

# TACT<sup>TM</sup>

TA-4700

IC/SMR AND PSTN INTERCONNECT

RACK MOUNT VERSION SERIAL/ITEM 533/nnn

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## OPERATOR MANUAL

Issue 7, JULY, 2006, AUTHOR: PETER ZEUG

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DESIGNED AND MANUFACTURED IN AUSTRALIA



**DESIGN TWO THOUSAND PTY LTD**

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# TACT TA-4700

## IC/SMR AND PSTN INTERCONNECT

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Telstra Managed Radio and Wireless Solutions, Southern Region Engineering

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## **SERVICE INFORMATION**

If problems are experienced with the installation or operation of the TACT TA-4700 IC/SMR and PSTN Interconnect please call the Help Desk Number listed below before returning units to the factory for repair.

In most cases, problems can be diagnosed and rectified over the phone, avoiding unnecessary transportation and service costs.



### **HELP DESK NUMBER:**

+61 3 9758 5933 (All hours)

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## TACT TA-4700 IC/SMR AND PSTN INTERCONNECT

### INTRODUCTION

TACT, the Telephone Access Control Terminal, is a proven hardware platform used for interconnecting conventional and trunked two-way radios to Priate Automatic Branch Exchanges (PABXs) and the Public Switched Telephone Network (PSTN).

The TACT architecture (with its radio interface, PSTN line interfaces, DTMF transceiver, and paging encoder) is ideally suited for Telstra IC/SMR and PSTN interface facilities. It allows full communication between conventional Priate Mobile Radio (PMR) networks, State Mobile Radio (SMR) Ministry of Post & Telecommunications (MPT) 1327 trunked radio networks (SMR) and the PSTN.

### OVERVIEW

The TACT TA-4700 IC/SMR & PSTN Interconnect (TA-4700) provides access to the SMR from the PMR and access to the PMR from the SMR. It also provides both-way access to (or from) the PSTN from the PMR. **For the DePARTMENT of Sustainability and Environment (DSE), the PMR is called the ‘*Incident Channel*’ and the MPT 1327 trunked radio network is the ‘*SMR*’.**

Two Base Station sites can also be interconnected over the PSTN.

Dual Tone Multi Frequency (DTMF) signalling from radios and PSTN telephones is used to set up calls in a ‘store and forward’ manner for number translation/manipulation and other reasons described in this manual.

The TA-4700 is interfaced to a TACT Line Interface Module (LIM), an SMR Interface Unit (SMRIU) and to the PSTN. See ‘*Installation Diagram*’.

### DESCRIPTION

The TA-4700 is based on the standard TACT TA-4700 hardware platform. The only custom built hardware is the inbuilt IC/SMR interface card. The application of the TA-4700 in this case is primarily a function of custom software.

A TA-4700 is interfaced to the TACT LIM (four wire Tx/Rx audio) via the TACT radio interface. A standard two wire analogue PSTN telephone line is connected to the LINE 1 port and the SMRIU is connected to the LINE 2 port.

TA-4700 audio connections to the TACT LIM are 4 wire, 600R with input and output levels between -30 dBm and +10 dBm, potentiometer adjustable (factory preset to -13.5 dBm).

### FEATURES

- Full communication between the Incident Channel, MPT1327 the SMR and the PSTN.
- Operators are provided with voice prompts, guides and responses where required.
- Intrusion tones when another party joins a voice call.
- Supervisory timers and network service tone detection for call supervision and call disconnection.
- Radio access from the PSTN. Any radio can be called from any PSTN telephone. Outside callers calling in to the TA-4700 will hear “*DSE Incident Channel*” and then be voice prompted to make an open channel voice call to the Incident Channel, an individual or group call to the SMR or to join in on an established call. This feature can be optionally PIN protected.
- Speed calling of up to nine user pre-programmed telephone numbers.
- Last number redial.

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## FEATURES (Continued)

- Local programming from the inbuilt keypad, and remote programming/diagnostics using DTMF.
- High bandwidth (>9600 bps data throughput).
- RS232 Serial port for call data/diagnostics, or programming from a PC.

## TA-4700 CONTROLS

The TA-4700 has a twelve button keypad controller used for programming functions. Some programming functions are also possible from any remote telephone.

## TA-4700 INDICATORS

Programming progress and success is displayed on the 7 segment monitor display. (Remote operation is prompted and confirmed by the voice synthesizer). The 7 segment monitor display also provides call progress information:

0 = silence  
1 = busy tone  
2 = modulated dial tone  
3 = nu tone  
4 = speech  
5 = continuous tone  
6 = indeterminate tone  
7 = ringing tone  
8 = unmodulated ringing tone.  
9 = random disconnect tone  
n. = DTMF

In addition to the monitor display, visual indication of operating progress is provided by six LEDs on the front panel marked 'POWER', 'READY', 'CONNECT', 'ON AIR' 'Tx', and 'Rx'.

The 'POWER' LED indicates that power is connected and that the internal fuse is intact. The 'READY' LED indicates that the system is ready for calls. The 'CONNECT' LED illuminates whenever the PSTN telephone line is 'looped'. The 'ON AIR' LED illuminates when the SMRIU is 'looped'. The Tx and Rx LEDs indicate transmit and receive audio from the TACT LIM.

## TA-4700 CONNECTORS

12→ 48V power input:	BL-2 plug.
Telephone line:	RJ 12
SMRIU:	RJ 12
TACT LIM:	RJ 45
RS232 Port	DB9 (Call Data /Diagnostics)

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## INSTALLATION

The TA-4700 is supplied in a 1 unit high, 19" rack mount enclosure with operating LED's and keypad controller on the front and radio (RJ45), telephone line (RJ12), SMRIU port (RJ12) and power (BL-2) connectors at the back. The TA-4700 is therefore ideally suited to be mounted in a standard 19" rack.

Installation is essentially 'plug and play' as described here.

### CONNECTING THE PSTN TELEPHONE LINE

The TA-4700 is connected to the PSTN Line or PABX analogue extension using the RJ 12 to 605 line cord provided. The RJ 12 end is plugged into the socket at the back of the TA-4700 marked 'LINE'. The 605 end (other plugs to order) is plugged into a working telephone socket.

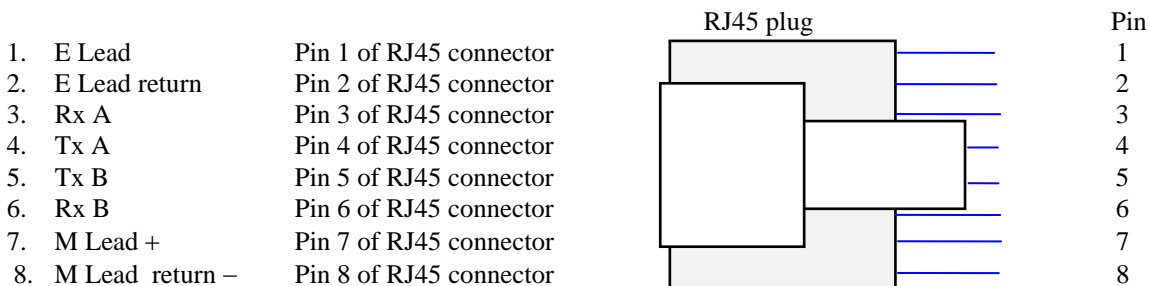
When connecting the TA-4700 to a PABX internal analogue extension, this extension can be programmed to 'ring' (direct in termination) when a designated exchange line number is called. This provides full access for callers calling in from any internal extension and/or from any outside line.

### CONNECTING THE SMRIU

The SMRIU (standard two wire analogue) is connected to the RJ12 socket marked 'CP1IU'. The length of wire running to the SMRIU should not exceed 100 metres of 0.4 mm twisted copper pair. The balance network in the two to four wire hybrid is optimised for the AUSTEL complex reference impedance.

### CONNECTING THE TACT LIM

The TA-4700 is connected to the Incident Channel via the TACT LIM. The RJ 45 plug is wired as shown here:



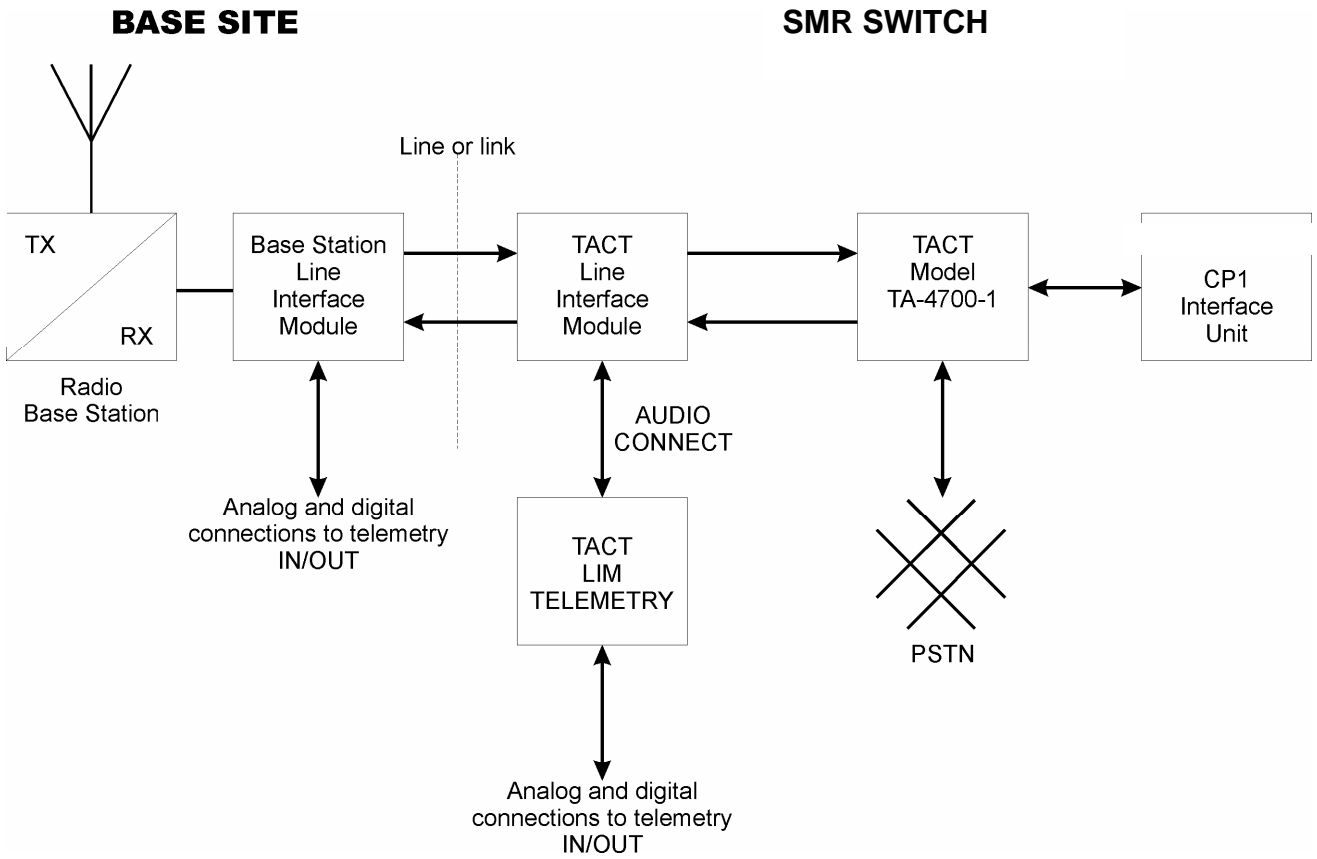
Note: Tx AB = VF out from TACT (to the TACT LIM).  
Rx AB = VF in to TACT (from the TACT LIM).  
E Leads are connected to the TACT LIM M Leads.  
M Leads are connected to the TACT LIM E Leads.

### CONNECTING POWER TO THE TA-4700

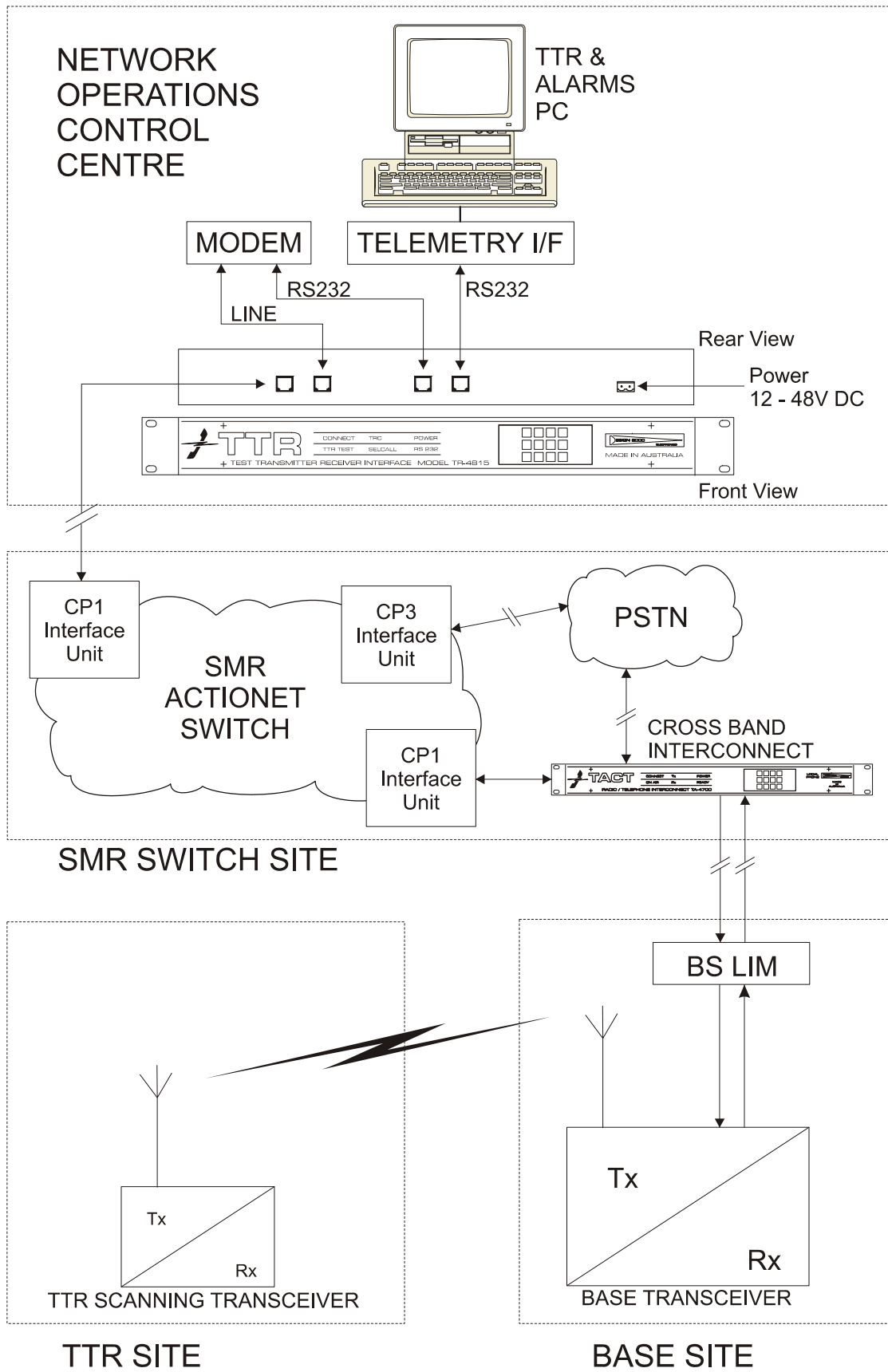
The TA-4700 can be powered from a nominal 12 → 48V dc supply, +ve or -ve earth, or floating. The power input is polarity insensitive. The nominal operating current is 135 mA @ 48 V with a maximum current of 160 mA. The power connector supplied is a BL-2 screw/clamp plug.

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**INSTALLATION BLOCK DIAGRAM**



**TACT TA-4700 AND TTR TESTING ARRANGEMENT**



Refer to Document G/99119 for details on Network Testing.



## CALL TYPES AND CALL HANDLING

As the name implies, the TACT TA-4700 IC/SMR & PSTN Interconnect provides for several call types.

In order to facilitate correct and successful operation, the TACT performs number conversions as shown below. The 'store and forward' method is used to prevent incorrect or unwanted digits from reaching the SMRIU or PSTN.

The dialling arrangements here pertain to DSE Trunked Mobiles on the State Mobile Radio network (SMR).

### TACT Number Conversion Table

CALL TYPE	DIGITS RECEIVED	DIGITS FORWARDED
Individual or group voice call. Radio number in <u>ANN</u> format	7nnnnnn # 8nnnnnn # 9nnnnnn # nnn #	Store and forward these digits the same as they were received to the SMRIU port noting the exceptions below
Individual voice call. Inter-fleet Radio number in abbreviated <u>MPT 1343</u> format to DSE (Prefix 230) State Pt Phillip North West South West North East  Gippsland Future Future VPC	2001 nnn # 2401 nnn # 2801 nnn # 3201 nnn # 3601 nnn # 4001 nnn # 4401 nnn # 4801 nnn # 5201 nnn # 5601 nnn #	Store, convert, and forward to the SMRIU port as follows:  7300 nnn # 7301 nnn # 7302 nnn # 7303 nnn # 7304 nnn # 7305 nnn # 7306 nnn # 7307 nnn # 7308 nnn # 7309 nnn #
Group voice call. Inter-fleet Radio number in abbreviated <u>MPT 1343</u> format to DSE (Prefix 230)	2351 nnn # 2751 nnn # 3151 nnn # 3551 nnn # 3951 nnn # 4351 nnn # 4751 nnn # 5151 nnn # 5551 nnn # 5951 nnn #	Store, convert, and forward to the SMRIU port as follows:  7300 nnn # 7301 nnn # 7302 nnn # 7303 nnn # 7304 nnn # 7305 nnn # 7306 nnn # 7307 nnn # 7308 nnn # 7309 nnn #
Individual voice call. Radio number in <u>MPT 1343</u> format	Large, small and mini fleets	Store, convert and forward to SMRIU port using the BF MPT to ANN conversion algorithm. <sup>o</sup>
Emergency PSTN call	000 # or 112 # or 999 #	Store, convert, and forward 000 to the PSTN line
PSTN call	0nn...#	Store, strip 0 and #, and forward nnn... to the PSTN line.
Call disconnect (Non executive PSTN calls)	* #	Release the PSTN line and disconnect all ports. (Not executive PSTN calls)

Executive PSTN call. May be used to dial up another base station site for site interconnect	* 9 * 0 nn...#	Store, strip * 9 * 0 and #, and forward nn... to the PSTN line. Mute subsequent DTMF digits except for * 9 * 0 #. TACT will restore PSTN connection if it is lost.
Executive PSTN call disconnect	* 9 * 0 #	Forward * 9 * 0 # to the PSTN. Release PSTN line and disconnect all ports.
PSTN Speed Call	0 x #	Dial number in memory location x
PSTN Last Number Re-dial	0 0 #	Redial last number dialled to the PSTN
Executive PSTN Speed Call	* 9 * 0 x #	Dial number in memory location x and treat as Executive call.
Executive PSTN Last Number Redial	* 9 * 0 0 #	Redial last number dialled to the PSTN and treat as Executive call.
Executive SMR call (not implemented)	* 9 * nnn... #	Store and forward these digits the same as they were received to the SMRIU port noting the exceptions above.
TACT Remote Programming Mode	* 6703 #	Mute all other audio paths & allow programming

Notes:

- ° For details on the BF MPT to ANN conversion algorithm refer to document 'Bill Forbes CALLS09'.

**In order keep directions simple, the User Instructions that follow grant that the number conversions occur automatically. Therefore the operator does not need to know the details of number conversions and is unaware that these actually take place.**

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## USER INSTRUCTIONS

### CALLS TO THE SMR FROM THE INCIDENT CHANNEL

#### Making an Individual or Group Voice Call

1. Press and hold the PTT button. (This step is radio dependent).
2. Dial the required mobile number then #.
3. Listen for audible ring tone.
4. If the mobile does not answer within thirty seconds you will hear "*Mobile unattended*" and then be automatically disconnected.
5. When the dialled mobile answers, proceed with the conversation.
6. To end the call, (press and hold PTT) press \* #.

### CALLS TO THE INCIDENT CHANNEL FROM THE SMR

#### Making an Open Channel Call to the Incident Channel

1. Dial the SMRIU.
2. Listen for "*DSE Incident Channel*".
3. Voice page call the required party.
4. When the called mobile answers, proceed with the conversation.
5. To end the call, (press and hold PTT) press \* #. Listen for "*SMR disconnected*".

### CALLS TO THE PSTN FROM THE INCIDENT CHANNEL

#### Making a Normal Telephone Call

1. Press and hold the PTT button. (This step is radio dependent).
2. Dial 0 followed by the required telephone number then #.  
(If the dialled number is busy, you are automatically disconnected).
3. Listen for ring tone and answer, then proceed with the conversation.
4. To end the call, (press and hold PTT) press \* #. Listen for "*PSTN disconnected*".

#### Making a call to Emergency

1. Press and hold the PTT button. (This step is radio dependent).
2. Dial 000 (or 112 or 999) then #.  
(If the number is busy, you are automatically disconnected).
3. Listen for ring tone and answer, then proceed with the conversation.
4. To end the call, (press and hold PTT) press \* #. Listen for "*PSTN disconnected*".

#### Making Executive PSTN Calls from the Incident Channel

1. Press and hold the PTT button. (This step is radio dependent).
2. Dial \* 9 \* 0 followed by the required telephone then #.  
(If the number is busy, TACT automatically redials).
3. Listen for ring tone and answer, then proceed with the conversation.
4. To end the call, (press and hold PTT) press \* 9 \* 0 #. Listen for "*PSTN disconnected*".

#### Notes:

- An Executive PSTN Call may be used to dial another TA-4700 to facilitate base station site interconnect over the PSTN.
- The originating TA-4700 signals to the receiving TA-4700 that this is an Executive call.
- An established Executive PSTN call will not time-out for any reason other than receipt of \* 9 \* 0 #.
- If the connection is unexpectedly lost, the originating TA-4700 automatically redials to re-establish the link.

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## **PSTN Speed Call**

Abbreviated (speed) dialling of up to nine frequently called telephone numbers from the Incident Channel.

### **To Store PSTN Speed Call Numbers**

1. From the TA-4700 Keypad, press \* 2 x, where x = memory location (1 → 9).
2. Enter the required telephone number (do NOT enter an extra 0 in front of the number when programming PSTN Speed Call numbers).
3. Press #. The number will be displayed for confirmation.
  - To check the number, press \* # 2x #.

### **To Dial PSTN Speed Call Numbers**

1. Press and hold the PTT button. (This step is radio dependent).
2. Dial 0 then the required memory location (1→ 9) followed by #.  
(If the dialled number is busy, you are automatically disconnected).
3. Listen for ring tone and answer, then proceed with the conversation.
4. To end the call, (press and hold PTT) press \* #. Listen for “*PSTN disconnected*”.

### **Last Number Re-dial.**

1. Press and hold the PTT button. (This step is radio dependent).
2. Dial 0 0 #.  
(If the dialled number is busy, you are automatically disconnected).
3. Listen for ring tone and answer, then proceed with the conversation.
4. To end the call, (press and hold PTT) press \* #. Listen for “*PSTN disconnected*”.

### **Executive PSTN Speed Call and Last Number Re-dial**

1. Simply dial \* 9 \* before the above dialling procedures.

## **CALLS TO THE INCIDENT CHANNEL FROM THE PSTN**

### **Making an Open Channel Call to the Incident Channel**

1. From any PSTN telephone, dial the PSTN directory number for the TA-4700.
2. Wait for answer and listen for “*DSE Incident Channel*”.
3. Voice page call the required party.
4. When the called radio answers, proceed with the conversation.
5. To end the call, press \* # or just hang up. Listen for Listen for “*PSTN disconnected*”.

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## GENERAL NOTES:

- ◆ A 'party-line' type conference call is established if:
  - the PSTN line is called when a call is up between the Incident Channel and the SMR.
  - the SMRIU is called when a call is up between the Incident Channel and the PSTN.
- ◆ An intrusion tone is heard when another party barges in.
- ◆ A conference call is automatically cleared when any party sends the call disconnect command (\* # or \* 9 \* 0 #).
- ◆ A non executive PSTN call is automatically released when one of the following conditions occur:
  - Five seconds of busy tone is detected.
  - any service tone other than ringing tone is detected.
  - line reversal on the telephone line is detected. (Line category ROI is recommended for all TA-4700 lines).
  - loop current loss on the telephone line is detected.
  - \* # is detected from any source (Non executive calls).
- ◆ An Executive PSTN call will not time-out for any reason other than receipt of \* 9 \* 0 #.
  - if busy tone is detected, the originating TA-4700 automatically redials the other TA-4700.
- ◆ If you make a mistake during dialling you can press \* \*, to 'escape', then start dialling again.

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## OPERATING AND PROGRAMMING SUMMARY

CODE	FUNCTION	FROM
nn...#	Call SMR mobile	INCIDENT CHANNEL
0nn...#	PSTN Call	INCIDENT CHANNEL
* *	'Escape' during dialling	INCIDENT CHANNEL
000 #	Call Emergency	INCIDENT CHANNEL
112 #	Call Emergency	INCIDENT CHANNEL
999 #	Call Emergency	INCIDENT CHANNEL
* 9 * 0 nn... #	Executive PSTN Call	INCIDENT CHANNEL
* 9 * nnn... #	Executive SMR Call (not implemented)	INCIDENT CHANNEL
0 x #	Dial PSTN Speed Call Number	INCIDENT CHANNEL
0 0 #	Last Number Re-dial	INCIDENT CHANNEL
TA-4700 PSTN Number	Incident Channel Open Channel call	PSTN
SMRIU Number	Call Incident Channel	SMR
* #	Disconnect	PSTN, INCIDENT CHANNEL or SMR
* 9 * 0 #	Disconnect Executive PSTN Call	PSTN, INCIDENT CHANNEL or SMR
* 6703 #	TACT Remote Programming Mode	PSTN or INCIDENT CHANNEL
* 2x nn...#	Store PSTN Speed Call Number	Keypad
* # 2x #	Check PSTN Speed Call Number	Keypad
* 92 0 #	PTT Key Tone ON to Radio (TACT LIM NO)	Keypad
* 92 1 #	PTT Key Tone OFF to Radio (TACT LIM YES)	Keypad
* 93 0 #	Power Save Mode OFF (continuous Tx)	Keypad
* 93 [1-160] #	Power Save Mode ON (Tx off after 1-160 secs)	Keypad
* 94 [1-100] #	Answer delay on PSTN line (100ms – 10,000ms)	Keypad
* 95 [1-100] #	Answer delay on SMR line (100ms – 10,000ms)	Keypad
* 48 #	Software version number	Keypad
# #	End Programming Mode	Keypad
* 67 70 96 00 #	Master Reset	Keypad (CAUTION)

Note:

Master Reset erases all customer programmed data and resets the TACT unit to the factory default condition. ie. Erase all speed call numbers, ID number = 4700, Call time limit = off.

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## SPECIFICATIONS

Enclosure	1U high, 19" rack mount.
Finish	Dulux metallic charcoal powder coat.
Power Requirement	12 → 48 Vdc nominal, polarity and ground insensitive.
Power Consumption	65 mA @ 48 V 135 mA @ 24 V 300 mA @ 12 V ie. 3.2 W nominal @ 48V
Initial Start Up Current	300 mA for 40 ms @ 48 V 500 mA for 50 ms @ 24 V 750 mA for 90 ms @ 12 V
Operating Temperature Range	-10 → +70 ° C.
Storage Temperature Range	-20 → 80 ° C ambient.
Humidity, Storage and Operating	To 98% non condensing.
Mean Time Between Failure:	> 20 years.
TACT LIM Interface	4 wire, fully isolated, 600 R nominal.
Input level	-30 → +10 dBm adjustable (-13.5 dBm nom.).
Output level	-30 → +10 dBm adjustable. (-13.5 dBm nom.).
Frequency range	300 Hz → 5 kHz.
COS detect	High impedance input, floating to +5V, grounded by radio to indicate COS.
PTT	Open collector output transistor, switching to ground for PTT activation.
Key (M) Tone	2970 Hz, -23.5 dBm into 600 Ohms
Telephone Line Interface	Standard two wire analogue ring in/loop out.
Ringer Equivalent Number (REN)	0.5.
Ring Detect	≥ 10V RMS @ 13-55 Hz (25 Hz nominal), ≥100 ms.
Answer Delay	100 – 10,000 ms (programmable).
SMRIU Interface	Standard two wire analogue ring in/loop out.
Ringer Equivalent Number (REN)	0.5.
Ring Detect	≥ 10V RMS @ 13-55 Hz (25 Hz nominal), ≥100 ms.
Answer Delay	100 – 10,000 ms (programmable).
In-band Signalling	<u>Dual Tone Multi Frequency (DTMF).</u>
PTT Key Tone	2970 Hz, -23.5 dBm into 600 Ohms
DTMF Dialler	100 ms on/off, -10dBm.
DTMF Receiver	-40 → 0 dBm sensitivity.
Telephone Service Tone detection	-30 dBm sensitivity, automatic cadence detection.
Busy Tone Detect	5 seconds of repeating on/off tone
5 Tone Paging Protocol	CCIR 40 ms.
Keypad	12 push button 4 x 3 numeric silicone membrane keypad.
Displays	7 segment numeric readout, 6 x status LEDs.
RS232 Port	9600 baud, N81 format.
Data Call Detect	-22 dBm programmable.
Firmware Storage Medium:	EPROM
Firmware System Number	SW 4773 14
Firmware Speech Number	SW 4776 04
ACA Supplier Code Number	N468.
Warranty	Two years

*Note: Specifications are subject to change without notice.*



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# **TACT TA-4700**

## **IC/SMR AND PSTN INTERCONNECT**

MADE IN AUSTRALIA BY



FOR



**Telstra Managed Radio and Wireless Solutions, Southern Region Engineering**



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## **TACT TA-4700 IC/SMR & PSTN INTERCONNECT**

### **PACKING LIST**

1 x TACT TA-4700 UNIT

1 x G/98107 OPERATOR MANUAL

2 x RJ12 →605 LINE CORD

1 x RJ45 PLUG

1 x BL-2 PLUG

2 x MOUNTING BRACKETS & SCREWS

1 x WARRANTY CARD

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# TACT TA-4700 FOR DSE INCIDENT CHANNEL

## POWER SAVE MODE (Ref.: SCN 373 & SCN 406)

When either an incoming or outgoing telephone or SMR call is initiated on the Incident Channel, TACT sends a key tone to the Incident Channel to turn on the radio transmitter.

To save power, TACT is able to turn off the key tone and transmitter after a period of silence on the telephone line and the SMR port. The period of silence required to activate the power save is programmable from 1 to 160 seconds, with a factory default time of 15 seconds.

### Keypad Programming

Press:

\* 93 0 # = Power Save Mode OFF (continuous Tx during a call), or:

\* 93 [1 → 160] # = Power Save Mode ON after 1 → 160 seconds of silence.

## = save changes and exit programming mode.

Please Note: \* 93 15 # = Default ie. Power Save Mode ON after 15 seconds of silence.

This feature is available with firmware revision SW-4733 13 or later.



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# TACT TA-4700 FOR DSE INCIDENT CHANNEL

## PROGRAMMABLE ANSWER DELAY (Ref.: SCN 450)

When an incoming telephone call is received on either the SMR port or PSTN port, TACT normally waits 1 second (1000 milliseconds) before answering. This Answer Delay is programmable from 100 milliseconds and 10 seconds in 100 millisecond increments.

One of the reasons is to compensate for the ring tone that the caller receives which is not always synchronized with the ringing voltage applied by the telephone exchange to TACT. If the ringing voltage is applied to TACT before the caller hears audible ring tone, there is a chance that TACT will appear to answer immediately, without the caller hearing any ring tone. Yep, the good old days of the 'early guard ring' where ring tone and ring voltage were perfectly synchronized are over.

### Keypad Programming

#### The PSTN Line Answer Delay

To program the PSTN Answer Delay, press:

\* 94 [1-100] #, where the number entered is multiplied by 100 milliseconds, eg. 30 = 3000 ms.

To check the PSTN Answer Delay, press:

\*# 94 #

To reset the PSTN Answer Delay to the 1 second default, press:

# 94 #

Press # # to save changes and exit programming mode.

#### The SMR Line Answer Delay

To program the SMR Answer Delay, press:

\* 95 [1-100] #, where the number entered is multiplied by 100 milliseconds, eg. 30 = 3000 ms.

To check the SMR Answer Delay, press:

\*# 95 #

To reset the SMR Answer Delay to the 1 second default, press:

# 95 #

Press # # to save changes and exit programming mode.

This feature is available with firmware revision SW-4733 14 or later. The busy tone detect has also been reduced from 7 seconds to 5 seconds & the disconnect voice prompts are faster.

