TB8100 base station

Connecting to TB8100 Base Stations via an Asynchronous Port Switch

Application Note TN-906
30 September 2004

Contents

1 The Purpose of an APS 3

2 Supported APS Units and their Main Features 4

2.1 Units Supported 4

2.2 Main Features 4

3 Physical Connections 5

4 Configuring the Service Kit and Base Station 9

4.1 Configuring the Service Kit for Dial-in via an APS 9

4.2 Configuring the Service Kit for a Direct Connection via an APS 11

4.3 Configuring the Base Station to Dial Out to an Alarm Center 11

5 Configuring the APS 13

5.1 Ensuring the Security of Configuration Data 13

5.2 Configuring the Set-up Switches 13

5.3 Configuring the Ports 14

6 Testing the Connection 17

7 Essential Modem Features 18

8 Known Issues or Limitations 18

Document Conventions

'Configure > Communications > Alarm Center' means 'click the Configure icon on the toolbar, then in the navigation pane find the Communications group, and select Alarm Center from it'.

Associated Documentation

TN-742: Remotely Monitoring and Configuring the TB8100 Base Station

TB8100 Installation and Operation Manual

TB8100 Service Kit and Alarm Center User's Manuals and online Help

Your APS User's Guide

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This Application Note provides information on how to connect multiple TB8100 base stations to a Service Kit or Alarm Center using an Asynchronous Port Switch (APS). It covers connection via direct serial link, and via PSTN lines using modems. Typical physical connections, APS configurations, base station configurations, Service Kit configurations, and modem settings are also described.

1 The Purpose of an APS

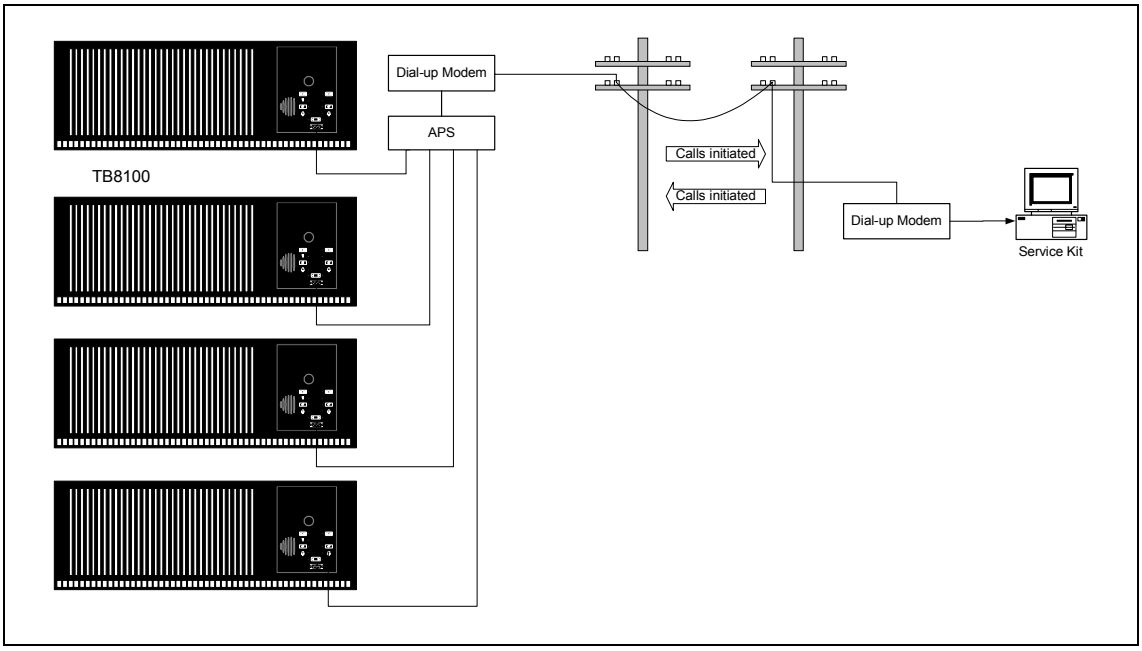
One of the most powerful features of the TB8100 base station is its ability to be remotely configured and monitored. This feature includes Service Kit access, for remote configuration, monitoring, and diagnostics, and automatic dial-out to an Alarm Center, as a result of an error condition or Task Manager stimulus. TN-742 describes the use of this feature in detail.

Without using an APS, however, a dedicated PSTN line is required for each base station installed on a site. The cost of these lines is very high, especially when the base stations are installed in remote locations. Using an APS allows a single phone line to service up to 31 base stations.

A typical connection scenario is shown in Figure 1 below. The diagram shows:

- four base stations connected to various ports on an APS
- the dial-up modem at the remote site
- the PSTN connection
- the modem at the local site
- a PC running either Service Kit or Alarm Center software.

Figure 1 Typical APS Connection



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2 Supported APS Units and their Main Features

2.1 Units Supported

The APS support feature in the TB8100 base station is intended to work with third party products. Tait Electronics Limited does not manufacture its own unit. The following third party units are supported:

- Western Telematic Inc. (WTI) APS-4, APS-8, APS-16, CMS-16, and CMS-32
- Black Box SW543A.

Any other APS that uses simple ASCII connect and disconnect commands and responses **may** work satisfactorily.

2.2 Main Features

These features are standard on the supported APS units listed above.

- You can connect up to 3, 7, 15, or 31 base stations per site to a single PSTN line or PC, depending on the APS chosen.
- The units are configured as DTE (Data Terminal Equipment).
- The units will support all baud rates recognised by the base station, i.e. 1200, 2400, 9600, 19200, 38400, 57600, and 115200.
- Although the APS ports can be individually configured, and may be password protected, the TB8100 base station **does not** support this. (Note that in "Common Configuration for all Ports" on page 14 the password is left undefined)
- The APS configurations are stored in non-volatile memory.
- Data clashes are prevented using a Busy response, i.e. if one base station tries to dial out while another is connected, it will receive a Busy response, and can try again later if configured to do so.
- The Service Kit or base station alarm dial-out software handle all common errors such as busy, lack of response, or communications failure.
- The APS can be powered from 115/230 VAC or −48 VDC. The power consumption is approximately 5 W.

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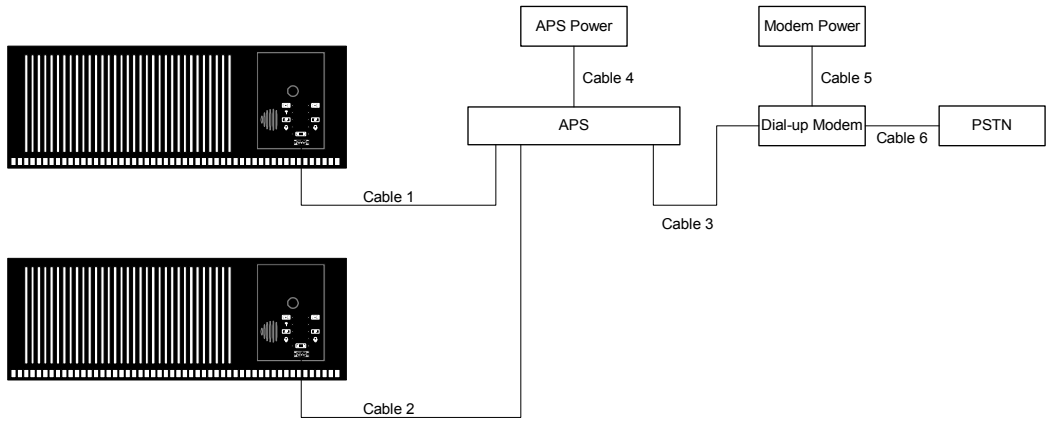
3 Physical Connections

In all the following connection types, only two or three base stations are shown connected to the APS for graphical convenience.

The modem is shown connected to the highest numbered port of the APS. This is for user convenience only, and allows an easy mapping between the base station number and port number when configuring the Service Kit. Any port could be used if desired.

A single null modem cable is supplied with the APS. The user must supply all other cables.

Figure 2 PSTN connection to base stations without a TaitNet RS-232 system interface board



Cables 1, 2 & 3	9-way **straight through** (not null modem) RS-232 cable
Cable 4	APS power cable, either AC mains or –48VDC, depending on the model chosen
Cable 5	modem power cable, usually AC mains
Cable 6	Telco connection, usually RJ11

Notes

- RS-232 connections are made via the control panel at the front of the base station.

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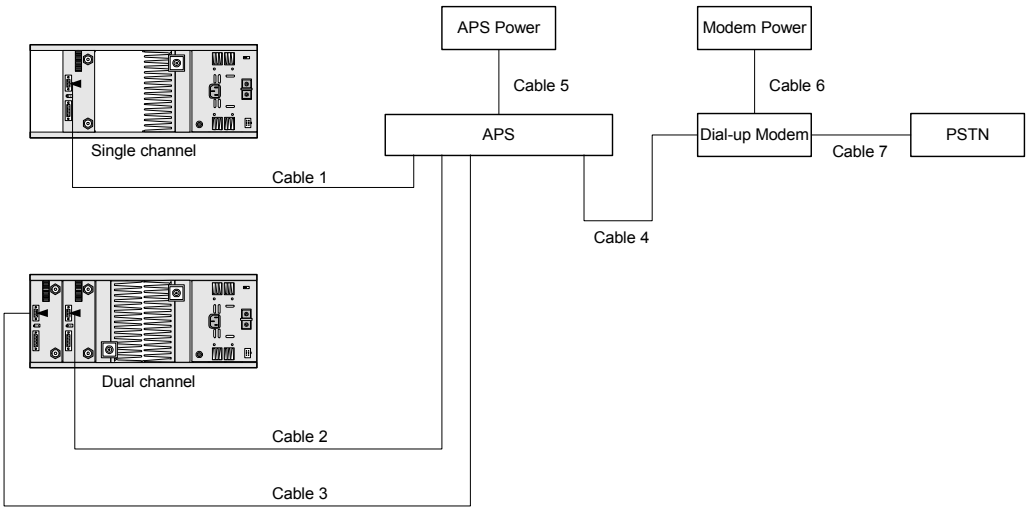
Figure 3 PSTN connection to base stations with a TaitNet RS-232 system interface board



Cables 1, 2, 3 & 4	9-way **straight through** (not null modem) RS-232 cable
Cable 5	APS power cable, either AC mains or –48 VDC, depending on the model chosen
Cable 6	modem power cable, usually AC mains
Cable 7	Telco connection, usually RJ11

Notes

- The TaitNet RS-232 system interface board is **essential** if you want remote diagnostics to both channels in dual channel subracks. It is optional for single channel subracks.
- Connections to the TaitNet RS-232 system interface board are on the rear panel of the reciter.
- Front or rear panel connections to single channel subracks can be mixed with rear panel connections to dual channel subracks, in any combination, on a single APS.
- The TaitNet RS-232 system interface board can be installed by the user, with care (refer to the TB8100 Service Manual). The reciter firmware will automatically detect the system interface board type, and route the RS-232 signals appropriately.
- If the TaitNet RS-232 system interface board is fitted, the control panel does not shut down in Power Saving modes, resulting in a small compromise in power saving effectiveness.

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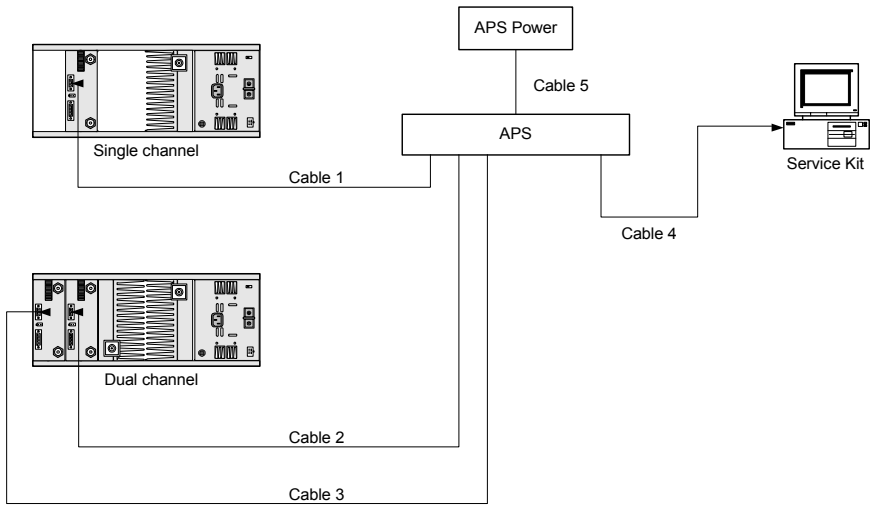
Figure 4 Direct connection to base stations with or without a TaitNet RS-232 system interface board



Cables 1, 2 & 3	9-way **straight through** (not null modem) RS-232 cable
Cable 4	9-way **null modem** RS-232 cable
Cable 5	APS power cable, either AC mains or –48VDC, depending on the model chosen

Notes

- The illustration above shows base stations with TaitNet RS-232 system interface boards, but front or rear connection can be used.

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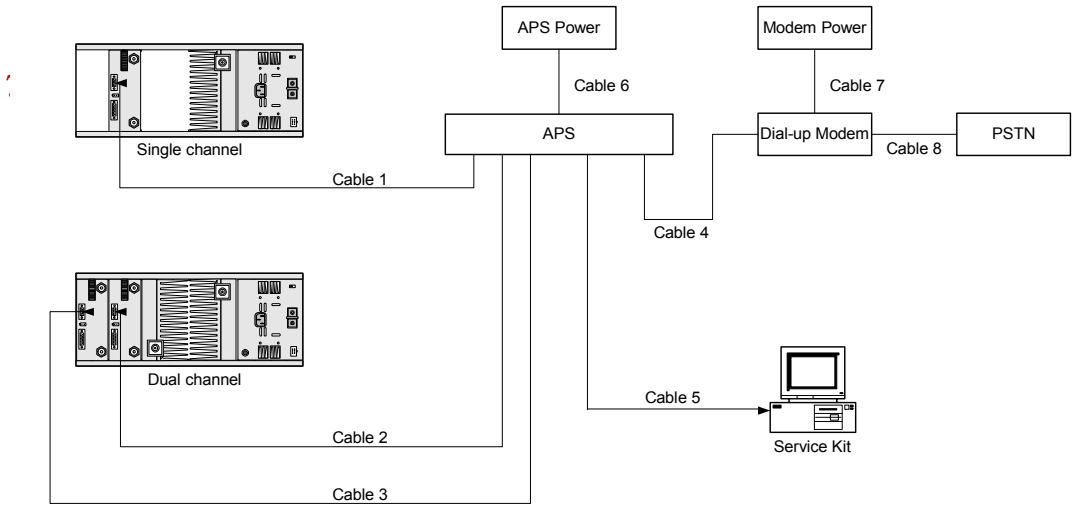
Figure 5 Combined PSTN and direct connections



Cables 1, 2, 3 & 4	9-way **straight through** (not null modem) RS-232 cable
Cable 5	9-way **null modem** RS-232 cable
Cable 6	APS power cable, either AC mains or –48VDC, depending on the model chosen
Cable 7	modem power cable, usually AC mains
Cable 8	Telco connection, usually RJ11

Notes

- The illustration above shows base stations with TaitNet RS-232 system interface boards, but front or rear connection can be used.
- If possible, the PC should be connected to a spare APS port so that normal dial-in and dial-out is not disrupted. If there is no spare port available, any port can be used, but some disruption may then possibly occur.

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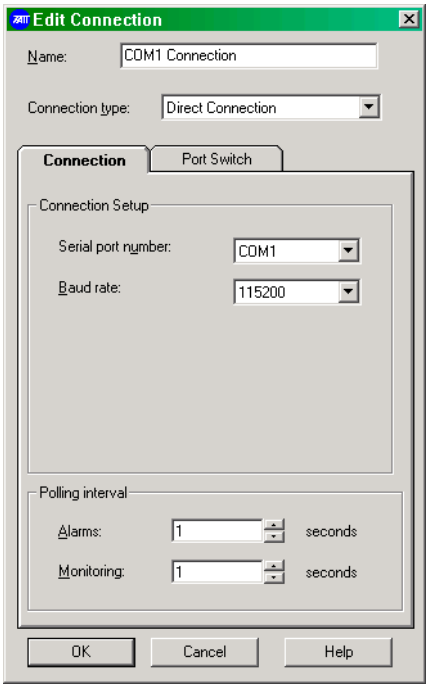
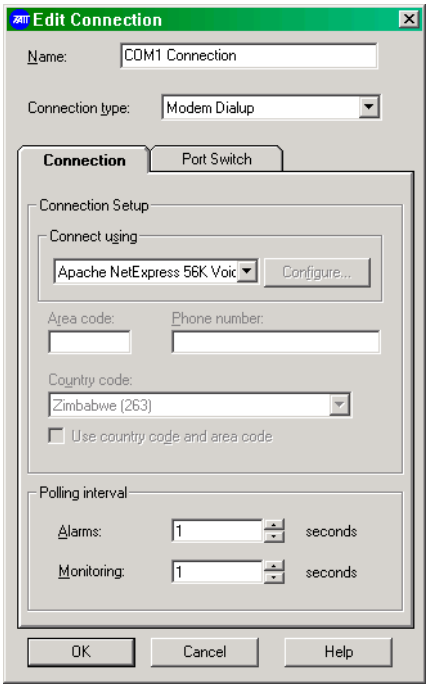
4 Configuring the Service Kit and Base Station

4.1 Configuring the Service Kit for Dial-in via an APS

1. Run the Service Kit and select Connect > New Connection. The Edit Connection screen appears.



2. In the **Connection type** list, select Modem Dialup. The Edit Connection screen changes to the one shown below.



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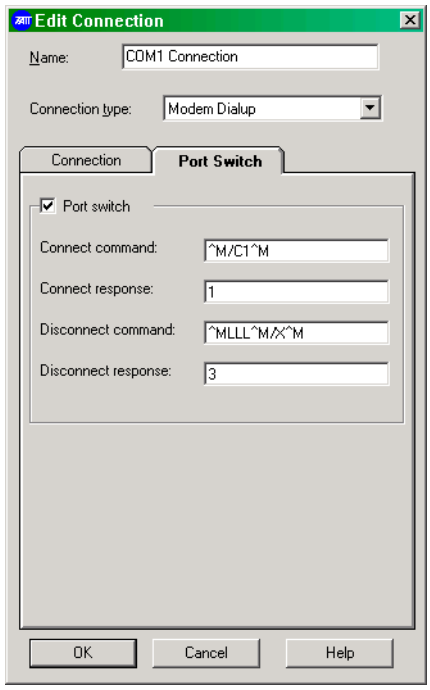
3. Set up the parameters in the Connection tab as usual (use the online Help if required).

4. In the Port Switch tab, select the **Port switch** check box.



5. In the **Connect command** field, enter ^M/Cx^M.
This means:

^M	instructs the APS to enter command mode[a]
/C	requests a connection
x	the port number of the base station you wish to connect to
^M	terminates the sequence

a. This is equivalent to the carriage return character.

Note Use the ^ (carat) symbol to instruct the Service Kit that this is a control character. **Do not** use the control key.

6. In the **Connect response** field, enter 1.

7. In the **Disconnect command** field, enter ^Mxxx^M/X^M.
This means:

^M	instructs the APS to enter command mode
xxx	three instances of the logoff character[a]
^M	terminates the sequence
/X^M	exits command mode

a. This must match the logoff character chosen when setting up the modem (L was chosen in this case). Refer to "Common Configuration for all Ports" on page 14.

8. In the **Disconnect response** field, enter 3.

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4.2 Configuring the Service Kit for a Direct Connection via an APS

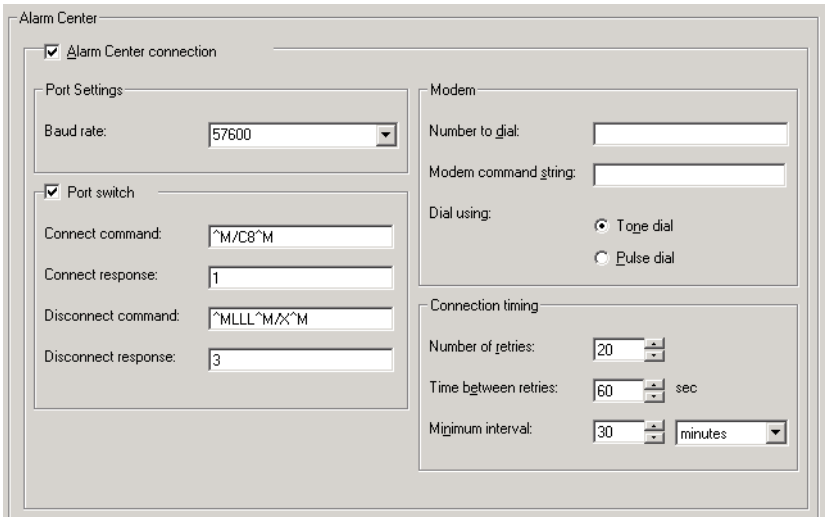
This configuration is similar to the one described in the previous section, except that you set the **Connection type** to Direct Connection. You can then connect the computer running the Service Kit software to any spare port on the APS, and connect to any base station that is not currently busy with either a dial-in or dial-out session.

4.3 Configuring the Base Station to Dial Out to an Alarm Center

This section provides details on configuring the Alarm Center connection, the port switch, and the connection timing. For full details on configuring the modem, refer to TN-742.

1. Run the Service Kit and select Configure > Communications > Alarm Center.

2. In the Alarm Center form, enable the Alarm Center connection and the Port switch (use the on-line Help if required).



3. In the **Baud rate** list, select 57600. If you select a different baud rate, ensure that the APS is set to the same rate (refer to "Configuring the Set-up Switches" on page 13).

4. In the **Connect command** field, enter ^M/Cx^M.
This means:

^M	instructs the APS to enter command mode[a]
/C	requests a connection
x	the port number to which the site modem is connected
^M	terminates the sequence

a. This is equivalent to the carriage return character.

The site modem is usually (but does not have to be) connected to the highest port number available. The above screen shows the settings for port 8 of an 8-port APS.

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5. In the **Connect response** field, enter 1.

6. In the **Disconnect command** field, enter ^Mxxx^M/X^M. This means:

^M	instructs the APS to enter command mode
xxx	three instances of the logoff character[a]
^M	terminates the sequence
/X^M	exits command mode

a. This must match the logoff character chosen when setting up the modem (L was chosen in this case). Refer to "Common Configuration for all Ports" on page 14.

7. In the **Disconnect response** field, enter 3.

8. In the **Connection timing** area, we recommend the following settings:

   - Set the number of retries to 20, the maximum allowed.
   - Set the time between retries to 60s for the first base station, and increment in steps of 5s for other base stations (e.g. set base station 2 to 65s, base station 3 to 70s, etc.). This prevents all base stations from retrying at the same time if a fault occurs that affects them all.
   - Set the minimum interval to at least 30 minutes. The interval should be long enough to allow all base stations to dial out if necessary; we suggest 30 minutes plus an extra 3 minutes for each base station on the site.

Note If there is a particular condition that can be guaranteed to affect all base stations (e.g. mains failure), we recommend that you enable this alarm on only two base stations. This precaution will prevent a mass dial-out attempt, but will still allow you to check for false alarms.

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5 Configuring the APS

5.1 Ensuring the Security of Configuration Data

The configuration data of many APS units is stored in RAM which has a battery back-up. This battery should have a life of approximately 3 years when the APS is not powered up, and may need to be changed periodically. You may also wish to replace the battery before installing your APS to ensure maximum battery life and security of configuration data. A typical symptom of battery failure is the loss of configuration data when the APS is powered down for some time.

The battery is typically a BR1225 and is located under a clip on the main board of the APS. To replace the battery, proceed as follows:

1. Disconnect the AC mains power.
2. Remove the top cover.
3. Carefully replace the battery, observing normal antistatic precautions.
4. Replace the cover.

5.2 Configuring the Set-up Switches

1. Power up the APS.
2. Configure the set-up switches as shown below. These switches are located on the rear panel of APS units with up to 8 ports, and on the bottom cover of units with 16 or more ports.

Switch	Setting	Function
SW1	ON (down)	sets the baud rate to 57k6
SW2	OFF	
SW3	OFF	
SW4	OFF	no handshaking
SW5	OFF	
SW6	OFF	terse messages
SW7	OFF	echo disabled
SW8	—	currently not used

The settings for SW1, SW2, and SW3 are optional, however the settings for all other switches are mandatory. We recommend a baud rate of 57k6, as it will give the highest possible data transfer rate through the modem on a "good" PSTN connection. If you select a different

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rate, you must select the same rate for the Alarm Center connection (Configure > Alarm Center > Port Settings > Baud rate; refer to "Configuring the Base Station to Dial Out to an Alarm Center" on page 11).

3. After you have set the switches, you must validate the set-up as follows:
   a. Simultaneously press the SET and CLEAR buttons on the front of the APS.
   b. Release the CLEAR button, wait for the port ACTIVITY LEDs to flash, then release the SET button.

5.3 Configuring the Ports

Connect a PC running a terminal program (HyperTerminal, ProComm, TerraTerm or similar) to any unused port on the APS, using a null modem cable.

Note Refer to the APS User's Guide for a detailed explanation of all the command codes. The commands shown in the following section are in upper case for clarity, however you can use lower case if you prefer.

Common Configuration for all Ports

1. Enter Command Mode using the [Enter] key.
2. Type the following commands:

/CP [Enter]	copies port parameters
7 [Enter] 1 [Enter]	sets all ports to Any-to-Any mode
9 [Enter] x [Enter]	where x sets the logoff character Note that this must be the same character you chose in the Service Kit procedures described in Section 4.1 and Section 4.3 (L in the examples shown). It must also be different from the character used to take the modem out of data mode, which is usually "+", but can be changed by the user. You can also choose control characters, which are shown by a preceding ^ (carat).
10 [Enter] 1 [Enter]	sets the disconnect sequence to 3 consecutive logoff characters, instead of just 1 Note that this is **essential** to avoid the possibility of random logoffs.
11 [Enter] 6 [Enter]	enables the timeout to 1 minute
12 [Enter] 3 [Enter]	sets the response type to Terse
13 [Enter] 1 [Enter]	disables the command echo
[Esc]	copies to all ports
Y [Enter]	answers the question "Are you sure (y/n)?"
/W [Enter]	displays port parameters

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3. Verify that the following is displayed.

```
PORT PARAMETERS #01:
 1. Port Name:              (undefined)
 2. Password:               (undefined)
 3. Baud Rate:              57.6K
 4. Bits/Parity:            8-None
 5. Stop Bits:              1
 6. Handshake Mode:         None
 7. Port Mode:              Any-to-Any
    74. DTR Output:         Pulse
 8. Supervisor Mode:        Permit
 9. Logoff Character:       L
10. Sequence Disconnect:    Three Characters
11. Timeout Disconnect:     1 Min
12. Response Type:          Terse
13. Command Echo:           Off
14. Accept Break:           Yes
```

If everything is correct, proceed to step 4, or re-enter the incorrect parameter as required.

4. **WTI APS-4, APS-8 and APS-16 Units Only**
This step is required because of a bug in the firmware of the APS-4, APS-8 and APS-16 units. The Copy Port Parameters command does not work for the timeout setting.
Type the following commands:

/Pn [Enter]	sets RS-232 parameters where n is the port number
11 [Enter] 6 [Enter]	enables the timeout to 1 minute
[Esc]	

Repeat this procedure for all ports.

5. If you do not want to configure a port as a modem port (refer to "Configuration for a Modem Port (if a modem is used)" below), exit Command mode by typing:

/X [Enter]	exits command mode

Otherwise, continue with "Configuration for a Modem Port (if a modem is used)" on page 16.

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Configuration for a Modem Port (if a modem is used)

We recommend that you configure the port to which the modem is connected as a modem port. This will ensure that the modem is re-configured after a power outage, and prevent it from using the wrong serial baud rate.

Type the following commands:

/Pn [Enter]	sets RS-232 parameters where n is the number of the port to which the modem is connected, usually the highest numbered port
	Verify that the timeout has been set correctly to 1 minute. If not, type 11 [Enter] 6 [Enter].
7 [Enter] 4 [Enter]	configures the port as a modem port
71 [Enter] AT [Enter]	sets the reset string to AT
72 [Enter] AT [Enter]	sets the initialisation string to AT
	This is just to ensure that no unwanted commands are issued to the modem.
73 [Enter] +++~~ATH0 [Enter]	ensures that modem hangs up after a timeout
	Note that the double ~ (tilde) puts a 2s delay between +++ and ATH0, allowing the modem to enter command mode.
[Esc]	
/X [Enter]	exits Command mode

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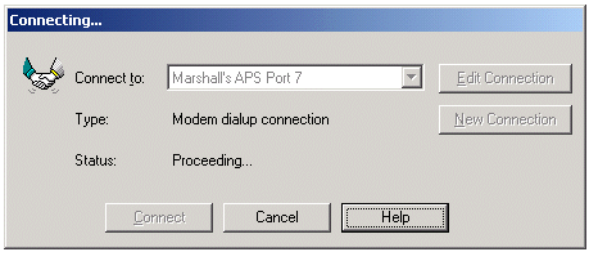
6 Testing the Connection

Connecting to the Base Station via the APS

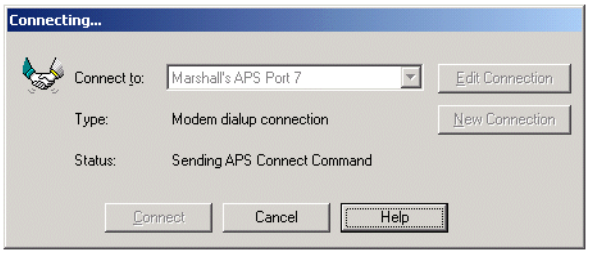
Once everything has been configured, dial in to the base station via the APS.

1. Run the Service Kit software and click Connect.

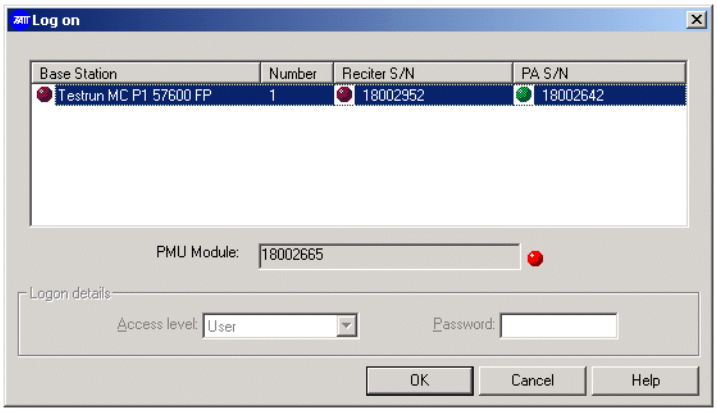
2. Select the APS connection previously set up. The following screen appears, as for a normal (non-APS) connection.



Once the modems have connected and established their protocol, the following screen appears. This screen is unique to APS connections.



Shortly afterwards, the correct port is connected, and the base station responds to its connection protocol. The normal base station logon screen now appears.



3. Continue with the connection session as normal.

4. When you have completed your session, disconnect in the normal way.

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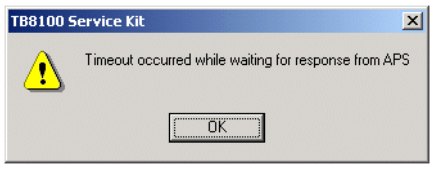
If the Connection is Unsuccessful

1. If an error occurs which is related to the APS, the following screen will appear.



2. If this screen appears, check the settings of both the APS and the Service Kit very carefully. If the you cannot resolve the problem, it may be useful to insert a serial communications monitor between the Service Kit PC and the modem. Compare the strings actually transmitted with those expected, and consult the APS User's Guide.

7 Essential Modem Features

The ATX0 command **must** be available in any modem which is used with the APS. This command limits the result codes to 0-4, i.e:

- 0 – OK
- 1 – connect
- 2 – ring
- 3 – no carrier
- 4 – error

Note Some modems will include result code 8 (no answer) in the list for ATX0. This is also acceptable. Refer to TN-742 for modem settings and configurations.

8 Known Issues or Limitations

Known Issue or Limitation	Solution
Some APS units store their configuration data in RAM with battery back-up. This data will be lost if the unit is powered down and the battery fails.	If you are unsure about the condition of the back-up battery, replace it before installing the APS (refer to "Ensuring the Security of Configuration Data" on page 13).
Applies to WTI APS-4, APS-8 and APS-16 units: You cannot use the Copy Port Parameters command to set the timeout.	You must set the port timeout on each port individually. If you try to set this parameter globally, it will appear to be successful, but the timeout will not work. Refer to "Common Configuration for all Ports" on page 14.

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Issuing Authority

This TN was issued by: John Crossland
Technical Publications Manager

Publication History

Publication Date	Author
30 September 2004	D Reynolds

Amendment Record

Publication Date	Page	Amendment
30 September 2004		First release

Tait Contact Information

Corporate Head Office New Zealand

Tait Electronics Limited, P.O. Box 1645, Christchurch, New Zealand
E-mail (Marketing): taitnet@taitworld.com
E-mail (Sales): sales@taitworld.com

Technical Support

Technical Support Manager
Tait Electronics Ltd, P.O. Box 1645, Christchurch, New Zealand
E-mail: support@taitworld.com

Internet

http://www.taitworld.com

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