

APPENDIX A

NEW ZEALAND POST OFFICE
ENGINEER-IN-CHIEF'S OFFICE
WELLINGTON

ER/SS 1752
ISSUE: 1
DATE: DECEMBER 1982

ENGINEERING REPORT

DTMF (Dual Tone Multi Frequency) TO
DP (Decaded Pulsing) INTRODUCTION TO
PUBLIC TELEPHONE EXCHANGES IN
NEW ZEALAND

FILE REFERENCE: EIC 389/25

PREPARED BY: G. VAN DIJK
APPROVED FOR
ISSUE BY: J. W. ELLIS

(For Official Use Only)

1. INTRODUCTION

Introduction of DTMF into the New Zealand Telephone network is imminent. Converters will be used to translate DTMF signals from subscribers telephones fitted with pushbutton keypads into loop disconnect pulses for operation of electromechanical telephone exchange equipment. The NZPO intends to use the same converter in both Crossbar and Step by Step exchanges. The converters are able to recognise DTMF signals of the following frequencies:

		<u>High Group Frequencies (Hz)</u>			
		<u>1209</u>	<u>1336</u>	<u>1477</u>	<u>1633</u>
<u>Low Group</u>					
<u>Frequencies</u>	<u>697</u>	1	2	3	A
	<u>770</u>	4	5	6	B
	<u>852</u>	7	8	9	C
	<u>941</u>	*	0	#	D

The letters A,B,C and D and * and # are not used in the New Zealand Telephone Network at present but are likely to be introduced in the future.

1.2 The converters are "transparent" to pulses generated by subscribers with rotary dials, thus it is possible to connect a mixture of rotary dial and DTMF phones on the one line or within the area of the exchange.

2. CROSSBAR EXCHANGES

2.1 All Crossbar Exchanges are to be converted first as per locally prepared installation programs. The converter in Crossbar Exchanges is required to monitor the A and B leg when an originating call is connected to the DPOR. Monitoring the A and B leg and detecting DTMF signals, the converter is to pulse the DPOR digit receive relay in the same manner as a rotary dial would via the A relay. See schematic in Fig. 1.

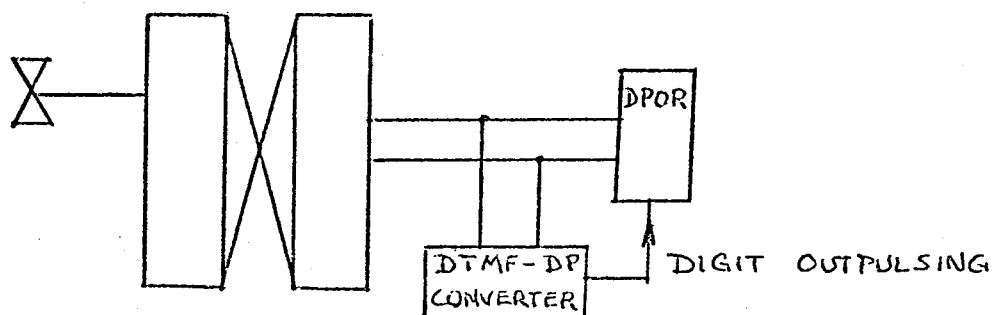


Fig. 1

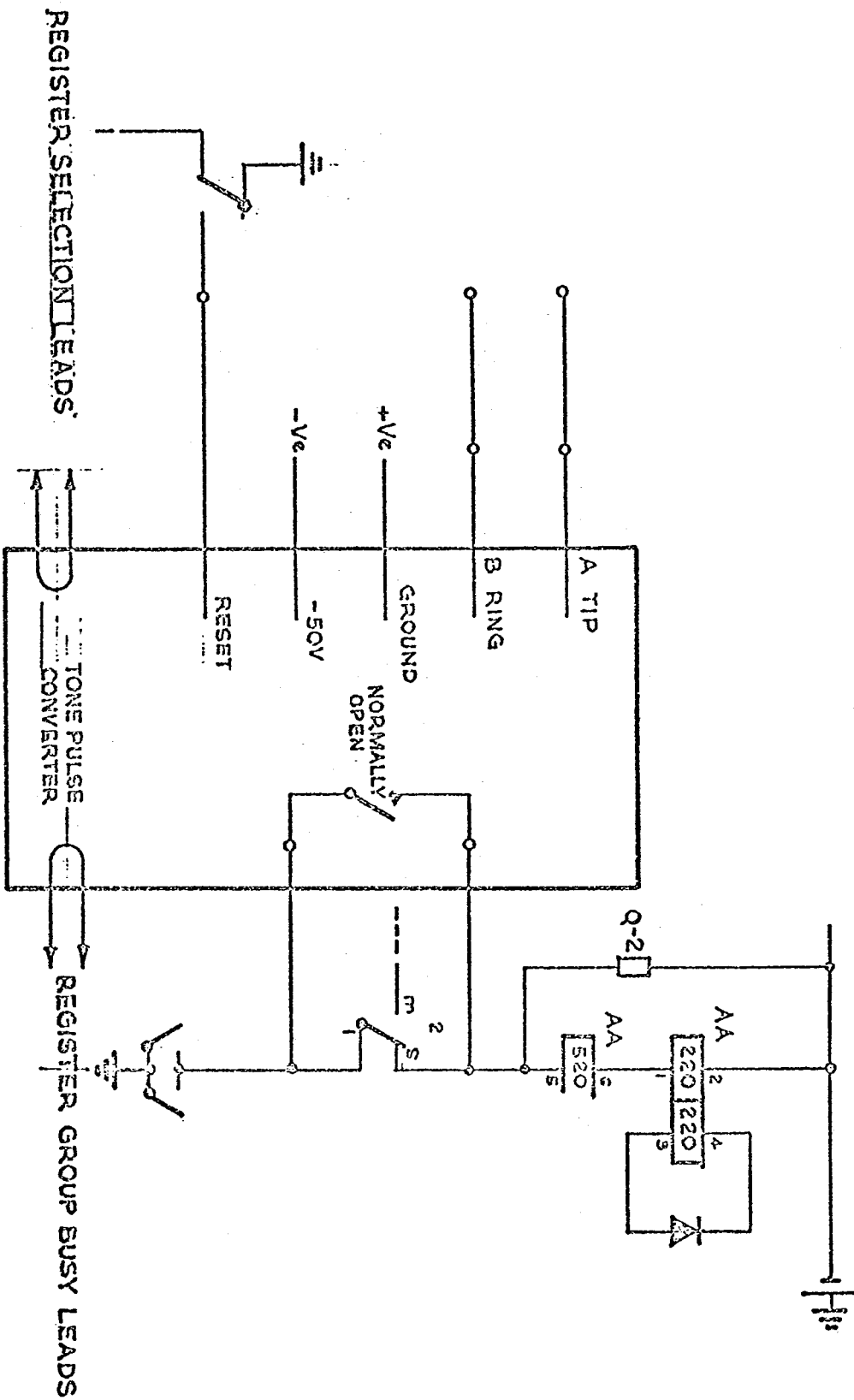
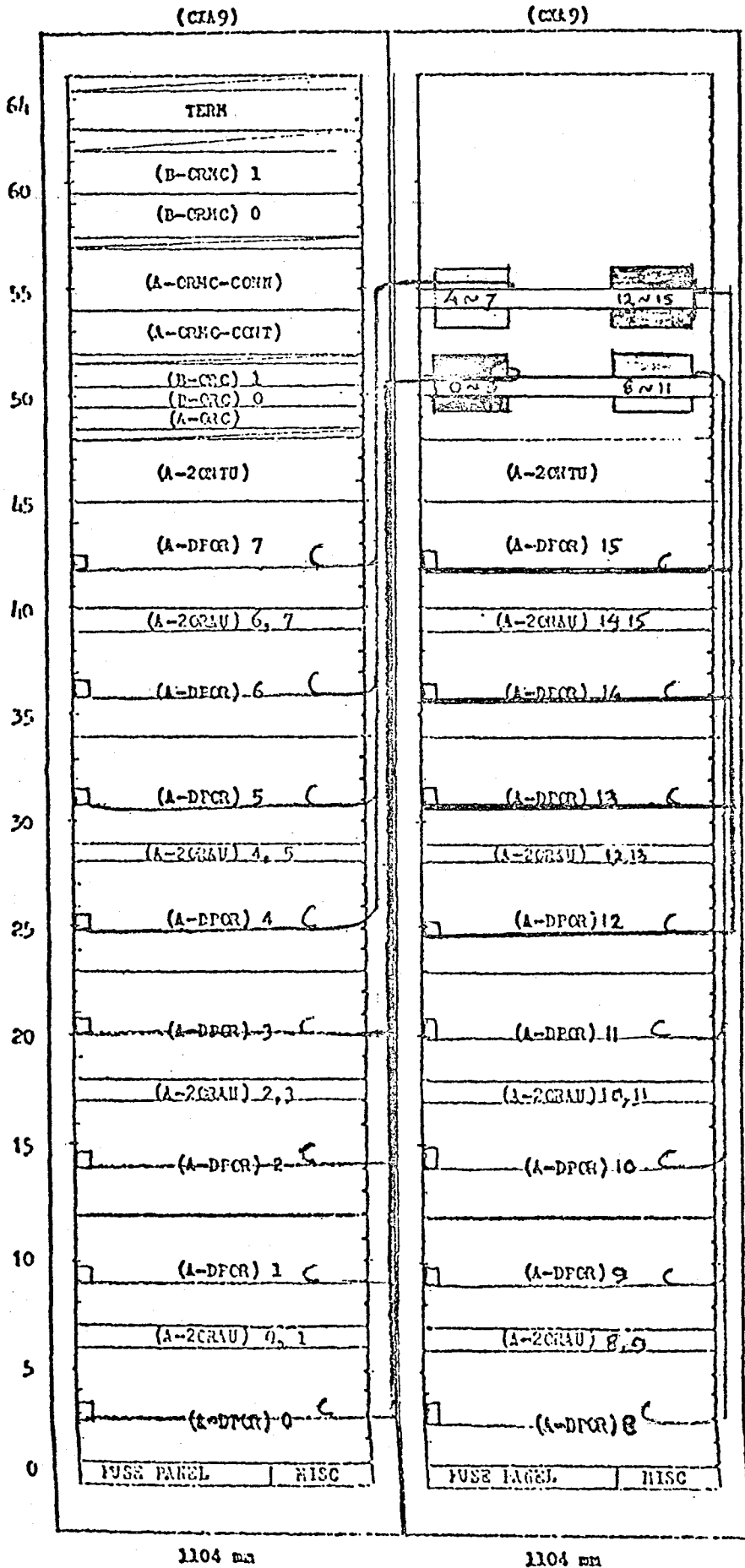


Fig. 2

TYPICAL
MOUNTING FOR
DTMF CONVERTER
BINS ON DPORT
NC 400



DP ORIGINATING REGISTER FRAME

DP ORIGINATING REGISTER FRAME

Fig. 3

2.2 One converter is required for each DPOR and the operation of the converter is to be under the control of the DPOR, as shown in fig. 2.

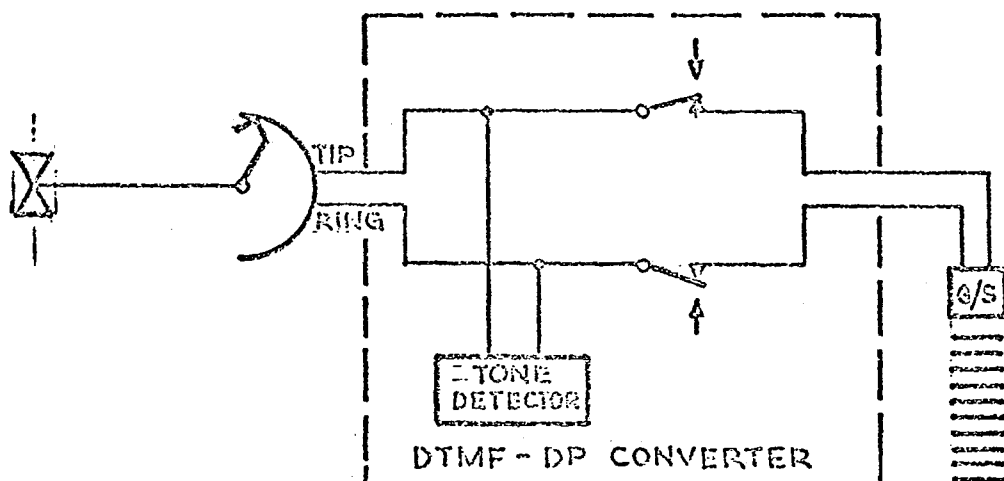
2.3 Converters are required to be installed within bins with up to 4 converters per bin. Two of these bins can be mounted on a mounting bar, which in turn is mounted in the spare space in the DPORF. (Where applicable), see fig. 3. The mounting of these converters will vary from exchange to exchange due to the following criteria:

- (1) 4-5 different types of Crossbar exchanges involved.
- (2) Varying sizes and widths of frames.
- (3) Not every X bar exchange will have space available in the DPORF (RSF).
- (4) DPOR frame groups split over different rows.

2.4 It has therefore been decided that each District make their own decision of where to mount the converter bins. An I.S. will be released shortly. No cableforms will be provided due to the number of types and the small quantity required.

3. SXS EXCHANGES

3.1 The converters in step exchanges are to be wired between the subscribers uniselector and the first stage of switching, be it DSR, Group selector or other. See fig. 4.



Definitions: Tip = +ve line lead = A line lead = Earth
 Ring = -ve line lead = B line lead = Battery

Fig. 4

In the idle state the converter is to connect the subs A and B legs through to the selector. The tone receiver is disabled until the converter recognises the "off hook" state of the subscriber. If tones are received they are checked and if valid then a "line splitting" operation takes place immediately the tone is removed from the subscribers line. During line split the converter maintains both the holding circuit to the selector and to the subscribers instrument.

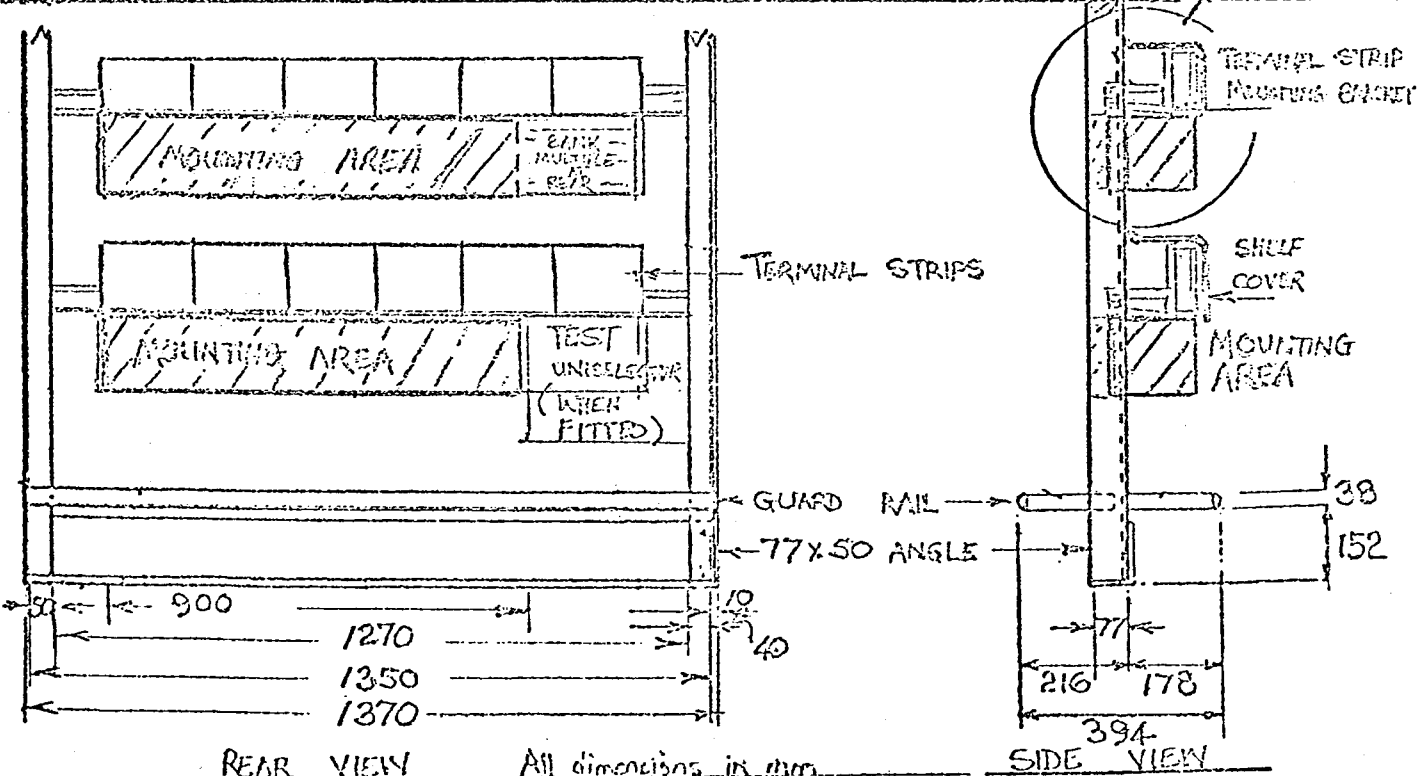
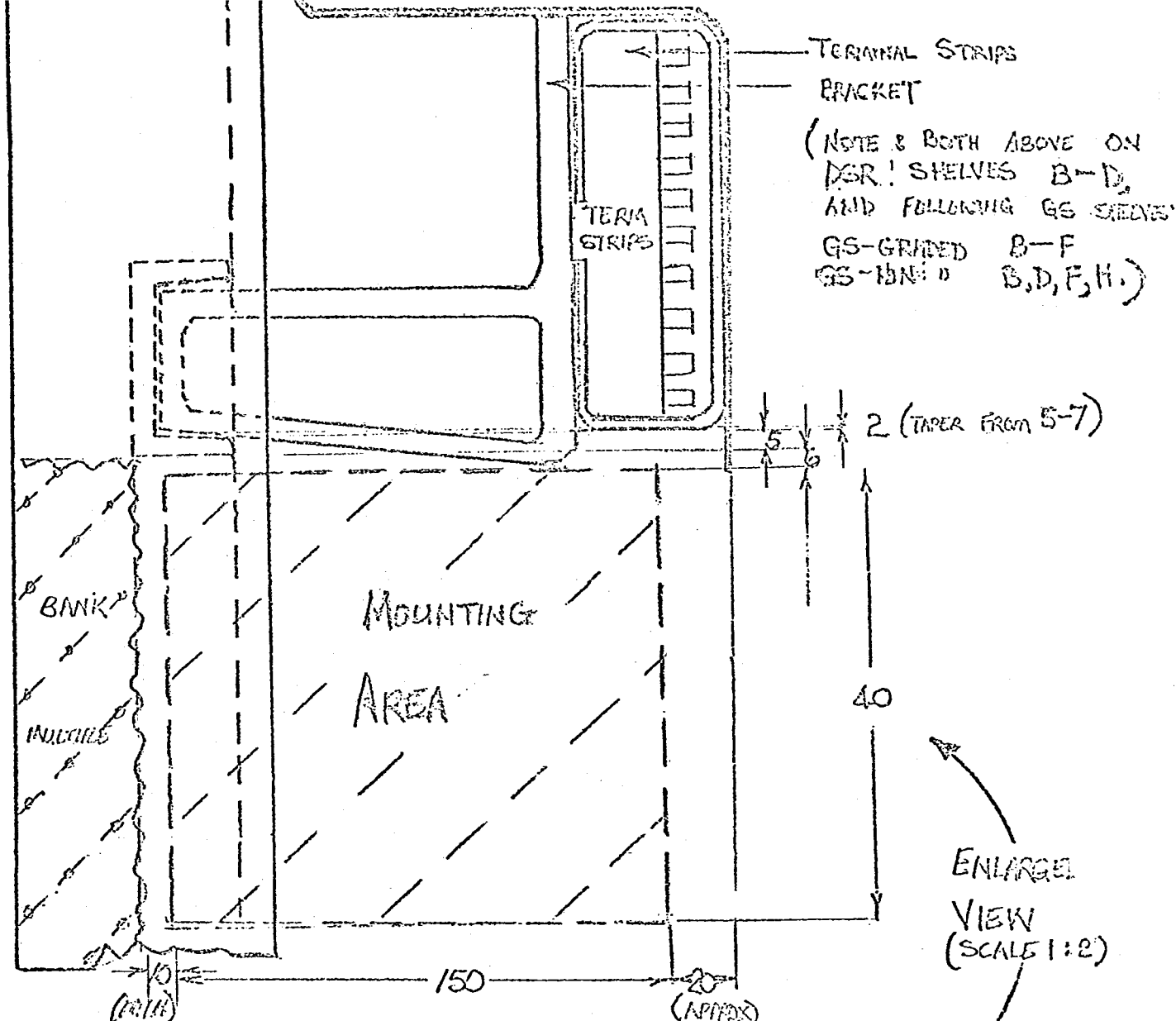
Outpulsing occurs immediately following line split.

LEDs are available on the converter to indicate:

- (1) Subscriber 'off hook'.
- (2) The converter has received valid DTMF signals.
- (3) Outstepping is taking place.

The converters are to be mounted in 5 card bins at the back of the appropriate selector shelf, two bins per shelf. See fig. 5. Cable forms will be supplied and will be already attached to the card bin by means of wire wrap. Selected wires will be taken off the U points and connected to the converter card via the cable form, other wires from the cable form will go into the U points.

In both X bar and SxS exchanges the converters will be powered from the earth and battery terminals of the associated DPOR or selector.



All dimensions in mm.
Scale approx 1:16

RACKMOUNTING SPACES: G/S AND DSR, TYPICAL VIEWS

4. MATERIAL

4.1 Converter cards need to be handled carefully and it is imperative that staff handling these cards are fully conversant with E.I. TELES Gen Z 0500. Requisitioning of material should follow the normal procedures. Converters and mounting hardware will be available from stock in January 1983. The following stock list numbers are assigned to the material (estimated prices in brackets in NZ\$).

LH 70 (102) DTMF/DP Converter X bar version Pamco P 7800
 LH 71 (114) DTMF/DP Converter SXS version Pamco P 7700
 LH 72 (40) Crossbar Mounting bin (4 cards)
 LH 73 (40) SXS Mounting bin (5 cards)
 LH 74 (25) Mounting bar for NC 400/460 Exchanges.

4.2 1% of spares may be requisitioned per district. The remaining spares will be held in stock. Urgent requests for spares will be attended to immediately. Cards are NOT to be tampered with. Faulty cards should be forwarded to TEAC so claims under the guarantee (if any) can be made.

5. TECHNICAL DETAILS

- 5.1 Single Tone Response: $+2$ to -26 dB \pm 1.8% of nominal frequency.
- 5.2 Response time to valid DTMF signals: 33 ms.
- 5.3 Interdigital Time: 35 ms.
- 5.4 Twist \pm 6 dB.
- 5.5 Max. acceptable tone variation: \pm 3.5% of nominal frequency.
- 5.6 Bridging Impedance $>$ 100k Ohms.
- 5.7 Digit storage capacity: 20.
- 5.8 Pulse speed: 10 ± 1 pps or 20 ± 1 pps. Interdigital pause 800 ms @ 10 pps or 400 ms @ 20 pps.
- 5.9 Noise immunity: 99.8% successful decode ^{with} noise at -12 dB.

5.10 Disable condition: on receipt of * or # (DTMF Receiver only).

5.11 Line split: Bifurcated make before break relay contacts on both TIP and RING.

6. DIAL TONE

6.1 In some exchanges dial tone filters will have to be fitted in the tone supply leads in cases where the 3rd Harmonic is not better than -30 dB.