CONTENTS

1. GENERAL

2. INSTALLATION

CONTENTS (Cont.)

1
GENERAL

1.1 INTRODUCTION

This manual describes the Commander N308 Business System, a system which is capable of providing a maximum of eight stations and three exchange lines. A Station is defined as either a telephone station, intercom station or a door station. Optional equipment may be connected, such as a Call Metering Unit and an external Music Source.

All matters relating to installation and maintenance of the N308 system are described in section two and three of this manual, the general section provides information which is common for both installation and maintenance staff.

1.1.1 WARNINGS

1. The following precautions must be observed when working on the system. The power switch on the power supply must be turned OFF when replacing stations, boards, re-wiring the system, or adding optional boards. If this work is done with the power ON, semiconductor circuits in the system may be damaged.
2. The N308 is a four wire telephone system. One pair is used for audio, the second for power and data. Hence it is imperative that the system is wired with the correct polarities. Check all wiring before initial power up of the system.

TELECOM CABLE	603/610 PLUG/SOCKET	DESIGNATION
White (WT)	2	LINE 1
Blue (BL)	6	LINE 2
Red (RD)	1	DATA +
Black (BK)	5	DATA —

3. Take special care not to short between any terminals. This may cause damage to the system.
4. The fuses that are provided in the system are unlikely to blow if the system is connected properly. The fuses may blow when a component or a station is replaced with the power ON, or wiring is incorrect.
   Standard fuse ratings 315mA use 375mA,
   0.8A use 1A.
5. **Handling of Boards:**

   This equipment contains a considerable number of MOS, and other static sensitive components. To reduce the incidence of premature failure due to static discharge, the following precautions MUST be taken:

   - Always ensure that power is disconnected before unplugging PBAs.
   - Always discharge static from yourself by touching a conductive part of the main equipment before handling boards.
   - Handle PBAs by the edge or by the handles. Do not handle PBA tracks, components or edge connectors (contaminants introduced by fingers can cause corrosion and high resistance connections).
   - Components are physically delicate. Finger pressure on a component can fracture, but not necessarily break component leads: a future fault.

   To protect against physical damage and damage due to static discharge, PBAs must ALWAYS be wrapped in aluminium foil (e.g. cooking foil) and inserted into an **ANTISTATIC** plastic bag and placed in the protective container provided with the new item.

   These procedures apply equally to both working and faulty PBAs. Careless handling, storage and transporting will cause secondary or future faults.

1.2 FACILITIES

- DISTINCT AUDIO AND VISUAL INDICATIONS
  Each call function has distinct audio and visual indicators to provide ease in determining status of the call.
- PUSH BUTTON DIALS
  Stations may either have an Abbreviated Voice Frequency (VF) Dial, Decadic or Abbreviated Decadic Dial fitted. The Abbreviated Dial provides Last Number Redial and Abbreviated Dialling with a memory capacity of 50 telephone numbers of up to 20 digits.
- MULTI-LINE
  Any exchange line can be selected by direct access (single key operation) at any telephone station to answer or initiate a call.
- PRIVACY
  Privacy on exchange lines and on the intercom link (option) is provided.
- CONFERENCE
  Up to three stations may be placed on the same exchange line.
- INTERCOM
  The system allows a call between any two stations in the system.
- DIRECT STATION SELECTION
  A station to station intercom call may be placed by direct access (single key operation) using the DSS keys.
- HANDSFREE TALKBACK MODE FOR INTERCOM CALLS
  The called party has a full handsfree conversation facility when called by another station in the system.
- MICROPHONE CUT-OFF
  While answering an intercom call in the handsfree mode, the microphone can be turned on or off by operation of the DND key.
- ALTERNATE POINT ANSWERING
  An intercom call can be answered by another station using the Privacy Release Key.
- ALL CALL PAGING
  All stations within the system may be called through the station speakers.
- TRANSFERRING CALLS
  Three methods are available to transfer exchange line calls to another station.
  - Using the Hold Key and asking the desired person to pick up the call.
  - The station can be selected directly using the DSS Keys.
  - All call facility may be used. This is done if the location of the person is not known.
- I-HOLD INDICATION
  The holding station is indicated by a distinctive flickering of the exchange line lamp.
- AUTOMATIC RECALL FOR A CALL ON HOLD
  Automatic Recall reminds the transferring station that a call which had been placed on hold is still unanswered after a set time has elapsed.
- DO-NOT-DISTURB
  Stops signalling at that station for all incoming calls.
- POWERFAIL TRANSFER
  Each exchange line is transfered to preassigned stations during power failure.
- POWERFAIL BELL
  Indication of a call during power failure is provided by an external bell.
- POWERFAIL INDICATOR
  If power fails for a short period, the power failure indicator LED on the Power Supply Unit may light up. This is an indication that a power failure has occured, and is not a system fault.
- INTERCOM STATION
  The Intercom Station may receive handsfree intercom calls and provides a monitoring facility.

* DOOR STATION
The Door Station may receive handsfree talk back calls. It also provides a chime key which when depressed, transmits a tone to Telephone and Intercom Stations. One Door Station may be used with the system.

* HANDSFREE CONSOLE
The Handsfree Console allows handsfree (voice switching) conversations for stations on all calls.

* TIE LINES
Using an optional Remote Extension and Tie Line Interface Unit the system can handle two types of tie lines, Ring-in/Ring-out and Loop-in/Ring-out. The tie lines take the place of exchange lines.

* REMOTE EXTENSIONS (2-WIRE TELEPHONE)
A remote extension can be connected to the systems using a Remote Extension and Tie Line Interface Unit which provides the 4-wire to 2-wire conversion, generation of ring voltages and tones.

* CALL METERING UNIT
A Call Metering Unit will display the number of metering pulses received on each exchange line. Using this the user may keep track of the cost of local, STD and ISD calls.

* MULTI EXCHANGE LINE CONFERENCE (SIMULTANEOUS OUTSIDE LINE CALLS)
A conference can be held between one station and two exchange line parties.

* ACCESS BARRING
A Trunk Access Barring Unit may be installed to inhibit the use of the trunk network by selected stations.

* EARTH RECALL OR SWITCHHOOK FLASH
When used with a PBX this facility allows the recall of an operator or transfer of a call.

* ALARM
The user may connect an alarm detector. When activated the system will provide an alarm tone which is transmitted to all stations.

* BACKGROUND MUSIC
If a music source is connected by the user, then, this music will be transfered to all stations not dedicated to a call.

* MUSIC ON HOLD
The above music source is directed to any exchange line caller put on Hold.

* EXTERNAL PAGING
If the user connects an external amplifier and speakers to the system, then ALL CALL paging may be broadcast.

1.3 OPERATING INSTRUCTIONS

CONTENTS

1.3.1 TELEPHONE STATION

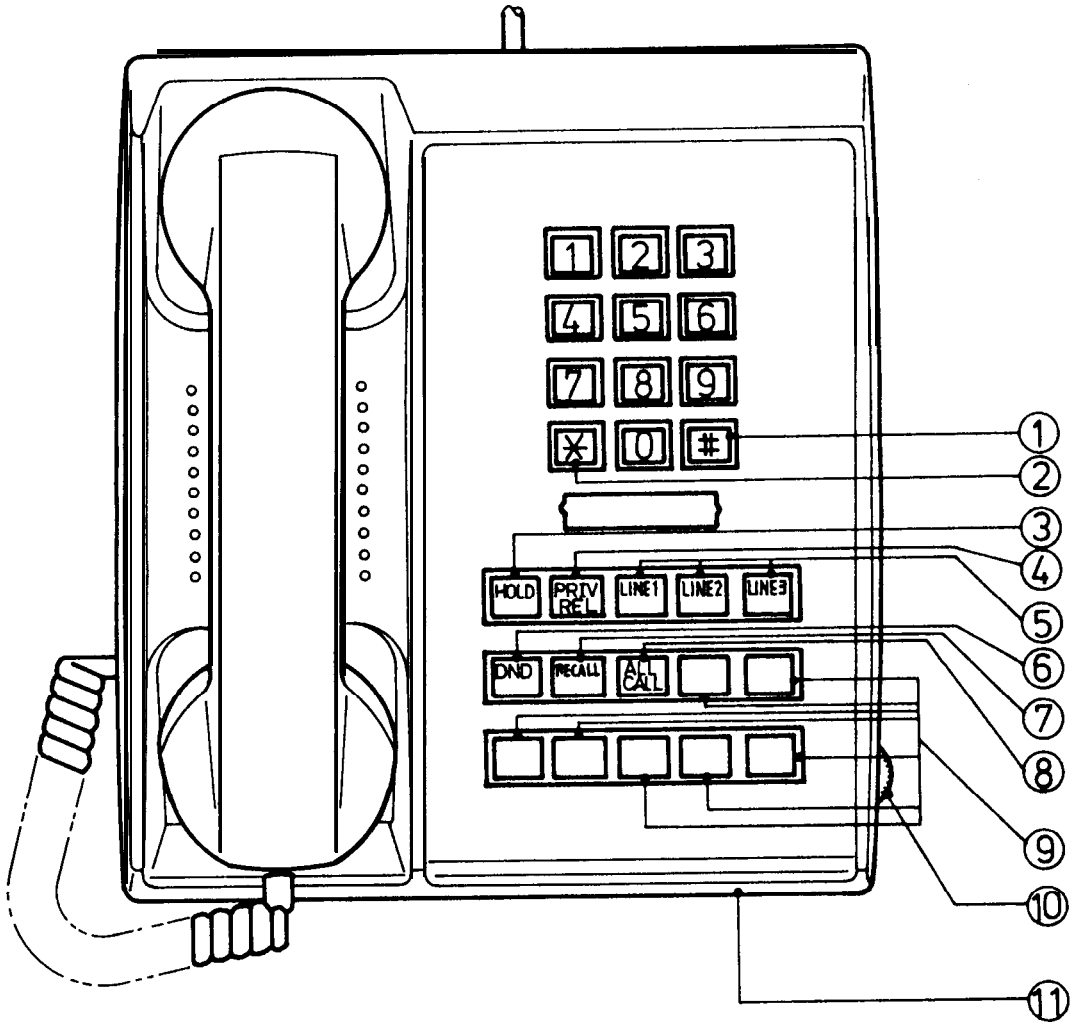


FIG. 1 - N308 TELEPHONE STATION
TS-308-DEC/DEAB/VFAB

1.3.1 .1 NOMENCLATURE (Figure 1)

1. Abbreviated Dialling '#' Button
2. Abbreviated Number Coding and Last Number Redial '*' Button
3. Hold 'HOLD' Key
4. Privacy Release 'PRIV REL' Key
5. Exchange Line Keys
6. Do Not Disturb 'DND' Key
7. Recall for PABX working 'RECALL' Key
8. All Call Paging 'ALL CALL' Key
9. Direct Station Selection - Intercom 'DSS' Keys
10. Volume Control
11. Microphone

1.3.1.2 LED INDICATION

Visual display of the status of calls is provided by the following flashing speeds.

LAMP	INDICATION	FLASHING RATE PER MINUTE
 Steady	Busy	Steady
 Slow Flash	Incoming Calls	60 IPM
 Flash	Hold Condition	120 IPM
 Rapid Flash	I-Hold Condition Microphone on	480 IPM

1.3.1.3 PLACING AN EXCHANGE LINE CALL

Lift the handset.

Operate a free Exchange Line Key (5).

After receiving dial tone, dial the desired number.

The selected Exchange Line LED (5) indicates:

 Busy at all stations

1.3.1.4 ANSWERING AN EXCHANGE LINE CALL

 Incoming calls are indicated by a Tone Ringer (if assigned) and the Exchange Line Lamp (5) flashes at all stations.

To answer the call, lift the handset and operate the Exchange Line Key (5).

The Exchange Line LED (5) will then indicate:

 Busy at all stations.

1.3.1.5 ABBREVIATED DIALLING

Up to 50 frequently called telephone numbers (maximum 20 digits) can be coded into the abbreviated dial.

(i) CODING

Lift the handset.

Select a free Exchange Line Key.

Operate the '#' button twice in quick succession (dial tone will cease).

Operate the '*' button.

Dial a two digit abbreviated code (00 to 49).

Dial the required telephone number.

If a pause (fixed duration) is required in the dialled number operate the '*' button twice in quick succession.

Operate '*','#' in quick succession (tone is now at normal level).

The telephone number is now coded in the selected memory location.

Another number can be stored in a similar manner. To clear all the telephone numbers in the dial:

Lift the handset
Select a free Exchange Line Key
Operate '#,#,*,*' in quick succession.

(ii) DIALLING USING AN ABBREVIATED NUMBER

Lift the handset.

Select a free Exchange Line Key.

Operate the '#' button twice in quick succession.

Dial the desired two digit memory location.

The stored number will then be dialled out automatically.

1.3.1.6 LAST NUMBER REDIAL (WITH ABBREVIATED DIAL)

Lift the handset.

Select a free Exchange Line Key (5).

Operate the '*' button twice in quick succession.

The last telephone number dialled on the key pad will automatically be redialled. A pause will not be inserted unless the '*' button was operated twice in quick succession while dialling the number.

1.3.1.7 LAST NUMBER REDIAL (WITH STANDARD DECADIC DIAL)

Lift the handset.

Select a free Exchange Line Key (5).

Operate the '#' button to automatically redial the last telephone number dialled on the keypad.

Note: Pause is not a available on this dial.

1.3.1.8 EXCHANGE LINE TRANSFER

There are three methods.

(i) VOCAL TRANSFER

Place the call on HOLD by operating the Hold Key (3) and tell the required person to answer the call.

The Exchange Line LED (5) at the transferring station indicates I-HOLD.

The Exchange Line LED (5) at all other stations indicates HOLD.

(ii) TRANSFER BY INTERCOM

Operate the DSS Key (9) of the required person (the call will automatically be put on Hold) and announce the call over the intercom.

The Exchange Line LED (5) at the transferring station indicates I-HOLD.

The Exchange Line LED (5) at all other stations indicates HOLD.

(iii) TRANSFER BY ALL CALL PAGING

Operate and hold the All Call Key (8) and announce the call.

The Exchange Line LED (5) at the transferring station indicates I-HOLD.

The Exchange Line LED (5) at all other stations indicates HOLD

The transferred call is taken by lifting the handset and operating the nominated Exchange Line Key (5).

1.3.1.9 AUTOMATIC RECALL

If the exchange line call is left on I-HOLD for a preset time the holding station will receive the Auto-Recall signal.

1.3.1 .10 EXCHANGE LINE CONFERENCE (OUTSIDE CALL CONFERENCE)

An outside call conference can be arranged by advising another station either vocally or by an intercom call.

(i) V O C A L

An outside call is established

The Exchange Line LED (5) at all stations indicates the first station has established an outside call

The first station user vocally requests the second station user join the call by operating the appropriate Line Key (5). The first station user establishes the conference by operating the PRRL Key (7).

The Exchange Line LED (5) at all stations indicates busy.

A third station may be added to the conference in the same manner

(ii) INTERCOM

An outside call is established

The Exchange Line LED (5) at all stations indicate the first station has established an outside call

The first station user places an intercom call to a second stations requesting the user join an outside call.

The Exchange Line LED (5) at the second station indicates HOLD.

The second station user is advised to operate the appropriate Line Key (5) when its LED goes steady. The first station operates the Line Key (5) again and then operates and holds the PRRL Key (4). The PRRL Key (4) is released when the conference has been established.

The Exchange Line LED (5) at all stations goes steady indicating the outside call has been re-established.

A third station may be added to the conference in the following manner. Establish a conference between two stations in the manner shown above.

The Exchange Line LED (5) at all stations indicates an outside call has been established.

Station one advises the second station user to operate and hold the PRRL Key (4) until the conference has been established.

Station one places an intercom call to a third station requesting the user to join the conference.

The HOLD LED (3) at the third station rapid flashes indicating an intercom call.

The third station is advised to lift the handset and then operate the appropriate Line Key (5) when the HOLD LED (3) is extinguished.

The first station then releases the intercom call by operating the appropriate Line Key (5).

The HOLD LED (3) is extinguished.

The Exchange Line LED (5) at all stations indicates busy.

Three stations and an outside party are now in conference.

1.3.1 .11 MULTI-EXCHANGE LINE CONFERENCE (SIMULTANEOUS OUTSIDE LINE CALL)

To set up a conference, a telephone station places an exchange line call. The station places that exchange line on HOLD and then places another exchange line call.

To start the conference, operate simultaneously the two Exchange Line Keys (5), that is, the existing exchange line and the exchange line that was placed on HOLD. A Conference now proceeds between two exchange line parties and one station.

If it is desired to remain speaking to one of the exchange line parties, then operate the corresponding Exchange Line Key (5). To end a conference replace the handset.

1.3.1 .12 PLACING AN INTERCOM CALL

Make sure the Hold LED (3) is not lit.

Lift the handset.

Operate the required DSS Key (9) and speak after a Single Tone Burst is heard.

A Single Tone Burst indicates the called station is free to receive the call.

A Double Tone Burst indicates the called party is busy.

A Repeating Tone indicates the called station is in the Do Not Disturb mode.

● The Hold LED (3) will light on all stations to show that the intercom link is busy.

1.3.1 .13 ANSWERING AN INTERCOM CALL

Incoming intercom calls are indicated by a Single Tone Burst followed by the calling party's voice being heard through the Speaker.

The call is answered as a 'Handsfree Talkback' call, without lifting the handset.

 The Hold LED (3) rapid flashes at the called station indicating that the microphone is active.

Operating the DND Key (6) during the call cuts the microphone off, operate again to reactivate it.

The call can be converted from Handsfree Talkback to normal mode by lifting the handset.

1.3.1 .14 ALTERNATE POINT ANSWERING

An intercom call to a particular station can be answered at any other station by lifting the handset and operating the Privacy Release Key (4).

1.3.1 .15 INTERCOM CONFERENCE

The system may be programmed so that any station may join an Intercom Call which has been established between any two stations with handsets lifted. The third party joins this call by simply lifting the handset. A three way conference is now established. Follow the same procedure if more stations are to join the conference.

1.3.1.16 DO NOT DISTURB

Operate the DND Key (6) to activate the Do Not Disturb facility

● The DND LED (6) will light to indicate that the facility is in use and all audible signals will be blocked to that station.

The facility is disabled by operating the DND Key (6) again.

1.3.1 .17 ALL CALL PAGING

Make sure the Hold LED (3) is not lit.

Lift the handset.

Operate the All Call Key (8) for the duration of the call.

Release the All Call Key (8) after the announcement is completed.

The paging announcement will be transmitted through the speakers of all stations that are on-hook.

1.3.1 .18 MONITORING WITH AN INTERCOM STATION

Monitoring is only available when the third exchange line is not fitted. For detail on this operation refer to section 1.3.2.1.2 'Monitoring Function'.

1.3.1.19 POWERFAIL

i) Short AC Mains Failure

If the AC mains is cut for a short period the power fail LED on the Power Supply will light up and calls in progress will be lost. Operate the reset switch located on the power supply to turn the lamp off. On power up the system automatically resets to restore the normal operation of the system. It is not necessary to call for Telecom service.

ii) AC Mains failure for an Extended Period

The system will automatically assign predetermined telephone stations to one of the three exchange lines. In this situation the facilities of the system cannot be used.

The stations are assigned as follows:

Exchange Line Number	Station Number
1	1, 4, 7
2	2, 5, 8
3	3, 6

When AC Mains is restored all of the calls in progress will be lost.

1.3.2 OTHER EQUIPMENT

1.3.2.1 INTERCOM STATION (Figure 2)

1.3.2.1 .1 Nomenclature

21. Monitoring Function (MON Key)
22. Do Not Disturb (DND Key)
23. All Call (AC Key)
24. Volume Control
25. Microphone
26. LEDs

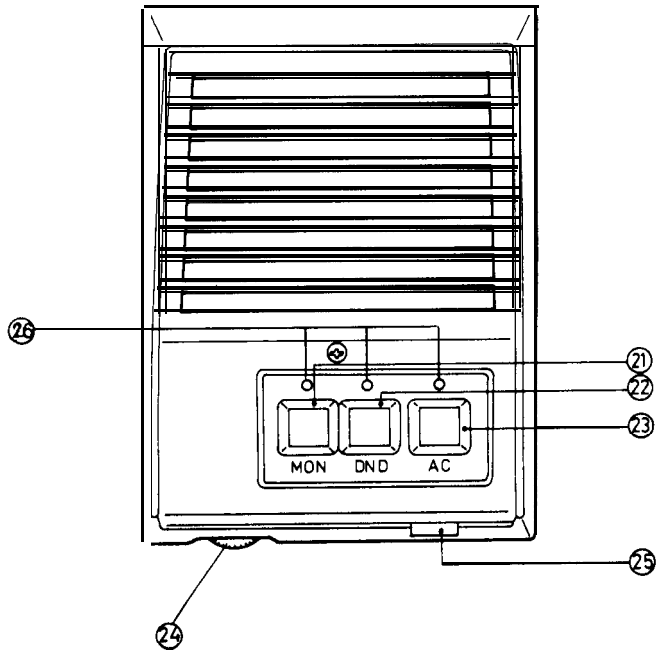


FIG. 2 - N308 INTERCOM STATION
IS-308

1.3.2.1.2 Monitoring Function

Used when up to three Telephone Stations wish to monitor sound in the vicinity of an Intercom Station. The reception at a monitoring telephone station is achieved as follows:

- Operate the MON Key (21) on the Intercom Station to turn the microphone on. The key will lock and the Monitoring LED will light up.

- Operate the MON Key (5) (3rd Exchange Line Key) at the monitoring Telephone Station (Monitor LED flashes at monitoring station and is steady at all other stations) to receive sounds from the Intercom Station.

To stop monitoring:

Operate the MON Key (5) at the monitoring station.

Operate the MON Key (21) at the Intercom Station to turn off the microphone.

Note: The MON Key is the third exchange line key on a telephone station, if all exchange lines are equipped monitoring is not possible.

1.3.2.1.3 Do Not Disturb

- DND Key (22) is operated to block out incoming Intercom Calls, All Calls and Background Music. Operate to lock and operate a second time to release the key.

The Do Not Disturb LED will light up to indicate Do Not Disturb status.

1.3.2.1.4 All Call

To announce a message to all stations in the system, operate the AC Key (23) for the duration of the call. Speak normally towards the microphone in the intercom station.

- The Hold LED of telephone stations and the All Call LED at the intercom station is lit.

1.3.2.1.5 Receiving Intercom Calls

Handsfree talkback is possible when both the microphone and loudspeaker are activated.

- An indication that the microphone is in the active state is rapid flash on the All Call LED.

1.3.2.2 DOOR STATION (Figure 3)

1.3.2.2.1 Nomenclature

31. Chime Key
32. Microphone

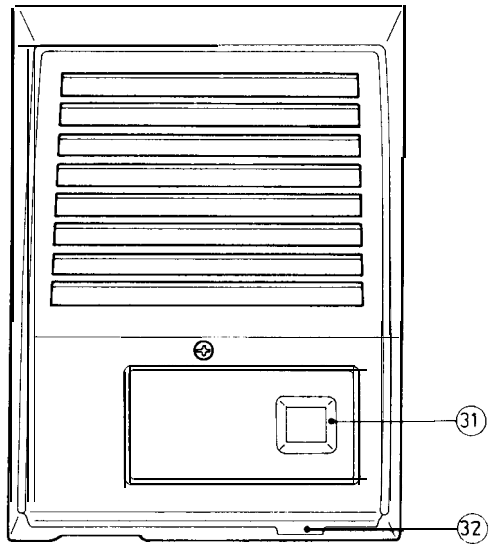


FIG. 3 - N308 DOOR STATION
DS-308

1.3.2.2.2 Operation

The Door Station provides Handsfree Talkback.

When the Chime Key (31) is operated at the Door Station, chime tone will be transmitted to telephone stations and intercom stations.

The Door Station chime is inhibited when a Direct Station Selection Key (9), assigned to the Door Station, is operated.

1.3.2.3 HANDSFREE CONSOLE (Figure 4)

1.3.2.3.1 Nomenclature

41. Microphone Cutoff (MIC/OFF Key)
42. ON/OFF Key
43. Volume Control

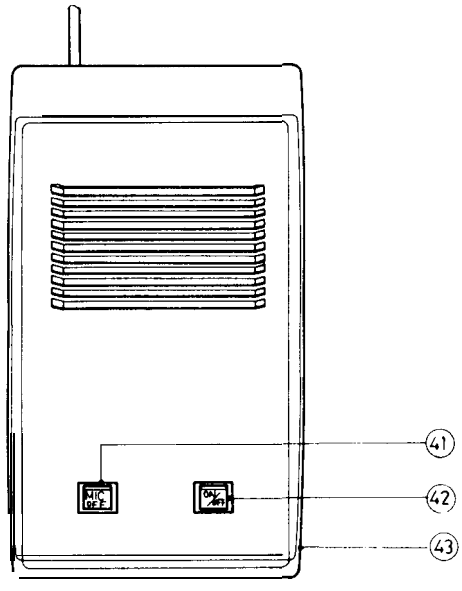


FIG. 4 - HANDSFREE CONSOLE
HFC-N

1.3.2.3.2 Operation

To seize a line:

Operate the ON/OFF Key (42).
The LED (42) will light up.
Then operate an Exchange Line Key (5) on the Telephone Station.

To release the line:

Operate the ON/OFF Key (42) again to release the line.

The LED (42) will go off when the line is released.

Transferring a call from the telephone station handset to the handsfree console:

Operate the ON/OFF Key (42) with the handset off-hook, then replace the handset.

Transferring a call from the handsfree console to the telephone handset:

Lift the handset and the handsfree console will be automatically released.

Privacy:

Operate the MIC/OFF Key (41) to cut off the microphone. Operate again to reactivate. The LED (41) indicates status.

1.3.2.4 REMOTE EXTENSION AND TIE LINE INTERFACE UNIT (RTIU) (Figure 5)

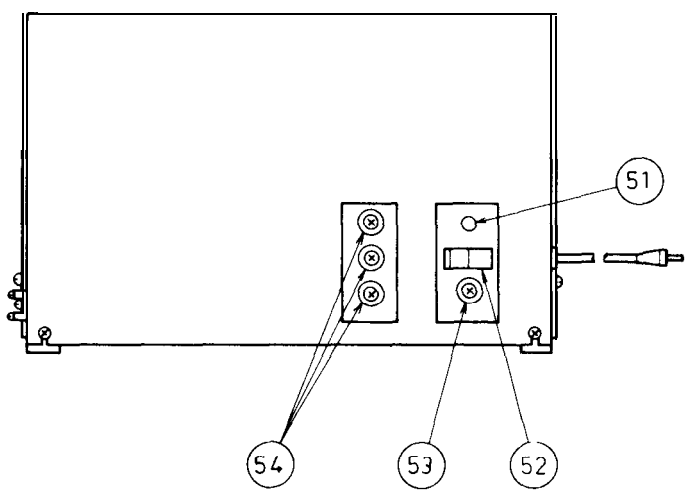


FIG. 5 - REMOTE EXTENSION AND TIE LINE INTERFACE UNIT
RTIU-N

1.3.2.4.1 Nomenclature

51. Power Failure Indicator
52. On/Off Mains Switch
53. AC Mains Fuse
54. Fuses

Remote Extension: Any Decadic Telephone.

Remote Extensions are located in premises remote from the system and are restricted in their use of system facilities.

1.3.2.4.2 Operation

(i) Tie-Line Call:

When a system uses a Tie Line, the Tie Line takes the place of an Exchange Line. Therefore, a Tie Line appears as an Exchange Line Key on each telephone station.

Placing a Call:-

Lift the handset.

Select an exchange line key which is assigned to a tie line.

Wait until the call has been accepted.

If the type of tie-line is Loop-In/Ring-Out the caller will hear ring tone while calling. For Ring-In/Ring-Out no ring tone will be heard.

Answering:-

Incoming calls are handled the same way as an exchange line call.

(ii) Remote Extension Calls:

Intercom Calls:-

Originating at a Remote Extension	Lift the Handset. Dial the desired station call code after receipt of internal dial tone (numbers 201 to 208, the digits 20 are the station call code and the last digit is the station number). The call may proceed.
Answering at Remote Extension	Incoming calls are indicated by ringing of the telephone bells. To answer the call, lift the handset.

Exchange Line Calls:

Placing a Call from a Remote Extension	Call a telephone station and ask that station to make an exchange line call to the required number. The station lifts the handset, dials the number and places the line on hold, and then informs the extension of the line number. The station replaces the handset and the remote extension then depresses the switch hook momentarily. Wait for internal dial tone. Dial exchange line selection code (31 to 33)
Answering at the Remote Extension	It is not possible to directly answer incoming exchange line calls. Answering must be performed by a telephone station and the call must be transferred to the Remote Extension.
Transferring to a Remote Extension	A telephone station places the call on Hold, then places an intercom call to the Remote Extension. The station user informs the extension of the exchange line on which the call had been answered. The station handset is placed on-hook. The Remote Extension depresses the switchhook momentarily. Waits for internal dial tone. Then dials the appropriate exchange line selection code (numbers 31 to 33) to receive the call.
Transferring from a Remote Extension	Depressing the switchhook momentarily will place the exchange line on hold, dial tone will be sent to the Remote Extension. Then dial the desired station call code. If the station is busy or it does not respond to the call, depress the switchhook and dial 3. The Remote Extension will reanswer the held line. Repeat the above operation if necessary.

1.4 SYSTEM COMPONENTS, CAPACITIES AND LIMITS

The basic N308 system is provided with the CPB-A and SLB-A boards factory equipped This provides two exchange line and four telephone station ports.

1.4.1 SYSTEM CAPACITY

The following table outlines the maximum capacity of the system, note that a maximum of eight stations can be connected.

TABLE 1.4.1 SYSTEM CAPACITY

COMPONENTS	MAXIMUM CONNECTION	NOTE
Exchange Line Intercom Link Monitoring path	3 1 1	 (1)
Telephone Station Intercom Station Door Station	8 2 1	Total of 8 stations (max)
Tie Lines 8 Remote Extensions	2	(2)
Hands Free Console Unit	One per telephone station	
Call Metering Unit	1	
Powerfail Bell	One per exchange line	

Notes: 1) Monitoring path is only available when the LNB-A board (third exchange line) is not equipped. The monitoring path is used as an additional audio path between an Intercom Station and a Telephone Station.

2) Tie Lines take the place of exchange lines.
Remote Extensions take the place of a station. The five possible combinations of Tie Lines and Remote Extensions are:

TABLE 1.4.2 SYSTEM LIMITS

ITEM	SPECIFICATION
MAX. LOOP LIMITS	
Telephone Station	26 ohm (150m0.5mm cable)
Intercom/Door Station	22 ohm (125m0.5mm cable)
Remote Extension	1500 ohm (8.7km0.5mm cable)
MUSIC SOURCE	
Input Impedance	1 kohm
Input Level	0.05 — 0.3V RMS
EXTERNAL AMPLIFIER	
Output Impedance	1 kohm
Output Level	0.23V RMS for 600 ohm each load 0.57V RMS for 47 k ohm each load
ALARM INPUT	
Sensing Type	Either N/O or N/C dry contacts

1.4.2 SYSTEM COMPONENTS (SEE APPENDIX 1)

The N308 system can be equipped with the following:

a) Main Equipment which provides for up to eight stations, three exchange lines and one intercom link.

b) Power Supply which supplies + 18V, − 18V and Common for the Main Equipment.

c) Powerfail Bell.

d) Telephone Station.

e) Intercom Station.

f) Door Station.

g) Handsfree Console.

h) Call Metering Unit.

i) Remote Extension and Tie Line Interface Unit.

j) External amplifier and speaker for broadcasting using the All Call paging feature of the system.

k) Music source for Background Music or Music-On-Hold.

l) Alarm detector.

m) Trunk Barring Unit.

1.4.2.1 MAIN EQUIPMENT

The Main Equipment is capable of handling up to eight stations with up to three exchange lines and has one intercom link. The Main Equipment cabinet may contain the following boards (Table 1.4.3).

TABLE 1.4.3 MAIN EQUIPMENT BOARDS

DESIGNATION	BOARD	DESCRIPTION	NOTE
Central Processor Board	CPB-A	Main control and common circuits. All CPB-A boards manufactured up to and including December 1981 (depicted by the date stamp 12-81 on the CPB-A) must have the MCB-A installed otherwise a system malfunction may occur. CPB-A's with date stamps l-81 and onwards will not malfunction if the MCB-A is removed and the programming link between terminals 1 and 2 on the AR connector is inserted.	Standard
Station Line Board	SLB-A	4 station interface circuits and 2 exchange line circuits	Standard
Multi-Confrencing Board	MCB-A	Multi-conferencing board to allow conference between one station and two exchange line parties. This board must be equipped as standard for all CPB-A boards manufactured before January 1982 (1-82)	Standard
Line Terminating Connector A	LTC-A	Exchange lines, powerfail bells, music source, external amplifier and alarm connections.	Standard
Line Terminating Connector B	LTC-B	Telephone station connections.	
Line Terminating Connector C	LTC-C	Telephone and intercom stations, or door station connections.	Expansion

TABLE 1.4.3 MAIN EQUIPMENT BOARDS (CONT.)

DESIGNATION	BOARD	DESCRIPTION	NOTE
4 Station Board	4SB-A	4 station interface circuits to increase the capacity of the system from 4 to 8 telephone stations	Expansion
Station Intercom Board	SIB-A	Expansion for 2 telephone stations and 2 intercom or one intercom and one door station	
Exchange Line Board	LNB-A	Third exchange line expansion	Options
Flashing/ Grounding Board	FG B-A	Earth Recall or Switchhook Flash	

1.4.2.2 POWER SUPPLY

Table 1.4.4 POWER SUPPLY BOARD

DESIGNATION	BOARD	DESCRIPTION	NOTE
Power Supply Board	PSB-A	Electronics required for + 18V, −18V supply	Regulators and transformers are not on this board

Note: Regulation
+18.0V @ 1.4A
−18.0V @ 1.1A

Current Limit is 2AMP
Input 207-270 Vac.
104W max.

1.4.2.3 STATIONS

(a) Telephone Station:

TABLE 1.4.5 TELEPHONE COMPONENTS

DESIGNATION	BOARD	DESCRIPTION
Station Board	STB-A	Main Control and Common Circuit
Keyboard	3KB-A	
Decadic Pulse Dial Board	DPB-A	
Abbreviated Voice Frequency Dial Board	AVB-A	50 Telephone numbers of up to 20 digits
Abbreviated Decadic Pulse Dial Board	'ADB-A	

(b) Intercom Station

TABLE 1.4.6 INTERCOM BOARD

DESIGNATION	BOARD	DESCRIPTION
Intercom Station Board	ISB-A	Control and Common Circuit

(c) Door Station

TABLE 1.4.7 DOOR BOARD

DESIGNATION	BOARD	DESCRIPTION
Door Station Board	DSB-A	Control and Common Circuit

1.4.2.4 OTHER EQUIPMENT

(a) Call Metering Unit:

TABLE 1.4.8 CALL METERING BOARD

DESIGNATION	BOARD	DESCRIPTION
Call Metering Board	CMB-A	Electronic interfacing required for the mechanical counters to read the metering pulses.

(b) Handsfree Console Unit:

TABLE 1.4.9 HANDSFREE CONSOLE BOARDS

DESIGNATION	BOARD	DESCRIPTION
Handsfree board	HFCB-A	Control and Common Circuit
Handsfree keyboard	HFKB-A	Key Board

(c) Trunk Barring Unit:

TABLE 1.4.10 TRUNK BARRING BOARD

DESIGNATION	BOARD	DESCRIPTION
Trunk Barring Board	TBB-A	Common Circuts and Terminals

1.4.2.5 REMOTE EXTENSION AND TIE LINE INTERFACE UNIT (RTIU)

The RTIU is equipped with a power supply, a ring generator (60 VRMS), tone source and a choice of plug-in circuit boards.

This unit is placed between the Main Equipment and decadic Remote Extensions and/or Tie Lines.

Boards used in this unit are listed below.

TABLE 1.4.11 RTIU CAPACITY

COMBINATION	TIE LINE	REMOTE EXTENSION
Case 1	1	0
2	2	0
3	1	1
4	0	2
5	0	1

TABLE 1.4.12 RTIU BOARDS

BOARD	DESCRIPTION	Q'TY	NOTE
RRB-A	Ring-in/Ring-out Tie Line Interface Board	Max. 2	(1)
LRB-A	Loop-in/Ring-out Tie Line Interface Board	Max. 2	(1)
RXB-A	Remote Extension Board	Max. 2	(2)
3IFB-A	N308 Interface Board	Max. 2	(2)
RTB-A	Ring and Tone Board.	1	Always required

Notes 1) Must be installed in the RXB-A card positions.
For Tie Lines, the appropriate Tie Line interface card is required.
2) For a Remote Extension the RXB-A and 3IFB-A boards are required.

1.4.3 BLOCK DIAGRAM AND DESCRIPTION

The system consists of the Main Equipment, Power Supply, Stations and optional equipment.

Refer to the N308 System Block diagram in Figure 6.

1.4.3.1 MAIN EQUIPMENT

Refer to Block Diagrams shown in Figure 7.

1.4.3.1 .1 Exchange Line Interface

Exchange lines are directly connected to an interface circuit. This interface incorporates a Holding Bridge and Incoming Ring Detector.

1.4.3.1.2 Switch Matrix

This matrix connects the exchange lines directly to the stations by means of miniature relays during the progress of a call and also in the event of a power failure.

1.4.3.1.3 Power, Data Transmit and Receive Circuits

A Power Regulator (series regulator +18V,-18V, common) is mounted on CPB-A. Power is supplied to the stations on one pair (B-pair), data signals are superimposed on this potential to allow two way communication between CPB-A and station microcomputers.

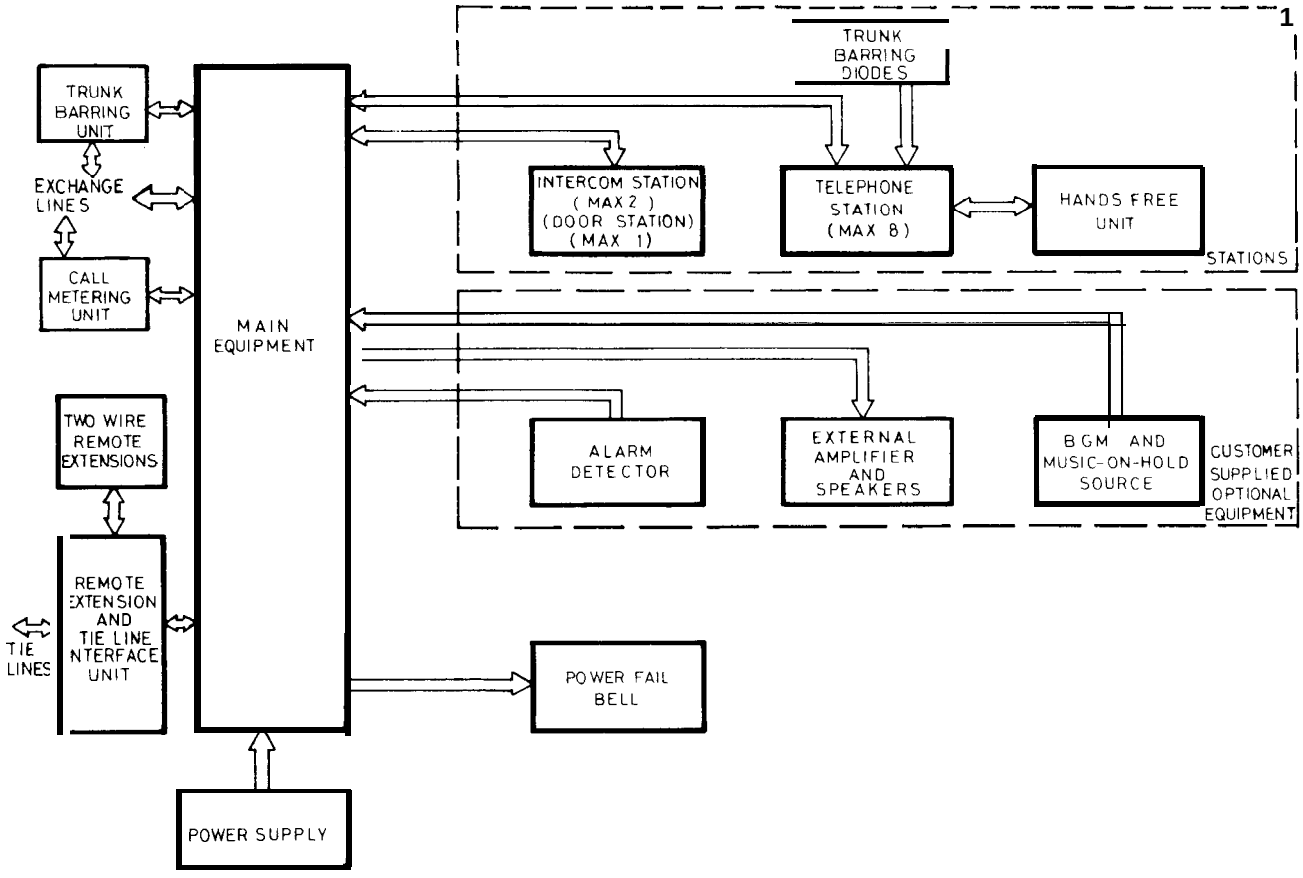


FIG. 6 - N308 SYSTEM BLOCK DIAGRAM

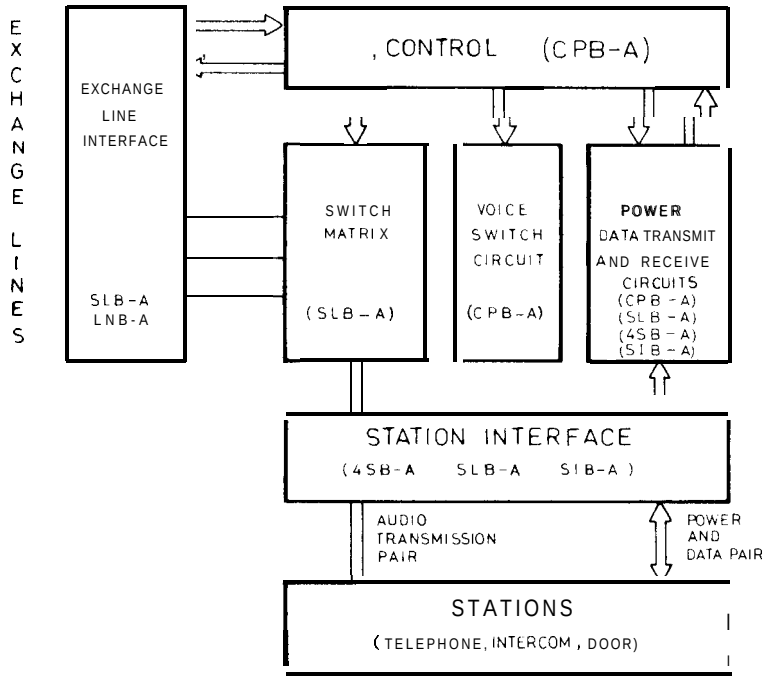


FIG. 7 - N308 MAIN EQUIPMENT BLOCK DIAGRAM

1.4.3.1.4 Station Interface

Depending on the customers choice, various combinations of station types may be interfaced

1.4.3.1.5 Voice Switching Circuit

Handsfree calls are possible using a phantom pair between the Audio Transmission pair (A) and the Power and Data pair (B). This path is used for audio signalling between the microphone in the telephone and the voice switching circuit in the main equipment. This circuit provides intercom handsfree conversation.

1.4.3.1.6 Control

The microcomputer scans the status of the line circuits, controls the switch matrix, paging circuit, intercom and station interface circuits in response to data received from the station.

1.4.3.2 TELEPHONE STATION

Refer to Block Diagram shown in Figure 8.

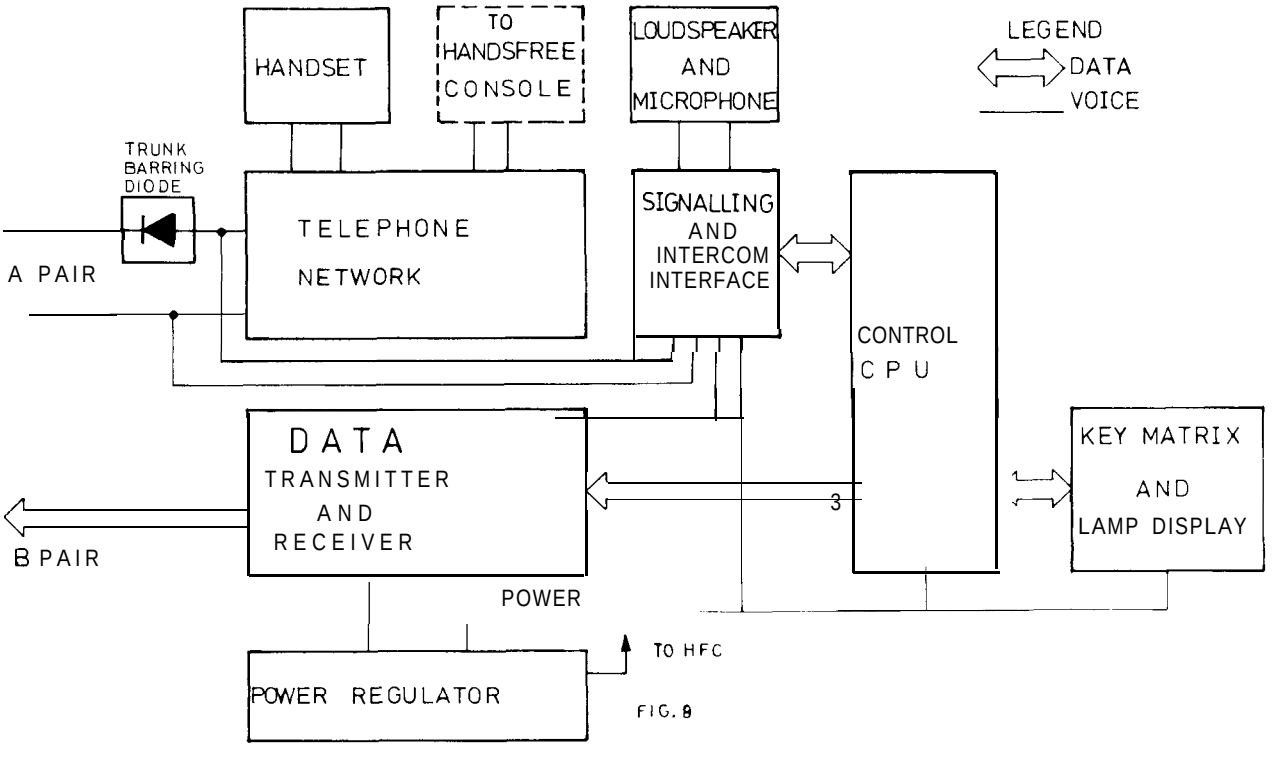


FIG. 8 - N308 TELEPHONE STATION BLOCK DIAGRAM

1.4.3.2.1 Telephone Network

When the handset is off-hook, the voice pair (A-pair) is connected to the handset circuit. When the handset is on-hook, the voice pair is connected to the loudspeaker and microphone circuit.

1.4.3.2.2 Signalling and Intercom Interface

The Interface provides two functions. First, signal generation is achieved by using a square wave tone oscillator which is controlled by the CPU to provide All Call alert tone, exchange line audible signalling and intercom tones. The second function, is for intercom calls, a loudspeaker amplifier and a microphone amplifier is used to interface between the A-pair and transducers. The microphone signal is simplexed on both pairs (voice and power) and is transmitted by a phantom method.

1.4.3.2.3 Data Transmitter and Receiver

Data is sent to and from the main equipment superimposed on the power pair (B-pair). A current source/sink technique is used for data transmission. The signals received from the main equipment are converted to voltage signals which are then detected by a differential amplifier and sent to the control CPU.

1.4.3.2.4 Power Regulator

A shunt type regulator is used to power the CPU and other circuitry in the telephone station.

1.4.3.2.5 Key Matrix and LED Display

The CPU scans the Key Matrix for depressed keys, the results of the scan are stored in RAM memory for transmission to the Main Equipment later.

The CPU also controls the LED driver circuits. Five driver circuits operate the LED's in the three exchange line keys, Hold key and D.N.D key to indicate status.

1.4.3.2.6 Control CPU (Central Processor Unit)

The CPU is a four bit parallel access microcomputer (uPD547C) and is used to control the telephone station. The CPU receives data from the Main Equipment which is used to control the speaker, microphone and LED's. The CPU also scans the key status which is then transmitted to the main equipment.

1.4.3.2.7 Handsfree Console Connection

The Handsfree Console is connected to a telephone station and provides handsfree (voice switching) circuitry to allow handsfree talkback for all calls.

1.4.3.2.8 Trunk Barring

The Trunk Barring Unit is used to ensure that the polarity of the exchange line as seen at the main equipment is the same polarity as the intercom battery feed regardless of a permanent reversal in exchange line polarity during operation. The unit achieves this by switching a relay to correct the polarity of the line.

However, it is necessary for the relay to be insensitive to Fleeting Test Reversals. A diode is installed in the telephone stations to be barred. The diode provides a category change signal in response to a fleeting test reversal from the exchange.

1.4.3.3 INTERCOM AND DOOR STATION (Figure 9)

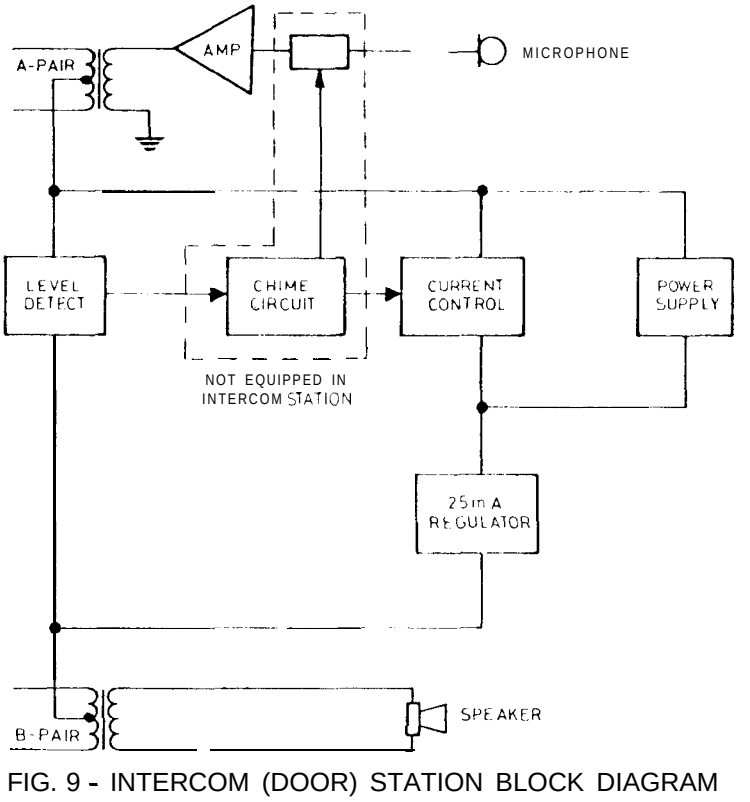


FIG. 9 - INTERCOM (DOOR) STATION BLOCK DIAGRAM

Both Intercom and Door stations have a microphone which is interfaced by an amplifier and isolating transformer to the A pair. Similarly the B pair is connected to the loudspeaker via an isolating transformer. Information from the main equipment is detected by voltage levels across A and B pairs. This same phantom path is used to transmit information to the main equipment by current levels.

The Door station only provides Handsfree Talkback facility and is equipped with a chime generator circuit.

1.4.3.4 HANDSFREE CONSOLE

Refer to the Block Diagram shown in Figure 10.

The handsfree console is connected to a station to allow handsfree operation on intercom and exchange line calls.

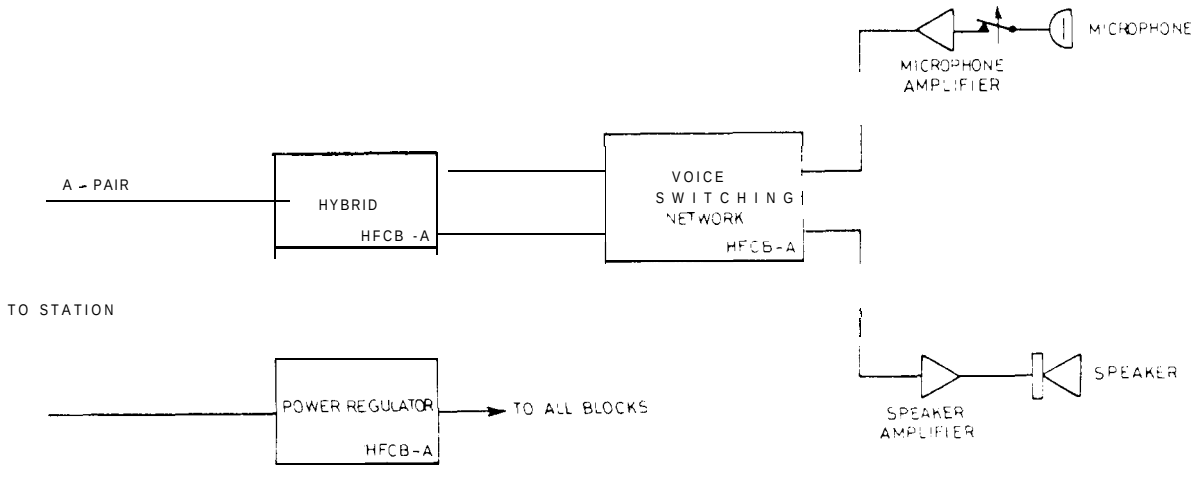


FIG. 10 - HANDSFREE CONSOLE BLOCK DIAGRAM

1.4.3.4.1 Hybrid

The Hybrid is connected to the main equipment audio path via the station A-pair and provides a 2 wire to 4 wire conversion.

1.4.3.4.2 Power Regulator

The Power Regulator takes power from the station to supply the handsfree console circuits.

1.4.3.4.3 Voice Switching Network

The Voice Switching Network is connected between the microphone, speaker and hybrid to prevent the handsfree console from singing. A noise operated gain adjusting device prevents the microphone switching on in a noisy environment.

1.4.3.4.4 Microphone Amplifier

The Microphone Amplifier is switched on and off by the key on the handsfree console.

1.4.3.4.5 Speaker Amplifier

The Speaker Amplifier is connected between the voice switching network and the speaker.

1.4.3.5 REMOTE EXTENSION AND TIE LINE INTERFACE UNIT

Refer to the Block Diagram shown in Figure 11.

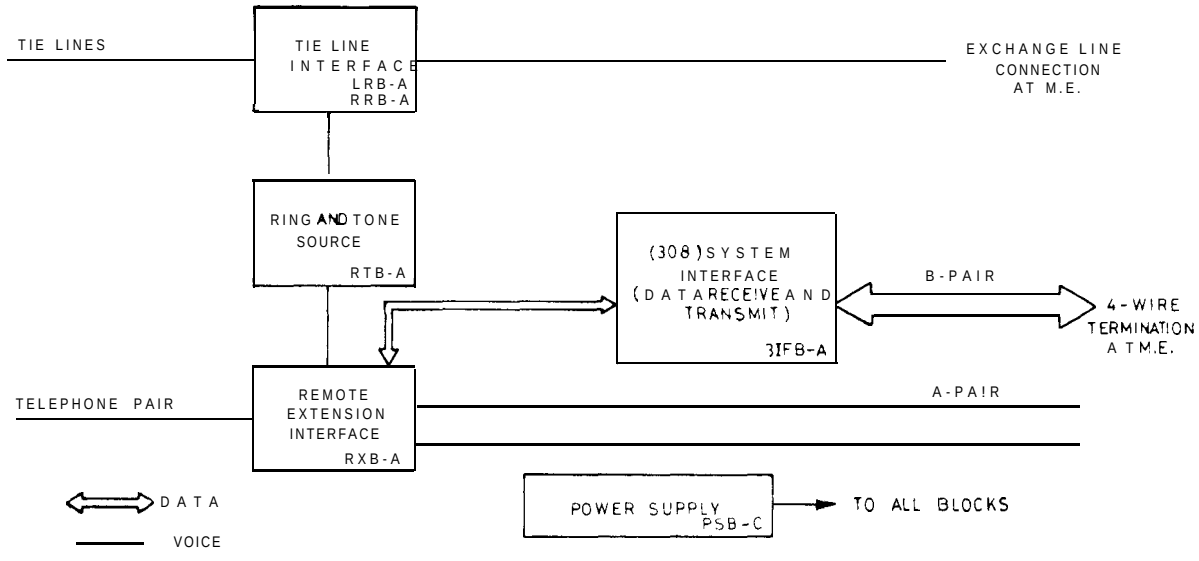


FIG. 11 - REMOTE EXTENSION AND TIE LINE INTERFACE UNIT BLOCK DIAGRAM

1.4.3.5.1 Ring and Tone Source

This provides two oscillators, one for busy, dial and ring tones and the other for cadencing busy tone and audible signalling. These signals are used by both the Remote Extensions and the Tie Lines. A 16 Hz, 60V generator supplies ring voltage.

1.4.3.5.2 Tie Line Interface

Two Tie Line interfaces are available, a Ring-in/Ring-out or a Loop-in/Ring-out type.

The Ring-in/Ring-out circuit detects ring on the Tie Line and then sends 16 Hz ring to the Main Equipment.

The Loop-in/Ring-out circuit detects the DC loop formed by the Tie Line and responds by sending 16 Hz ring to the Main Equipment.

1.4.3.5.3 System Interface

This performs a function similar to a station, it stores key matrix and lamp data for data receive and transmit. It has the same 4 bit microcomputer as is in the telephone station.

1.4.3.5.4 Remote Extension Interface

This is used to interface a two-wire remote extension to the Main Equipment. A microcomputer is used to read loop disconnect data, control of ring signals for the remote extension and ring tone for the Main Equipment.

1.5 MECHANICAL DESCRIPTION

1.5.1 PHYSICAL DIMENSIONS AND WEIGHT OF SYSTEM EQUIPMENT

TABLE 1.5.1 PHYSICAL DIMENSIONS AND WEIGHT

EQUIPMENT	DIMENSION (m/m)	WEIGHT (kg)
Main Equipment	305(H)X215(W)X105(D)	3.50
Power Supply	240(H)X212(W)X120(D)	6.25
Telephone Station	223(H)X194(W)X84(D)	1.10
Intercom Station	162(H)X113(W)X54.5(D)	0.35
Door Station		0.30
RTIU	260(H)X380(W)X152(D)	11
Hands Free Console	223(H)x124(W)X84(D)	0.7
Call Metering Unit	110(H)X261(W)X73(D)	1.9
Trunk Barring Unit	174(H)X120(W)X45(D)	0.73
Powerfail Bell	100(H)X74(W)X47(D)	0.2

1.5.2 Dismantling Instructions and Equipment Drawings

The following drawings are intended to assist in dismantling of parts. The removal of parts may require the following special notes.

a) The Main Equipment standard and expansion boards are spaced using five hexagonal standoffs. To dismantle, first gently pull the flat ribbon cables from the appropriate connectors as shown in figure 22. The boards are separated by removing the screws in the hexogonal standoffs. Optional boards are simply unplugged from their respective connectors as shown in figure 23.

b) Telephone Station

Remove colour panel of the station by placing a screwdriver in the slot provided at the front of the colour panel and housing, twist the screwdriver to remove panel. The dial is removed by slipping the dial brackets to the left and then lifting.

If a woodgrain colour panel is to be replaced by an orange or brown one, the woodgrain panel should be returned to the store to ensure adequate supplies are available for maintenance and workshop use.

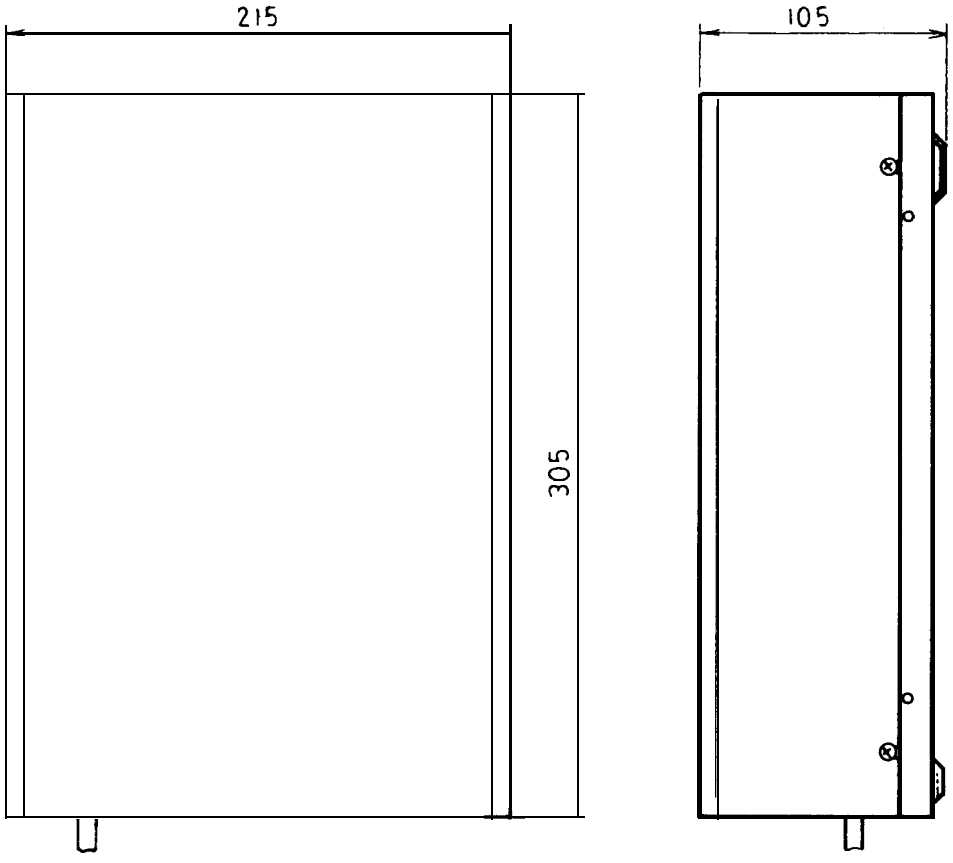


FIG. 12 - N308 MAIN EQUIPMENT
ME-308

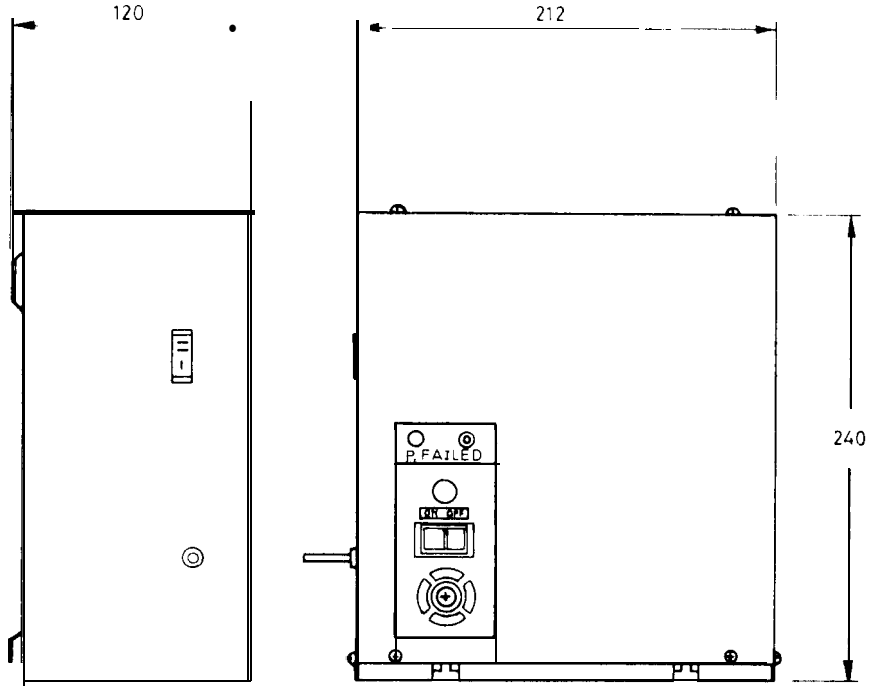


FIG. 13 - N308 POWER SUPPLY
PS-308

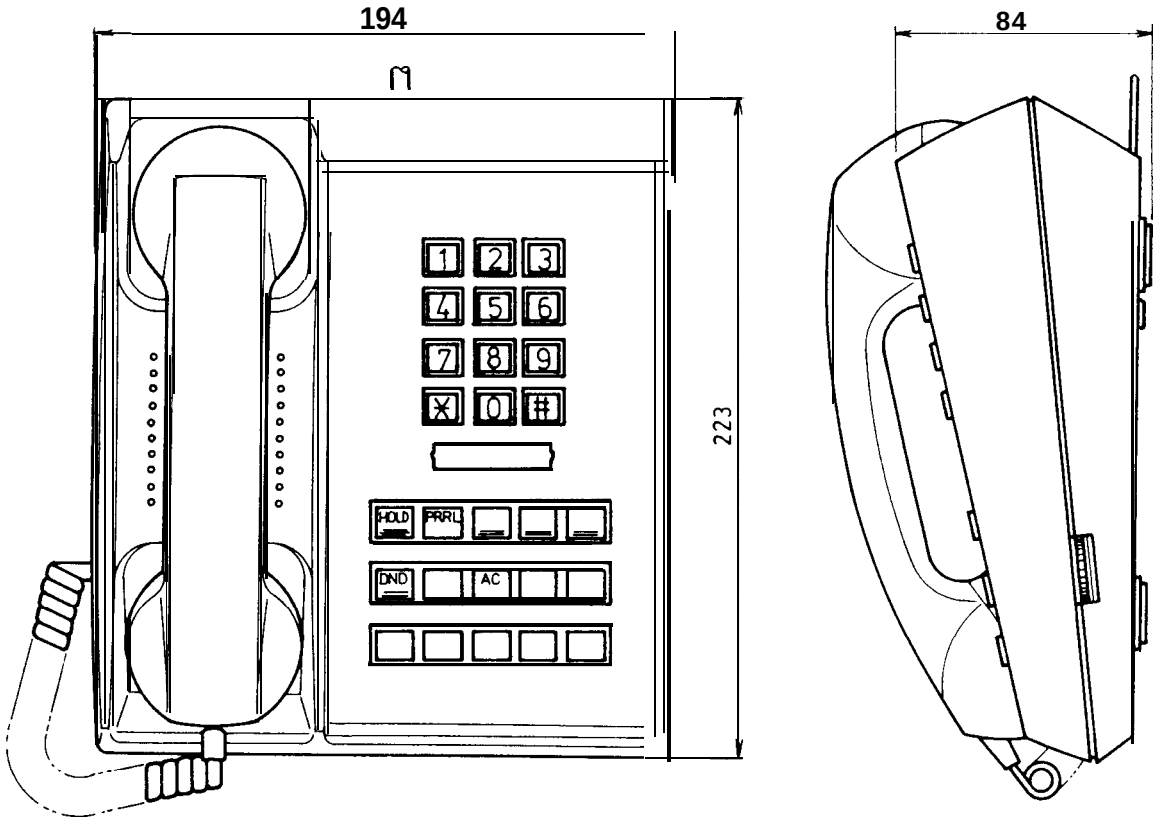


FIG. 14 - N308 TELEPHONE STATION
TS-308 DEC/DEAB/VFAB

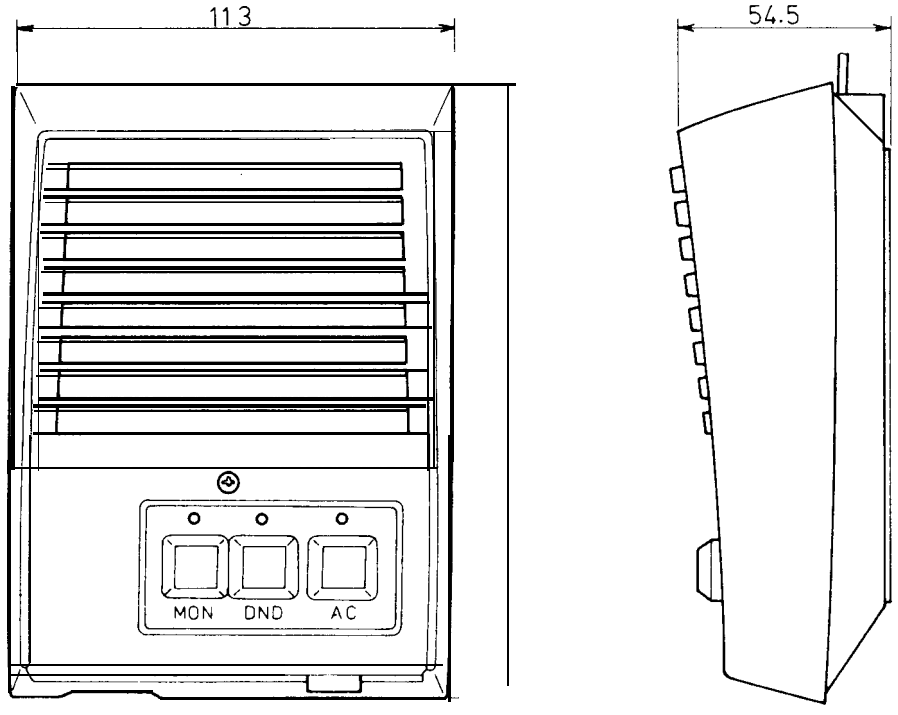


FIG. 15 - N308 INTERCOM STATION
IS-308

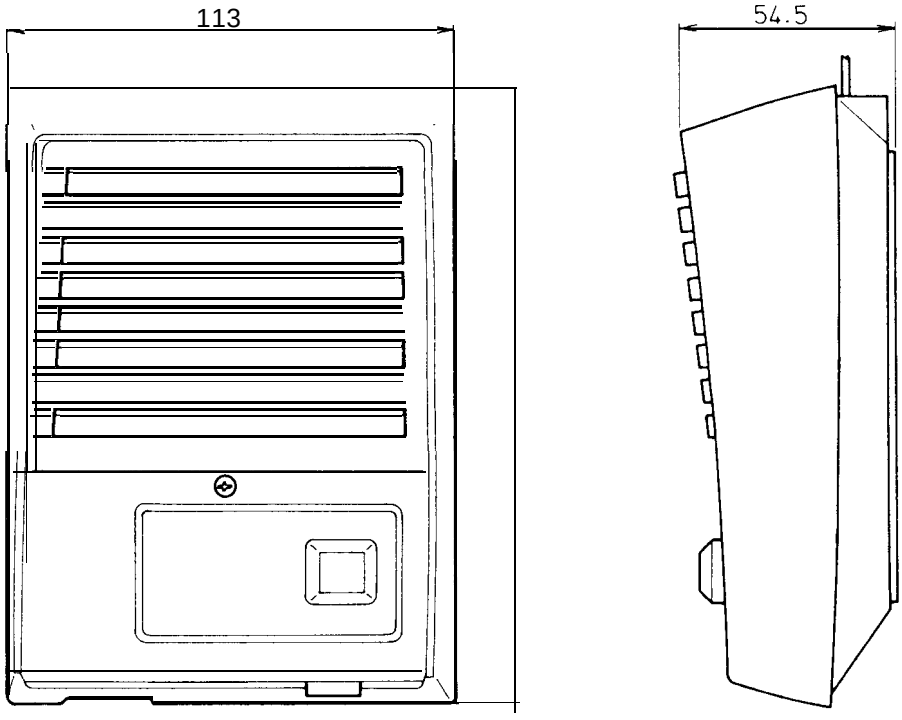


FIG. 16 - N308 DOOR STATION
DS-308

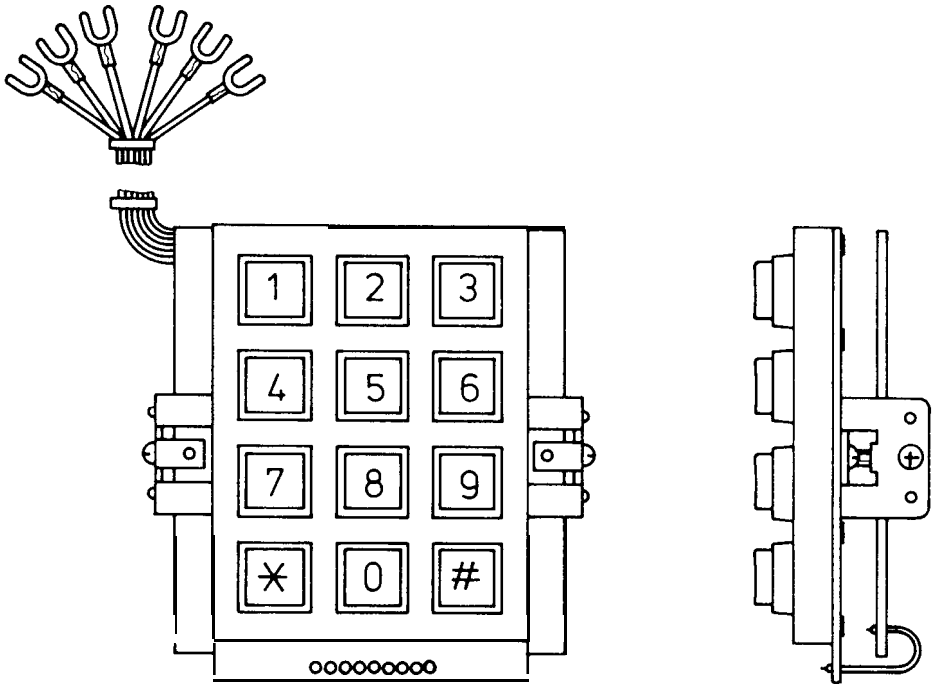


FIG. 17 - N308 DIALS

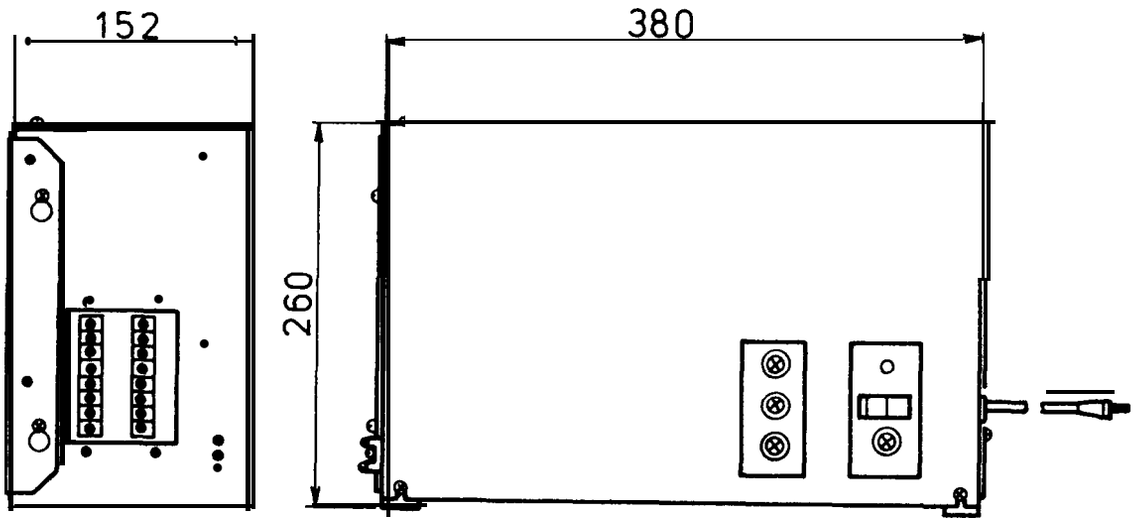


FIG. 18 - REMOTE EXTENSION AND TIE LINE INTERFACE UNIT
RTIU-N

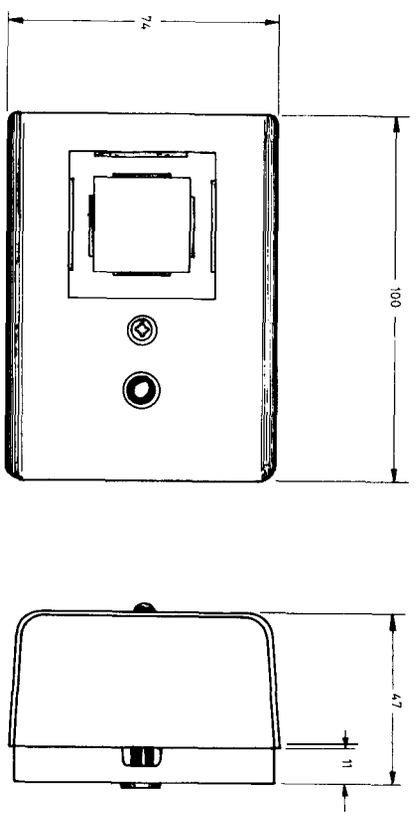


FIG. 19 - POWERFAIL BELL
PFB-N

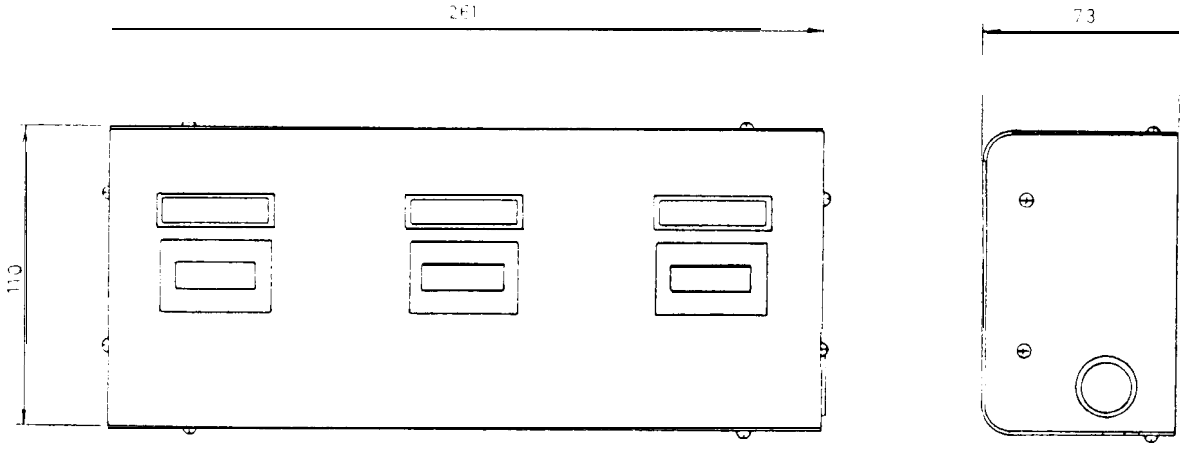


FIG. 20 - CALL METERING UNIT
CMU-N

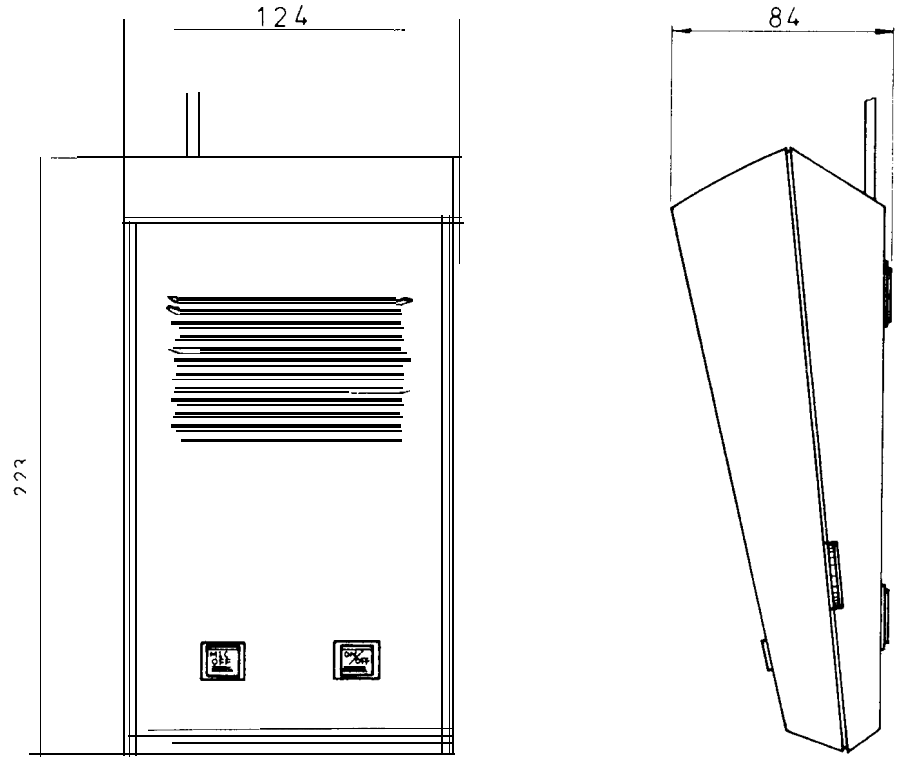


FIG. 21 - HANDSFREE CONSOLE
HFC-N

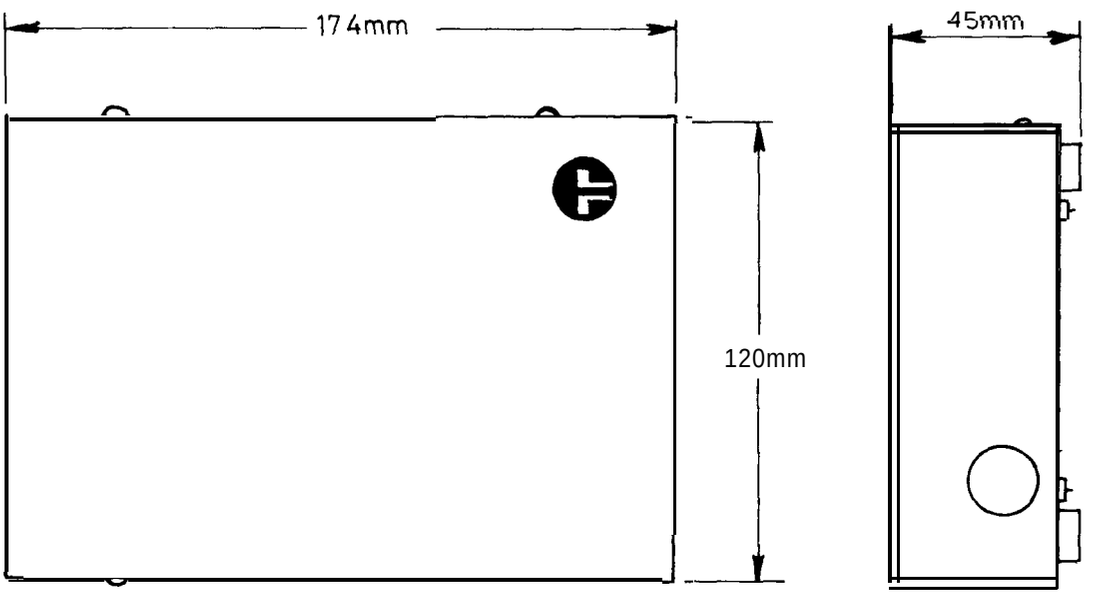


FIG. 21 A - TRUNK BARRING UNIT

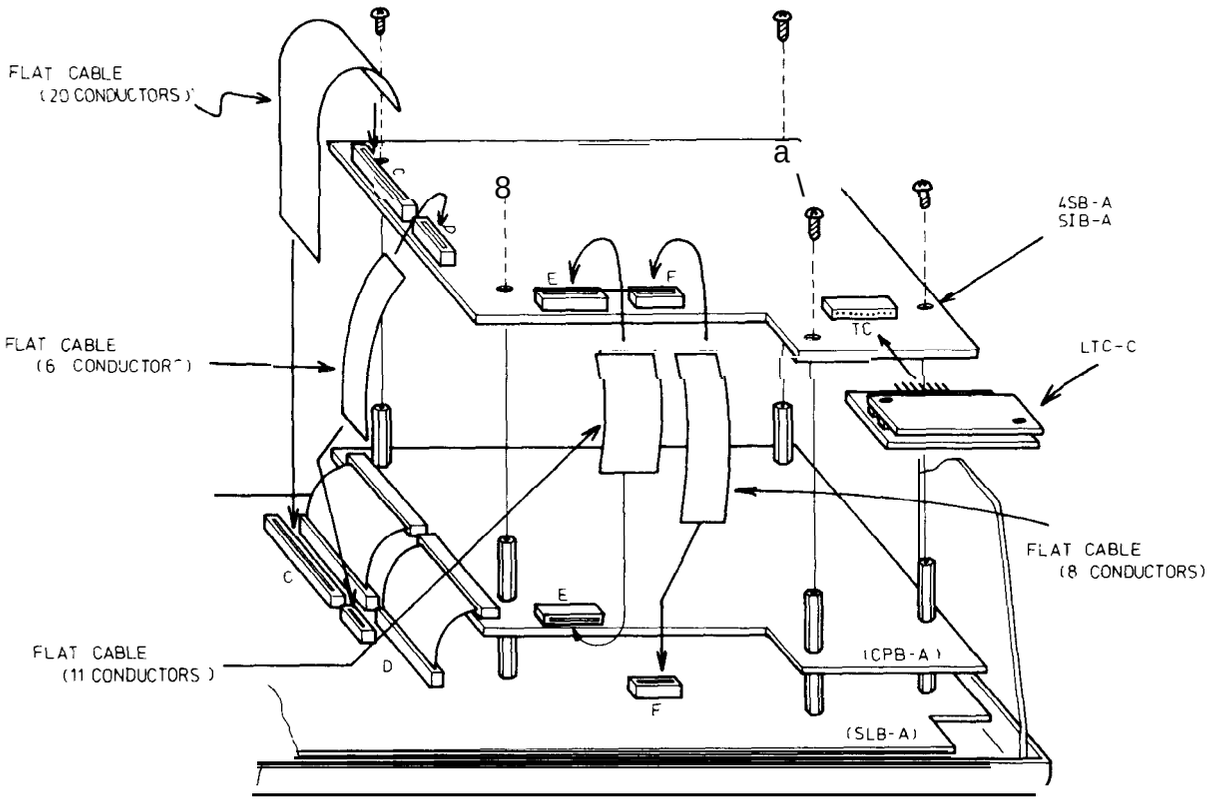


FIG. 22 - EXPANSION BOARD INSTALLATION
(SIB-A, 4SB-A)

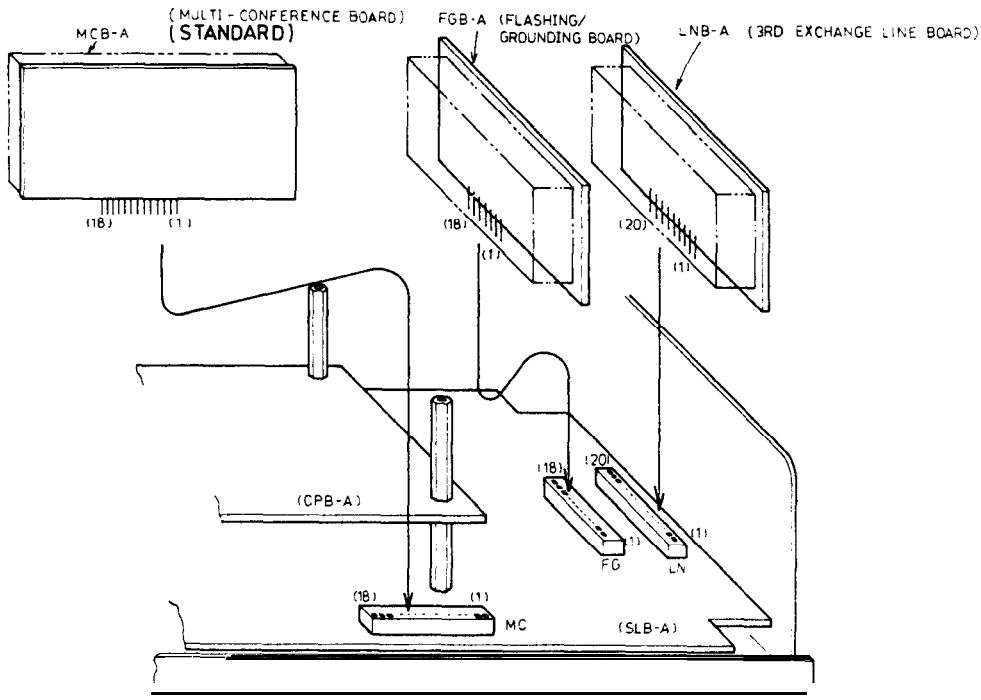


FIG. 23 - BOARD INSTALLATION
(MCB-A, FGB-A, LNB-A)

2
INSTALLATION

2.1 INTRODUCTION

The following installation section is structured to provide a logical sequence for installation of the N308 system. The steps to be followed are:

1. The sales form is completed by sales staff. Using this form the necessary equipment is ordered and the facilities required for a particular installation is determined.
2. Mount equipment: Main Equipment, Power Supply, Stations, Powerfail Bell, RTIU, Call Metering Unit and Trunk Barring Unit.
3. Cable to MDF/IDF and stations.
4. Terminate exchange lines on LTC-A, stations to LTC-B and LTC-C, recall earth, if required, to LTC-B.

   Terminate music source, external amplifier and alarm detector to LTC-A, if required.

   Equip lightning protection and terminate a Telecom earth on the Call Metering Unit.
5. Install expansion and option boards in the main equipment.
6. Power-up the system.
7. Check cabling by measuring voltages at 610 sockets. The correct voltages are given in section 3.2.3 Stations.
8. Connect Handsfree Consoles to associated stations and then plug in all stations.
9. Insert programming links for determining facilities.
10. Carry out the functional test to ensure the system is operating correctly.
11. Leave a copy of the sales form as the site records.

2.1.1 WARNINGS

1. The following precautions must be observed when working on the system. The power switch on the power supply must be turned OFF when replacing stations, boards, re-wiring the system, or adding optional boards. If this work is done with the power ON, semiconductor circuits in the system may be damaged.
2. The N308 is a four wire telephone system. One pair is used for audio, the second for power and data. Hence it is imperative that the system is wired with the correct polarities. Check all wiring before initial power up of the system.

TELECOM CABLE	603/610 PLUG/SOCKET	DESIGNATION
White (WT)	2	LINE 1
Blue (BL)	6	LINE 2
Red (RD)	1	DATA +
Black (BK)	5	DATA —

3. Take special care not to short between any terminals. This may cause damage to the system.
4. The fuses that are provided in the system are unlikely to blow if the system is connected properly. The fuses may blow when a component or a station is replaced with the power ON, or wiring is incorrect.

   Standard fuse ratings 315mA use 375mA,
   0.8A use 1 A.

5. Handling of Boards:

This equipment contains a considerable number of MOS, and other static sensitive components. To reduce the incidence of premature failure due to static discharge, the following precautions MUST be taken:

- Always ensure that power is disconnected before unplugging PBAs.
- Always discharge static from yourself by touching a conductive part of the main equipment before handling boards.
- Handle PBAs by the edge or by the handles. Do not handle PBA tracks, components or edge connectors (contaminants introduced by fingers can cause corrosion and high resistance connections).
- Components are physically delicate. Finger pressure on a component can fracture, but not necessarily break component leads: a future fault.

To protect against physical damage and damage due to static discharge, PBAs must ALWAYS be wrapped in aluminium foil (e.g. cooking foil) and inserted into an **ANTISTATIC** plastic bag and placed in the protective container provided with the new item.

These procedures apply equally to both working and faulty PBAs. Careless handling, storage and transporting will cause secondary or future faults.

2.2 SALES INFORMATION

The Telephone Order for any S.B.S. will be accompanied by an S.B.S. System Order.

Sales staff, after consultation with the customer, complete the System Order.

The information provided in this form will enable the ordering of the various items required for the installation. It also provides information required when programming the system.

Three copies of the System Order are forwarded to the installation area. On completion of the installation any variation to the System Order should be noted on each copy of the order. One copy of the System Order should remain with the equipment to provide a record of the particular installation. The remaining two copies should be returned to the local Telecom Business Office.

As an interim measure, prior to the provision of a record-holder the System Order should be placed in an envelope. The envelope should then be secured to the back of the Main Equipment (ME-308) using double-sided tape. Note: the envelope should be placed so that it can be readily accessed by maintenance staff.

COMMANDER TELEPHONE SYSTEM ORDER
MODEL N308

Telecom Australia

☐ SALE ☐ RENTAL

NOTE : Please tick appropriate boxes
- *Delete whichever not applicable.*

CUSTOMERS NAME	SERVICE NO.

ADDRESS	NATURE OF BUSINESS	
Postcode	CUSTOMER CONTACT	TELEPHONE

DATE OF APP'N	DATE ISSUED	SERVICE ORDER NO.	COMPLETION DATE	SALES CONTACT	TELEPHONE

TYPE OF INSTALLATION

☐ NEW ☐ REMOVAL ☐ REPLACES (Specify type and model) .... ____ . ____ . _____ __ __ __ ..... ____

CENTRAL EQUIPMENT (Additional to Basic Provided)

Item	No. Req'd	Item	No. Req'd
☐ Addit.Exch. Line Module		SYSTEM OPTIONS	
☐ Addit. Station Capacity Module		☐ Call Metering Unit	
☐ Remote Stn/Tie Line Interface Unit		☐ Powerfail Bells	
☐ Remote Station Module			
☐ Tie Line Module			

EQUIPMENT CODE (Installing Officer Only)

SYSTEMS OPTIONS

☐ B.G.M. to External Paging ☐ Intercom Privacy ☐ Intercom Monitoring
☐ All Call Tone to Busy Stations ☐ PABX Recall

AUTO RECALL TIMER SETTING – 32. 64, 96, (Circle One)

AUTHORISED ATTACHMENT CONNECTIONS

Type	Permit No.	Mode of Connection	Service Order No
☐ Background Music			
☐ External Alarm			
☐ External Paging			

EXCHANGE/TIE LINE CONNECTIONS

Line No.	Line Type	Details
1		
2		
3		

STATION DETAILS

STN NO.	DESIGNATION AND/OR LOCATION	STATION TYPE AND COLOUR	OPTIONS ("✓" where required) Audible Signalling None	On-hk	Off-hk	BGM	PF Bell	H'Free Cons	Wall Kit	TRUNK BARRING
1										
2										
3										
4										
5										
6										
7										
8										

TS 171 (9/81) FRONT

BUSINESS OFFICE COPY 1

FIG. 24 - SYSTEM ORDER

EXPLANATORY NOTES

1. COMPLETION DATE : To be inserted by installing officer on completion of installation.

2. SALES CONTACT : Sales Officer conducting negotiations with customer.

3. EXCHANGE / TIE LINE CONNECTIONS :

(i) Exchange Line — show exchange number

(ii) Tie Lines — show equipment type and exchange number at distant end

4. STATION DETAILS :

(i) Designation and/or Location : Show location and or name of station user, e.g. MNGR, STORE, JONES, etc. If this is restricted to approximately 5 letters it may be typed on station keys.

(ii) Station Type And Colour :

(a) Key Stations — show DEC (Decadic without Abbreviated Dialling). DEAB (Decadic with Abbreviated Dialling) or VFAB (Voice Frequency) and colour of panel i.e. WG (Woodgrain), BR (Brown) or OR (Orange).

(b) Door or Intercom Stations — Show Door or I/com (no colour option with these)

(c) Remote Stations — Show "REM" and required instrument type and colour (e.g. CF Ivory)

TS 171 (9/81) BACK

2.3 LOCATION AND MOUNTING OF EQUIPMENT

2.3.1 WALL MOUNTING

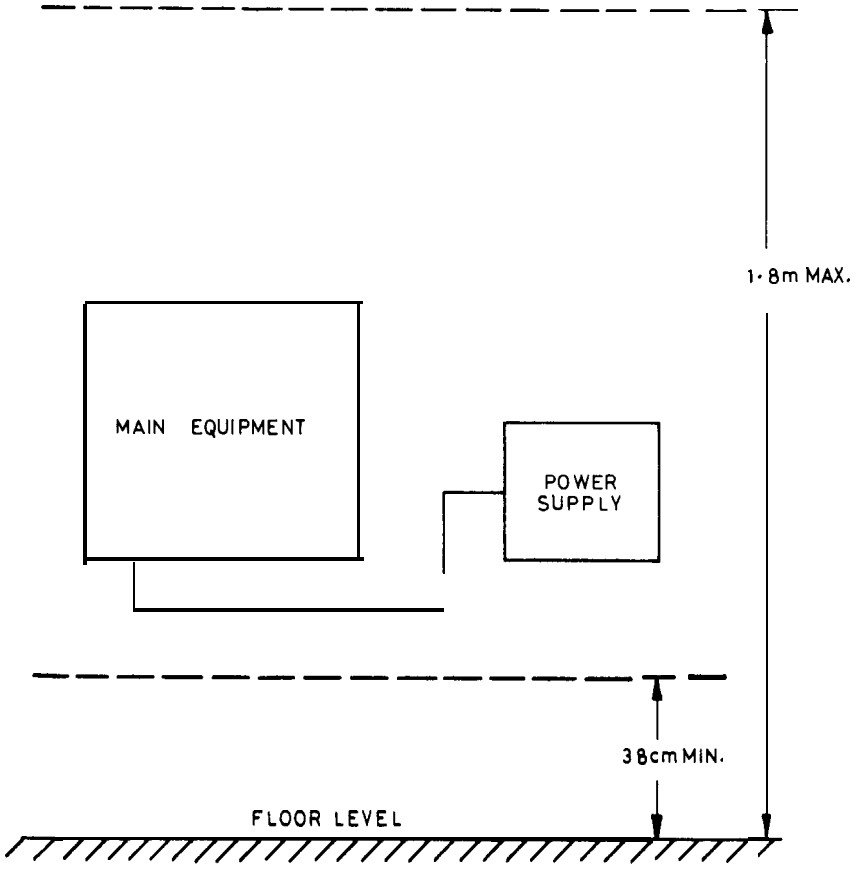


FIG. 25 - LIMITATIONS ON WALL MOUNTING

All items of equipment must be located in positions which allow good access for maintenance activities. The customer is responsible for providing satisfactory lighting for installation and maintenance activities at the equipment. When wall mounting equipment, allowance should be made for at least 30 cm clear wall space on each side and 1 metre of clear floor space in front of the units. Equipment must be located not less than 38cm and not more than 1.8m from the floor. Refer to Figure 25.

The customer will provide a single phase 200-250 volt, 10 amp, 50Hz AC general purpose outlet within 1 metre of the equipment. The power outlet must be adequately earthed.

2.3.2 MAIN EQUIPMENT (Figure 12)

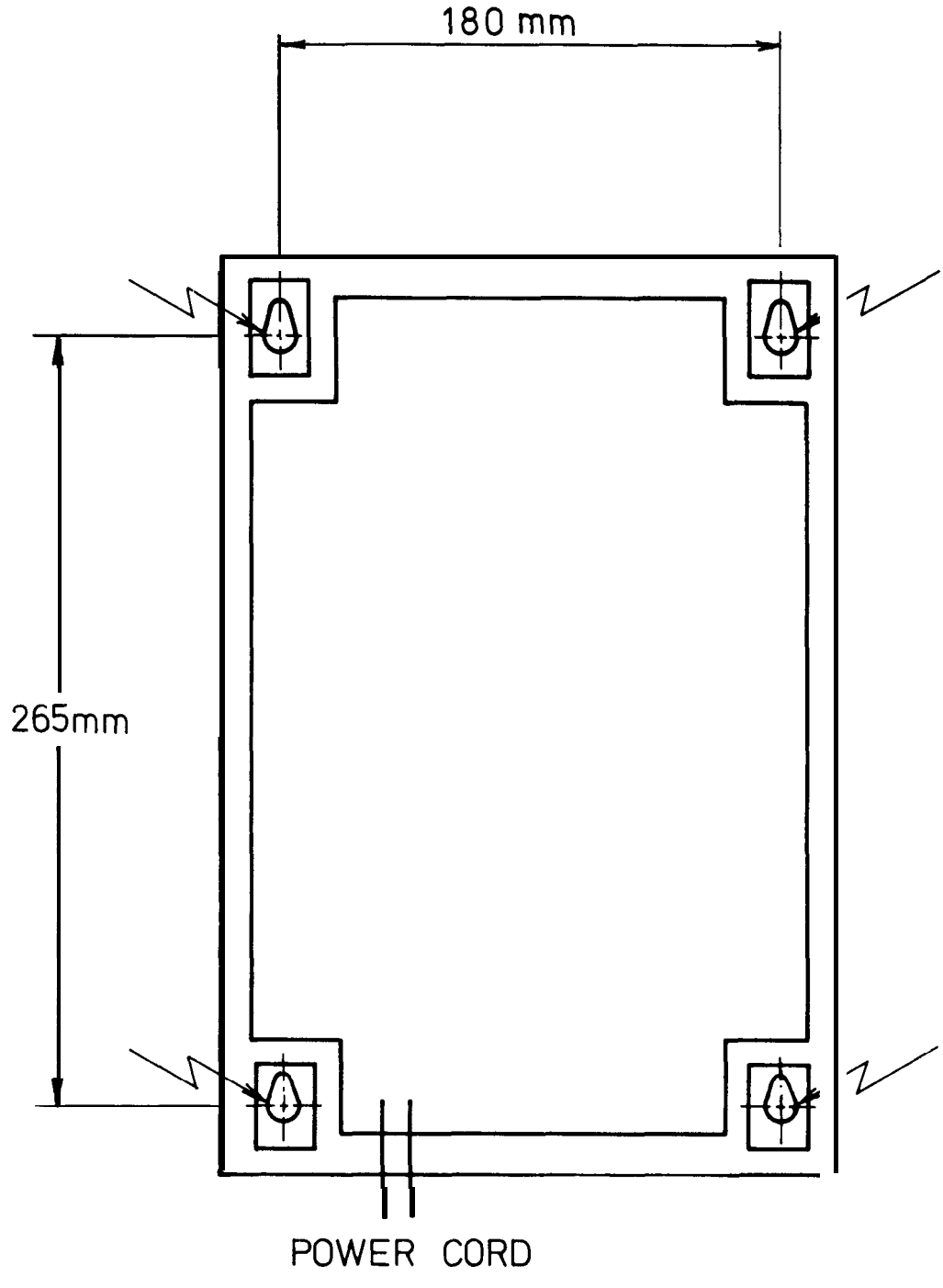


FIG. 26 - WALL MOUNTING OF MAIN EQUIPMENT

The Main Equipment is mounted on a wall using 4 screws supplied with the Main Equipment as shown in Figure 26.

Screw the four screws into a wall so that the teardrop holes located on the base of the main equipment align. Mount the main equipment and then tighten the screws.

2.3.3 POWER SUPPLY (Figure 13)

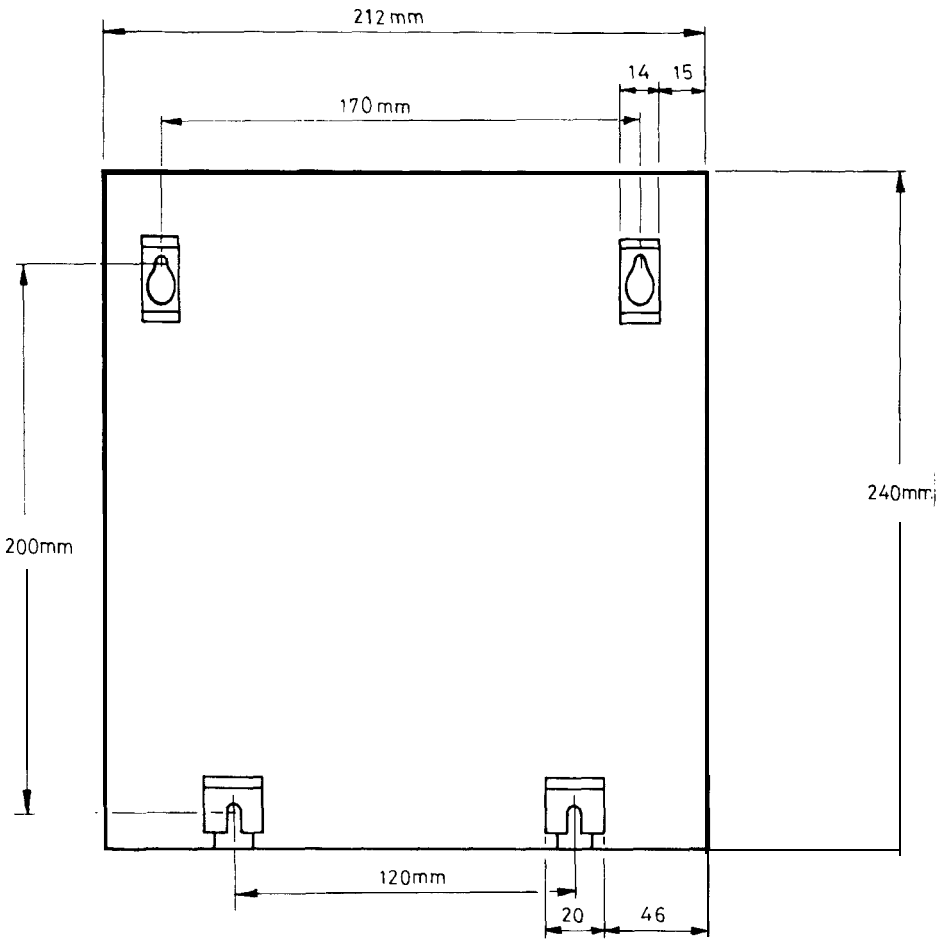
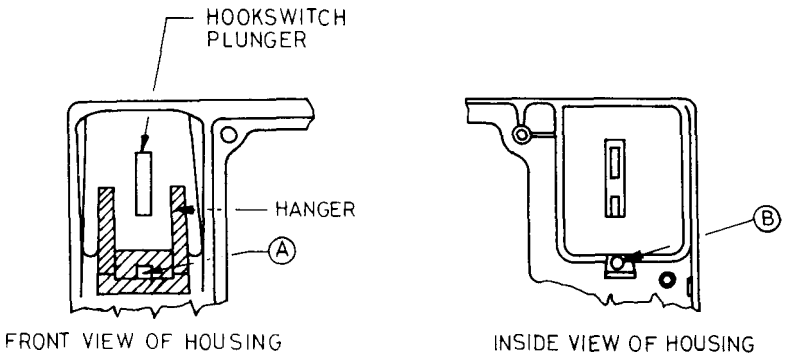


FIG. 27 -WALL MOUNTING OF POWER SUPPLY

The Power Supply Unit is mounted on the wall using the four screws supplied. Position the four screws on a wall in positions corresponding to the four holes located on the back of the Power Supply (refer to Figure 27). Then slide the unit so as to position the screws through the two tear drop holes and into the lower slots, refer to Figure 13. Select a mounting position close to both the main equipment and a 240 VAC power supply such that the cords which are supplied with the units can reach.

2.3.4 TELEPHONE STATION (Figure 14)



INSTALLATION OF THE HANDSET HANGER

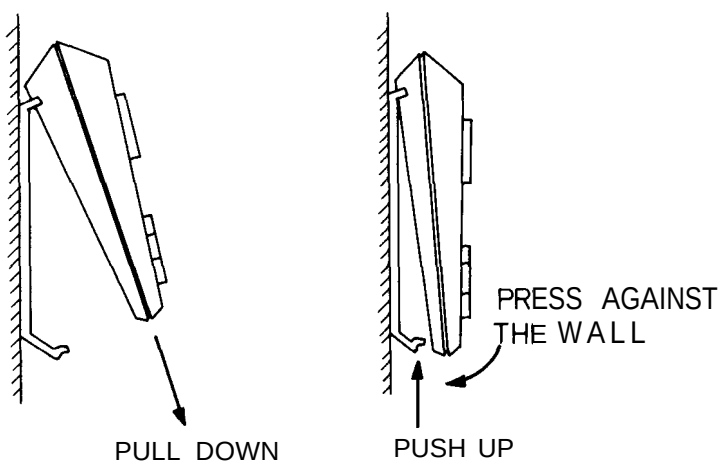


FIG. 28 - INSTALLATION OF THE HANDSET HANGER
POSITIONING STATION ONTO THE WALL MOUNTING BRACKET

In order to mount the telephone station on a wall, a Wall Mounting Bracket is required.

- Mount the bracket on the wall by means of the four screws which are supplied with the bracket. The bracket is located so that the edge with the two projecting tabs is at the top.
- Next, remove the front panel of the telephone station with a screw driver and remove the top moulding from the base moulding.
- Insert the hanger into the square hole (Point A in Figure 28). This hole is located in the recess on the top moulding used for the receiver of the handset. Then, fix the metal retainer with the screws from inside the housing (Point B in Figure 28). After the installation of the handset hanger to the top moulding, reassemble the top moulding to the base moulding and replace the front plate.
- Mount the telephone plug and socket on the wall in the centre of the Wall Mounting Bracket. The line cord should be gathered together and placed inside the Wall Mounting Bracket.
- Now clip the telephone station into the Wall Mounting Bracket as shown in Figure 28.

This is done by firstly fixing the two tabs on the top edge of the bracket into the two square holes located in the base moulding of the telephone station. Then, push the telephone station base towards the bracket, until it clips with the lower portion of the bracket.

2.3.5 INTERCOM STATION AND DOOR STATION (Figures 15 and 16)

Intercom Station

- Loosen the screw located on the front panel of the Intercom Station. Then separate the top moulding from the base moulding.
- Mount the base moulding on the wall using the two screws supplied with the station.
- Place the line cord from the station into the slot provided in the base moulding.
- Re-assemble the top moulding and base moulding.

Door Station

- Loosen the screw located on the front panel of the Door Station. Then separate the top moulding from the base moulding.
- Mount the base moulding on the wall using the two screws supplied with the station.
- The Door Station is not provided with a line cord. A cable is connected directly to the four screw terminals on the DSB-A board (Figure 35).
- This cable can then be fed through a hole located on the base moulding and then along the slot provided.
- Re-assemble the top moulding and base moulding.

2.3.6 REMOTE EXTENSION AND TIE LINE INTERFACE UNIT (RTIU) (Figure 18)

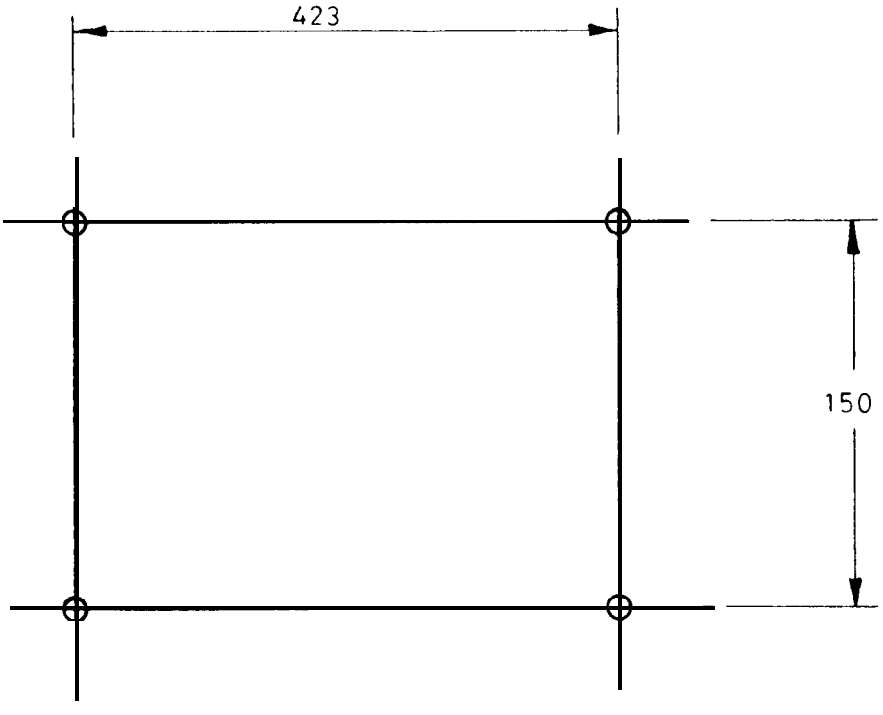


FIG. 29 - WALL MOUNTING RTIU

The RTIU is wall mounted. Remove the two wall mounting brackets from the rear corners of the cabinet. Reassemble with the bracket sides containing the two teardrop holes projecting out from the side of the cabinet and flush with the back. Screw the four screws into a wall so that the bracket holes of the RTIU align. Mount the RTIU and then tighten the screws (refer to Figure 29).

2.3.7 POWERFAIL BELL (Figure 19)

An exchange line may have a powerfail bell connected to it. It is therefore important that the bell is located in close proximity to the stations that are assigned for that exchange line during power failure, refer to 2.4.8.1.

The bell is mounted on a wall. Remove the cover of the bell by unscrewing the centrally located screw. Then use the two screws (provided with the bell) to mount in the desired position.

2.3.6 CALL METERING UNIT (Figure 20)

This unit is wall mounted. Remove the cover of the unit by loosening the four screws. Screw the base onto the wall. The two mounting holes on the base are 24cm apart. Terminate all necessary wiring (section 2.4.6.1) on the terminal block and reassemble.

2.3.9 HANDSFREE CONSOLE (Figure 21)

The Handsfree Console is positioned next to the telephone station.

2.3.10 TRUNK BARRING UNIT (Figure 21 A)

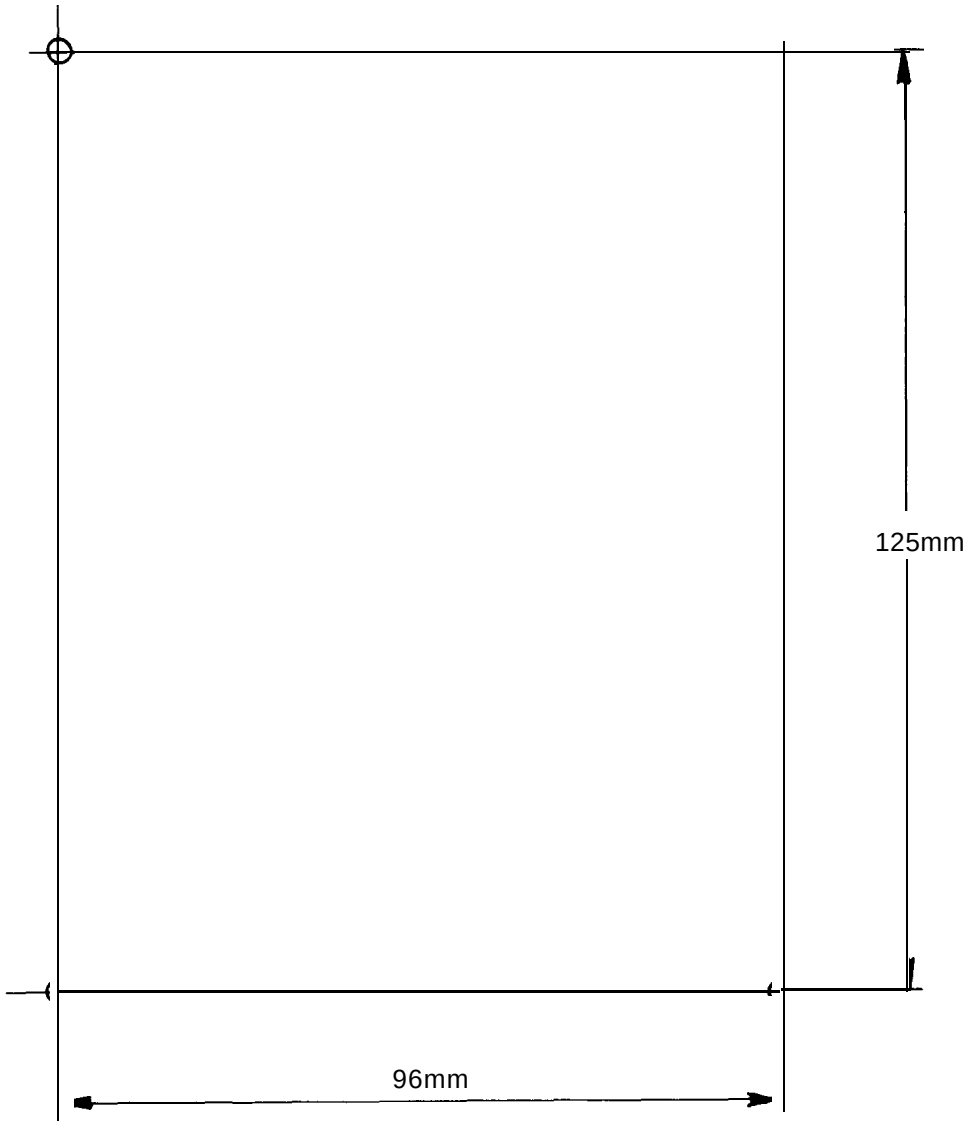


FIG 29A - WALL MOUNTING FOR THE TRUNK BARRING UNIT

This unit is wall mounted. Remove the cover of the unit by loosening the four retaining screws. Screw the base onto the wall (refer to Figure 29A for hole centers) Terminate all necessary wiring (Section 2.4.6.3) on terminal block and reassemble.

2.4 EQUIPMENT, ASSEMBLING AND TERMINATING

Exchange lines for the N308 Business System are taken from an MDF/IDF. If a Music Source, External Amplifier or Alarm Detector is required, cables from LTC-A are connected to the MDF/IDF. From the frame, cables are terminated on a permitted attachment 604/611 plug and socket. Alternatively they may be connected directly to the 604/611 plug and socket, the choice of which depends on ease and neatness of the installation (refer to Figure 30).

For the mode of connection refer to the sales form in Section 2.2.

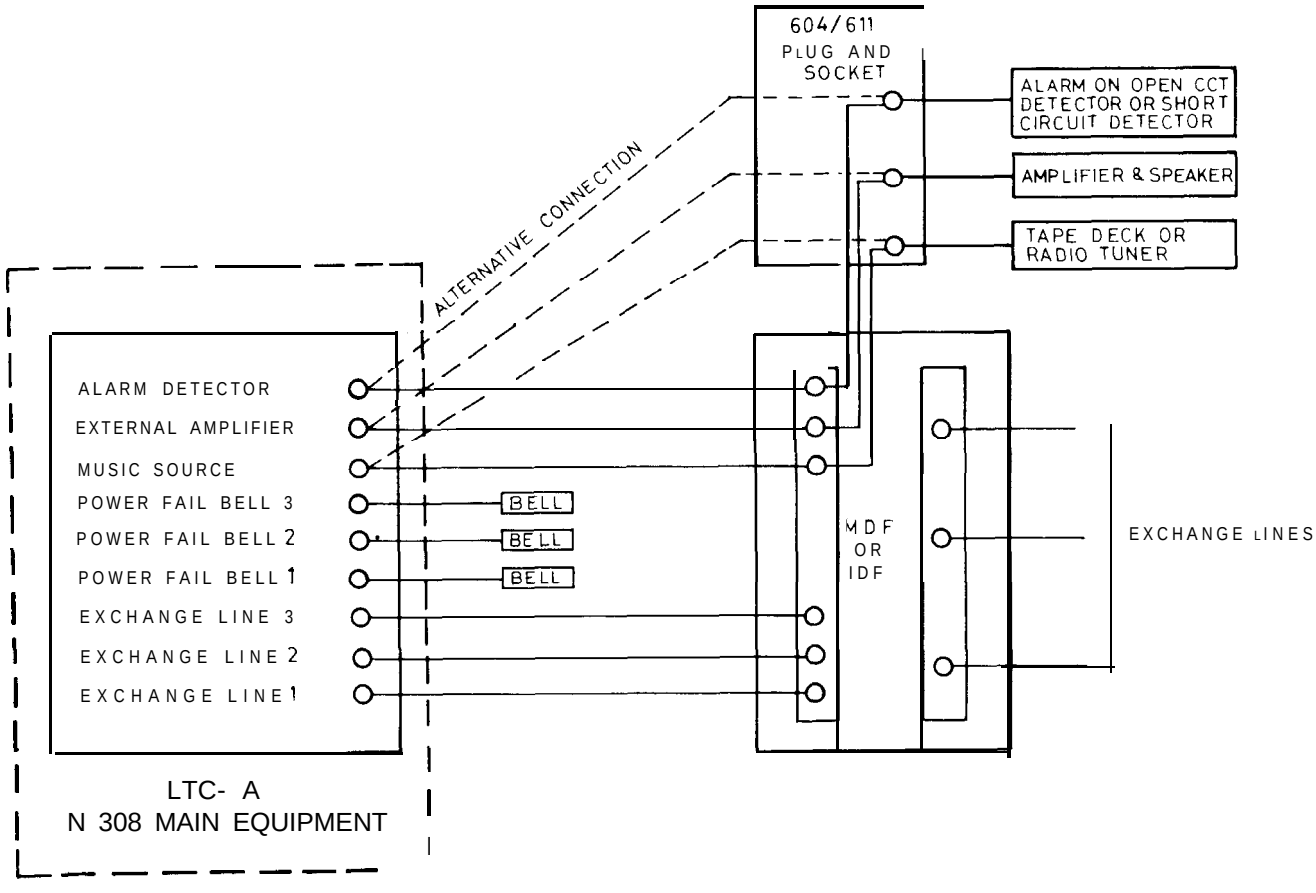


FIG. 30 - TERMINATING OF SYSTEM

2.4.1 MAIN EQUIPMENT ASSEMBLY

The basic N308 system is provided with the CPB-A and SLB-A boards factory equipped. The multi-conferencing facility (simultaneous exchange line calls) has been offered as a standard facility and therefore the MCB-A should be installed. This provides a two exchange line and a four telephone station service. Terminal boards LTC-A and LTC-B are supplied plugged into the SLB-A board TA and TB connectors. To this can be added one expansion board (a 4SB-A, or a SIB-A board) and all or any of the three option boards (viz. LNB-A, FGB-A and MCB-A).

First remove the cover of the Main Equipment by loosening the screws which are located at each corner of the cabinet. Inside the cabinet are two layers of circuit boards i.e. the CPB-A and the SLB-A. Flat ribbon cable is used to interconnect these boards with the expansion board.

i) Expansion Board

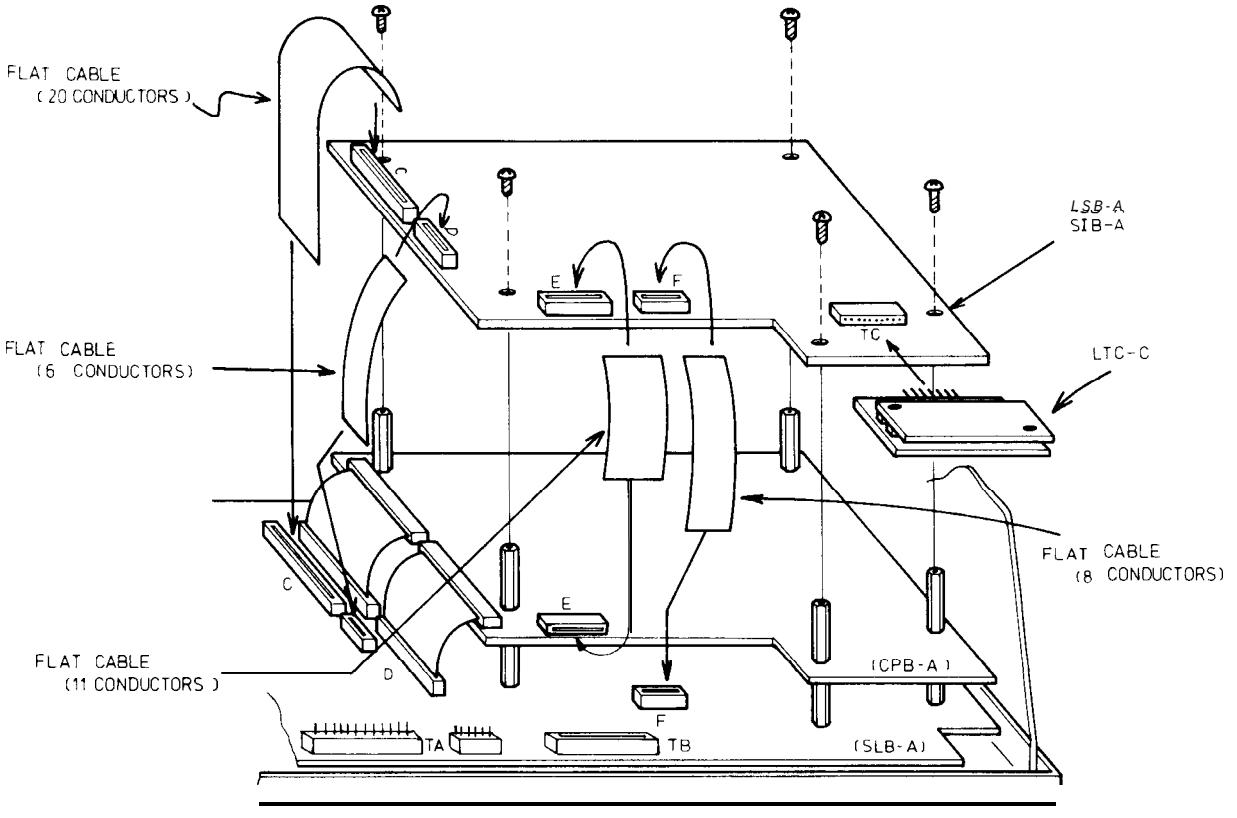


FIG. 31 - EXPANSION BOARD INSTALLATION
(SIB-A, 4SB-A)

The expansion board is mounted above the CPB-A board by screwing into the five hexagonal standoffs shown in Figure 31. Flat ribbon cables are used for interconnection between the CPB-A and SLB-A boards and the expansion board. Take special care to ensure that the exposed contacts of the ribbon cable are facing the terminals of the connector.

The LTC-C terminal board is supplied with the expansion board and should be plugged into the TC connector of the expansion board.

ii) Optional Boards

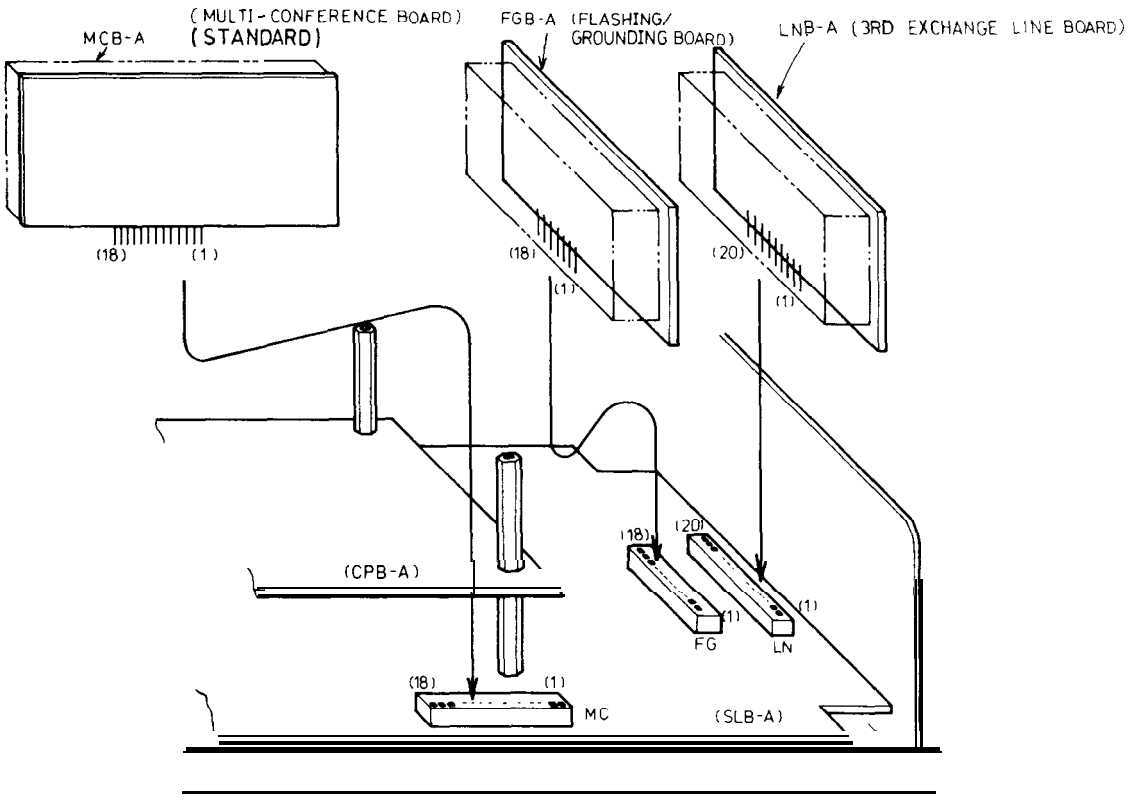


FIG. 32 - BOARD INSTALLATION
(MCB-A, FGB-A, LNB-A)

a) The LNB-A board is used to provide a third exchange line for the system. This board connects into the LN connector located on the SLB-A board. However, before doing this remove the programming links in positions 15-16 and 18-19 on the LN connector (refer Table 2.51 intercom monitoring).

Note that the components on the LNB-A board face the centre of the cabinet. (For location of the LN connector see Figures 32 and 40).

b) The MCB-A Multi-Conferencing Board is plugged into the MC connector located on the SLB-A board (see Figures 32 and 40). The programming link between terminals 1 and 2 on the AR connector must be removed. (Refer to Figure 41 and Table 2.51).

c) The FGB-A board is added to provide Flashing (switchhook flash) or Earth Recall (see Table 2.51 for the position of programming links in L1, L2 and L3) when used in conjunction with a PBX.

The board is plugged into connector FG (see Figures 32 and 40), after programming links 13-I 4, 15-16 and 17-I 8 are removed.

If a FGB-A board is fitted and any line does not require either Earth Recall or Switchhook Flash, then put a programming link between 2 and 3 on the appropriated connector (L1, L2 or L3).

Note: *If the above boards are removed, then it is important that the programming links are replaced.*

2.4.2 POWER SUPPLY (Figure 13)

Plug the power supply cord from the Main Equipment into the Power Supply. Plug the AC cord from the Power Supply into the mains power point.

2.4.3 REMOTE EXTENSION AND TIE LINE INTERFACE UNIT (Figures 18 and 33)

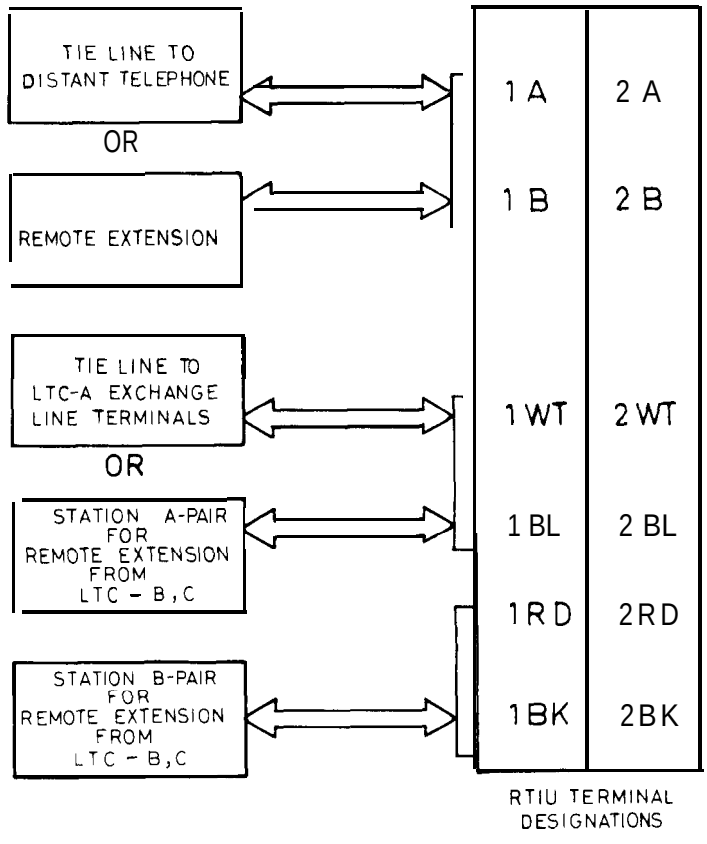


FIG. 33 - RTIU TERMINAL CONNECTIONS

Boards are simply plugged into the desigated positions in the cabinet. Cables are terminated as follows:

a) Tie Lines

A Tie Line takes the place of an exchange line. For example, a fully equipped N308 system (3 exchange lines) equipped with one Tie Line becomes a 2 exchange line, 1 Tie Line system. Hence the Exchange Line Key now becomes a Tie Line Key for the appropriate line. The Tie Line terminates on 1 A/B or 2 A/B on the RTIU and the connection to the Main Equipment is taken from 1 WT/BL or 2WT/BL.

TABLE 2.4.1 TIE LINE CONNECTION

308 Main Equipment LTC-A Terminal	RTIU TERMINAL	TIE LINE
1A or 2A or 3A* 1B 2B 3B	1 WT or 2WT 1A or 2A 1BL 2 B L 1B 2B	A B

**Note: The LNB-A third exchange line board must be installed.*

b) Remote Extensions

A remote extension takes the place of a station. The maximum loop resistance for a Remote Extension is 1500 ohms corresponding to 8.7 km of 0.5mm cable. The Remote Extension terminates on 1 A/B or 2 A/B and the 4-wire station connection to the Main Equipment is via 1 WT, BL, RD, BK or 2 WT, BL, RD, BK.

TABLE 2.4.2 REMOTE EXTENSION CONNECTION

RTIU TERMINAL	LINE CORD COLOUR	308 MAIN EQUIPMENT LTC-B, C TERMINAL	REMOTE EXTENSION
1A or 2 A			A
1B 2B			B
1WT or 2WT	White	WT*	
1BL 2BL	Blue	BL	
1RD 2RD	Red	RD	
1BK 2BK	Black	BK	

**Note: Where WT is 1 WT to 8 WT etc.*

2.4.4 STATIONS

This section contains information for the installation of the three types of station equipment which can be used with the N308 system.

These three station types are:

1. Telephone Station
2. Intercom (ICM) Station
3. Door Station.

Stations are to be connected to the LTC-B and LTC-C terminal boards as described in section 2.4.9.2 and 2.4.9.3.

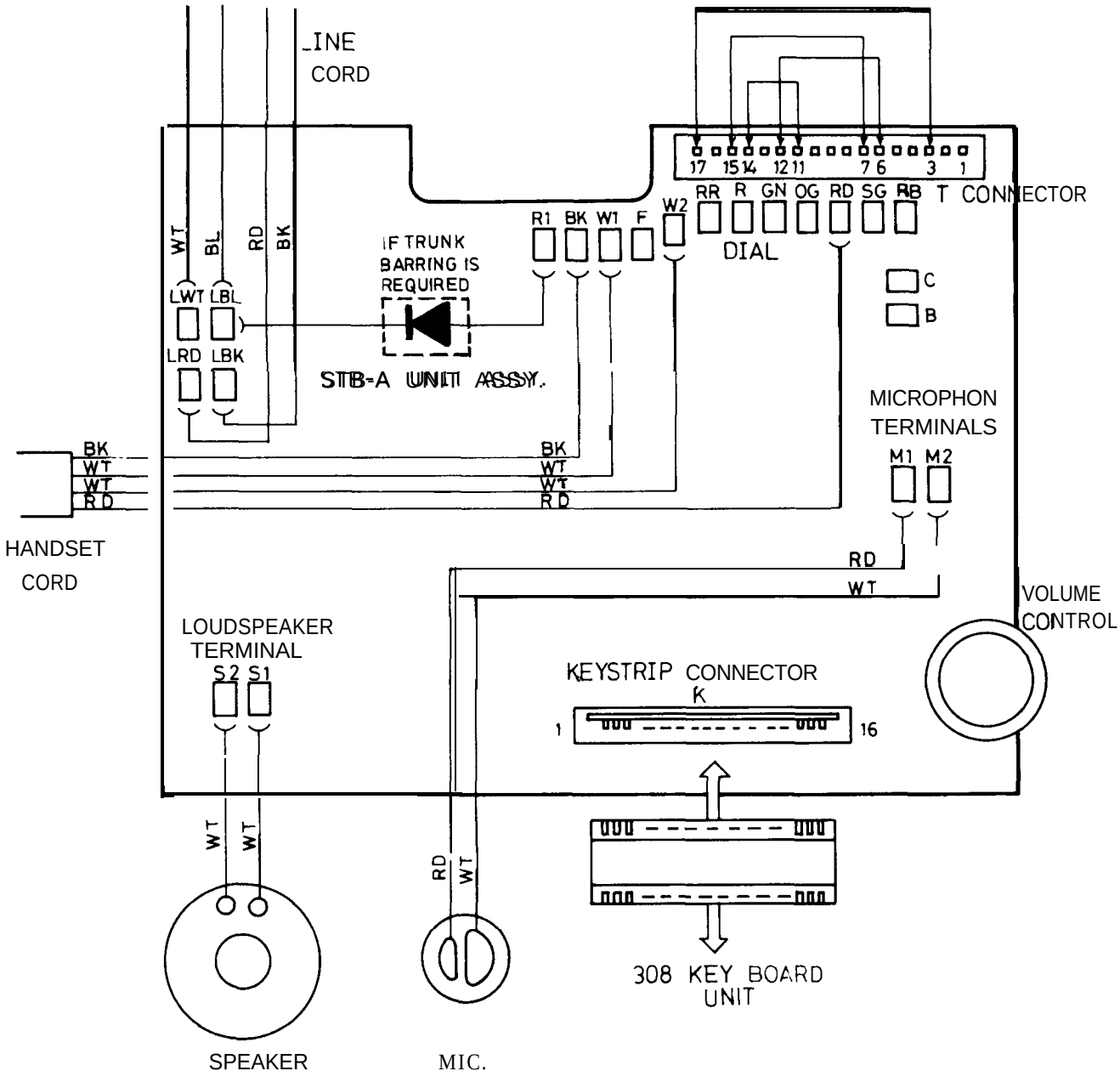


FIG. 34 - STB-A STATION BOARD ASSEMBLY

2.4.4.1 TELEPHONE STATION

The N308 telephone station is provided with a VF abbreviated dial or a decadic dial. The abbreviated decadic dial is an option. (See Figure 17).

The memory of the abbreviated dial has a capacity of up to 50 telephone numbers of 20 digits length. The abbreviated dials require a lithium battery (supplied with the station) to be installed into a battery holder located on the DEC/ABRV or VF/ABRV dial. Remove the dial (refer to Section 1.5.2b) and insert the battery. Take care not to touch the battery with your fingers, clean the battery with clean rag or tissue, ensure the polarity of the battery is the same as that indicated on the PCB.

Check for the correct wiring of the dial leads and T connector straps.

The dial leads are connected to the terminals located at the top of the STB-A board. The T connector is located on the STB-A board. For dial and strapping connections refer to Table 2.4.3 and Figure 34.

TABLE 2.4.3 308 TELEPHONE STATION CONNECTIONS

STB-A TERMINAL DESIGNATIONS	HANDSET CORD	LINE CORD	DIALS	T CONNECTOR STRAPPING	
				TERMINAL	STRAP
LWT		WT		T1	0
LBL*		BL	0	T2	
LRD		RD	|	T3	
LBK		BK	|	T4	
RI'			0	T5	
BK	BK			T6	0
W1	WT			T7	0
F			BL	T8	
w 2	WT			T9	
RR			OR	T10	
R				T11	0
GN				T12	0
OG			RD	T13	2
RD	RD			T14	0
SG			BR	T15	3 0
RB			SL	T16	4
C			GN	T17	0
B					1

**Note:* *Strap between LBL and RI.*

2.4.4.2 INTERCOM STATION

The intercom station can only be assigned as station 7 or 8 when using an SIB-A expansion board.

The intercom station cable is connected to the assigned station interface terminals on the LTC-C board in the main equipment.

2.4.4.3 DOOR STATION

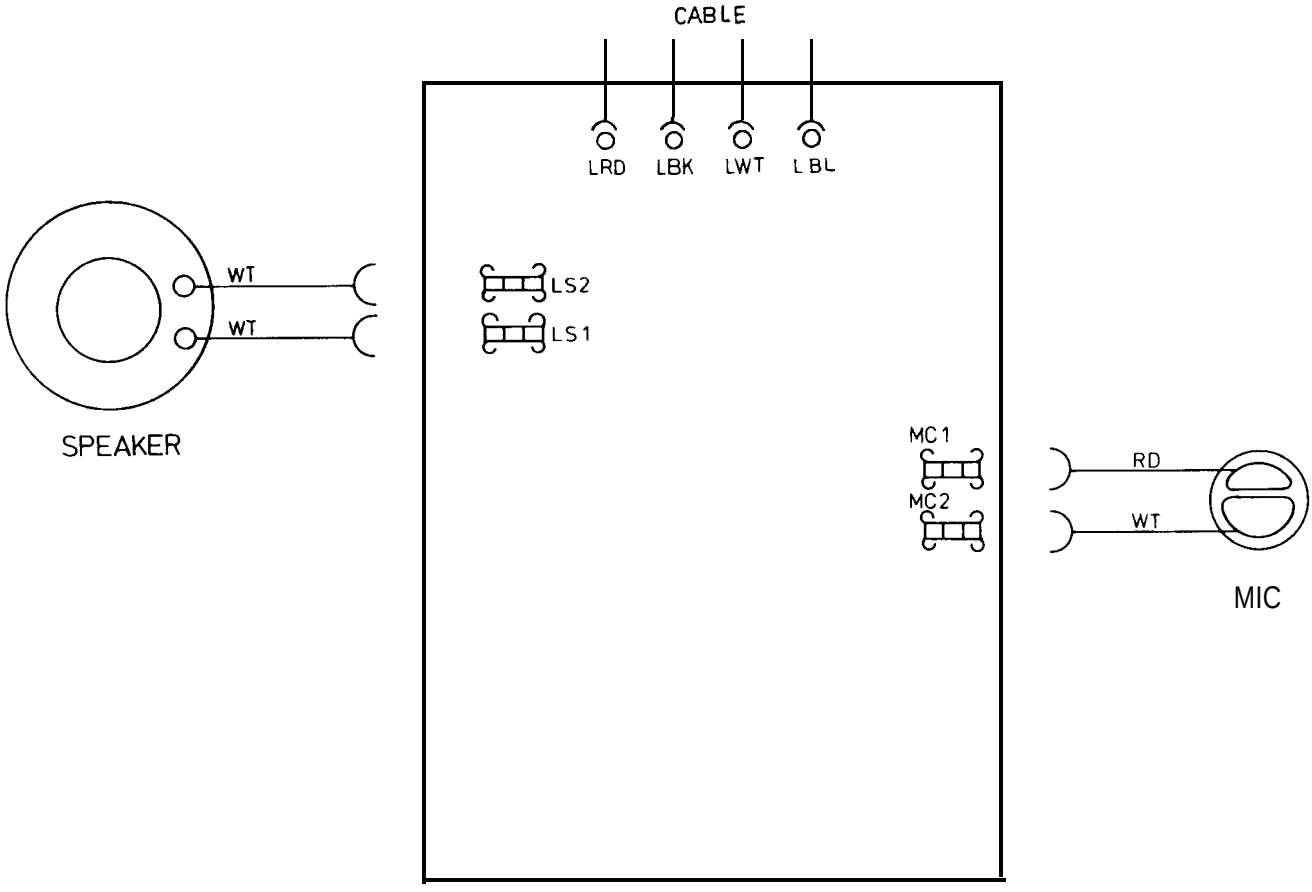


FIG. 35 - DSB-A DOOR STATION BOARD

The door station does not have a line cord. Remove the top moulding of the door station and connect the cable directly onto the four screw terminals located on the DSB-A Board (Figure 35). Each terminal is designated so as to correspond with LTC-C.

Only one door station can be connected to the system, this being one of the station interfaces 7 or 8 when an SIB-A is used.

2.4.5 POWERFAIL BELL

The bell is connected directly to the LTC-A terminal board in the Main Equipment. During powerfail conditions the bell is connected across the exchange line.

Refer to Table 2.4.6 for terminal connection.

2.4.6 OPTIONAL EQUIPMENT

Three facilities are available to tailor the system to the customers requirements. They are firstly, a Call Metering Unit which displays the number of metering pulses which have been detected on exchange line calls. Secondly, a Handsfree Console which is connected to a Telephone Station to provide Handsfree conversations for all calls. The third option is a Trunk Barring Unit which provides access barring for STD/ISD calls.

2.4.6.1 CALL METERING UNIT

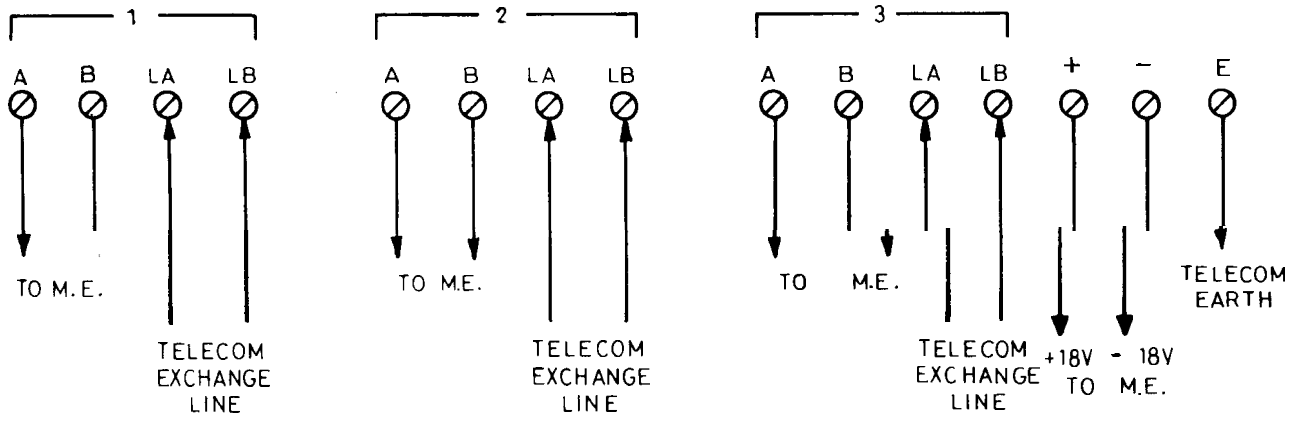


FIG. 36 - CALL METERING UNIT WIRING

The Call Metering Unit uses mechanical counters to display the number of metering pulses on up to three exchange lines. The N308 has a maximum capacity of three exchange lines, the lines are cabled via the Call Metering Unit. Terminate the exchange lines on the appropriate screw terminal which lie on the bottom of the CMB-A board. Positive (+18V) and negative (–18V) is supplied from the Main Equipment. A cable is taken from the + 18V and –18V terminals on the SLB-A in the Main Equipment. Telecom metering earth is connected directly to the CMU (refer to Figure 36).

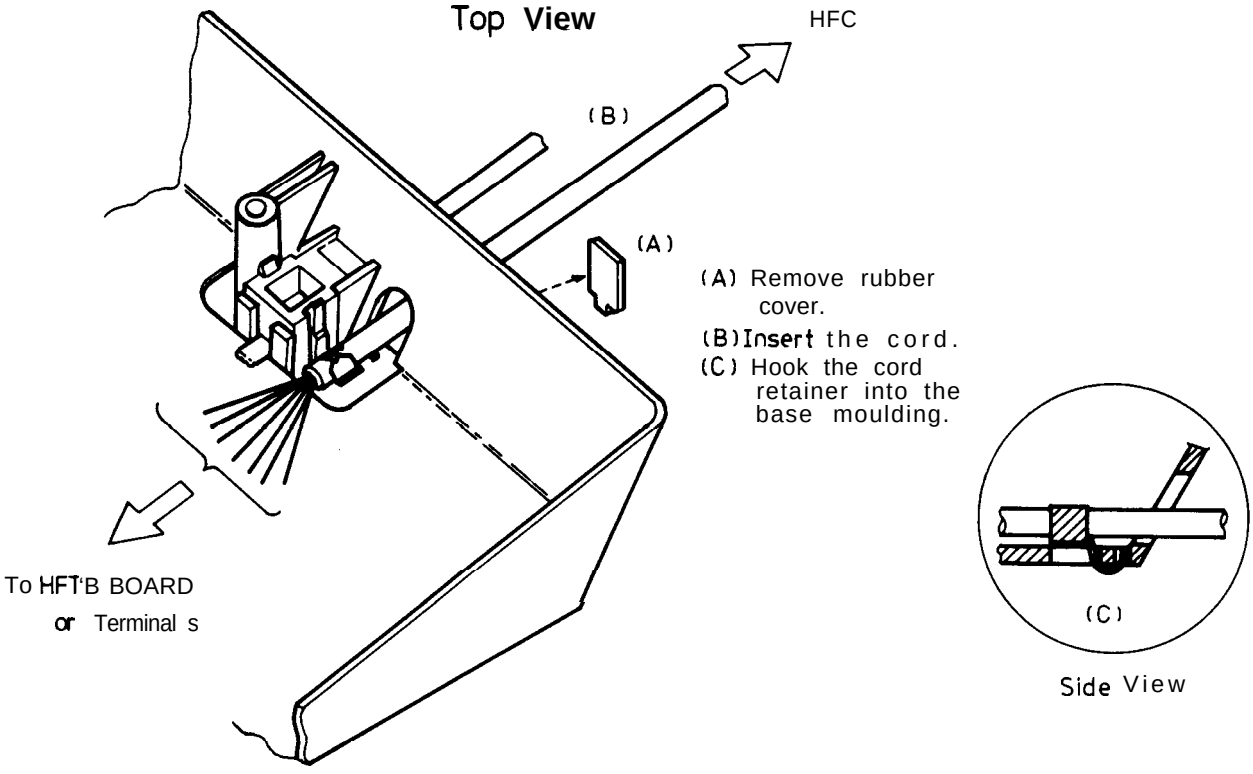


FIG. 37 - HANDSFREE CONSOLE CABLE INSTALLATION

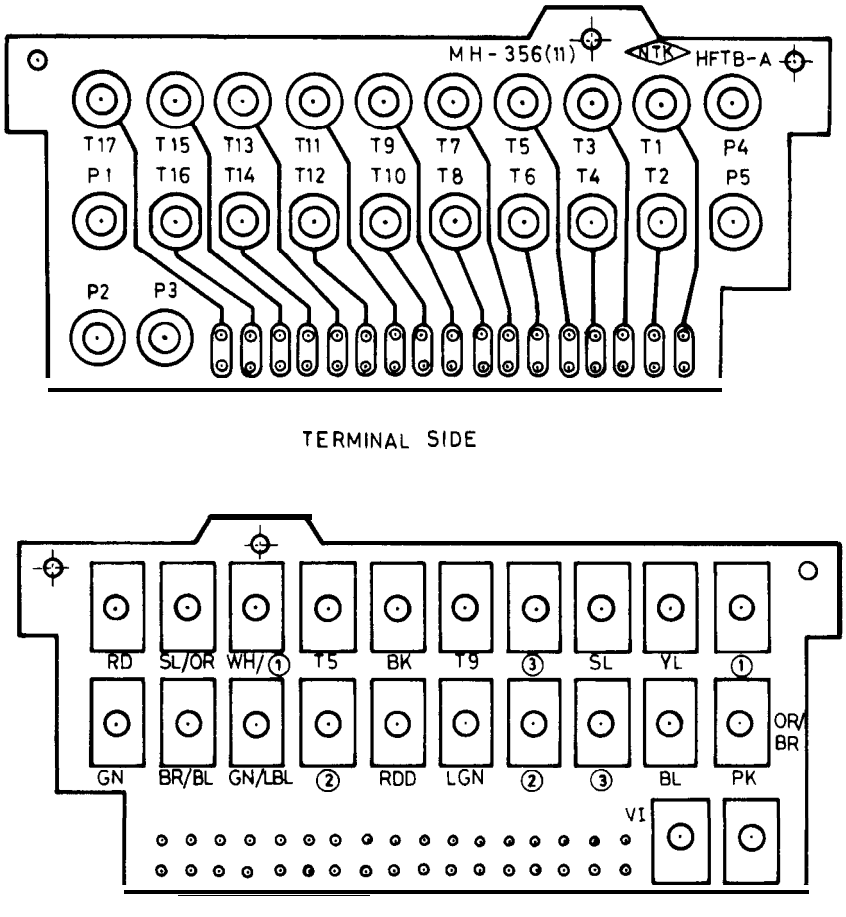


FIG. 38 - HFTB-A HANDSFREE TERMINAL BOARD

2.4.6.2 HANDSFREE CONSOLE

Remove the front panel and the top moulding of handsfree console.

Ensure that slide switch designated "K" is set to 20V.

Replace the front panel and the top moulding.

Remove the front panel of the telephone station.

Remove the dial.

Remove the hole cover from the base moulding and insert the handsfree console cord into the hole (figure 37).

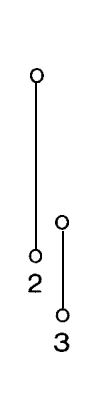
Connect the leads from the handsfree console to the HFTB-A board which is provided with the Handsfree Console and insert straps (Figure 38 and Table 2.4.4).

Plug the HFTB-A board into the T connector on the STB-A board after removing the T connector straps. Ensure terminals on the HFTB-A face towards the rear of the station.

Replace the dial and the front panel.

TABLE 2.4.4 N306 TELEPHONE STATION WITH HANDSFREE CONNECTION USING A HANDSFREE TERMINAL BOARD

HFTB-A TERMINAL DESIGNATIONS (COPPER SIDE)	HFTB-A QUICK REF TERMINAL DESIGNATIONS	DIAL	HANDS FREE CONSOLE CORD	HFTB-A STRAP CONNECTIONS
P4	P4		RD	
P5	GN		GN	
T1	SL/OR	SL	OR	
T2	BR/BL	BR	BL	
T3	WH/①		WT	
T4	GN/LBL	GN	LBL	
T5	T5			
T6	②			
T7	BK		BK	
T8	RDD	RD		
T9	T9			
T10	LGN		LGN	
T11				
T12	②			
T13	SL		SL	
T14	③			
T15	YL		YL	
T16	BL	BL		
T17	①			
P1	OR/BR	OR	BR	
P2	PK		PK	
P3	VI		VI	



2.4.6.3 TRUNK BARRING UNIT

The Trunk Barring Unit in conjunction with diodes installed in the barred stations provides access barring for the N308 system. This unit is fixed to a wall adjacent to the N308 Main Equipment. The following table outlines the required connections.

TABLE 2.4.4A TRUNK BARRING UNIT CONNECTIONS

TBU TERMINAL	CONNECTION
+18	Power Supply terminal '+ 18' located on the SLB-A in the Main Equipment
COM	Power Supply terminal 'COM' located on the SLB-A in the Main Equipment.
1LA, 1LB 2LA, 2LB 3LA, 3LB	Exchange Line (1) Exchange Line (2) Exchange Line (3)
1A, 1B* 2A, 2B 3A, 3B	Terminals '1 A' and '1 B' located on the LTC-A Terminals '2A' and '2B' located on the LTC-A Terminals '3A' and '3B' located on the LTC-A

**NOTE: It is important that the TBU terminals nA and nB are connected to LTC-A terminals nA and nB respectively (n = 1, 2 or 3)*

The TBU is supplied with 8 diodes that are installed in stations that require access barring

Remove the colour panel from the station. Unscrew and remove the station housing.

Remove the strap between LBL and R1 . These terminals are located at the top left hand corner of the STB-A board. Replace this strap with a diode supplied. The red lead of the diode is connected to R1 and the blue lead is connected to LBL. (refer to Figure 34). Reassemble the station.

Any spare diodes should be retained by field staff for use at a later time if modifications are required.

2.4.7 ADDITIONAL EQUIPMENT PROVIDED BY THE CUSTOMER

Additional equipment, which must have a current Telecom Permit to Connect, can be connected to the system to enhance and extend the facilities already provided.

This equipment will be connected to the Main Equipment via a 604/61 l plug and socket, using the appropriate connection mode.

2.4.7.1 PUBLIC ADDRESS SYSTEM FOR EXTERNAL PAGING

Refer to Section 2.4.9.1 for the terminal connections for an external amplifier. The output impedance of the external amplifier is 1 K ohms.

2.4.7.2 MUSIC SOURCE

Music Source for Background Music (BGM) or Music-on-Hold (MOH), is connected to the MS1 AND MS2 terminals on the LTC-A board.

BGM and MOH are provided by connecting an external music source, such as a tape deck or radio tuner. The output impedance of the source should be between 2K and 10K ohms. The input impedance of the music source connection is 1 K ohms.

BGM can be programmed for each station individually - refer to Table 2.5.2 and 2.5.3. MOH provides music for held exchange lines.

2.4.7.3 ALARM DETECTOR

An external alarm detector can be connected to the LTC-A terminal board. This alarm activates the main equipment to send a high pitched warbling tone to all stations. The alarm may be programmed by using a programming link. It may be activated by an open circuit detector or a closed circuit detector. (see section 2.5.1.2)

2.4.6 STATION ALLOCATION

2.4.6.1 POWER FAILURE TRANSFER ALLOCATION

The N308 system connects the exchange lines directly to stations when power fails. This is done so that individual stations can act as a normal telephone. These stations are assigned as shown below.

TABLE 2.4.5

EXCHANGE LINE NUMBER	TELEPHONE STATION NUMBER FOR EXCHANGE LINE CALL TRANSFER
1	1,4,7
2	2,5,8
3	3,6

It is important that the stations with the same Exchange Line be placed in close enough proximity to each other so that the Powerfail Bell may be heard.

One Powerfail Bell can be connected for each Exchange line.

2.4.8.2 DIRECT STATION SELECTION KEY ALLOCATION

A call from any station may be placed by direct access (single key operation), hence the keys on the telephone station need to be designated in the following manner.

- Firstly, assign the numbers from 1 to 8 to the stations of your configuration (inclusive of Telephone, Intercom or Door Stations).

  Note: An Intercom or Door Station can only be assigned to numbers 7 or 8.

- There are only 7 DSS keys on a telephone station, as no key is needed to call up your station.
- The designation of the DSS key numbers is shown below for station 8.

HOLD	PRIV REL	LINE 1	LINE 2	LINE 3
DND	FL/GRD	ALL CALL	DSS-1	DSS-2
DSS-3	DSS-4	DSS-5	DSS-6	DSS-7

- Insert the designation paper into the key cap of each station, from no. 1 to 8. Your station does not have a station key designation.

  For instance, if a station is designated as the no. 4 station, the above station number designation table will change as shown below:

HOLD	PRIV REL	LINE 1	LINE 2	LINE 3
DND	FL/GRD	ALL CALL	DSS-1	DSS-2
DSS-3	DSS-5	DSS-6	DSS-7	DSS-8

2.4.9 MAIN EQUIPMENT TERMINATIONS

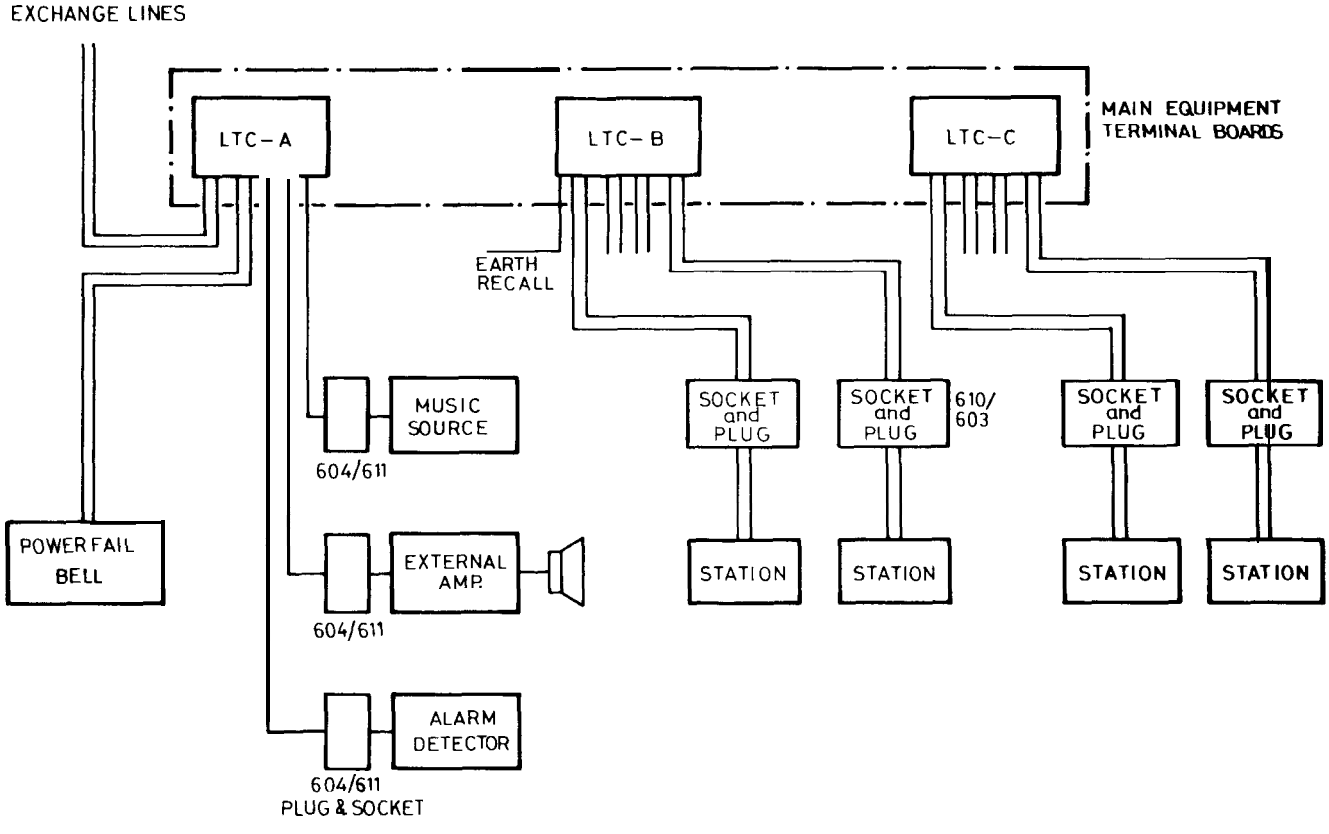


FIG. 39 - N308 SYSTEM LAYOUT

The range of equipment which is connected to the main equipment is shown in figure 6 and is achieved using three terminal connectors LTC-A, LTC-B and LTC-C, two of which are on the SLB-A and the other is on the 4SB-A or SIB-A (Figures 40, 42, 43). When installing the cabling allow enough slack for terminal boards LTC-A and LTC-B to be plugged together (Figure 45). This permits the stations to operate in the powerfail mode when the main equipment is removed for service.

The stations may be cabled directly to the Main Equipment or via the Building Distribution System.

Note: *The maximum cable loop resistance for a telephone station is 26 ohms, or 150m of 0.5mm cable. Maximum cable loop resistance for an intercom or door station is 22 ohms, or 125m of 0.5mm cable.*

The terminals on the three line terminal connectors LTC-A, LTC-B and LTC-C are now explained.

2.4.9.1 LTC-A CONNECTIONS

The following equipment is connected to the LTC-A:-

i) Exchange Lines

Consideration should be given to station assignments since a relay connects each exchange line to preassigned stations when power fails (see Table 2.4.5).

ii) Powerfail Bells

Powerfail Bells may be connected to the LTC-A terminal board. The Powerfail Bells (see Table 2.4.6) are connected only during power fail.

iii) Music Source For Music-On-Hold or Back Ground Music (BGM)

BGM and MOH can be provided by connecting an external music source to the MS1 and MS2 terminals on LTC-A.

iv) Output for External Amplifier

An external amplifier and speakers can be connected to EA1 and EA2 of LTC-A. It is possible to program (see section 2.5.1.3) All Call announcements only or All Call announcements and background music. Shielded cable should be used to connect the amplifier and the main equipment.

v) Input from Alarm Detector

An external detector can be connected to the AL1 and AL2 terminals, which activates the main equipment to send a high pitched warbling tone to all stations.

Table 2.4.6 : LTC-A Connections

CABLE (from/to)	LTC-A TERMINALS	CONNECTION BLOCK
Exchange Line 1	1A 1B	MDF OR IDF
Exchange Line 2	2A 2B	
Exchange Line 3	3A 3B	
Powerfail Bell for Exchange Line 1	1BA 1BB	
Powerfail Bell for Exchange Line 2	2BA 2BB	
Powerfail Bell for Exchange Line 3	3BA 3BB	
Music Source	MS1 MS2	604/611 PLUG AND SOCKET
External Amplifier	EA1 EA2	
Alarm Detector	AL1 AL2	

Note 1 : When LTC-A is plugged into SLB-A, the terminal block must face towards the outside of the Main Equipment. Refer to Figure 45.

2.4.9.2 LTC-B CONNECTIONS

The LTC-B terminal board connects telephone stations 1 to 4 to the Main Equipment. These connections must be correctly made as a wrong connection may cause fuses to blow or damage to components.

The connections are as shown in the Table below:

Table 2.4.7 : LTC-B Connections

STATION NUMBER	WIRE COLOUR	610 SOCKET PIN CONNECTION	LTC-B TERMINAL
1	White	2	1WT
	Blue	6	1BL
	Red	1	1RD
	Black	5	1BK
2	White	2	2WT
	Blue	6	2BL
	Red	1	2RD
	Black	5	2BK
3	White	2	3WT
	Blue	6	3BL
	Red	1	3RD
	Black	5	3BK
4	White	2	4WT
	Blue	6	4BL
	Red	1	4RD
	Black	5	4BK
Earth Recall			ER

Note 1: If the system is equipped with Earth Recall connect the ER terminal on LTC-B to the Recall Earth.

Note 2: When LTC-B is plugged into SLB-A, the terminal block must face towards the outside of the Main Equipment. Refer to Figure 45.

2.4.9.3 LTC-C CONNECTIONS

The LTC-C terminal board connects stations 5 to 8 (Telephone, Intercom or Door Stations) to the Main Equipment. When SIB-A is installed, station numbers 7 and 8 must be an Intercom or Door Stations.

Table 2.4.6 : LTC-C Connections

STATION NUMBER	WIRE COLOUR	610 SOCKET PIN CONNECTION	LTC-C TERMINAL
5	White	2	5WT
	Blue	6	5BL
	Red	1	5RD
	Black	5	5BK
6	White	2	6WT
	Blue	6	6BL
	Red	1	6RD
	Black	5	6BK
7	White	2	7WT
	Blue	6	7BL
	Red	1	7RD
	Black	5	7BK
8	White	2	8WT
	Blue	6	8BL
	Red	1	8RD
	Black	5	8BK

Note 1: When LTC-C is plugged into 4SB-A or SIB-A, the terminal block must always face upward.

2.4.10 LIGHTNING PROTECTION

Lightning Protection must be provided. The method of protection is comprehensively explained in Headquarters SBS Engineering Branch Information Document Number T32. “Lightning Protection for Commander N Series Business Systems”.

2.5 INSTALLATION PROGRAMMING

Programming on the N308 system is achieved by removing or inserting programming links between various pairs of terminals. These links provide information for the four bit microprocessor in the main equipment to define and control the N308 system.

For ease in description, the programming is divided into two groups:

a) System Basis
b) Station Basis

The following section numbers refer to the tables at the end of this section for example, section 2.5.2.3 refers to table 2.5.2 Part 3. The following description is intended to provide further information than that which is summarised in the tables. Refer to Figures 40 to 44 for connector locations.

2.5.1 SYSTEM FEATURE PROGRAMMING

2.5.1.1 INTERCOM MONITORING

Intercom monitoring is not possible when the third exchange is connected.

2.5.1.2 ALARM SIGNALLING

A high pitched warbling tone can be provided at all stations when activated by an alarm detector which is provided by the customer. The alarm is activated by the microprocessor when it detects an

a) open circuit if the programming link in the AL connector is between terminals l-2 or
b) closed circuit if a link is between terminals 2-3.

The system may also transmit the alarm signal to a door station, see section 2.5.3.3.

Note: When no alarm detector is connected programme for closed circuit alarm.

2.5.1.3 ALL CALL THROUGH EXTERNAL AMPLIFIER

All Call announcements may be broadcast when an external paging amplifier and speakers are connected. The system can be programmed so that only All Call announcements are broadcast or All Call announcements and background music are broadcast. This is done by inserting programming links in the EA connector as shown in table 2.51.

2.5.1.4 ALL CALL WARNING TONE FOR BUSY STATION

If the station is busy on an exchange line call, an All Call announcement cannot be received, since there is only a single audio path. However it is possible, by programming link arrangement to send an alert tone to the station to inform the user of an All Call message.

2.5.1.5 INTERCOM PRIVACY

Only one intercom link is provided in the system. The system can be programmed so as to stop other stations from entering the call after the call has been answered. If the intercom is busy, incoming calls must be announced using the All Call facility. This will alert the intercom users, as well as other stations, except those that have an exchange line call in progress.

The intercom link may, by inserting a programming link between IP connector pin 1 and 2, allow all other stations to enter the intercom call simply by going off-hook.

2.5.1.6 AUTO RECALL TIMER SETTING

If an exchange link call is left on I-Hold for a preset time the holding station will receive the Auto-Recall signal. This time is programmed by the insertion of programming links between various terminals 3 to 6 on the AR connector of the CPB-A board.

2.5.1.7 SWITCHHOOK FLASH

An open loop switchhook flash can be used to provide recall of the operator or flash for transfer. This method of operation can only be used with a PABX which uses Voice Frequency Dialling.

2.5.1.8 EARTH RECALL

This facility provides an earth on one side of a PBX line to recall an operator or transfer a call.

2.51 .9 MULTI-CONFERENCING NOT EQUIPPED

If the MCB-A board is not equipped then insert a programming link between terminals 1 and 2 in the AR connector. This applies to CPB-A boards manufactured after I-82. Boards manufactured prior to this date must have the MCB-A equipped.

2.5.2 STATION FEATURE PROGRAMMING : AUDIBLE-SIGNALLING FOR TELEPHONE STATIONS (STA CONNECTOR)

2.5.2.1 OFF HOOK AUDIBLE SIGNALLING

The station will receive a muted audible indication for exchange line calls on any of the exchange lines when the station is off hook, on hook signalling is also provided.

2.5.2.2 ON HOOK AUDIBLE SIGNALLING

A station so programmed will receive an audible indication of exchange line calls on all exchange lines only when the station is on hook.

2.5.2.3 BACKGROUND MUSIC

If a music source is connected to terminals MS1 and MS2 as described in section 2.4.9.1 all stations may be provided with Background Music (BGM).

2.5.3 STATION FEATURE PROGRAMMING : AUDIBLE-SIGNALLING FOR INTERCOM OR DOOR STATIONS (ICM CONNECTOR)

2.5.3.1 INTERCOM STATION OR DOOR STATION

This programming link is used to inform the system that the interface is set-up for an Intercom Station (link inserted) or a Door Station (link removed).

2.5.3.2 INTERCOM STATION WITH BACKGROUND MUSIC

If a music source is connected to terminals MS1 and MS2 on the LTC-A connector background music may be provided by inserting a programming link for each station.

2.5.3.3 DOOR STATION WITH ALARM

The system is informed that a Door Station interface is required, see 2.5.3.1 above. Only one Door Station is to be used with the system, and this must be one of station interface 7 or 8 when using a SIB-A.

Alarm signals will be transmitted to the Door Station when a programming link is inserted. No alarm signals will be transmitted to the Door Station when the programming link is removed.

TABLE 2.5.1 : SYSTEM FEATURE PROGRAMMING

SECTION REFERENCE	OPTION	CONNECTOR Location	Designation	Programming link between	REMARKS
2.5.1.1	Intercom Monitoring	SLB-A	LN	15 & 16 188 19	This option is not available when the third Exchange Line is equipped
2.5.1.2	Alarm Signalling contact closure contact opening	CPB-A CPB-A	AL AL	2 & 3 1 & 2	If an alarm detecting device is not used connection (2 8 3) is required.
2.5.1.3	All Call through the External Amplifier with BGM without BGM	CPB-A CPB-A	EA EA	1 & 2 2 & 3	
2.5.1.4	All Call Warning Tone Warning tone to busy station. No Warning Tone.	CPB-A CPB-A	HB HB	2 8 3 1 & 2	
2.5.1.5	Intercom Privacy No Intercom Privacy	CPB-A CPB-A	IP IP	2 8 3 1 & 2	
2.5.1.6	Auto Recall Timer Setting	CPB-A	AR	3 & 4 5 & 6 3 a 4,5 8 6	32 seconds 64 seconds 96 seconds
2.5.1.7	Switchhook Flash	FGB-A	L1 L2 L3	1 & 2 1 & 2 1 & 2	If the FGB-A is not equipped the FG connector programming links (13 & 14), (15 & 16) and (17&18) located on SLB-A, must be inserted.
2.5.1.8	Earth Recall	FGB-A	L1 L2 L3	2 & 3.4 a 5 2 & 3,4 & 5 2 & 3,4 & 5	If Earth Recall or Switch-hook Flash is not used on an exchange line and FGB-A is equipped, then a programming link is inserted between pins 2 and 3 on the appropriate line connector (L1,L2 and L3).
2.5.1.9	Multi-Conferencing not equipped	CPB-A	AR	1 8 2	If the MCB-A is used the programming link must be removed.

Precaution: The CC Connector is used during manufacture and must not *be removed, the programming link is between pins 2 and 3.*

Table 2.5.2 : Audible Signalling for Telephone Stations

SECTION REFERENCE	OPTION	TELEPHONE STATION NUMBER								"STA" CONNECTOR LOCATION
		1	2	3	4	5	8	7	8	
2.5.2.1	OFF HOOK Audible Signalling (insert the programmrng link between)	1 & 2	6 & 7	11 & 12	168 17	1 & 2 1 & 2	6 & 7 6 8 7	11 & 12	16 & 17	SLB-A 4SB-A SIB-A
2.5.2.2	ON HOOK Audible Signalling (insert the programmrng link between)	2 8 3	7 8 8	1 2 8 1 3	178 18	2 8 3 2 8 3	7 8 8 7 8 8	128 13	17 & 18	SLB-A 4SB-A SIB-A
2.5.2.3	Background Music (BGM) (insert the programming link between)	4 8 5	9 & 10	14 & 15	19 & 20	4 & 5 4 8 5	9 & 10 9 & 10	14 & 15	19 & 20	SLB-A 4SB-A SIB-A

NOTE . For no audible signalling on incoming exchange line calls remove the programming links for both ON HOOK and OFF HOOK signalling for each station as required.

Table 2.5.3 : Audible Signalling for Intercom or Door Stations

SECTION REFERENCE	OPTION	INTERCOM OR DOOR STATION NUMBER								"ICM" CONNECTOR LOCATION
		1	2	3	4	5	8	7	8	
2.5.3.1	Intercom Station (insert the programming link between) Door Station link removed							1 & 2	5 8 6	
2 . 5 . 3 . 2	Intercom Station with BGM (insert the programming link between)							1 & 2 3 & 4	5 & 6 7 & 8	SIB-A
2 . 5 . 3 . 3	Door Station with Alarm (insert the programming link between)							3 & 4	7 & 8	

Precaution: Interfaces 7 or 8 can be assigned as a Door Station Only one Door Station is to be connected to the system.

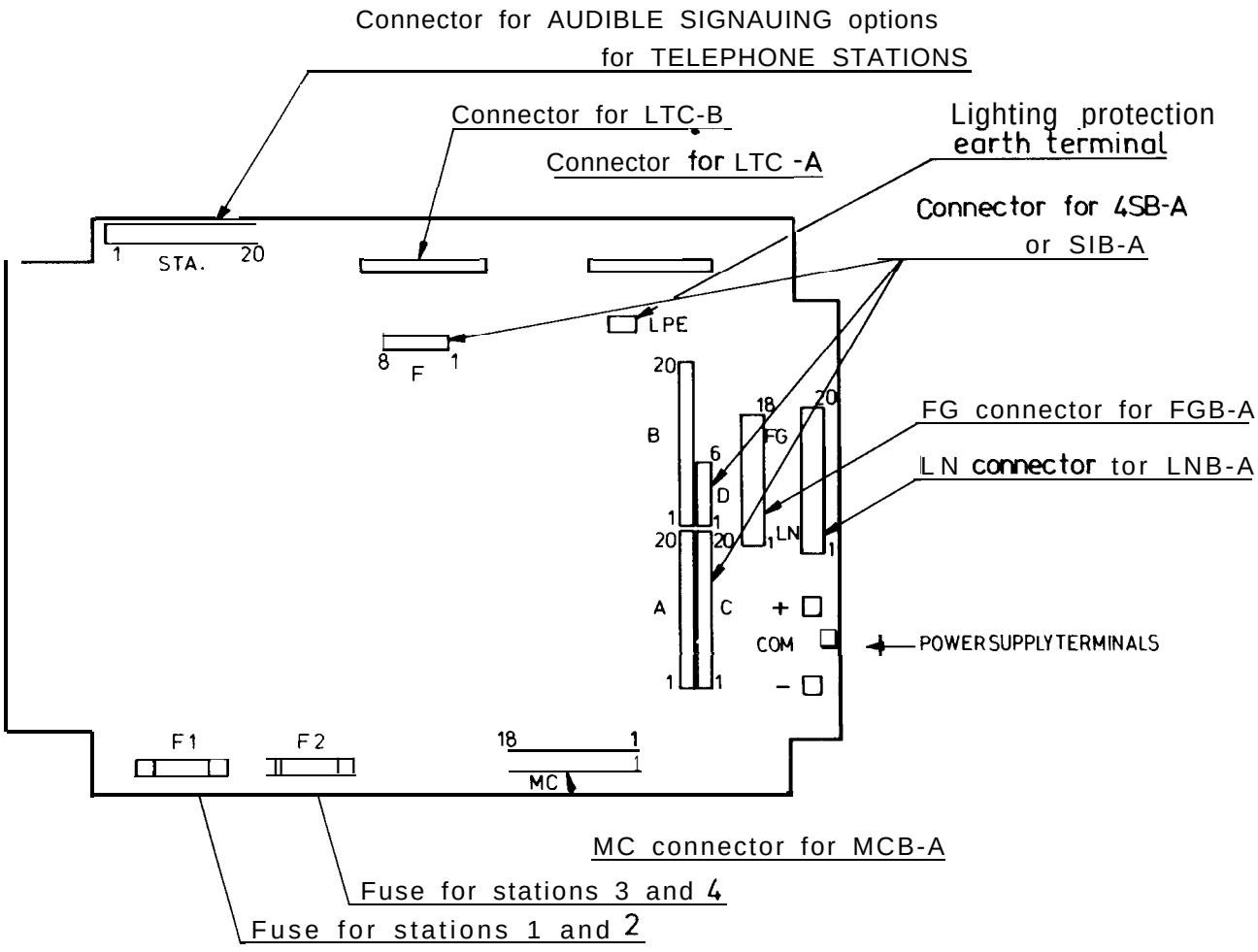


FIG. 40 - SLB-A CONNECTOR LAYOUT

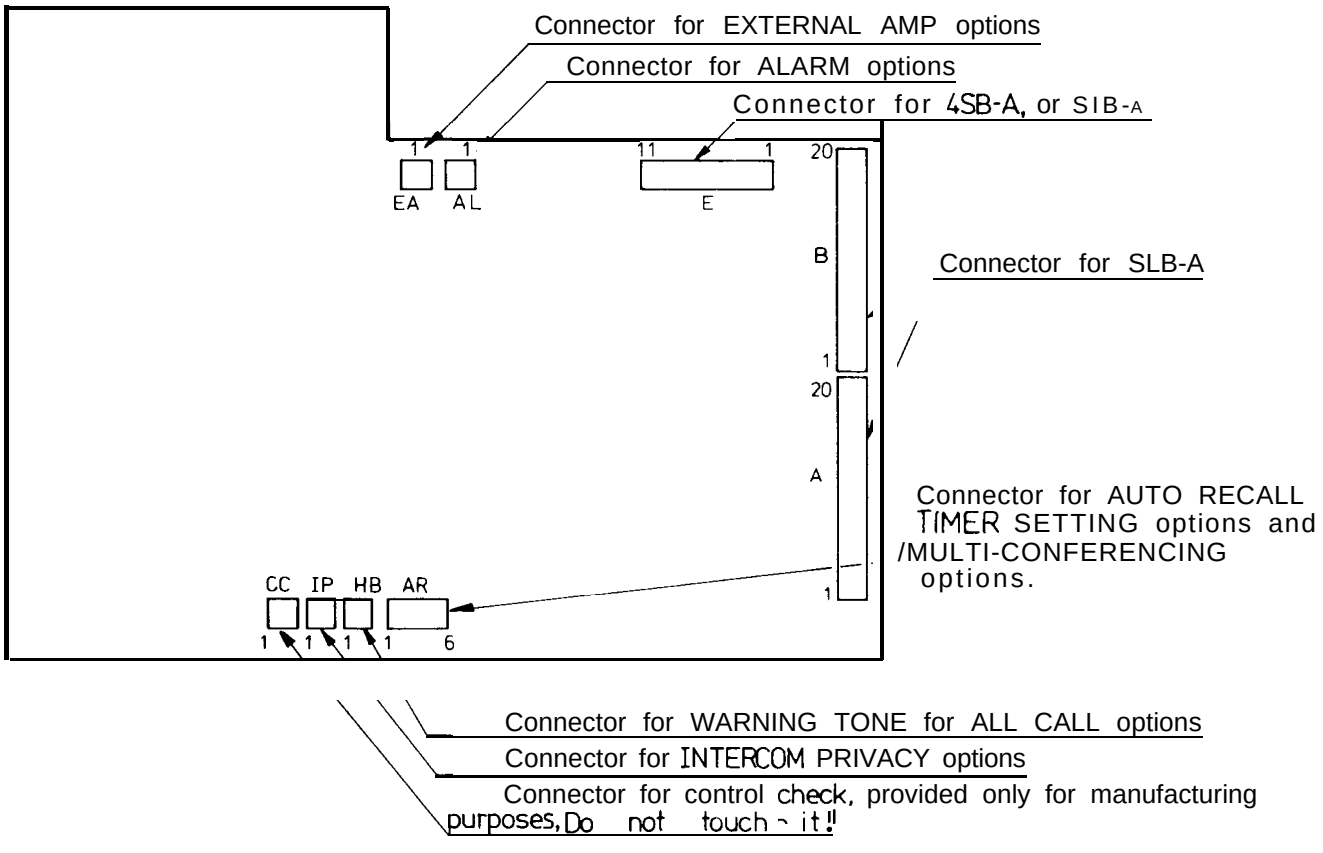


FIG. 41 - CPB-A CONNECTOR LAYOUT

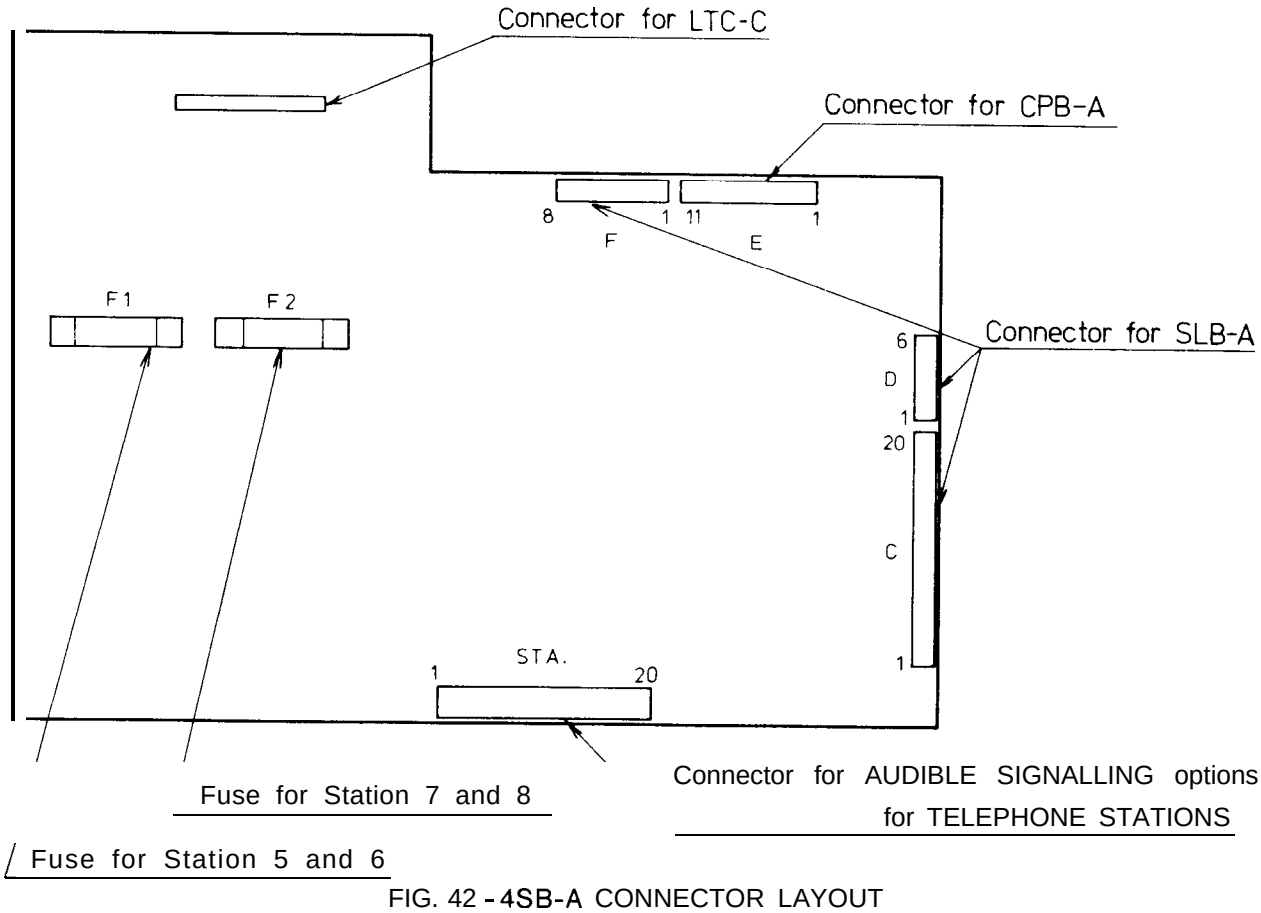


FIG. 42 - 4SB-A CONNECTOR LAYOUT

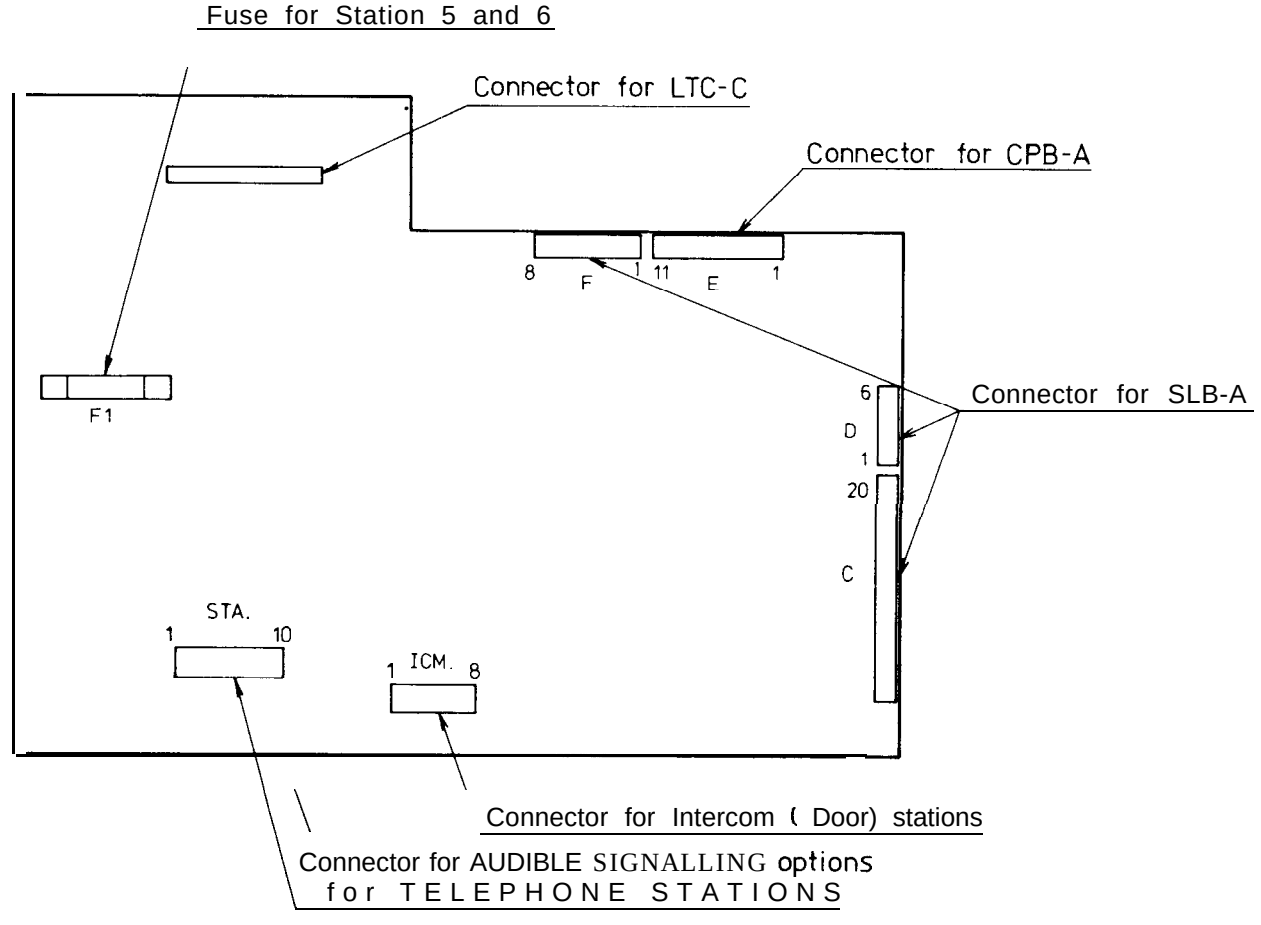


FIG. 43 - SIB-A CONNECTOR LAYOUT

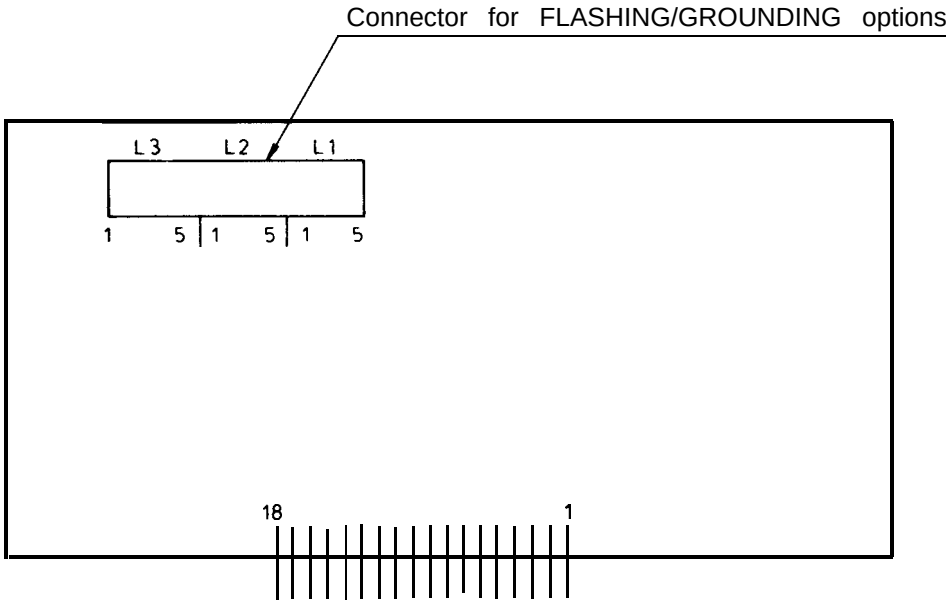


FIG. 44 - FGB-A CONNECTOR LAYOUT

2.6 FUNCTIONAL TEST

When installation is complete the installer must test all exchange lines and stations connected to the system for proper operation. The application of power to the system will switch the matrix and power relays. This should be heard along with a short burst of tone which may sound from the station speakers.

If a fault appears, refer to the Fault Finding Flow Charts and Suggested Repair Action in sections 3.5 and 3.6.

2.6.1 POWER SUPPLY TEST

The installer should check the voltage of the power supply before testing. The voltage between the + 18V terminal on the SLB-A (to which a red wire from the power connector is screwed) and the COM terminal (green wire) must be within the range + 18V plus minus 0.5V. The voltage between the COM and -18V terminals (black wire) must be within the range of -18V plus minus 0.5V.

2.6.2 SYSTEM TEST

The inspection should be started from Item 1 'Background Music (BGM)', however, if there is no audible signal connected to the music source terminals, then start from Item 2.

When testing the BGM facility, all stations should be arranged to provide this option by inserting the programming links into all the appropriate STA connectors and ICM connectors (see Table 2.5.2 and 2.5.3). When the test is completed restore the programming links to the original state.

The test procedure should proceed according to the following chart.

It is important that the chart is followed in sequence since each check item depends on preceding items. If an unexpected result occurs refer to section 3.6.

It is possible to test a specific function by starting at a break-in point indicated by the * symbol.

ITEM	CHECK ITEM	ACTION	EXPECTED RESULT	REPAIR SUGGESTION
*1	Background Music (BGM) when idle	Power On	BGM heard from all Telephone and Intercom stations programmed for BGM.	3.6.1
*2	Seizure & All Call	Lift handset at each station. Operate ALL CALL (AC) key. Return handset.	BGM stops. Hold LED will be lit at all stations, and double tone burst will be heard from the speakers at all the stations	3.6.2
3	Exchange Line Seizure	Lift handset of station #1 and operate a LINE key. Then dial another exchange line.	The line LED is lit at all stations. Exchange dial tone is heard through the handset.	3.6.3

TEM	CHECK ITEM	ACTION	EXPECTED RESULT	REPAIR SUGGESTION
4	Incoming Call Audible Signalling	If only one line is installed then arrange a call to that line.	incoming audible signalling is heard at the stations assigned to signal. The line LED will flash at 60 IPM.	3.6.4
5	Answer	Lift handset at a signalling station(#2). Operate the incoming LINE key at station #2.	Audible signalling ceases or is muted if the station is assigned to off hook signalling. The flashing LED at all stations changes to steady. The handset is connected to the exchange line.	3.6.5
6	Hold	Operate the HOLD key at station # 1. Leave station #2 off hook.	The line LED at station #1 flashes at 480 IPM. The LED at the other stations flashes at 120 IPM. Station #2 will hear Music On Hold if a source is connected.	3.6.6
7	Auto Recall	Leave station #2 off hook and wait.	Station #1 will hear audible signalling when the preset time has elapsed.	3.6.7
8	Reseizure	Operate the held exchange LINE key at station # 1. Operate the HOLD key at station # 1.	The LED at all stations is steady. Stations # 1 and #2 can converse. Same as 6.	3.6.8
9	Privacy	Operate the LINE key seized by station #2 at station #1.	Station #1 will hear nothing, and no conversation is possible between stations # 1 and #2.	3.6.9
10	Privacy Release	Operate the PRRL key at station #2.	Stations #1 and #2 will be able to converse and also hear MOH from the line held by station # 1 previously.	

ITEM	CHECK ITEM	ACTION	EXPECTED RESULT	REPAIR SUGGESTION
11	Automatic Hold	Seize the held line at station #1. Call station #2 by operating the DSS keys.	The line is held again and station #2 hears MOH. At the same time, double tone burst will be heard through the speaker at station #2, the same tone burst will be heard through the handset at station # 1. The HOLD LED at all stations will be lit. The exchange line LED at station #1 flashes at 480 IPM and the LEDs at other stations will flash at 120 IPM.	3.6.10
12	Re-signal	At station #1 operate the DSS key for station #2.	Again, the double tone burst will be heard at both stations. But there is no talkback.	
13	Answer via HOLD Key	Operate the HOLD key at station #2. Release the held exchange lines.	The line being seized by station #2 is held. HOLD LED at station #2 is on, and the intercom call is answered by station #2.	3.6.1 1
*14	Handsfree Talkback	Call station #2 by operating the DSS key at station # 1.	Single tone burst will be heard through the handset at station # 1 and from the speaker at station #2. Station #2 can talk back to station #1 via the microphone. The HOLD LED is flashing at 480 IMP at station #2 and is steady at all other stations.	3.6.12
15	Microphone Off	Operate DND key at the station #2.	DND LED at station #2 will turn on and station #1 will not hear any voice from station #2.	3.6.13
16	Microphone On	Operate DND key again at station #2.	Station #1 will hear talk back from station #2.	

ITEM	CHECK ITEM	ACTION	EXPECTED RESULT	REPAIR SUGGESTION
17	Handset Answering	Lift handset at station #2.	Station #2 can respond to station # 1 using the handset. The HOLD LED changes to steady.	3.6.1 1
18	Intercom Privacy	Lift the handset at station #3 Hang up stations.	If the intercom privacy option is set to No-Privacy in the Main Equipment, station #3 should be able to converse with stations #1 and #2. If the intercom privacy option is set to Privacy, station #3 should be excluded from the conversation between stations #1 and #2.	3.6.14
*19	DND	Operate DND key at station # 2. Call station #2 from station # 1 Release DND mode by operating DND key again at station #2. Call station #2 from station #1.	DND LED at station #2 is turned on. Station #1 will hear DND busy tone when calling station #2. All HOLD LED's lit. Same as 14	3.6.13
20	Alternate Point Answering	Lift handset at station #3. Operate PRRL key at station #3.	Station #3 can not respond to this call. Station #3 will respond to the call instead of station #2. HOLD LED at station #2 changes to steady.	3.6.15

2.6.3 TELEPHONE STATION TEST

The following test is to be performed for the remaining untested telephone stations.

*21	Seize line	Lift handset and operate a line key.	The line LED is lit at all stations. Exchange dial tone is heard through the receiver.	3.6.3

ITEM	CHECK ITEM	ACTION	EXPECTED RESULT	REPAIR SUGGESTION
22	Conversation	Dial another exchange line. Answer call at another station. Hang up stations.	Audible signalling will be heard at assigned stations. The LINE LED at all stations will flash at 60 IPM. The stations will be able to converse. The LINE LED is steady at all stations.	3.6.4 3.6.5
23	Intercom	Operate the DSS keys for all other connected stations.	Single tone burst and handsfree talkback conversation is possible.	3.6.12

2.6.4 SWITCHHOOK FLASH OR EARTH RECALL TEST

When the system is equipped with the FGB-A.

*24	Switchhook Flash (Option to be set)	Seize an exchange line at station #1. Dial one digit. Operate RECALL Key and release it.	Exchange dial tone is heard. The dial tone disappears. Hear the dial tone again.	3.6.16
25	Earth Recall (Option to be set)	Place an incoming exchange line call and then operate RECALL key and release it.	This facility is required when the system is installed behind a PBX which provides Earth Recall capability. The station will get PBX dial tone.	

2.6.5 MULTI-CONFERENCING TEST

When the system is equipped with MCB-A.

*26	Multi-Conferencing	Call a known party using exchange line #1 and place it on hold. Call another known party using exchange line #2. Then, operate both exchange line keys simultaneously.	A three-party conference will be established.	3.6.17

ITEM	CHECK ITEM	ACTION	EXPECTED RESULT	REPAIR SUGGESTION

2.6.6 INTERCOM MONITORING TEST

When the third exchange line is not required, that is, LNB-A is not equipped in the system, a telephone station can provide the monitoring facility. Test for each intercom station connected to the system.

*27	Monitor	Operate MON key at an Intercom Station. Operate MON key at a telephone station. (Third LINE key). Talk into Intercom Station	MON LED is lit. If the Intercom Station is arranged to provide BGM, the BGM will be cut off. BGM is cut off, if the option is provided. MON LED will flash at 60 IPM at the monitoring station, but is steady at the other station. The voice is heard through the speaker at the monitoring station.	3.6.18
28	Call While Monitoring	Lift the handset at the monitoring station. Seize an exchange line and release it by placing the handset on hook	The MON LED remains flashing at 60 IPM. Return to monitoring state at the end of the call.	

2.6.7 DOOR STATION TEST

When a Door Station is equipped in the system.

*29	Door Station with Chime.	Idle Place an ALL CALL at station # 1. Call the Door Station from station # 1 by operating the DSS key. Operate the button at the Door Station.	No Background Music is heard at the Door Station. The All Call is not heard at the Door Station. Door Station can respond to station # 1 by talk back, after hearing a single tone burst. The Door Chime tone will be heard from all stations, except stations in use.	3.6.19

2.6.8 ALARM TEST

When an Alarm System is connected.

*30	Alarm Signal	Activate the alarm circuit.	Warning tone should be heard from all stations including the Door Station if this option is assigned.	**3.6.20**

ITEM	CHECK ITEM	ACTION	EXPECTED RESULT	REPAIR SUGGESTION

2.6.9 CALL METERING UNIT TEST

When a Call Metering Unit is connected to the system.

* 31	Call Metering Unit	Seize an exchange line and make a call. Place handset on hook.	Call Metering Unit counts metering pulses.	3.6.21

2.6.10 HANDSFREE CONSOLE TEST

When a Handsfree Console is connected to a telephone station

* 32	Handsfree Console	Operate ON/OFF key. Seize an exchange line. Lift Handset. Depress ON/OFF key, then return handset. Call another station using DSS key. Depress MIC/OFF key. Depress ON/OFF key.	ON/OFF LED lights steadily. Line Key LED goes steady. Hear exchange dial tone. ON/OFF LED goes off. Dial tone transferred to handset. ON/OFF LED lights steadily. Dial tone heard through speaker. Talk handsfree. MIC/OFF LED lights steadily. Called station cannot hear calling station. ON/OFF, MIC/OFF and DSS LED's go off. Call is disconnected.	3.6.22

2.6.1 OA TRUNK BARRING UNIT

When a Trunk Barring Unit is connected to the system.

* 32A	Exchange Line seizure Barred Call	Seize an exchange line at a barred station Dial a barred number Place handset on hook	Line Key LED goes steady Hear exchange dial tone Hear exchange barring tone	3.6.22A

2.6.11 TIE LINE TEST

When the system is equipped with an RTIU (Remote Extension and Tie Line Interface Unit) When a Tie Line is connected.

* 33	Tie Line Seizure	Seize a tie line at a station.	Tie line LED lights steadily If LRB board fitted, RTIU sends ring voltage. Station hears ring tone. If RRB board fitted, RTIU sends ring voltage for a second. No ring tone.	3.6.23

ITEM	CHECK ITEM	ACTION	EXPECTED RESULT	REPAIR SUGGESTION
3 4	Tie Line Answered	Answer at tie line.	Ring tone stops. Station and tie line party can talk.	3.6.24
*35	Incoming Tie Line Call.	Call in from tie line.	Incoming call produces audible signalling and tie line LED flashes at 60 IPM. If LRB fitted, ring tone is sent to tie line.	3.6.25
36	Answering a Tie Line Call.	Depress line key.	Tie line LED lights steadily. Station and tie line can talk.	3.6.26

2.6.12 REMOTE EXTENSION TEST

When a Remote Extension is connected.

*37	Intercom Call (Remote Extension to Station)	Lift the handset.	Hear internal dial tone.	3.6.27
		Dial station call code. (201 to 208)	Call is made to that station. Handsfree talk-back call. Ask station to hold an exchange line.	3.6.28
38	Exchange Line Call. (Remote Extension to Exchange Line).	Lift the handset.	Hear internal dial tone.	
		Ensure that an exchange line is placed on hold by a telephone station.		
		Dial appropriate exchange line selection code (31 to 33).	Hear local exchange dial tone.	
	Hold	Depress the switchhook momentarily.	Exchange line placed on hold. Internal dial tone to remote extension.	**3.6.29**
		Redial appropriate exchange line selection code (31 to 33).	Hear local exchange dial tone.	
		Place hand-set on-hook.	Line is released	3.6.30

3
MAINTENANCE

3.1 TEST EQUIPMENT AND MAINTENANCE AIDS

A multimeter, continuity tester and other normal on-site Telecom equipment is all that is required. A small and medium sized philips head and straight blade screw drivers are required. Fault finding flow charts are provided in section 3.5 as an aid to find and repair faults. To maintain service during maintenance it is possible to join the LTC-A and LTC-B connectors together (Figure 45) which directly connects the first three stations to the three exchange lines and powerfail bells.

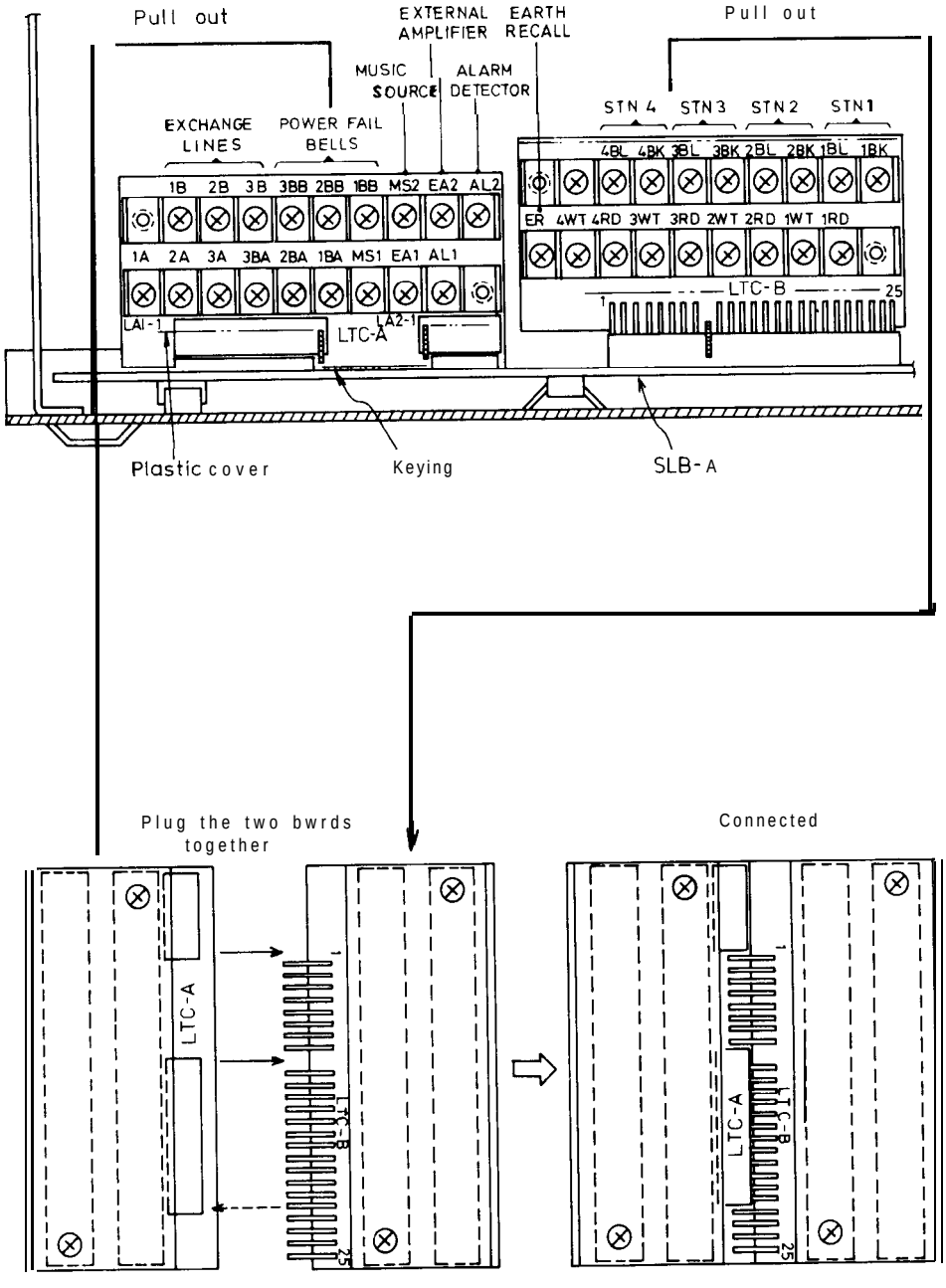


FIG. 45 - CONNECTION OF LTC-A AND LTC-B TO PROVIDE EXCHANGE LINE OPERATION WHILE CARRYING OUT SERVICE

3.2 TEST POINTS

3.2.1 MAIN EQUIPMENT

Exchange Lines, Powerfail Bells, Music Source, External Amplifier and Alarm Detector are accessed on the LTC-A board (refer Section 2.4.9.1 and Figure 45). Exchange lines should be approx. 50 Volts with all stations on hook. Powerfail bell terminations should have approx. 75 Vrms when in operation (i.e. during ring).

Telephone, Intercom and Door station A and B pair terminal connections are accessed on LTC-B and LTC-C (refer to sections 2.4.9.2 and 2.4.9.3). Refer to section 3.2.3 for the approximate voltages that are expected on the LTC-B and LTC-C boards.

Power Supply voltages for the Main Equipment are accessed on terminals on the SLB-A board (refer to Figure 40).

3.2.2 POWER SUPPLY

Supply of + 18V,-18V plus minus 0.5V with reference to COM is accessed at the socket located on the Power Supply, refer to Figure 46.

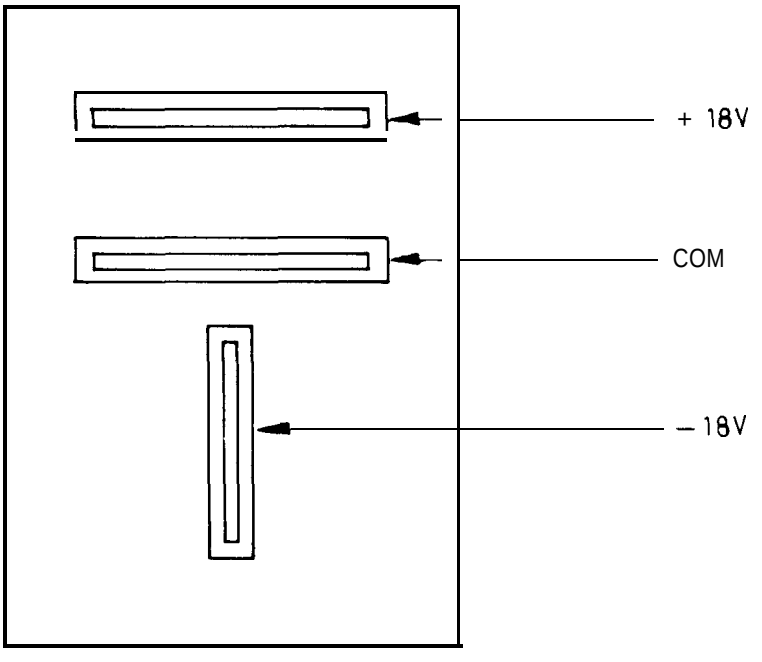


FIG. 46 - MAIN EQUIPMENT POWER SOCKET LOCATED ON SIDE OF THE POWER SUPPLY

3.2.3 STATIONS

Telephone station A and B pairs are accessed at the 610 socket and LBL, LWT and LRD, LBK quick connect terminals which are located on the STB-A (refer Figure 34). The A-pair should have a voltage of between 3V and 12V (polarity unimportant) when an exchange line is seized by the station. The B-pair should have a potential difference of approx. + 28V (terminal LRD (pin 1) with reference to LBK (pin 5)) in the same condition. The B-pair should also have a potential difference of +36V at the socket when the station is disconnected.

A multimeter may be used providing the test battery potential does not exceed 1.5V. Input resistances are:-

A pair open circuit when handset is on hook and greater than 5K ohm when handset is off hook.

B pair greater than 5K ohm.

Intercom and Door stations are accessed on the ISB-A and DSB-A (Figure 35) boards respectively.

Signalling between main equipment and intercom station is by voltage detection between A and B pairs. Measure LRD with reference to LBK, it is +30V during idle, +20V during talkback and +15V during All Call.

Signalling between main equipment and door station is by voltage detection between A and B pairs. Measure LRD with reference to LBK, it is +30V during idle and +20V during talkback.

Input resistance of the Intercom and Door stations is:-

- A pair is greater than 1 Mohm.
- B pair is approx. 10 ohms.
- LRD with reference to LWT is greater than 5K.

3.2.4 HANDSFREE CONSOLE

Access test points on the HFTB-A terminal board (Figure 38) which is located in the telephone station (plugged into the T connector on STB-A). Terminal T2 is +20V with reference to T1 and is used to supply the handsfree console.

3.2.5 REMOTE EXTENSION AND TIE LINE INTERFACE UNIT

Test points are accessed on the side of the RTIU (refer to Figure 18 and 33). Since a Tie Line takes the place of an exchange line, terminals A and B are 48V when idle and between 3V and 12V when the Tie Line is seized.

For the Remote Extension voltages are similar to A and B above. The voltage between LWT and LBL is between 3V and 12V and LRD with reference to LBK is approx. +30V.

3.3 POWER SUPPLY INDICATION

The power supply is equipped with a Power Failure Indicator Lamp which lights when power fails for a short period. This indicates to the user that the trouble does not lie with the telephone system, and therefore does not require Telecom service. On power up the system is automatically reset. The Reset Switch is operated to turn off the lamp.

3.4 MAINTENANCE PROCEDURES

It is recommended that the following spares are carried by service staff:

COMPONENT	IMPORTANCE
Transmitter	Non Critical
Receiver	Non Critical
Cords (Handset and Line)	Non Critical
603 Plug/610 Socket	Non Critical
Fuses as outlined in table 3.6.1	Non Critical
Keytops (3 colours)	Non Critical
Installation Cable (2 pair not flat cable)	Non Critical

The following parts will be kept at the FDC/SDC store. When the diagnostic flow charts indicate that one or more of these parts requires replacement, they should be obtained from the store on a one-for-one basis.

Power Supply	Non Critical
Printed Board Assemblies	
CPB-A	Critical
SLB-A	Critical
4SB-A	Non Critical
SIB-A	Non Critical
LNB-A	Non Critical
FGB-A	Non Critical
MCB-A	Non Critical
RRB-A	Non Critical
LRB-A	Non Critical
RXB-A	Non Critical
3IFB-A	Non Critical
RTB-A	Non Critical
Telephone Station	Non Critical
Intercom Station	Non Critical
Door Station	Non Critical
Call Metering Unit	Non Critical
Handsfree Console	Non Critical
Trunk Barring Unit	Non Critical

3.4.1 MAINTENANCE PROCEDURES

Due to the sensitivity of some components (especially the MOS components) and their susceptibility to damage by static discharge, maintenance will be limited to changeover in the case of PBAs, and replacement of telephone parts in the case of stations. To protect faulty assemblies, all transport of PBAs, telephones etc., must take place in the protective containers supplied with the new item.

For faulty assemblies and items such as Telephone Station, Handsfree Consoles, Intercom and Door Stations, RTIU, Power Supply and Main Equipment, all transport must take place in the protective containers supplied with the new item.

3.4.2 PRINTED BOARD ASSEMBLIES (PBAs)

Any fault in a PBA will necessitate replacement of the whole assembly. No repair of PBAs will be done on site or in field depots. Faulty PBAs will be repaired free of charge by the manufacturer under the terms of the guarantee. Any attempt to repair a PBA in the field will invalidate the guarantee for that PBA.

Most facilities of this system are provided by the insertion of programming links into connectors on various PBAs. Before replacing any PBA indicated by the diagnostic flow charts, perform the following:

- Ascertain whether the faulty facility is provided by the insertion of programming links.
- Check with tables 2.5.1, 2.5.2 and 2.5.3 and ensure that the appropriate links are inserted.
- When installing the new PBA, ensure that the links provided on the replacement PBA are identical to those installed on the faulty PBA.

3.4.3 TELEPHONE STATIONS

Maintenance on telephone stations will be confined to replacement of transmitter and receiver insets, cords, plugs and sockets. Faults in the PBAs within the telephone station, or with the pushbutton assemblies, (as indicated by the diagnostic flow charts) will be rectified by replacement of the telephone station complete.

3.4.4 OTHER ITEMS

Other stations include: Intercom Station (IS), Door Station (DS), Handsfree Console (HFC), and Call Metering Unit (CMU). When any of these items are diagnosed as faulty by the use of flow charts or testing, they will be changed over complete.

The Remote Extension and Tie Line Interface Unit (RTIU) will be maintained similarly to the Main Equipment, i.e. individual PBA's will be replaced when they are diagnosed to be faulty. When the RTIU power supply is diagnosed to be faulty, it will necessitate changeover of the RTIU complete. The PBA's in the RTIU will need to be re-installed in the RTIU.

3.4.5 POWER SUPPLY

The power supply, when diagnosed as being faulty, will be changed over complete.

Note: These power supplies are powered from the 240 Volt mains supply and hazardous voltages are present within. Do not remove covers or attempt to repair these devices in the field.

3.4.6 WARNINGS

1. The following precautions must be observed when working on the system. The power switch on the power supply must be turned OFF when replacing stations, boards, re-wiring the system, or adding optional boards. If this work is done with the power ON, semiconductor circuits in the system may be damaged.

2. The N308 is a four wire telephone system. One pair is used for audio, the second for power and data. Hence it is imperative that the system is wired with the correct polarities. Check all wiring before initial power up of the system.

TELECOM CABLE	603/610 PLUG/SOCKET	DESIGNATION
White (WT)	2	LINE 1
Blue (BL)	6	LINE 2
Red (RD)	1	DATA +
Black (BK)	5	DATA -

3. Take special care not to short between any terminals. This may cause damage to the system.

4. The fuses that are provided in the system are unlikely to blow if the system is connected properly. The fuses may blow when a component or a station is replaced with the power ON, or wiring is incorrect.

Standard fuse ratings	315mA	use	375mA,
	0.8A	use	1A.

5. **Handling of Boards:**

This equipment contains a considerable number of MOS, and other static sensitive components. To reduce the incidence of premature failure due to static discharge, the following precautions MUST be taken:

- Always ensure that power is disconnected before unplugging PBAs.
- Always discharge static from yourself by touching a conductive part of the main equipment before handling boards.
- Handle PBAs by the edge or by the handles. Do not handle PBA tracks, components or edge connectors (contaminants introduced by fingers can cause corrosion and high resistance connections).
- Components are physically delicate. Finger pressure on a component can fracture, but not necessarily break component leads: a future fault.

To protect against physical damage and damage due to static discharge, PBAs must ALWAYS be wrapped in aluminium foil (e.g. cooking foil) and inserted into an **ANTISTATIC** plastic bag and placed in the protective container provided with the new item.

These procedures apply equally to both working and faulty PBAs. Careless handling, storage and transporting will cause secondary or future faults.

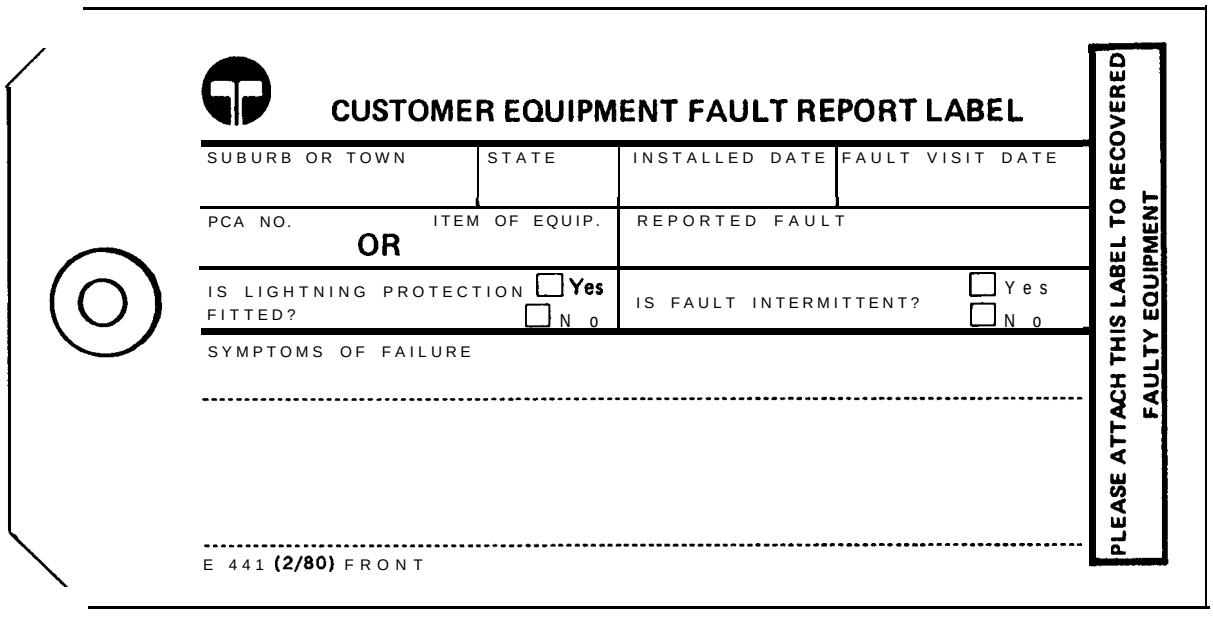


FIG. 47 - CUSTOMER EQUIPMENT FAULT REPORT LABEL

To assist repair of assemblies and other items field staff must attach a Customer Equipment Fault Report Label E441 (Figure 47) to all faulty assemblies at the time of field replacement. As the circuits of these assemblies are very complex, any information regarding the faulty condition will be of great assistance to the repair centre. If the fault condition is suspected of being intermittent, this should be noted also.

3.5 FAULT FINDING FLOW CHARTS

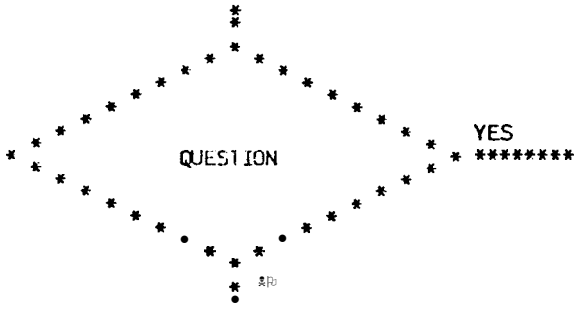
The **disgnostic** flow charts may be used whenever a system failure occurs. They are a means of **localising** a fault **occurence** in one of the printed board assemblies **(PBA)** in an established working system.

Always commence at the “Start” block.

Flow Chart Symbols:

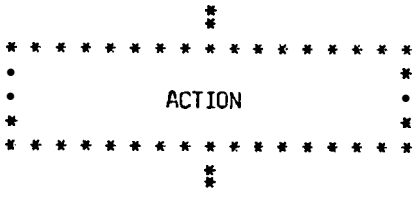
(a) Decision Function:

This block contains a question which may be answered only by a ‘YES’ or a ‘NO’. One only of its two outward paths may be taken, depending upon that answer.



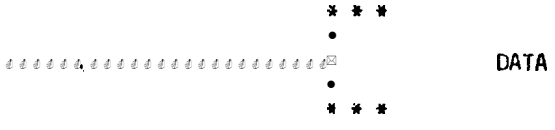
(b) Action/Operation:

This block contains instructions defining an action to be taken (e.g. board replacement) or a test to be made (this will precede a decision function). It is essential to comply exactly with the instructions.



(c) Data Block:

This does not form part of the fault-finding sequence, but provides necessary information (e.g. connector points, terminal allocations, etc.) required by an ‘Action or Decision Block’. It is attached to the relevant ‘Action or Decision’ block by a dotted line.



(d) Exit/Entry Points:

Numbered circles are used to move from page to page within a flow chart. In the example shown, exits to point '2' appear on both pages 6 and 9; entry point '3' is located on page 7. Each circle has its destination (or origin) page number(s) noted beside it.

3.5.1 SYSTEM CHECK

The following flow charts are intended to provide a maintenance procedure to repair a system by replacing faulty boards. If the main equipment needs to be replaced (CPB-A and SLB-A), and no spares exist, then it is possible to connect the LTC-A and LTC-B boards together to allow the system to remain in service as a simple two line telephone system. (See Figure 45).

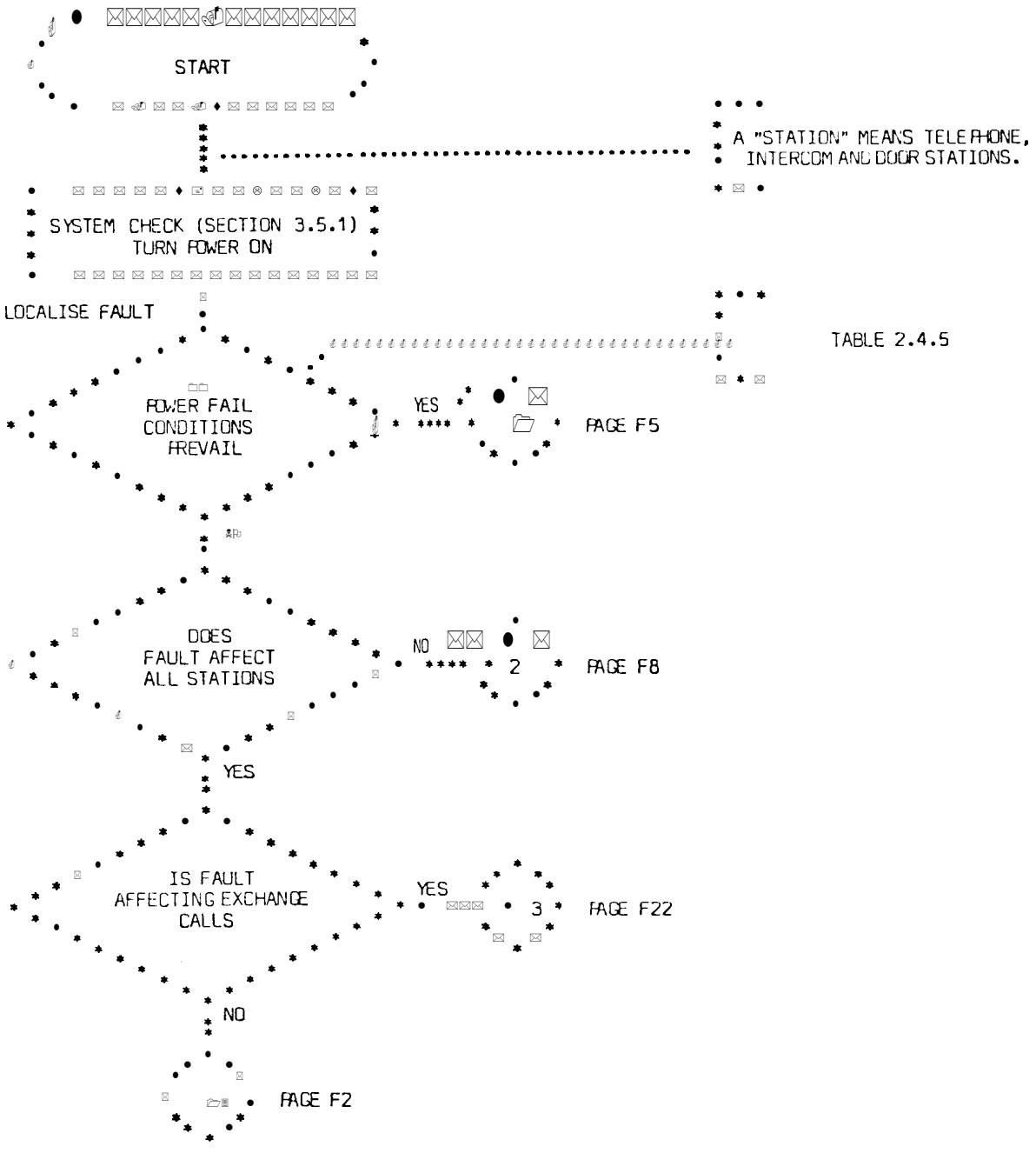
The following points are included as an aid to fault diagnosis and should be carried out as the first step in the flow charts.

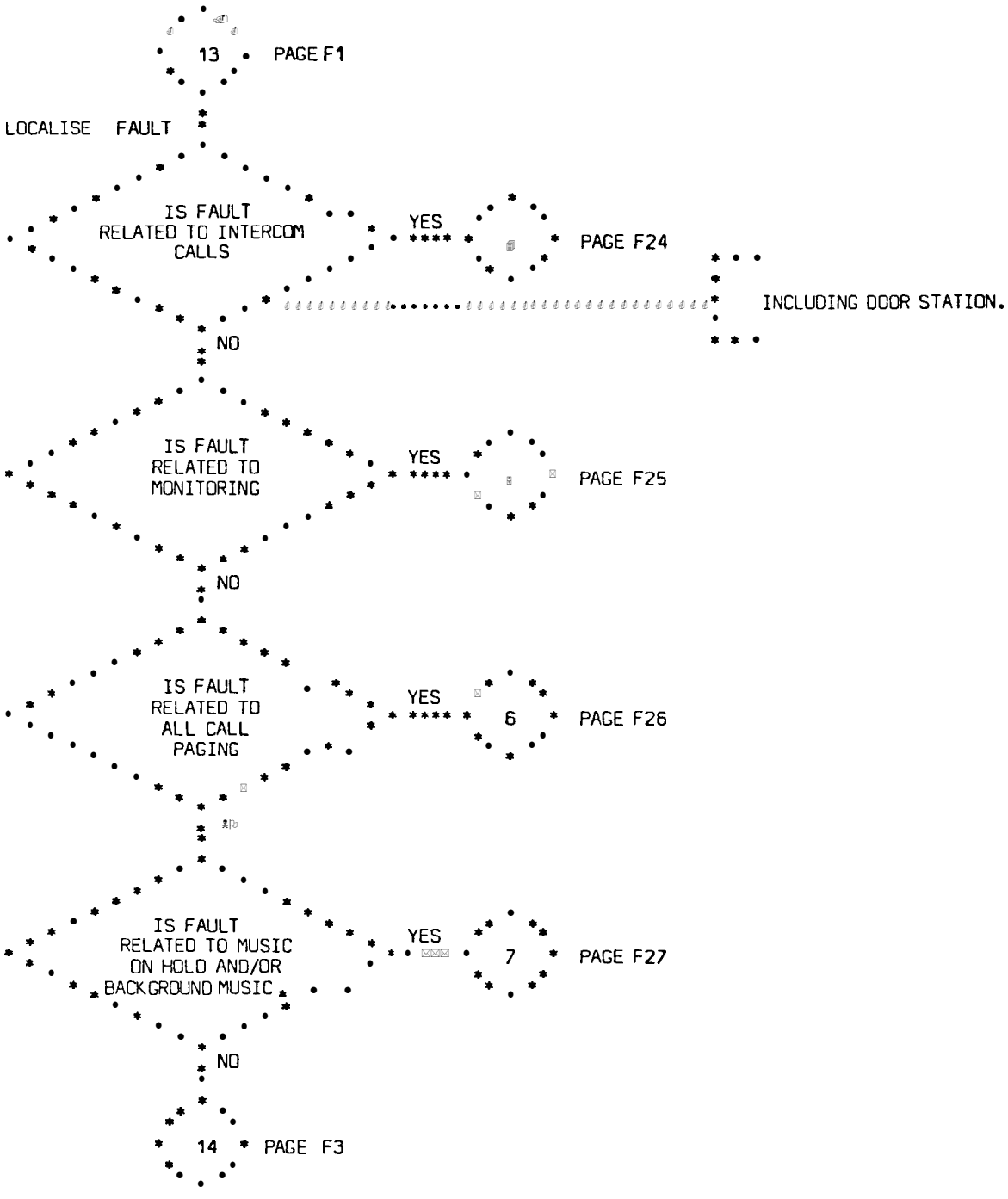
1. The power switch on the Power Supply must be turned off when replacing stations or PBA's. If work is done with the power on, semi conductor circuits in the system may be damaged.
2. Note the warnings on the handling of PBA's containing MOS circuitry in Section 3.4.6.
3. The following items must be checked:

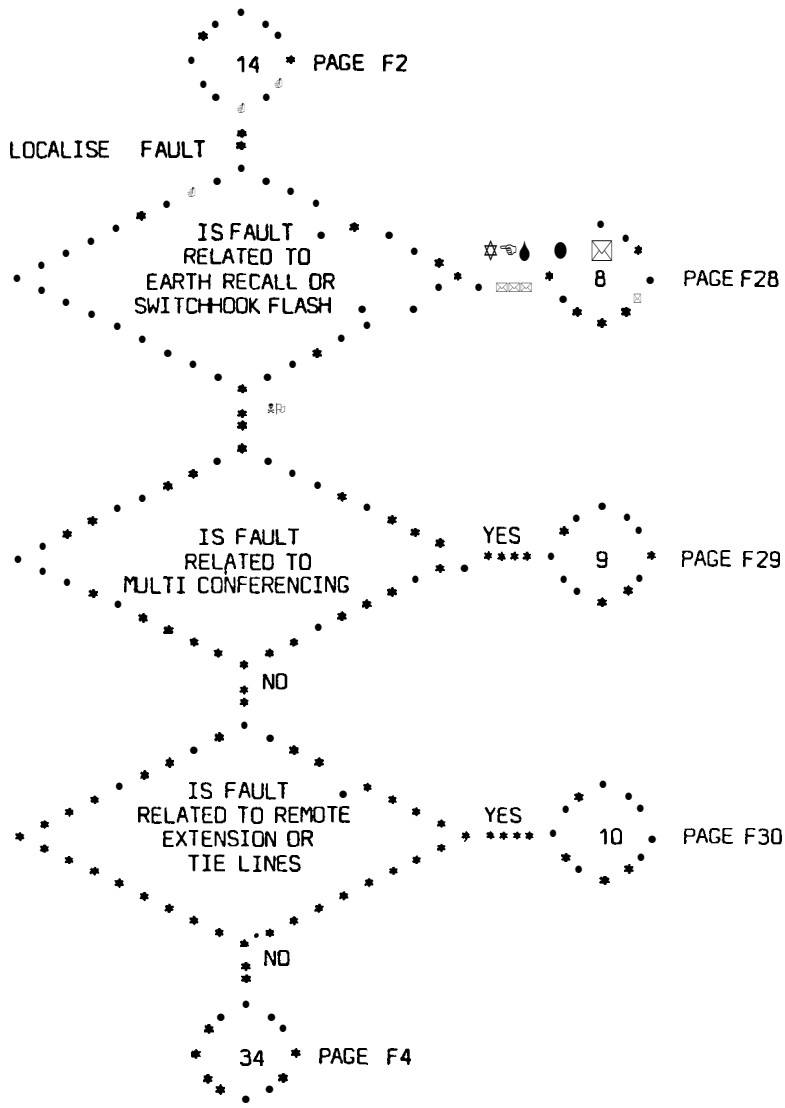
- Cables run between the main equipment and all stations.
- Termination of cables at LTC connectors in the main equipment and terminations at all stations. (Refer Section 2.4.9).
- Connection of flat cable between boards in the main equipment (Refer Figure 31).
- The fuses on the interface cards SLB-A, 4SB-A and SIB-A. (Refer to Table 3.6.1 Fuse Ratings).
- The LTC connectors are correctly inserted.
- The programming link in the CC connector on CPB-A must be between pins 2 and 3. (Refer to Figure 41).
- The correct programming link allocation for the system layout.
- Ensure that the MCB-A board is inserted and the AR connector link between 1 and 2 is removed on CPB-A's manufactured up to and including December 1981

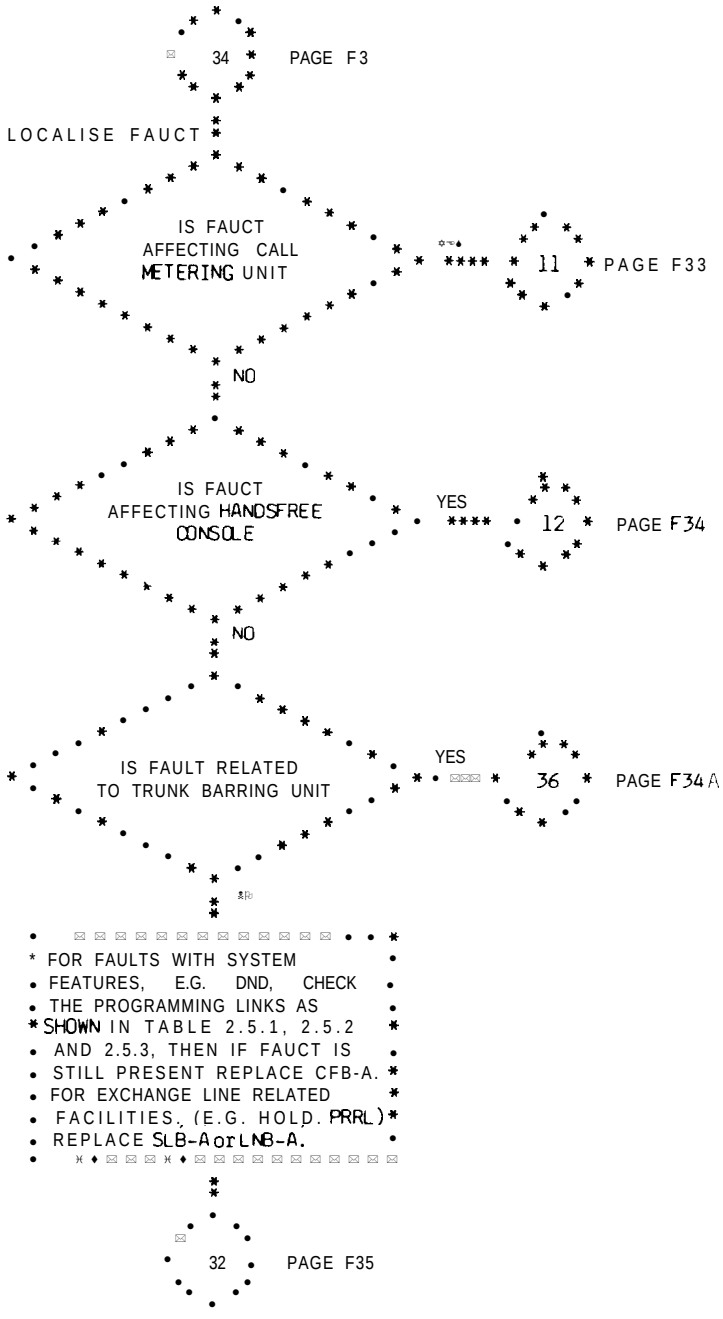
3.5.2 SWAP FAULTY COMPONENT TO CONFIRM FAULT

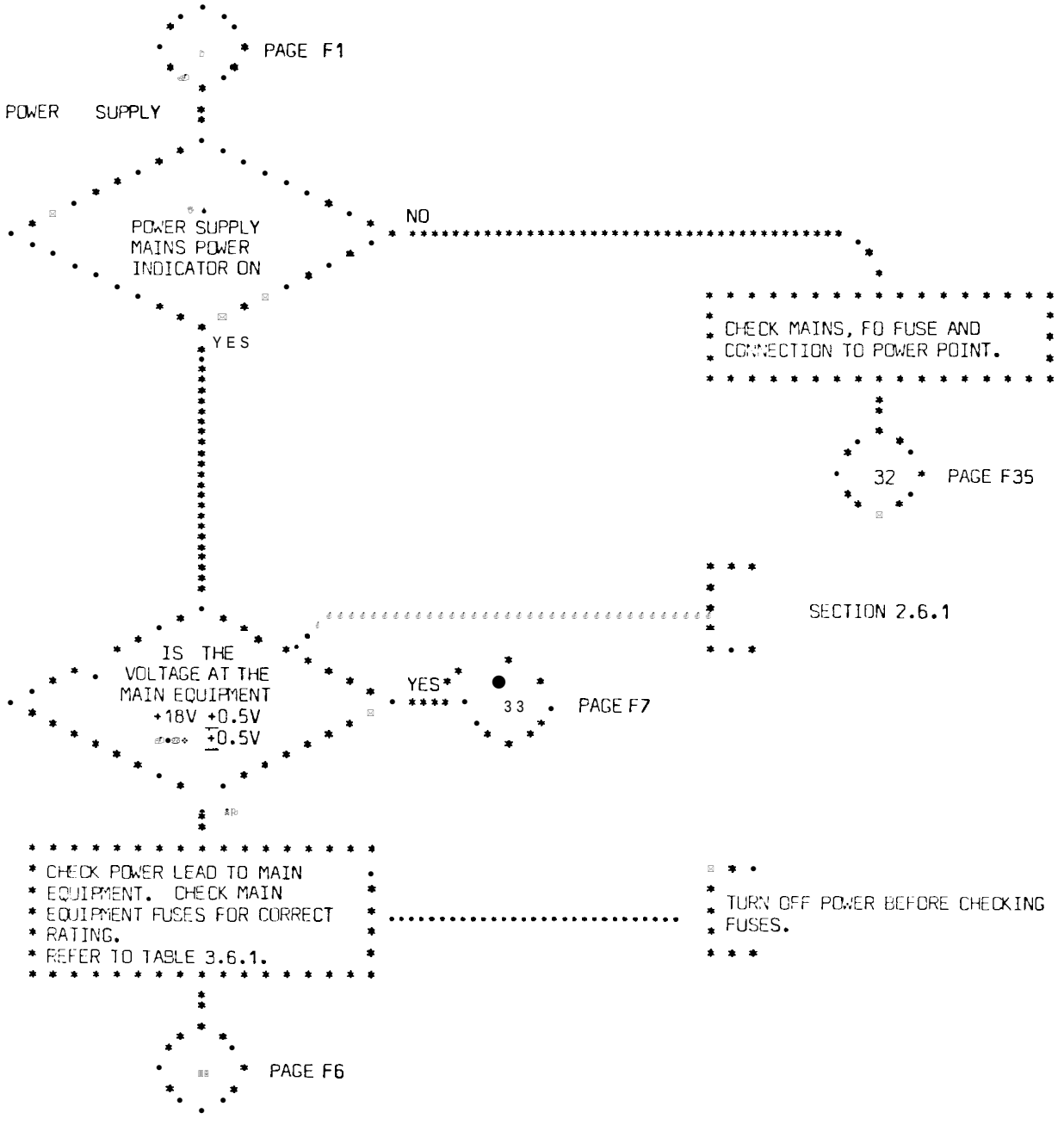
When a faulty item has been located and it is duplicated in the system e.g. station, swap the components and check that the fault follows the faulty item.

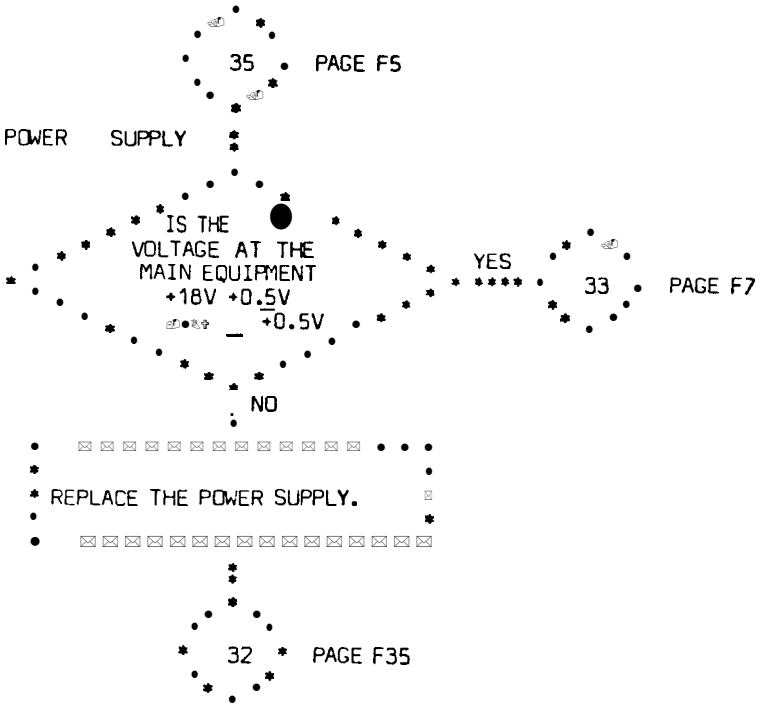

START
A "STATION" MEANS TELEPHONE, INTERCOM AND DOOR STATIONS.
SYSTEM CHECK (SECTION 3.5.1)
TURN POWER ON
LOCALISE FAULT
TABLE 2.4.5
POWER FAIL CONDITIONS PREVAIL
YES
PAGE F5
DOES FAULT AFFECT ALL STATIONS
NO
2
PAGE F8
YES
IS FAULT AFFECTING EXCHANGE CALLS
YES
3
PAGE F22
NO
PAGE F2

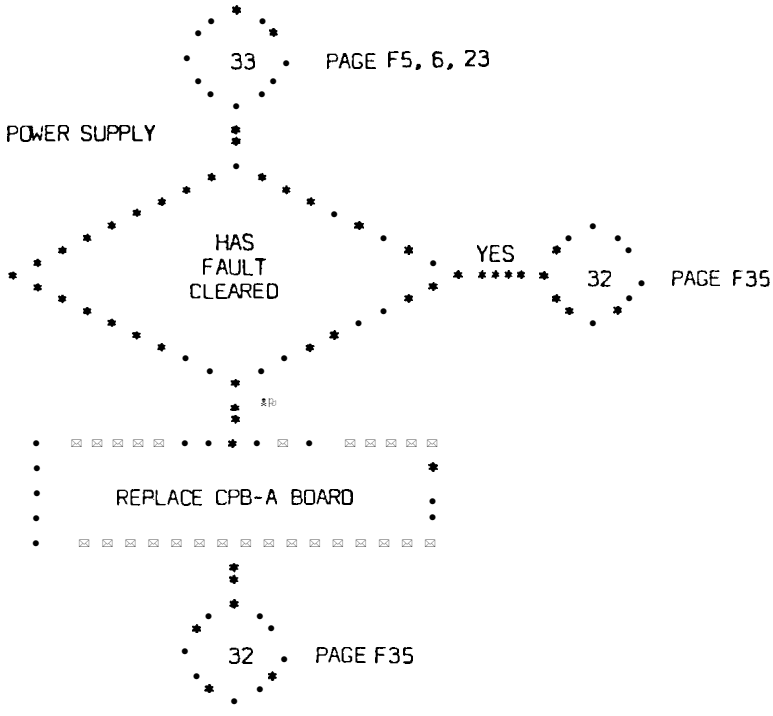

13
PAGE F1
LOCALISE FAULT
IS FAULT RELATED TO INTERCOM CALLS
YES
PAGE F24
INCLUDING DOOR STATION.
NO
IS FAULT RELATED TO MONITORING
YES
PAGE F25
NO
IS FAULT RELATED TO ALL CALL PAGING
YES
6
PAGE F26
IS FAULT RELATED TO MUSIC ON HOLD AND/OR BACKGROUND MUSIC
YES
7
PAGE F27
NO
14
PAGE F3

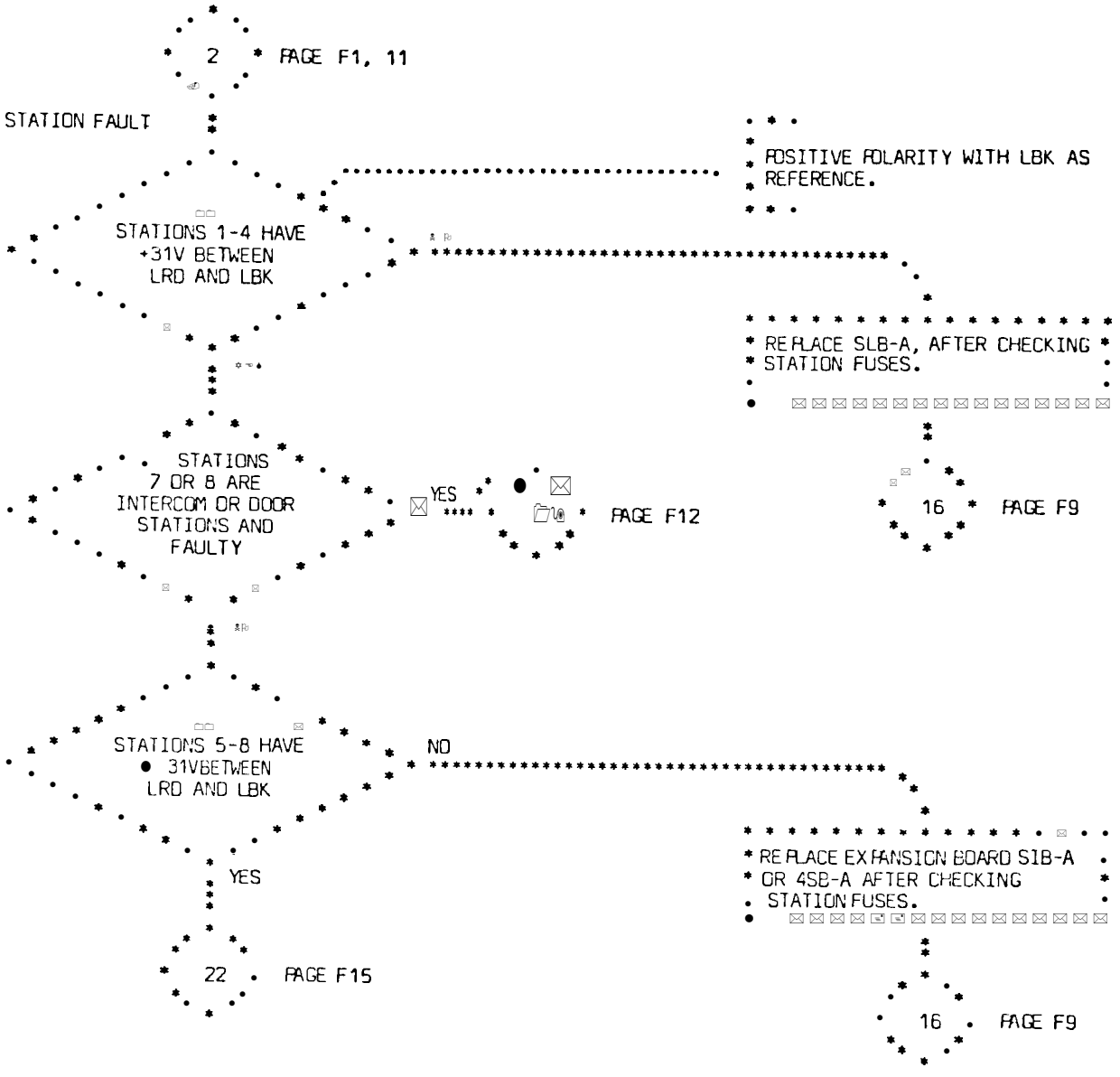

14
PAGE F2
LOCALISE FAULT
IS FAULT RELATED TO EARTH RECALL OR SWITCHHOOK FLASH
8
PAGE F28
IS FAULT RELATED TO MULTI CONFERENCING
YES
9
PAGE F29
NO
IS FAULT RELATED TO REMOTE EXTENSION OR TIE LINES
YES
10
PAGE F30
NO
34
PAGE F4

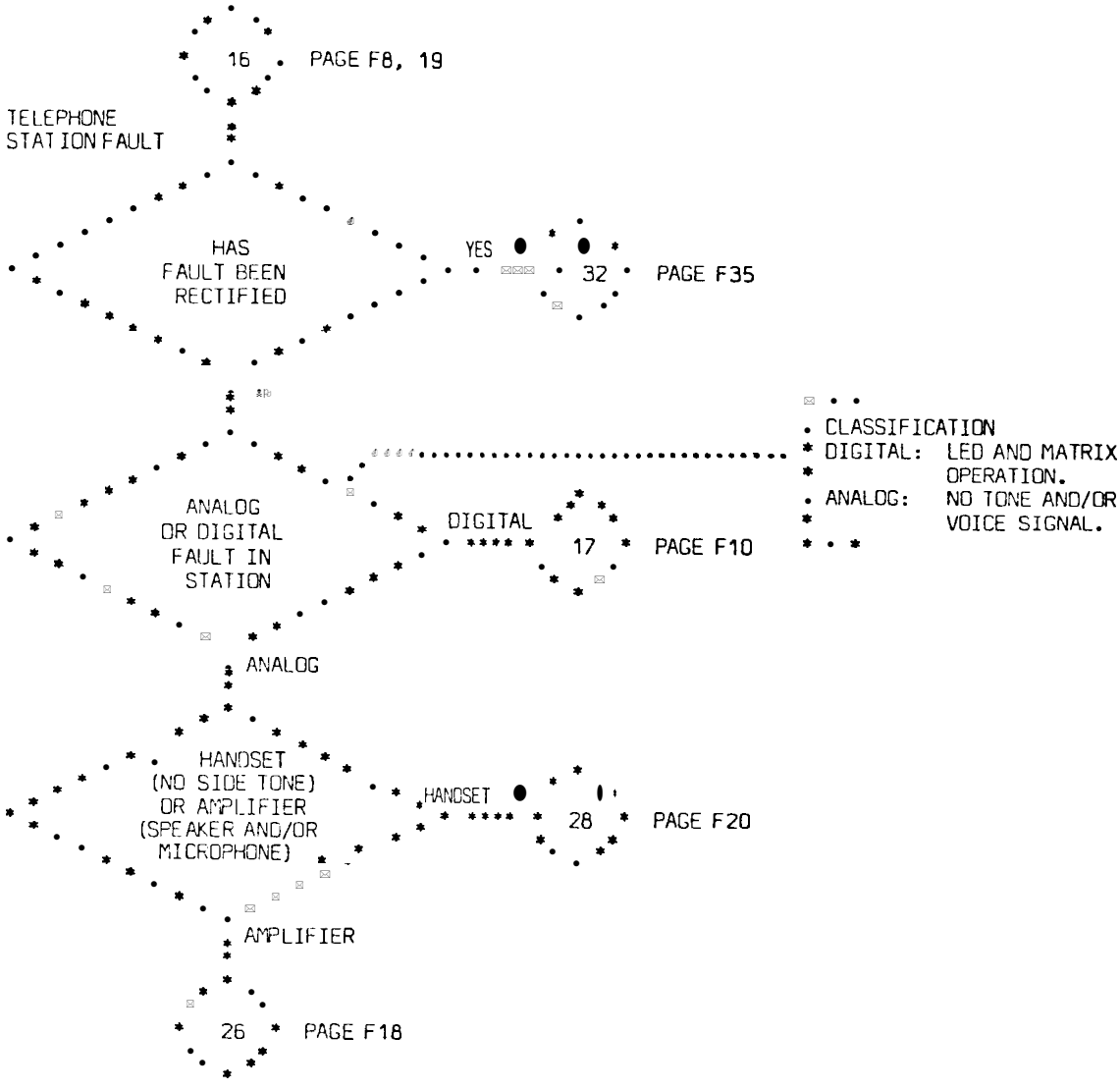

34
PAGE F3
LOCALISE FAUCT
IS FAUCT AFFECTING CALL METERING UNIT
YES
11
PAGE F33
NO
IS FAUCT AFFECTING HANDSFREE CONSOLE
YES
12
PAGE F34
NO
IS FAULT RELATED TO TRUNK BARRING UNIT
YES
36
PAGE F34A
* FOR FAULTS WITH SYSTEM FEATURES, E.G. DND, CHECK THE PROGRAMMING LINKS AS SHOWN IN TABLE 2.5.1, 2.5.2 AND 2.5.3, THEN IF FAUCT IS STILL PRESENT REPLACE CFB-A. FOR EXCHANGE LINE RELATED FACILITIES, (E.G. HOLD. PRRL) REPLACE SLB-A or LNB-A.
32
PAGE F35

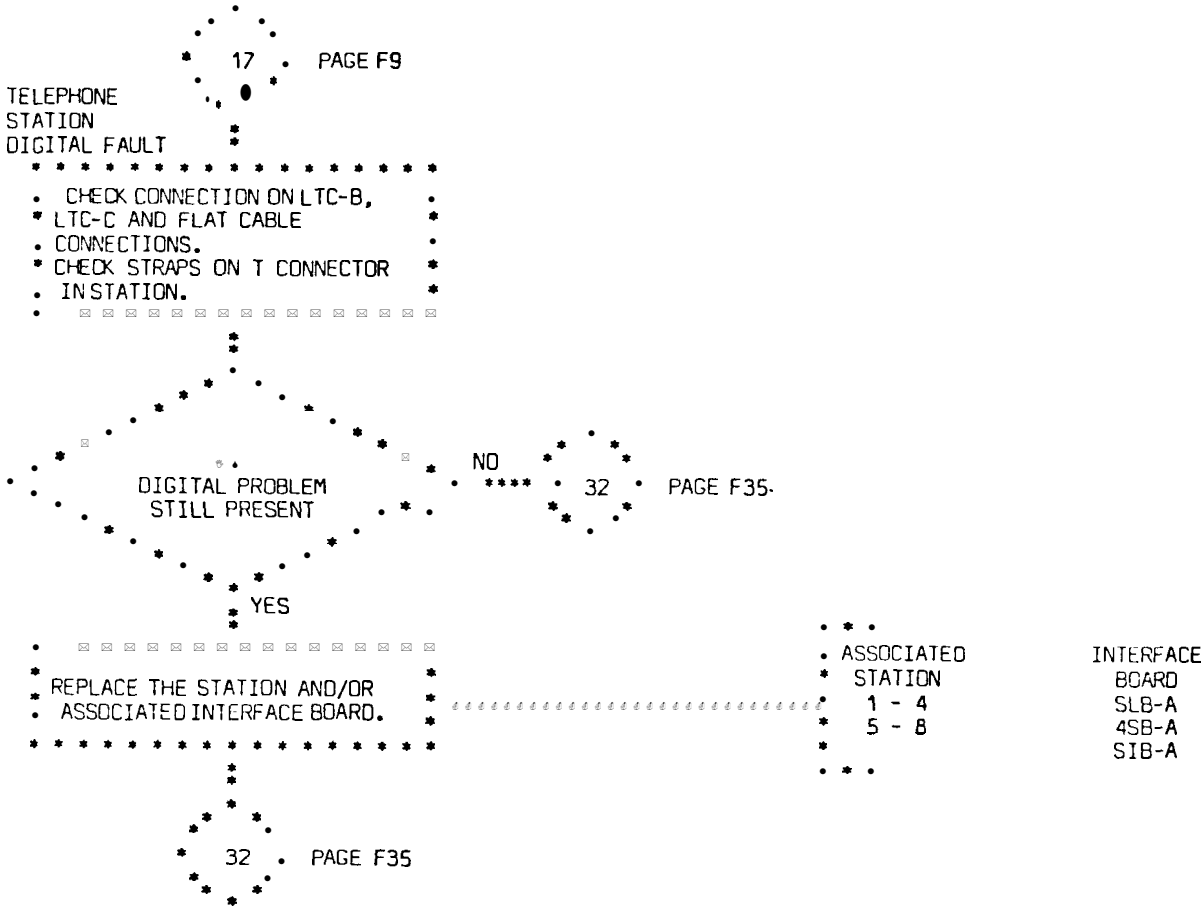

PAGE F1
POWER SUPPLY
POWER SUPPLY MAINS POWER INDICATOR ON
NO
CHECK MAINS, FO FUSE AND CONNECTION TO POWER POINT.
32
PAGE F35
YES
SECTION 2.6.1
IS THE VOLTAGE AT THE MAIN EQUIPMENT +18V +0.5V -0.5V
YES
33
PAGE F7
CHECK POWER LEAD TO MAIN EQUIPMENT. CHECK MAIN EQUIPMENT FUSES FOR CORRECT RATING. REFER TO TABLE 3.6.1.
TURN OFF POWER BEFORE CHECKING FUSES.
PAGE F6

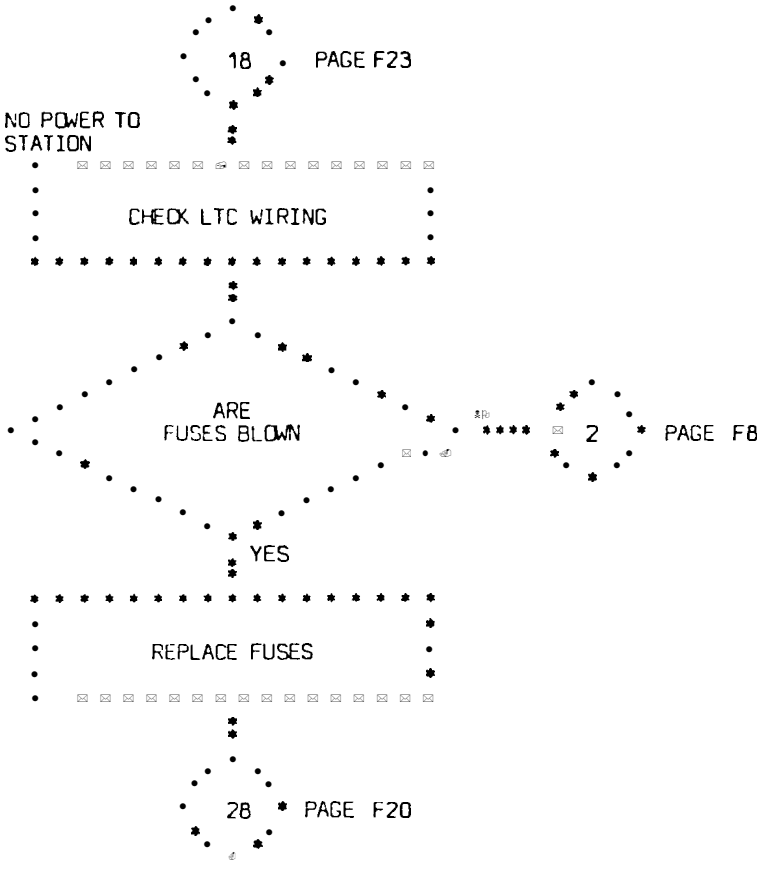

35
PAGE F5
POWER SUPPLY
IS THE VOLTAGE AT THE MAIN EQUIPMENT +18V +0.5V -0.5V
YES
33
PAGE F7
NO
REPLACE THE POWER SUPPLY.
32
PAGE F35

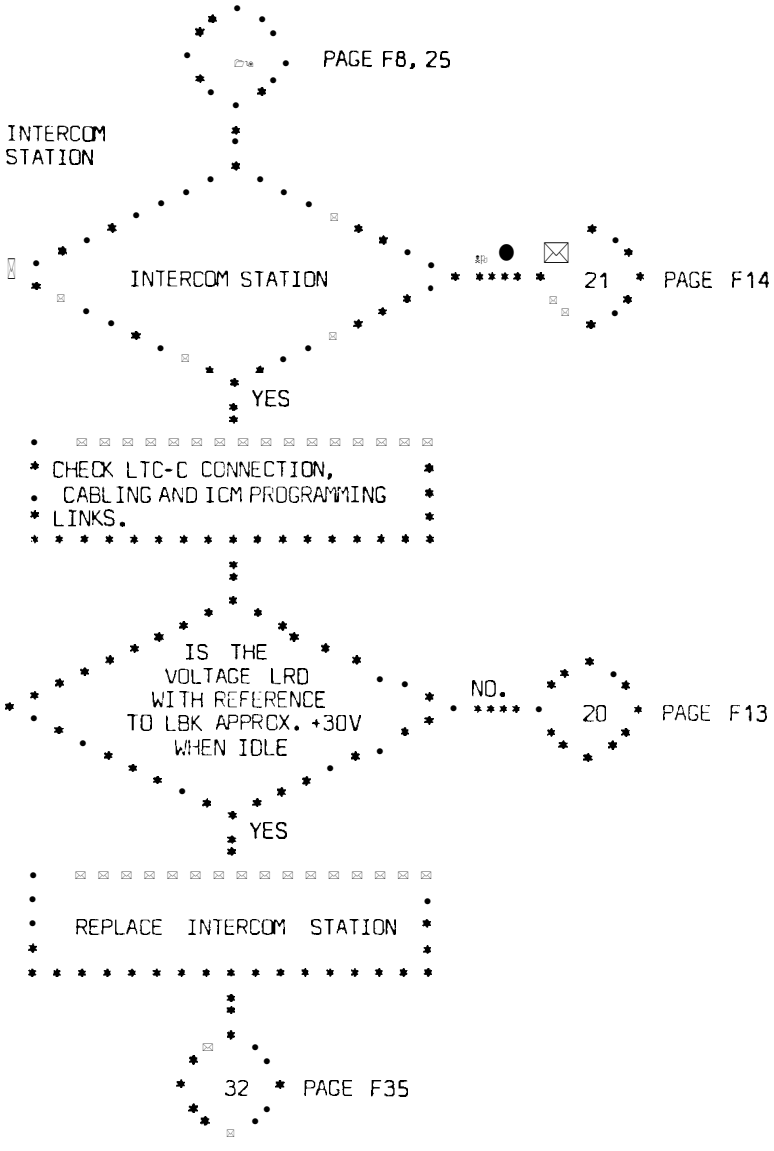

33
PAGE F5, 6, 23
POWER SUPPLY
HAS
FAULT
CLEARED
YES
32
PAGE F35
REPLACE CPB-A BOARD
32
PAGE F35

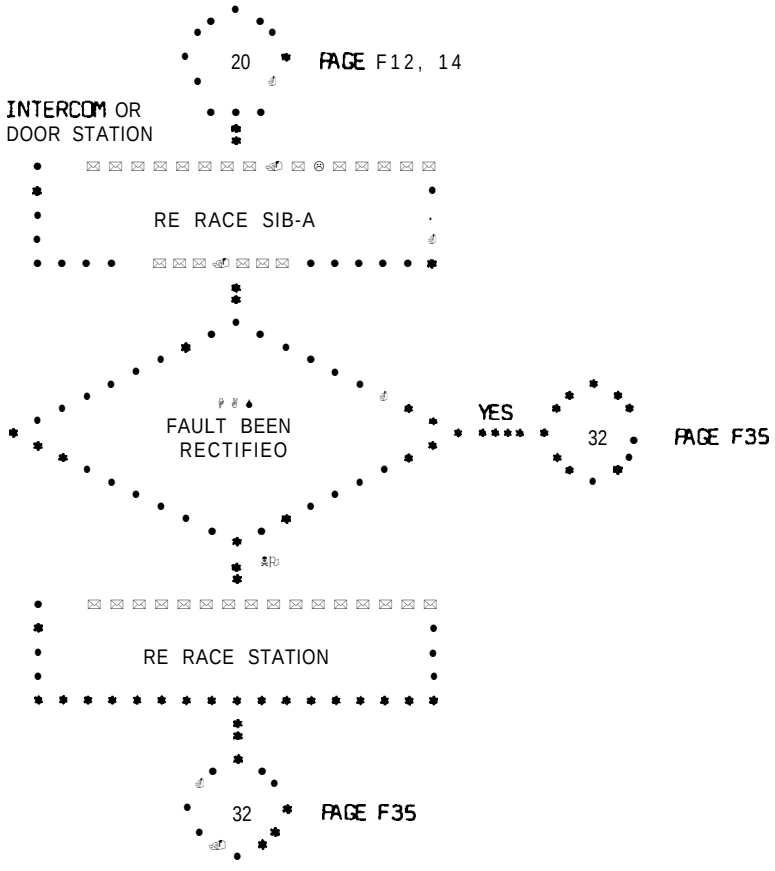

2
PAGE F1, 11
STATION FAULT
POSITIVE POLARITY WITH LBK AS REFERENCE.
STATIONS 1-4 HAVE +31V BETWEEN LRD AND LBK
REPLACE SLB-A, AFTER CHECKING STATION FUSES.
16
PAGE F9
STATIONS 7 OR 8 ARE INTERCOM OR DOOR STATIONS AND FAULTY
YES
PAGE F12
STATIONS 5-8 HAVE 31VBETWEEN LRD AND LBK
NO
REPLACE EXPANSION BOARD SIB-A OR 4SB-A AFTER CHECKING STATION FUSES.
YES
22
PAGE F15
16
PAGE F9

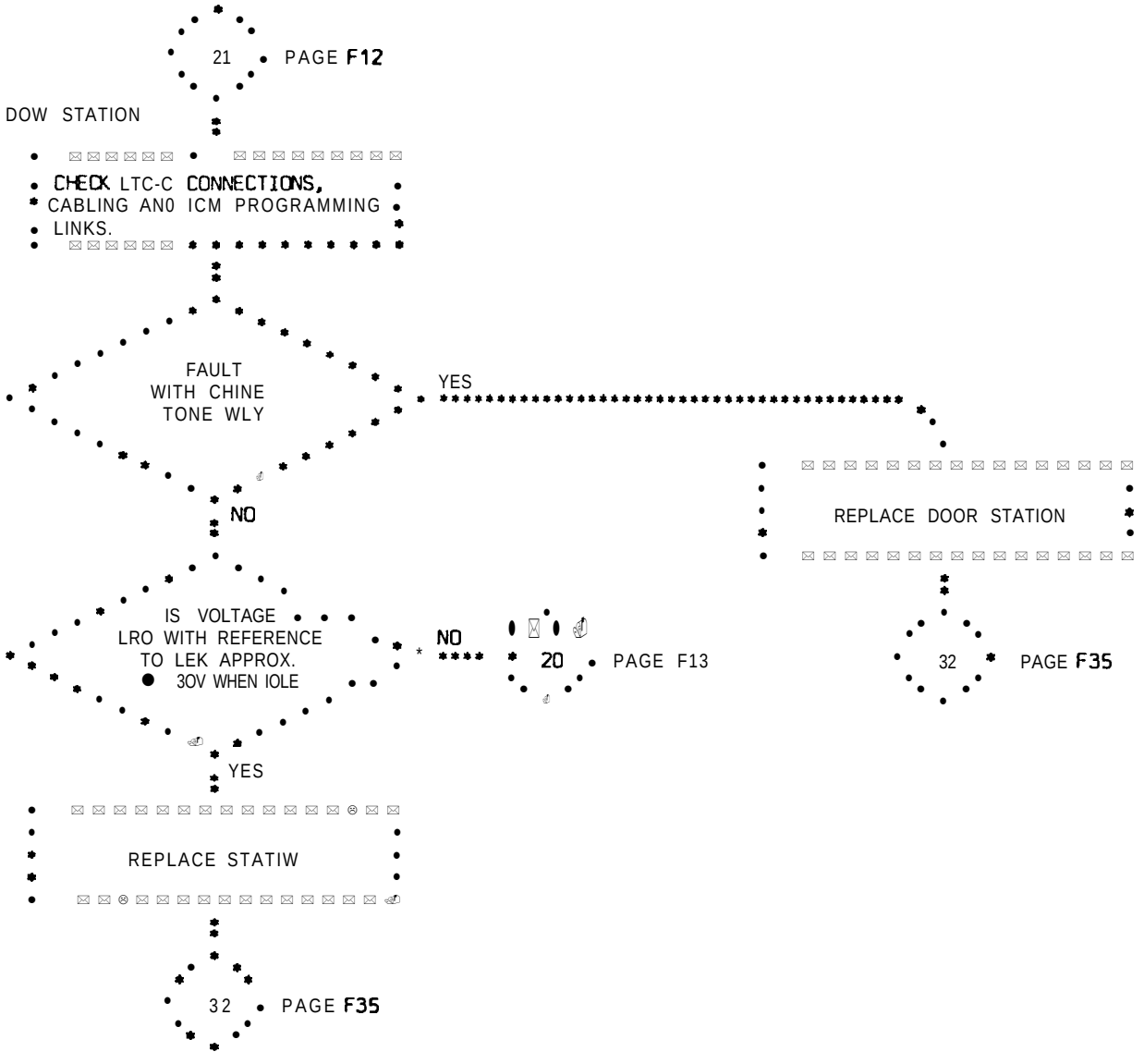

16
PAGE F8, 19
TELEPHONE
STATION FAULT
HAS
FAULT BEEN
RECTIFIED
YES
32
PAGE F35
CLASSIFICATION
DIGITAL: LED AND MATRIX
OPERATION.
ANALOG: NO TONE AND/OR
VOICE SIGNAL.
ANALOG
OR DIGITAL
FAULT IN
STATION
DIGITAL
17
PAGE F10
ANALOG
HANDSET
(NO SIDE TONE)
OR AMPLIFIER
(SPEAKER AND/OR
MICROPHONE)
HANDSET
28
PAGE F20
AMPLIFIER
26
PAGE F18

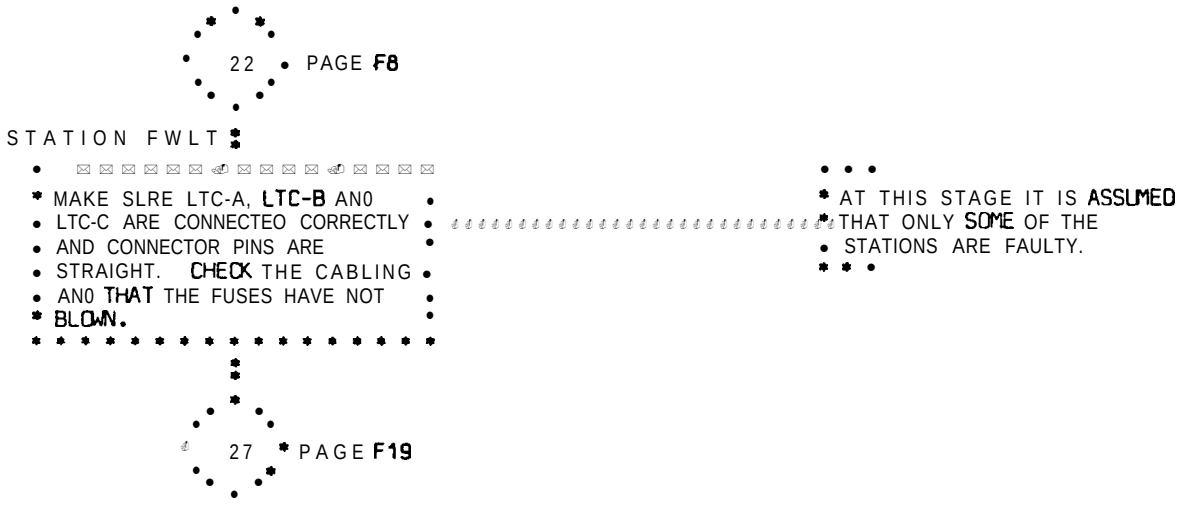

17
PAGE F9
TELEPHONE
STATION
DIGITAL FAULT
CHECK CONNECTION ON LTC-B,
LTC-C AND FLAT CABLE
CONNECTIONS.
CHECK STRAPS ON T CONNECTOR
IN STATION.
DIGITAL PROBLEM
STILL PRESENT
NO
32
PAGE F35.
YES
REPLACE THE STATION AND/OR
ASSOCIATED INTERFACE BOARD.
ASSOCIATED
STATION
1 - 4
5 - 8
INTERFACE
BOARD
SLB-A
4SB-A
SIB-A
32
PAGE F35

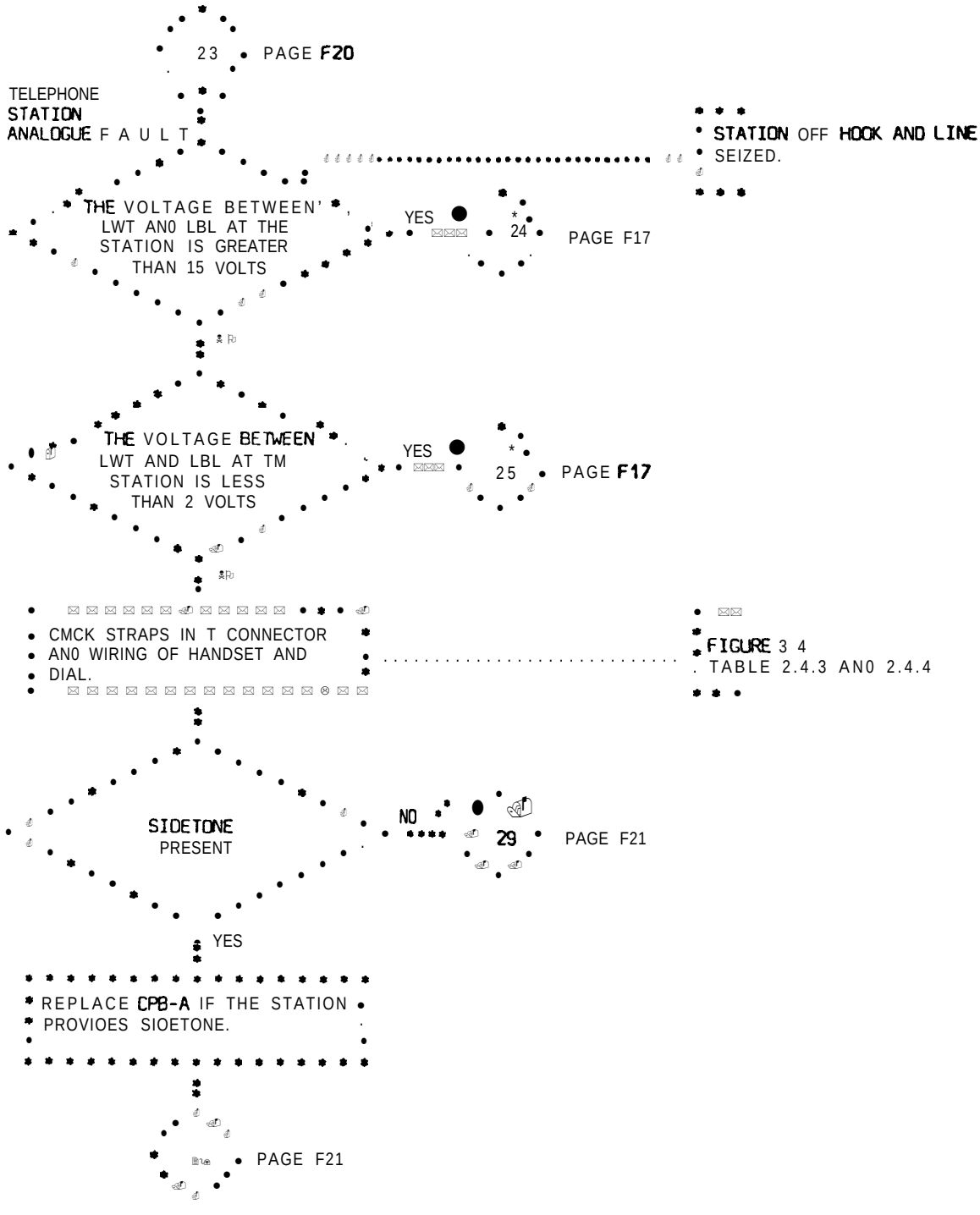

18
PAGE F23
NO POWER TO STATION
CHECK LTC WIRING
ARE FUSES BLOWN
2
PAGE F8
YES
REPLACE FUSES
28
PAGE F20


PAGE F8, 25
INTERCOM STATION
INTERCOM STATION
21
PAGE F14
YES
CHECK LTC-C CONNECTION, CABLING AND ICM PROGRAMMING LINKS.
IS THE VOLTAGE LRD WITH REFERENCE TO LBK APPROX. +30V WHEN IDLE
NO.
20
PAGE F13
YES
REPLACE INTERCOM STATION
32
PAGE F35


20
PAGE F12, 14
INTERCOM OR
DOOR STATION
RE RACE SIB-A
FAULT BEEN
RECTIFIEO
YES
32
PAGE F35
RE RACE STATION
32
PAGE F35


21 PAGE F12
DOW STATION
CHECK LTC-C CONNECTIONS, CABLING AN0 ICM PROGRAMMING LINKS.
FAULT WITH CHINE TONE WLY
YES
NO
REPLACE DOOR STATION
IS VOLTAGE LRO WITH REFERENCE TO LEK APPROX. 30V WHEN IOLE
NO
20 PAGE F13
32 PAGE F35
YES
REPLACE STATIW
32 PAGE F35


22 PAGE F8
STATION FWLT
MAKE SLRE LTC-A, LTC-B AN0
LTC-C ARE CONNECTEO CORRECTLY
AND CONNECTOR PINS ARE
STRAIGHT. CHECK THE CABLING
AN0 THAT THE FUSES HAVE NOT
BLOWN.
AT THIS STAGE IT IS ASSUMED
THAT ONLY SOME OF THE
STATIONS ARE FAULTY.
27 PAGE F19


23 PAGE F20
TELEPHONE STATION ANALOGUE F A U L T
STATION OFF HOOK AND LINE SEIZED.
THE VOLTAGE BETWEEN LWT AN0 LBL AT THE STATION IS GREATER THAN 15 VOLTS
YES
24
PAGE F17
THE VOLTAGE BETWEEN LWT AND LBL AT TM STATION IS LESS THAN 2 VOLTS
YES
25
PAGE F17
CMCK STRAPS IN T CONNECTOR AN0 WIRING OF HANDSET AND DIAL.
FIGURE 3 4
TABLE 2.4.3 AN0 2.4.4
SIDETONE PRESENT
NO
29
PAGE F21
YES
REPLACE CPB-A IF THE STATION PROVIOES SIOETONE.
PAGE F21

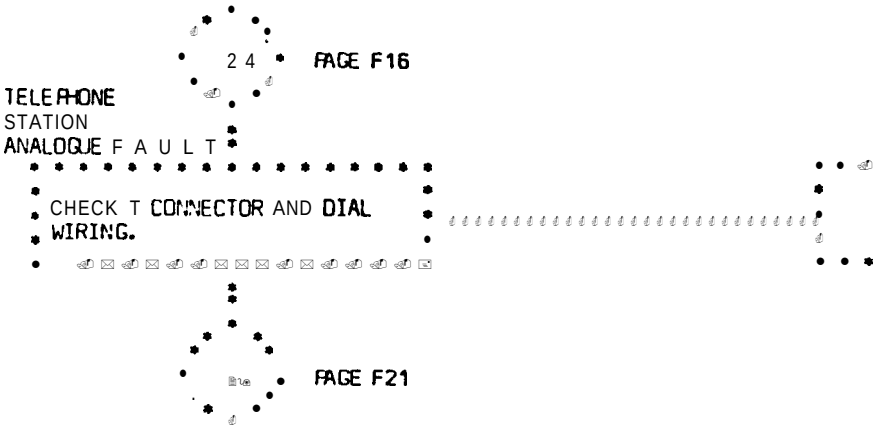
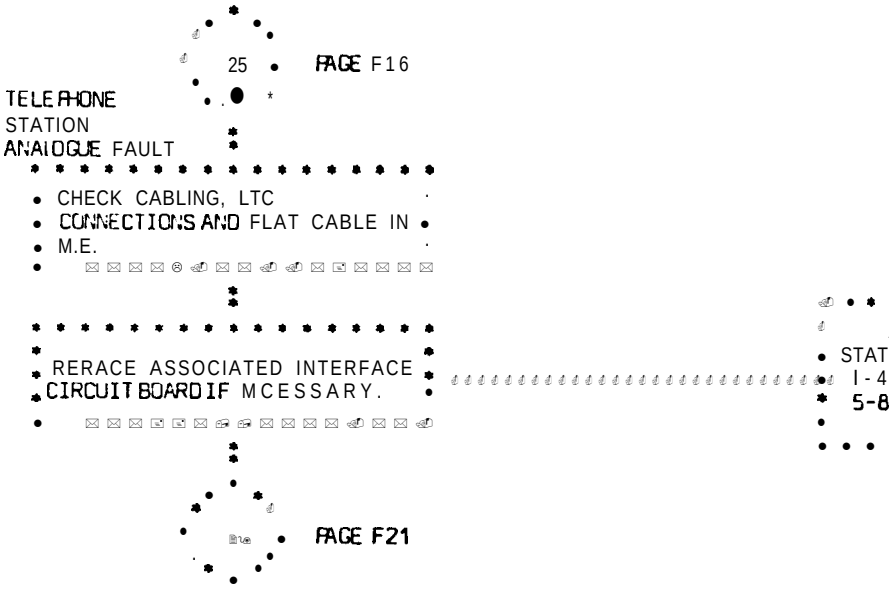
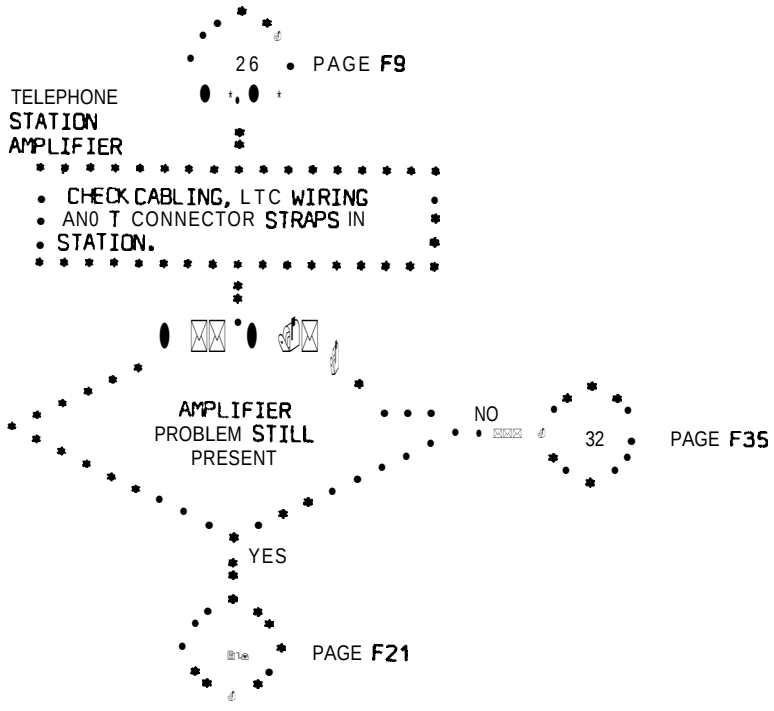
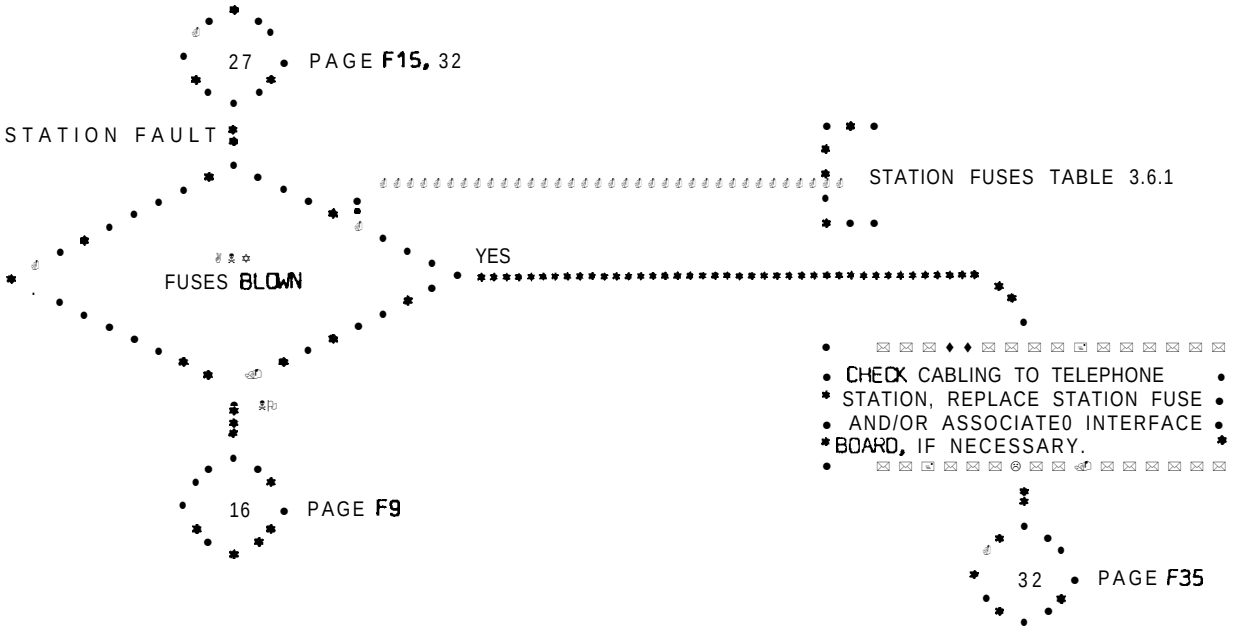


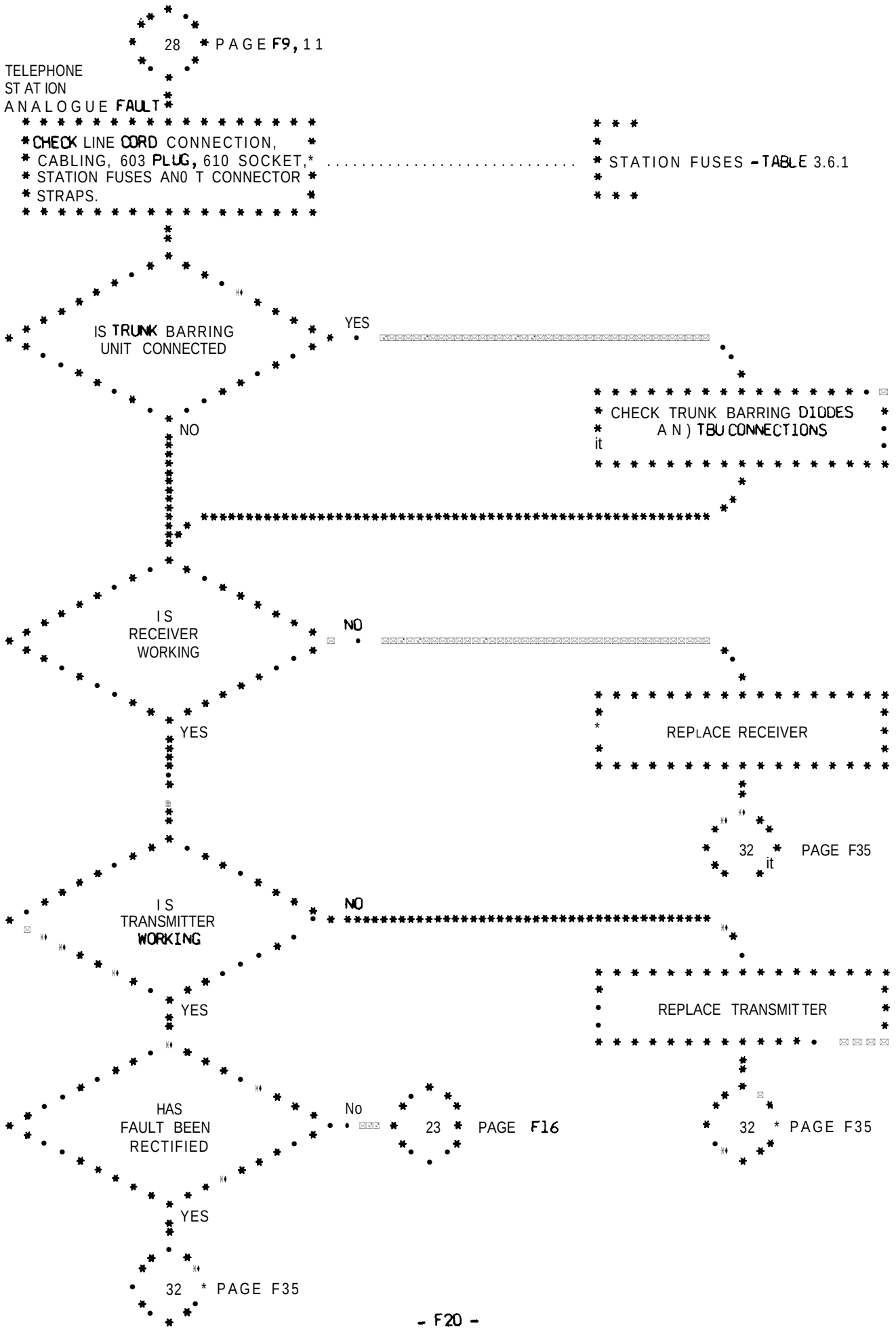
TABLE 2.4.3

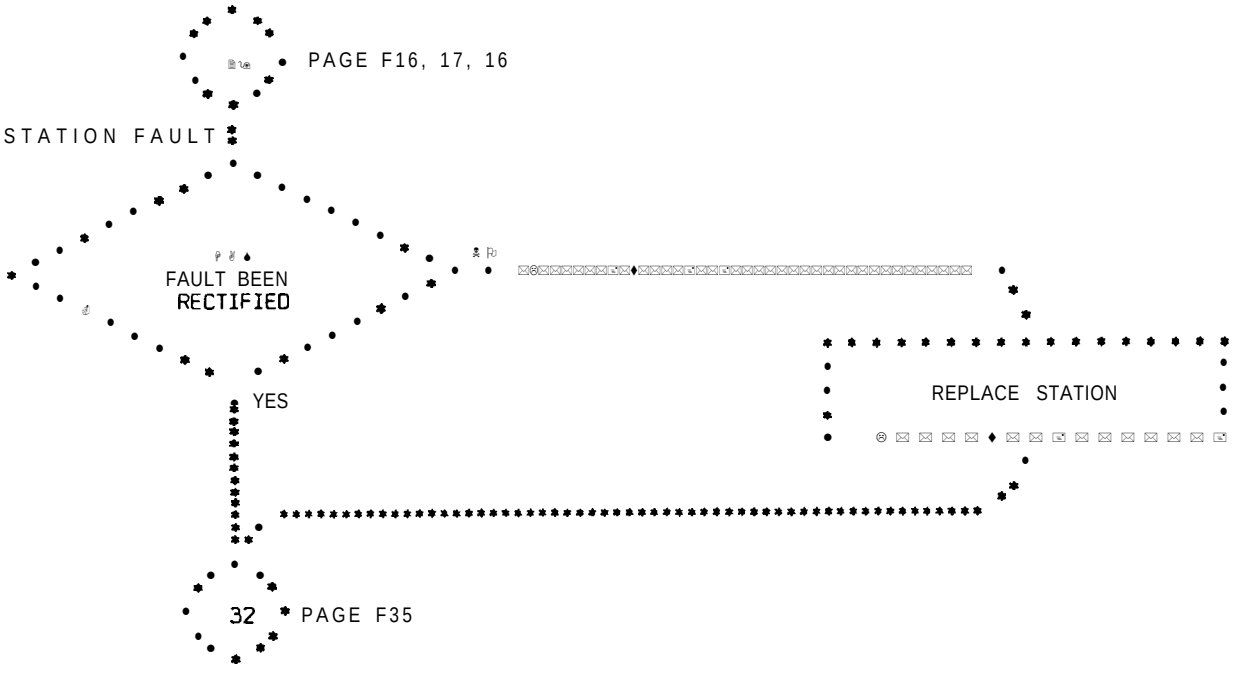


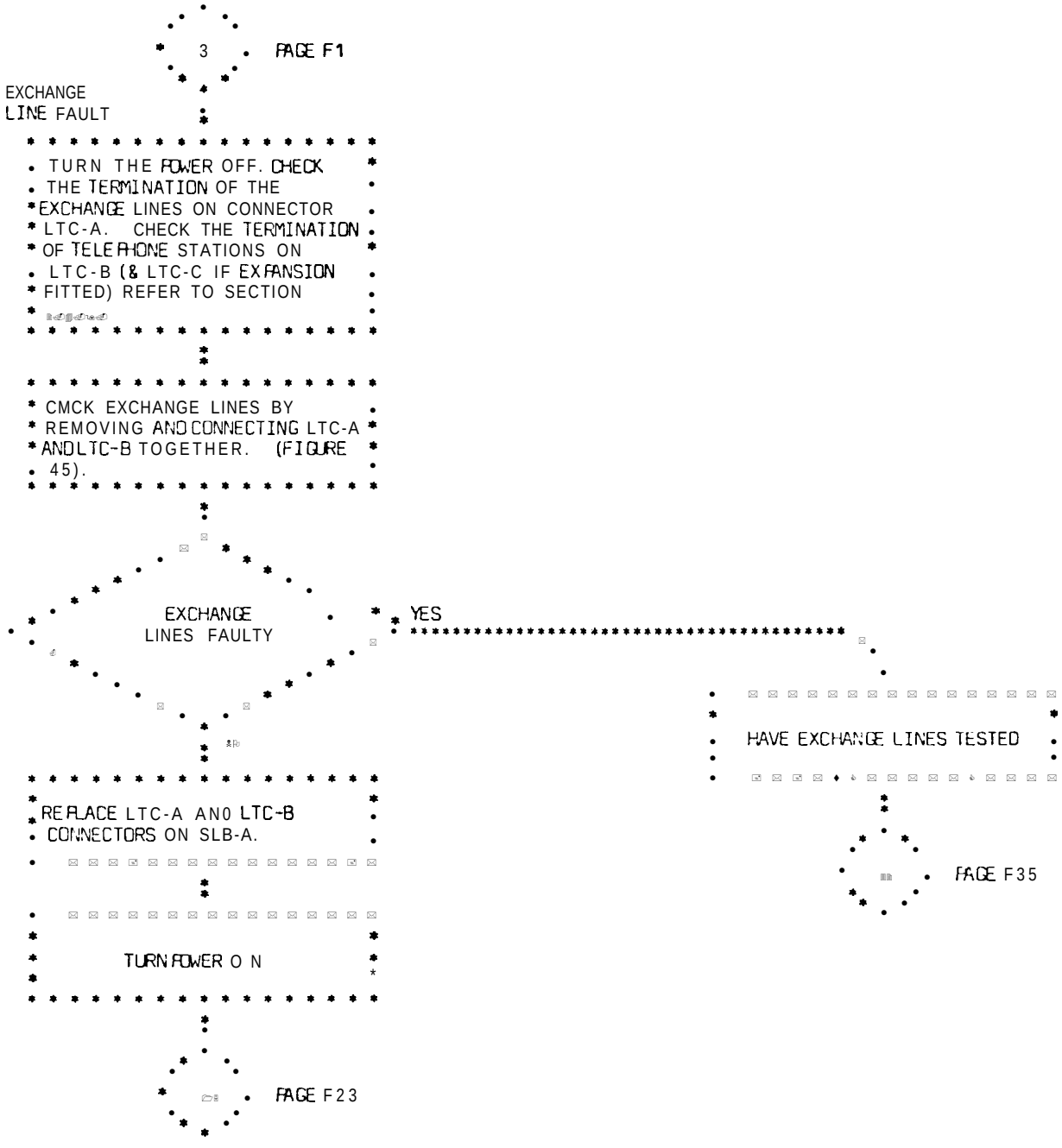
ASSOCIATED INTERFACE	
STATION	BOARD
1-4	SLB-A
5-8	4SB-A
	SIB-A

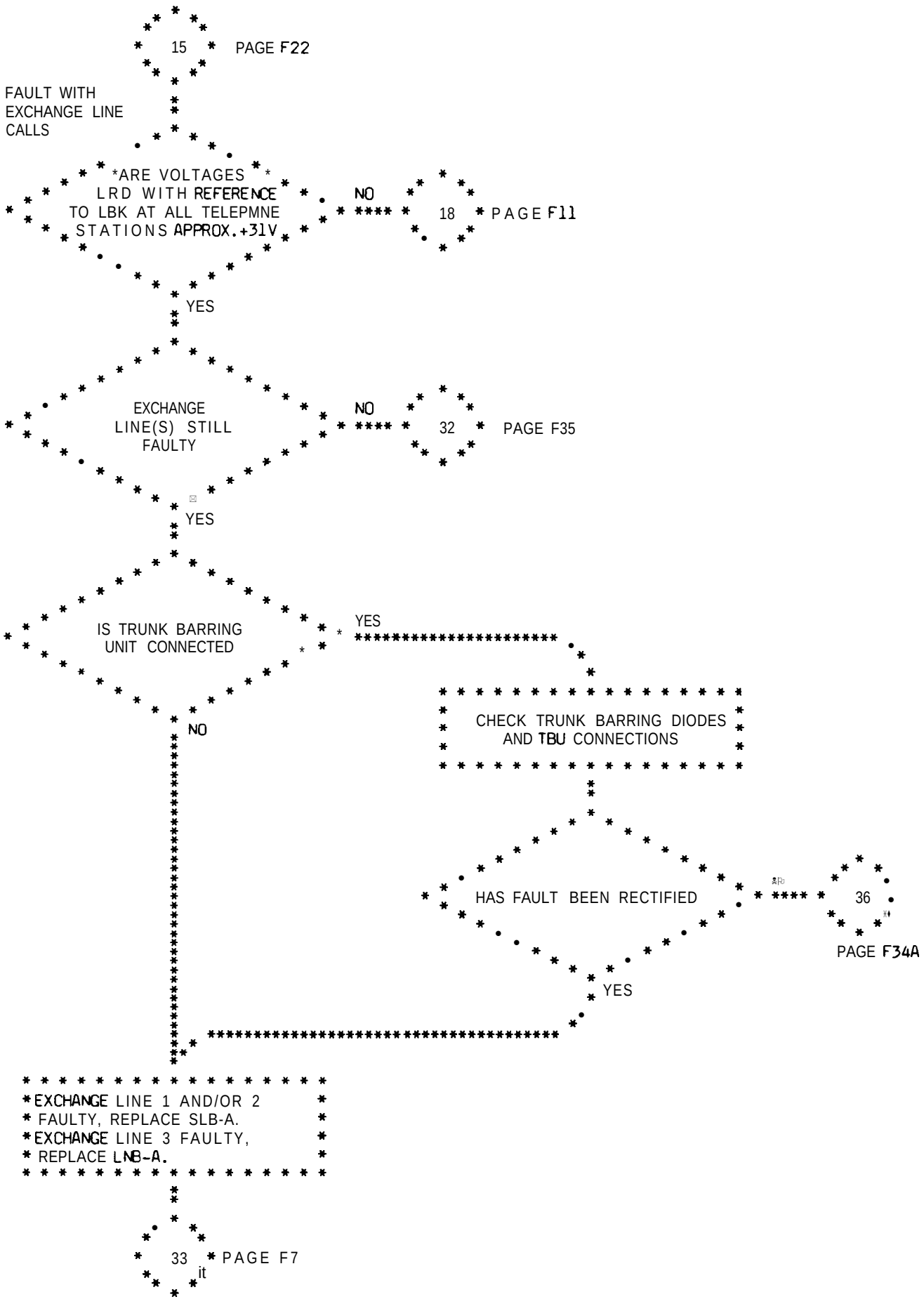

26
PAGE F9
TELEPHONE
STATION
AMPLIFIER
CHECK CABLING, LTC WIRING
AND T CONNECTOR STRAPS IN
STATION.
AMPLIFIER
PROBLEM STILL
PRESENT
NO
32
PAGE F35
YES
PAGE F21

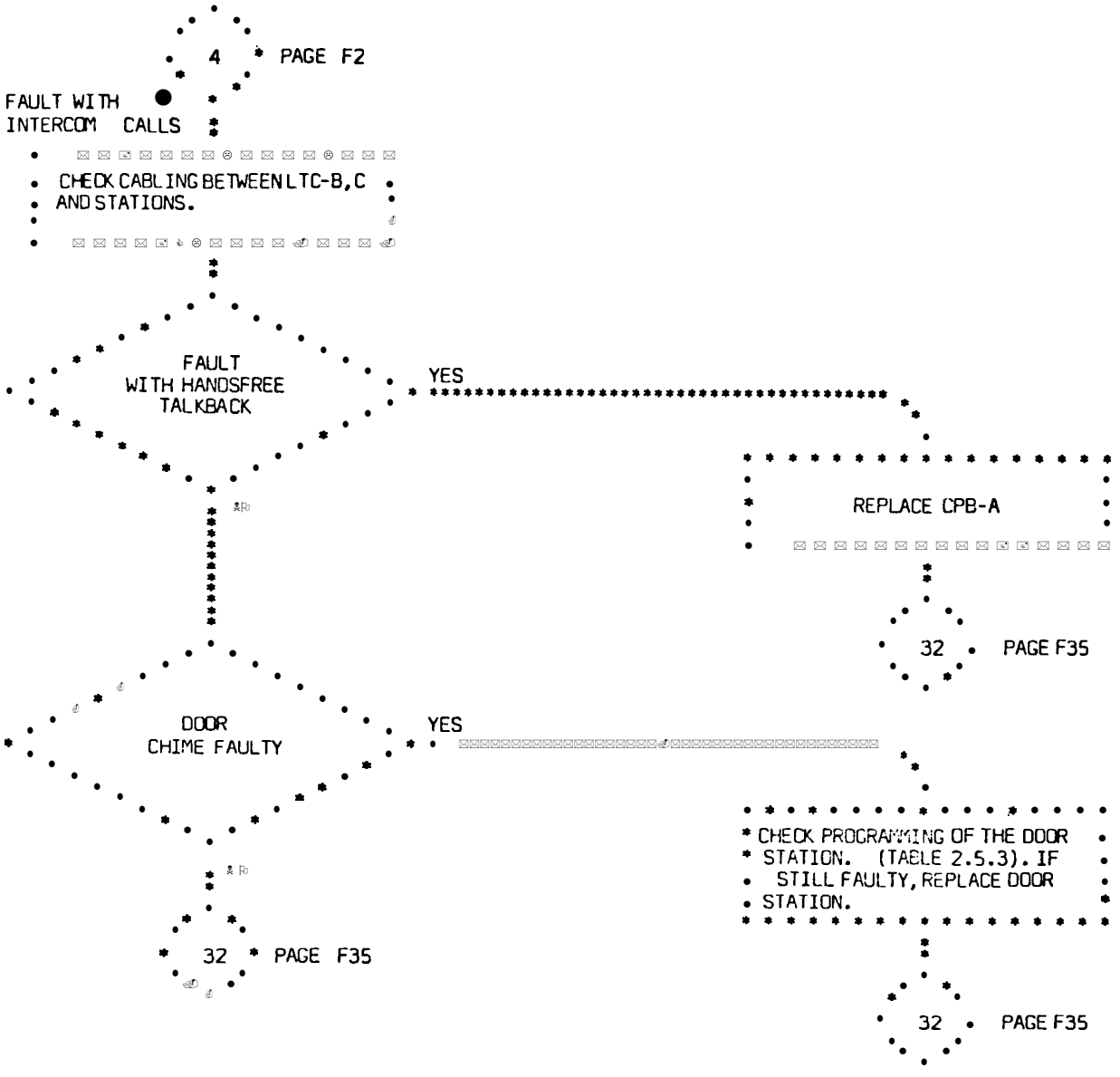

27 • PAGE F15, 32
STATION FAULT
STATION FUSES TABLE 3.6.1
YES
FUSES BLOWN
CHECK CABLING TO TELEPHONE STATION, REPLACE STATION FUSE AND/OR ASSOCIATE0 INTERFACE BOARD, IF NECESSARY.
16 • PAGE F9
32 • PAGE F35

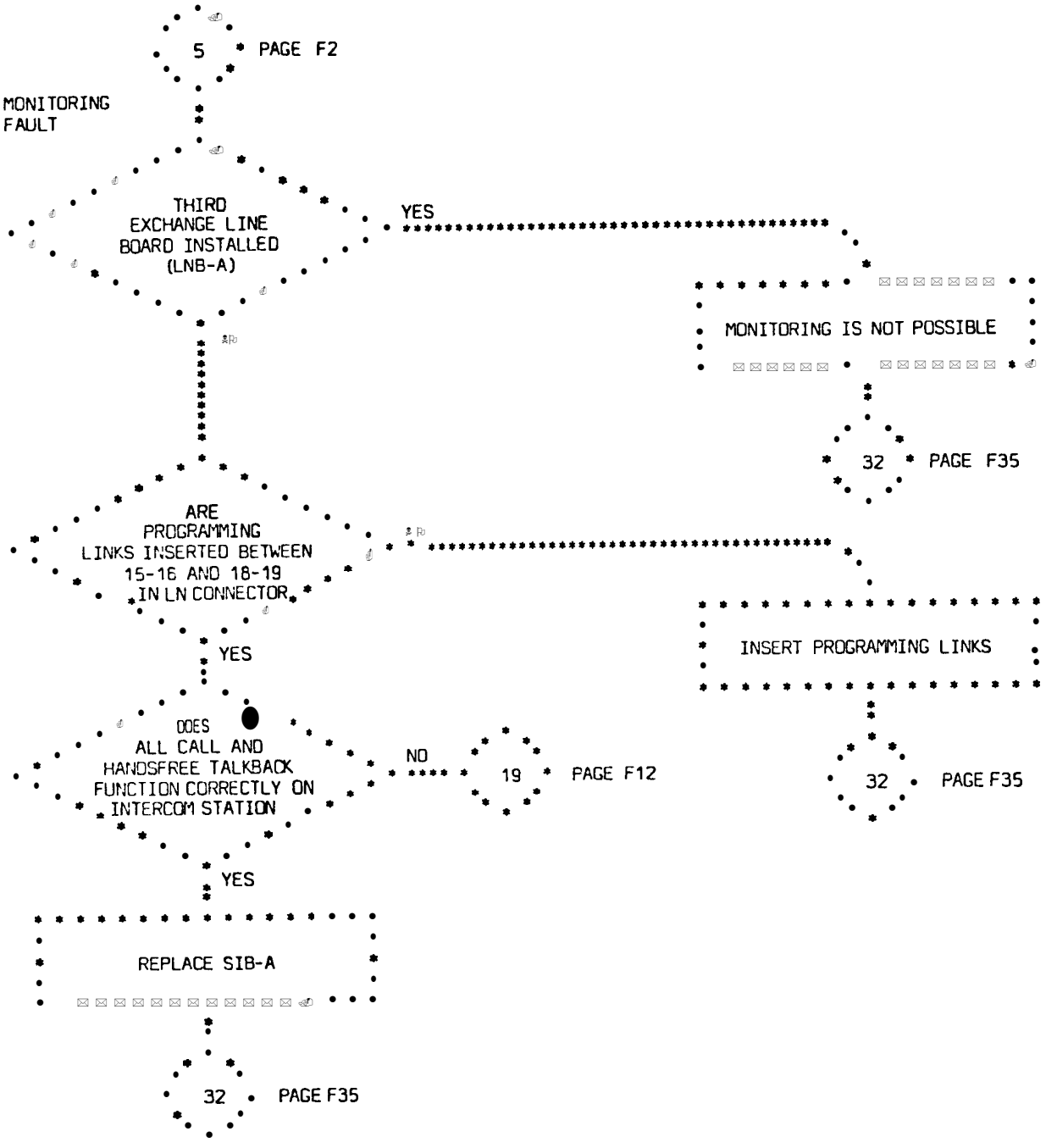

28 PAGE F9, 11
TELEPHONE
STATION
ANALOGUE FAULT
CHECK LINE CORD CONNECTION, CABLING, 603 PLUG, 610 SOCKET, STATION FUSES AN0 T CONNECTOR STRAPS.
STATION FUSES - TABLE 3.6.1
IS TRUNK BARRING UNIT CONNECTED
YES
NO
CHECK TRUNK BARRING DIODES AN) TBU CONNECTIONS
IS RECEIVER WORKING
NO
YES
REPLACE RECEIVER
32 PAGE F35
IS TRANSMITTER WORKING
NO
YES
REPLACE TRANSMITTER
HAS FAULT BEEN RECTIFIED
No
23 PAGE F16
32 PAGE F35
YES
32 PAGE F35

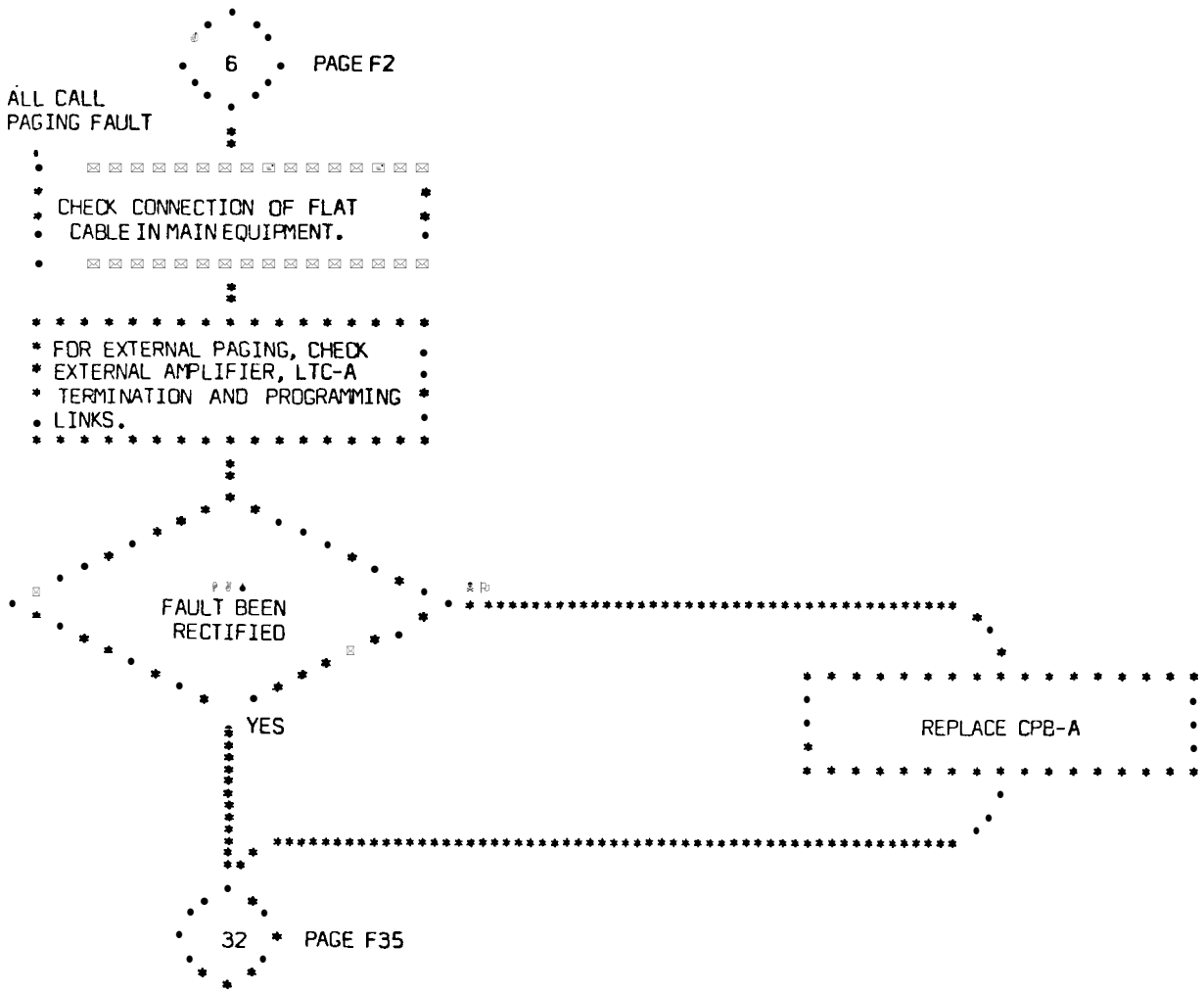

PAGE F16, 17, 16
STATION FAULT
FAULT BEEN
RECTIFIED
YES
REPLACE STATION
32
PAGE F35

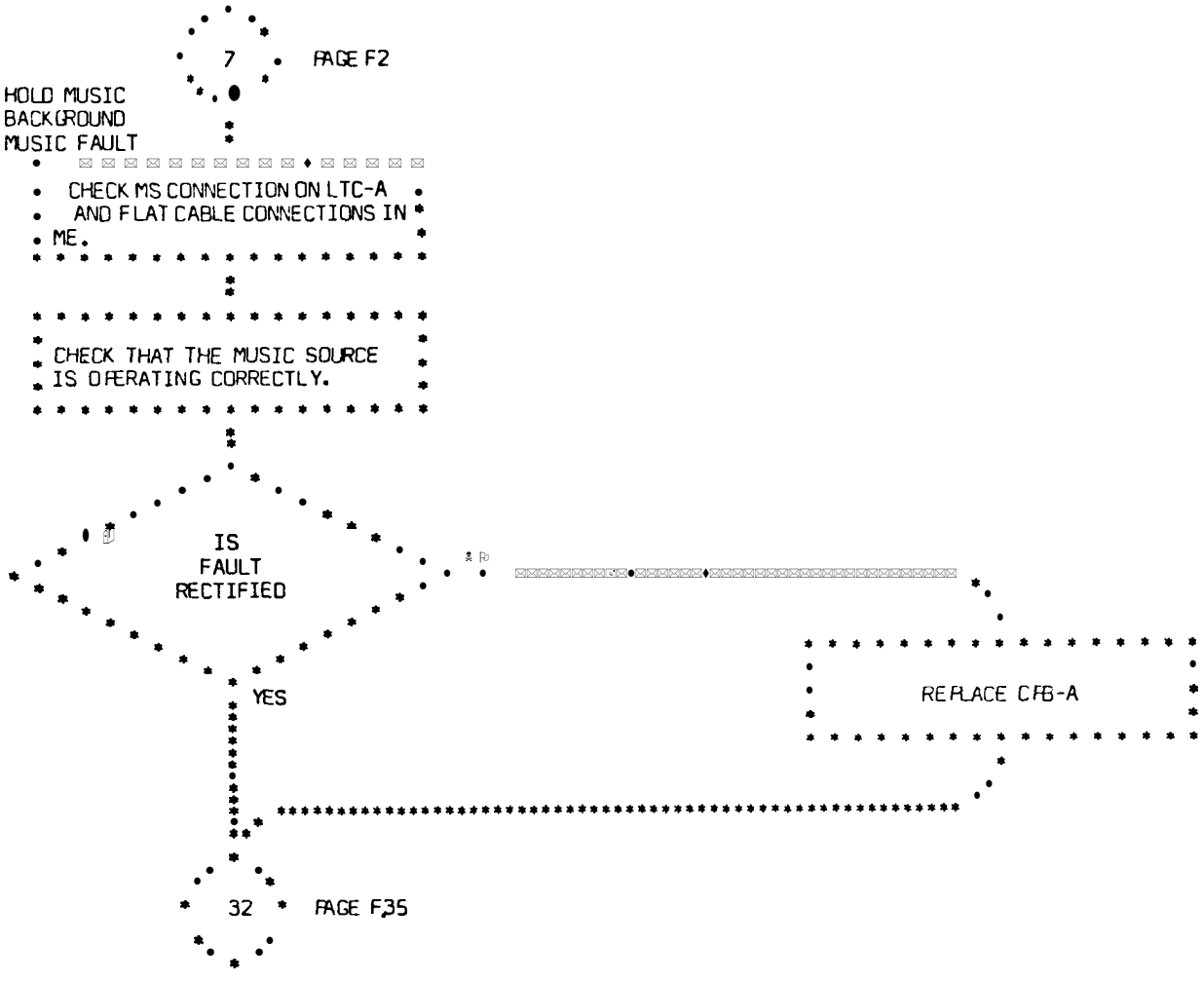

3
PAGE F1
EXCHANGE
LINE FAULT
TURN THE POWER OFF. CHECK THE TERMINATION OF THE EXCHANGE LINES ON CONNECTOR LTC-A. CHECK THE TERMINATION OF TELEPHONE STATIONS ON LTC-B (& LTC-C IF EXPANSION FITTED) REFER TO SECTION
CMCK EXCHANGE LINES BY REMOVING AND CONNECTING LTC-A AND LTC-B TOGETHER. (FIGURE 45).
EXCHANGE LINES FAULTY
YES
HAVE EXCHANGE LINES TESTED
PAGE F35
REPLACE LTC-A AN0 LTC-B CONNECTORS ON SLB-A.
TURN POWER O N
PAGE F23

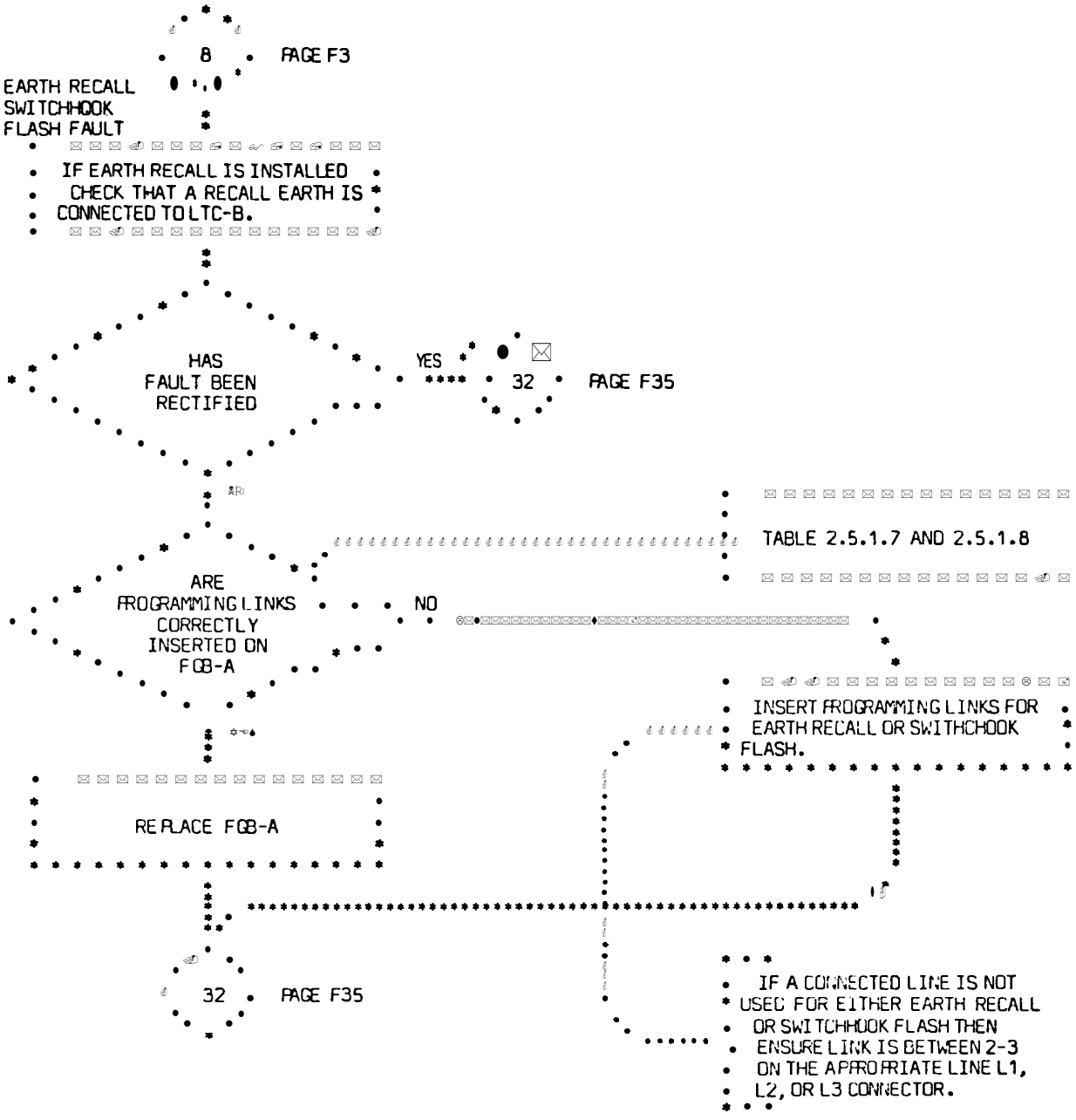

15
PAGE F22
FAULT WITH EXCHANGE LINE CALLS
*ARE VOLTAGES LRD WITH REFERENCE TO LBK AT ALL TELEPMNE STATIONS APPROX.+31V
NO
18
PAGE F11
YES
EXCHANGE LINE(S) STILL FAULTY
NO
32
PAGE F35
YES
IS TRUNK BARRING UNIT CONNECTED
YES
NO
CHECK TRUNK BARRING DIODES AND TBU CONNECTIONS
HAS FAULT BEEN RECTIFIED
36
PAGE F34A
YES
*EXCHANGE LINE 1 AND/OR 2 FAULTY, REPLACE SLB-A.
*EXCHANGE LINE 3 FAULTY, REPLACE LNB-A.
33
PAGE F7

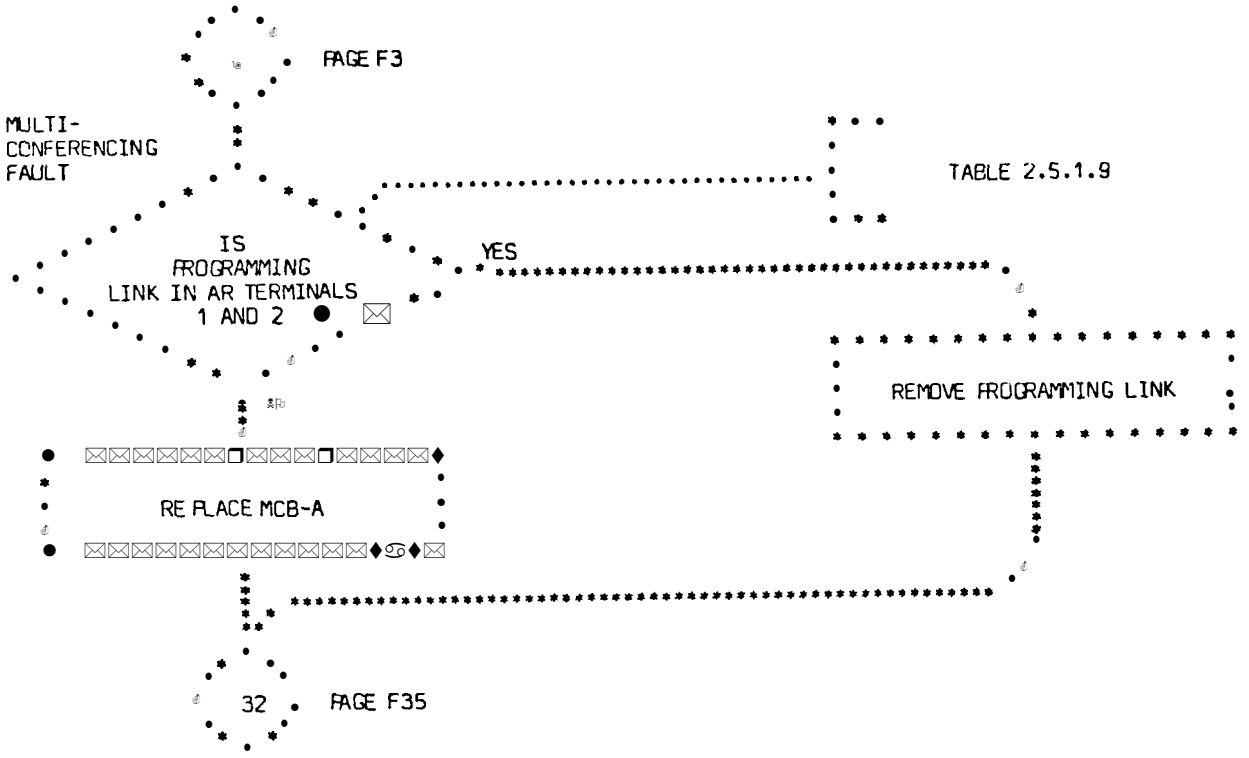

4
PAGE F2
FAULT WITH INTERCOM CALLS
CHECK CABLING BETWEEN LTC-B,C AND STATIONS.
FAULT WITH HANDSFREE TALKBACK
YES
REPLACE CPB-A
32
PAGE F35
DOOR CHIME FAULTY
YES
CHECK PROGRAMMING OF THE DOOR STATION. (TABLE 2.5.3). IF STILL FAULTY, REPLACE DOOR STATION.
32
PAGE F35
32
PAGE F35

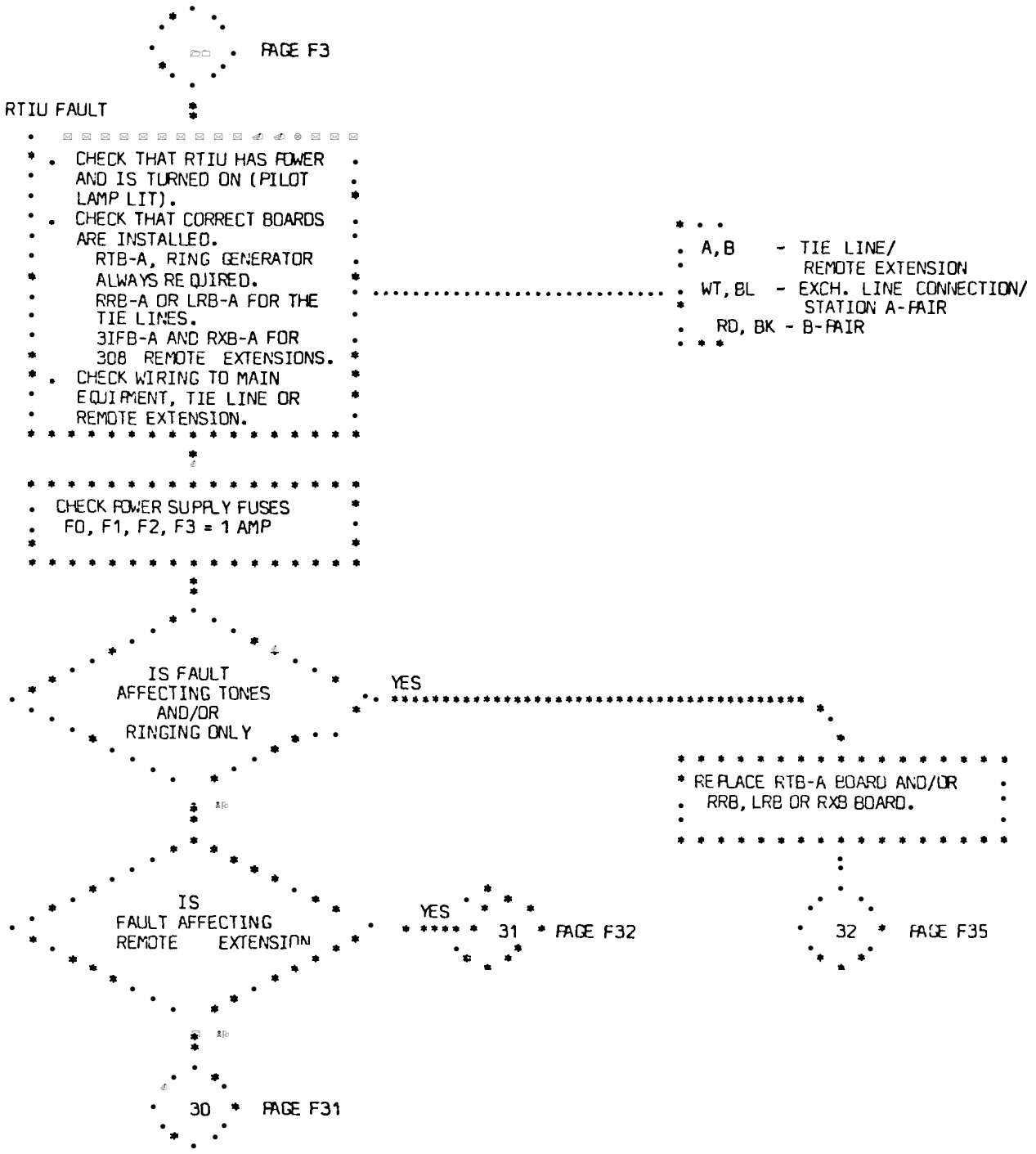

5
PAGE F2
MONITORING FAULT
THIRD EXCHANGE LINE BOARD INSTALLED (LNB-A)
YES
MONITORING IS NOT POSSIBLE
32
PAGE F35
ARE PROGRAMMING LINKS INSERTED BETWEEN 15-16 AND 18-19 IN LN CONNECTOR
YES
INSERT PROGRAMMING LINKS
32
PAGE F35
DOES ALL CALL AND HANDSFREE TALKBACK FUNCTION CORRECTLY ON INTERCOM STATION
NO
19
PAGE F12
YES
REPLACE SIB-A
32
PAGE F35

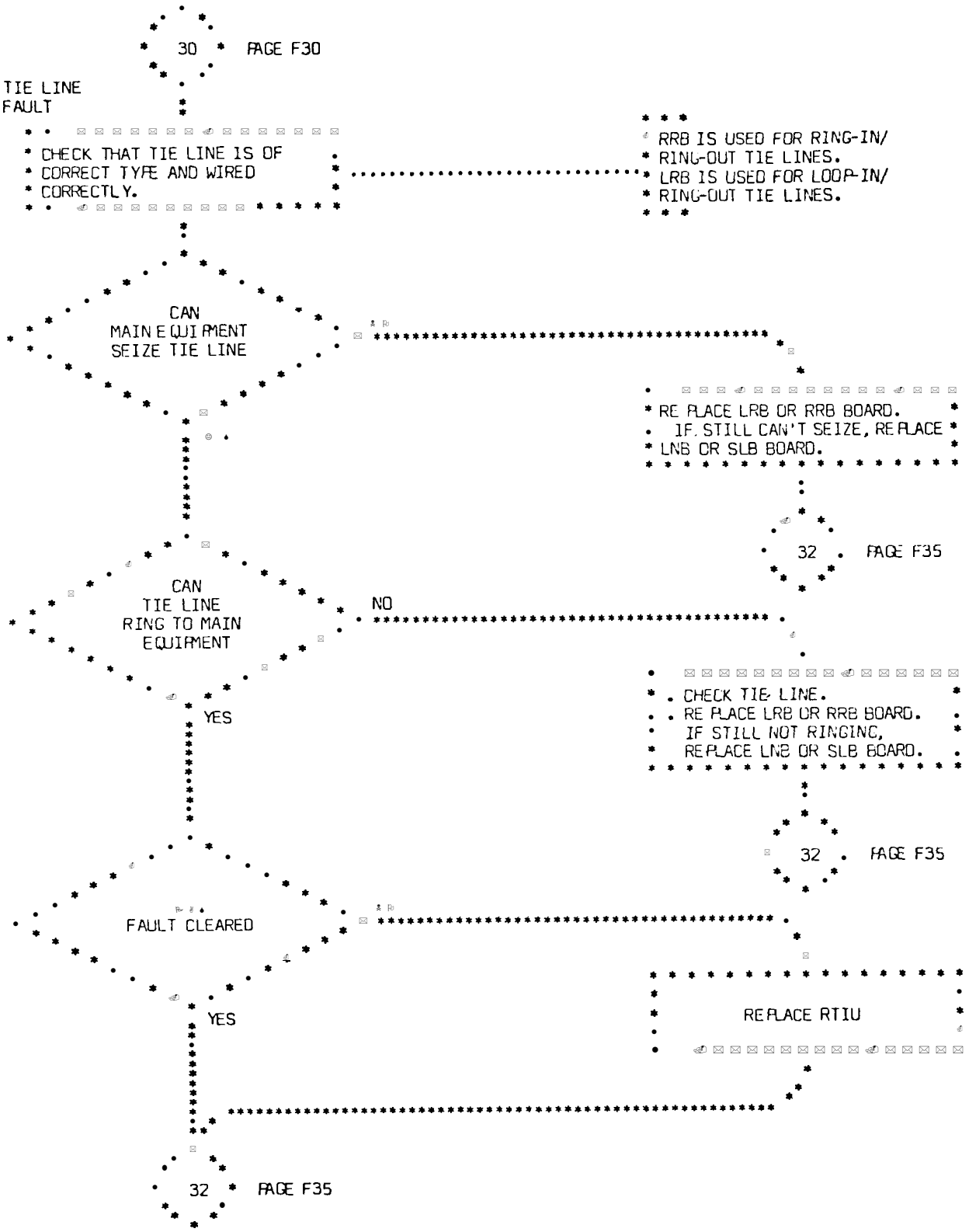

6
PAGE F2
ALL CALL
PAGING FAULT
CHECK CONNECTION OF FLAT CABLE IN MAIN EQUIPMENT.
FOR EXTERNAL PAGING, CHECK EXTERNAL AMPLIFIER, LTC-A TERMINATION AND PROGRAMMING LINKS.
FAULT BEEN RECTIFIED
YES
REPLACE CPB-A
32
PAGE F35

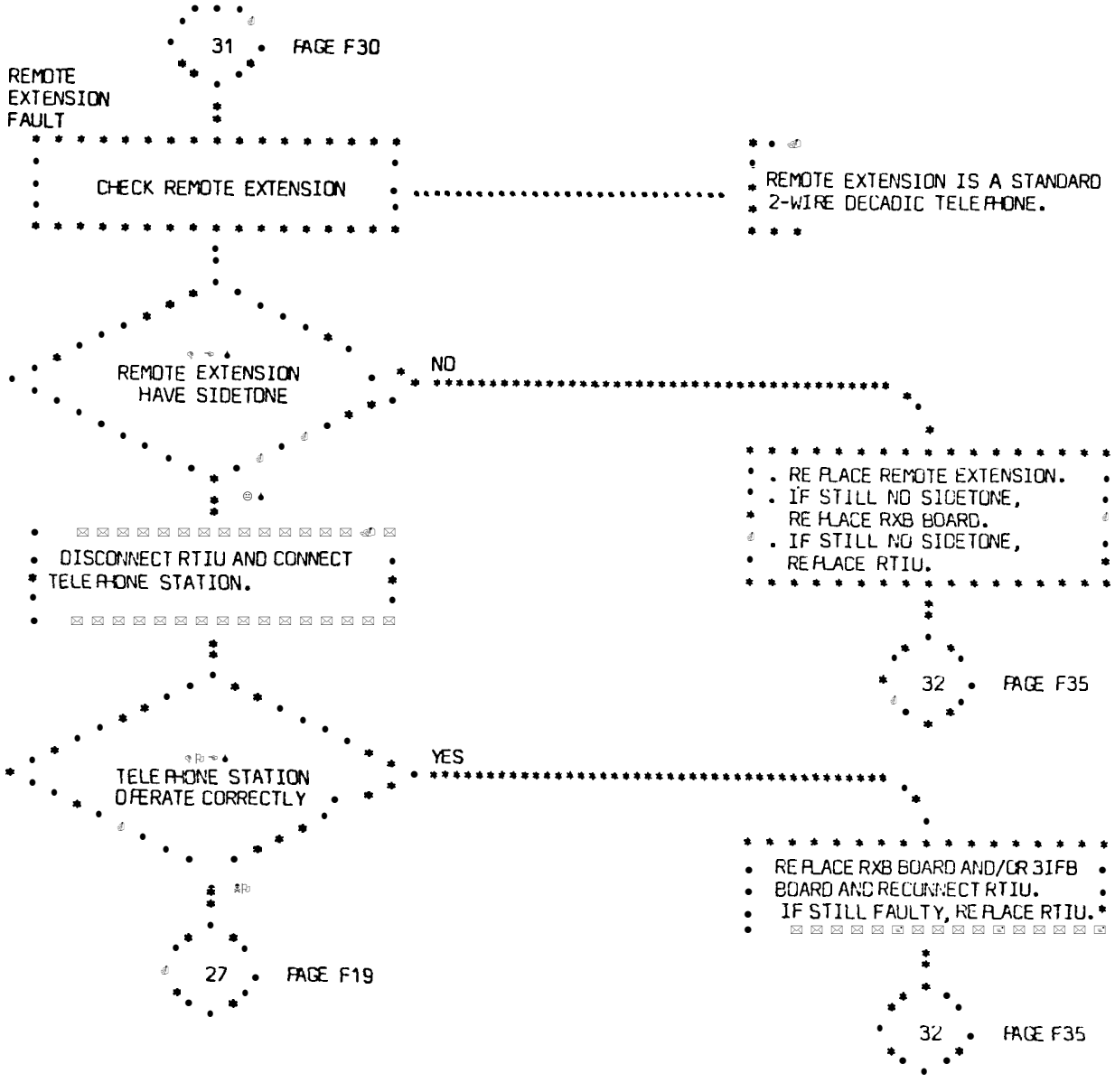

7
PAGE F2
HOLD MUSIC
BACKGROUND
MUSIC FAULT
CHECK MS CONNECTION ON LTC-A
AND FLAT CABLE CONNECTIONS IN
ME.
CHECK THAT THE MUSIC SOURCE
IS OPERATING CORRECTLY.
IS
FAULT
RECTIFIED
YES
REPLACE CPB-A
32
PAGE F35

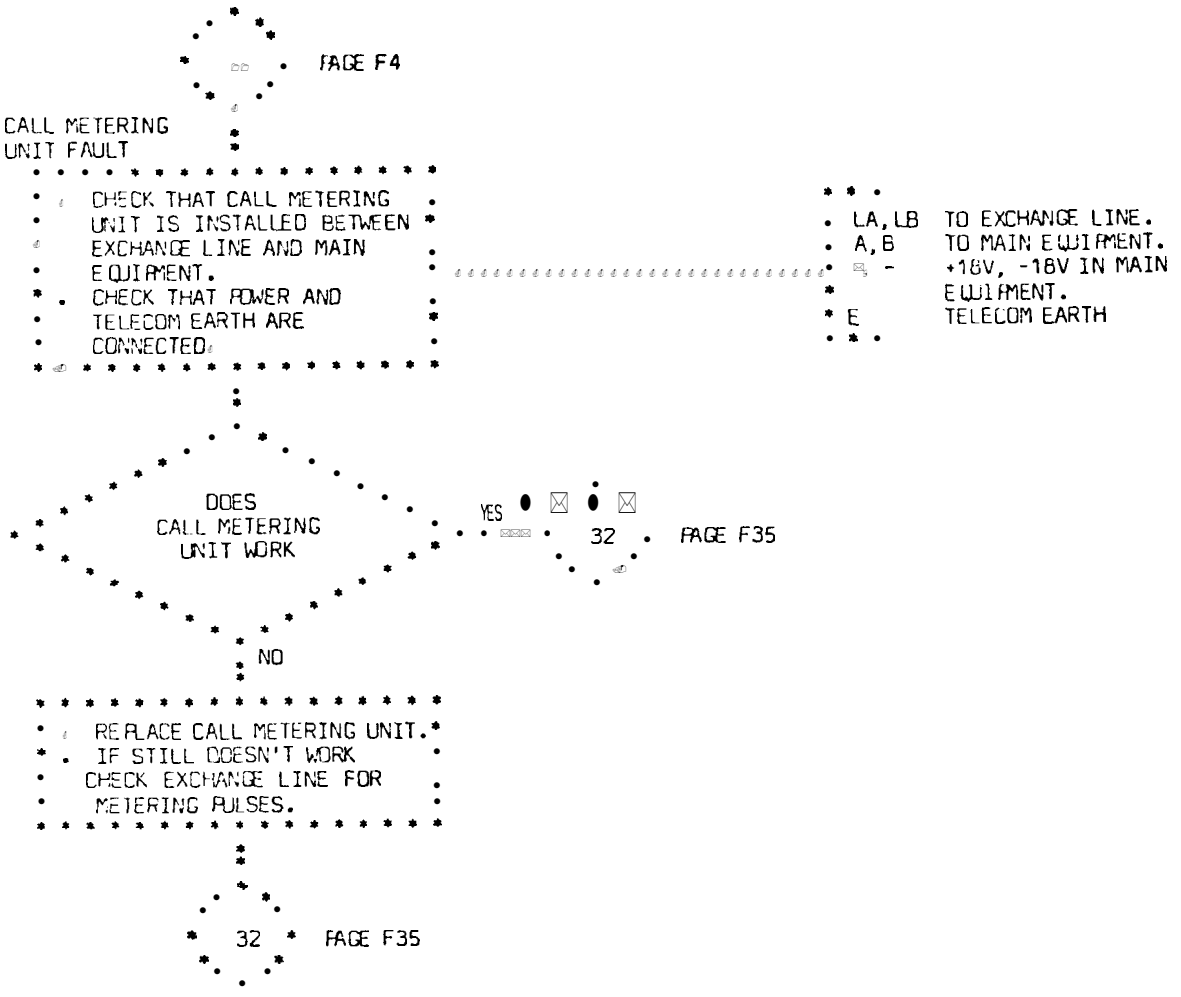

8
PAGE F3
EARTH RECALL
SWITCHHOOK
FLASH FAULT
IF EARTH RECALL IS INSTALLED
CHECK THAT A RECALL EARTH IS
CONNECTED TO LTC-B.
HAS
FAULT BEEN
RECTIFIED
YES
32
PAGE F35
TABLE 2.5.1.7 AND 2.5.1.8
ARE
PROGRAMMING LINKS
CORRECTLY
INSERTED ON
FCB-A
NO
INSERT PROGRAMMING LINKS FOR
EARTH RECALL OR SWITHCHOOK
FLASH.
REPLACE FCB-A
32
PAGE F35
IF A CONNECTED LINE IS NOT
USED FOR EITHER EARTH RECALL
OR SWITCHHOOK FLASH THEN
ENSURE LINK IS BETWEEN 2-3
ON THE APPROPRIATE LINE L1,
L2, OR L3 CONNECTOR.

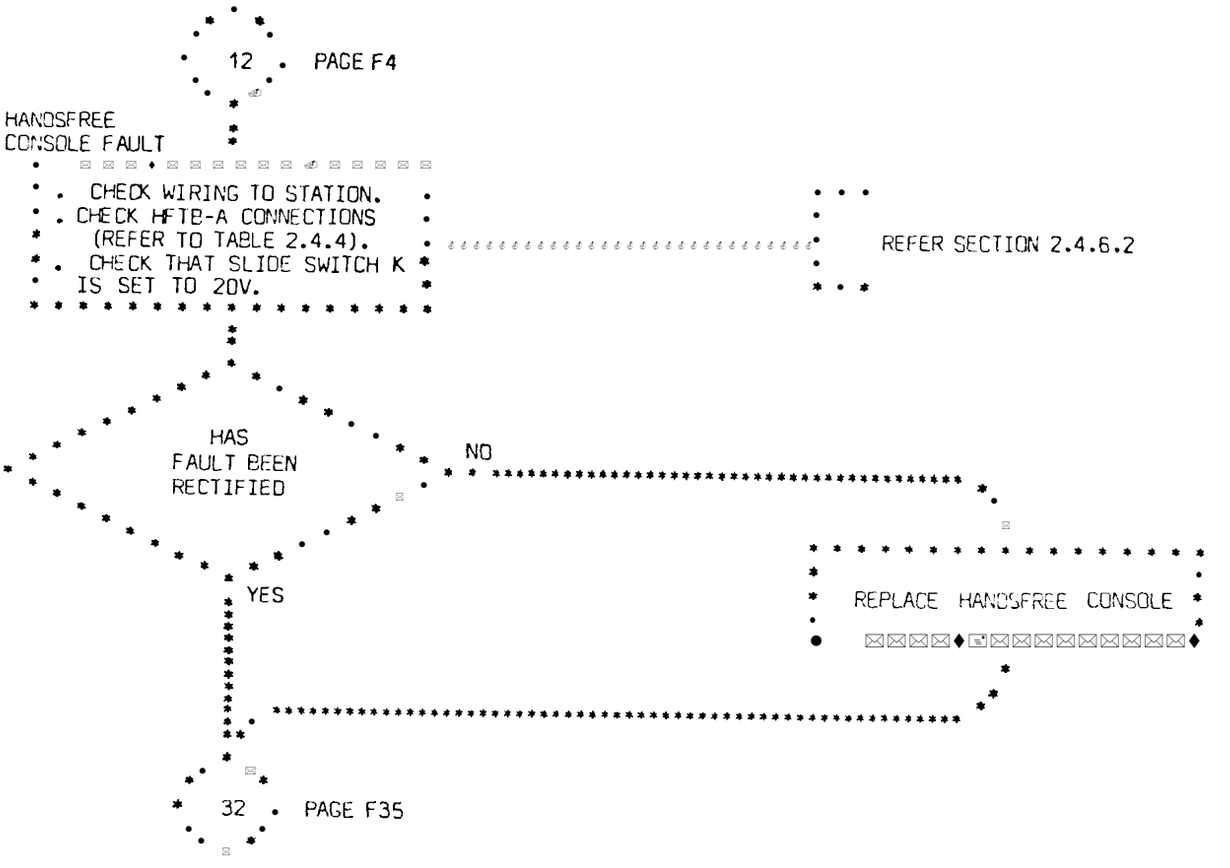

PAGE F3
MULTI-
CONFERENCING
FAULT
TABLE 2.5.1.9
IS
PROGRAMMING
LINK IN AR TERMINALS
1 AND 2
YES
REMOVE PROGRAMMING LINK
RE PLACE MCB-A
32
PAGE F35

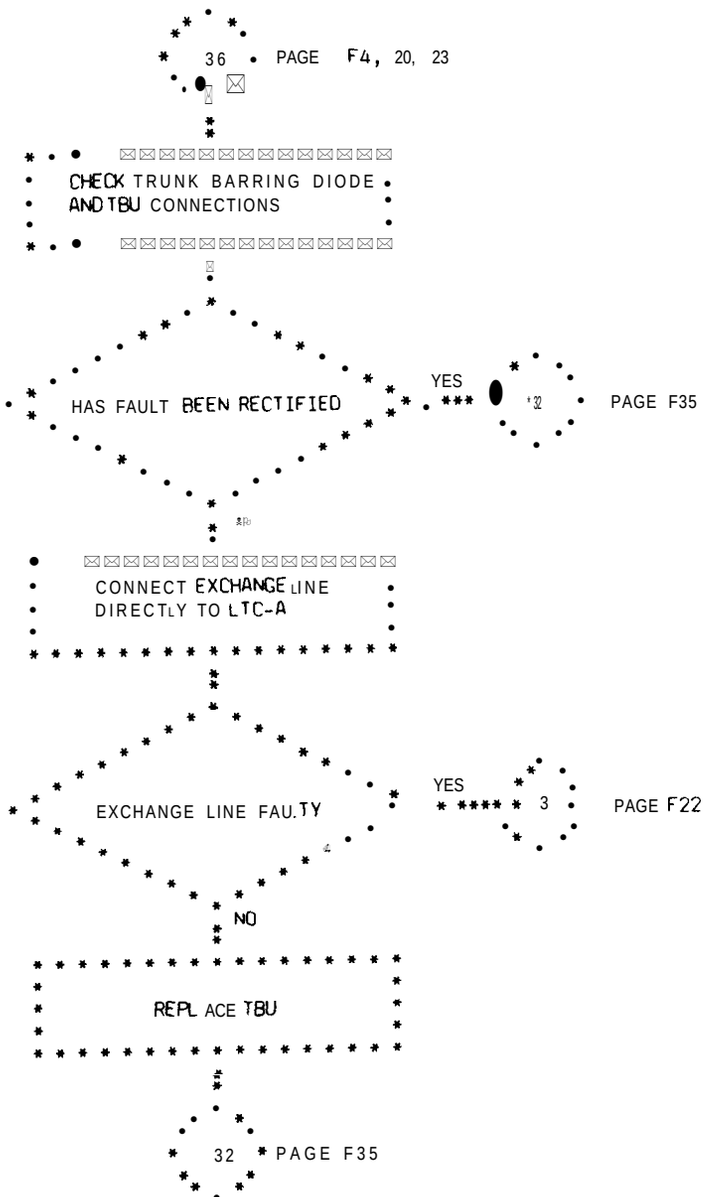

PAGE F3
RTIU FAULT
CHECK THAT RTIU HAS POWER AND IS TURNED ON (PILOT LAMP LIT).
CHECK THAT CORRECT BOARDS ARE INSTALLED.
RTB-A, RING GENERATOR ALWAYS REQUIRED.
RRB-A OR LRB-A FOR THE TIE LINES.
3IFB-A AND RXB-A FOR 308 REMOTE EXTENSIONS.
CHECK WIRING TO MAIN EQUIPMENT, TIE LINE OR REMOTE EXTENSION.
A,B - TIE LINE/ REMOTE EXTENSION
WT, BL - EXCH. LINE CONNECTION/ STATION A-PAIR
RD, BK - B-PAIR
CHECK POWER SUPPLY FUSES F0, F1, F2, F3 = 1 AMP
IS FAULT AFFECTING TONES AND/OR RINGING ONLY
YES
REPLACE RTB-A BOARD AND/OR RRB, LRB OR RXB BOARD.
IS FAULT AFFECTING REMOTE EXTENSION
YES
31 PAGE F32
32 PAGE F35
30 PAGE F31

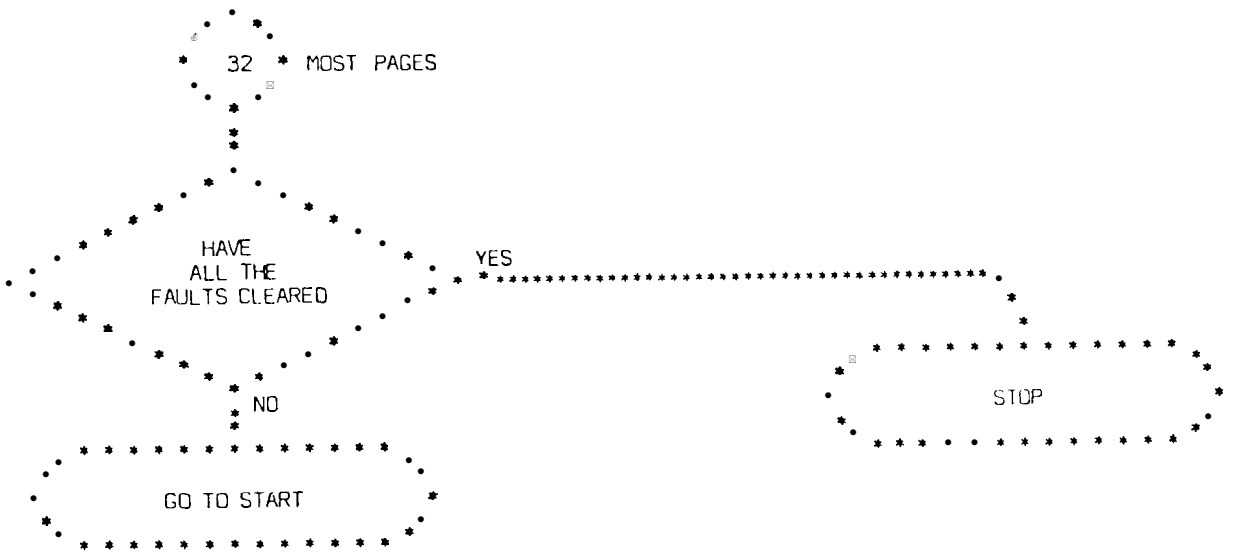

30
PAGE F30
TIE LINE FAULT
CHECK THAT TIE LINE IS OF CORRECT TYPE AND WIRED CORRECTLY.
RRB IS USED FOR RING-IN/ RING-OUT TIE LINES.
LRB IS USED FOR LOOP-IN/ RING-OUT TIE LINES.
CAN MAIN EQUIPMENT SEIZE TIE LINE
RE PLACE LRB OR RRB BOARD.
IF STILL CAN'T SEIZE, REPLACE LNB OR SLB BOARD.
32
PAGE F35
CAN TIE LINE RING TO MAIN EQUIPMENT
NO
YES
CHECK TIE LINE.
RE PLACE LRB OR RRB BOARD.
IF STILL NOT RINGING,
REPLACE LNB OR SLB BOARD.
32
PAGE F35
FAULT CLEARED
YES
REPLACE RTIU
32
PAGE F35


31 • PAGE F30
REMOTE EXTENSION FAULT
CHECK REMOTE EXTENSION
REMOTE EXTENSION IS A STANDARD 2-WIRE DECADIC TELEPHONE.
REMOTE EXTENSION HAVE SIDETONE
NO
. RE PLACE REMOTE EXTENSION.
. IF STILL NO SIDETONE, RE PLACE RXB BOARD.
. IF STILL NO SIDETONE, RE PLACE RTIU.
32 • PAGE F35
DISCONNECT RTIU AND CONNECT TELE PHONE STATION.
TELE PHONE STATION OPERATE CORRECTLY
YES
RE PLACE RXB BOARD AND/OR 3IFB BOARD AND RECONNECT RTIU. IF STILL FAULTY, RE PLACE RTIU.
27 • PAGE F19
32 • PAGE F35


PAGE F4
CALL METERING UNIT FAULT
CHECK THAT CALL METERING UNIT IS INSTALLED BETWEEN EXCHANGE LINE AND MAIN EQUIPMENT.
CHECK THAT POWER AND TELECOM EARTH ARE CONNECTED.
LA, LB TO EXCHANGE LINE.
A, B TO MAIN EQUIPMENT.
- +18V, -18V IN MAIN EQUIPMENT.
E TELECOM EARTH
DOES CALL METERING UNIT WORK
YES
32
PAGE F35
NO
REPLACE CALL METERING UNIT. IF STILL DOESN'T WORK CHECK EXCHANGE LINE FOR METERING PULSES.
32
PAGE F35


12 . PAGE F4
HANDSFREE
CONSOLE FAULT
. CHECK WIRING TO STATION.
. CHECK HFTB-A CONNECTIONS
(REFER TO TABLE 2.4.4).
. CHECK THAT SLIDE SWITCH K
IS SET TO 20V.
REFER SECTION 2.4.6.2
HAS
FAULT BEEN
RECTIFIED
NO
YES
REPLACE HANDSFREE CONSOLE
32 . PAGE F35


36
PAGE F4, 20, 23
CHECK TRUNK BARRING DIODE AND TBU CONNECTIONS
HAS FAULT BEEN RECTIFIED
YES
32
PAGE F35
CONNECT EXCHANGE LINE DIRECTLY TO LTC-A
EXCHANGE LINE FAULTY
YES
3
PAGE F22
NO
REPLACE TBU
32
PAGE F35


32 * MOST PAGES
HAVE
ALL THE
FAULTS CLEARED
YES
NO
STOP
GO TO START

3.6 SUGGESTED REPAIR ACTION

This section describes a check list, for the replacement of boards and replacement of stations, if an unexpected result is obtained during the test specified in section 2.6 Functional Test.

When a station does not operate properly, check the associated fuse. Fuses for stations 1 to 4 are provided on the SLB-A, and fuses for stations 5 to 8 are on the 4SB-A or SIB-A boards.

TABLE 3.6.1 FUSE RATINGS

EQUIPMENT	LOCATION	NOTE	RATING
Main Equipment	SLB-A, SIB-A, 4SB-A	Station Fuses	375mA (one for two stations) 3AG size
Power Supply	Front Panel	AC Mains	1 Ampere M205 size
Remote Extension and Tie Line Interface Unit	Front Panel	FO Mains F1 48V F2 24V F3 5V	1 Ampere 1 Ampere 1 Ampere 1 Ampere M205 size

3.6.1 BACKGROUND MUSIC (BGM)

Check that the Music Source is connected to the MS1/MS2 terminals (LTC-A board) and the appropriate STA (station) and ICM (intercom) programming links are correct. If BGM is still faulty then check the following points:

a) That the connection of the Music Source to the MS1/MS2 terminal is in good condition and that the source has a suitable output (2K to 10K ohms impedance).

If it is possible to hear the music through the receiver of a Buttinski connected in parallel to the MS1 /MS2 terminals, then this source should be satisfactory.

b) Check that the LTC-A terminal board is plugged into the connector properly and the pins are not bent.

c) Check that the flat ribbon cable connecting CPB-A and SLB-A together is properly inserted. When inserting or pulling out the flat cable, ensure that the power switch is OFF.

d) Check that the power supply voltage on the SLB-A is +18V,-18V plus minus 0.5V with reference to COM.

e) Check the connecting cable between the Main Equipment and the Station for shorting and continuity.

f) Check that none of the fuses on the SLB-A, 4SB-A and SIB-A have blown.

g) If no stations have Background Music then replace CPB-A.

If Background Music is not obtained from some of the stations, proceed with the following test.

a) Check that the appropriate programming links are inserted in the STA or ICM connectors (Table 2.5.2 Installation).

b) Check the fuse corresponding to the station.

c) The voltage LRD should be approx. +31 V with reference to LBK conductor at the station. If this is not correct, check the line cord and it's connection on the STB-A board.

d) If the voltage between LRD and LBK is correct, the strapping wires on the T connector (refer to Figure 34). Note that the straps are located on the HFTB-A board if the Handsfree Console is connected. (refer Tables 2.4.3 and 2.4.4).

If Background Music is still not heard then replace the station and/or SLB-A or 4SB-A or SIB-A.

3.6.2 ALL CALL

- Background Music can not be cut off when the handset is lifted

Each of the items in 3.6.1 must be checked. If this phenomenon is observed at all of the stations, replace CPB-A. If only some of stations present this problem, replace the corresponding station interface board, such as 4SB-A. Refer to Table 1.4.3. However, before replacing the components, 3.6.1 must be reviewed carefully.

- All Call cannot be originated

Check that the LED in the HOLD key is lit by depressing the ALL CALL key. If the LED is lit data transmission between the station and main equipment should be operating correctly, therefore, proceed to item 'd'.

If the LED in the HOLD key does not light check the following:

a) Try to originate the All Call from another station to determine if the problem is system based or station based.

b) If it is a system based problem, check the power supply voltage, LTC connections, flat cable connections and fuses. If the problem still occurs after checking, replace CPB-A.

c) If the problem is observed only when the call is made from some of the stations, check the faulty stations and associated interface boards. Test the voltage of LRD with reference to LBK in the station, it should be +31V approx., and also check the line cord connections. The straps on the T connector should be checked (refer to Figure 34). If they are correct, replace the station and/or station interface board in the Main Equipment.

- No All Call audio path.

d) If the originating station does not have side tone in the handset while operating the All Call key, check the wiring of the line cord, dial connection and the straps on the T connector. Check the voltage between LWT and LBL conductors, the correct value is between 3 and 12V when the handset is off hook and the All Call is in progress.

If the expected voltages can not be obtained, and/or no side tone is heard, replace the telephone station. In the case of no voltage between LWT and LBL, first check the cable and then proceed with the next test which replaces boards in the Main Equipment as follows:

- No side tone can be obtained at any of the stations, -- change CPB-A.
- Only some of the telephone stations do not have side tone, -- change the station interface board associated with the stations.

3.6.3 EXCHANGE LINE SEIZURE

Lifting the handset and operating the exchange line key should connect the station to the exchange line. If this does not occur, check test items 1 and 2 in Section 2.6.2 System Test. If there is no faults with those tests, proceed with the following tests.

a) Test the exchange line connection to 1A/1B, 2A/2B and 3A/3B on LTC-A, using a Buttinski.

b) Check LTC-A insertion in the SLB-A connector.

c) LNB-A board is required to provide a third exchange line. Check for the proper installation of this board, if equipped.

d) To provide Switchhook Flash or Earth Recall facility, the FGB-A board is required. Check for proper installation of the FGB-A, the correct insertion of programming links, and that a recall earth is connected to ER on LTC-B (refer to Table 2.4.7).

e) If no FGB-A board is equipped, make sure that the programming links are inserted between 13-l 4, 15-l 6 and 17-l 8 in the FG connector on the SLB-A board.

f) If FGB-A board is equipped, then those PBX lines that do not have Earth Recall or Switchhook Flash must have programming links inserted between terminals 2 and 3 on the appropriate L1, L2 or L3 socket (located on the FGB-A).

3.6.4 INCOMING CALLS

During exchange line incoming calls, the associated LED, built into the key, will flash at 60 IPM at all stations, and incoming audible signalling will be heard from station speakers. If no audible signalling is heard, check the programming links in the STA connectors for each station, eg. for station one programming links between l-2 or 2-3 provides on hook signailing or off hook signalling respectively. At the station assigned off hook, the audible signalling is muted when the handset is lifted.

Check that the Do Not Disturb mode (DND Key) is not activated.

3.6.5 ANSWER

Refer to 3.6.3 Exchange Line Seizure

3.6.6 HOLD

If MOH is defective, check section 3.6.1 Background Music. If background music works, but no music is transferred to the exchange line, then check the flat ribbon cable. If a specific line does not present MOH, change SLB-A or LNB-A if it is the third exchange line.

3.6.7 AUTO RECALL

A recall timer duration of 32 seconds, 64 seconds or 96 seconds may be set by inserting programming links into the AR connector on the CPB-A. If there are no programming links in the AR connector, audible signalling will be sent as soon as a line is placed on hold, hence ensure that a programming link is in place.

3.6.8 RESEIZURE

Refer to 3.6.3 Exchange Line Seizure.

3.6.9 PRIVACY

Replace the CPB-A board.

3.6.10 AUTOMATIC HOLD

Refer to 3.6.6 Hold.

3.6.11 HANDSET ANSWERING

Refer to 3.6.2 All Call (b),(c) and (d).

3.6.12 HANDSFREE TALKBACK

If no side tone is obtained at the originating station, check 3.6.2 All Call. When the problem is considered to be in the speaker circuit or microphone circuit, test whether the problem is in the station or Main Equipment. This is done by exchanging the station. If the problem remains then the problem lies within the Main Equipment. Replace the associated interface board. Otherwise check the stations wiring and line cord.

3.6.13 MICROPHONE CONTROL AND DO-NOT-DISTURB

Depression of DND key activates DND if this is done while the station is in the idle state. However, the DND key activates microphone mute when the station is receiving an intercom call. The control of LED's is handled in the station, therefore, when a lamp does not operate correctly the fault must lie within the station. Check flat cable connection in the station. Replace the station.

3.6.14 PRIVACY ON INTERCOM CALLS

In the event of a fault, check the Main Equipment CPB-A board IP connector programming links. Privacy is controlled by the microprocessor in the Main Equipment.

3.6.15 ALTERNATE POINT ANSWERING

Refer to 3.6.9 Privacy.

3.6.16 FGB-A FACILITY

a) Switchhook Flash

Check the programming link connection between l-2 in the L1, L2 and L3 connector. Check that the board is correctly inserted. If the problem is limited to only this facility, replace FGB-A.

b) Earth Recall

Check the programming link connection between 2-3 and between 4-5 in the L1, L2 and L3 connector. Check that the board is correctly inserted. Check that a recall earth is connected to LTC-B (refer to Table 2.4.7). If the problem is limited to only this facility, replace FGB-A.

3.6.17 MULTI-CONFERENCING

Check that the MCB-A is correctly inserted into the connector. If the problem is limited to only this facility, replace MCB-A.

3.6.18 INTERCOM STATION

Power and data transmission to an intercom station is different to that of a telephone station. The RD-BK pair is assigned to the speaker path, and WT-BL pair is assigned to microphone path. Power and data transmission uses phantom connection with the above two pairs. If the interface board is the SIB-A, the intercom station can only be connected to the station port 7 and 8. Check the cable connection with the the intercom station by checking the voltage between RD and WT, and BK and BL. It is approx. 31V when idle. If the voltage is incorrect, check the cabling.

3.6.19 DOOR STATION

Refer to Section 3.6.18 Intercom Station. The chime tone is produced in the door station. Therefore, if the voice circuit and key operation are normal, but no chime tone is sent, replace the door station.

The programming link l-2 in the ICM connector corresponding to the door station must not be connected. If the link is inserted then the station is assigned as an intercom station and not a door station. If connection 2-3 is made in the ICM connector, then alarm signalling will be sent to the door station.

3.6.20 ALARM SIGNAL

a) If no alarm signal is heard at any station:

- Check AL1 and AL2 termination on the LTC-A board.
- Check the programming link in the AL connector on the CPB-A.
- Replace CPB-A.

b) If no alarm signal is heard at some stations, exchange stations to find a faulty station. If only alarm tone is found to be defective, replace CPB-A.

3.6.21 CALL METERING UNIT

1. Check that the Call Metering Unit is installed as follows:

   LA,LB: Exchange Line from MDF/IDF.
   A, B: Exchange Line Connection to the Main Equipment.
   +, -: To + 18V and -18V on SLB-A in the Main Equipment.
   E: Telecom Earth.

2. Check that metering pulses are provided on the exchange line.
3. Replace Call Metering Unit.

3.6.22 HANDSFREE CONSOLE

1. Check that the station has power (LED's are lit) and that the K switch in the HFC is set to 2ov.
2. Check wiring for Handsfree Console (Table 2.4.4) and ribbon connector in the HFC.
3. Check that the D connector in the HFC has links 1 to 2 and 4 to 5.
4. Check that the microphone and speaker are connected in the HFC:-

   Speaker: to SP1 and SP2
   Microphone: RD to Ml and WT to M2.
5. Check that the station can make an ordinary intercom call, if it can, replace the Handsfree Console.

3.6.22A TRUNK BARRING UNIT

1. Check that the Trunk Barring Unit is installed correctly (refer to Table 2.4.4A).
2. Check that the trunk barring diode is installed in the correct manner (see Section 2.4.6.3 and Figure 34)
3. Check that the local exchange is equipped to preform the required barring
4. Replace Trunk Barring Unit

3.6.23 TIE LINE SEIZURE

1. Check wiring to the tie line as follows:

   A, B: to tie line
   WT,BL: to exchange line connection in the main equipment.
2. Check that the RTIU has power, that it is turned on, and the pilot lamp is lit. Check all fuses (1 A, size M205).
3. If the LRB board is fitted, the tie line should receive interrupted ring voltage and the calling station should hear ring tone. If there are no tones or voltage, replace LRB board.
4. If the RRB board is fitted, the tie line should receive ring voltage for approximately one second. If not, replace RRB board.
5. If still no ring voltage or tone, replace the RTB board.
6. Replace RTIU and re-install boards.

3.6.24 TIE LINE ANSWERED

1. If a LRB board is fitted, ring should stop when a dc loop is completed by the tie line. Battery feed of 48V is supplied to the tie line. If faulty, check fuses, then replace LRB board.
2. If a RRB board is fitted, ring should stop after approx. one second. If not, replace RRB board.

   The RRB board does not provide battery feed or a dc loop to the tie line.

3.6.25 INCOMING TIE LINE CALL

1. If a LRB is fitted, a dc loop on the tie line should send interrupted ring voltage to the main equipment and ring tone to the tie line. If unsuccessful replace the LRB board.
2. If a RRB is fitted, ring voltage from the tie line should be detected and interrupted ring voltage is sent to the main equipment. If unsuccessful, replace the RRB board.

3.6.26 ANSWERING TIE LINE

1. Replace LRB or RRB board.

3.6.27 REMOTE (TWO WIRE) EXTENSION INTERCOM CALL

1. Check wiring at the RTIU as follows:

   A,B: remote extension
   WT,BL: A-pair from main equipment
   RD,BK: B-pair from main equipment
2. Check that the RTIU has power, is turned on and that the pilot lamp is lit. Check all fuses (1 A, size M205).
3. Check voltage between wires to remote extension, the correct value is 48V. If the voltage is wrong, recheck fuses, replace RXB board and RTIU, if necessary.
4. If no dial tone, replace RTB board.
5. Check transmitter, receiver, gravity switch and wiring of the extension.

3.6.28 REMOTE EXTENSION INTERCOM CALL

1. Remote extension must be a decadic telephone. Test the telephone on an exchange line
2. Check that a 31FB board and a RXB board are installed for each remote extension.
3. Replace RXB board.
4. Replace 31FB board.

3.6.29 REMOTE EXTENSION HOLD

1. The gravity switch is depressed for about half a second. If unsuccessful, try again.
2. Replace RXB board.

3.6.30 REMOTE EXTENSION DISCONNECTION

1. Check that the telephone is on hook for at least one second
2. Change remote extension.
3. Replace RXB board.
4. Replace 31FB board.

3.7 REPAIR PROCEDURES

3.7.1 PRINTED BOARD ASSEMBLIES

No repair of PBA's will be carried out on site or in field depots. Any fault in a PBA will necessitate replacement of that assembly.

All faulty PBA's will be suitably packaged (refer 1.1.1) and promptly returned to your State Workshops on a changeover basis. A Customer Equipment Fault Report Label (E441) must be attached to all faulty PBAs, and filled out with as many details of the fault condition as possible.

Each State Workshop should keep an accurate record of all PBAs despatched and recieved to ensure that replacements are obtained one-for-one.

3.7.2 OTHER ITEMS — (Refer to 3.4)

No repair of these items will be carried out on-site or in field depots. Any fault in an item will necessitate replacement of that item complete; exceptions — where a fault has been diagnosed to the PBA; or the Spare Parts listed in Appendix 1 pages 130 & 131. Consumable items (parts listed in Spare Parts Appendix 1), will be disposed of in a manner similar to other consumable items.

All faulty items will be suitably packaged (same type of carton and packaging as supplied with new item) before forwarding from the field to the local store, for forwarding to the Sifting Room using Form S417 procedures.

Note: *A* Customer *Equipment* Fault Report Label *(E441)* must be *attached* to *all* faulty items, *and filled* out *with* as many details of the fault condition as *possible.*

Replacement items will be obtained using normal requisitioning procedures on your State Supply Branch.

APPENDIX 1

CONTENTS

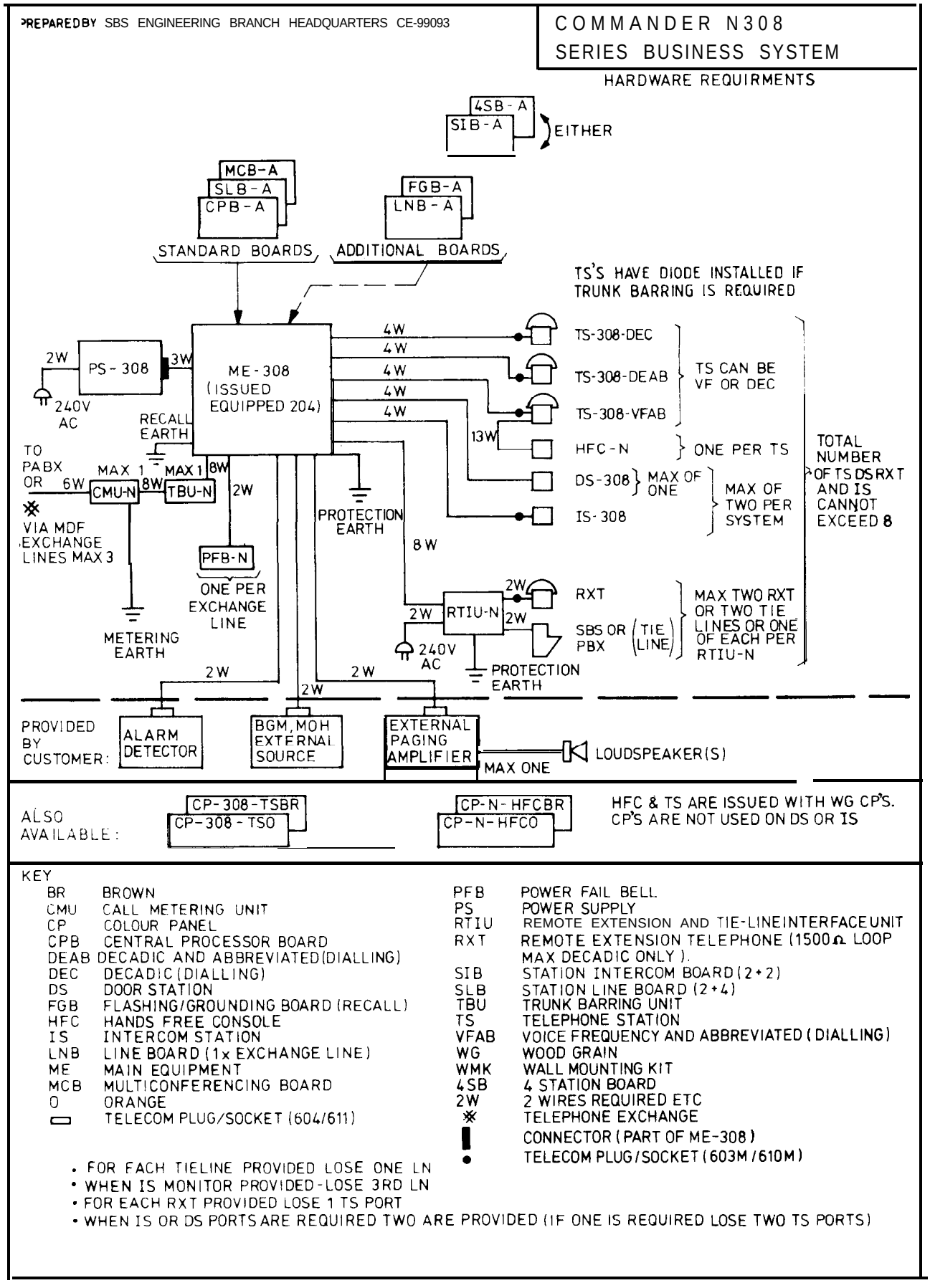
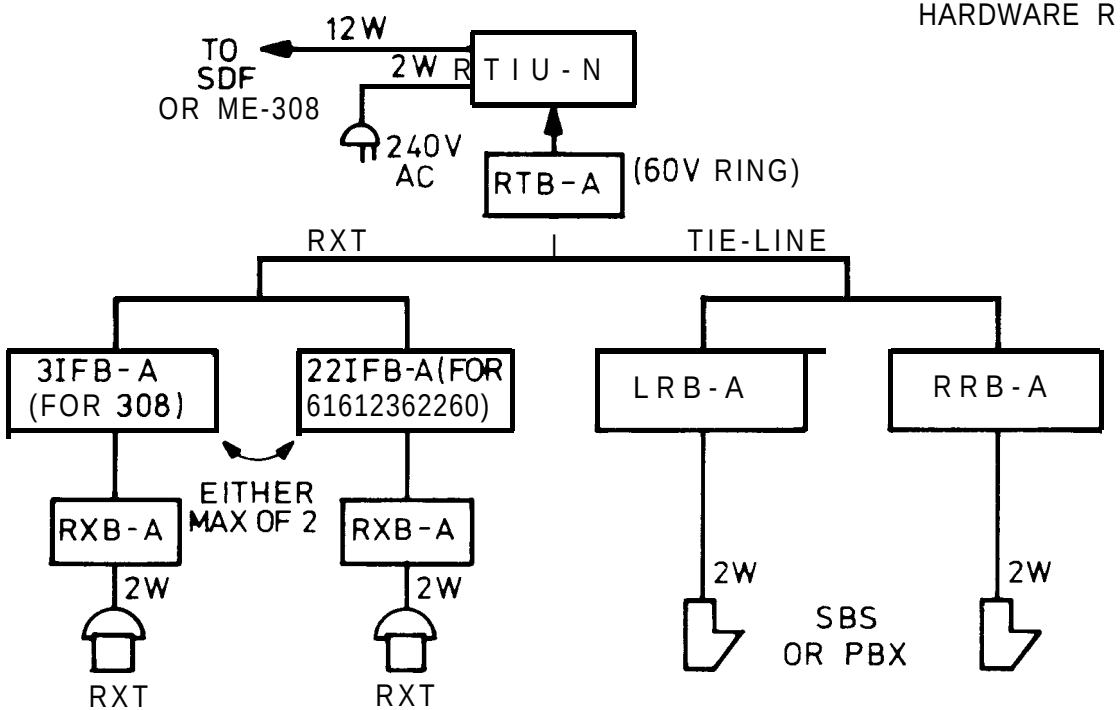


FIG. AI - COMMANDER N308 HARDWARE REQUIREMENT

PREPARED BY SBS ENGINEERING BRANCH HEADQUARTERS CE-99093

COMMANDER N SERIES BUSINESS SYSTEM

REMOTE EXTENSION AND TIE-LINE SUMMARY HARDWARE REQUIREMENTS



EACH RTIU-N CAN FEED TWO TERMINAL CONNECTIONS

TIE-LINE	RXT
0	1
0	2
1	1
2	0
1	0

EG. TO PROVIDE ONE RXT AND ONE TIE-LINE WITH LR SIGNALLING USED WITH N308 REQUIRE:

1 x RTIU-N
Ix RTB-A
I x 3IFB-A
Ix RXB-A
Ix LRB-A

RXT & TIE-LINE LOOP LIMITED TO 1500-n

RXT MAY BE ANY TEL_ECOM APPROVED DECADIC DIALLING TELEPHONE.

KEY:

31FB	308 INTERFACE BOARD	RTI U	REMOTE EXTENSION AND TIE-LINE INTERFACE UNIT.
22 IFB	22 INTERFACE BOARD		
LRB	LOOP-IN RING-OUT BOARD	RXB	REMOTE EXTENSION BOARD
PBX	PRIVATE BRANCH EXCHANGE	RXT	REMOTE EXTENSION TELEPHONE
RRB	RING-IN RING-OUT BOARD	SBS	SMALL BUSI NESS SYSTEM
RTB	RING TONE BOARD	SDF	SYSTEM DISTRIBUTING FRAME
		2 w	2 WIRE ETC.

FIG. A2 - RTIU HARDWARE REQUIREMENT

N308 INSTALLATION PARTS CHECK LIST[1]

SERIAL 338

CODE	ITEM NO.
ME-308	3381300
PS-308	301
MCB-A	323
LNB-A	320
SIB-A	322
4SB-A	321
FGB-A	324
TS-308-DEC	302
TS-308-DEAB	340
TS-308-VFAB	341
DS-308	303
IS-308	304
HFC-N	546
WMK-N-TS	568
CMU-N	567
PFB-N	571
TBU-N	328
RTIU-N	560
RTB-A	563
3IFB-A	569
RXB-A	561
LRB-A	565
RRB-A	564
CP-308-TSWG	317
CP-308-TSO	318
CP-308-TSBR	319
CP-N-HFCWG	557
CP-N-HFCO	558
CP-N-HFCBR	559

N308 MAINTENANCE PARTS CHECK LIST[2]

SERIAL 338

CODE	ITEM NO.
CPB-A	3381326
SLB-A	327
DSSHFCB-6161236-C	609
HB-N-C	602
HC-N-C	611
HFCC-N-C	608
HRC-N-C	603
HTC-N-C	604
KC-N-C	613
KC-N-CL	614
KC-N-O	616
LC-N	612
REC-N	600
TNWC-N	610
TRA-N	601
TSB-N-C	606
TSC-N-C	605
KC-N-RL	615

SERIAL 288

CODE	ITEM NO.
PLUG, TYPE 603M	268/39
SOCKET, TYPE 61 OM	40
SOCKET, TYPE 611	50

SERIAL 11

CODE	ITEM NO.
FUSE-3AG-0.375A	11/114
FUSE-M205-1A	108

1. Parts listed are all those which may be required at installation. Full details may be found in the following pages.
2. Parts listed are those which may be required for maintenance. Full details may be found in the following pages. See also N308 installation Parts – Check List

LIGHTNING PROTECTION PARTS AS REQUIRED.

N308 PARTS LIST

ITEM NO.	CODE	DESCRIPTION	REMARKS
MAIN COMPONENTS			
338/300	ME-308	Main Equipment 308	Houses the N308 control equipment. Is issued with 2 exchange line and 4 station ports.
3381301	PS-308	Power Supply 308	Used to power 338/300.
PRINTED BOARD ASSEMBLIES			
338/326	CPB-A	Central Processor Board A	Used as maintenance part for 338/300.
3381324	FGB-A	Flashing/Grounding Board A	Used in 3381300 when hook flash or grounding PBX recall is required.
338/320	LNB-A	Exchange Line Board A	Used in 3381300 to provide 1 additional exchange line port.
3381323	MCB-A	Multi-Conferencing Board A	Used in 3381300 to provide multi-conferencing facility.
3381322	SIB-A	Station Intercom Board A	Used in 338/300 to provide an additional 2 telephone station ports. Also provided are 2 ports for intercom or door stations. Maximum of one door station only.
338/327	SLB-A	Station Line Board A	.Use as maintenance part for 3381300. Provides 2 exchange lines and 4 station ports.
338/321	4SB-A	4 Station Board A	Used in 338/300 to provide 4 additional telephone station ports.
STATIONS			
3381302	TS-308-DEC	Telephone Station 308 ● DEC	Standard station for N308 BS. Provides decadic dialling.
338/340	TS-308-DEAB	Telephone Station 308 . DEC/ABRV	Option for N308 BS. Provides decadic and abbreviated dialling.
338/341	TS-308-VFAB	Telephone Station 308 . VF/ABRV	Option for N308 BS. Provides VF and abbreviated dialling.
3381303	DS-308	Door Station 308	Used with N308 to provide intercom and doorbell facilities.
338/304	IS-308	Intercom Station 308	Used with N308 to provide intercom facility.

ITEM NO.	CODE	DESCRIPTION	REMARKS
MISCELLANEOUS ITEMS			
3381546	HFC-N	Handsfree Console	For use with N308, 616, 1236, 2260 BS's when handsfree exchange line facilities are required. Must be used in conjunction with a telephone station.
3381568	WMK-N-TS	Wall Mounting Kit N	Used when wall mounting N Series BS's telephone stations.
338/571	PFB-N	Powerfail Bell N	For use with N Series BS's to indicate incoming ring on exchange lines during powerfail conditions.
338/567	CMU-N	Call Metering Unit N	For use with N Series BS's to record number of exchange line meter pulses received. Each unit can meter 3 lines.
338/328	TBU-N	Trunk Barring Unit N	For use with N308 BS when trunk access barring is required. Issued complete with 8 diodes.
3381560	RTIU-N	Remote Extension and Tie Line Interface Unit N	For use with N Series BS's when remote station(s) and/or tie line(s) are to be connected. Provides mounting for 338/561, 563, 564, 565, 569.
338/569	3IFB-A	Interface Board A 308	For use in 338/560 when connected to N308 BS.
338/563	RTB-A	Ring and Tone Board A	For use with 338/560.
338/561	RXB-A	Remote Extension Board A	For use with 338/560.
3381565	LRB-A	Loop-in/Ring-out Tie Line Interface Board A	For use with 338/560.
3381564	RRB-A	Ring-in/Ring-out Tie Line Interface Board A	For use with 338/560.
268/50		Socket, type 611	Used when connecting permitted attachments.
SPARE PARTS			
338/609	DSSHFCB-6161236-C	DSS/Handsfree Console Base ● Colonial Cream	
338/602	HB-N-C	Handset Body ● Colonial Cream	
3381611	HC-N-C	Handset Cord ● Colonial Cream	
3381608	HFCC-N-C	Handsfree Console Case ● Colonial Cream	
3381603	HRC-N-C	Handset Receiver Cap .Colonial Cream	
338/604	HTC-N-C	Handset Transmitter Cap .Colonial Cream	
3381613	KC-N-C	Key Cap - Clear	

ITEM NO.	CODE	DESCRIPTION	REMARKS
338/614	KC-N-CL	Key Cap - Clear with Lens	
338/616	KC-N-O	Key Cap - Orange	
3381612	LC-N	Line Cord	
3381600	REC-N	Receiver Insert	
3381610	TNWC-N	Telephone Number Window Cover	
338/601	TRA-N	Transmitter Insert	
338/606	TSB-N-C	Telephone Station Base ● Colonial Cream	
3381605	TSC-N-C	Telephone Station Case ● Colonial Cream	
338/6 15	KC-N-RL	Key Cap - Red with Lens.	
11/114	Fuse-3AG-0.375A	Fuse, 0.375 Amp, 3AG type	Used as maintenance part for 338/321, 327.
11/108	Fuse-M205-1A	Fuse 1 Amp, M205 type	Used as maintenance part for 338/301.
268/39		Plug, type 603M	Used as maintenance part to connect 338/302, 304, 340, 341 and RXT.
COLOUR PANELS			
3381317	CP-308-TSWG	Colour Panel, 308 Telephone Station ● Woodgrain	Issued with 338/302, 340, 341.
338/318	CP-308-TSO	Colour Panel, 308 Telephone Station ● Sunset Orange	Used with 338/302, 340, 341, so that station colour can be changed to suit surrounding decor.
338/319	CP-308-TSBR	Colour Panel, 308 Telephone Station ● Chocolate Brown	Used with 338/302, 340, 341, so that station colour can be changed to suit surrounding decor.
338/557	CP-N-HFCWG	Colour Panel Handsfree Console ● Woodgrain	Issued with 338/546.
3381558	CP-N-HFCO	Colour Panel Handsfree Console ● Sunset Orange	Used with 338/546 so that station colour can be changed to suit surrounding decor.
3381559	CP-N-HFCBR	Colour Panel Handsfree Console .Chocolate Brown	Used with 338/546 so that station colour can be changed to suit surrounding decor.