

# 4 – WIRE AUDIO TERMINAL ADAPTER

Model 4WTA-128R

In 19" rack case

Rev. 3d

August 2005

## USER INSTRUCTIONS





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## 4 – WIRE AUDIO TERMINAL ADAPTER

Model 4WTA-128R

### USER INSTRUCTIONS

**NOTE:** This Manual can be downloaded in soft form from [www.c10.com.au](http://www.c10.com.au)

#### 1 WARNING

**This equipment contains dangerous voltages and is to be installed and maintained by service personnel only**  
TNV-2 circuits are accessible at the rear of this cabinet.

- *The connectors marked **Tel1** and **Tel2** will output a voltage of 110Vrms during ringing.*

*The 4-Wire Audio Terminal Adapter 4W-TA128R shall be installed in a location compliant with the requirements of a restricted access location.*

*To meet the requirements of a restricted access location:*

- *Access can only be gained by service personnel or by users who have been instructed about the reason for the restrictions applied to the location and about the precautions that shall be taken; and*
- *Access is through the use of a tool or lock and key or other means of security and is controlled by authority responsible for the location.*

#### 2 INTRODUCTION

##### 2.1 Technology Overview – ISDN

**ISDN** (*Integrated Services Digital Network*) provides end to end digital communications over the regular telephone lines.

The **Basic Rate ISDN** provides two simultaneous communications channels on one physical telephone line. They are called **B1** and **B2** channels and there is a “**D**” common channel which provides the signaling and control functions for both **B1** and **B2** channels.

The **D** channel has a capacity of 16 kbit / second, while the **B** channels have a capacity of 64 kbit / second each and in each direction, equal to the speed used in telephone exchanges to digitise the voice on the **PSTN** network (*Public Switched Telephone Network – the old (or current) style telephony*).

Beyond the telephone exchange, digital transmission is used in all cases, but the difference between **PSTN** and **ISDN** is the latter is digital end to end while **PSTN** has an analogue segment between the exchange and the end user.

**ISDN** doubles the line capacity, with 2 independent communication channels over one physical line. The end to end nature of the **ISDN** transmission opens up a number of additional services that are available to the user, exclusive to **ISDN**.

## **2.2 Multiple Subscriber Numbers (MSN)**

The two “**B**” channels which are the bearers of voice or other information on one physical telephone line allow 2 simultaneous telephone calls on one line. Different numbers can be allocated to the 2 channels. In fact, up to 8 telephone numbers can be allocated to one physical line, along with the main number.

The “**S/T bus**” can accept up to eight **ISDN** devices to be connected together on the same bus. Each one of them can have one **MSN** allocated to it. The advantage is: when multiple devices are connected to the same line, each one will ring on an incoming call if its own allocated number is called, while the others will not ring on that particular incoming call.

Several **ISDN** telephones, a Group 4 fax machine etc (up to 8) can all be connected to the same line, bearing individual telephone numbers which can be called and only the called device will ring or answer. For that, each device that has a number allocated to it must be aware of that number, which means the allocated number must be programmed, or stored, in the device.

The limitation is that only 2 of them can be used on a call at any given time (think of this like a **PABX** with 2 incoming lines and 8 dial-in extensions).

On another hand, any of the (up to) 8 devices on one line that does not have an **MSN** allocated and programmed, will ring on an incoming call to the main number. For example, 8 **ISDN** telephones with no number programmed will all ring simultaneously on an incoming call to the main number, but will not ring if any one of the 8 **MSN** is called. If there are several telephones ringing at the same time, the first one answered will take the call and the others will stop ringing.

On outbound calls on a system with multiple subscriber numbers, the first 2 telephones (or other devices) going off hook will seize the 2 available **B** channels and an attempt to use the other devices will result in receiving a “busy” tone until a **B** channel becomes available (again, like a 2 / 8 line **PABX** when both external lines are in use).

## **2.3 ISDN based 4 – Wire Audio Terminal Adapter**

In the case of the **4 – Wire Audio Terminal Adapter** the advantage in using the **ISDN** technology is mainly the loss-less voice communication in both directions, with a good separation between the transmit and receive path.

It provides the best quality that can be obtained in the 3.1 kHz bandwidth available in telephone communications.

Every time a **PSTN** number is dialed up, there is a variation in signal level and line quality, depending on the line length, connection path, cross talk or noise picked up in the cable etc.

The end-to-end digital communication used in **ISDN** eliminates this variability, while maintaining the flexibility of the dial up connections.

The **4 – Wire Audio Terminal Adapter** offers 2 independent telephone services, using 2 analogue telephones and each one of them can be independently switched to the 4-wire mode when a separate transmit and receive path are available.

Switching between the 2-wire and 4-wire operation can be done manually by the user, or automatically, using the auto-dial and auto-answer in-built functions.

### 3 PHYSICAL DESCRIPTION

The 4 – Wire Audio Terminal Adapter Model 4WTA-128R is installed in a 19” rack-mountable case with a height of 1RU and 220 mm depth. The overall dimensions are: 440 mm (Width) by 225 mm (Depth) by 44 mm (height) and the weight is about 3.8 kg. The indicated width does not include the 19” mounting brackets, which are removable.

#### 3.1 Power Supply

The power supply unit is internal.

The connection is by IEC320 socket

The supply voltage can be between 90 – 264 V AC at a frequency of 47 – 63 Hz

#### 3.2 Ambient

The operating ambient temperature is in the range 0 – 45<sup>0</sup> Celsius.

#### 3.3 Front Panel (See Fig. 1)

There are 10 green front panel indicators (LED) with the following functions.

From left to right:

**LED 1:** USB power indicator

**LED 2, LED 3:** Auto-Answer programming status display for **Port 1** (top LED) and **Port 2** (bottom).

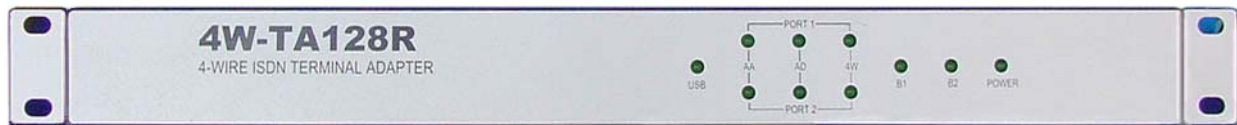
**LED 4, LED 5:** Auto-Dial programming status display for **Port 1** (top LED) and **Port 2** (bottom LED).

**LED 6, LED 7:** 4-Wire indicator for **Port 1** (top LED) and **Port 2** (bottom LED)

**LED 8:** B1 channel indicator

**LED 9:** B2 channel indicator

**LED 10:** POWER indicator



**NOTE:** LED's 2 to 9 are also used briefly during the power up self test

Figure 1 – FRONT PANEL

#### 3.4 Rear Panel (See Fig. 2 and 3 and 10: WIRING DIAGRAM)

From left to right the following connectors and switches are installed:

- **Power** – Standard IEC320 mains connector
- **Reset** – A 2-way male connector. Shorting the 2 pins momentarily will cause a system reset



Figure 2 – REAR PANEL

- **T. R. switch** (Terminating Resistors) – Normally this switch is left in the ON position to provide an impedance matching between the unit and the S/T bus. It can be switched off if other ISDN devices (e.g. an ISDN digital telephone) are connected to the same bus and have terminating resistors. Only one device on the S/T bus must have the terminating resistors switched in, all the others must be off. This is the device at the end of a long S/T bus.

- **S/T interface** – This is the connection to the digital telephone network (**ISDN**). A 4-wire telephone cable terminated at each end with an **RJ45** modular plug needs to be used, with the other end connecting to an **NT** (Network Termination) which is part of the ISDN network and offers a “**U**” interface (connected to the **ISDN** telephone line) and an **S/T** interface available to the user. Alternatively, the **S/T** bus can be hardwired to the 4-way connector just above the **RJ45** socket (they are internally connected in parallel). A matching wire-able pluggable connector needs to be used in this case. Pins 1 – 4 (**counting right-to-left**) are connected to pins 3 – 6 on the RJ45 jack.
- **Audio 1** and **Audio 2** provide the 4-wire connections for the 2 channels. The connectors are **RJ45** modular type and the pin-out for each port is:  
Input (signal into the port): Pins 4 and 5  
Output (signal out of the port): Pins 1 and 2  
The 4 **RJ45** pins are also paralleled to the 4-way male connector above, for hard wiring via a wire-able pluggable connector. The input into the port is on pins 4 and 3 **from the right**, the output is on the pins 2 and 1 **from the right**. See 10, **WIRING DIAGRAM**.
- **USB** – a standard **USB** port allows for communication with the **TA** using the **AT** command set, including firmware upgrades. It is only used for test and maintenance by technical people. The USB port is NOT electrically isolated from the telephone ports Tel1 and Tel2 and therefore it can be subjected to telecommunications over-voltages that are dangerous to people or to the PC or laptop connected to the USB port.
- **TEL 1, TEL2** are **RJ12** type connectors providing connections for 2 standard (analogue) telephones. Connect one or two telephones here and calls can be made and received in the normal fashion. Alternatively, 2 standard telephones can be hard wired to the 4-way connector above, using a wire-able pluggable connector. Tel2 connections are to pins 1 and 2 and Tel1 is on pins 3 and 4, when **counting right-to-left**.

In addition to making and receiving calls, when a call is established with another **4 – Wire Audio** unit, the telephones can be used to manually switch the unit at each end to 4-wire operation. The telephones also allow for port programming for automatic operation (dialing or answering).



**Figure 3 – REAR PANEL (detail)**

## 4 OPERATION

Two analogue telephones connected to **TEL 1** and / or **TEL 2** allow the user to make or receive any calls. Making calls could be subject to Out-Bound Call Barring (**OCB**), if used.

The way calls are received depends on the telephone port programming. An **ISDN** line allows multiple numbers to be used for one line. There is a main (service) number for the physical line and up to 8 **MSN** (**Multiple Subscriber Number**) can be allocated. Two of these **MSN** could be allocated to the 2 ports and in this case each telephone will only ring if the incoming call is made to that particular number. If no **MSN** are programmed in a port, then the telephone will ring to any valid number of the ISDN service when called. If both ports have blank **MSN** (no **MSN** programmed), they will both ring on an incoming call to the ISDN service. See *MSN / Auto Answer programming*.



**Abbreviations:****OH**=Off Hook**DT**=Dial Tone**RR**=Recall**NN**=Telephone number**CT**=Confirmation tone**AA**=Auto Answer**AD**=Auto Dial

## **4.1 Entering Keypad commands**

The unit can be programmed and operated by using keypad commands.

Most of the keypad commands are entered after picking up the handset and pressing the Recall key:

**OH RR**, followed by the command itself.

## **4.2 Canceling a Keypad command**

If a wrong key has been pressed while entering a command, the command can be canceled by pressing the Recall (**RR**) key again and then the command can be re-entered (no need to hang up).

## **4.3 Manual operation**

Dial the number of the remote unit or answer the call made by the remote unit to establish a 2-wire connection (as in a normal phone call). Then switch between 2-wire and 4-wire mode:

Switch to 4 wire:

**OH RR \*\*4#** [CT + LED on], hang up

**NOTE:** This command is intended for switching between 2-wire and 4-wire on a connected call only.

When switched to 4-wire without a connected call, unexpected results can occur:

- if the telephone rings, answering a port that is already in 4-wire results in receiving silence
- taking the handset off hook from idle in 4-wire mode receives silence
- if a valid number is dialed while in 4-wire mode, the B-party will ring, on answering this call both parties receive silence

Switch to 2 wire:

**OH RR #\*4#** [CT + LED off]

In manual-to-manual operation, coordination is needed between the 2 ends to manually switch to 4-wire.

## **4.4 Keypad programming**

### **4.4.1 Storing telephone numbers**

Each port has 3 memory locations where 3 numbers can be stored.

**Location 01** is for the number to be used for **Auto Dialing**.

**Location 02** is for the number to be used for **Auto Answer**

**Location 10** is for the **MSN** (Multiple Subscriber Number) allocated to the port

Store at location **01** the number to be dialed when the **Auto Dial** function is enabled. The number can be stored as a local (8 digit) number or as a **FNN** (Full National Number) with all 10 digits.

Storing the **FNN** is recommended.

Store at location **02** the number allocated to the port for **Auto Answering** purpose.

**Currently this number has to be stored as an 8-digit (local) number.** This is the number allocated to the port and the telephone connected to the port will only ring if the auto answer is disabled and if this number is called by the remote party.

Store at location **10** the **MSN** allocated to the port. This has to be stored as an FNN, 10 digit number, which is otherwise the same as the auto answer number: the port will auto answer or ring the telephone only if this number is called.

**For the Auto Answer to work, the Auto Answer number must be the same as the last 8 digits of the MSN for each port. That is the AA number must be stored as a local (8 digit) number, while the MSN must be a 10 digit FNN.**

To store numbers or program a port, a telephone connected to that particular port can be used, or the programming can be done via the **USB** port and **AT** commands, using a computer or terminal. (See 5.3 “Using the USB port”).

#### 4.4.1.1 Storing an Auto-Dial Number

To store a telephone number at location 01 (See the above list of abbreviations):

**OH RR \*128 [CT] 01\*NN\*\* [CT]**

Where NN is the number to be dialed during the Auto Dial operation.

FNN (10 digit) form is recommended

Leave NN blank to erase the existing number:

**OH RR \*128 [CT] 01\*\*\* [CT]**

#### 4.4.1.2 Storing an Auto-Answer Number

To store a telephone number at location 02:

**OH RR \*128 [CT] 02\*NN\*\* [CT]**

Where NN is the number that particular port will answer to.

For the Auto Answer to work, the AA number must be identical to the MSN for that port, but location 02 requires a local (8 digit) number.

Leave NN blank to erase the existing number:

**OH RR \*128 [CT] 02\*\*\* [CT]**

#### 4.4.1.3 Storing an MSN

To store a number at location 10 (MSN):

**OH RR ##2# [CT] \*\*128 [CT] 10\*MSN\*\* [CT] RR\*\*2# [CT] [On Hook]**

In the above operation “MSN” is the number allocated to that particular port, in an FNN form (10 digits). Please note, this is identical to the auto answer number, but including the area code.

To erase an MSN, enter “00” instead of the actual number:

**OH RR ##2# [CT] \*\*128 [CT] 10\*00\*\* [CT] RR\*\*2# [CT] [On Hook]**

**NOTE:** Entering some key pad commands can be quite daunting unless this is done frequently and the user is well familiar with these commands. Alternatively, programming can be done by the way of **AT** commands, see 5, “USB INTERFACE” and in particular 5.3.2, “Changing the configuration”.

## 4.4.2 Enabling Auto Answer or Auto Dial

These two functions are mutually exclusive.

If enabling one function is attempted while the other one is already active, a rejection tone will be heard and the command is not executed.

#### **4.4.2.1 Auto Answer**

An Auto Answer number has to be programmed first at location 02.

If the location 02 is blank, the “Enable AA” command will be rejected.

If the number at location 02 is deleted while AA is enabled, AA will be automatically disabled

To enable AA

**OH RR \*\*8#** [CT + AA LED on]

To disable AA

**OH RR #\*8#** [CT + AA LED off]

#### **4.4.2.2 Auto Dial**

An Auto Dial number has to be programmed first at location 01.

If the location 01 is blank, the “Enable AD” command will be rejected.

If the number at location 01 is deleted while AD is enabled, AD will be automatically disabled

To enable AD

**OH RR \*\*9#** [CT + AD LED on]

To disable AD

**OH RR #\*9#** [CT + AD LED off]

### **4.5 Automatic operation**

#### **4.5.1 Auto Dial**

The unit programmed for **AD** will dial about 10 s after power up or power recovery.

It will also dial about 5 minutes after the connection is re-established, following a loss of connection.

The unit will switch to 4-wire prior to dialing.

**NOTE:** If both ports are enabled for auto dial they won't dial out simultaneously, the dialing is staggered between the two ports.

#### **4.5.2 Auto Answer**

The unit programmed for **AA** will answer a call to the programmed number, without ringing.

After answering it will automatically switch to 4 wire operation.

### **4.6 Call Termination**

#### **4.6.1 Call termination after manual 4-wire connection**

To terminate or release a 4-wire connection, first switch back to 2-wire mode, (*See 3.1*), then hang up.

At the remote end the call will be terminated or released as well and it will be switched to 2-wire.

#### **4.6.2 Call termination after Auto Answer**

To terminate or release a call on a unit that had auto-answered, the same procedure can be used as for manual operation: manually change to 2-wire and hang up:

**RR #\*4#** [CT], Hang up

At the remote end the call will also be terminated or released.

However, if the call was automatically initiated at the other end (full automatic operation – Auto Dial / Auto Answer), after 5 minutes of idling the remote unit will auto dial again, attempting to re-establish the connection. If this is not the user’s intention, the Auto Dial of the remote unit should be disabled (**RR #\*9#**).

In automatic operation it is recommended to terminate or release the call at the originating end and turn off the auto dial to prevent it from re-establishing the connection again.

### **4.6.3 Call termination after Auto Dial**

To terminate or release a call after auto dial the manual procedure can be used, followed by disabling the auto dial:

**OH RR #\*4#** [CT], Hang up  
**OH RR#\*9#**

If the call is manually terminated or release but the Auto Dial is not disabled, it will attempt to connect again 5 minutes later.

At the remote end the call will also be terminated or released and the unit will switch to 2-wire.

## **5 LOSS OF POWER**

### **5.1 Mains Power lost**

The **4-wire Audio Terminal** cannot operate without mains power.

If the mains power is lost any current call will be lost.

### **WARNING:**

**The analogue telephones connected to the unit will not be able to operate.**

**This includes making calls to emergency numbers.**

If it is vital to ensure the telephone communication (2-wire mode only) under a mains power loss condition, a user supplied, digital (**ISDN**) telephone can be connected directly to the second **S/T** port of the Network Termination unit (**NT1**). This unit is powered from the **ISDN** line and the telephone will be operational all the time. In this case the ISDN telephone must be set to “emergency” (or “restricted”) mode.

This is independent of and it has no relation to the **4-Wire Audio Terminal Adapter**.

### **5.2 Mains Power re-established**

#### **5.2.1 Manual operation**

If the lost call had been manually established, the user has to establish the call again, manually. This requires one operator at each end and coordination between them.

#### **5.2.2 Automatic operation at one end.**

If Auto Dialing was used to establish the call, with manual answer at the other end, after power recovery the unit will auto dial again at about 10 seconds after the power is back. At the other end an operator will have to answer manually and switch to 4-wire. The answering unit needs to be in 2-wire mode for the telephone to ring and be answered.

If Auto Answer was used to establish the call, when the power is re-established the unit will remain in 2-wire auto answer mode, waiting for an incoming call.

### 5.2.3 Automatic operation at both ends.

If a call was established full automatically and then lost due to a power failure.

If the power failure is at the originating end, the remote unit will hang up and switch to 2-wire, waiting for an incoming call. When the power is established at the originating unit, it will auto dial after about 10 seconds and the 4-wire call is resumed automatically.

If the power failure is at the answering end, the originating end will attempt to establish the connection by dialing out every 5 minutes. When the power is back at the answering end, the connection will be re-established automatically, switching to 4-wire mode.

## 6 USB INTERFACE

The **4-Wire Audio Terminal Adapter** can be programmed and operated by using the telephone keypad, without a need to connect it to a computer.

However, when a **PC** or a **Laptop** with a **USB** interface is available, it can be used to check the programming status or to program the **Terminal Adapter**.

### 6.1 Accessing the USB Port

The **USB** port and the 2-wire telephone ports should never be used at the same time.

When any cable is plugged into **Tel1** or **Tel2**, there is a possibility that dangerous voltages appear on these lines and then feed back into the **USB** port, posing a safety hazard for the operator or creating the possibility of damage to the **PC** or **Laptop**.

For this reason, before connecting the **USB** cable to the **4-Wire Audio Terminal Adapter**, the **Tel1** and **Tel2** 2-wire telephone cables must be removed. When the configuration work requiring the **USB** interface is finished, disconnect the **USB** cable and plug back the **Tel1** and **Tel2** cables.

### 6.2 Installing the USB driver

The **USB** interface is using the FT245AM chip from FTDI.

A driver for this chip can be downloaded from the **FTDI** site ([www.ftdichip.com](http://www.ftdichip.com)). Go to DRIVERS and select VCP drivers. Download R9052154 which works on all Windows versions or download a later driver if a new one becomes available in time.

When the **4-Wire Audio Terminal Adapter** is connected to a **PC**, a “Found new hardware” message should appear. Follow the prompts on the screen and choose the option “Have disk”, indicating the location on the local disk where the driver had been placed. If a driver is available on a **CD**, the path to this driver can be indicated.

**NOTE:** Windows XP is the recommended platform on which the **USB** port will operate, although Windows 2000 can also be used.

### 6.3 Using the USB Port

Once the **USB** interface is connected to a computer, a **Terminal Emulator** program must be run on the computer. The **HyperTerminal** provided with the operating system (**Windows xxxx**) under **Accessories** can be used or other terminal emulation programs (eg **PComm Lite**).

When the terminal emulator is running, a window will display any commands typed on the computer keyboard and responses from the **TA**.

To open this window, a number of parameters have to be selected first:

- select the virtual **COM** port that corresponds to the **USB** interface on your computer. To check which COM port should be used, go to: Start-Settings-Control Panel-System-Hardware-Device Manager. Click on the + in front of “Ports (Com + LPT)”.
- Baud rate: **115200** bps
- Data bits: **8**
- Stop bits: **1**
- Parity: **none**
- Flow control: hardware (**RTS / CTS**)
- Terminal type: **ANSI**

To check the connection:

**AT**

You should see the response:

**Ok**

**NOTE:** the **AT** commands can be typed in lower case or upper case, or a combination of both. However, the first 2 characters (**AT**) must be both in upper case (**AT**) or lower case (**at**), but not mixed.

In the following paragraphs the commands will be shown in upper case, but lower case can also be used.

### **6.3.1 Checking the configuration**

Now a set of commands, all beginning with “**AT**” (and called “**AT Commands**”) can be used to check the existing configuration of the **4-Wire Audio Terminal Adapter (TA)**.

Two commands are useful for checking the configuration:

**AT%A7=0**

Displays the Auto Answer and Auto Dial status and numbers programmed at location 01 and location 02 for auto dial and auto answer (if any).

*Example:*

Type:

**AT%A7=0**

Answer:

***Auto Answer : Disabled***

***Auto Dial : Disabled***

***Auto Dial Number\_Port\_1 ==***

***0297388315***

***Auto Answer Number\_Port\_1 ==***

***97438783***

***OK***

**AT&V2**

Displays the **MSN** programming (if any) in Port 1 and Port 2.

*Example:*

Type:

**AT&V2**

Answer:

**DIRECTORY NUMBER SUB-ADDRDSS**

**DATA : Buffer empty Buffer empty**

**POTS-A: 0297438783 Buffer empty**

**POTS-B: Buffer empty Buffer empty**

**OK**

### **6.3.2 Changing the configuration**

Some commands, like turning on or off the Auto Answer or Auto Dial and switching between 2-wire and 4-wire operation can be easily issued on the telephone keypad.

Programming telephone numbers is more difficult on the telephone keypad, due to the lack of visual feedback.

In this case, if a computer is available, there are **AT** commands which make the number programming easy, via the **USB** interface.

#### **6.3.2.1 MSN Programming**

**The numbers must be in FNN, 10-digit format.**

**Multiple Subscriber Numbers must be programmed for Auto Answer operation.**

For Port 1:

**AT\$AN=nn** where **nn** is the **MSN** allocated to Port 1

**AT\$AN=** (no number entered, just press Return): will delete the existing number

If a number is programmed as **MSN** for Port 1, the **TA** will only ring Port 1 if this particular number (nn) is called..

For Port 2:

**AT\$BN=mm** where **mm** is the **MSN** allocated to Port 2

**AT\$BN=** (no number, just press Return): will delete the existing number

If a number is programmed as **MSN** for Port 2, the **TA** will only ring Port 2 if this particular number (mm) is called.

**NOTE:** After MSN programming, the numbers can be checked by typing:

**AT&V2**

#### **6.3.2.2 Auto Dial number programming**

**For the Auto Dial to work, Auto Dial must be enabled after programming the numbers**

To program an Auto Dial number nn for Port 1 (at location 01 – Port 1):

**AT\*ADnn**

To delete the number programmed at Auto Dial location 01, Port 1:

**AT\*AD**

To program an Auto Dial number nn for Port 2 (at location 01, Port 2):

**AT\*BDnn**

To delete the number programmed at Auto Dial location 01, Port 2:

**AT\*BD**

To enable Auto Dial on Port 1:

**AT\*EAD**

To enable Auto Dial on Port 2:

**AT\*EBD**

To disable Auto Dial on Port 1:

**AT\*UAD**

To disable Auto Dial on Port 2:

**AT\*UBD**

After Auto Dial programming, the numbers and the enable status can be checked by using the command:

**AT%A7=0**

### **6.3.2.3 Auto Answer number programming**

**The Auto Answer numbers must be programmed as local (8-digit) numbers.**

**MSN programming is also required for the Auto Answer to work**

**For the Auto Answer to work, Auto Answer must be enabled after programming the numbers**

To program an Auto Answer number nn for Port 1 (at location 02, Port 1):

**AT\*Ann**

To delete the number programmed at Auto Answer location 02 Port 1:

**AT\*AA**

To program an Auto Answer number nn for Port 2 (at location 02, Port 2):

**AT\*BAnn**

To delete the number programmed at Auto Answer location 02 Port 2:

**AT\*BA**

To enable Auto Answer on Port 1:

**AT\*EAA**

To enable Auto Answer on Port 2:

**AT\*EBA**

To disable Auto Answer on Port 1:

**AT\*UAA**

To disable Auto Answer on Port 2:

**AT\*UBA**

**NOTE:** If the port has an MSN programmed, then the Auto Answer number must be the same as the MSN for that port, except it is programmed as a local (8 digit) number.

After programming Auto Answer and Auto Dial numbers, the numbers and enable status can be checked by using the command:

**AT%A7=0**

### **6.3.3 Manually dialing a number using AT commands**

To dial the number nn using Port 1 and change to 4-wire:

**AT\*DAnn**

To dial the Auto Dial number stored at location 01 and switch Port 1 to 4-wire:

**AT\*DAA**

To abort a dial command in progress or to hang up and change to 2-wire:

**AT\*G1**



To dial the number nn using Port 2 and change to 4-wire:

**AT\*DBnn**

To dial the Auto Dial number stored at location 01 and switch Port 2 to 4-wire:

**AT\*DBB**

To abort a dial command in progress on Port 2 or to hang up and change to 2-wire:

**AT\*G2**

### 6.3.4 Firmware upgrade

To check the current software version type:

**ATI3**

If a new version is available, it can be loaded in the TA using the **USB** port.

Start a terminal emulator program (**NOTE**: using the **HyperTerminal** may run the risk of corrupting the flash memory and damaging the unit).

With the terminal emulator settings as shown at 5.2, “*Using the USB Port*” type:

**AT%FAPPS**

When you see the question:

“*Erase and reprogram flash eeprom contents? y/n*”

Answer: **Y**

Wait for the message:

“*Ready for ASCII download*” and start the file transfer.

Use Protocol: **ASCII** and Direction: “**Transmit**” or “**Send**” and indicate the file name of the new firmware (usually xxxx.rom, where xxxx is the version number).

Wait for the download to finish (at 115200 bps it takes slightly more than 2 minutes).

Do not disconnect power, the **USB** cable or reset the computer during this time.

When you see the “*Code Update Successful*” message, type **ATI3** again and confirm the new version number.

Type **AT&F**

Switching the power off for 5 – 10 seconds and back on is also recommended after a software update.

The unit is now ready for operation.

## 7 SPECIFICATIONS

**Power:** 90 – 264 Vac, 47 – 63 Hz

**Power supply:** internal, with IEC320 socket

**Ambient:** The operating ambient temperature is in the range 0 – 45<sup>0</sup> Celsius.

**Dimensions:** 440 mm (Width) by 225 mm (Depth) by 44 mm (height)

**Weight:** 3.8 kg

### Two 2-wire ports

- Compliant with the relevant parts of TS002-2001, but the ringing waveform is trapezoidal at about 110 Vpp.
- The psophometrically weighted noise limit is met.
- Port impedance: TN12
- Ports classified as TNV2

### Two 4-wire ports

- Compliant with the relevant parts of TS006-2001 and TS024-1997
- Port impedance: 600  $\Omega$  transmit and receive
- Send Relative Level: +9 dBr
- Receive Relative Level: +9 dBr
- Lossless communication with a bandwidth between 300 Hz and 3400 Hz
- DC level: no DC voltage present on the input or output port (transformer coupling)
- DC current capability: The port can accept up to 100 mA DC indefinitely, without damage

### Connector for ISDN S/T bus

**Terminating resistors** (100  $\Omega$ ), can be switched on or off

**S/T bus compliance:** S0031

**USB port**

**Reset connection:** external

**Indicators:** 10 green LED's:

- Power on
- B1: ISDN Bearer 1 active
- B2: ISDN Bearer 2 active
- USB power on
- Port 1 AA enabled
- Port 1 AD enabled
- Port 1 in 4W mode
- Port 2 AA enabled
- Port 2 AD enabled
- Port 2 in 4W mode

**Safety compliance:** AS NZS 90650.1-2003

**EMI Compliance:** AS/NZS 3548:1995 Class A (CISPR 22 Class A)

**Network compatibility:** Circuit mode, 64 kbit/s 8 kHz structured, demand established ISDN 2 bearer service with information transfer capability of "3.1 kHz audio"

**Remote testing:** only by using a loopback plug on the 4-wire ports, when the unit is programmed for auto answer.

## 8 APPENDIX

### 8.1 GLOSARY

**ANSI** – American National Standards Institute

**ASCII** – American Standard Institute for Information Interchange

**Audio 1** – The 4-wire connection corresponding to the Port Set 1; **RJ45** socket on the rear panel

**Audio 2** – The 4-wire connection corresponding to the Port Set 2; **RJ45** socket on the rear panel

**AT command** – The **AT**tention command set mainly used with modems, allowing communication between a terminal and the modem

**B channel** – The “bearer” channel in ISDN, carrying the voice or other information in digital form, at a speed of 64 kbps

**Basic Rate ISDN** – A low speed (low capacity) ISDN channel, transmitting 64 + 64 + 16 kbps (B1+B2+D) between the ISDN exchange and the subscriber (Digital communication over the local loop)

**COMn** – Serial communications port on a computer. Usually n=1 – 4 (sometimes 1 – 256). Several RS232 or USB ports can have their names allocated as COMn on the same computer.

**CD** – Compact Disk

**D channel** – Auxiliary channel used in ISDN for signaling for both B1 and B2 channels. The speed is 16 kbps. The D channel can also be used for other purposes.

**EIA** – Electronic Industries Association

**FNN** – Full National Number – 10 digit number composed of the 8 digit local number plus 2 digit area code

**Group 4 Fax** – A digital facsimile transmission or equipment directly compatible with the ISDN technology, without a need for a terminal adapter

**HyperTerminal** – A terminal emulator available in Microsoft Windows operating systems

**ISDN** – Integrated Services Digital Network. Most PSTN telephone lines (analogue) can be converted to digital local loop as ISDN coexists with PSTN

**kB** or **KB** – kilo Byte = 1024 byte. One byte = 8 bits

**kbps** – Kilo Bit per Second: unit expressing the speed of data transmission. Generally used with the meaning: 1 kb = 1000 or 1024 bits

**Laptop** – A compact, portable Personal Computer, usually battery powered

**LED** – Light Emitting Diode – solid state device widely used as visual on / off indicator

**MSN** – Multiple Subscriber Number

**NT1** – Network Termination 1 – ISDN device converting between the “U” interface and a combined “S” and “T” (S/T) interface. The “S” interface is used for Point to Multi-Point services while the “T” interface is used for Point to Point services.

**NT2** – Network Termination 2 – is usually a PABX connecting to the “T” interface and it may have “S” interface extensions.

**OCB** – Outbound Call Barring – Supplementary service offered by Telstra: certain categories of outgoing calls are barred while any incoming calls can be received

**OCBF** – Outbound Call Barring Fixed – Permanent call barring of certain categories of outbound calls

**OCBV** – Outbound Call Barring Variable – A call barring arrangement where up to 2 levels of barring can be controlled by an authorized user using one or two passwords

**PABX** – Private Automatic Branch Exchange

**PC** – Personal Computer

**Port 1, Port 2** – In the present document refers to the 2-wire telephone connection TEL 1 or TEL2 or the 4-wire audio connection Audio 1 or Audio 2. The 2-wire and 4-wire connections of the same communications channel is called in this document a “Port Set” e.g. Port Set 1, Port Set 2

**Port Set** – see above

**PSTN** – Public Switched Telephone Network. This is the old, analogue, traditional dial up telephone system. Today only the local loop (Exchange to Subscriber) is still analogue. In the Exchange all analogue signals are converted to digital for further transmission and back to analogue when they are sent down the local loop.

**RJ11, RJ12, RJ45** – “Registered Jack” – Modular telephone sockets. The “RJ” terminology is mainly used in the U.S., with the number defining the particular wiring mode. In Australia RJ11 or RJ12 are used to designate the more narrow socket with 2 – 6 contacts (maximum 6 positions) and RJ45 refers to the wider socket with 2 – 8 contacts (maximum 8 positions). *See 2.2.*

**RS-232** – an EIA standard for serial communications: “Interface between data terminal equipment and data communication equipment employing serial binary data interchange”.

Usually referred to as RS-232-C or RS-232-D.

**S/T** – combined S and T interface in an ISDN Network Termination. User ISDN compatible equipment or a TA (Terminal Adapter) are connected to this interface

**TA** – Terminal Adapter. A device interfacing the S/T ISDN port to non-ISDN devices.

**TEL 1** – The 2-wire connection corresponding to Port Set 1; **RJ12** socket on the rear panel.

**TEL 2** – The 2-wire connection corresponding to Port Set 2; **RJ12** socket on the rear panel.

**Terminal Emulator** – A program running on a computer, which makes the computer behave like terminal and allows communications via a serial port

**U** – The “U” interface is the point where the ISDN telephone line (between the Exchange and the Subscriber) is connected to the NT (Network Termination).

**USB** – Universal Series Bus

## 8.2 AT Commands

### 8.2.1 AT Commands

The following is a list of only some of the AT commands, that are relevant to the operation of the TA. Where an equivalent telephone keypad sequence is available, it is also listed here for convenience.

**ATI***n* – display firmware information (n=0 – 9)

**ATI3** – firmware version

**ATI9** – date and time of compilation

**AT&F** – factory reset

**AT%A5=0** change to overlap sending      Keyboard: **RR \*\*2\***

**AT%A5=1** change to En bloc sending      Keyboard: **RR #\*2#**

**AT%A5?** Interrogate

**AT\$AN=N**    Store MSN=N Port 1    Keyboard: **RR #\*2# [CT] \*\*128 [CT] 10\*NN\*\* [CT] RR\*\*2#**

**AT\$AN=**    Delete MSN Port 1    Keyboard: **RR #\*2# [CT] \*\*128 [CT] 10\*00\*\* [CT] RR\*\*2#**

**AT\$BN=N**    Store MSN=N for Port 2    As above, but use the telephone connected to Tel2

**AT\$BN=**    Delete MSN for Port 2

**AT&V2**      Display MSN stored numbers

**AT&Vn**      Display other status information (n = 0 to 8)

**AT%A7=0**

Display Auto Dial and Auto Answer numbers

**AT\*ADnn**    Store / Modify the A/Dial No for Tel1 (location 01)    Keyboard: **RR \*128[CT] 01\*N\*\***

**AT\*AAnn**    Store / Modify the A/A No for Tel1 (location 02)      Keyboard: **RR \*128[CT] 02\*N\*\***

**AT\*AD**      Delete the A/Dial No for Tel1 (location 01)          Keyboard: **RR \*128[CT] 01\*\*\***

**AT\*AA**      Delete the A/A No for Tel1 (location 02)              Keyboard: **RR \*128[CT] 02\*\*\***

**AT\*BDnn**    Store / Modify the A/Dial No for Tel2 (location 01)    Keyboard: **RR \*128[CT] 01\*N\*\***

**AT\*BAnn**    Store / Modify the A/A No for Tel2 (location 02)      Keyboard: **RR \*128[CT] 02\*N\*\***

**AT\*BD**      Delete the A/Dial No for Tel2 (location 01)          Keyboard: **RR \*128[CT] 01\*\*\***

**AT\*BA**      Delete the A/A No for Tel2 (location 02)              Keyboard: **RR \*128[CT] 02\*\*\***

**AT%A7=7**    Continuous ringing on Tel1; Off hook to stop ringing

**AT%A7=8**    Continuous ringing on Tel2; Off hook to stop ringing

**AT%A11=0**    Switch Port 1 to 2W                                      Keyboard: **RR #\*4# (on Tel1)**

**AT%A11=1**    Switch Port 1 to 4W                                      Keyboard: **RR \*\*4# (on Tel1)**

**AT%A12=0**    Switch Port 2 to 2W                                      Keyboard: **RR #\*4# (on Tel2)**

**AT%A12=1**    Switch Port 2 to 4W                                      Keyboard: **RR \*\*4# (on Tel2)**

**AT\*DAnn**    Port 1 will dial number nn and switch to 4W (voice call)

**AT\*DAA**    Port 1 will dial the number stored for auto dial (in location 01 Tel 1) and switch to 4W

**AT\*G1**      Port 1 will hang up an existing call and switch to 2W

**AT\*DBnn**    Port 2 will dial number nn and switch to 4W (voice call)

**AT\*DBB**    Port 2 will dial the number stored for auto dial (in location 01 Tel 2) and switch to 4W

**AT\*G2** Port 2 will hang up an existing call and switch to 2W

<b>AT*EAA</b>	Enable AA on Port 1	Keyboard: <b>RR **8#</b> (on Tel1)
<b>AT*EAD</b>	Enable AD on Port 1	Keyboard: <b>RR **9#</b> (on Tel1)
<b>AT*EBA</b>	Enable AA on Port 2	Keyboard: <b>RR **8#</b> (on Tel2)
<b>AT*EBD</b>	Enable AD on Port 2	Keyboard: <b>RR **9#</b> (on Tel2)
<b>AT*UAA</b>	Disable AA on Port 1	Keyboard: <b>RR #*8#</b> (on Tel1)
<b>AT*UAD</b>	Disable AD on Port 1	Keyboard: <b>RR #*9#</b> (on Tel1)
<b>AT*UBA</b>	Disable AA on Port 2	Keyboard: <b>RR #*8#</b> (on Tel2)
<b>AT*UBD</b>	Disable AD on Port 2	Keyboard: <b>RR #*9#</b> (on Tel2)

### **ATS36?**

Bitwise information on Port 1 / Port 2 status: 2W / 4W, AA / AD enabled

TBD

### **ATQ3 Q5**

Turn on the debug mode

### **ATQ4**

Turn off the debug mode

### **ATL0**

A-Law

### **ATL1**

u-Law

## 8.2.2 AT Responses

There is a limited set of responses to AT commands, monitoring the call progress and 2-wire / 4-wire status.

<b>S/W Version 2054</b>	<b>Comments</b>
Tel-1 switch to 2W!	Tel1 in 2w mode
Tel-2 switch to 2W!	Tel2 in 2w mode
Tel-1 switch to 4W!	Tel1 in 4w mode
Tel-2 switch to 4W!	Tel2 in 4w mode
originate Voice call established on Tel 1!	Tel1 receives Connect message
originate Voice call established on Tel 2!	Tel2 receives Connect message
incoming Voice call established on Tel 1!	Tel1 sends Connect message
incoming Voice call established on Tel 2!	Tel2 sends Connect message
RINGING on Tel 1!	Tel1 receives Alerting message and ring tone (Called telephone ringing)
RINGING on Tel 2!	Tel2 receives Alerting message and ring tone (Called telephone ringing)
BUSY on Tel 1!,dis ind	Tel1 (originate) receives Disconnect message and busy tone
BUSY on Tel 2!,dis ind	Tel2 (originate) receives Disconnect message and busy tone
DISCONNECT on Tel 1!	Tel1 sends Release message or receives Release message
DISCONNECT on Tel 2!	Tel2 sends Release message or receives Release message
<<<<TEL-1 Enable AutoDial OK>>>>	Tel1 enabled for Auto Dial
<<<<TEL-2 Enable AutoDial OK>>>>	Tel2 enabled for Auto Dial
<<<<TEL-1 Enable AutoAnswer OK>>>>	Tel1 enabled for Auto Answer
<<<<TEL-2 Enable AutoAnswer OK>>>>	Tel2 enabled for Auto Answer
Switch Tel1 to 4W only connecting!	Must be on a connected call to be able to switch to 4-wire mode
Switch Tel2 to 4W only connecting!	Must be on a connected call to be able to switch to 4-wire mode
TEL-1 Enable AutoDial Fail! Wrong phone number !	Auto Dial Enable command rejected because there is no Auto Dial number stored at location 01 of Tel1
TEL-2 Enable AutoDial Fail! Wrong phone number !	Auto Dial Enable command rejected because there is no Auto Dial number stored at location 01 of Tel2
TEL-1 Enable AutoAnswer Fail! Wrong phone number !	Auto Answer Enable command rejected because there is no Auto Answer number stored at location 02 of Tel1
TEL-2 Enable AutoAnswer Fail! Wrong phone number !	Auto Answer Enable command rejected because there is no Auto Answer number stored at location 02 of Tel2

## 9 TROUBLESHOOTING

### 9.1 Auto Dial problems

1. Can't activate the Auto Dial function (The keypad command **\*\*9#** is answered with a reject tone)

Possible cause:

- Auto Dial number not programmed at location 01 for that port. *See 3.2.1 and 3.2.2.2*
- Auto Answer is already enabled (the two are exclusive)

2. The **TA** seizes a **B** channel, switches to 4-wire, but then it drops the call and returns to idle

Possible cause:

- Wrong number programmed at location 01
- The called number is busy
- The called number is not answered (At the remote site Auto Answer not enabled and not answered manually either)
- Wrong / Different number programmed in the remote unit as **MSN** or Auto Answer number.

### 9.2 Auto Answer problems

1. Can't activate the Auto Answer function (The keypad command **\*\*8#** is answered with a reject tone)

Possible cause:

- Auto Answer number not programmed at location 02 for that port. *See 3.2.1 and 3.2.2.1*
- Auto Dial is already enabled (the two are exclusive)

2. The telephone rings but there is no Auto Answer

Possible cause:

- Wrong number programmed at location 02
- The number programmed at location 02 is correct, but it includes the area code (**FNN** – *See 3.2.1*, the number must be programmed as a “local”, 8-digit number)

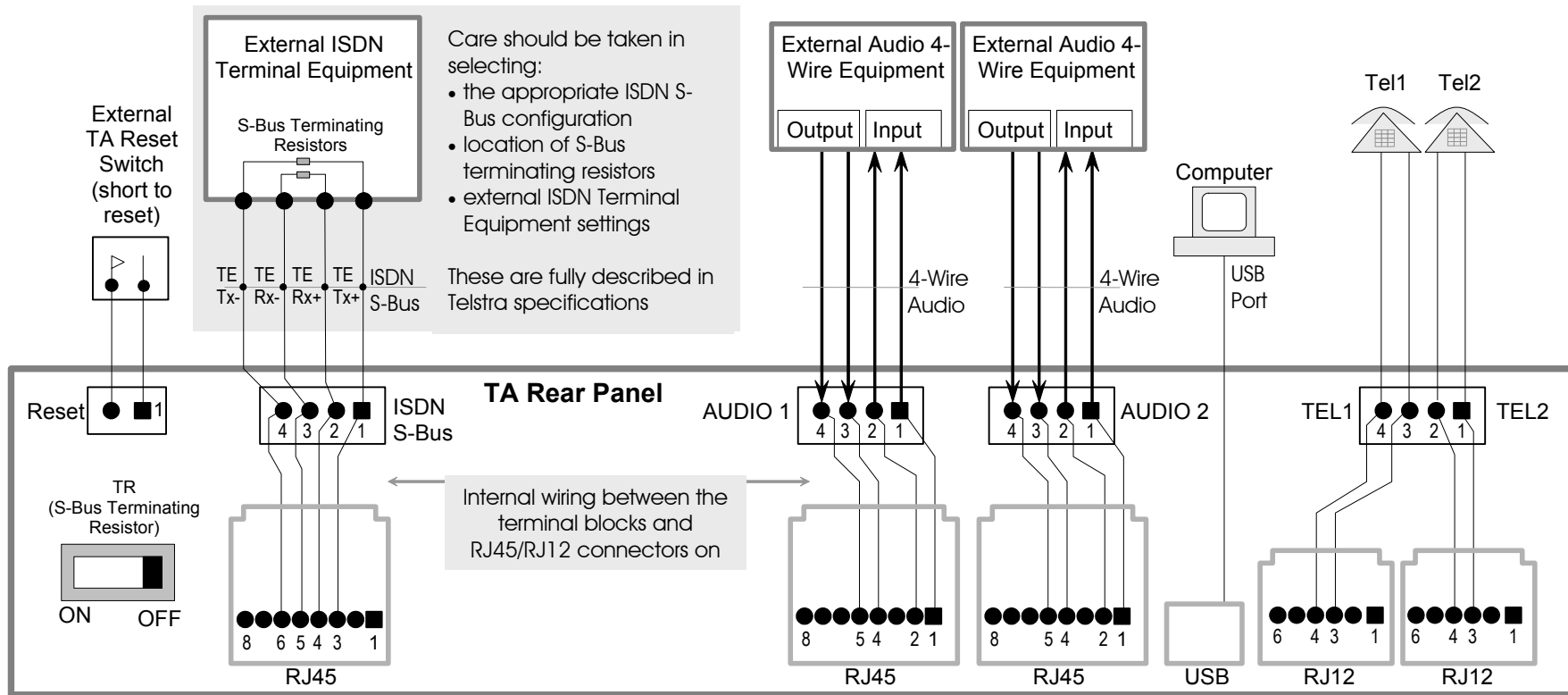
3. There is no Auto Answer and a telephone connected to the port does not ring

Possible cause:

- Incorrect **MSN**; If a number is programmed as **MSN**, the port will only ring the telephone if the called number is identical to the **MSN** programmed at location 10
- The number called is the main line number, while an **MSN** is programmed at location 10. The telephone will only ring if the **MSN** is called and will not ring if the main number is called.



# 10 WIRING DIAGRAM



## NOTES:

1. The TA will usually be connected to the ISDN NT1 via the ISDN S-Bus RJ45 connector, hence external ISDN Terminal Equipment if required will have to be wired into the ISDN S-Bus screw connector. External audio 4-wire equipment and telephones can be connected to the TA via the screw terminals or RJ45/RJ12 connectors.
2. The TA audio output signal for each port is on screw terminals 1 & 2 as well as RJ45 terminals 1 & 2 as shown above.
3. The TA audio input signal for each port is on screw terminals 3 & 4 as well as RJ45 terminals 4 & 5 as shown above.