



Payphone Services
Technical Support

Product and Service Description

TPS3035-S02, Issue 2

Payphones & Metering

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1. PURPOSE

To advise the Customer Field Workforce about payphones and metering and to provide a test method for called subscriber answer signals for both 50 Hz and 12 kHz payphone lines.

2. INTRODUCTION

The last two decades has seen many changes in the communications industry, especially in telephone exchanges, the customer access network (CAN) and payphones.

Telephone exchanges have changed from mechanical control to computer control, from a low-density format (one line per circuit board) to a high-density format (many lines per circuit board). The customer access network has changed from a single copper wire pair to include for example pair gain systems, high capacity radio concentrators and USOSAT. The humble payphone has also changed whereby today the payphone user can pay for their call with coin or via electronic cash stored on a Smartcard.

However given the above changes, Telstra payphones require a Called Subscriber Answer (CSA) signal, sent from the telephone exchange, in order for the payphone to collect the cost of the call.

3. CALLED SUBSCRIBER ANSWER (CSA)

When the called party answers on a chargeable call, the telephone exchange sends a two-part signal to the payphone, made up of a line reversal (LR) and a meter pulse (MP). This two-part signal is termed Called Subscriber Answer (CSA). The line reversal indicates the call is chargeable and the meter pulse, be it 50 Hz or 12 kHz, will cause the payphone to collect the cost of the call. The sending sequence of CSA is important, it is always a line reversal followed by a meter pulse. Should the sequence be reversed, occur simultaneously or one part be missing, then the payphone may not operate correctly.

4. METER PULSE

4.1. Start Delay

After the exchange has sent a "line reversal" it waits a finite time before sending the meter pulse. The approximate start delay for AXE is 1 second +/- 50 ms, for System 12 (S12) it is 300 ms +/- 50- ms. The Goldphone, Bluephone, HandiPhone (DTOP) and Tsp1/CT3H will accept a meter pulse, be they either 50 Hz or 12 kHz, starting 50 ms after line reversal.

4.2. Characteristics

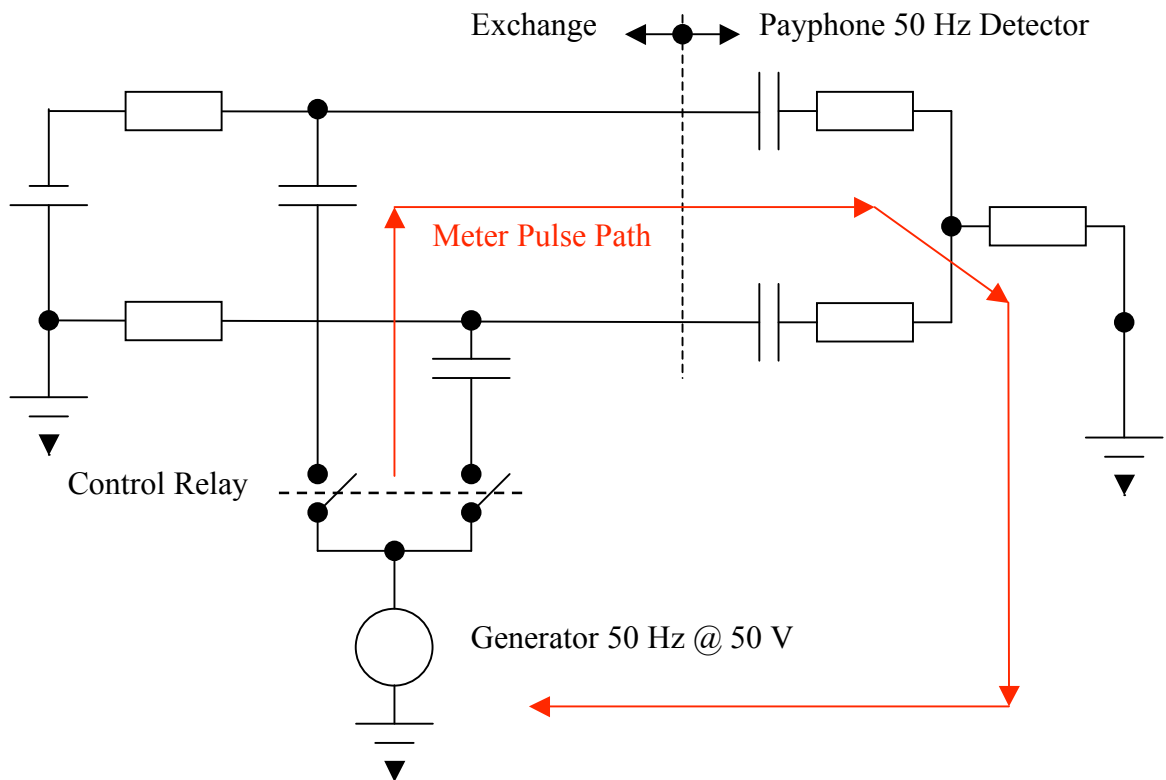
The meter pulse sent by the exchange has three characteristics namely – frequency, duration (how long for) and level (how much voltage).

Nominal Frequency	Nominal Duration	Nominal Level
50 Hz	250 ms +/- 50 ms	50 V rms
12 kHz	250 ms +/- 50 ms	2.1 V rms

A 50 Hz meter pulse, because of the way it is sent and its higher level can be detected by a payphone over a longer cable pair than a 12 kHz meter pulse.

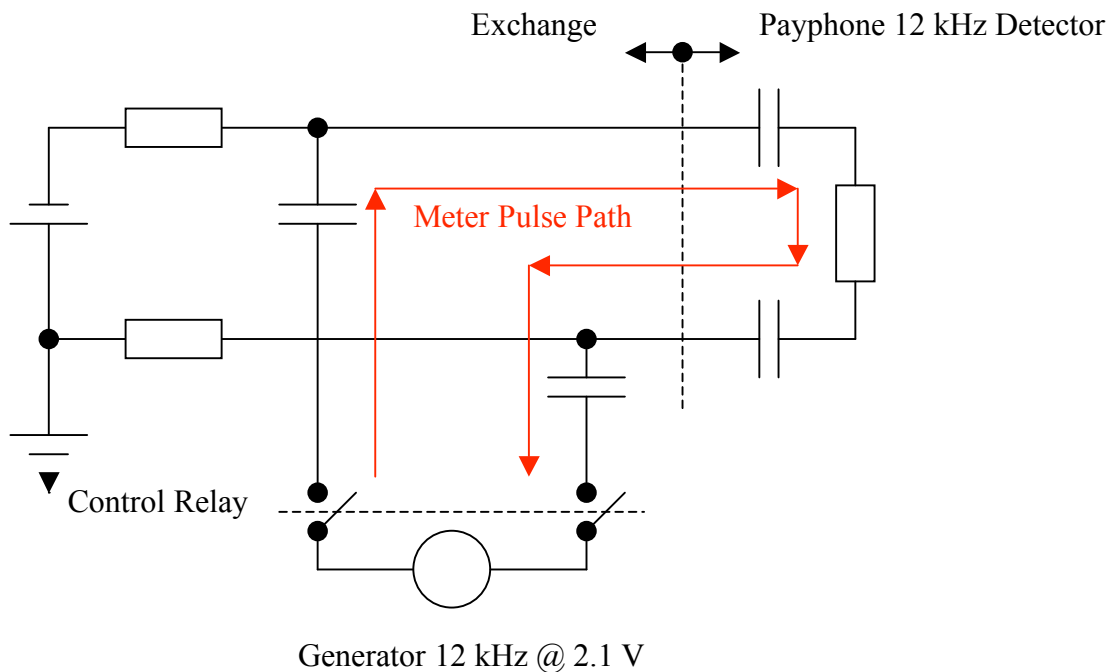
4.3. 50 Hz Circuit

After line reversal, the 50 Hz meter pulse is injected longitudinally on the line and an earth return path is required at the payphone, the circuit is representative not actual.



4.4. 12 kHz Circuit

After line reversal, the 12 kHz pulse is injected transversally on the line and no earth return path is required at the payphone, the circuit is representative not actual.



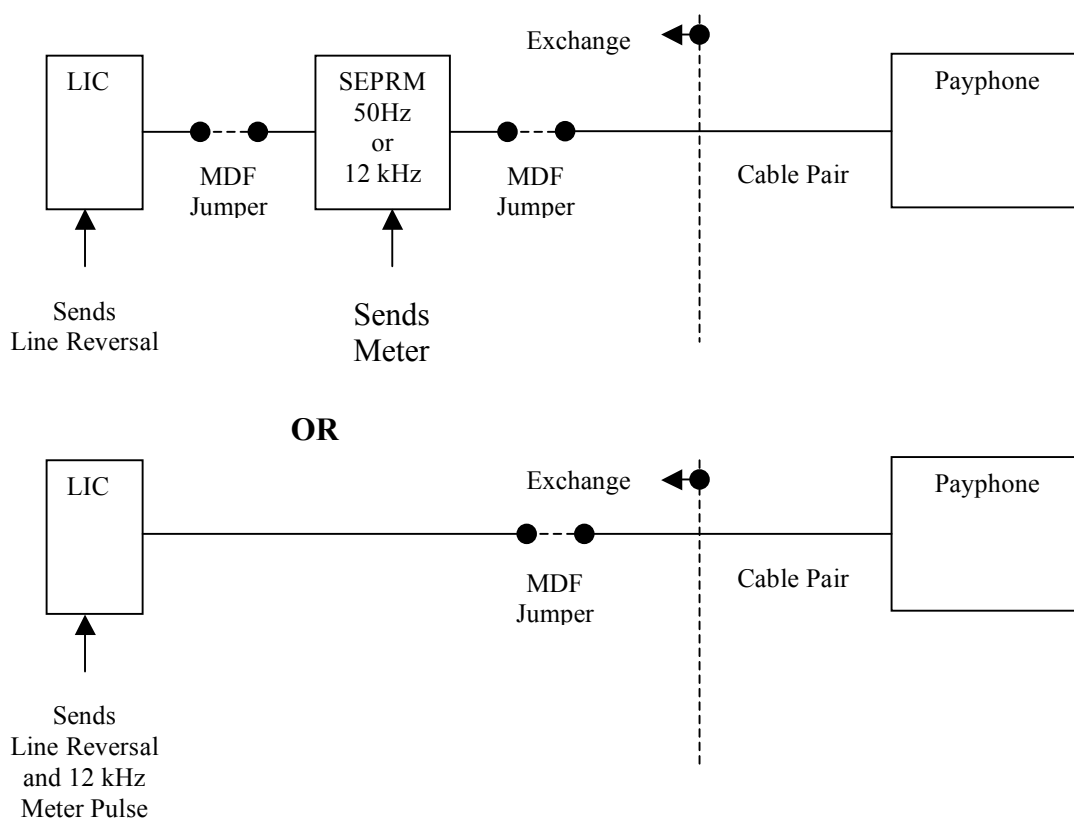
5. TELEPHONE EXCHANGE CSA

5.1. Background

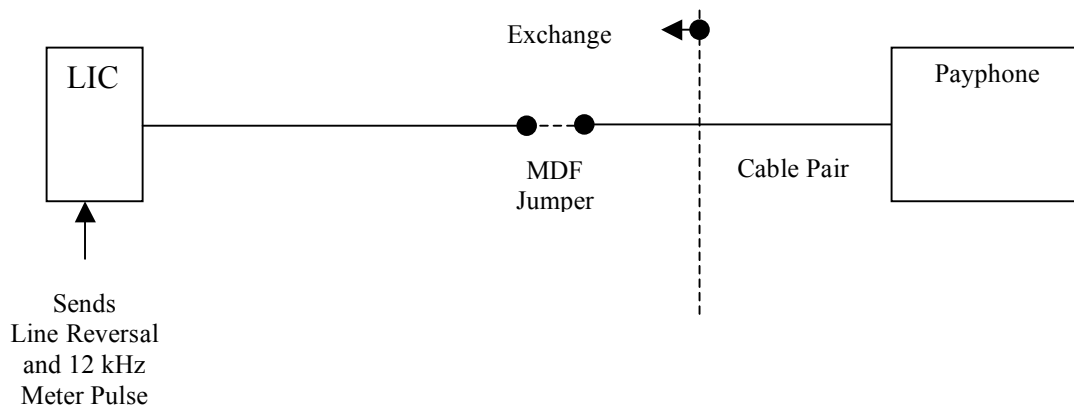
All customer lines and payphone lines are connected to a Line Interface Circuit (LIC) in the exchange. Early generation LIC provide line reversal with the meter pulse being provided by an additional hard-wired device called a SEPRM. Whilst later generation LIC provide both line reversal and meter pulses.

Irrespective of the exchange type (AXE, S12) or LIC generation, CSA is always a line reversal followed a short time later by the meter pulse.

5.2. AXE Basic Layout



5.3. S12 Basic Layout



5.4. Payphone Lines

In general, every line number in a telephone exchange has an association with another number called the “Category Number” or simply “Category” stored in the exchange’s computer that describes the line. Historically, a line number with a payphone category is called a “payphone line”.

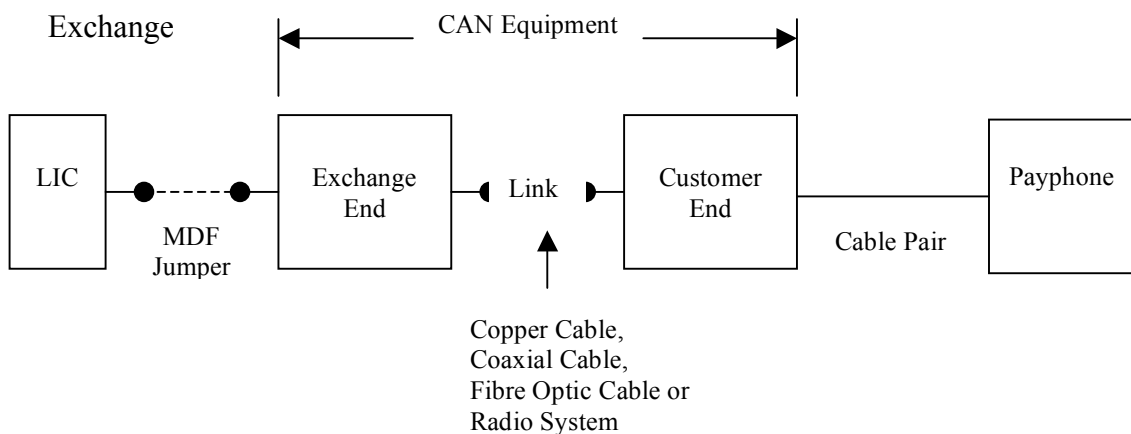
The category number will cause certain events to occur when a call is made from or to the line number. For example, line number 9329 0630 has the category number 329 which is the category for a “payphone line” and, when an outgoing call is made on line number 9329 0630 the exchange sends CSA.

Should a “payphone line” have an **incorrect category** it may result in no line reversal or no meter pulse or both.

6. CUSTOMER ACCESS NETWORK (CAN)

6.1. Background

The customer access network by definition is “the technology used to connect a service with the telephone exchange”, traditionally, it was a pair of copper wires. Setting aside the traditional example, it is better to think of CAN equipment in terms of “all other forms of technology that facilitates a connection” for example, Pair Gain Systems, CMUX, DRCS, HCRC, IRIM, SCADS, USOSAT and many others.

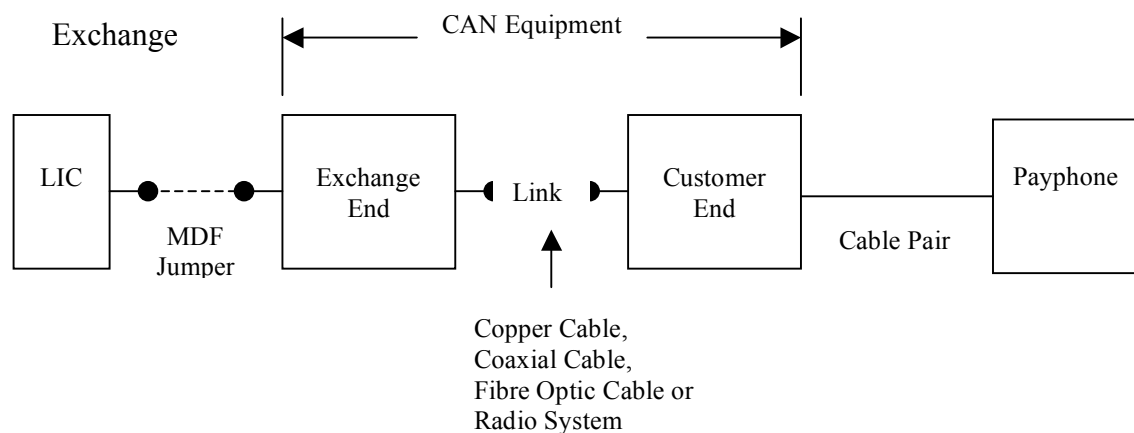


Generally, CAN systems have an exchange end and a customer end and both ends of the CAN talk to one another using a dedicated protocol (language) via a link. The CAN link carries all signals be they protocol or voice, and the link can be over copper pairs, a coaxial cable, a fibre-optic cable or a radio system.

6.2. Basic Operation

Using a payphone line as an example, an imaginary CAN system called “Wombat” is configured as per steps 1 and 2:

1. The CAN exchange end is configured to **accept** exchange signals such as CSA.
2. The CAN customer end is configured to **send** signals such as CSA.



When a line reversal occurs at the LIC, the CAN exchange end detects it. The exchange end then translates the line reversal into a signal, dedicated protocol (language), that it sends to the customer end of the CAN via the link. The customer end understands the protocol and replicates the line reversal. Thus, the line reversal occurring at the LIC is passed to the payphone via the CAN equipment and, a similar sequence occurs when a meter pulse is sent by the exchange.

The basic operating principle on all CAN systems is, “what ever happens at one end of the system is duplicated at the opposite end, irrespective of signal type or direction on the proviso the system is correctly configured for the particular service it is interfacing”.

From a payphone perspective, CAN equipment must be transparent and by default it must replicate all the signals and facilities that exist on a traditionally wired line.

7. HOW TO TEST A PAYPHONE LINE FOR CSA

7.1. Occupational Health & Safety

At all times, staff should use Personal Protection Equipment approved by Telstra Care, failure to do so may place you at risk.

ELECTRICAL SAFETY WARNING

Hazardous voltages may exist between Telecommunication Lines and all types of Earthing Systems

Hazardous voltages may exist between different Earthing Systems

7.2. Introduction

The following test procedures assume all testing is performed at the payphone.

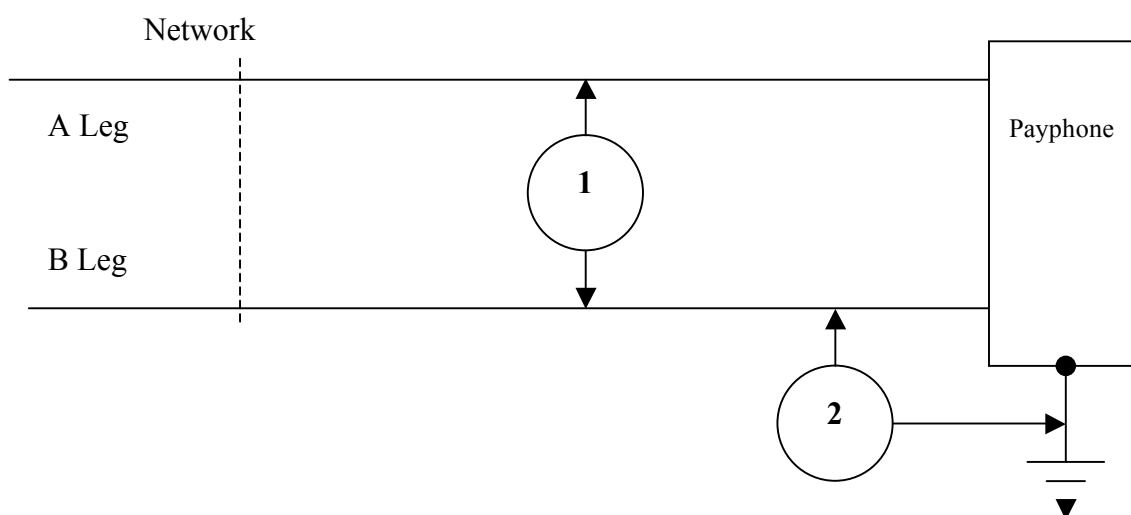
Make sure that your test equipment, Buttinski (Ruggerbutt or HD Telecom model HD630) and Multi-Meter are in working order.

Only use the listed test numbers for your test calls because they are not recorded in the billing system and the payphone customer will not be charged for them.

7.3. Test Numbers

Test Number	Description
127 22 100	Local Call, 1 meter pulse
127 22 101	STD Slow, 1 meter pulse approximately ever 43 seconds
127 22 102	STD Fast, 1 meter pulse approximately ever 6 seconds

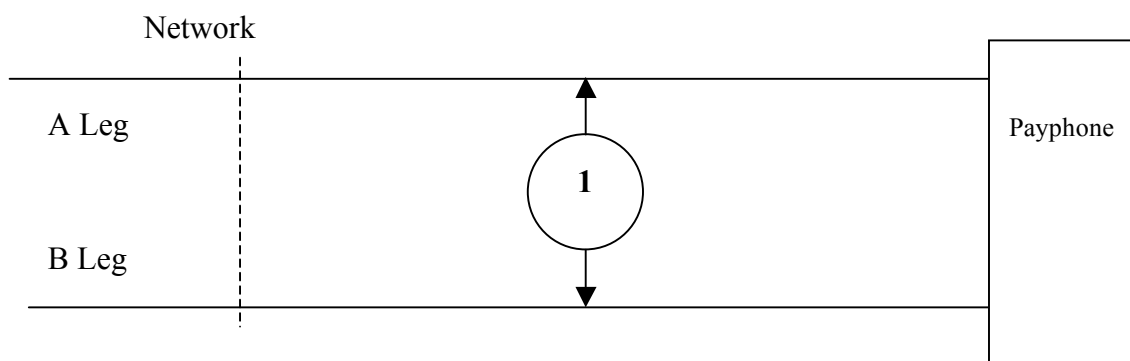
7.4. CSA 50 Hz Site



CSA Test & Buttinski	Setup	How to Test
Line Reversal Ruggerbutt & HD630	1	1. Loop the line, note the colour of the "POL" LED 2. Make a chargeable call on the Buttinski 3. The "POL" LED changes colour on line reversal
Meter Pulse Ruggerbutt & HD630	2	1. Buttinski in monitor mode & listen 2. Make a chargeable call on the payphone 3. When the 50 Hz pulse is sent you hear a "Buzz" 4. Also test for 50 Hz presence on the other leg

Record your results and use them as a "look up" in section 7.6 "Action Table".

7.5. CSA 12 kHz Site



CSA Test & Buttinski	Setup	How to Test
Line Reversal Ruggerbutt & HD630	1	1. Loop the line, note the colour of the “POL” LED 2. Make a chargeable call on the buttinski 3. The “POL” LED changes colour on line reversal
Meter Pulse – Ruggerbutt	1	1. Loop the line with the Ruggerbutt & make a chargeable call, monitor the 12 kHz LED 2. The 12 kHz LED will pulse when a 12 kHz meter pulse is detected
Meter Pulse – HD630	1	1. HD630 in monitor mode clipped across the line 2. Make a chargeable call on the payphone & monitor the “HF Detection” LED on the HD630 3. The “HF Detection ” led will pulse when a 12 kHz is pulse is detected

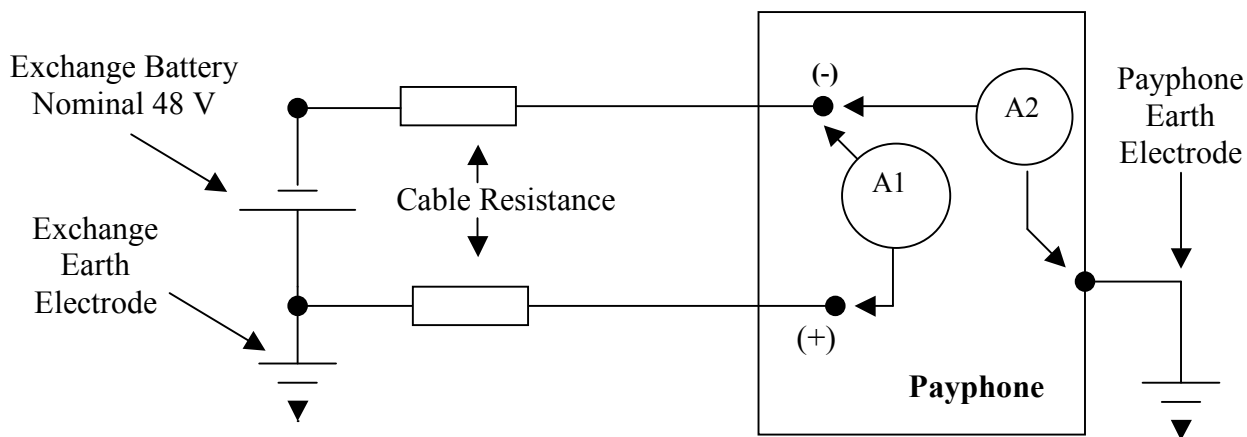
Record your results and use them as a “look up” in section 7.6 “Action Table”.

7.6. Action Table

Test Result	Possible Fault	Who to Contact
CSA OK	1. Payphone Fault	SME / Regional Support 1800 032 502
No CSA	1. Incorrect Category 2. CAN Configuration	1. Payphone Testers 1800 641 496 2. SME / Regional Support 1800 032 502
No Reversal	1. Incorrect Category 2. CAN Configuration	1. Payphone Testers 1800 641 496 2. SME / Regional Support 1800 032 502
No Meter Pulse	1. Incorrect Category 2. CAN Configuration 3. 50 Hz site, earthing fault 4. 12 kHz site, dead tails	1. Payphone Testers 1800 641 496 2. SME / Regional Support 1800 032 502 3. SME / Regional Support 1800 032 502 4. SME / Regional Support 1800 032 502

8. FUNCTIONAL EARTHING

The following Test Procedure can be used to determine the presence of an effective functional earth at the payphone that meets the 30 Ohm maximum for earth electrode resistance under AS/ACIF S009:2001 Section 5 Figure 4 Note 2 page 56. However, if the result from the test procedure indicates a high value of earth resistance, then the recommended practice is to use a Geo-Ohm meter or its equivalent to measure the payphone earth electrode resistance.



Test Procedure: This process requires the use of an Ammeter with the payphone handset being on-hook.

1. Connect the Ammeter between the negative and positive legs of the line, as per A1 above, and record the loop current.
2. Connect the Ammeter between the negative leg of the line and the earth point within the payphone, as per A2 above, and record the earth current.
3. Divide the reading in step (1) by the reading in step (2). Results up to 1 are considered “OK”, and results greater than 1 require further investigation, see Table 1 for examples.

Loop (mA)	Earth (mA)	Result	Comment
30	60	0.5	Earth = 0 Ω
60	100	0.6	Earth approximately = to 30 Ω
60	60	1.0	Earth approximately = to 200 Ω
40	8	5	Earth approximately = to 1800 Ω
30	3	10	Earth approximately = to 3800 Ω
45	Nil		Further Investigation Required

Table 1.

Influencing Factors: There are many factors effecting the earth current reading, some are the presence of foreign voltages, the feedbridge type, earth wiring joints, earth electrode resistance (exchange / local), soil type and its moisture content.

9. AXE FUNCTION BLOCKS & CSA

In AXE telephone exchanges, the exchange software is divided into Function Blocks. These function blocks are used to control and monitor Sub-Systems. The sub-systems can be located locally (eg LSM) within the exchange or remotely (eg RSS). The name of the Line Card varies within each of the sub-systems. However, some line cards are common to a number of sub-systems.

Function Block	Sub – System	Model	Line Card
LI3	LSM		ALB2
	RSS	P83	LIB7
	RSS	P86	LIB7++
	RSS	P90	ALB2
LI5V	RIM		POTS / UNIVERSAL
LIV5G	CMUX	NU/AU or ANR V2.0	ATLC – C
	RIM Multi-link	RIM ES	POTS / UNIVERSAL
LIRA1	IRIM		POTS / UNIVERSAL
SE		SEPRM1 (50 Hz)	
		SEPRM2 (12 kHz)	

All line cards can send line reversal on “B” number answer. However, some line cards are capable of sending a 12 kHz metering pulse, whilst others require the use of a series in line SEPRM (1 or 2) to send a metering pulse. The sending of CSA to the payphone is controlled and supervised by the Function Block that is responsible for sub-system and line card that connects to the payphone.

10. DEFINITIONS

The following words, acronyms and abbreviations are referred to in this document.

Term	Definition
A	Ampere
AXE	Type of switching technology
CAN	Customer Access Network
k	Kilo, prefix, times one thousand
HF	High Frequency
Hz	Hertz
LED	Light Emitting Diode
LIC	Line Interface Circuit
LR	Line Reversal, reversal in line polarity
m	Milli, prefix, one thousandth part
MP	Meter Pulse
POL	Polarity
rms	Root Mean Square
s	Second
SME	Subject Matter Expert
S12	System 12, type of switching technology
V	Volt

11. DOCUMENT CONTROL SHEET

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If you have a suggestion for improving this document, complete and forward a copy of *Suggestions for Improvements to Documentation* (form 000 001-F01).

Issue No	Issue Date	Nature of Amendment
1	1 April 2003	Original Document
2	26 October 2004	Section 8, reworded "Functional Earthing" Section 9, new "AXE Function Blocks & CSA"

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