Post Office Telecommunications

Customers Apparatus Guide Notes

Push Button Telephones and X-Press Callmaker

Vocational Training Division
THQ/TP7.1.2

April 1979

GUIDE NOTES

These notes have been designed to help the maintenance technician or the installer when he meets unfamiliar items of customers apparatus. Many of these items will have been introduced since the technician completed his formal training.

THQ/TPD/TP7.1.2. VOCATIONAL TRAINING DIVISION.

CONTENTS

1. SELF CONTAINED (SC) PUSH BUTTON TELEPHONES

Telephones in this group contain miniaturised electronic circuitry which stores the digits as they are keyed and then transmits them to the public exchange in the form of the normal loop-disconnect dial pulses. Because the action of "keying" is much faster than the equivalent action of "dialling" there will be some delay before ringing or other tone is received.

Details of the telephones in this group will now be given.

TELEPHONE 1/764 AND 2/764 (DIAGRAM N864)

These two telephones differ slightly from one another due to different manufacturers techniques but they are both basically standard Teles 746 and can be used where a 746 would be used except:—

a. on a Plan 4 where more than one push button tele is required. (Note: the Tele 1/766 Push Button Trimphone could be used for the additional tele(s) see page 4).
b. on a Plan 4 arrangement on PMBX extensions.
c. in conjunction with Lamp Signalling Units Nos. 1 and 2.

The keypad circuit of these telephones is powered by an internal nickel cadmium battery which is normally charged by current from the exchange line while the telephone is not in use. It is important therefore that the handset is replaced after a call, and on a Plan 4 — that the telephone is left plugged into the line, to allow the battery to recharge.

Details of batteries and charging arrangements are given on pages 8-11.

Reference TIs B4 B0140 — Facilities
C3 B3022 — Installation
E5 B2830 — Maintenance
Diagram N848 — Auxiliary parts

TELEPHONE 765 (DIAGRAM N865)

This is the wall mounted version and at the date of this guide is available only in ivory.

It can be used as the main and/or extension instrument on Plans 1A, 105 and 107 and as the operators instrument on 2/switchboards, except where interswitchboard circuits with dialling facilities are required.

NOTE: this instrument *cannot* be used:

a. on Plan 4 installations.
b. with Lamp Signalling Units Nos. 1 & 2.
c. with watch receivers.

The keypad circuit of this telephone is powered by an internal nickel cadmium battery which is normally charged by current from the exchange line while the telephone is not in use. It is important therefore that the handset is replaced after a call to allow the battery to recharge.

Details of batteries and charging arrangements are given on pages 8-11.

References TIs B4 B0146 — Facilities
C3 B3209 — Installation
E5 B2765 — Maintenance
Diagram N848 — Auxiliary parts

TELEPHONE 766 (DIAGRAM N866)

This is the Push Button Trimphone (SC) formerly known as the "Keypad Trimphone". It can be used on exchange lines, both exclusive and shared service and as an extension from all PBXs except those requiring Multi-frequency (MF) or Code "C" signalling (see Paras 3 and 4). It can also be used on all Plan arrangements except Plan 105/105A where it can only be used for *external* extensions or Plan 107/107A extensions only. TI B4 B0152 gives a full list of applications.

Unlike other SC push button telephones the Tele 766 does not require a separate battery for the keypad circuit, the necessary power being drawn directly from the line.

A lightning protector is connected between terminals T8-T19 but on some models it may be included in the "send unit" and connected to T19 by a green wire. This wire *must not be removed*.

Connexions must only be made to the terminals indicated on the 'N' diagrams, connecting to terminals other than those indicated could damage the sender unit.

References TIs B4 B0152 — Facilities
C3 B3025 — Installation
E5 B2832 — Maintenance
Diagrams N820, N4700 — Additional parts

TELEPHONE 768 (DIAGRAM N868)

This is a 4 button telephone equivalent to the Tele 740. It can be used on plan arrangements in place of the Tele 740 where more than 2 buttons are required.

The Tele 768 *cannot* be used:

a. On Plan 2A arrangement.

b. With Lamp Signalling Units Nos. 1 & 2.

c. With the Headset No. 1 associated with PMBX2/switchboards.

The keypad circuit of this telephone is powered by an internal nickel cadmium battery which is normally charged by current from the exchange line while the telephone is not in use. It is important that the handset is replaced after a call to allow the battery to recharge.

Details of batteries and charging arrangements are given on pages 8-11.

References TIs B4 B0145 — Facilities
C3 B3028 — Installation
E5 B2828 — Maintenance
Diagrams N848, N4700 — Additional parts

LOUDSPEAKING TELEPHONE (LST 4E) (DIAGRAM N4477)

The LST 4E is similar to the LST 4 but is fitted with a push button keypad in place of the dial, a further difference is the provision of a volume control for the tone caller.

The LST 4E may be fitted at the main or extension of Plans 1, 1A and 12A, and at the extensions of Plans 5, 5A, 7, 105/105A, 107/107A and Plan 9. It may also be used with Key and Lamp Units.

The keypad circuit is powered by an internal nickel cadmium battery housed behind the microphone compartment, the battery is normally charged by current from the power unit associated with the LST. Under mains fail conditions or with the power unit switched off the battery will be discharged when the keypad is used.

Details of batteries and charging arrangements are given on pages 8-11.

References TIs B4 B0142 — Facilities
C3 B2000 — General Information
C3 B2004 — Installation
E5 B2806 — Maintenance
Diagram N4475 — Additional parts, PBX extensions etc.

TESTING

These telephones can be tested in the normal manner. The keypad can be tested with the RSC but each digit must be keyed separately allowing the unit to finish sending before keying the next digit.

When using SALT for testing, during the dial test sequence key digits 1, 3 and 0 separately, checking for dial tone after each digit is sent before keying the next.

MAINTENANCE

On-site maintenance is the same as that for a Tele 746. It is not intended that the keypad should be changed as a separate item; where keypad faults are found the complete telephone should be changed.

No attempt should be made to adjust either the speed or the ratio of the pulsing circuit nor should any attempt be made at clearing other faults in the keypad circuitry.

When changing a telephone the battery should be removed from the recovered instrument. Take care not to damage the wiring, hold the body of the battery connector, never pull on the wires. Pack the faulty telephone carefully to prevent damage and return it and the battery to Section Stock.

Pages 8-11 give details of batteries and charging arrangements, always check the battery voltage and charge current after connecting a new telephone.

Failure to break dialling tone when testing the replacement telephone on an outgoing call may be due to a discharged battery. Check the battery voltage and charging current.

BATTERIES

Two types of rechargeable battery are used in push button telephones, these are *not* interchangeable and are:

Battery Secondary No. 22 (Red) 4.8v used in Teles 1/764, 765, 768 and the LST 4E.

Battery Secondary No. 23 (Blue) 7.2v used in Tele 2/764.

The batteries are of different sizes and are held firmly in the telephone by means of spring clips. They are positioned differently in the various telephones. You should ensure that you obtain the correct battery from Stores and if you have any difficulty in fixing the battery recheck that you have the correct one.

The battery dispenser used in the Store incorporates a charging circuit and batteries are issued in a fully charged condition. Never allow a battery to be overcharged or subjected to excessive heat (keep them in the shade in summer, not on the seat of your van). Overcharging or overheating can cause the battery case to split.

In the telephone the battery is connected to the circuit via a non-reversible plug. You should always handle the body of the connector, *never* pull on the wires. The connections are frail and cannot be remade satisfactorily at the customer's premises.

BATTERY CHARGING ARRANGEMENTS

The batteries in the telephones are normally charged by current from the exchange line but on PBX extensions and some other installations charging is from a local Power Unit, for example in the LST 4E the power unit supplied for the amplifier is also used to charge the battery. You will find the type of charging arrangements specified in the 'N' diagrams. Teles 764, 765 and 768 are issued strapped for "line charging", the 'N' diagram for each tele shows in Tables 1 and 2 the strapping changes required to suit power unit charging for different types of installation.

CHARGING BY LINE CURRENT

Fig. 1 shows the circuit for line charging:

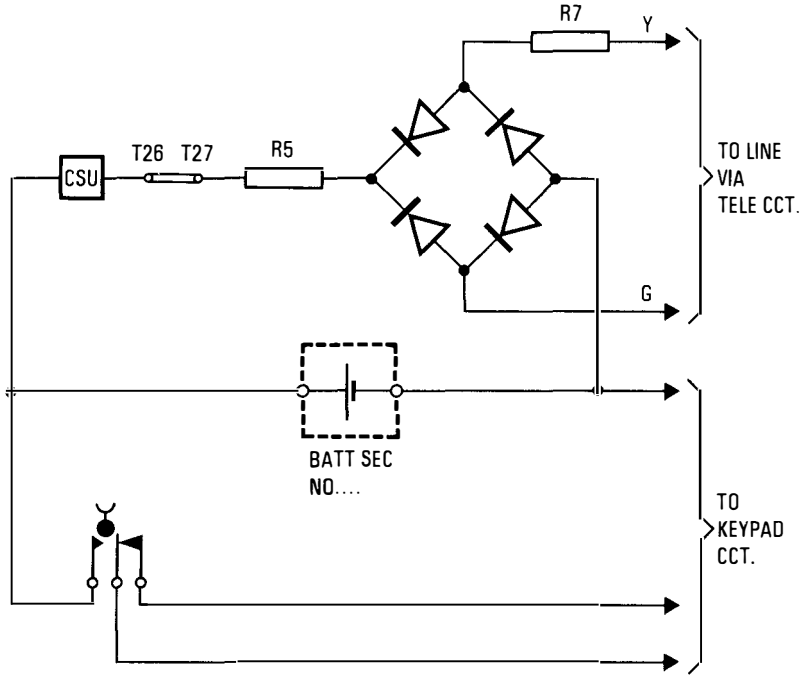


FIG. 1

CSU — Charge Switching Unit disconnects the charging circuit from the line when the line is in use.

To check the charging circuit connect a suitable milliammeter in place of the strap T26 (−ve) and T27 (+ve). With the handset on the rest a current of 2-3 mA should flow after 30-100 seconds. Replace the strap after testing the charge current.

CHARGING BY POWER UNIT (TELES 764, 765, 768)

This method is used when the telephone is not charged from the line, eg Plan 105 or where there is more than one push button telephone on the line. It is also used for 1+1 carrier installations. A Power Unit 53A is fitted at installations not already provided with a Power Unit. Fig. 2 shows the circuit arrangement:

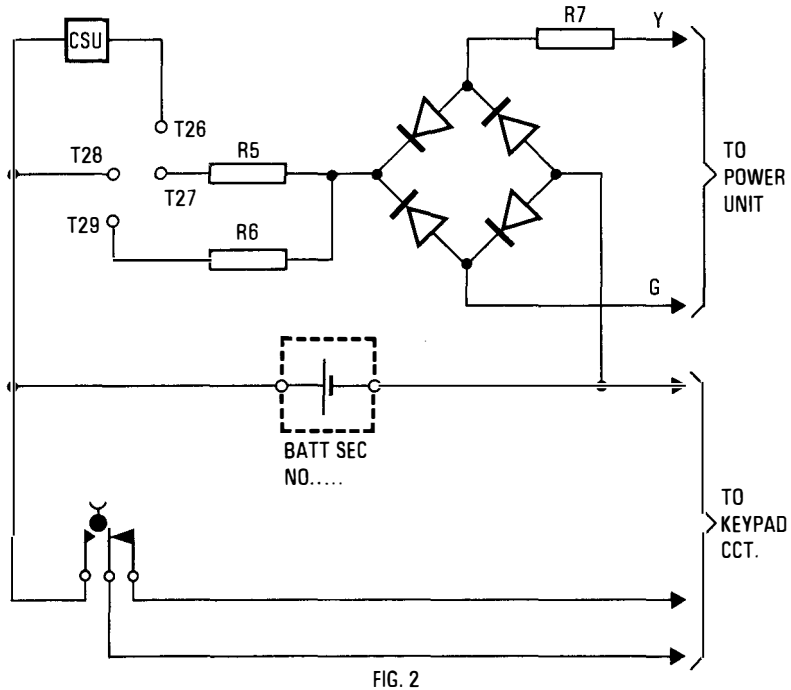


FIG. 2

NOTE: The strap between T26 and T27 *must be removed* and
for 10v Power Unit strap Terminals T27-T28.
for 50v Power Unit strap Terminals T28-T29.

It is important that these changes are made, incorrectly connecting the battery can result in overcharging which will damage the battery.

To check the charging current connect a suitable milliammeter in place of the strap T27 (+ve) and T28 (−ve) for 10v power units *or* T29 (+ve) and T28 (−ve) for 50v power units. With the handset on the rest the meter should show a current of 2-3 mA.

Replace the strap after testing the charge current.

CHARGING BY POWER UNIT LST 4E

The charging circuit is shown in Fig. 3.

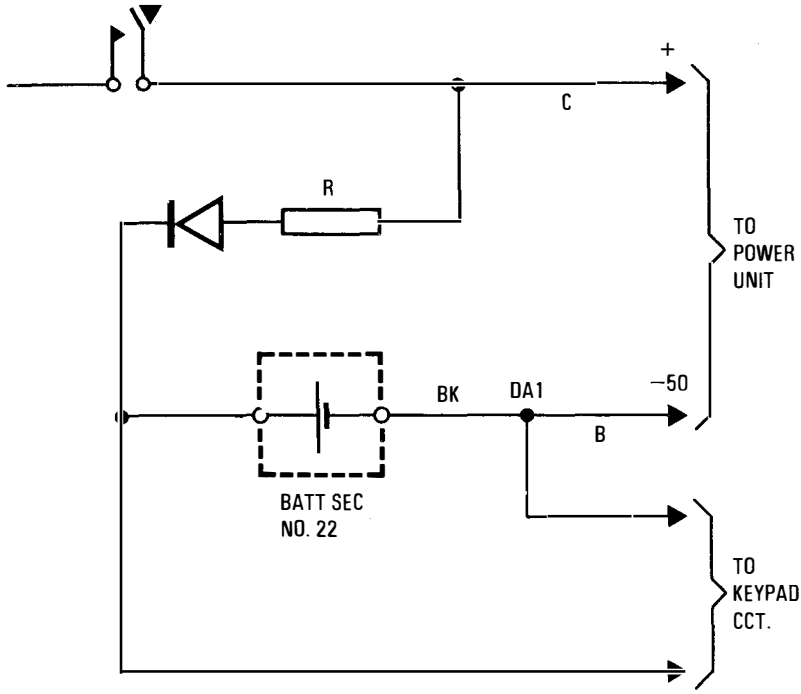


FIG. 3

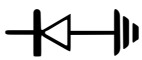
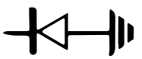
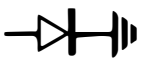
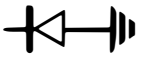
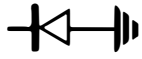
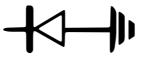
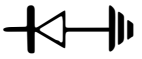
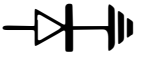
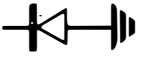
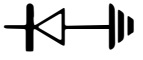
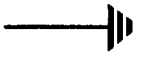
To check the charging current connect a suitable milliammeter in series with the Black lead on terminal DA1, a current of approximately 3 mA should be measured. Reconnect the lead to terminal DA1 when testing is completed.

2. SIGNALLING

There are 2 basic types of signal from the telephone to the exchange. One consists of dc conditions on the line and the other of combinations of alternating frequencies within the speech range.

DC CODE 'C'

This dc signalling system is used on extensions of certain types of PABX. A range of telephones are used as extension instruments each similar to a standard telephone but fitted with a Push Button Unit in place of a dial. This has 12 buttons numbered 1-0 and * and ⌗. Key * has no present use, key ⌗ is used to provide hold, transfer and recall facilities. The operation of a push button extends a combination of dc signals to the PABX. These signals are shown in Table 1:

BUTTON PRESSED	SIGNAL		BUTTON PRESSED	SIGNAL	
	'B' WIRE	'A' WIRE		'B' WIRE	'A' WIRE
1		DIS	7		
2	DIS		8	DIS	
3			9		
4		DIS	0		
5			*		
6			⌗		

The table shows that the condition applied to each wire is either a disconnection, direct earth or earth via a rectifier (diode) in either of its directions.

Because the conditions are to each wire it is important that the 'A' and 'B' wires are not reversed, looking at the table you will see that a reversal will cause the conditions for digit 2 to be sent when digit key 1 is pressed, and vice versa, similarly digits 4 and 8, 5 and 7, 6 and 9 will be reversed.

TELEPHONE FOR CODE 'C' SIGNALLING (DIAGRAM SA(L) 4252)

The telephones in this group are based on standard instruments but all have a Push Button Unit in place of a dial. They are:

Tele SA 4252 — Similar to the Tele 746 and can be used in those situations where a 746 would be used. It can be fitted with 1 or 2 press buttons if required for Plan arrangements.

Tele 1/SA 4252 — This instrument is now obsolescent and is not to be used except for the modification of existing plan numbers. It can be fitted with up to 6 press buttons and 2 lamps.

Tele 2/SA 4252 — This is similar to the Tele 740 and can be fitted with up to 4 press buttons and 2 lamps.

Tele 3/SA 4252 — This is the wall mounted version and is similar to the Tele 711.

Loudspeaking Telephone SA 4255 — Similar to the LST 4 but is fitted with a Push Button Unit No. 3 for Code 'C' signalling.

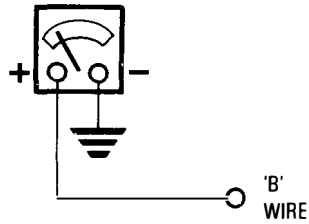
TESTING CODE 'C' TELEPHONES

The signalling conditions can be tested either by using a 4 lamp tester which is desribed in TI E5 B2820 and may be constructed locally, or by an ohmmeter (Meter Multirange) connected between either wire of the pair and earth.

A sequence of 4 tests is required to test all the conditions if using a Meter Multirange, these are:

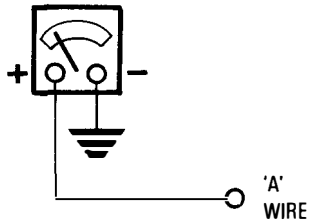
With the Meter Multirange set to the lowest ohms range and connected −ve to earth, +ve to B wire. Press each push button in turn, note that readings should be obtained only when buttons 1, 3, 4, 6, 7, 9, ✱, ⌗ are pressed.

Buttons 2, 5, 8, 0 give *no* readings.



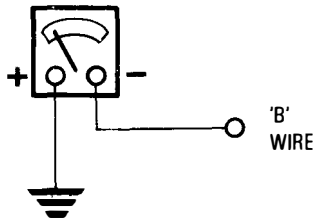
The Meter now connected with −ve to earth and +ve to the A wire. Press each button in turn, readings should be obtained when buttons 2, 3, 5, 6, 8, 9, 0, ⌗ are pressed.

Buttons 1, 4, 7, ✱, give *no* readings.

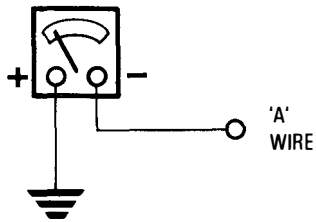


Meter connections are now changed to connect +ve to earth and −ve to the B wire. With each button pressed in turn readings should be obtained when buttons 4, 5, 6, 0, ✱, ⌗ are pressed.

Buttons 1, 2, 3, 7, 8, 9, give *no* readings.



Meter connections are again changed to +ve to earth, −ve to A wire. Each button is pressed in turn. Readings are obtained when buttons 7, 8, 9, 0, ✱, ⌗ are pressed.



No readings are received for buttons 1, 2, 3, 4, 5, 6.

MAINTENANCE

On site maintenance is the same as that for a Tele 746. No attempt should be made to adjust the Push Button Unit; when faults are found in the PBU on Plessey keyphones, identified as "Mark 1" the keypad can be changed for a PBU 3A which is available via the Rate Book.

On GEC keyphones, identified as "Mark 2" and by the manufacturers code "GEN" the keypad cannot be changed, the whole telephone must be changed.

Spare telephones should be held as normal stock at the PABX.

References TIs B4 B0101 — Facilities
E5 B2820 — Maintenance
Diagram N848 — Auxiliary parts

3. SSMF4 MULTI-FREQUENCY SIGNALLING

This is an ac signalling system, the code sent to the exchange is made up of a combination of tones which are produced by a multi-frequency oscillator housed within the instrument and powered directly from the line. When "keying" a number the tones can be heard in the receiver, this is known as the "confidence tone" and is intended to give the user an indication that the call is progressing satisfactorily.

The telephones using this signalling system were introduced for use on PABXs but their use may be extended to some public exchanges.

TELEPHONES FOR SSMF4 (DIAGRAM SA (L) 4258)

There are 4 types of telephone for PABX use. They are similar to the standard telephones but have a Push Button Unit No. 4 fitted in place of the dial. The PBU No. 4 has 12 buttons marked 1 to 0 and also * and # which may be used to provide other facilities.

Telephone SA 4258 — Similar in appearance and use to the Tele 746.

Telephone 2/SA 4258 — Similar to the Tele 740 and has provision for 4 press buttons and 2 lamps.

Telephone 4/SA 4258 — Wall mounted and similar to the Tele 711.

Loudspeaking Telephone SA 4265 — Similar to the LST but with a PBU No. 4 fitted in place of the dial.

TESTING

Until a special tester is available to test the output of the line powered multi-frequency oscillator a simple check can be made that tones are being transmitted. Lift the handset and listen while pressing each button slowly in turn. As the button is pressed a combination of tones will be heard.

MAINTENANCE

Maintenance is confined to changing faulty parts as on a standard Tele 746. No attempt should be made to adjust the PBU or the oscillator. Remember the oscillator is line powered and a battery is not required.

If a fault is proved on the PBU or the oscillator change the telephone. Spare telephones should be held as normal stock at the PABX.

References TIs B4 B0101 — Facilities
E5 82821 — Maintenance
Diagram N848 — Auxiliary parts

4. X-PRESS CALLMAKER (TELE 1/772 DIAGRAM N872)

This telephone resembles the Tele 764 but has a Push Button Unit in place of the dial. The PBU has 12 *black* buttons with the white markings 1 to 0, T (for transmit) and P (for programme). The telephone incorporates a rechargeable nickel cadmium battery to power the keypad circuit. It is important that the handset is replaced after a call to avoid discharging the battery which is recharged from the line when the telephone is idle.

The telephone may be operated as:

a. a push button telephone.

b. a callmaker capable of storing up to 10 exchange line numbers each of up to 18 digits, each stored number being associated with a digit button from 1 to 0.

c. a callmaker capable of repeating the last number that was manually "keyed".

The signalling used is 10 loop/disconnect pulses per second similar to the standard dial, therefore there will be delay between "keying" the required number and receiving ringing or other tone.

APPLICATION

The telephone may be used in place of a Tele 746 except on a Plan 4 with more than one push button telephone or with Lamp Signalling Units Nos. 1 and 2.

TO REPEAT THE LAST MANUALLY KEYED NUMBER

Lift the handset and on receipt of dial tone depress and release button 'T' twice.

NOTE: When strapped for PABX working this facility cannot be used for internal calls. When using the facility the first operation of button 'T' sends the PABX Access digit. Wait for exchange dial tone, then press button 'T' a second time to send the exchange number.

OPERATION AS A CALLMAKER

TO STORE A NUMBER: Note that if the telephone is to be used on a PABX a wiring change is required within the telephone. Move the red-white wire from T31 to T28. This will allow for storage of a PABX access digit.

Lift the handset and place it to one side. You will need both hands for the following operations:

i. Depress and *hold down* button 'P'.
ii. Depress and release the digit button under which the number is to be stored, say digit 5.
iii. "Key in" the required telephone number in the normal fashion, say 01-234 5678.
iv. Release button 'P'.
v. Replace the handset.

In the example we have chosen the number 01-234 5678 is stored "under" the digit button 5. The number could have contained up to 18 digits. This allows for international numbers to be stored.

TO SEND A STORED NUMBER (D.E.L. WORKING)

i. Lift the handset and listen for dial tone.
ii. Depress and release button 'T'.
iii. Depress and release the digit button under which the required number is stored.

In our example if we wish to call 01-234 5678 then we would press and release button 'T', then press and release button 5.

TO STORE THE PABX ACCESS DIGIT

Lift the handset and place it to one side.

i. Depress and *hold down* button 'P'.
ii. Depress and release button 'T'.
iii. Depress and release the digit button corresponding to the PABX Access digit (eg. 7).
iv. Release button 'P' and replace the handset.

The exchange number can then be stored as previously described. Note extension numbers cannot be stored.

TO SEND A STORED NUMBER (PABX WORKING)

I. Lift the handset and listen for dial tone.
ii. Depress and release button 'T'.
iii. Depress and release the digit button under which the required number is stored.

Using the previous examples, if we wish to make an "outside" call to 01-234 5678 from an extension then pressing and releasing button 'T' sends the access digit 7, after waiting for the exchange dial tone pressing and releasing digit button 5 sends 01-234 5678.

Should the customer attempt to "store" and then send extension numbers operation of button 'T' will result in the sending of the PABX Access digit routing the call to the public exchange. This has been found to be a common cause of the complaint — "unable to call extension" or "unable to dial out".

TO ERASE A STORED TELEPHONE NUMBER

i. Lift the handset and place it to one side.
ii. Depress and hold down button 'P'.
iii. Depress and release the digit button under which the number to be erased is stored.
iv. Release button 'P'.
v. Replace the handset.

TO CHANGE A STORED TELEPHONE NUMBER

It is not necessary to erase a stored number before replacing it with a new number. Keying a new number into the store "under" a digit button already used replaces the previous number in that store.

Similarly if it should be necessary to change the PABX Access digit it is only necessary to repeat the procedure described for storing the Access digit but using the appropriate new digit button.

WARNING

IF THE BATTERY IS DISCONNECTED OR DISCHARGED ALL STORED NUMBERS WILL BE LOST.

BATTERIES

The battery required for this telephone is the Battery Secondary No. 23 (Blue) 7.2v which is not supplied with the telephone and must be requisitioned separately. The battery is fitted inside the instrument and is connected by a plug and socket. Fig. 7 shows the installation of the battery.

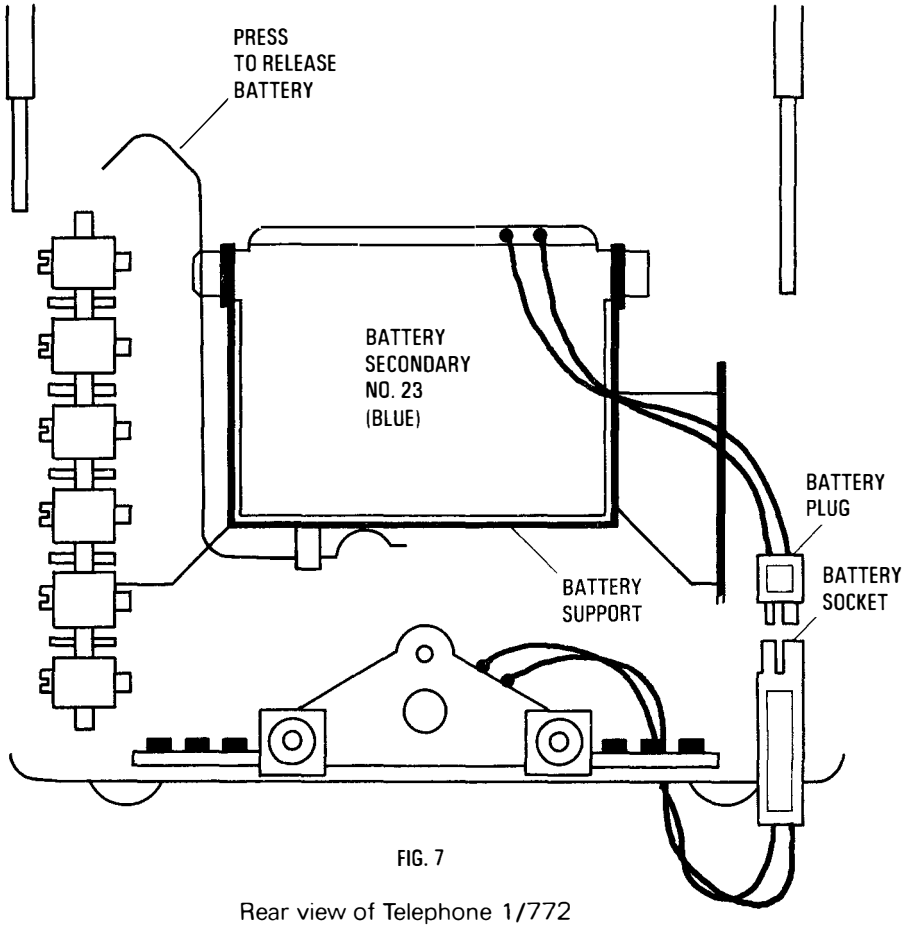


FIG. 7

Rear view of Telephone 1/772
With the cover removed

BATTERY CHARGING ARRANGEMENTS

The battery may be charged from the line or from a Power Unit. N872 gives the details of the charging arrangements to suit different types of installation and the strapping changes necessary. The diagrams on Pages 9 and 10 may also be used for this telephone.

LINE CHARGING

The telephone is issued with straps arranged for line charging. These are shown on the 'N' diagram, Tables 1 and 2 of N872 also show the connections for various installations.

To check the battery and charging circuit first connect a suitable milliammeter across the strap T26-T27 then remove the strap. With the handset on the rest a current of 2-3mA should flow after 30-100 seconds. Replace the strap T26-T27 when testing is completed before disconnecting the meter.

POWER UNIT CHARGING

When connected for power unit charging the strap T26-T27 *must* be removed.

For a 10v power unit a strap should be inserted between T27-T28, the yellow and green wires from the PBU being connected to the power unit 10v terminals.

For a 50v power unit a strap should be inserted between T28-T29, the yellow and green wires from the PBU being connected to the power unit 50v terminals. To check the charging current first connect a suitable milliammeter across the strap Tele T28-T29 (T27-T28) then remove the strap. With the handset on the rest a current of 2-3mA should be measured. Replace the strap when testing is completed before disconnecting the meter.

NOTE. When the battery is disconnected or discharged all stored numbers will be lost. The telephone will have to be completely reprogrammed.

ALWAYS CONNECT THE METER BEFORE REMOVING THE STRAP AND REPLACE THE STRAP BEFORE DISCONNECTING THE METER.

MAINTENANCE

Maintenance is confined to changing faulty parts as on a standard Tele 746. No attempt should be made to adjust the PBU or to clear faults on the keypad circuitry. Where keypad faults are found the complete telephone should be changed.

When changing a telephone the battery must be removed from the recovered instrument. Take care not to damage the wiring, hold the body of the connector, never pull on the wires. The telephone and the battery should be returned to Section Stock.

References TIs B4 M0061 — Facilities
C3 B3027 — Installation
E5 B2760 — Maintenance
Diagrams N848, N4700 — Auxiliary Units

DIFFICULTIES

THQ relies to a large extent on the A646 procedure to show up problems which staff experience with items of equipment. Please take advantage of this procedure to inform THQ of difficulties, so that corrective action can be taken.

TI EI A00Q1 describes the A646 procedure fully.

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