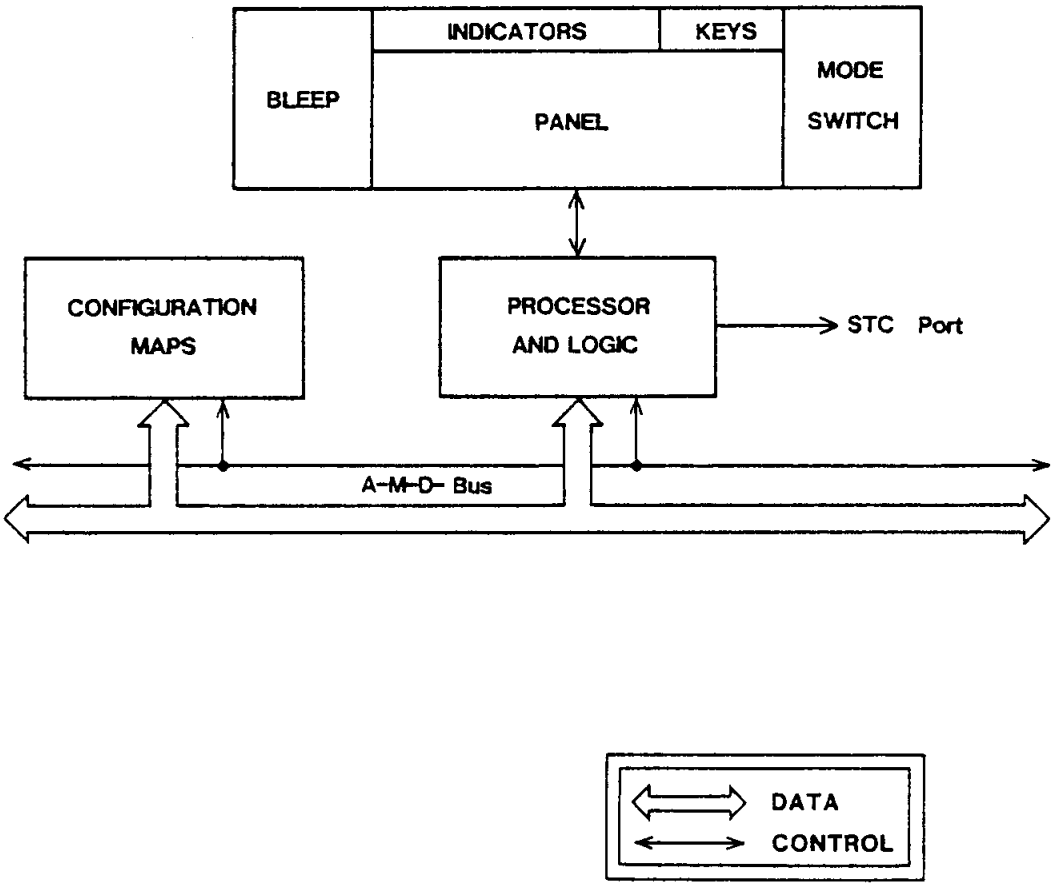
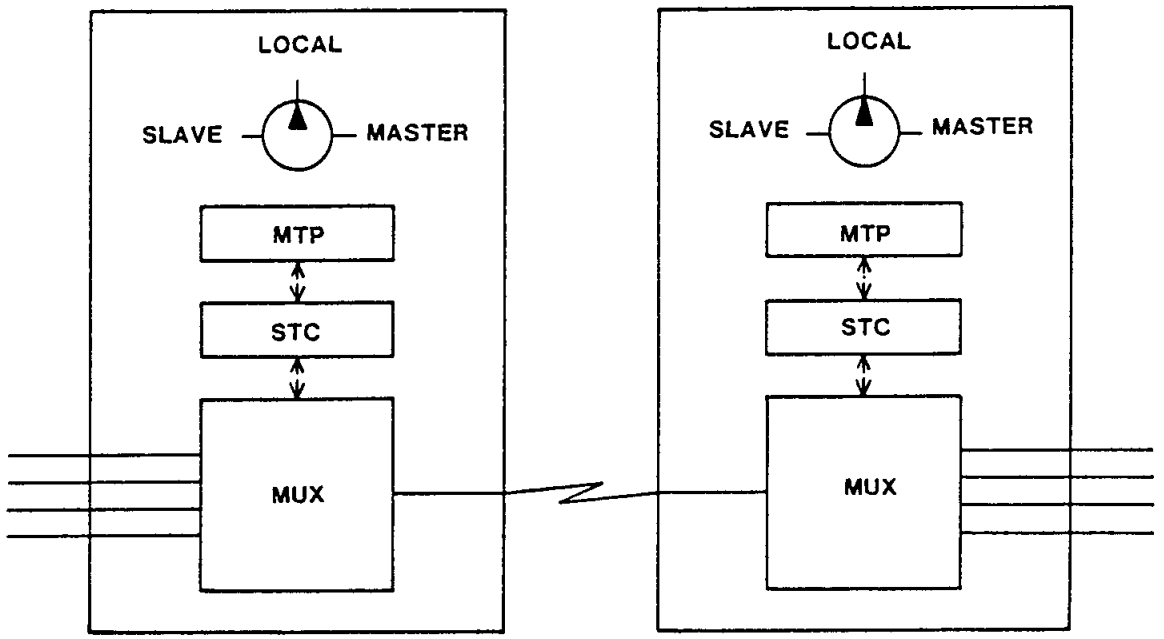
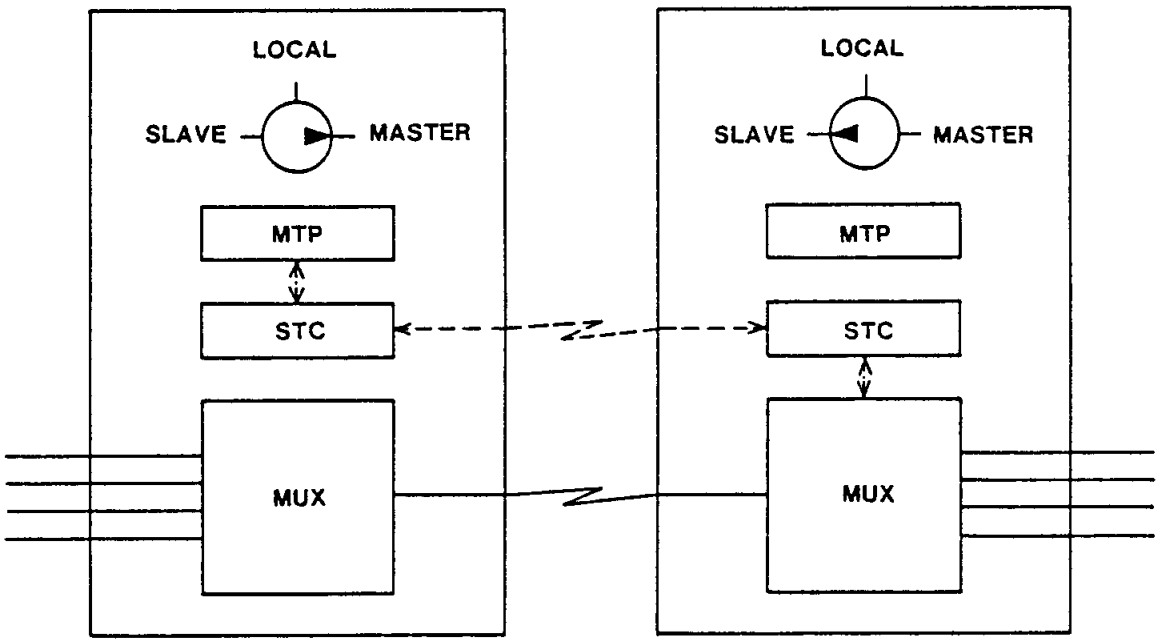



FIGURE 2-7

STC AND MTP SIMPLIFIED BLOCK DIAGRAM




A. TWO DATELMUXES IN LOCAL MODE




B. DATELMUXES IN MASTER AND SLAVE MODES

—— DATA

------- CONTROL

FIGURE 2-8
LOCAL/MASTER/SLAVE MODES

## 2.5.2 DEVICE MAPS

The term "device" is used to describe:

a) An ARQ module,
b) The Set of all low speed channels connected to a DATELMUX.

The term "channel" is used to describe a data path connected to a DATELMUX (rather than the complete path through it).

"Low speed" channels are those connected via low speed ports.

"Virtual" channels are those connected via high speed links (the data occupy slots in the framed data stream). In normal multiplexer operation, low speed channels will be interconnected to virtual channels.

Virtual channels will be connected to other virtual channels (on another device) if the DATELMUX is mid-pointing (eg the 5500 in London in Figure 1-2).

Figure 2-9 is a simplified example to illustrate these points. It has three devices, four low speed channels and twelve virtual channels. These are interconnected to form eight channel-pairs; note that four of these are mid-pointing. All these channels are full-duplex (data can flow both ways simultaneously).

Within the DATELMUX, each channel (low speed and virtual) is allocated a "queue" in the main buffer, into which to deposit its incoming data. This is illustrated in Figure 2-10. (These queue numbers are called the "absolute" numbers of the channels.)

It will be seen that each device has a buffer queue starting number (called its "base") and a number of channels (called its "size").

A "Device Map" is a list of the devices in a DATELMUX, with each one's base and size. Thus the Device Map for the example system is:-

| Device | Base | Size |
|---|---|---|
| 0 | 1 | 4 |
| 1 | 5 | 6 |
| 2 | 11 | 6 |

The channel numbers can be expressed more conveniently when related to their devices, as shown in Figure 2-11. These are called their "relative" numbers.

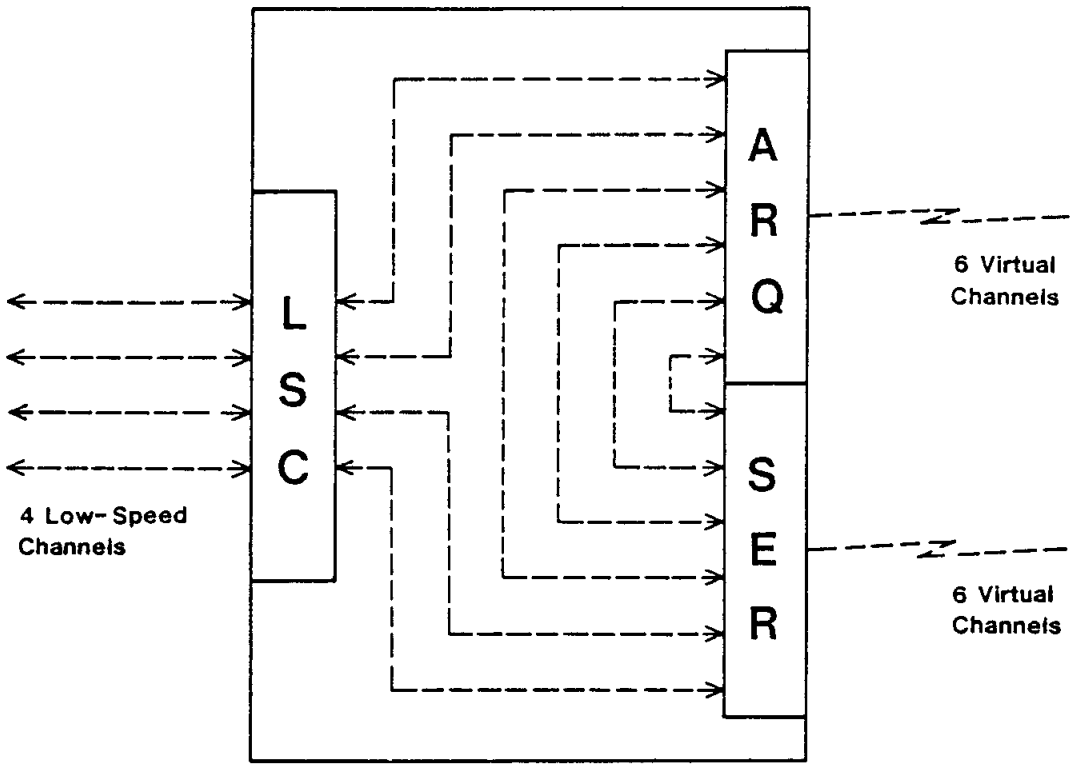



FIGURE 2-9
EXAMPLE 5500 WITH LOW SPEED AND VIRTUAL CHANNELS

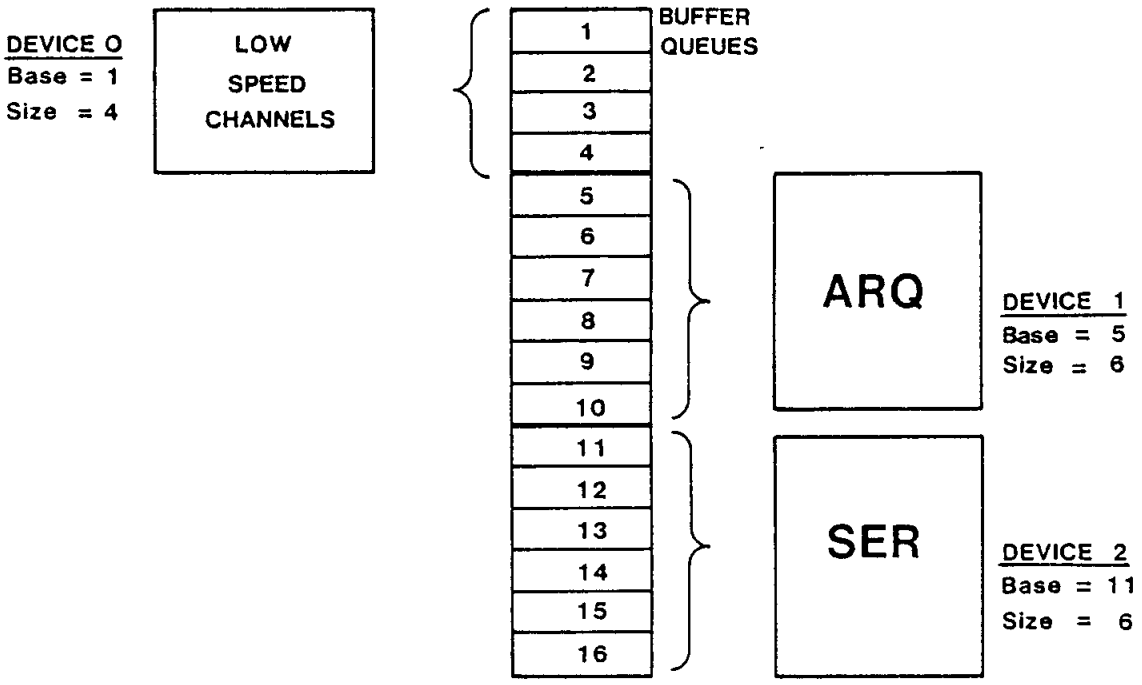



FIGURE 2-10
EXAMPLE DEVICE NUMBERING

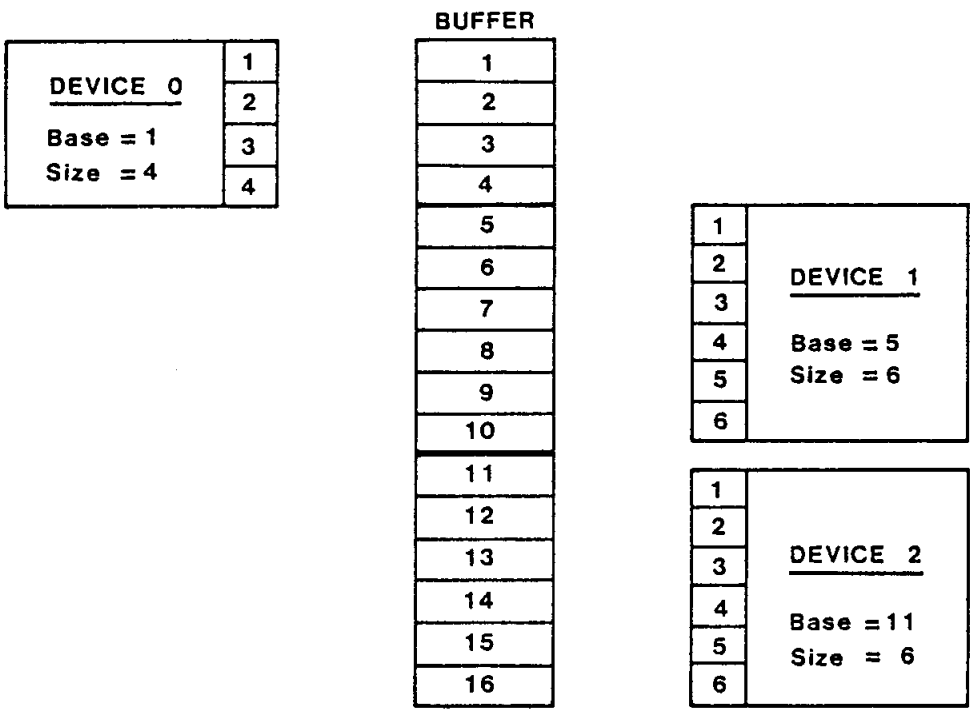



FIGURE 2-11
EXAMPLE CHANNEL NUMBERING

### 2.5.3 Channel Maps

The purpose of a Channel Map is to record the desired interconnections between channels. These may be made between low speed channels and virtual channels, or between a virtual channel on one device and a virtual channel on another device. They are listed in pairs for the complete DATELMUX. The Channel Map for the example system is:-

| Device.Channel | To | Device.Channel |
|---|---|---|
| 0.1 | - | 1.1 |
| 0.2 | - | 1.2 |
| 0.3 | - | 2.5 |
| 0.4 | - | 2.6 |
| 1.1 | - | 0.1 |
| 1.2 | - | 0.2 |
| 1.3 | - | 2.4 |
| 1.4 | - | 2.3 |
| 1.5 | - | 2.2 |
| 1.6 | - | 2.1 |
| 2.1 | - | 1.6 |
| 2.2 | - | 1.5 |
| 2.3 | - | 1.4 |
| 2.4 | - | 1.3 |
| 2.5 | - | 0.3 |
| 2.6 | - | 0.4 |

It can be seen that since interconnections are in pairs (eg 0.3 to 2.5, and 2.5 to 0.3), there are routes for (full-duplex) transmission in both directions.

In the 5500 a particular channel's incoming data is routed to its corresponding buffer queue, and its outgoing data is taken from the buffer queue of its mapped (interconnected) channel. For example Channel 0.3's incoming data is routed to buffer queue 3, and its outgoing data is taken from buffer queue 15. Channel 2.5's incoming data is routed to buffer queue 15, and its outgoing data taken from buffer queue 3. This is illustrated in Figure 2-12, which for clarity shows only this one mapped channel pair.

The route of incoming data from low speed channels (Device 0) is determined automatically by hardware, depending on the physical slot into which the LSC card is plugged. (Although this is automatic, it must be allowed for in the mapping operation.)

The route of incoming data from high speed devices (ARQ) is determined by the device specifying the address, which it obtains from the Device Map.

The route of outgoing data to all channels is determined by reference to the Channel Map.

Mapping and control data also needs to be output from the MTP/STC and routed to a low speed or virtual channel. For this purpose it is allocated its own special channel number (Channel 0.0).

Figure 2-13 is a functional block diagram of a more practical example 5500. Information regarding the practical aspects of mapping, including the actual numbers allocated by hardware to devices and channels, is given in Section 6.6.

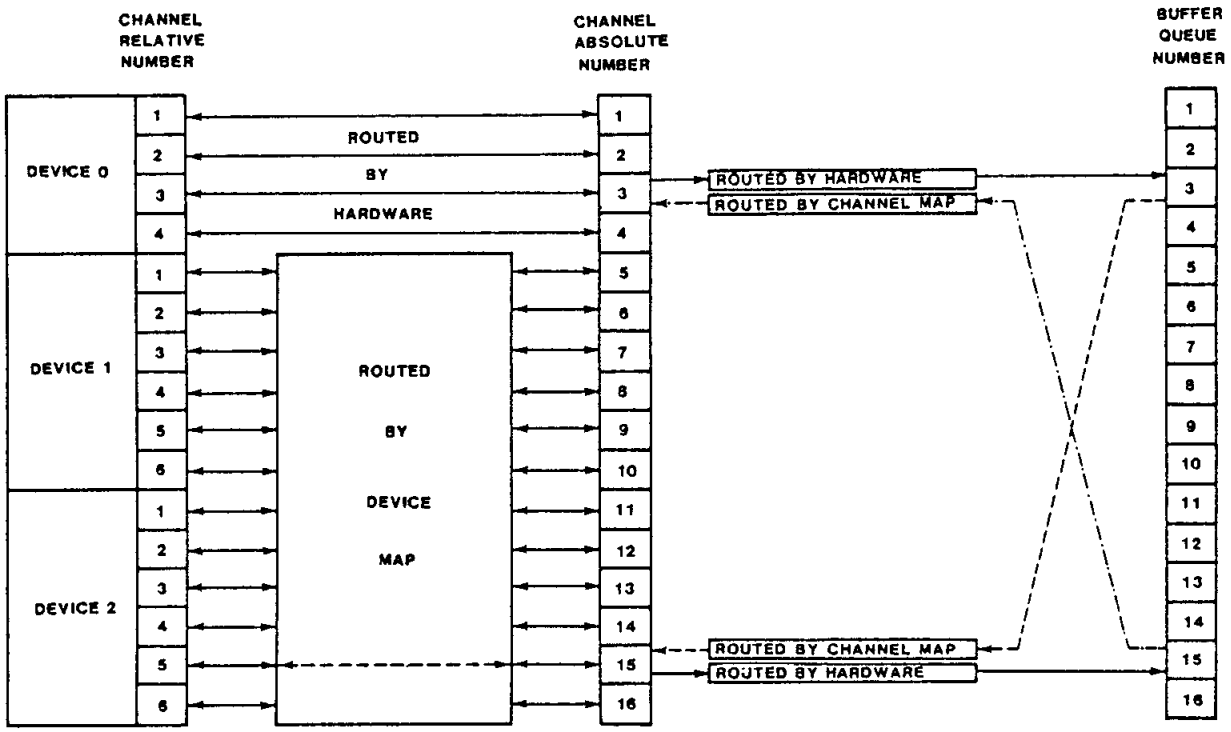



FIGURE 2-12
EXAMPLE CHANNEL MAP 0,3-2,5

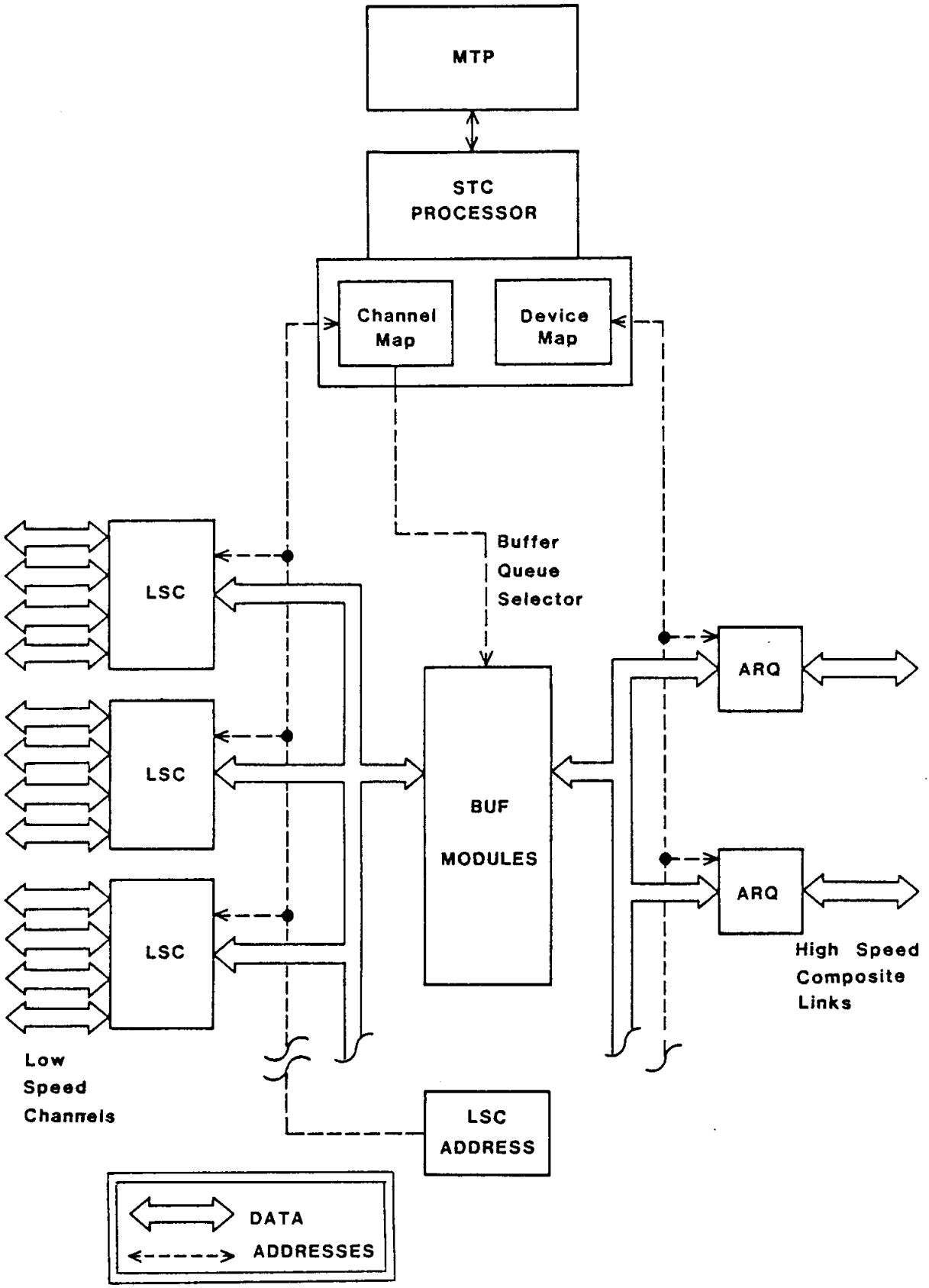



FIGURE 2-13

FUNCTIONAL BLOCK DIAGRAM OF EXAMPLE 5500

### 2.5.4 SPEED MAPS

Low speed channels in the 5500 may have their transmission rate set at the MTP, when their switches on the LSC modules are set for ABR operation. The speeds so set are saved in a Speed Map which, like the Device and Channel Maps, is part of Maps 1 and 2 held in the STC.

### 2.5.5 MAP 1 AND MAP 2

The STC contains two Configuration Maps, Map 1 and Map 2. Each comprises a Device Map and a Channel Map, plus a Speed Map. Either Map 1 or Map 2 may be selected for configuring the system (the Active Map) and either may be edited (the Edit Map) as shown in Figure 2-14. Note that the Non-active map may be, or may not be, the same as the Edit map. Selection is from the MTP (described in Section 4).

### 2.5.6 BATTERY

To prevent the maps being lost when the 5500 is powered down, a rechargeable battery is used on the STC module. This is trickle charged when power is on, and (if fully charged) maintains the map for a minimum of 15 hours after it has been switched off.

Bus Ext  Bus Term.

## 2.6 BEM AND BTM MODULES (FIGURE 2-15)

These modules do not functionally affect the data or addresses, but merely perform a hardware function of extending the busses when more than one frame is used in an 5500.

## 2.7 INITIALISATION

Initialisation is the process which resets the module hardware and restarts the software, clearing out all RAM and re-establishing parameters from DIL switch settings. It occurs automatically when mains power is applied, or when the reset pins are connected together.

Initialisation of the STC module is the process by which it organises the system after power is applied. The following sequence occurs:-

i) The STC attempts to find a good map: first checking the map that was previously Active, then (if that is unsuccessful) the alternative map. If they are absent or irretrievably corrupted, a basic "no map" state is set up. (During this period the map is not switched on to the LSC or ARQ modules, which may therefore flash error codes.)

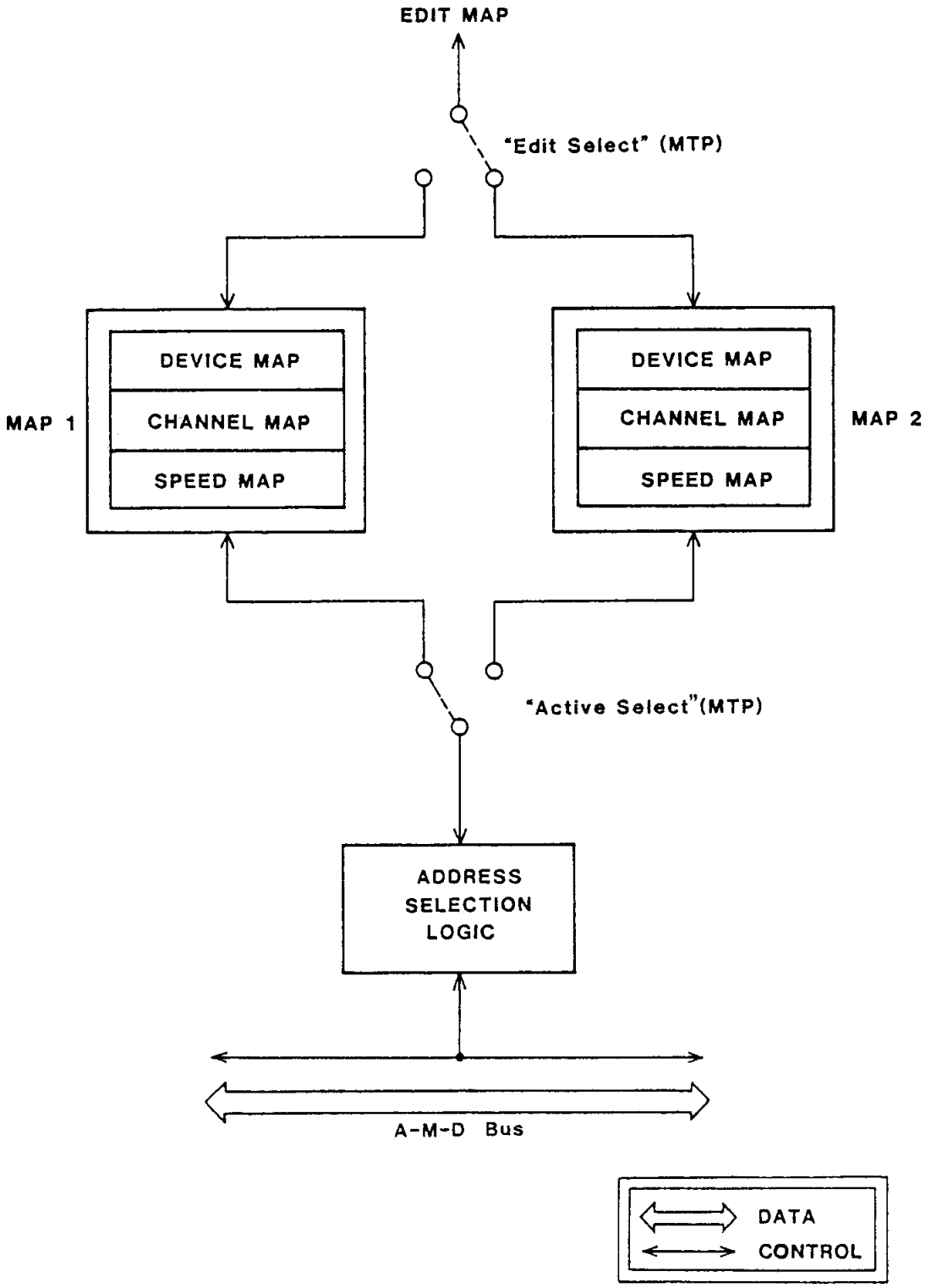



FIGURE 2-14
CONFIGURATION MAPS

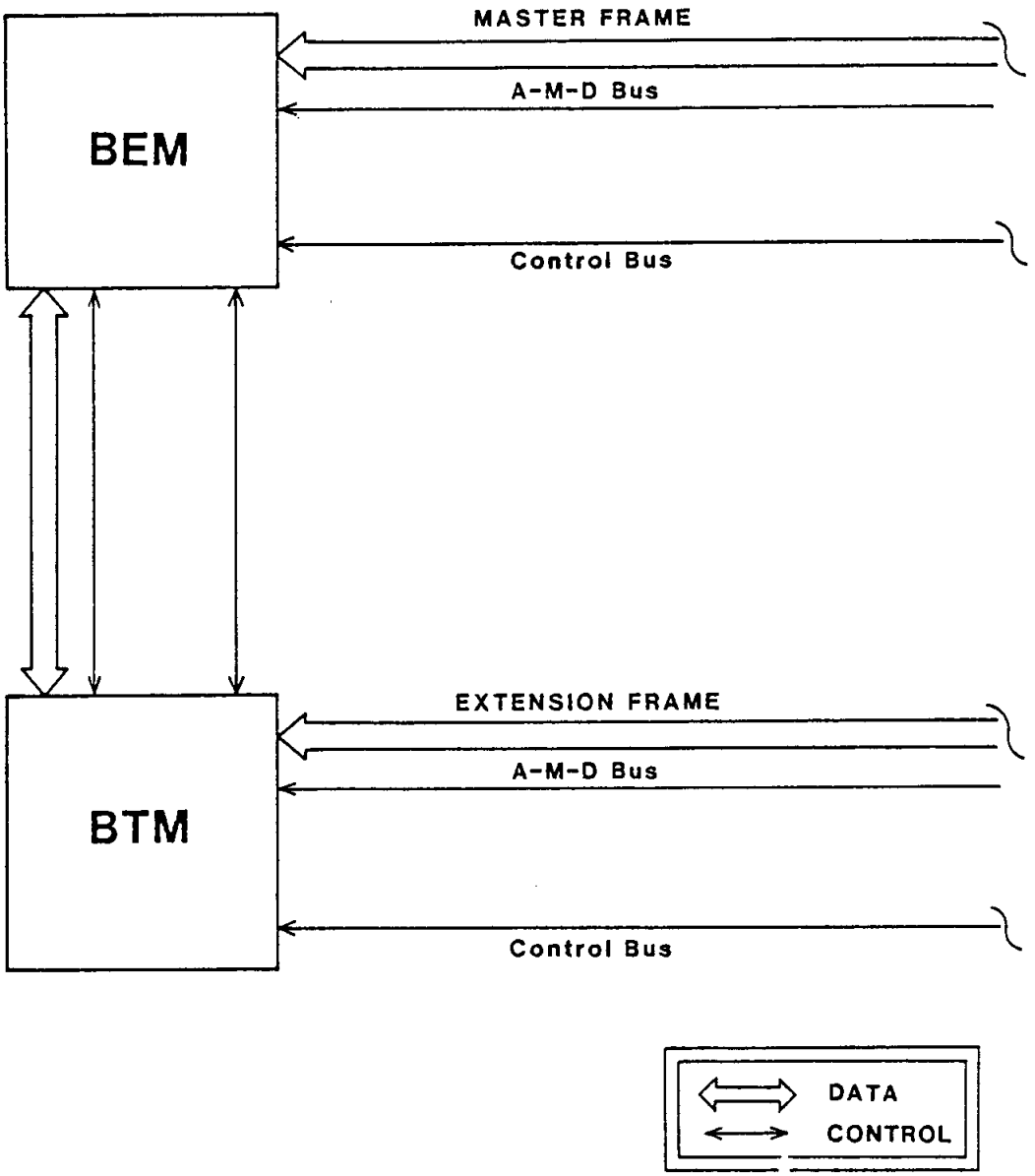



FIGURE 2-15
BEM AND BTM SIMPLIFIED BLOCK DIAGRAM

ii) The map is turned on.

iii) Any centrally stored speeds are sent to LSC cards.

iv) Control updates are sent to all channels to reinitialise them.

v) The buffers are reinitialised.

vi) A wait period is allowed for the USO module, (if the unit is an 5500).

vii) The system is ready.

# SECTION 3

# PRODUCT DESCRIPTION

## 3.1 THE 5500 UNIT

The 5500 is constructed on a modular basis. Each 5500 comprises a number of standard plug-in cards, plus the 17-slot frames needed to accommodate them. The minimum number of frames is one, the maximum is five. Frames are standard 19-inch rack size. They may either be mounted in a standard 19 inch rack, or each one may be mounted in a single-frame standalone enclosure. Interconnecting cables are long enough (two metres overall) to allow single-frame enclosures to stand on top of each other, or side-by-side. Figure 3-1 shows a single-frame 5500, and a five-frame 5500.

There are eight types of printed-circuit cards:-

| | |
|---|---|
| LSC | Low Speed Channel card (five versions) |
| BUF | Buffer card (three versions) |
| ARQ | Automatic Repeat on Request card (two versions) |
| TAC | Timing and Control card |
| STC | System Test and Configuration card |
| BEM | Bus Extension Module |
| BTM | Bus-Termination Module |

Each frame includes its own power supply. It has space for a Mapping and Test Panel (MTP) to be fitted, and has 17 slots for plug-in cards. In multi-frame 5500s, one frame (at a convenient height) is nominated Master Frame. It contains the System Test and Configuration (STC) module (plus its port) and MTP. The remainder are Extension Frames.

Standalone enclosures include fan units. Rackmount units require fan trays, with one mounted underneath alternate Master and Extension frames (ie 1 or 2 frames need 1 tray, 3 or 4 frames need 2 trays, 5 frames need 3 trays).

The connectors for the low speed channels, the high speed links and the STC port are mounted on a panel at the rear of the unit (see Figure 3-2). The connector positions are numbered in rows for ease of reference, and are equivalent to the card slots, e.g. an LSC card in slot 3 has a channel socket in each of positions 3A, 3B, 3C, and 3D; an ARQ card in slot 16 has its plug in position 16A. (An STC card in Master frame slot 17 has its special port plug in position 15D.)

All connections to the printed-circuit cards are made through the backplane. The circuit cards can be removed from the slots by ejector levers mounted on the upper edge of the cards.

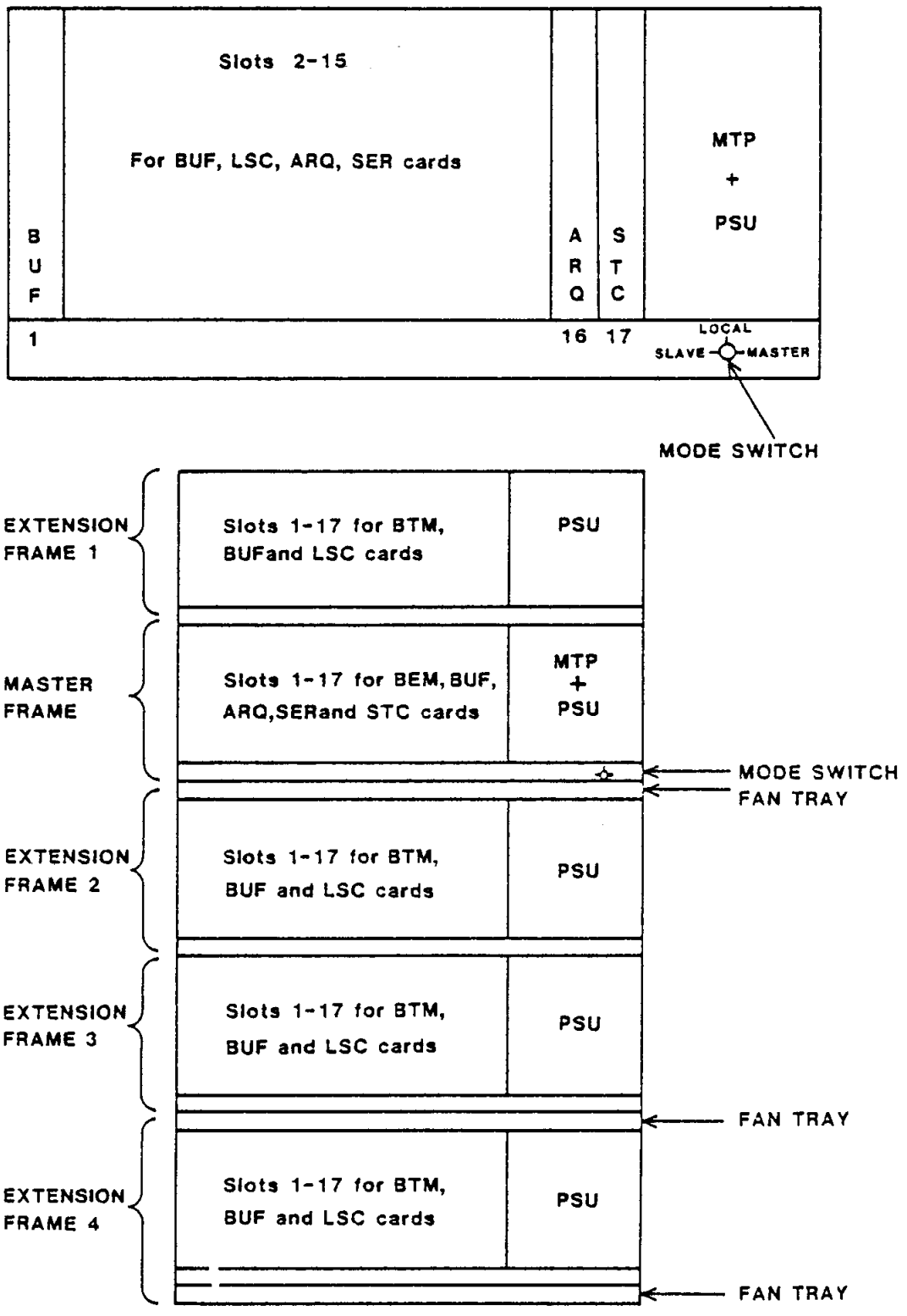



FIGURE 3-1

SINGLE AND MULTI-FRAMED 5500s, FRONT

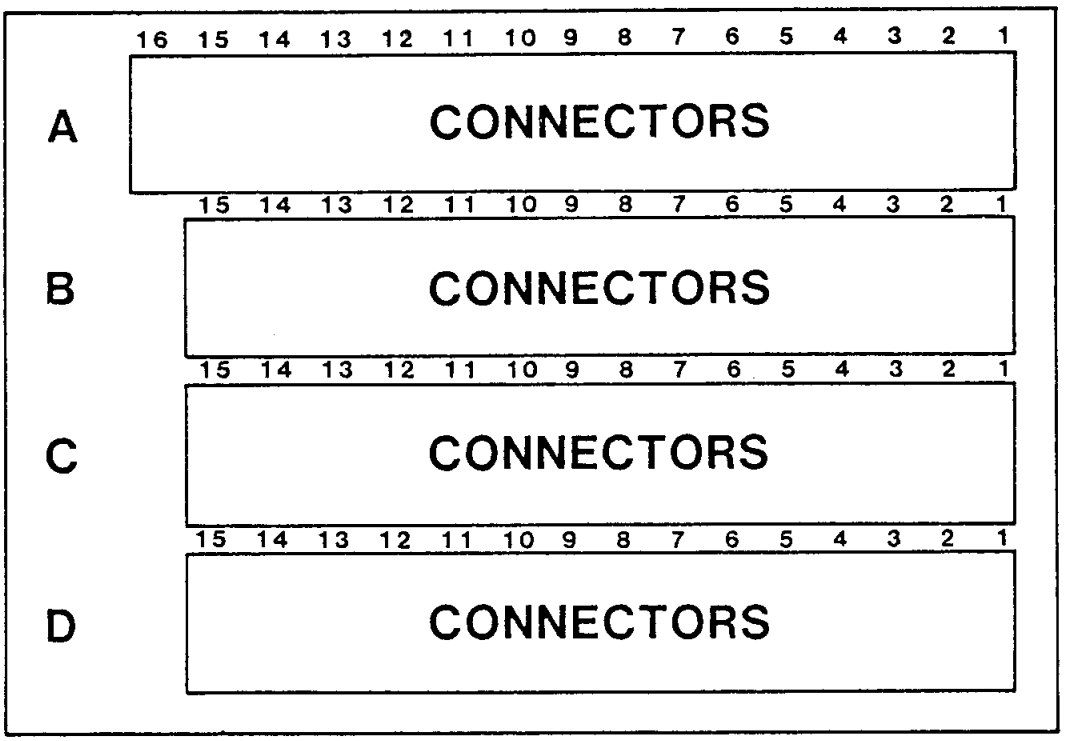



FIGURE 3-2
ONE 5500 FRAME, REAR

In addition to the controls and indicators on the MTP, there are other controls and indicators fitted to the front edges of the printed circuit cards.

Each frame connects to the mains supply by a 3-core cable with approximately 2 metres free length, terminating (in UK) in a standard 13 amp plug fused at 3 amps.

The Appendix contains forms that may be filled in for specific installations.

### 3.1.1 THE STC SPECIAL PORT

This has a standard V24/V28 interface with the same connections as those of the composite link shown in Table 3-1.

### 3.1.2 THE MODE KEYSWITCH

This is mounted beneath the MTP. In Local Mode (key in lock turned to centre position) the 5500 is controlled by its own MTP. In Slave Mode (key in lock turned counter-clockwise or removed) the 5500 MTP and card controls are inoperative. In Master Mode (key in lock turned clockwise) the MTP may be used to control a Slave 5500.

## 3.2 COMPOSITE LINK INTERFACE

### 3.2.1 ARQ1

Each ARQ1 card terminates in a 25-way D-type plug. The interface signals conform to CCITT V24/V28 and are listed in Table 3-1.

A 3-metre cable is supplied to connect this plug to the socket of a standard modem. It is wired straight through, ie pin 2 to pin 2, pin 3 to pin 3, etc. (Part No 5001)

| PIN NO. | CCITT CIRCUIT | SIGNAL |
|---|---|---|
| 2 | 103 | Transmitted Data |
| 3 | 104 | Received Data |
| 4 | 105 | Request to Send |
| 5 | 106 | Clear to send |
| 6 | 107 | Data Set Ready |
| 7 | 102 | Signal Ground |
| 8 | 109 | Carrier Detect |
| 15 | 114 | Transmitter Clock |
| 17 | 115 | Receiver Clock |
| 20 | 108/2 | Data Terminal Ready |
| 23 | 111 | Data Rate Select |
| 24 | 113 | External Transmit Clock |

TABLE 3-1

ARQ1 COMPOSITE LINK INTERFACE

3.2.2 ARQ2

The ARQ2 card terminates in a 25-way D-type plug which carries all the signals required for the three standard interfaces (see Table 3-2). Connection to a modem is made using a cable appropriate to the interface type required, selected from those listed below.

V35 Interface Cable (Figure 3-3)

Part No 5006.
25-way D-type socket to 34-way MRAC plug.
Length 3 metres.

X21 Interface Cable (Figure 3-4)

Part No 5007.
25-way D-type socket to 15-way D-type plug.
Length 3 metres.

V24 Interface Cable (Figure 3-5)

Part No 5005.
25-way D-type socket to 25-way D-type plug.
Length 3 metres.

## 3.3 LS CHANNEL INTERFACE (FIGURE 3-3)

Each low speed port is required to connect to its terminal or computer either directly by cable, or over a modem link (onward linking), as illustrated in the example networks in Section 1. A full description is provided in each LSC Section.

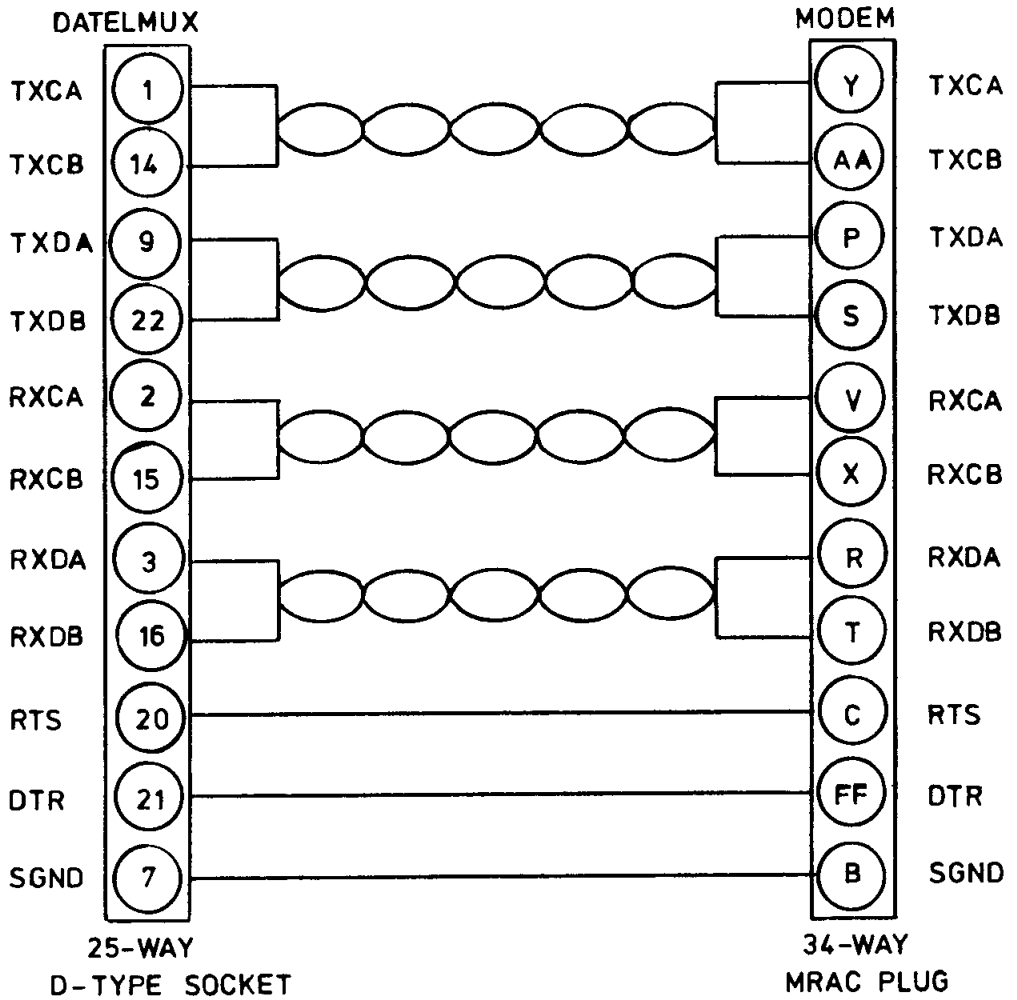



FIGURE 3-3

V35 INTERFACE CABLE

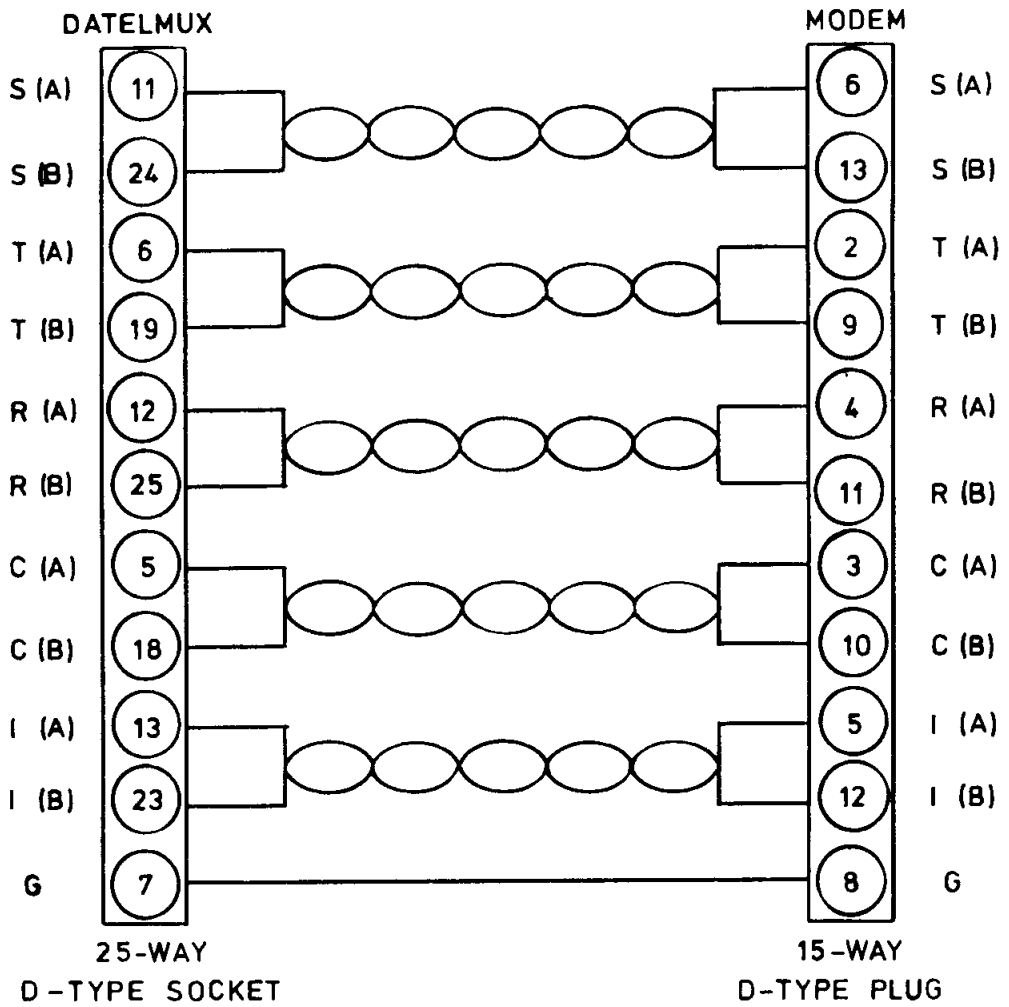



FIGURE 3-4

X21 INTERFACE CABLE

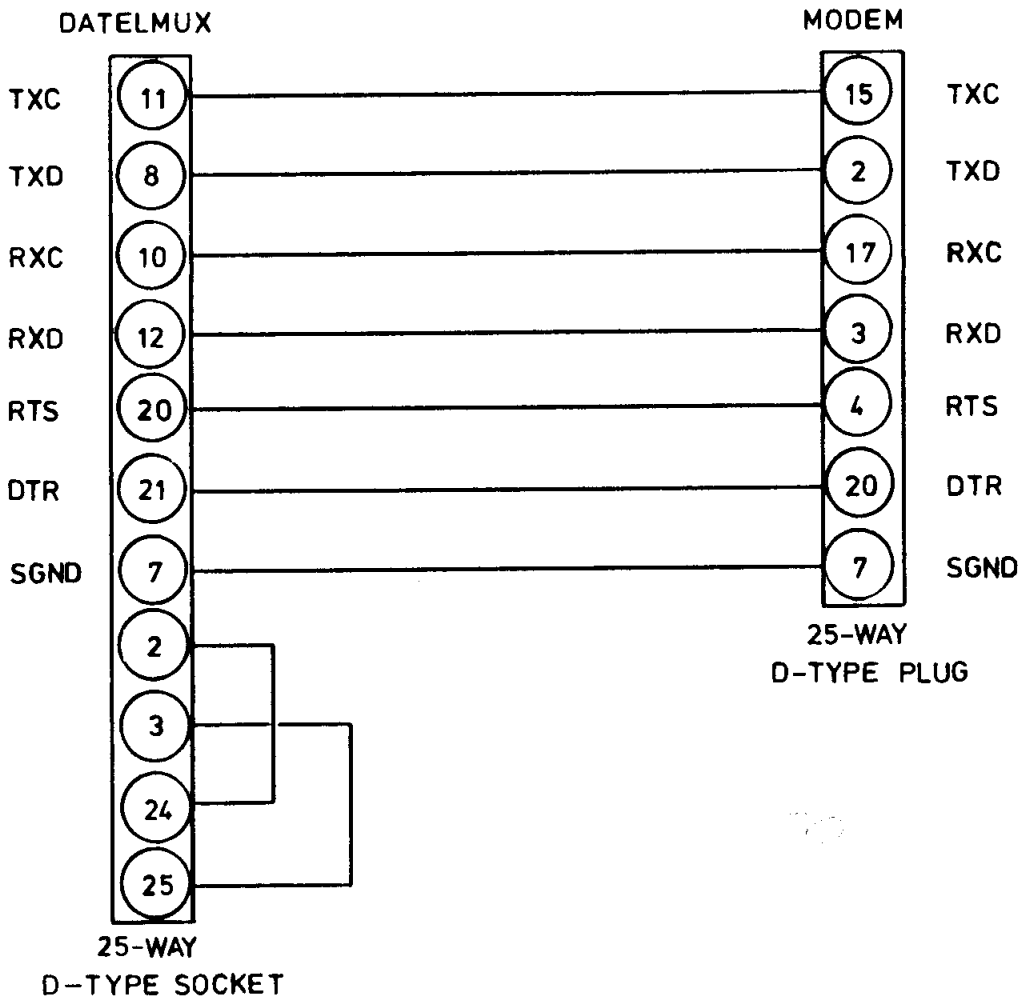



FIGURE 3-5

V24 INTERFACE CABLE

| PIN NO | TYPE | MNEMONIC | SIGNAL DESCRIPTION |
|---|---|---|---|
| 1 | V35 | TXCA | Transmitter Clock (A) |
| 2 | V35 | RXCA | Receiver Clock (A) |
| 3 | V35 | RXDA | Received Data (A) |
| 4 | V11 | CLKA | 80 kHz internal clock (A) |
| 5 | X21 | CA | Control (A) |
| 6 | X21 | TA | Transmit (A) |
| 7 | ALL | SGND | Signal Ground |
| 8 | V24 | TXD | Transmitted Data |
| 9 | V35 | TXDA | Transmitted Data (A) |
| 10 | V24 | RXC | Receiver Clock |
| 11 | X21/V24 | SA/TXC | Signal Element Timing (A) |
| 12 | X21/V24 | RA/RXD | Receive (A) |
| 13 | X21 | IA | Indication (A) |
| 14 | V35 | TXCB | Transmitter Clock (B) |
| 15 | V35 | RXCB | Receiver Clock (B) |
| 16 | V35 | RXDB | Received Data (B) |
| 17 | V11 | CLKB | 80 kHz internal clock (B) |
| 18 | X21 | CB | Control (B) |
| 19 | X21 | TB | Transmit (B) |
| 20 | V24/V35 | RTS | Request To Send |
| 21 | V24/V35 | DTR | Data Terminal Ready |
| 22 | V35 | TXDB | Transmitted Data (B) |
| 23 | X21 | IB | Indication (B) |
| 24 | X21 | SB | Signal Element Timing (B) |
| 25 | X21 | RB | Receive (B) |

TABLE 3-2

ARQ2 COMPOSITE LINK INTERFACE

## 3.4 POWER SUPPLY (FIGURE 3-1)

The DATELMUX 5500 operates from 240 volt ± 10%, 45-55 Hz (optionally 115 volt ± 10%, 60 HZ; see Section 5.10) single-phase AC mains supply. The modules inside the unit produce +5 volts, +15 volts and -15 volts D.C. The power supply assembly is mounted behind the MT Panel or blanking panel.

### 3.4.1 FAN SOCKET

The power supply incorporates a socket into which a fan tray can be connected.

### 3.4.2 FUSE

The fuse is mounted on the rear of the power supply.

| SUPPLY | FUSE |
|---|---|
| 240 VAC | 2A slow blow, 5 x 20 mm |
| 115 VAC | 5A slow blow, 5 x 20 mm |

TABLE 3-3

FUSE RATINGS

## 3.5 LSC CARDS

The various types of LSC card are described in the relevant Sections.

## 3.6 BUF CARDS (FIGURE 3-6)

There are two alternative versions of BUF card: BUF2 and BUF3. They are interchangeable and compatible, (except when used as "Master BUFs" in a multi-frame 5500, see para 5.1.5). The BUF2 and BUF3 cards have six error indicators and one pushbutton switch.

OVF — Indicator (red). When illuminated, indicates buffer overflow (buffer had to discard data, but cause is elsewhere in system).

MF — Indicator (red). When illuminated, indicates memory fault (faulty buffer card).

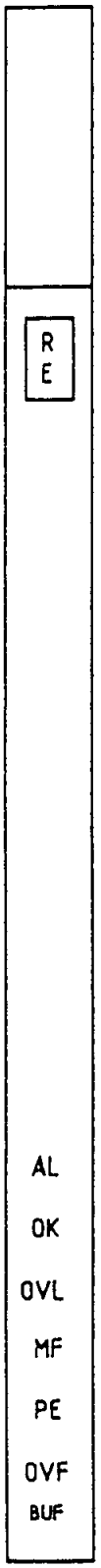
PE — Indicator (red). When illuminated, indicates loss of parity for a character read from the memory (faulty buffer card).

OK — Indicator (green). When illuminated, indicates that the background routine is running normally. When off, indicates that self-initialise has occurred or the background routine is not running.

AL — Indicator (red). When illuminated, indicates an alarm condition (OVF, PE or MF on).

OVL — Indicator (yellow). When illuminated, indicates that the buffer has reached the overload threshold.

RE — Momentary pushbutton. Resets the error indicators.




BUF 2 AND BUF 3

FIGURE 3-6
BUFFER MODULE INDICATORS
AND CONTROLS

## 3.7 ARQ AND TAC CARDS

### 3.7.1 ARQ1 (Figure 3-7)

The ARQ1 card provides the standard V24 modem interface which carries the composite framed data to/from the remote DATELMUX. This is terminated at a plug at the rear of the 5500. The ARQ1 card has three pushbutton controls, five general indicators and seven V24 interface indicators. The ON state of a red LED on the ARQ1 is a warning sign and may indicate an error.

CL — Pushbutton (latching). When OUT, circuit is in normal mode. When IN, circuit is in loopback mode.

RE — Pushbutton (momentary). When pressed, resets ERR indicator.

UT — Pushbutton (latching). When OUT, Utilisation Indicator shows peak composite link utilisation; when IN, Utilisation Indicator shows current composite link utilisation.

UT — Indicator (numeric display). Shows peak utilisation (maximum utilisation since UT pushbutton was last OUT) or current utilisation (average over last 20 frames) in tenths of the maximum frame length. Both transmitted and received data streams are checked, and the highest is displayed. During power-up, the letters "t" and "u" are shown (see Table 6-5 for fault indications).

X — Indicator (red). Error condition. Illuminated when the ARQ software detects erroneous operating conditions.

OKY — Indicator (green). Illuminated under normal operating conditions. Extinguished when ARQ software detects erroneous operating conditions (ie when X is illuminated).

ERR — Indicator (red). Composite link error rate monitor. Illuminated when the ARQ detects an error rate exceeding approximately 1 in $10^5$. Reset by RE button.

CLB — Indicator (yellow). Lit while composite loopback is switched on.

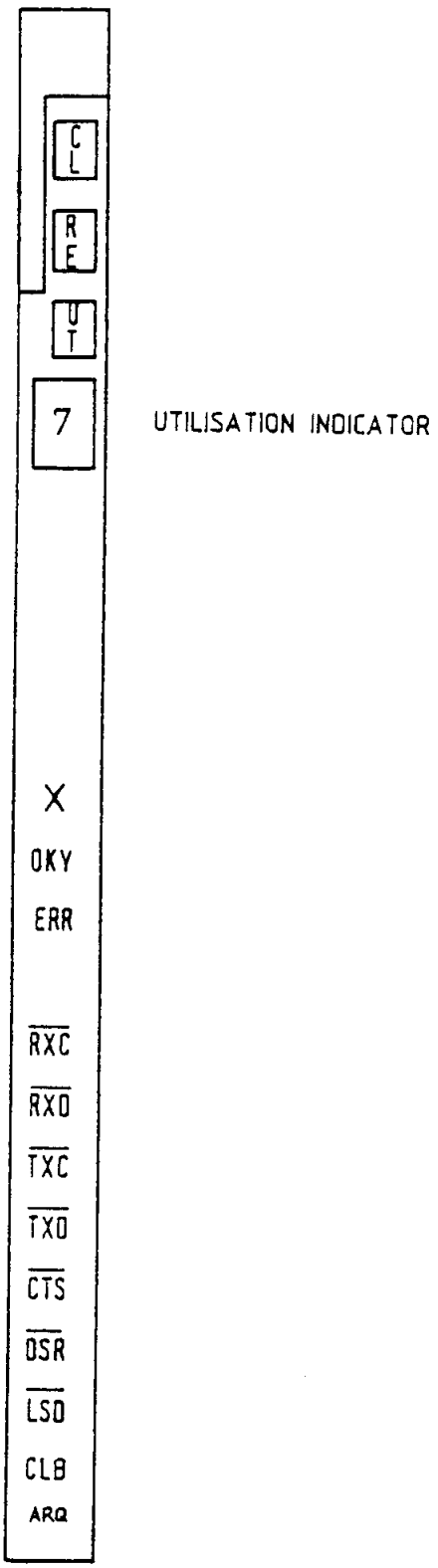



FIGURE 3-7
ARQ1 MODULE INDICATORS
AND CONTROLS

Composite Link Interface Indicators. Table 3-4 lists the meaning of the indicators for the seven lines that are monitored. Note that these are complements (indicated by a bar above the signal mnemonic), ie under normal operating conditions the indicators are off.

| IND | NAME | MEANING WHEN LIT |
|---|---|---|
| RXC | Receive Clock | Loss of Receive Clock from modem |
| RXD | Receive Data | Loss of Receive Data from modem |
| TXC | Transmit Clock | Loss of Transmit Clock from modem or internal oscillator |
| TXD | Transmit Data | Loss of Transmit Data from DATELMUX |
| CTS | Clear to Send | Modem not ready to accept data from the DATELMUX |
| DSR | Data Set Ready | Modem disconnected or switched off |
| LSD | Line Signal Detector | Loss of carrier from modem |

TABLE 3-4

ARQ1 V24 INTERFACE INDICATORS

### 3.7.2 ARQ2 (Figure 3-8)

The ARQ2 card provides the high speed modem interface which carries the composite framed data to/from the remote DATELMUX. The interface is terminated at a 25-way plug at the rear of the 5500 (but see Section 3.2.2). The card has three pushbutton controls, five general indicators and four interface indicators. The ON state of a red indicator on the ARQ2 is a warning sign and may indicate an error.

CL Pushbutton (latching). When OUT, circuit is in normal mode. When IN, circuit is in loopback mode.

RE Pushbutton (momentary). When pressed, resets ERR indicator.

UT — Pushbutton (latching). When OUT, Utilisation Indicator shows peak composite link utilisation; when IN, Utilisation Indicator shows current composite link utilisation.

UT — Indicator (numeric display). Shows peak utilisation (maximum utilisation since the UT pushbutton was last OUT), or current utilisation (average over the last 20 frames), in tenths of the maximum frame length (see para 3.1.3). Both transmitted and received data streams are checked, and the highest is displayed. During power-up, the letters "t" and "u" are shown (see Table 5-1 for fault indications).

X — Indicator (red). Error condition. Illuminated when the ARQ2 software detects erroneous operating conditions.

OK — Indicator (green). Illuminated under normal operating conditions. Extinguished when ARQ2 software detects erroneous operating conditions (ie when X is illuminated).

ERR — Indicator (red). Composite link error rate monitor. Iluminated when the ARQ2 detects an error rate exceeding approximately 1 in $10^5$. Reset by RE button.

EW — Indicator (yellow). Extended Window mode. Lit when 64 frame window size is operative.

CLB — Indicator (yellow). Lit while composite loopback is switched on.

Composite Link Interface Indicators. Table 3-5 lists the meanings of the indicators for the four lines that are monitored. Note that these are complements (indicated by a bar above the signal mnemonic), ie under normal operating conditions the indicators are off.

| IND | NAME | MEANING WHEN LIT |
|---|---|---|
| RXC | Receive Clock | Loss of Receive Clock from modem |
| RXD | Receive Data | Loss of Receive Data from modem |
| TXC | Transmit Clock | Loss of Transmit Clock from modem or internal oscillator |
| TXD | Transmit Data | Loss of Transmit Data from DATELMUX |

TABLE 3-5

ARQ2 V24 INTERFACE INDICATORS

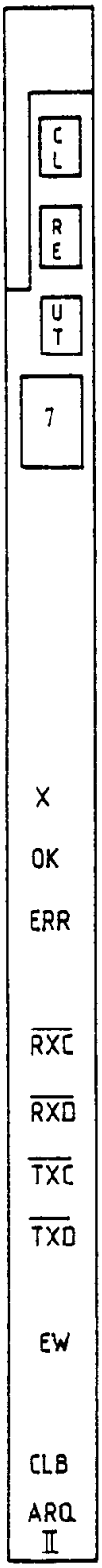



FIGURE 3-8
ARQ2 MODULE INDICATORS AND CONTROLS

### 3.7.3 TAC CARD

The TAC card, used with the ARQ2 card if the 5500 does not have an ARQ1 card, provides the necessary timing and control functions, and does not have any controls or indicators.

## 3.8 BEM AND BTM CARDS

The Bus Extension Module and Bus Termination Module are used in multi-frame Datelmux to extend the buses. BEM and earlier BTM (BTM1) modules do not have any indicators or controls. Later BTM (BTM2) modules are designed primarily for DATELMUX Standby systems and have two indicators.

ACT Active (green). On when the "normal" system is active.

SBY Standby (yellow). On when the "standby" system has been selected.

# SECTION 4

# MAPPING AND TEST PANEL AND STC CARD

## 4.1 INTRODUCTION

The Mapping and Test panel (MTP) comprises 40 keys (push contact switches) of which 20 have LED indicators; an Error LED indicator; two single-digit displays; and two six-digit displays. It is shown in Figure 4-1.

The 5500 is an extremely versatile unit, and the operations that can be carried out from it are complex. As the individual keys and indicators react differently in different circumstances, they will therefore not be described individually, but as sets of actions and reactions called Functions.

Functions are divided into three different Levels. In general, System Level functions are those which affect the DATELMUX node as a whole (eg Select which of maps 1 or 2 will be active), Device Level functions affect particular devices eg allow Channel Maps to be constructed), and Channel Level functions affect particular channels (eg allow Channel Maps to be constructed).

This section describes the use of the MTP for performing each function. The sequences in which these fuhctions are carried out to perform complex operations are given in Section 6. The descriptions give the general pattern of key use; the operator may find other routes-or "short cuts" when familiar with these Standard routines.

The MTP is designed to provide assistance to the operator in carrying out the various functions by providing specific indications of the progress of the operation, and giving prompts for subsequent actions.

Functions initiated on an MTP will, unless specifically stated otherwise, operate on the local (attached) multiplexer when switched to Local (Mode Keyswitch), or on the accessed remote multiplexer when in Master Mode.

Physically, the digit-type displays are grouped together (upper left) with their Display Mode keys (including indicators). The Numeric keys with other Data Entry keys (no indicators) form a keypad (lower left) with Command keys (lower right). The main Function keys (including indicators) form a group (top right) with the primary selection keys at the top.

The STC card, which contains the maps and the microprocessor and logic associated with the Mapping and Test Panel, contains no user indicators or controls.

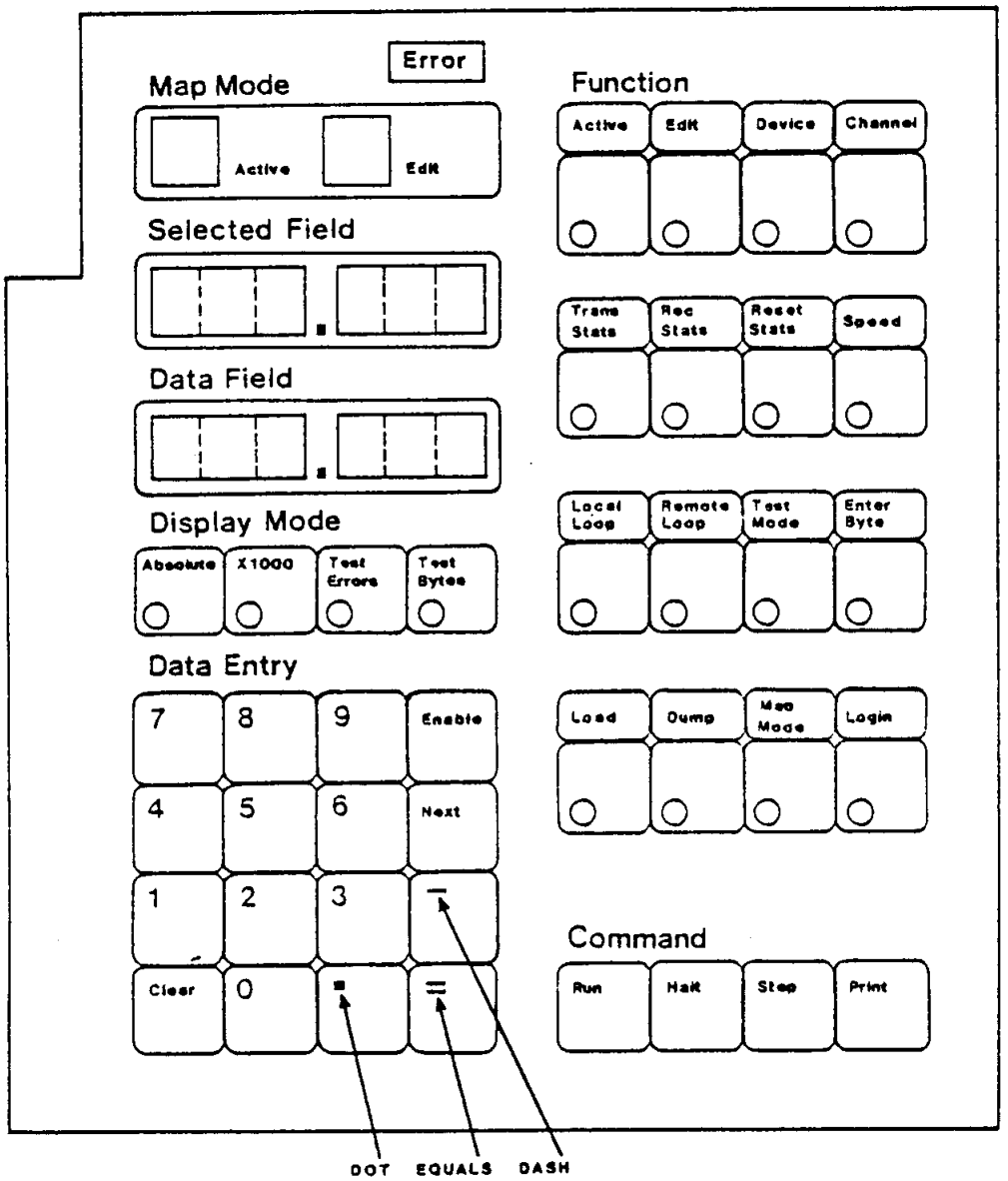



FIGURE 4-1
THE MAPPING AND TEST PANEL

This section includes references to the USO card, which is the card used in the Enhanced DATELMUX 5500. Each reference is preceded by an asterisk (*), and these references may be ignored if the equipment does not include a USO card.

## 4.2 KEYS

When pressed, a key only moves about 1 mm, which is not easily detected by the finger. Therefore an audible signal (bleep) is generated as acknowledgement of a key depression. Pressing a key produces one of the following responses:-

Short Bleep indicates that the key depression has been accepted by the STC microprocessor software.

Continuous Bleep indicates that the key depression has been received by the STC microprocessor software, but rejected because it has an unacceptable or illegal action at that point in the procedure. A coded error message is displayed. The continuous bleep stops on depression of the CLEAR key. The error message is deleted by second depression of the CLEAR key.

No Response indicates that the key depression has not been received by the STC microprocessor software.

Entries made by keys are "queued" by the system as they are made, so that it is not necessary for one action to be completed before another is entered at the keyboard. (This does not apply during Device/Channel Print or Run, or during System Dump or Load. In these cases keys other than HALT are ignored.)

## 4.3 INDICATORS AND DISPLAYS

### 4.3.1 ERROR INDICATORS

This LED indicates that power is on, but that the MTP and STC are inoperative. It is normally on for a short period immediately after applying mains power.

### 4.3.2 KEY INDICATORS

Function and Display Mode keys have LEDs which are visible through a window in the key. They are linked via the STC microprocessor software, and are lit when the function or state requested by the key is established. A blinking LED indicates an undetermined state or an incomplete number entry.

### 4.3.3 MAP MODE DISPLAYS

These show the reference numbers of the maps (1 or 2) that have been selected as the Active map and as the Edit map.

### 4.3.4 SELECTED FIELD AND DATA FIELD DISPLAYS

The information that appears in these displays depends on the Level and Function, and is described in the relevant paragraphs. Each comprises two 3-digit fields. A blinking field is an operator prompt, ie indicates the next position for entry.

Errors are indicated by the message "Err" in Data Field left, and the error code in Data Field right (see Section 4.8).

## 4.4 LEVELS

The functions that can be carried out at each of the three levels (System, Device and Channel) are listed in Tables 4-1, 4-2 and 4-3, together with a short explanation of the purpose for which each function is used.

The subsequent paragraphs in this section describe each function in detail, followed by a tabulated summary. At the top right of each page is the level (SYS, DEV or CHAN) at which it is carried out.

The operational stages at which the functions are used, are given in Section 6.

| LEVEL | FUNCTION | PURPOSE |
|---|---|---|
| SYSTEM LEVEL | EDIT | Selection of map for editing. |
| | ACTIVE | Selection of map for use. *Switching USO on or off if present. |
| | DUMP | Copying the Edit map to a medium. |
| | LOAD | Reading a map from a medium to the non-Active position. |
| | PRINT | Printing the numbers of the Edit and Active Maps. |
| | LOGIN | Local mode: giving a password to the DATELMUX.<br>Master mode: Enabling the MTP of the Master DATELMUX to control a Slave DATELMUX. |

*See Section 4.1

TABLE 4-1

SYSTEM LEVEL FUNCTIONS

| LEVEL | FUNCTION | PURPOSE |
|---|---|---|
| DEVICE LEVEL | MAP MODE | Setting up or changing Device Maps. (Assigning Channels to Devices.) |
| | NEXT | Selection of next sequential Device. |
| | LOCAL (COMPOSITE) LOOPBACK | Changing the normal/loopback status of a Device. |
| | RECEIVE STATS | Displaying statistical information relating to the composite link in the receive direction. |
| | TRANSMIT STATS | Displaying statistical information relating to the composite link in the transmit direction. |
| | RESET STATS | Resetting all statistics counters and displays to zero. |
| | PRINT | Printing the Base, Size and statistics for Device(s). |
| | DUMP | Displaying Device Issue numbers. |

TABLE 4-2

DEVICE LEVEL FUNCTIONS

| LEVEL | FUNCTION | PURPOSE |
|---|---|---|
| CHANNEL LEVEL | MAP MODE | Setting up or changing Device Maps. (After assignment to Devices.) |
| | NEXT | Selection of next sequential Channel. |
| | ABSOLUTE | Displaying absolute Channel nos. |
| | SPEED | Setting transmission rate of Channels |
| | LOCAL (CHANNEL) LOOPBACK | Changing the normal/loopback status of local Channels. |
| | REMOTE (CHANNEL) LOOPBACK | Changing the normal/loopback status of remote Channels. |
| | PRINT | Printing Channel Maps. |
| | DUMP BYTE | Displaying Channel Issue numbers. Sending a byte to a Channel. |
| | TEST MODE | Testing the paths of Channels through the system. |

TABLE 4-3

CHANNEL LEVEL FUNCTIONS

## 4.5 SYSTEM LEVEL

System level is entered automatically when the 5500 is switched on and is either in Local mode, or is in Master mode and has accessed a Slave 5500. Re-entry is obtained by the EDIT key.

When System level is entered the Edit function is automatically selected (and may be used, or another function Selected instead).

There is no separate key or LED for System level; the EDIT key and LED are used for both level and function.

The following functions can be executed at this level:

Edit (entered automatically)
Active
Dump
Load
Print
Login

Exit from System level is by DEVICE key to go to Device level, or CHANNEL key to go to Channel level.

### 4.5.1 EDIT FUNCTION SYS

This function allows the operator to choose which of the two maps (1 or 2) is available for editing (eg by Map Mode functions).

It is entered automatically whenever System level is selected (eg when the 5500 is powered on, when EDIT is pressed, or when any other System level function is completed or aborted).

It displays, in the Map Mode Edit display, the number (1 or 2) of the map currently selected for editing, blinking. This may, if desired, be changed by pressing the 1 or 2 NUMBER key. *If a USO card is plugged in, it will also display a message "USO hlt" (USO halted) or "USO run" (USO running) "nd nnn" (node number).

If error 50/51 occurs repeatedly at System level, press EQUALS (=). This causes an attempt to load Active=2, Edit=1. Press ENABLE, when it will try to enter again. If this succeeds the maps should be checked, as they may have been corrupted.

| ENTRY | NEXT KEY | RESULT |
|---|---|---|
| EDIT | None | Displayed map number is selected for editing. |
| | 1 | |
| | 2 | |

| EXIT | RESULT |
|---|---|
| ACTIVE | Goes to function requested. |
| DUMP | |
| LOAD | |
| PRINT | |
| LOGIN | |
| DEVICE | Goes to level requested. |
| CHANNEL | |

### 4.5.2 ACTIVE FUNCTION

This function allows the operator to choose which of the two maps (1 or 2) is to be Active (ie the one used by the 5500 as the reference for making the Channel interconnections).

It is entered by the ACTIVE key and displays, in the Map Mode Active display, the number (1 or 2) of the currently active map, blinking. This can either be accepted by the ENABLE key, or changed by the 1 or 2 key followed by ENABLE. The MTP then automatically goes to the Edit function.

(*If a USO card is present and halted, the "hlt" will also blink, and the USO may be changed to "run" by pressing RUN ENABLE, whereupon the MTP will return to the Edit function. If the USO is running, only the "run" Will blink, and it will not be possible to change the Active map until the USO has been halted.)

| ENTRY | NEXT KEY | RESULT |
|---|---|---|
| ACTIVE | ENABLE | Map Shown in Active Display is made active. Goes to Edit function. |
| | 1 ENABLE | Map requested is made active. Goes to Edit function. |
| | 2 ENABLE | |

### 4.5.3 DUMP FUNCTION

This function produces a machine-readable copy of the Edit Map on a terminal-dependent medium (punched paper tape, magnetic tape or disk). A long bleep sounds upon successful completion.

Execution of the DUMP can be aborted by the HALT key. Erroneous data in the map will also cause abortion. Error number will Show the reason.

(*USO-related mapping will not be dumped when the Active map is dumped if the USO is running.)

| ENTRY | NEXT KEY | RESULT |
|---|---|---|
| DUMP | None | Whole map is dumped. Goes to System level. |
| | HALT | Dump is halted. generates error 98. Upon clearing, goes to Edit function. |

### 4.5.4 LOAD FUNCTION

This function loads a network map from a terminal-dependent medium (punched paper tape, magnetic tape or disk) into the non-Active map position. It overwrites the non-Active map but does not overwrite the Active map.

The function is also used to copy from the Active map, to load a null map, or to remove errors from the Channel map. If the first character (before the medium is read) is a keyed MAP, DASH (-), OR EQUALS (=); then it will copy, load a null map or clean the Channel map respectively, and turn off the reader. These operations cannot be aborted.

After pressing the LOAD key, the LED blinks until detection of the first character, after which it becomes steady. On completion, the LED goes out and a long bleep sounds.

The LOAD operation can be stopped by CLEAR before the first character is read. Once the first character has been read, the loading operation can be aborted by HALT; the use of HALT causes an error message. Once the first character has been read the old map is lost. Failure to load successfully leaves the non-Active map cleared, and generates error 98.

(Note that the end-of-line check sums appear blinking in the Selected Field Display (left) and can be used to monitor the progress of the load.)

| ENTRY | NEXT KEY | RESULT |
|---|---|---|
| LOAD | None | Whole map is read from medium to non-Active map memory. Goes to System level. |
| | CLEAR (before first character is read) | Function terminates, existing map unchanged. Goes to System level. |
| | MAP (before first character is read) | The Active map is copied into the non-Active position. |
| | DASH (-) (before first character is read) | A null map is loaded into the non-Active position. |
| | EQUALS (=) (before first character is read) | The Channel map is cleaned (errors removed). |
| | HALT (after first character read) | Function aborts, map is cleared, generates error 98. Upon clearing, |

### 4.5.5 PRINT FUNCTION

This function prints out on an external printer, the number of the Active Map and the number of the Edit Map in the format

ACTIVE = (1 or 2)  EDIT = (1 or 2)

(Note that this key, for physical convenience, is located with the Command keys on the keyboard.)

| ENTRY | NEXT KEY | RESULT |
|---|---|---|
| PRINT | None | Prints the numbers of the maps in the Active and Edit displays. Goes to System level. |

*If a USO card is present, the message "USO running node = nnn" or "USO halted" is also printed.

### 4.5.6 LOGIN FUNCTION (LOCAL MODE)

The Login function acts in the following way when the Mode keyswitch is in the LOCAL position.

The function enters a 6-digit password into the STC of the 5500 (overwriting any previous password). This becomes the address of the MTP for remote access purposes when it is set to Slave mode. Pressing the LOGIN key must be followed by 6 digits and ENABLE. the digits appear one-at-a-time in the Selected Field display (right). The sequence is fixed and any deviation causes an error message to appear (a mistake during entry of the 6 digits can be cleared by pressing CLEAR three times). The password must be remembered as there is no way to recall it.

| ENTRY | NEXT KEY | RESULT |
|---|---|---|
| LOGIN (Local mode) | nnnnnn (6 digits) | Each digit appears in RH position of selected Field Display. |

| NEXT KEY | RESULT |
|---|---|
| ENABLE | New password entered. Goes to System level. |

### 4.5.7 LOGIN FUNCTION (MASTER MODE)

The Login function acts in the following way when the Mode keyswitch is at MASTER.

The function is used to enter the password of a remote physically connected Slave 5500, so that the Master (local) MTP may be used to control it. When the 5500 is switched to Master all LEDs are extinguished (if the link to the Slave is in loopback then the message "loop" is displayed). Press LOGIN followed by the 6 digits of the Slave password. The local MTP now takes control of the remote multiplexer. When control of the slave is to cease, press LOGIN to log it off.

Only the password already entered into the Slave will be recognised. Any different numerical entry causes no response. (If no password has been entered, or it has been lost due to a long power down, try ..... (six dots), the password automatically entered by the system.

A Login via an external link will always take precedence over a Login via an internal link.

If the LOGIN key is pressed immediately after logging in internally, its function is the same as in Local mode (see 4.5.6). This allows a new Login Code to be entered directly after logging in internally.

| ENTRY | RESULT | NEXT KEY | RESULT |
|---|---|---|---|
| LOGIN (Master Mode) | Any logged-on Slave is logged-off | None | Local 5500 may be switched back to Local Mode. |
| | | nnnnnn (password of Slave) | Master MTP in control of Slave Multiplexer. Goes to System level. |

## 4.6 DEVICE LEVEL

The functions that can be carried out at Device Level relate to one of the physical Devices (ARQ) in the 5500 at a time. Selection of a particular Device (by its number) therefore has to take place before a function can be initiated.

Thus there are two sub-levels: Device Select sub-level in which the required Device is selected, followed by Device Function sub-level in which the relevant functions can be carried out.

Device Select sub-level is obtained by the DEVICE key. this displays Device number 0 in the Selected Field Display (right) blinking. If a different Device is required, its number is entered with the NUMBER Keys.

Device Function sub-level is now obtained by the ENABLE key. (If pressing ENABLE to select a Device results repeatedly in Error 52, use EQUALS (=) ENABLE. This will give the selected Device with Base = 1, Size = 0). This causes the number in the selected Field Display to be accepted, and it stops blinking. Any of the following functions may now be carried out (although Map Mode is entered automatically):-

Map Mode
Next
Local (composite) Loopback (entry from Map Mode only)
"Receive" Statistics
"Transmit" Statistics
Reset Statistics
Print
Device Issue Number (Dump)

The automatically-entered Map Mode may be changed to another function.

Changing from the selected Device to another Device (ie going from the Function sub-level up to the Select sub-level) is by the DEVICE key (followed by the new NUMBER and ENABLE). This is done automatically in some functions. Changing to the next sequential Device is by the NEXT key.

Exit from Device level is by the EDIT key to go to System level or by CHANNEL key to go to Channel level.

### 4.6.1 MAP MODE FUNCTION

The purpose of this function is to enable the operator to enter and/or change the Device Map whose number is displayed in the Map Mode Edit display (1 or 2).

The operations are carried out on one Device at a time, starting with the selected Device (Selected Field display, right).

The function is in three Stages, of which Stage 2 (which facilitates sequential operations from one Device to another) may be omitted or repeated.

Entry to the Map Mode function is automatic when Device Function sub-level is reached. Entry may also be made from other Device level functions by the MAP MODE key (same Device selected) or the NEXT key (next sequential Device selected).

Stage 1 displays the following information:-

Base (lowest numbered Channel of the set assigned to the selected Device) in Data Field display left.

Size (quantity of Channels assigned to the selected Device) in Data Field display right.

The displayed Base is blinking. If desired, this may be overwritten by (one, two or three) NUMBER keys. Access to the size is by the DOT key. If desired, this may now be overwritten by (one, two or three) NUMBER keys, eg:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Original display: | 2.4 | key: | 4 | new display: | 4.4 |
| " | " | 2.4 | " | .3 | " | " | 2.3 |
| " | " | 2.4 | " | 6.12 | " | " | 6.12 |

Pressing a NUMBER or DOT key causes the Map Mode LED to blink until Stage 2 is completed. Stage 1 must be followed by Stage 2 or Stage 3.

Stage 2 facilitates sequential mapping operations, either one Device at a time or for a number of sequential Devices. This stage may be omitted if not required (eg if only making changes to an existing map).

STEP enters the displayed Base and Size into the map of the selected Device. (If this was Device 15, it then selects Device 0 and automatically takes the Stage 3 NEXT action.) If it was Device 0-14, it then selects the next Device and displays the suggested Base (the next Channel after the one just mapped, ie Base of previous Device + Size of previous Device). The displayed Size (blinking) is the Size of the Device just mapped, eg

| | | | |
|---|---|---|---|
| Display: | Device 2 | Base 8 | Size 4 |
| Key: | STEP | | |
| Display: | Device 3 | BaSe 12 | Size 4 |
| Key: | 6 | | |
| Display: | Device 3 | Base 12 | Size 6 |
| Key: | STEP | | |
| Display: | Device 4 | Base 18 | Size 6 |

RUN n ENABLE is the same as STEP, but instead of advancing by one Device, it advances by n Devices. At each Device it enters the new Base and (same) Size. If this would take it past Device 15, or if n = 0, it maps Device 15, then selects Device 0 and automatically takes a Stage 3 NEXT action and stops.

The STEP and/or RUN n ENABLE actions may be repeated before going to Stage 3.

Stage 3 clears or enters the displayed information into the map, then takes further action depending on which key is pressed.

CLEAR deletes the displayed Base and Size (without entering it into the map), and displays the original information from the map for the selected Device.

ENABLE enters the displayed Base and Size into the map and leaves the MTP in Map Mode with the same Device selected, showing the newly entered information.

NEXT enters the displayed Base and Size into the map and leaves the MTP in Map Mode with the next sequential Device selected (after 15 it reverts to 0) with its mapped Base and Size displayed.

Completion of Stage 3 allows another Device level function to be selected by the appropriate function key, or another Device to be selected by the DEVICE key, or another level to be selected by the EDIT or CHANNEL key.

| ENTRY | STAGE 1 | DATA FIELD | GO TO |
|---|---|---|---|
| MAP MODE | . (DOT) | Old Base, old Size, displayed. | Stage 2 or 3 |
| | m (1-3 digits) | New Base, old Size, displayed. | |
| | .n (1-3 digits) | Old Base, new Size, displayed. | |
| | m.n | New Base, new Size, | |

| STAGE 2 | RESULT | GO TO |
|---|---|---|
| STEP | Displayed Base and Size entered, next Device selected, new Base displayed (Base + Size of previous Device), previous Device Size displayed blinking (at Device 15 goes automatically to Stage 3 NEXT). | Stage 2 or 3 |
| RUN n ENABLE | As STEP repeated n times (at Device 15 goes automatically to Stage 3 NEXT and stops) | |

| STAGE 3 | RESULT | GO TO |
|---|---|---|
| CLEAR | Displayed Base and Size cleared, Base and Size from Map displayed. | or .Exit |
| ENABLE | Displayed Base and Size entered, same data displayed. | |
| NEXT | Displayed Base and Size entered, next Device selected, its mapped Base and Size displayed. (After Device 15 selects Device 0 and displays its mapped Base and Size) | |

| EXIT | RESULT |
|---|---|
| NEXT | Stays in Map Mode with next Device selected |
| LOCAL LOOPBACK | Goes to requested function with same Device selected. |
| RECEIVE STATS | |
| TRANSMIT STATS | |
| RESET STATS | |
| PRINT | |
| DUMP | |
| DEVICE | Goes to Device Select sub-level. |
| EDIT | Goes to level requested. |
| CHANNEL | |

### 4.6.2 NEXT FUNCTION

This function, when used at Device Function sub-level, causes entry to the Map Mode function for the next Sequential Device. It is actioned by the NEXT key.

| ENTRY | RESULT |
|---|---|
| NEXT | Goes to Map Mode function with next sequential Device selected. |

### 4.6.3 LOCAL COMPOSITE LOOPBACK FUNCTION

This function has limited entry; it can only be entered from Device Level Map Mode (ie not directly after completion of any of the three statistics functions). The map selected for-Edit must be the same as that selected for Active (* and if a USO card is present, it must be halted).

Each Device circuit, at any particular time, is in either normal or loopback mode. Its status is shown by the CLB indicator on the Device plug-in card. Each time that Map Mode is entered (or re-entered from its Stage 2 by CLEAR, ENABLE or NEXT) the status of the selected Device is read and displayed by the LED behind the LOCAL LOOP key:-

LED off = normal mode
LED on = loopback mode
LED blinking = status not established

The status of the Device may be changed by the CL pushbutton on the plug-in card, or from the MTP by the Local Composite Loopback function. This is done, once the LED has stopped blinking, by pressing the LOCAL LOOP key.

| ENTRY | LOCAL LOOP LED | NEXT KEY | RESULT |
|---|---|---|---|
| MAP MODE | On = Normal | LOCAL LOOP | Status changed. Re-enters Map Mode, display changed. |
| | Off = Loopback | | |

### 4.6.4 RECEIVE STATISTICS FUNCTION

This function displays the throughput and error statistics in the receiving direction, for the Selected ARQ Device. The format displayed in the Data Field is:-

XX.YYY

where

XX is the peak utilization since the last reset.

YYY is the number of errors since the last reset. If the number of errors exceeds 999, the symbol --- will be displayed.

The function is entered by the REC STATS key. It is only available when the Active map is selected for editing. After this another Device level function (except Local Loopback) may be selected by its function key, or another Device number may be selected by the DEVICE key or another level may be selected by the EDIT or CHANNEL key.

| ENTRY | RESULT |
|---|---|
| REC STATS | Receive statistics displayed. |

| EXIT | RESULT |
|---|---|
| MAP MODE | Goes to function requested. |
| NEXT | |
| TRANS STATS | |
| RESET STATS | |
| PRINT | |
| DUMP | |
| DEVICE | Goes to Device Select sub-level |
| EDIT | Goes to level requested. |
| CHANNEL | |

### 4.6.5 TRANSMIT STATISTICS FUNCTION

This function displays the throughput and error statistics in the transmitting direction, for the selected ARQ Device. The format displayed in the Data Field is:-

XX.YYY

where

XX is the peak utilization since the last reset.

YYY is the number of errors since the last reset. If the number of errors exceeds 999, the symbol --- will be displayed.

The function is entered by the TRANS STATS key. It is only available when the Active map is selected for editing. After this another Device level function (except Local Loopback) may be selected by its function key, or another Device number may be selected by the DEVICE key, or another level may be selected by the EDIT or CHANNEL key.

| ENTRY | RESULT |
|---|---|
| TRANS STATS | Transmit statistics displayed |

| EXIT | RESULT |
|---|---|
| MAP MODE | Goes to function requested. |
| NEXT | |
| REC STATS | |
| RESET STATS | |
| PRINT | |
| DUMP | |
| DEVICE | Goes to Device Select sub-level. |
| EDIT | Goes to level requested. |
| CHANNEL | |

### 4.6.6 RESET STATISTICS FUNCTION

This function resets the receive and transmit statistics counters and displays to zero. It is actioned by the RESET STATS key. It is only available when the Active map is selected for editing. *If a USO card is present and running, it is not available.

After this function, another Device level function (except Local Loopabck) may be selected by its function key, or another Device number may be selected by the DEVICE key, or another level may be selected by the EDIT or CHANNEL key.

| ENTRY | RESULT |
|---|---|
| RESET STATS | Receive and transmit statistics zeroed. |

| EXIT | RESULT |
|---|---|
| MAP MODE | Goes to function requested. |
| NEXT | |
| REC STATS | |
| TRANS STATS | |
| PRINT | |
| DUMP | |
| DEVICE | Goes to Device Select Sub-level. |
| EDIT | Goes to level requested. |
| CHANNEL | |

### 4.6.7 PRINT FUNCTION DEV

This function prints out, on a user's printer connected to the DATELMUX, information relating to specified Devices. The information printed for each is Base, Size, TX Stats and RX Stats. Note that for TX Stats and RX Stats to be printed, the map selected for Editing must be the Active map (ie the numbers in Edit and Active of Map Mode display must be the same) otherwise these will be blank. The format is the same as that displayed for the individual function.

The print-out starts with the Device whose number is in the Selected Field display, and continues for n Devices. The function is actioned by keys PRINT n ENABLE. When PRINT is keyed, n = 1 is entered automatically. If n would take it through Device 15, it stops at 15. If n = 0, it prints to 15 and stops. Printing may be stopped at any time by pressing HALT. At the end of printing the MTP goes to Map Mode function, with the next sequential Device selected.

| ENTRY | NEXT KEY | RESULT | NEXT KEY |
|---|---|---|---|
| PRINT | ENABLE | Prints info of selected Device. Goes to Map Mode, next Device. | |
| | n ENABLE | Prints info of n Devices from selected Device (stops at 15). Goes to Map Mode, next Device. | None (HALT stops printing) |
| | 0 ENABLE | Prints info of all Devices from selected Device to 15. Goes to Map Mode, Device 0. | |

### 4.6.8 DEVICE ISSUE NUMBERS FUNCTION

This function, which is accessed via the DUMP key, displays the issue number of the ARQ software in the left Data Field. The first digit is the device identifier (see Table 4-4). The right side displays the issue number of the remote device (ie the one at the other end of the composite link). Non-reporting local devices display ---, non-reporting remote devices display 000. The right display will always show --- if the left shows ---, or the link is down.

If used on Device 0, the left field displays the STC issue number (right field blank). If selecting a USO or Monitor card the left field shows the level and the right the issue number. Available only when Active map is selected for editing.

| ENTRY | RESULT |
|---|---|
| DUMP | Device Issue/Level numbers displayed. |

| EXIT | RESULT |
|---|---|
| MAP MODE | Goes to function requested. |
| NEXT | |
| REC STATS | |
| TRANS STATS | |
| RESET STATS | |
| PRINT | |
| DEVICE | Goes to Device Select sub-level. |
| EDIT | Goes to level requested. |
| CHANNEL | |

| IDENTITY CODE | DEVICE |
|---|---|
| -- -- -- | Non-reporting local Device<br>No communication with remote Device |
| 0 | Non-reporting remote Device |
| 1 | - |
| 2 | - |
| 3 | - |
| 4 | ARQ2 |
| 5 | STC |
| 6 | ARQ1 |
| 7 | 5300 Composite Link Processor |
| 8 | 5300 Onward Linking Processor |
| 9 | 5100 |
| A | 5100 Speed Enhanced |
| B | 5141/2 |
| C | - |
| D | - |
| E | Monitor |
| F | USO |

TABLE 4-4

DEVICE IDENTITY CODES

## 4.7 CHANNEL LEVEL

The functions that can be carried out at Channel level relate to one of the Channels in the 5500 at a time. Selection of a particular Channel (by its Device/Channel number) has to take place before a function can be initiated.

Thus there are two sub-levels: Channel Select sub-level in which the required Channel is selected, followed by Channel Function sub-level in which the relevant functions can be carried out.

Channel Select sub-level is obtained by the CHANNEL key. This displays any previously selected Channel number in the format m.n (Device.Channel) in the Selected Field display, with the Device number blinking. (If no Channel had previously been selected, it displays m.1 where m = lowest numbered Device to have been assigned a block of channels. If no Device has any Channels, the display is 0.0.)

If the displayed Device number is required press DOT; if not, enter new NUMBER followed by DOT. Either will cause the Channel number to blink. If a different Channel number is required, enter the new NUMBER.

Channel Function sub-level is now obtained by the ENABLE key. (If pressing ENABLE for a legitimate selected Channel results in errors, use EQUALS (=) ENABLE, which will cause the Channel to self-map). This causes the numbers in the Selected Field display to be accepted, and it stops blinking. Any of the following functions may now be carried out (although Map Mode is entered automatically):-

Map Mode
Next
Absolute
Speed
Local (Channel) Loopback
Remote (Channel) Loopack
Print
Channel Issue Number (Dump)
Byte
Test Mode

The automatically-entered Map Mode may be changed to any other function.

Changing from the selected Channel to another Channel (ie going from the Function sub-level up to the Select sub-level) is by the CHANNEL key (followed by selection of the required Channel). This is done automatically in some functions. Exit from the Channel level is by the EDIT key to go to System level, or by DEVICE key to go to Device level.

### 4.7.1 MAP MODE FUNCTION

The purpose of this function is to enable the operator to enter and/or change the Channel map whose number (1 or 2) is displayed in the Map Mode Edit Display.

The operations are carried out on one Channel at a time, starting with the selected Channel (Selected Field display). The function is in three stages, of which Stage 2 (which facilitates sequential operations from one Channel to another) may be omitted or repeated.

Entry to the Map Mode function is automatic when Channel Function sub-level is reached. Entry may also be made from other Channel level functions by the MAP MODE key (same Channel selected) or the NEXT key (next sequential Channel selected).

Stage 1 displays the following information:-

| | |
|---|---|
| Selected Field display: | Device.Channel (selected Channel) |
| Data Field display: | Device.Channel (mapped Channel) |

The displayed mapped Device number (Data Field left) is blinking. If desired, this may be overwritten by (one or two) NUMBER keys. Access to the mapped Channel number (Data Field right) is by the DOT key. If desired, this may now be overwritten by (one, two or three) NUMBER keys, eg

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Original Data Field: | 2.4 | key: | 4 | | new display: | 4.4 | | |
| " " " | 2.4 | " | .3 | | " | " | 2.3 | |
| " " " | 2.4 | " | 6.12 | | " | " | 6.12 | |

If the selected Channel is to be self-mapped, an alternative to the above procedure is to use the EQUALS key which does it automatically, eg

| | |
|---|---|
| Selected Field display: | 1.2 |
| Original Data Field display: | 2.4 |
| Key: | EQUALS |
| New Data Field display: | 1.2 |

Pressing EQUALS, DOT or a NUMBER key causes the Map Mode LED to blink until Stage 3 is completed. Stage 1 must be followed by Stage 2 or Stage 3.

Stage 2 facilitates sequential mapping operations, either one Channel at a time or for a number of sequential Channels. This stage may be omitted if not required (eg if only making changes to an existing map).

STEP enters the displayed Device.Channel from the Data Field display into the Channel map. Then it displays the next sequential Channel in the Selected Field display, and the next sequential mapped Channel in the Data Field display (ie each display Channel number is incremented by one).

eg Current displays: 2.13 (Selected Field)
11.5 (Data Field)

Press STEP,

New displays: 2.14 (Selected Field)
11.6 (Data Field)

If the currently selected Channel is the last one for that particular Device, pressing the STEP key automatically takes the Stage 3 NEXT action.

RUN n ENABLE is the same as STEP, but instead of advancing one Channel, it advances by n Channels. At each Channel it enters the new mapped Channel number.

eg Current displays: 2.10 (Selected Field)
11.2 (Data Field)

Press RUN 4 ENABLE. Each successive Channel is mapped, up to:

New displays: 2.14 (Selected Field)
11.6 (Data field)

If n would take it to the next Device, it then automatically takes the Stage 3 NEXT action, and stops.

eg Current displays: 2.10 Selected Field)
11.2 (Data Field)

Press RUN 6 ENABLE. Each successive Channel is mapped, up to 2.14 (last Channel), followed by:-

New display: 3.1 (Selected Field)
m.n (Data Field)

The STEP and/or RUN n ENABLE actions may be repeated before going to Stage 3.

Stage 3 clears or enters the Data Field display into the Channel Map, then takes further action depending on which key is used.

CLEAR deletes the displayed Device.Channel from the Data Field display (without entering it into the map) then displays the original mapped Channel which it reads from the map.

ENABLE enters the displayed Device Channel from the Data Field display into the Channel map, leaving the same Channel selected.

NEXT enters the displayed Device Channel from the Data Field display into the Channel map, leaving the next sequential Channel selected and its mapped Channel displayed.

eg Current displays: 2.13 (Selected Field)
11.5 (Data Field)

Press NEXT,

New displays: 2.14 (Selected Field)
m.n (Data Field)

If the currently selected Channel is the last one for that particular Device, it displays the first channel for the next (mapped) Device, with its mapped Channel.

eg Current displays: 2.14 (Selected Field)
11.6 (Data Field)

Press NEXT,

New displays: 3.1 (Selected Field)
m.n (Data Field)

Completion of Stage 3 allows any other Channel level function to be selected by the appropriate function key, or another Channel to be selected by the CHANNEL key, or another level to be selected by the DEVICE key.

*If USO is present and running, it may bar mapping on specific Channels.

| ENTRY | STAGE 1 | DATA FIELD | GO TO |
|---|---|---|---|
| MAP<br><br>MODE | . (DOT) | Old Device and old Channel numbers displayed. | Stage<br><br>2 or 3 |
| | m<br>(m = 1-2 digits) | New Device and old Channel numbers displayed. | |
| | . n<br>(n = 1-3 digits) | Old Device and new Channel numbers displayed. | |
| | m.n | New Device and new Channel numbers displayed. | |
| | = (EQUALS) | Selected Field copied to Data field (self-mapped) | |

| STAGE 2 | RESULT | GO TO |
|---|---|---|
| STEP | Data Field display entered into map as mapped Channel. Selects new Channel, showing its suggested (next in sequence) mapped Channel. (At last Channel of selected Device goes automatically to Stage 3 NEXT.) | Stage<br><br>2 or 3 |
| RUN<br>n<br>ENABLE | As STEP repeated n times. (At last Channnel of selected Device goes automatically to Stage 3 NEXT and stops.) | |

| STAGE 3 | RESULT | GO TO |
|---|---|---|
| CLEAR | Data Field display cleared, replaced by original mapped Channel. | Stage 1 or Exit |
| ENABLE | Data Field display entered into map as mapped Channel. | |
| NEXT | Data Field display entered into map as mapped Channel, next Channel selected and its mapped Channel displayed. (After last Channel of Device goes to next Device and displays its first Channel and its mapped Channel) | |

| EXIT | RESULT |
|---|---|
| NEXT | Goes to function requested. |
| ABSOLUTE | |
| SPEED | |
| LOCAL LB | |
| REMOTE LB | |
| PRINT | |
| DUMP | |
| BYTE | |
| TEST MODE | |
| CHANNEL | Goes to Channel Select sub-level. |
| EDIT | Goes to level requested. |
| DEVICE | |

### 4.7.2 NEXT FUNCTION

This function, when used at Channel Function sub-level, causes the Map Mode function to be entered for the next sequential Channel. It is actioned by the NEXT key.

(Note that the NEXT key may also be used during the execution of other functions. The action is detailed in the

descriptions of those functions.)

| ENTRY | RESULT |
|---|---|
| NEXT | Goes to Map function with next sequential Channel selected. |

### 4.7.3 ABSOLUTE FUNCTION

The Channel numbers are normally displayed relative to the Device to which they are assigned. For a Selected Channel, the Absolute function at Channel Function Sub-level adds the Device base to the relative Channel number, and displays the result in the right-hand segment of the Data Field display. It is actioned by the ABSOLUTE key.

Exit is by MAP, NEXT, SPEED, PRINT, DUMP or BYTE to go to those functions on the same Channel, CHANNEL to go to Channel Select sub-level (for another Channel or Test or Loopback function), or by EDIT or DEVICE to go to another level.

| ENTRY | RESULT |
|---|---|
| ABSOLUTE | Displays absolute number of selected Channel. |

| EXIT | RESULT |
|---|---|
| MAP MODE | Goes to function requested. |
| NEXT | |
| SPEED | |
| PRINT | |
| DUMP | |
| BYTE | |
| CHANNEL | Goes to Channel Select sub-level. |
| EDIT | Goes to level requested. |
| DEVICE | |

### 4.7.4 SPEED FUNCTION

The purpose of this function is to allow an operator at the MTP to check the speed/code combination to which any low speed channel circuit (on an LSC card) is set, and, if it is in ABR mode, actually to set the speed/code of the Channel from the MTP (to any speed from 50 to 9600 bps). The function is carried out on the Active map.

Entry to the function is by the SPEED key. The speed/code of the selected Channel is then displayed in the right Data Field, in an octal code Shown in Table 4-5. This can be cross-referenced to the switches on the LSC card by reference to the LSC User Guides. eg LSC Switches set to (lsb)10011010(msb) give a speed of 1200 bps for a character of 7 data bits plus one stop bit. This is displayed as 31 (ie in octal with bit 1 (SW1) as the least significant bit).

When the LSC card switches are set to ABR mode (switches set at 11111000, display showing 37) the speed/code can be set at the MTP. The speed which is entered by the operator not only goes to the LSC channel, but is "saved" (stored in the map for the channel) for future reference and for automatically setting the channel to the same speed after the DATELMUX has been powered off and on again. (Speeds can only be saved for Channels up to Absolute Channel 256).

The saved speed is shown in the Data Field left (note that ---indicates no saved speed). NUMBER keys may now be used to set a new speed/code combination in accordance with Table 4-5. The new code is displayed in Data Field left, entered into the speed map, and sent to the LSC card as a command, by the STEP key. It takes a second or so for the command to reach the LSC card and set it, and for the speed to be returned to the MTP and displayed in the (right) Data Field. (If a different Speed is returned, it is probable that the LSC switches were not set to ABR; the error must be corrected at the LSC card itself. A --- display means that the LSC card has not returned a reply.)

*If a USO card is present and running, it may bar access to the actual speeds on specific Channels.

| | | DATA PLUS STOP BITS | | | | |
|---|---|---|---|---|---|---|
| | | 5+1.5 | 7+1 | 7+2 | 8+1 | 8+2 |
| SPEED | 50 | 0 | 20 | 40 | 60 | 160 |
| | 75 | 1 | 21 | 41 | 61 | 161 |
| | 100 | 2 | 22 | 42 | 62 | 162 |
| | 110 | 3 | 23 | 43 | 63 | 163 |
| | 134.5 | 4 | 24 | 44 | 64 | 164 |
| | 150 | 5 | 25 | 45 | 65 | 165 |
| | 200 | 6 | 26 | 46 | 66 | 166 |
| | 300 | 7 | 27 | 47 | 67 | 167 |
| | 600 | 10 | 30 | 50 | 70 | 170 |
| | 1200 | 11 | 31 | 51 | 71 | 171 |
| | 1800 | 12 | 32 | 52 | 72 | 172 |
| | 2000 | 13 | 33 | 53 | 73 | 173 |

Split Baud Rate adds 200 to code

| | | DATA PLUS STOP BITS | | | |
|---|---|---|---|---|---|
| | | 8+1 | 8+1+C | 8+2 | 8+2+C |
| SPEED | 2400 | 14 | 54 | 114 | 154 |
| | 3600 | 34 | 74 | 134 | 174 |
| | 4800 | 15 | 55 | 115 | 155 |
| | 7200 | 35 | 75 | 135 | 175 |
| | 9600 | 16 | 56 | 116 | 156 |

Split Baud Rate adds 200 to code
C = Bit 6 SET

| | DISPLAY | ENTER |
|---|---|---|
| NO SPEED | --- | - |
| CARD IN ABR | 37 | |
| CARD IN DLL | 377 | |

TABLE 4-5

SPEED FUNCTION CODES

| ENTRY | RESULT | NEXT KEY | RESULT |
|---|---|---|---|
| SPEED | Selected Channel previously saved speed displayed left, actual Channel speed displayed right. | STEP | Displayed (left) speed saved and sent to LSC. (Returns to Speed). |
| | | n STEP (n = 1-3 coded digits) | New speed displayed, saved and sent to LSC. (For Channels above abs 256, display is --- and speed not saved). |
| | | - STEP | Null speed displayed and saved. (Returns to Speed). |
| | | CLEAR | Returns display to previously saved speed. (Returns to Speed). |

| EXIT | RESULT |
|---|---|
| MAP | Goes to function requested. |
| NEXT | |
| ABSOLUTE | |
| PRINT | |
| DUMP | |
| BYTE | |
| CHANNEL | Goes to Channel Select sub-level |
| EDIT | Goes to level requested. |
| DEVICE | |

### 4.7.5 LOCAL CHANNEL LOOPBACK FUNCTION

This function has limited entry it can only be entered after selecting a Channel, mapping a Channel, printing, or a Channel Loopback function (ie not directly after completion of an Absolute, Speed, Dump, Byte or Test function). The map selected for Edit must be the same as that selected for Active. (*If a USO card is present and running, it may bar access to individual Channel loopbacks.)

Each LSC Channel circuit, at any particular time, is in either normal or loopback mode. The status is shown not only by the LLB indicator on the local LSC and by the RLB indicator on the remote LSC card (when the thumbwheel switches are set to select the appropriate circuit); but also, when the channel has been selected at the MTP, by the LED behind LOCAL LOOP:

LED off = normal mode
LED on = loopback mode
LED blinking = status not established

The status is checked and the LED is updated each time Map Mode is entered, or loopback is changed at the MTP.

The status may be changed by the S/R pushbutton on the LSC card, or from the MTP when in this function. This is done, once the LED has stopped blinking, by pressing LOCAL LOOP.

| ENTRY | RESULT |
|---|---|
| LOCAL LOOP | Changes normal/loopback status. |

| NEXT KEY | RESULT |
|---|---|
| Any other Channel level function | Goes to requested function on selected Channel. |
| CHANNEL | Goes to Channel Select sub-level. |
| EDIT | Goes to level requested. |
| DEVICE | |

### 4.7.6 REMOTE CHANNEL LOOPBACK FUNCTION

This function has limited entry; it can only be entered after selecting a Channel, mapping a Channel, printing, or a Channel Loopback function (ie not directly after completion of an Absolute, Speed, Dump, Byte or Test function). The map selected for Edit must be the same as that selected for Active. (*If a USO card is present and running, it may bar access to individual Channel loopbacks.)

Each LSC Channel circuit, at any particular time, is in either normal or loopback mode. The status is shown not only by the RLB indicator on the local LSC and by the LLB indicator on the remote LSC card (when the thumbwheel switches are set to select the appropriate circuit); but also, when the channel has been selected at the MTP, by the LED behind REMOTE LOOP :

LED off = normal mode
LED on = loopback mode
LED blinking = status not established

The status is checked and the LED is updated each time Map Mode is entered.

The status may be changed by the S/R pushbutton on the LSC card, or from the MTP when in this function. This is done, once the LED has stopped blinking, by pressing REMOTE LOOP.

| ENTRY | RESULT |
|---|---|
| REMOTE LOOP (limited entry) | Changes normal/loopback status. |

| NEXT KEY | RESULT |
|---|---|
| Any other Channel level function | Goes to requested function on selected Channel |
| CHANNEL | Goes to Channel Select sub-level. |
| EDIT | Goes to level requested. |
| DEVICE | |

### 4.7.7 PRINT FUNCTION

This function prints, on a user's printer connected to the DATELMUX, a list of channel mapping interconnections.

The list starts with the selected Channel and continues with all mapped Channels (including self-mapped) until either the specified number (n) of Channels has been printed, or the highest numbered Channel to be mapped has been printed, when it stops.

The function is actioned by PRINT n ENABLE. When PRINT is keyed, n = 1 is entered automatically, but can be changed by keying another NUMBER. If n = 0 it prints from the selected Channel to the highest number mapped Channel. Printing may be stopped at any time by pressing HALT

At the end of printing the MTP goes to Map Mode function, with the next sequential Channel selected (after printing the highest numbered mapped Channel, it selects Channel 0.0, the internal Channel).

| ENTRY | NEXT KEY | RESULT | NEXT KEY |
|---|---|---|---|
| PRINT | ENABLE | Prints map of selected Channel, stops in Map Mode. | None (HALT stops printing) |
| | n ENABLE | Prints map of n Channels from selected Channel, stops in Map Mode. | |
| | 0 ENABLE | Prints map of all Channels from selected Channel, stops in Map Mode. | |

### 4.7.8 CHANNEL ISSUE NUMBERS FUNCTION

This function is accessed by the DUMP key. It displays the issue number of the local (selected) channel in the left Data Field, and the issue number of the remote (mapped) channel in the right Data Field. The first digit specifies the type of channel card (see Table 4-6). Non-reporting channels show 000. No reply from a channel is indicated by --- (if the left Data Field shows ---, so will the right Data Field). This should only happen if no loopbacks or speeds were reported either. The most likely cause is that no channel card is connected, *or that it is blocked by a running USO.

The function is available only when the Active map selected for Editing.

| ENTRY | RESULT |
|---|---|
| DUMP | The Channel Issue Number is displayed |

| EXIT | RESULT |
|---|---|
| MAP MODE | Goes to function requested. |
| NEXT | |
| ABSOLUTE | |
| SPEED | |
| PRINT | |
| BYTE | |
| CHANNEL | Goes to Channel Select sub-level |
| EDIT | Goes to level requested. |
| DEVICE | |

| IDENTITY CODE | CHANNEL |
|---|---|
| - - - | No response |
| 0 | Channel present but doesn't report |
| 1 | LSC1 |
| 2 | LSC2 |
| 3 | LSC3/3A |
| 4 | LSC4 |
| 5 | LSC5 |
| 6 | - |
| 7 | 5300 Channel Processor |
| 8 | 5300 Channel Processor S-E |
| 9 | 5100 |
| A | 5100 Speed Enhanced |
| B | 5141/2 |
| C | 5300 Synchronous Transport Processor |
| D | - |
| E | - |
| F | - |

TABLE 4-6

CHANNEL IDENTITY CODES

### 4.7.9 BYTE MODE FUNCTION

This function is accessed by the BYTE key, which displays --- in the right Data Field. A byte can now be entered in octal by using the numeric keys (see Table 4-7 for octal codes).

The number is shown in the right Data Field, and pressing STEP causes the byte to be sent to the selected channel. STEP may be repeated to send the same byte again, or a new byte may be entered.

The function may be used for data or control bytes. This function is available only when the Active map is selected for Editing. *A USO may bar sending a byte to specific channels.

This function (unlike Byte in Test) does not disturb mapping.

| ENTRY | NEXT KEY | RESULT | NEXT KEY |
|---|---|---|---|
| BYTE plus OCTAL NUMBER | STEP | Byte (number is sent to selected channel. | STEP (to repeat) |

| EXIT | RESULT |
|---|---|
| MAP MODE | Goes to function requested. |
| NEXT | |
| ABSOLUTE | |
| SPEED | |
| PRINT | |
| DUMP | |
| CHANNEL | Goes to Channel Select sub-level |
| EDIT | Goes to level requested. |
| DEVICE | |

| B7 → B6 → B5 → | | | | | 0 0 0 | 0 0 1 | 0 1 0 | 0 1 1 | 1 0 0 | 1 0 1 | 1 1 0 | 1 1 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B4 | B3 | B2 | B1 | OCTAL VALUE | 0 | 20 | 40 | 60 | 100 | 120 | 140 | 160 |
| 0 | 0 | 0 | 0 | 0 | NULL | DLE | SP | 0 | @ | p | ` | p |
| 0 | 0 | 0 | 1 | 1 | SOH | DC1 | ! | 1 | A | Q | a | q |
| 0 | 0 | 1 | 0 | 2 | STX | DC2 | " | 2 | B | R | b | r |
| 0 | 0 | 1 | 1 | 3 | ETX | DC3 | #£ | 3 | C | S | c | s |
| 0 | 1 | 0 | 0 | 4 | EOT | DC4 | $ | 4 | D | T | d | t |
| 0 | 1 | 0 | 1 | 5 | ENQ | NAK | % | 5 | E | U | e | u |
| 0 | 1 | 1 | 0 | 6 | ACK | SYN | & | 6 | F | V | f | v |
| 0 | 1 | 1 | 1 | 7 | BEL | ETB | ' | 7 | G | W | g | w |
| 1 | 0 | 0 | 0 | 10 | BS | CAN | ( | 8 | H | X | h | x |
| 1 | 0 | 0 | 1 | 11 | HT | EOM | ) | 9 | I | Y | i | y |
| 1 | 0 | 1 | 0 | 12 | LF | SUB | * | : | J | Z | j | z |
| 1 | 0 | 1 | 1 | 13 | VT | ESC | + | ; | K | [ | k | { |
| 1 | 1 | 0 | 0 | 14 | FF | FS | , | < | L | \ | l | \| |
| 1 | 1 | 0 | 1 | 15 | CR | GS | - | = | M | ] | m | } |
| 1 | 1 | 1 | 0 | 16 | SO | RS | . | > | N | ^ | n | ~ |
| 1 | 1 | 1 | 1 | 17 | SI | US | / | ? | O | - | o | DEL # |

TABLE 4-7

CONVERSION, ASCII/BINARY/OCTAL

### 4.7.10 TEST MODE FUNCTION

This is a powerful function which enables the operator to make comprehensive checks of a Datelmux system, one Channel at a time. However it requires exclusive use of the Channel that has been selected.

Suggested procedures, which can be followed until the operator is familiar with the facilities, are given in Section 7 of this Manual.

The function has three stages, at which various sub-functions allow different test patterns, different procedures, and different methods of displaying the results.

The function has limited entry; it can only be entered after: Selecting a Channel, or Mapping a Channel, or Printing, or Local or Remote Channel Loopback (ie it cannot be used directly after completion of an Absolute, Dump, Byte or Speed function). It is only available when the Active map has been selected for editing. *If a USO card is present and running, it may bar access to individual Channel tests.

Entry is by the TEST MODE key, which connects the selected Channel to the Test circuit (any other Channel to which it was mapped is disconnected for the duration of the test, and temporarily self-mapped; the original mapping is restored when Test Mode is terminated).

Stage 1 Test Pattern (ASCII or Specific Character). The ASCII test pattern is entered automatically (for transmission). This comprises CRLF (Carriage-Return-Line-Feed) followed by the printable characters of the ASCII set. The alternative is to press ENTER BYTE followed by a specific character (entered in octal, see Table 4-5). This character is normally alpha-numeric for data display, but could be a control code for carrying out a particular test.

Stage 2 (Test Byte or Test Error). This stage is reached automatically (with either ASCII test pattern or Enter Byte test pattern). The Test Byte sub-function is entered automatically, but can be changed to Test Error if desired. The Test Byte sub-function displays the transmitted character in the left of the Data Field display, and the received character in the right of the Data Field display (both in octal, see Table 4-7). In the absence of a character, the display is ---. The Test Error sub-function displays the number of transmitted characters in the left of the Data Field Display (transmitted characters divided by 1000 if the X1000 key is pressed), and the number of erroneous received characters in the right of the Data Field Display.

Stage 3 (Transmit/receive or receive; single or continuous)
This stage is reached automatically, with either ASCII or Enter Byte test pattern, and in either Test Byte or Test Error sub-function. Test Byte can use STEP, RUN, DOT or EQUALS; Test Error can use STEP or RUN. STEP initiates the transmission of one character. The MTP then waits for input from the channel. If input is received, it is compared with the expected character (which will usually be the last one sent). An unexpected control code causes no error. RUN initiates the transmission of a continuous character stream. It checks each returned character with the expected character. In Test Bytes sub-function it terminates on detection of the first error (or with the HALT key). In Test Error sub-function, it is terminated by the HALT key. Unexpected control characters are ignored.

DOT (.) is used in the Test Bytes sub-function to initiate one read from the selected Channel. If a character is present (either in a buffer or from a terminal) it is displayed in Data Field right; if no character is present it displays ---.

EQUALS (=) is used in the Test Bytes sub-function to initiate continuous read from the selected Channel (from buffers and any connected terminal). Every half second the Data Field right display is updated with the last character received. Termination is by the HALT key.

Note. This function has been described in logical stages, but the user will find that in practice variations to the sequence can be carried out (eg after selecting continuous Tx/Rx or Rx in Stage 3, the display mode (Test Byte or Test Error) of Stage 2 may be changed). Before leaving Test Mode, clear the route of any characters that may be left in buffers by using DOT or EQUALS.

| ENTRY | STAGE 1 | RESULT |
|---|---|---|
| TEST | No key | ASCII set available for transmission |
| (limited entry) | ENTER BYTE<br>x<br>(x = required character) | Character x available for transmission. |

| ENTRY | STAGE 2 | RESULT |
|---|---|---|
| TEST MODE (STAGE 1) | TEST BYTE | Characters will be displayed. |
| | TEST ERROR | Error count will be displayed. |

| ENTRY | STAGE 3 | RESULT | NEXT KEY |
|---|---|---|---|
| TEST MODE (STAGE 2) | STEP | One character transmitted and received. | STEP (if required) |
| | RUN | Character stream transmitted and received. | HALT |
| | . (DOT) | One character read. | . (DOT) (if required) |
| | = (EQUALS) | Continuous read | HALT |

| EXIT | RESULT |
|---|---|
| MAP | Goes to function requested, same channel. |
| NEXT | |
| ABSOLUTE | |
| SPEED | |
| PRINT | |
| DUMP | |
| BYTE | |
| CHANNEL | Goes to Channel Select sub-level |
| EDIT | Goes to level requested. |
| DEVICE | |

## 4.8 ERROR MESSAGES

Errors are indicated by "Err" in Data Field left, blinking. A two digit error code is displayed in Data Field right, blinking. In general, errors fall into two classes: those which result from incorrect operator actions, and can easily be corrected by the operator; and those which result from some internal cause in the system, and which it may not be easy for the operator to correct.

### 4.8.1 OPERATOR-TYPE ERRORS

These include pressing keys in the wrong Sequence, keying non-existent Devices or Channels or peripherals, keying out-of-range numbers, etc. The error codes are listed in Table 4-8. Recovery from these situations is by keying CLEAR (which causes the blinking message to become steady) and CLEAR again (which clears the error message). This generally takes the MTP back to one level or sub-level higher than the one in which the error became apparent (eg an error in Channel function sub-level clears to Channel Select sub-level). The operator may then re-try the whole sequence.

### 4.8.2 INTERNAL-TYPE ERRORS

If a hardware or software fault prevents the operator entering legal key sequences, or prevents the equipment from carrying them out, a different range of error codes applies, as listed in Table 4-9. These may be caused by an error in the non-Active Map (due to low battery allowing corruption when the Datelmux was powered off); a fault in the Datelmux; mains power problems; errors entered by equipment being switched during operations, etc. Recovery from these problems may not be possible from the MTP.

If "Err" is displayed with no error code (in Master/Slave mode), recovery can be achieved by going back to LOGIN and starting again.

| CODE | ERROR |
|---|---|
| 10 | Illegal key at System level. |
| 12 | Illegal key at System level. |
| 13 | Illegal key at Device level. |
| 14 | Illegal key at Device level. |
| 15 | Illegal key at Device level. |
| 16 | Illegal key at Device Print. |
| 17 | Illegal key at Channel Print. |
| 19 | Invalid attempt to modify log-in sequence. |
| 20 | Illegal key at Channel level. |
| 22 | Illegal key at Channel level. |
| 23 | Illegal key at Channel level. |
| 41 | Illegal Base or Size for current system. |
| 42 | Attempt to overlap when entering Base or Size. |
| 43 | Action forbidden on Active map. |
| 44 | Action forbidden on non-Active map. |
| 45 | Channel in Selected Field does not exist. |
| 46 | Channel in Data Field does not exist. |
| 47 | Speed not available on this Channel. |
| 48 | Invalid speed code. |
| *82 | USO has reserved this Channel, function not available. |
| *83 | USO reserving Channels, try again. |
| *85 | Not available when USO running. |
| 99 | Entered number too large. |

TABLE 4-8

ERROR CODES, OPERATOR-TYPE ERRORS

| CODE | ERROR |
|---|---|
| 50 | Unable to read or verify Active or Edit values. |
| 51 | A System level: hardware not set to required Active or map not turned on by software. At other levels: Edit map number lost. |
| 52 | Unable to verify Base/Size values (overlap or out of range). |
| 53 | Base/Size values which were entered did not get into memory (possible Channel Map Corruption). |
| 54 | Asymmetrical map of a Channel. *(A running USO will suppress thiS error on its reserved Channels). |
| 55 | Number in map is not a Channel. |
| 60 | Device reported as missing or non-operational. |
| 61 | Device alarm. |
| 71 | Test box already in use. |
| *81 | USO did not obey Run/Halt command. |
| *84 | Check again (USO & STC clashed when accessing map). |
| 98 | Check-sum error in Load (faulty tape or communications) or Dump. |

TABLE 4-9

ERROR CODES, INTERNAL-TYPE ERRORS

# SECTION 5

# CONFIGURATION AND INSTALLATION

The modular construction of the 5500 allows optimization of the configuration for specific applications. The purpose of this section is to describe the configuration rules and to give step-by-step instructions for installation.

The Appendix contains forms that may be filled in for specific installations.

## 5.1 CARDS AND FRAMES

Each 5500 will comprise 1 to 5 frames, and will contain one MT Panel, one STC card, and a number of LSC, BUF, ARQ, BEM and BTM cards. The following rules govern the number of cards required, and their location in the frames(s).

### 5.1.1 LSC CARDS

Details of speeds per channel and channels per card are given in the appropriate LSC Sections.

Each card should contain only DCE version circuits, or only DTE version circuits, if the indicator labels are to read correctly.

### 5.1.2 BUF CARDS

The minimum number of BUF cards (of the chosen sizes) required is the number of low speed channels, plus the number of mid-pointed virtual channels, divided by 60 (rounded up).

### 5.1.3 FRAMES

A multi-frame system is required if the LSC + BUF + ARQ cards exceed 16 (or are planned to exceed 16). If not, the cards can be accommodated in a single frame.

### 5.1.4 SINGLE FRAME CARD ALLOCATION

Mandatory:
- 1 STC + MTP
- 1 ARQ1 (optionally TAC if ARQ2 in slot 15)
- 1 BUF

Optional:
- 11 ARQ* )
- 14 LSC ) Maximum 14
- 3 BUF )

*Maximum 3 can be ARQ2

The BUF cards occupy slot 1 (and 2, 3, 4 if necessary). The STC occupies slot 17, the mandatory ARQ1 (or TAC) slot 16 with the ARQ in descending slot numbers. LSC cards can occupy the remaining slots. See Figure 5-1.

### 5.1.5 MULTI-FRAME CARD ALLOCATION

The frame containing the STC and MTP is called the Master and should not normally contain LSC cards (if the Master frame does contain LSC cards, there must be a BUF card in Slot 1, and the first BEM card in Slot 2). In 2, 3, or 4 frame Systems the Master is normally the top frame; in 5 frame systems it is normally next to top (for accessibility). One BEM (in the Master frame) and one BTM (in the Extension frame) is required for each Extension frame.

Master Frame

Mandatory:
- 1 STC + MTP
- 1 ARQ1 (optionally TAC if ARQ2 in slot 15)
- 1 BEM (Slot 1)

Optional:
- 11 ARQ* (Slots 15-5)
- 3 BEM/BUF (Slots 2-4)

*Maximum 3 can be ARQ2

Any remaining slots are left empty. See Figure 5-2.

Extension Frames

Mandatory:
- 1 BTM (slot 16)
- 1 BUF (slot 17)

Optional:
- 15 LSC (slots 1-15) ) Maximum
- 1 or 3 BUF (slots 15-13) ) total 15

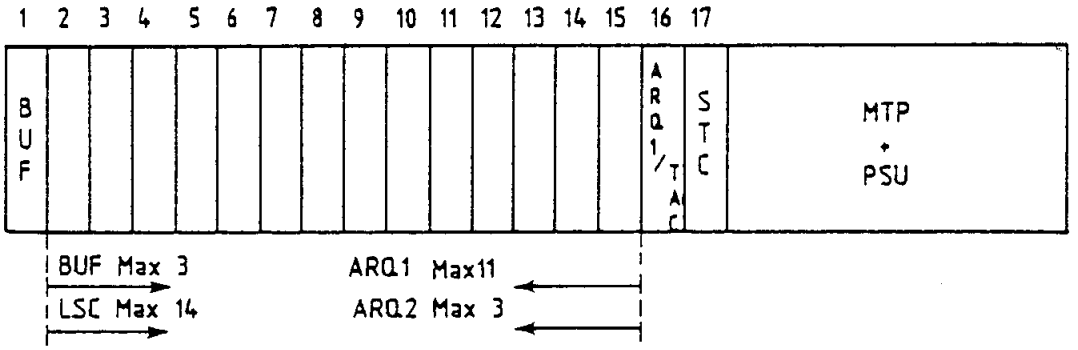



FIGURE 5-1
SINGLE FRAME CONFIGURATION

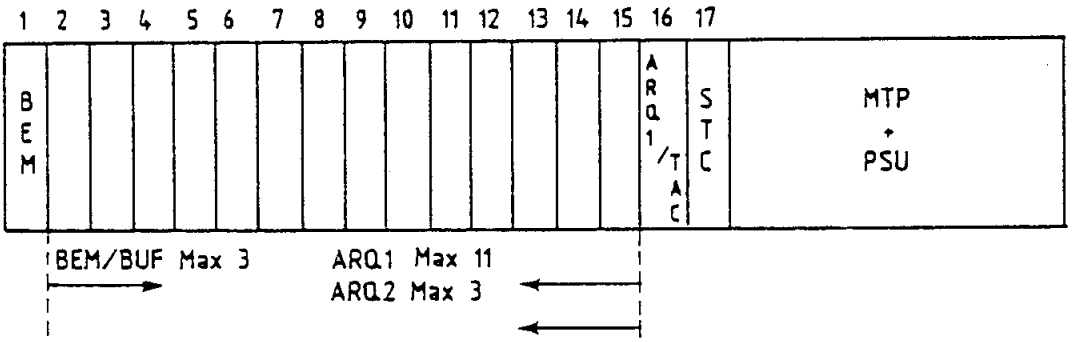



FIGURE 5-2
MASTER FRAME CONFIGURATION

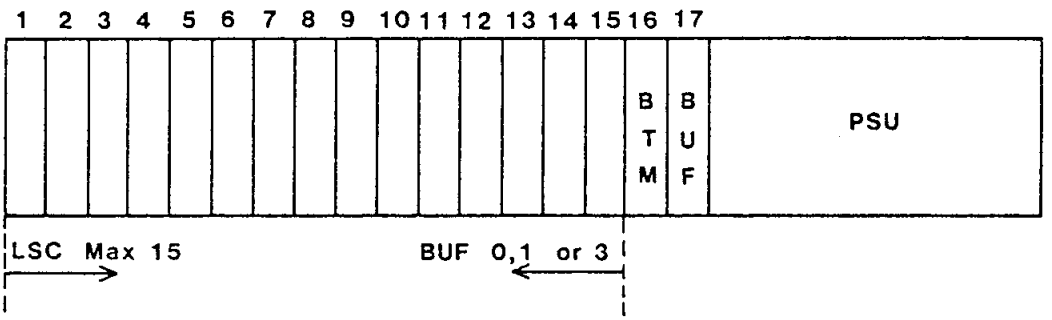



FIGURE 5-3
EXTENSION FRAME CONFIGURATION

The BUF cards in slot 17 of each Extension frame (and slot 1 of the Master frame if used for LSCs) are known as the Master BUFs and determine the LSC addresses. All Master BUFs in a multi-frame 5500 must be of the same type (eg all BUF2s or all BUF3s). BUFs in any other slots may be of any type. See Figure 5-3.

The BTM module normally used with Systems without Standby Facility is BTM1 (no indicators), which has no Straps. If a BTM2 (two indicators) is used, the link should be in the LK1 NORMAL position.

Fans

Fan trays are required on the basis of one per two frames, with a minimum of one tray.

## 5.2 INSTALLATION

The installation area must be clean, and free from environmental extremes. A minimum of 1 metre (3 feet) is required in front of the equipment for access to the controls. It is recommended that at least 600 mm (2 feet) be left at the rear for access to terminal and modem cables.

After unpacking, inspect for physical damage and verify that the printed-circuit cards are correctly inserted into the slots of the card frame.

## 5.3 INTERFACES

Check interfaces between the Datelmuxes and all other equipment which is to be connected (modems, computers, terminals) to ensure compatibility of all data and control lines. Changes must be made as necessary to the equipment, the cables or the interconnnections (headers) within the Datelmuxes.

## 5.4 INTERFACE CABLES

i) Ensure that all L.S. ports that are to have DTE configuration, have a cross-over cable (see LSC Sections).

ii) Ensure that the high speed link connector has the correct cable 5001 for ARQ1; 5004, 5005 or 5006 for ARQ2 .

iii) Ensure that any extension cables between Datelmux and computer are suitable (see LSC Sections).

## 5.5 REMOVAL OF PLUG-IN CARDS

These operations are only to be carried out by personnel qualified to do so.

### 5.5.1 LSC CARDS

i) Ease card from connector by raising lever at top of card.

ii) Pull card clear of frame.

iii) Replacement is by pushing the card fully home in the connector.

### 5.5.2 ALL OTHER CARDS

i) Switch off mains power.

ii) Ease card from connector by raising lever at top of card.

iii) Pull card clear of frame.

iv) Replacement (with power off) is by pushing the card fully home in the connector.

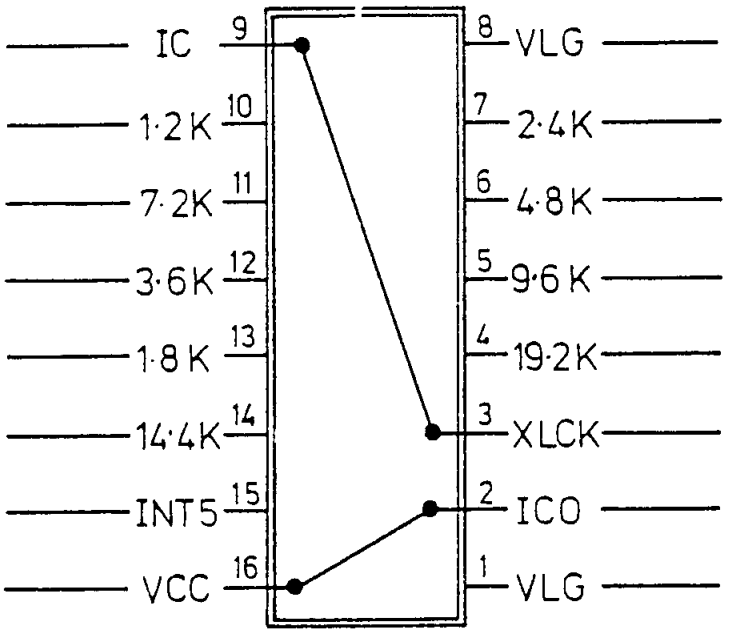
## 5.6 ARQ CARD STRAPPING

### 5.6.1 ARQ1

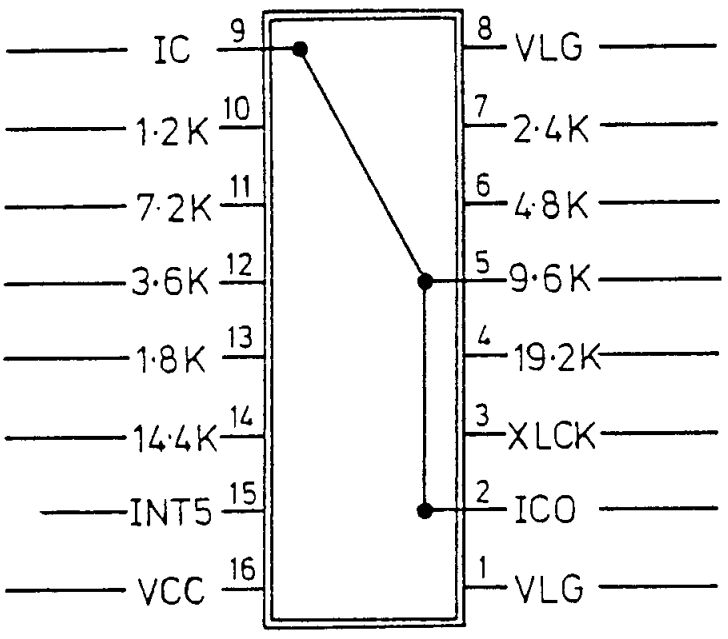
The ARQ1 card has a header (location A3) on which the required clock should be strapped. See Figure 5-4. The ARQ1 timing is taken from Pin 9 (IC). This can be strapped to the appropriate internal clock frequency, or to Pin 3 (External Clock from the modem). The clock fed to the modem on Pin 2 (ICO) may be taken from the appropriate internal clock frequency, or inhibited by strapping to Pin 16 (VCC).

### 5.6.2 ARQ2

Table 5-1 lists the ARQ2 strap options. Figure 5-5 shows the position on the card of the links referenced.




STANDARD STRAPPING FOR EXTERNAL CLOCK




STANDARD STRAPPING FOR INTERNAL CLOCK
(Example for 9600)

FIGURE 5-4
ARQ1 A3 HEADER STRAPS

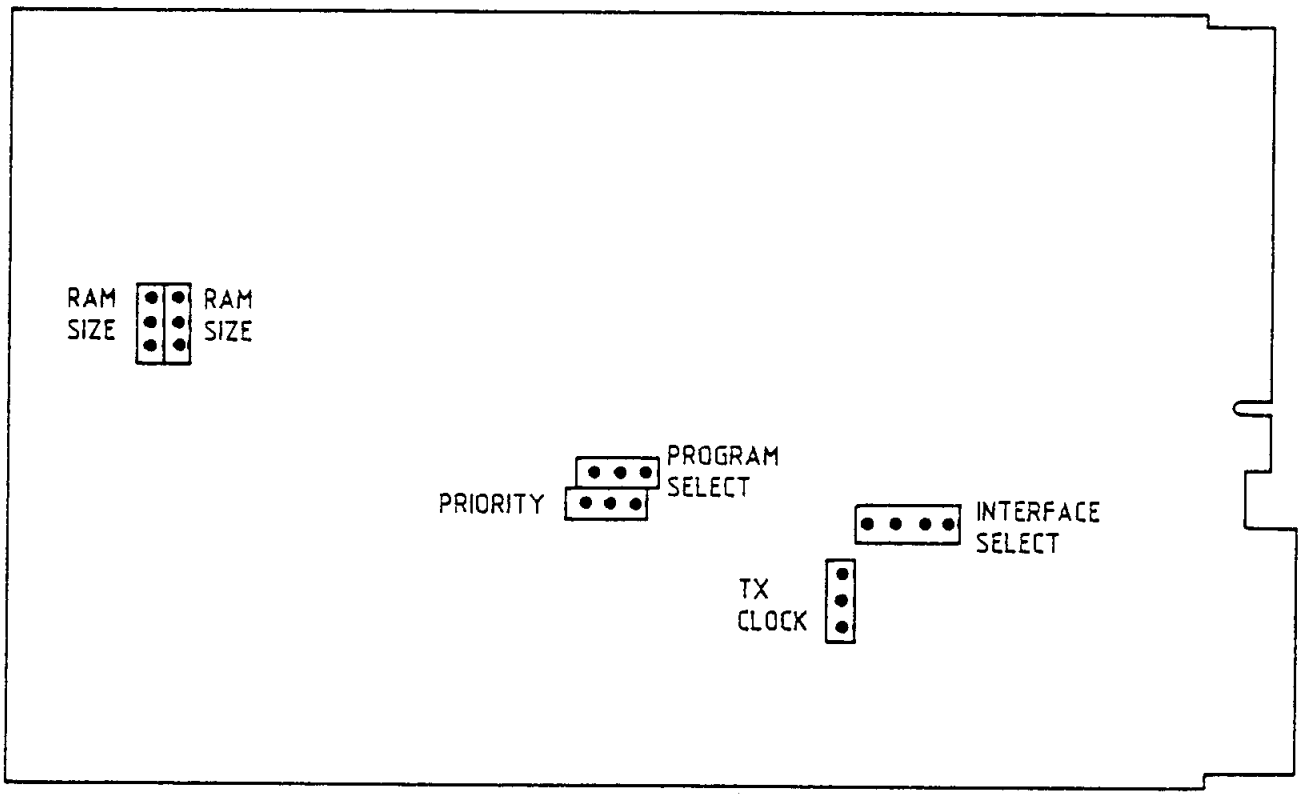



FIGURE 5-5
ARQ2 OPTION LINK LOCATIONS

| LINK NAME | OPTION | POSITION |
|---|---|---|
| RAM SIZE | 6 x 16K RAM devices installed | 16K |
| | 2 x 64K RAM devices installed | 64K |
| PRIORITY | Selective channel priority disabled | DIS |
| | Selective channel priority enabled | EN |
| PROGRAM SELECT | Standard transmission mode | NOR |
| | Extended window mode | EW |
| TX CLOCK | External transmit clock | EXT |
| | Internal transmit clock (80 kHz) | INT |
| INTERFACE SELECT | V35 interface selected | V35 |
| | X21 interface selected | X21 |
| | V24 interface selected | V24 |

TABLE 5-1

ARQ2 STRAP OPTIONS

RAM SIZE

These two links are set on assembly and must not be altered by the user (they allow the use of alternative types of RAM device but otherwise have no effect upon ARQ2 operation).

Priority

This link enables/disables the feature which provides priority servicing of selected low speed channels by the ARQ2.

Program Select

This link selects either the standard (8 frame) or extended (64 frame) window size to be used by the ARQ2 over the high speed composite link.

TX Clock

This link Selects the ARQ2 transmitter clock source, which is normally the modem. An 80 kHz internal clock can be selected for testing the ARQ2 card when no modem clock is available.

Interface Select

This link is set according to the type of modem interface and must be used in conjunction with the appropriate interface cable (see Section 3.2).

### 5.6.3 TAC CARD

The TAC card has no straps.

## 5.7 STC CARD STRAPPING

The STC has to be strapped for a) the total number of BUF cards in a single frame, or b) the total number of BUF + BEM cards in the Master Frame of a multi-frame Datelmux, as shown in Table 5-2.

| NUMBER OF BUF + BEM CARDS | POSITION OF LINKS | |
|---|---|---|
| | L2 | L3 |
| 1 | AC | AB |
| 2 | AB | AC |
| 3 | AB | AB |
| 4 | AC | AC |

TABLE 5-2 STC LINKS

Later STC cards have a removable link in series with the battery. This link should be removed when the card is in storage for more than 24 hours (to conserve battery life), and fitted when the card is replaced in the Datelmux.

## 5.8 BUF CARD STRAPPING

### 5.8.1 BUF2/3

The BUF2 and BUF3 modules use the some basic card. The difference is achieved by different size memories and appropriate straps. These are factory-installed and are not available to the user.

## 5.9 POWER SUPPLY

The power supply module can be converted for 115 VAC operation (by qualified personnel only) by the following procedure:-

i) Disconnect from mains.

ii) Disconnect DC power leads from motherboard, noting position of each lead.

iii) Free the mains leads from the rear panel and disconnect the green earthing wire from the screw terminal.

iv) Disconnect the fan cable from the socket adjacent to the mains lead.

v) Remove the retaining screw from the front of the PSU and carefully slide the PSU forward and out of the frame.

vi) Remove the four screws holding the cover plate and remove the cover.

vii) Identify the PSU manufacturer. If Farnell Instruments, go to step viii. If Weir Electronics, go to step ix.

viii)On Farnell units two pins labelled 115V LINK are adjacent to the mains terminals. Solder an 18 guage tinned copper wire link between these terminals. Go to step x.

ix On Weir units two scres terminals at the left end of the mains input block are labelled LINK FOR 115V. Link these terminals with a short insulated wire terminated with ring lugs. Identify fuse FSI adjacent to the terminal block and remove fuse. Replace With fuse type 8AF, HRC.

x) Replace cover.

xi) Identify fuse on rear panel of PSU assembly. Remove fuse and replace with 20 mm slow blow fuse rated at 5 amps

xii) Amend serial number labels on PSU and on rear panel of card frame as necesssry to read 115 VOLT.

xiii) Reassemble unit, taking great care to refit the DC power leads correctly to the motherboard.

xiv) Repeat the whole procedure for all other card frames in the unit.

xv) Check that all fan units are suitable for 115 volt operation.

## 5.10 CHECKOUT PROCEDURE

The appropriate parts of this procedure may be carried out after installing or reconfiguring a Datelmux. Familiarity with the contents of the other sections of this guide will be an advantage Do not interfere with "headers" etc on the plug-in cards unless competent to do so.

Since this section describes operation of the Datelmux in a different manner from Section 4 (ie step-by-step instead of by Function), the user is recommended to read it even though not intending actually to check out the equipment.

Unless stated otherwise, all keys and LEDs are on the MTP.

### 5.10.1 STC AND MTP FUNCTIONAL CHECKS

| | ACTION | RESULT |
|---|---|---|
| 1 | Unplug all card frames from the mains supply. Fit the master frame with a known working ARQ in slot 16, the STC in slot 17 and a BUF in slot 1. The STC should have LK2 A-C and LK3 A-B. | |
| 2 | Plug the master card frame into the mains supply. | On the MTP, the Error LED lights for a few seconds, and then the message "Hold" appears in the Data Field. After several seconds this goes out. |
| 3 | Insert key into Mode keyswitch, turn to LOCAL. Press ACTIVE 1 ENABLE 2 LOAD - ENABLE ACTIVE 2 ENABLE 1 LOAD - ENABLE. | Edit LED lights, Active digit shows "2", and Edit digit shows "1". blinking. |
| 4 | Switch Mode to MASTER. | MTP LEDs extinguish. Message "loop" appears. |
| 5 | Switch back to LOCAL. | MTP display returns as in 3 above. |
| 6 | Press 2. | Edit digit on MTP shows "2", blinking. Short bleep as key is pressed. |
| 7 | Press 1. | Edit digit shows "1",blinking. |

| | | |
|---|---|---|
| 8 | Press ACTIVE | Active LED lights, blinking moves to Active digit. |
| 9 | Press ENABLE | Active LED goes out, blinking moves back to Edit digit. |
| 10 | Press CHANNEL | Edit LED goes out, Channel LED lights. "0.0" appears in Selected Field LHS, blinking. |
| 11 | Press DEVICE | Channel LED goes out, Device LED lights. Selected Field contains "0", blinking, in RHS. |
| 12 | Press ENABLE | "1.0" appears in Data Field with "1" blinking. Map Mode LED lights and Local Loop LED blinks. |
| 13 | Press .3 ENABLE | Data,Field now shows "1.3", with "1" blinking. |
| 14 | Press CHANNEL ENABLE. | Data Field and Selected Field both show "0.1". Remote Loop also blinks. |
| 15 | Press NEXT | Selected Field and Data Field both display "0.2". |
| 16 | Press EDIT | Selected Field, Data Field, Local Loop, Map Mode LEDs all go out. Edit LED lights. Edit digit blinks. |
| 17 | Press LOGIN | Edit digit stops blinking, Login LED lights. |
| 18 | Press 4 5 6 7 8 9 | As each key is pressed, the number appears in Selected Field right. |
| 19 | Press CLEAR | Bleep sounds continuously, "error 19" appears in Data Field. |
| 20 | Press CLEAR twice. | On first press, bleep stops. On second press, STC returns to Edit mode. |

| | | |
|---|---|---|
| 21 | Press DEVICE 1 ENABLE<br>4.10 ENABLE. | "4.10" appears in Data Field. |
| 22 | Press EDIT ACTIVE 1 ENABLE<br>DEVICE 1 ENABLE | Data Field shows "4.0" |
| 23 | Press TRANS STATS | Data Field shows "0.0". Trans Stats LED lights. |
| 24 | Press REC STATS | Trans Stats LED goes out.<br>Rec Stats LED lights. |
| 25 | Press RESET STATS | Rec Stats LED goes out.<br>Reset Stats LED lights. |
| 26 | Press MAP MODE | Reset Stats LED goes out,<br>Map Mode LED lights. |
| 27 | Press LOCAL LOOP | Local Loop LED lights.<br>On ARQ, CLB lights. |
| 28 | Disconnect frame<br>from mains. | |

## 5.10.2 STC AND MTP MISCELLANEOUS CHECKS

| | | |
|---|---|---|
| 1 | Ensure ARQ has header strapped for Internal or External Clock. | |
| 2 | Fit a BUF card in slot 1. Fit an LSC card, strapped for 2400 bps, into slot 2. | |
| 3 | Connect to mains supply. | |
| 4 | Wait for Active "2", Edit "1" to appear on MTP. | No lights on BUF or LSC; on ARQ: X,RXC,RXD,CTS,LSD,DSR lit |
| 5 | Turn Mode key to MASTER. | Data Field shows "loop". |
| 6 | Turn Mode key back to LOCAL. Press DEVICE ENABLE .8 STEP 4 ENABLE | Data Field shows "1.8". The shows "9.4". |
| 7 | Press CHANNEL 0.5 ENABLE | Selected Field shows "0.5" Data Field shows "0.5" |
| 8 | Press 0.6 ENABLE | Data Field changes to "0.6". |
| 9 | Turn LSC thumbwheel switch to 0. Press LOCAL LOOP on MTP. | Local Loop LED on MTP lights. LLB LED on LSC lights. |
| 10 | Turn LSC thumbwheel switch | LLB light goes out, RLB lights. |
| 11 | Press LOCAL LOOP on MTP | Local Loop LED goes out, LLB on LSC goes out. |
| 12 | Press REMOTE LOOP on MTP | Remote Loop LED on MTP lights on LSC. |
| 13 | Press REMOTE LOOP and then LOCAL LOOP on MTP. Turn LSC thumbwheel switch to 0. | Finish with Local Loop lit and Remote Loop out, on the MTP. LLB lit on the LSC. |
| 14 | Press TEST MODE. | Test Mode LED flashes, Test Bytes LED lights, Data Field shows "------". |
| 15 | Press RUN | Left and right halves of data field show the same number, changing every half second. Test Mode LED stops blinking |

| | | |
|---|---|---|
| 16 | Press HALT | Data Field stops changing, Test Mode LED starts blinking. |
| 17 | Press ENTER BYTE | Data Field left shows "0", RHS is blank. Enter Byte LED blinks. |
| 18 | Press 400 | Data Field left shows "400". |
| 19 | Press STEP | Data Field right shows "400". Enter Byte LED is on. |
| 20 | Press TEST MODE RUN | As in 15 above. |
| 21 | Press TEST ERRORS | Test Bytes LED goes out, Test errors LED lights, Data Field left shows incrementing numbers, Data Field right shows "0". |
| 22 | Press X1000 | Data Field left shows a low number, incrementing every 30 seconds. X1000 LED lights. |
| 23 | Press TEST BYTES | As in 15 above. |
| 24 | Press HALT MAP MODE | Map Mode LED lights. |
| 25 | Press CHANNEL 1.1 ENABLE ABSOLUTE. | Absolute LED lights, Data Field right shows"9". |
| 26 | Press CHANNEL 0.5 ENABLE | Selected Field shows "0.5", Data Field shows "0.6". |
| 27 | Press SPEED | Speed LED lights, Data Field shows "---.14". LHS is blinking. |
| 28 | Press "14" | "14" moves into LHS of Data Field |
| 29 | Press STEP | No change. |
| 30 | Press - . | Data Field left reverts to blinking "---". Speed LED blinks. |
| 31 | Press ENABLE | Data Field shows "0.6". |
| 32 | Press = ENABLE | Data Field shows "0.5". |
| 33 | Switch off. | |

### 5.10.3 PRINT, DUMP AND LOAD CHECKS

| | | |
|---|---|---|
| 1 | Connect a 300 bps KSR printer (or VDU) which raises CTS to the STC port. | MTP shows Active = "2", Edit = "1". Switch on. |
| 2 | Press EDIT PRINT | Printer prints "Active = 2", "Edit = 1". |
| 3 | Press DUMP | Dump LED lights momentarily followed by a long bleep. Printer prints "AD0001000B002D C00000000F0052<". |
| 4 | Press LOAD | Load LED blinks. |
| 5 | Type A on printer. | Load LED stops blinking. |
| 6 | Type F001B on printer. | "001B" moves into Selected Field left, blinking. |
| 7 | Type < on printer. | A long bleep sounds, and STC returns to Edit mode. |
| 8 | Unplug the frame from the mains. | |

### 5.10.4 LOADED BUS CHECKS

1 Power off. Fit all cards required by the system in their assigned slots. All LSCs should be strapped for 2400 bps. All ARQs should be strapped for 9600 bps.

2 Strap the STC for the number of BUF cards plus BEM cards in the master frame:-

| No of Cards | LK2 | LK3 |
|---|---|---|
| 1 | A-C | A-B |
| 2 | A-B | A-C |
| 3 | A-B | A-B |
| 4 | A-C | A-C |

| | | |
|---|---|---|
| 3 | Power on. | MTP should say Active = "2", Edit = "1", after a delay. On LSC cards the LB LED should not be on. |
| 4 | Press CHANNEL 0.0 ENABLE ABSOLUTE | The Data Field should show a times the number of BUF cards plus BEM cards in the Master frame. |

### 5.10.5 LSC DATA CHECKS

| | | |
|---|---|---|
| 1 | Self-map all LSC channels in all frames. | |
| 2 | On each LSC check LB LED. | No LSC should have its LB LED on. |
| 3 | Validate all four channels on every LSC. | All channels should validate correctly. |
| 4 | Using a Data Generator and a control simulator box, pass data at 2400 bps, and all four controls, into every LSC channel in turn. Use the thumbwheel switch in positions 3, 7, 11 and 15 for looking at the LSC indicators. (In the absence of a Data Generator use available terminals as far as possible). | Data and controls should return without error, and the appropriate LEDs on the LSC should light. VAL, LLB, RLB and LB should not be on. |

### 5.10.6 ARQ DATA CHECKS

| | | |
|---|---|---|
| 1 | Assign at least one channel to each ARQ. | |
| 2 | Put all ARQs in loopback. | All ARQs should have OKY LED lit. |
| 3 | Use the internal test box to pass data into the first ARQ. Leave in test byte mode. | Data should return without error. |
| 4 | Take the first ARQ out of loopback, and put it into loopback again after 7 to 8 seconds. | Data should stop returning when the link is broken, and continue again without error when the link is remade. |
| 5 | Repeat steps 3 and 4 for every ARQ present. | |
| 6 | Power off. Swap the positions of the first and second ARQ. | |
| 7 | Power on. | The maps should still exist as left before power down. |

| | | |
|---|---|---|
| 8 | Put ARQ 1 and ARQ 2 in loopback. | |
| 9 | Use the internal test box to pass data into ARQ 1. | Data should return error-free. |
| 10 | Use the test box to pass data into ARQ 2. | Data should return error-free. |
| 11 | Power off. Swap ARQ 1 and ARQ 3. Power on. | |
| 12 | Put ARQ 1 into loopback. Use the internal test box to pass data into ARQ 1. | Data should return error-free. |
| 13 | Repeat 11 and 12, until every ARQ has been tested in slot 16. | All ARQs should pass data without error in slot 16. |
| 14 | Take all the ARQs out of loopback and connect them into pairs, using high speed cross-over cables. | Every ARQ paired up should light the OKY LED. No other LEDs should be alight. |
| 15 | Use the text box to pass data into either end of each pair. | Data should return without error. |
| 16 | If an ARQ was left uncoupled, now couple this to one of the tested ARQs and again pass data from the test box. | Data should return without error. |

# SECTION 6

# OPERATING PROCEDURES

## 6.1 INTRODUCTION

This section outlines the procedures to be followed, by referring to the relevant functions described in Section 4. This approach is adopted rather than step-by-step fully detailed instructions, to enable the user to become familiar with the capabilities of the equipment. (However the step-by-step instructions in Section 5.11 should be read to provide further familiarisation.)

It is recommended that as much experience as possible is gained by actually using the MTP.

## 6.2 SWITCHING ON

After installation and checkout, connect all operational equipment and ensure that all switches are in correct positions (Mode switch to Local, cards not in loopback). Connect power. If the STC has a charged battery the following initialisation sequence occurs (see Section 2.7):-

i) ERROR indicator comes on for about 10-45 secs.

ii) Message "Hold" then appears for up to 20 secs.

iii) Display goes to System level.

If the battery was discharged, the ERROR indicator will only be on for about 3 seconds, and new maps must be entered. If the battery was on partly charged, the previous maps may have been corrupted (although the Active map will have been "cleaned up") and need to be reconstructed.

A cold start in Slave Mode will cause the minimum Device Map:

| Device | Base | Size |
|---|---|---|
| 1 | $\frac{1}{2} - + 1$ | 1 |

and Channel Map:

| Device.Channel | To | Device.Channel |
|---|---|---|
| 1.1 | | 0.0 |

to be inserted in the Active Map. (Where S = system size; ie the number displayed when selecting the absolute value of 0.0.)

## 6.3 NORMAL OPERATION

During normal operation, the ARQ green OKY light will be on, the BUF2 or BUF3 (if present) green OK light will be on, and some of the LSC V24 interface indicators will be on, depending on the status of the lines.

The Mode switch should be set as required.

When the 5500 is out of use (for example at night) do not power down, but switch to Slave mode and remove the key.

## 6.4 MAPPING

A map is set up by selecting either Map 1 or Map 2 in Edit mode, then constructing first the Device Map followed by the Channel Map. Maps may be set up either at the local Datelmux with the Mode switch in Local, or at a remote Datelmux by using a Master/Slave configuration.

### 6.4.1 SELECTING ACTIVE AND EDIT MAPS

Use ACTIVE (SYS) and EDIT (SYS) Functions.

### 6.4.2 CONSTRUCTING DEVICE MAPS

Refer to Section 2 for the theoetical explanation of Device and Channel Maps, and to Figures 5-1, 5-2 and 5-3 for the allocation of physical cards to slots. The example in Figures 2-9 to 2-12 is continued in Figure 6-1. The first task is to map out on paper the allocation of channels to devices, taking the following practical considerations into account:-

a) Device Numbering. Devices are automatically numbered by the hardware, depending on the physical slot occupied by the card, in accordance with Table 6-1.

| DEVICE NO | REFERS TO | |
|---|---|---|
| 0 | all low speed Channels | |
| 1 | | 16 |
| 2 | | 15 |
| 3 | | 14 |
| 4 | | 13 |
| 5 | ARQ | 12 |
| 6 | in Slot No: | 11 |
| 7 | | 10 |
| 8 | | 9 |
| 9 | | 8 |
| 10 | | 7 |
| 11 | | 6 |
| 12 | | 5 |

TABLE 6-1

DEVICE NUMBERING

b) Low Speed Channel Numbering. Low speed channels are automatically numbered by the hardware depending on the physical slot occupied by the LSC card, in accordance with Table 6-2 for single-frame Datelmuxes, or Table 6-3 for multi-frame Datelmuxes. These numbers must be included in the Device Map. If master/slave configurations will be required, the necessary channels must be included (see Section 6.10).

c) In single-frame Datelmuxes there will be a BUF card in Slot 1, and possibly also in Slots 2, 3 and 4 (Figure 5-1). These addresses are not available for channels but must be allowed for, as shown in Slots 1 and 2 of Figure 6-1. Slots to the right hand side of (ie with higher numbers than) the "last" LSC card do not need to be allowed for.

| SLOT | CHANNEL NUMBERS | REMARKS |
|---|---|---|
| 1 | 1-4 | Occupied by BUF |
| 2 | 5-8 | May be occupied |
| 3 | 9-12 | by BUF, |
| 4 | 13-16 | or LSC |
| 5 | 17-20 | |
| 6 | 21-24 | |
| 7 | 25-28 | |
| 8 | 29-32 | May be occupied |
| 9 | 33-36 | by ARQ, or LSC |
| 10 | 37-40 | |
| 11 | 41-44 | |
| 12 | 45-48 | |
| 13 | 49-52 | |
| 14 | 53-56 | |
| 15 | 57-60 | |

TABLE 6-2

LS CHANNEL NUMBERING, SINGLE FRAME DATELMUX

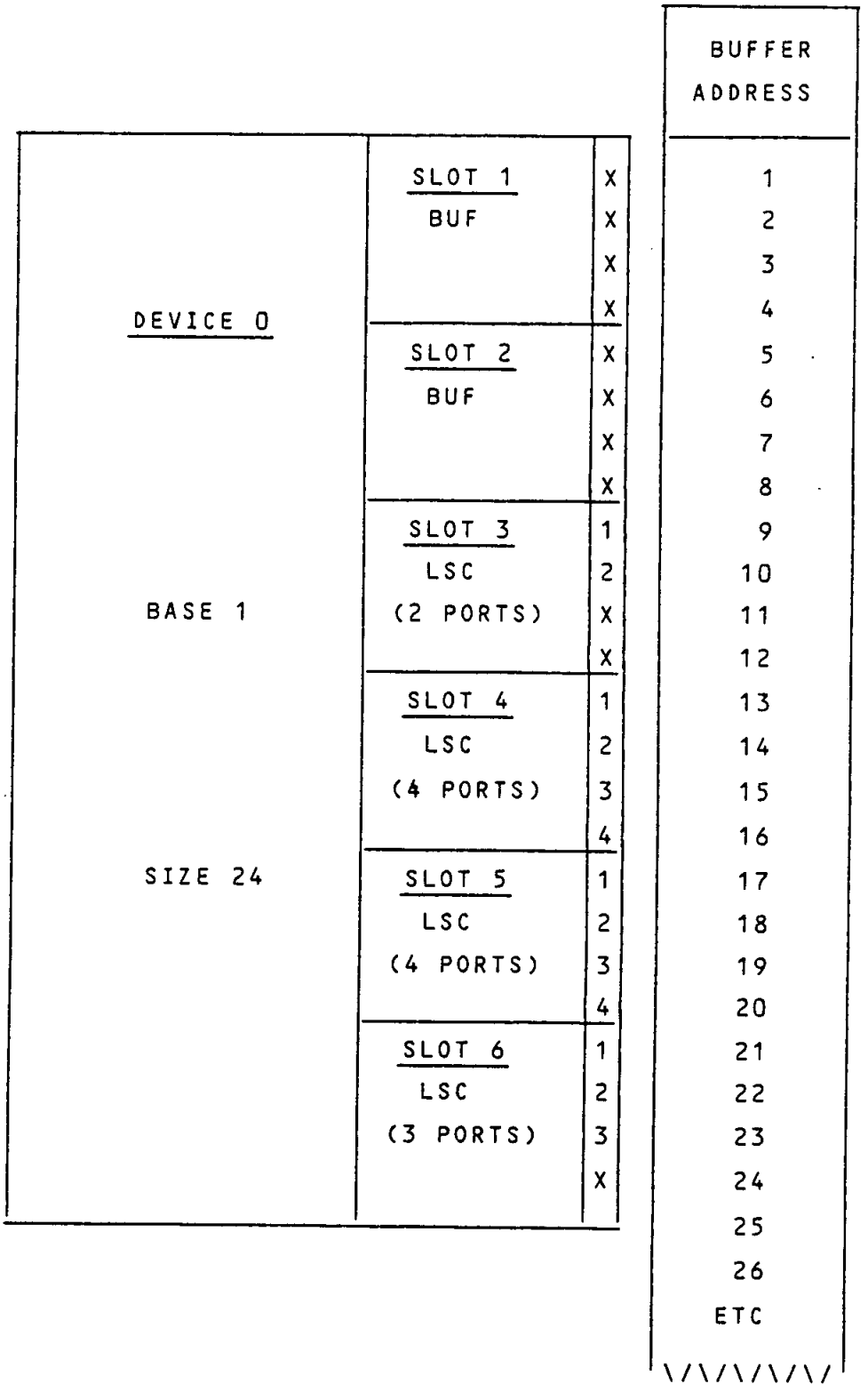



FIGURE 6-1
EXAMPLE DEVICE 0 MAP (SINGLE FRAME DATELMUX)

d) In standard multi-frame Datelmuxes the master frame does not contain LSC cards (see Figure 5-3). The problem in para a) therefore doesn't arise. The first LSC frame contains addresses 1 to 48 (with 4 BUF cards), 1 to 56 (with 2 BUF cards) or 1 to 60 (with 1 BUF card). The second LSC frame contains addresses 65 to 112 (or 120 or 124), the third frame 129 to 176 (or 184 or 188) and the fourth frame 193 to 240 (or 248 or 252). (Note that there are maximum 60 usable addresses per frame, giving the total of 240 channels). Again, slots to the right hand side of the "last" (highest numbered) LSC card can be ignored.

e) In both single and multi-frame Datelmuxes, each LSC has four addresses, even though all its ports are not used. See the examples in slots 3 and 6 of Figure 6-1.

In the example of Figure 6-1 only 13 ports are connected, but Device 0 requires an allocation of 24 channels. The ARQ device mapped as in Figure 2-11, including virtual channels that are mid-pointed.

Translate the paper map into an 5500 map by using the MAP MODE (DEV) Function.

| CHANNEL NUMBERS | | | | | REMARKS |
|---|---|---|---|---|---|
| SLOT | 1st EXT | 2nd EXT | 3RD EXT | 4TH EXT | |
| 1 | 1-4 | 65-68 | 129-132 | 193-196 | |
| 2 | 5-8 | 69-72 | 133-136 | 197-200 | |
| 3 | 9-12 | 73-76 | 137-140 | 201-204 | |
| 4 | 13-16 | 77-80 | 141-144 | 205-208 | |
| 5 | 17-20 | 81-84 | 145-148 | 209-212 | |
| 6 | 21-24 | 85-88 | 149-152 | 213-216 | LSC |
| 7 | 25-28 | 89-92 | 153-156 | 217-220 | cards only |
| 8 | 29-32 | 93-96 | 157-160 | 221-224 | |
| 9 | 33-36 | 97-100 | 161-164 | 225-228 | |
| 10 | 37-40 | 101-104 | 165-168 | 229-232 | |
| 11 | 41-44 | 105-108 | 169-172 | 233-236 | |
| 12 | 45-48 | 109-112 | 173-176 | 237-240 | |
| 13 | 49-52 | 113-116 | 177-180 | 241-244 | May be |
| 14 | 53-56 | 117-120 | 181-184 | 245-248 | occupied by BUF |
| 15 | 57-60 | 121-124 | 185-188 | 249-252 | |

TABLE 6-3

LS CHANNEL NUMBERING, EXTENSION FRAMES

### 6.4.3 CONSTRUCTING CHANNEL MAPS

Having constructed the Device Map, now list the channels for each device (see Section 2.6.3). Note that all channels not being interconnected (eg those marked X in Figure 6-1) will be self-mapped.

eg
0.1 - 0.1
0.2 - 0.2
0.3 - 0.3
0.4 - 0.4
0.5 - 0.5
0.6 - 0.6
0.7 - 0.7
0.8 - 0.8
0.11 - 0.11
0.12 - 0.12
0.24 - 0.24

Translate the complete list into a Channel Map by using the MAP MODE (CHAN) Function. Include any channels required for Master/Slave configurations (see Section 6.5).

### 6.4.4 CHANGING MAPS

Changes may be made to maps when the 5500 is in either Local or Master mode.

The Device Map (of the non-active map only) may be changed. The set of channels included in the Device Map will automatically follow any change to the Base (providing the Size is not decreased). If the Size is increased, the extra locations will automatically be self-mapped. "Bad" Channel mapping is automatically "cleaned-up" by the system at the same time. Use the MAP MODE (DEV) Function.

The Non-active Channel Map may be changed freely. Changes may be made from, and to, any channel. Any channels freed by these changes will automatically be self-mapped. Use the MAP MODE (CHAN) Function.

Changes to the Active Channel Map are restricted to self-mapping, and mapping channels which were self-mapped. Use the MAP MODE (CHAN) Function.

## 6.5 SETTING UP MASTER/SLAVE CONFIGURATIONS

There are two stages to this operation. Stage 1 is only required when making initial contact with a slave that has no map (or whose map is lost or corrupted). This is done by a special dial-up modem "external" link. Stage 2 comprises taking control of the slave (for entering maps and carrying out other functions) via the normal high speed "internal" link between the two

Datelmuxes. (It is not recommended to set up maps etc over the external link due to the probability of corruption by the line; the internal link has the benefit of error detection and correction.)

### 6.5.1 EXTERNAL LINK

The physical connections are shown in Figure 6-2. Carry out the following steps:-

i) The remote Datelmux must either have a password entered into it (in Local mode) by the LOGIN/LOCAL (SYS) Function, or the automatically entered ..... (six dots) may be used.

ii) The remote Datelmux must be powered on, switched to Slave mode, and have its STC port connected to the external dial-up link.

iii) Set the local Datelmux to Local Mode, map 0.0 (the STC) to a low speed DCE channel, and make this map Active.

iv) Connect this low speed DCE channel to the dial-up external modem link (using the DCE cross-over cable).

v) Switch local Datelmux to Master mode.

vi) Establish dial connection.

vii) Use the LOGIN/MASTER (SYS) Function to establish control by the local MTP.

viii) Map Channel 0.0 of the remote Datelmux to a high speed virtual channel (to the local Datelmux), and make this map Active.

ix) Switch local Datelmux to Local mode and map its Channel 0.0 to the same virtual channel. The system is now set up to allow full control of the remote Datelmux via the high speed link as in Figure 6-3, when this map is made Active. (Care must be taken not to change the map in such a way as to disconnect oneself!)

### 6.5.2 INTERNAL LINK

When a remote Datelmux has its STC Channel 0.0 mapped to a suitable HS channel, the local MTP can be logged on to it by the LOGIN/MASTER (SYS) Function, to enable all MTP functions to be carried out. Mapping etc. should be done by this internal route rather than by the dial-up external route, because of the likelihood of transmission errors by the latter route. If, due to map corruption etc, contact cannot be made with the remote Datelmux by this route, the

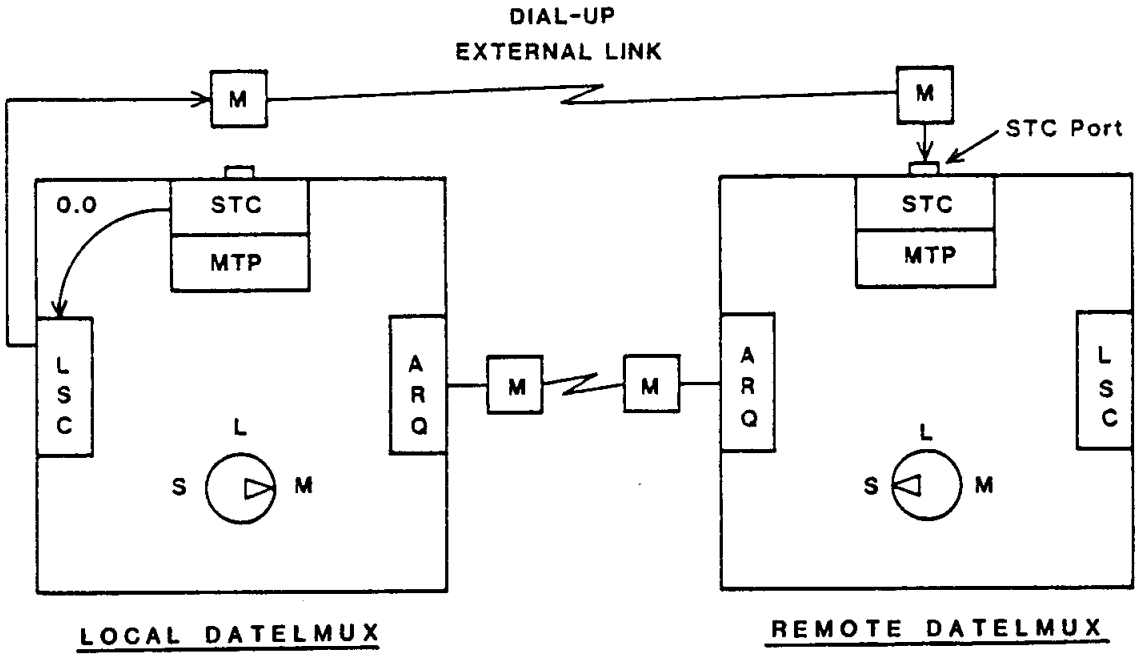



FIGURE 6-2
EXTERNAL/MASTER/SLAVE LINK

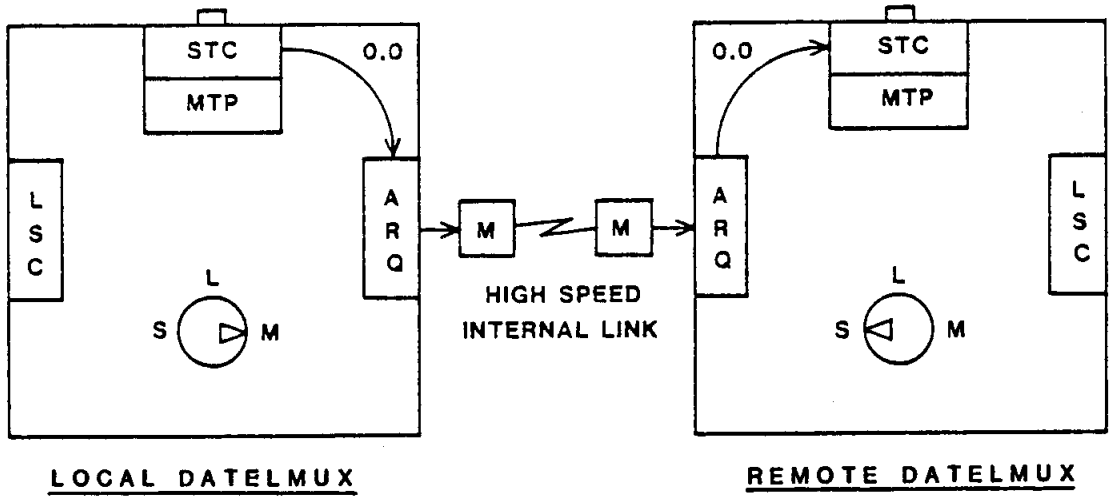



FIGURE 6-3
INTERNAL MASTER/SLAVE LINK

Datelmux external link must be used first. Note that in the event of conflict between internal and external links (ie both connected at the same time), the external takes precedence.

It should be noted that when in internal mode the slave remains logged on until Login is pressed again. If the master is switched to Local and back to Master, pressing Edit is usually sufficient to re-activate the display. (If the master was switched off in the middle of a non-system number entry etc., it may be necessary to complete it before pressing Edit.)

## 6.6 SETTING CHANNEL SPEEDS AND OPTIONS

The transmission rate of any channel link through the Datelmux network may be established either by setting the switches on the LSC cards to the appropriate speed (or to ABR), or from the MTP.

### 6.6.1 AT THE LSC MINIATURE SWITCHES

Details are given in the relevant LSC Section.

### 6.6.2 AT THE MTP

i) Set the speed/code switches on the LSC cards at both ports (ie at each end of the link) to ABR.

ii) Set the Edit Map to be the same number as the Active Map (EDIT (SYS) Function).

iii) Set the speed at the channel on one LSC to the required speed by the SPEED (CHAN) Function. This will not only set, but also "save" the speed in the Speed Map, so that the channel will automatically be reset to the same speed when the Datelmux is powered down and up again.

iv) The low speed channel at the other end of the link will automatically set itself to the required speed.

v) All low speed channels (including those in (iv) above) which are not to have saved speeds, should have DASH (-) entered into the Speed Map by the SPEED (CHAN) Function. (This prevents any being mis-set when the Datelmux is powered off and on again.)

vi) If the SPEED (CHAN) Function is erroneously used to select a particular speed when the LSC switches are not set to ABR but to a "fixed" speed, an error message will result. This can only be cleared at the LSC card.

## 6.7 STATISTICS

The Peak Utilisation or Current Utilisation for any ARQ link may be displayed at the appropriate ARQ card in single digit (ie % divided by 10) format. See Section 3.7.

The Peak Utilisation and Error Count for any ARQ link may be dislayed on the MTP in 2-digit format by using the RECEIVE STATS (DEV) or TRANSMIT STATS (DEV) Functions together with the RESET STATS (DEV) Function.

## 6.8 PRINTING OR VIEWING

Either a printer or a VDU may be used. It requires the following specification:

a) KSR (Keyboard Send-Receive).

b) V24 interface suitable for that in Table 6-4. (Note that this is a plug; a socket-to-socket cross-over cable may be required; control is by CTS and DSR signals.)

c) Speed of 300 bps.

d) At least 72 characters per line.

e) Continuous stationery, or roll-up on screen.

The unit must be connected to the STC port. Output can then be achieved by the PRINT (SYS), PRINT (DEV) and PRINT (CHAN) Functions.

| PIN NO. | CCITT CIRCUIT | SIGNAL |
|---|---|---|
| 2 | 103 | Transmitted Data |
| 3 | 104 | Received Data |
| 4 | 105 | Request to Send |
| 5 | 106 | Clear to send |
| 6 | 107 | Data Set Ready |
| 7 | 102 | Signal Ground |
| 8 | 109 | Carrier Detect |
| 15 | 114 | Transmitter Clock |
| 17 | 115 | Receiver Clock |
| 20 | 108/2 | Data Terminal Ready |
| 23 | 111 | Data Rate Select |
| 24 | 113 | External Transmit Clock |

TABLE 6-4

STC PORT INTERFACE

## 6.9 STORING MAPS ON STORAGE MEDIA

Maps may be "dumped" onto paper tape or magnetic tape in a suitable unit, and "loaded" back into the STC (Maps 1 and/or 2) when required. The unit must have the following specifications:

a) V24 interface suitable for that in Table 6-4. (Note that this is a plug; a socket-to-socket cross-over cable may be required; control is by CTS and DSR signals.)

b) Speed of 300 bps.

The unit must be connected to the STC port. Writing onto the medium and reading from it can then be achieved by the DUMP (SYS) and LOAD (SYS) Functions.

## 6.10 ERROR INDICATIONS

In general, errors may be caused by sources outside the Datelmux (terminal, modem or line faults), or inside the Datelmux (power supply, logic faults). See Table 6-5. It is usually wise to eliminate the more usual outside troubles (a break in the line or a terminal switched off for example) before suspecting a fault within the logic of the unit. The fault reporting system, together with the testing procedures in Section 7, should enable a user to pin-point the cause of trouble by a process of elimination. NOTE. The power supply and logic cards may only be removed by personnel qualified to do so. See Sections 5.5 and 5.10.

## 6.11 CLEARING ERROR INDICATORS

After clearing the fault, press the appropriate Reset button. LSC. See relevant LSC Sections.

BUF2 AND BUF3 Pressing the RE button, if the fault if not persistent, will clear the AL indicator. It is necessary to press the RE button again to clear any other error lights.

| CARD | SYMPTOM | ACTION |
|---|---|---|
| ALL | All lights, including UT indicator, off | Check fuse and mains supply Replace fuse if blown. If blows again, suspect power supply |
| LSC | See LSC Section OVF light on | See LSC Section Check for line faults etc. If OK and pressing RE does |
| BUF2 and BUF3 | AL and OVF lights on | Check for line faults etc. If OK and pressing RE does not clear it, suspect BUF card card |
| | AL and MF or PE lights on | Suspect BUF card (memory faulty) |
| ARQ1 and ARQ2 | UT indicator blank (other lights on) | Suspect ARQ card |
| | UT indicator shows "t" or "u" except | Suspect ARQ card |
| | UT indicator shows "[" | Check composite link. |
| | UT indicator shows "]" | Check mapping for inclusion of ARQ. |
| | ERR light on | Check composite link |
| | OKY (or OK) light off, X & one or more RXC, TXC, RXD, LSD on | Attempt composite loopback test. If not accepted, or error persists in loop-back mode, suspect ARQ card. If OK in loopback, check modems, cables etc. |
| - | Data transmission errors | Check that speed/code settings on LSC cards are correct for DTEs connected to them. Use loopback test to aid diagnosis. |

TABLE 6-5
ERROR SYMPTOMS

# SECTION 7

# TEST PROCEDURES

## 7.1 TESTING METHOD

A supervisor can rapidly test the Datelmux and the lines to locate a fault by use of the controls on the plug-in cards and/or the MTP. As loopback interrupts the normal data flow, the loopback pushbuttons are only operational when the Mode key is in the Local or Master position. Validation generates its own signal, but loopback tests require the use of data from a terminal or the MTP (Test Function). The faulty area is established by a process of elimination. Normally, testing will be carried out from the MTP, but there are occasions when basic testing from the plug-in cards may be necessary. Loopback functions from the MTP are, in any case, effected through the appropriate plug-in card.

## 7.2 LSC TESTS

Tests that can be initiated at the LSC cards are described in the relevant LSC Sections.

## 7.3 ARQ LOOPBACK

The ARQ composite loopback operation is illustrated in Figure 7-1.

i) Turn Mode key to Local.

ii) Press CL pushbutton on the ARQ card. The CLB indicator should light to show loopback operation.

iii) Check data flow under loopback conditions.

iv) Press CL to terminate loopback (CLB goes out).

v) Turn Mode key counterclockwise.

## 7.4 TESTING FROM MTP

### 7.4.1 LOOPBACK TESTS

These have the same effect as the procedures given in the LSC Sections. They are described in Section 4, and they comprise the LOCAL CHANNEL LOOPBACK (CHAN), REMOTE CHANNEL LOOPBACK (CHAN) and LOCAL COMPOSITE LOOPBACK (DEV) Functions. They may be used to loop back test data from a terminal, or from the MTP/STC. They should be carried out with the Active map selected for Editing.

### 7.4.2 TEST DATA

The STC contains a test data generator. This can produce a data stream comprising the printable ASCII character set, or specifically generated characters. It can be used to output test data to a terminal or computer; or in conjunction with a loopback function, when the returning test data is checked by the STC and the reSults reported at the MTP.

It is actioned by the TEST MODE Function, with the Active map selected for Editing. If loopback is required, the appropriate function must be set first, and cleared afterwards.

## 7.5 SAFETY

Fuses must only be replaced with the correct type and value, and must not be Short-circuited.

Disconnecting the protective earth, or breaking the protective earth circuit (inside or outside the equipment), can render the equipment dangerous.

The power supply must not be connected to the mains when outside the case, except by fully qualified personnel. The capacitors inside the unit may still remain charged after disconnecting the mains.

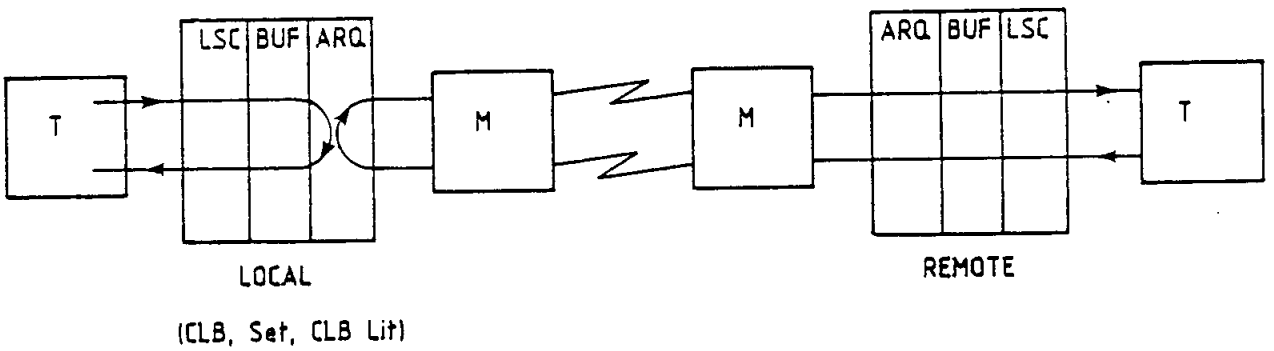
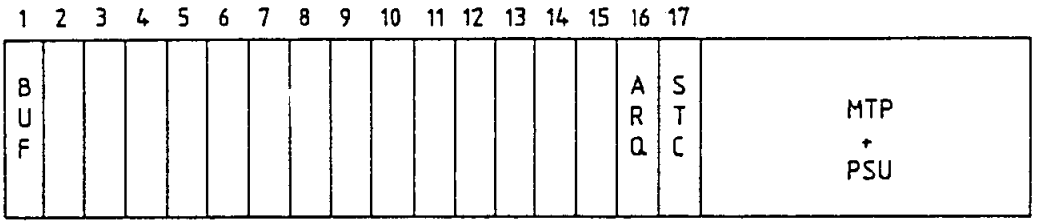
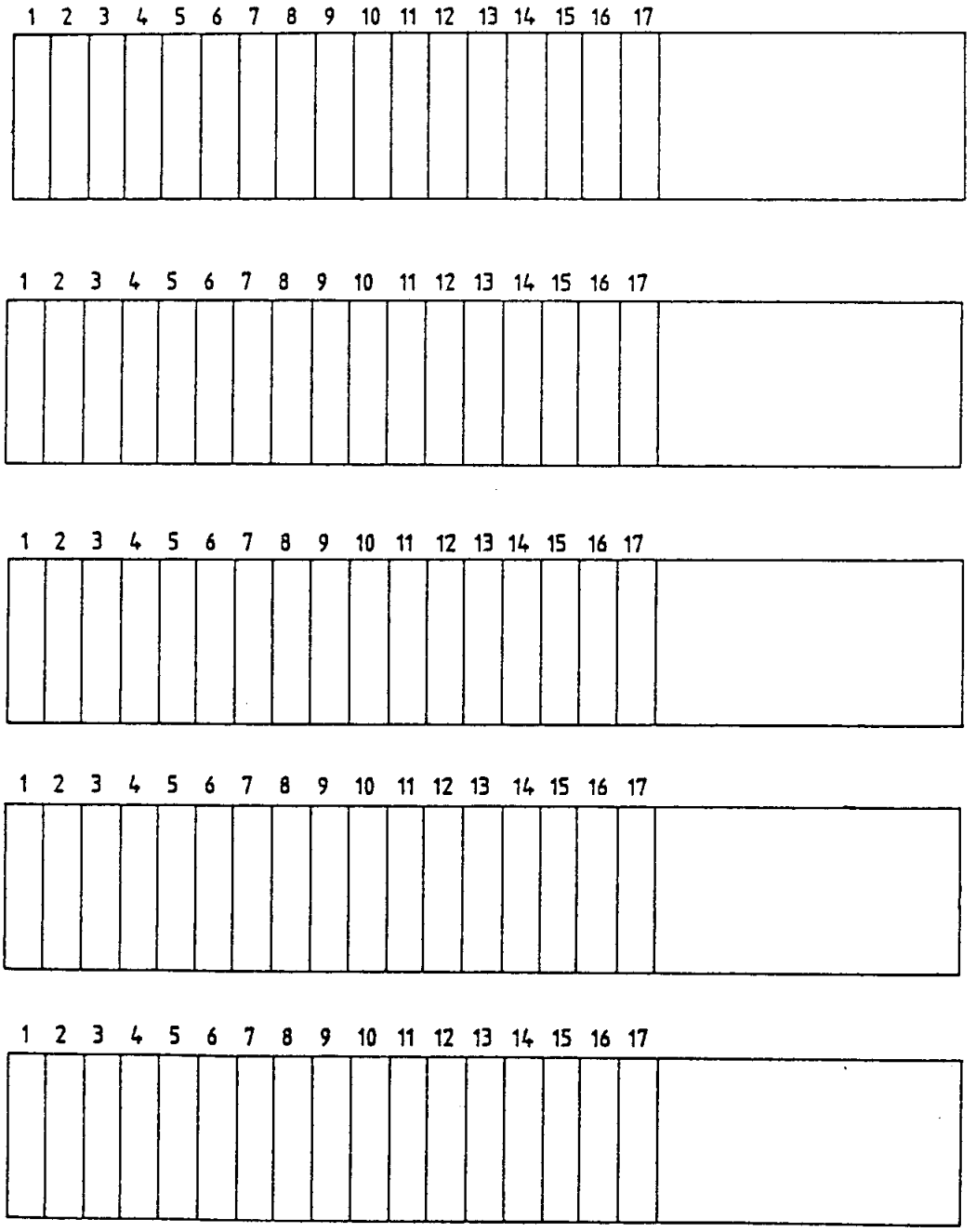


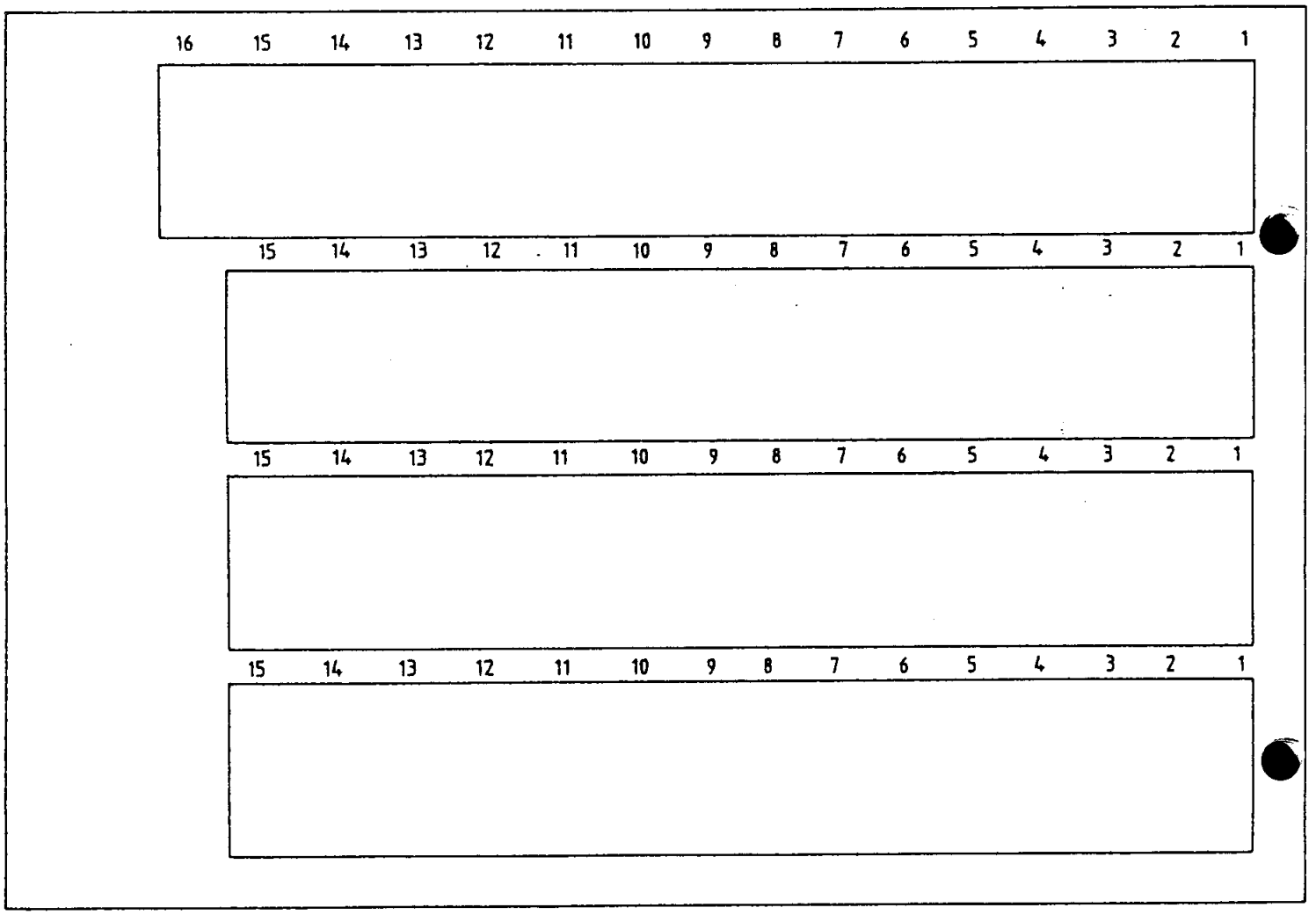

FIGURE 7-1
COMPOSITE LOOPBACK




## CARDS
## SINGLE FRAME CONFIGURATION (FRONT)




## CARDS
## MULTI-FRAME CONFIGURATION (FRONT)




## CONNECTORS (REAR)