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Products

Hong Kong Alarm Signalling Equipment Installation Guide

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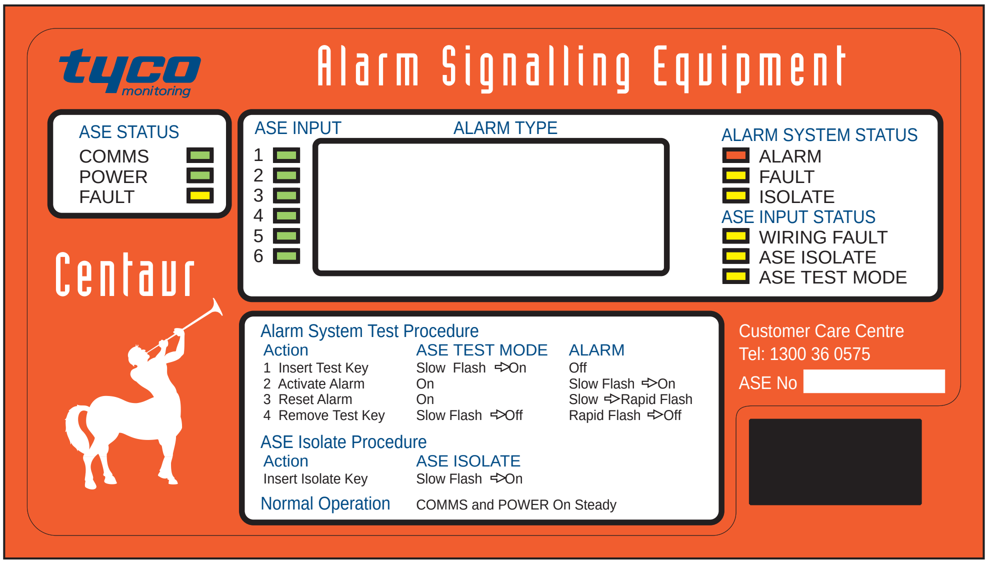
About the Centaur

The Centaur is self-contained Alarm Signalling Equipment (ASE) which monitors up to six alarm systems (either fire detection or fire suppression), and sends alarm, fault and isolation information to the ADT Control and Monitoring System (CMS). It communicates through a radio link and/or conventional dial-up telephone line. When installed with a radio, the radio is the primary communications link and the telephone line is configured as a backup link or secondary communications link.



General RF Theory

1. Digital Radio Network

Centaur communicates with the ADT CMS via a Mobitex™ Digital Radio Packet network as its primary link.

The Digital Radio Packet network carries digital data over an analogue medium, radio. Although there are radio systems capable of carrying both voice and data, the system chosen by ADT is optimised for carrying data only.

2. Mobitex™

Mobitex™ is a radio network technology designed exclusively for two-way, wireless data communications (see Figure 1). The technology, developed by Swedish Telecom, has been in use for over 15 years. Mobitex™ networks are operating in 14 countries, including Australia, Belgium, Canada, China, Hong Kong, the Netherlands, the United Kingdom, the United States of America, Sweden and France.

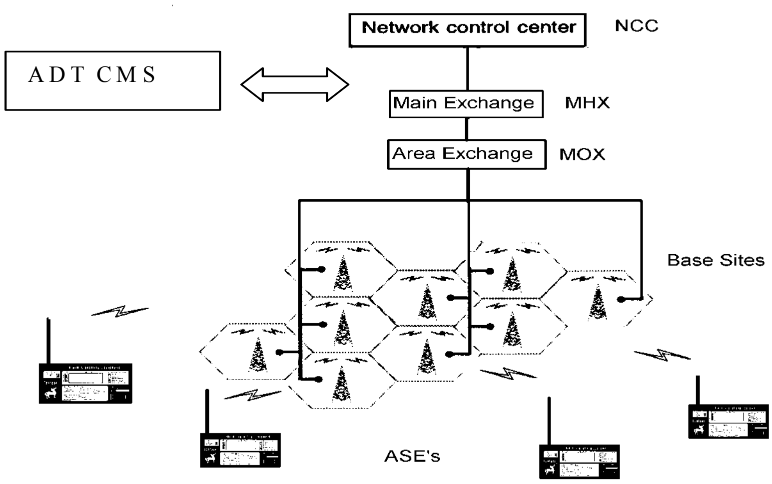


Figure 1: Typical Mobitex™ Network Structure

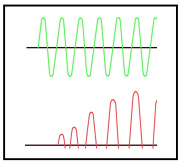
The Mobitex™ network has a hierarchical (or pyramidal) network structure.

An intelligent base station serves each radio cell.

Each device (ASE) and host (CMS) attached to a Mobitex™ network is assigned a unique Mobitex Access Number (MAN). The Mobitex™ protocol guides digital data, formed into packets, from the ASE to the CMS and vice-versa. All packet transmissions are checked for integrity prior to passing to the next stage. Automatic error correction and re-transmission of data may occur as the result of borderline radio signal conditions.

3. Frequency of Operation

The frequency band used by the radio system is in the range 820 to 870 Megahertz (MHz). This has several implications:



- The wavelength of the RF carrier is approx. 360 mm. The majority of antennae used with the ASE units will be ½ wave antennae or least 180 mm long.

- The radio communications path between the ASE antenna and the radio base antenna should, if possible, be **'line of sight'**. There should be few, and ideally no obstacles between the ASE antenna and the base site antenna.

  If optical line of sight in the open is not quite possible (just out of sight), it can still be possible to obtain reliable communications with the base because of a natural phenomenon known as diffraction. Diffraction (or bending) of radio waves allows communications between two antennae which are in an almost 'line of sight' condition (see Figure 2). Diffraction allows an increase of approx. 20% extra distance over the optical 'line of sight'.

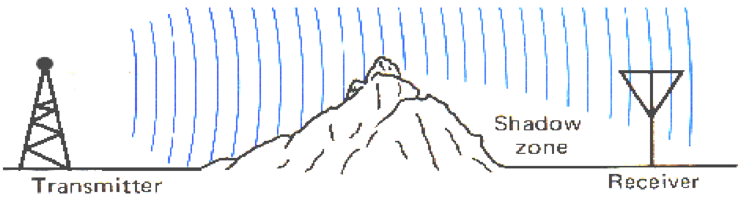
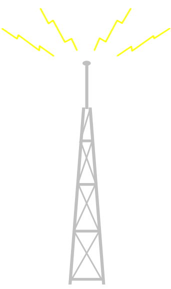


Figure 2: The RF waves bend downward over the top of the mountain towards the ground

- As the frequency of radio waves increases, so does the inability of an RF signal to penetrate a building. At 850 MHz the RF signal is attenuated to a greater extent inside buildings than, for example, the frequency of Broadcast FM radio at about 100 MHz. However, the signal strength is attenuated to a lesser extent inside a building than for example a mobile telephone operating at 1300 MHz.

4. Signal Strength



Signal strength is the measure in dBuV/m (decibel microvolts per metre) of the <u>strength</u> of a radio frequency signal. Generally, the stronger the RF signal, the more reliable and intelligible the communications will be between the transmitter and receiver.

The signal strength of an RF source is affected by many things such as:

Free Air Loss. The further you are from the RF source, the weaker the signal strength will be due to dispersion of the RF signal. This is much like the resultant ripple after a stone is dropped into the middle of a pond.

Reflections. Radio signals may have more than one path from the transmitter to the receiver. Usually a direct free air path exists. As well as this path, one or more unwanted secondary paths may also exist, this is known as multi-pathing. This secondary path can either add or subtract to the main signal and cause unwanted effects in the receiver. Multi-pathing in radio receivers can cause many problems.. In a broadcast TV system, reflections can be seen as a ghost alongside the main picture (see Figure 3).

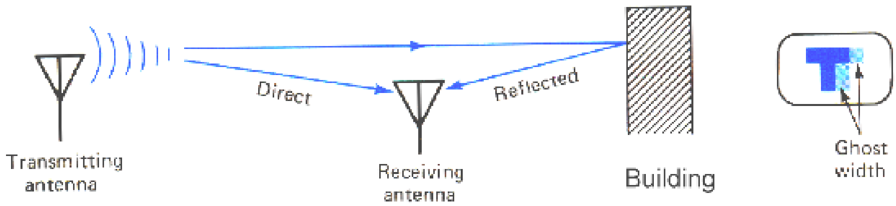


Figure 3: Multipathing of an RF signal

Short Term Fade. Short term fade can be caused by reflections off moving objects such as vehicles, roller doors, people or other RF reflective surfaces in the near vicinity of an antenna.

Losses Inside Buildings. The signal strength, even a short distance inside a building, can be 1/1000th (-30dB) of the signal that exists on a nearby outside wall of that building.

Long Term Cyclic Fade. The received signal strength from a source can vary in its intensity due to natural environmental and weather conditions such as rain, sun and sun spot activity.

Physical Obstructions to RF Signal

Man Made Obstructions (Fixed)

- Buildings
- Walls
- Roofs
- Pipes
- Tinted glass. Some types of tinted glass contain minute metal particles which will tend to shield and reflect the RF signal.
- etc.

Man Made Objects (Movable)

- Roller Doors
- Cars and trucks
- Fork lifts
- etc.

Natural Obstructions

- Trees
- Hills
- Horizon
- Rain
- People
- etc.

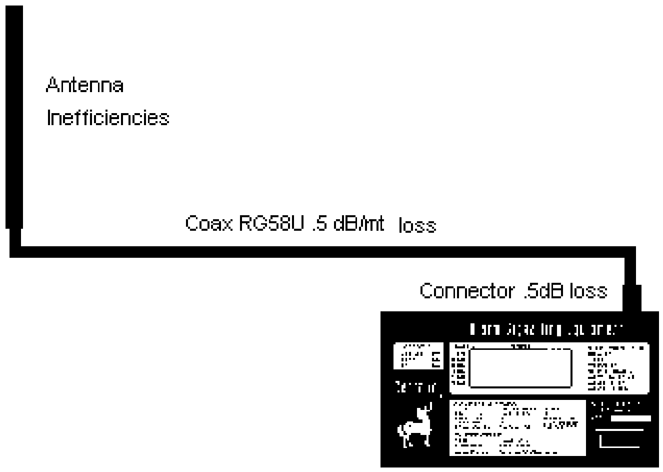
5. Hardwire RF Losses

It is very important to keep all losses in the RF path as low as possible.

Power and losses in the RF transmission path are calculated in dBm (decibel milliwatts). Many parts of this transmission path can contribute losses that affect the overall efficiency of the RF system (see Figure 4).

The level of RF signal in both the transmit (TX) and the receive (RX) paths will be equally affected.

Please Note	*If the losses in a system add up to, 3dB, then half of the power <u>transmitted</u> out of the modem fails to reach the antenna and therefore the outside world. The level of received signal into the modem is also attenuated by half.*



* Individual losses add up to a total system loss. Poor VSWR adds further loss.

Figure 4: Losses in the RF system add up and come from all items in the Transmission/Receive path of the ASE modem.

Types of losses include:

- **Connector Loss.** Every connection made, although having electrical continuity, will add a small amount of loss, typically 0.5 dB to 1.0 dB. A poor termination or poor quality connector can create even higher losses.

- **Cable Loss.** Every metre of cable used, although again having electrical continuity, will add some amount of loss at radio frequencies, typically 0.5 dB/metre, for RG58U coax (pictured left). A 6 metre run of RG58U coax will introduce 3 dB of loss. Long runs may require the use of a more efficient coaxial cable such as RG213 which has typically half the loss of RG58U. The max. possible length of a coax run and therefore the loss induced, depends primarily upon the level of signal you have to start with.

- **Antenna Loss.** Inefficiencies in antenna construction also add loss.

- **Voltage Standing Wave Ratio (VSWR).** VSWR (or SWR as it is commonly called) is a measure of the ability to radiate all of the power from the transmitter into the air via the antenna.

  When the impedance (similar to resistance) is not uniform along the path that the signal travels out to the antenna, impedance mismatches occur. These mismatches cause some of the power to be reflected back down the coaxial cable and into the transmitter where it is dissipated as heat in the radio's electronics. This is wasted power. These mismatches can be caused by, amongst other things, poor installation procedures and untuned antennae. Therefore the antennae will come pre-tuned to the mid-band frequency of all bases used in the RF system. No cutting or tuning of the antennae will be necessary.

  A VSWR of 1:1 is ideal and shows NO mismatches. If the installation guidelines are followed, then the VSWR of the antenna and installation should be close to 1:1.

6. About Antennae

➢ Radiation Pattern And Gain

Each type of antenna has a characteristic radiation pattern that can be plotted using an RF signal strength meter.

The level of RF energy around an antenna in all planes, can be plotted and depends for a fixed power level upon the physical construction of the antenna.

Gain is the ability of the antenna to concentrate the power applied to the antenna into a particular direction. Some antennae, such as a Yagi (see Figure 6 and 7), exhibit gain over and above a standard issue ½ wave dipole antenna (see Figure 5 and left). This antenna makes better use of the available energy, somewhat akin to the lens in a magnifying glass.

If an antenna has a transmit gain in a particular direction then it will also have a corresponding amount of receive gain in the same direction .

⌧ Please Note	*A 3dB gain due to antenna construction means you can get an effective DOUBLING of the available power, giving an Effective Radiated Power (ERP) of two times the actual power applied.*

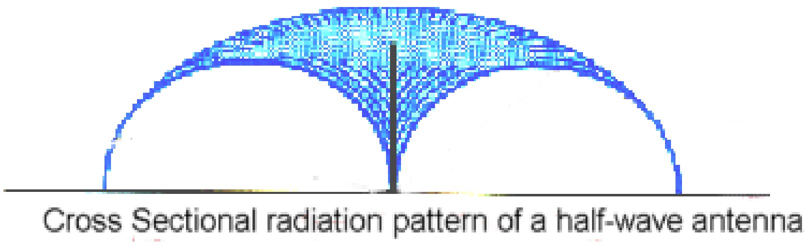


Figure 5: Side view. Radiation Pattern of an omni-directional antenna such as the ½ wave whip. The antenna radiates equally around the azimuth. The shape or pattern from above can be likened to a doughnut and from the side, like a ½ section of a flattened doughnut.

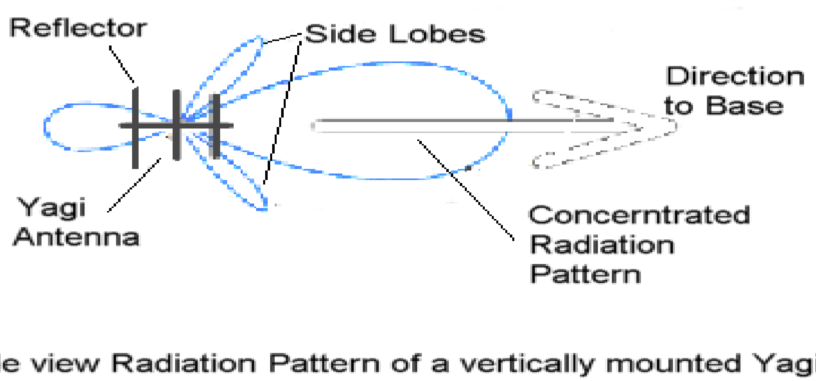


Figure 6: Side View Radiation Pattern of a Vertical Yagi Antenna. The available energy is concentrated in one direction, at the front of the antenna at the expense of other directions (rear and side), much like a lens.

- **Polarisation**

Generally polarisation refers to the physical orientation of the antenna. If the transmitting antenna is oriented vertically, then it is critical that the receiving antenna should also be vertical. This is the situation with the ADT ASE. It uses a vertically polarised antenna system.

- **There are 5 types of antennae that are available**

½ Wave Internal with TNC connector
½ Wave Int/Ext light duty with 5 metre cable
½ Wave External heavy duty with N connector
Phased Array offering gain
Yagi External with N connector. Various number of elements. 6 element unit shown below.

Table 1: ADT supplied antennae

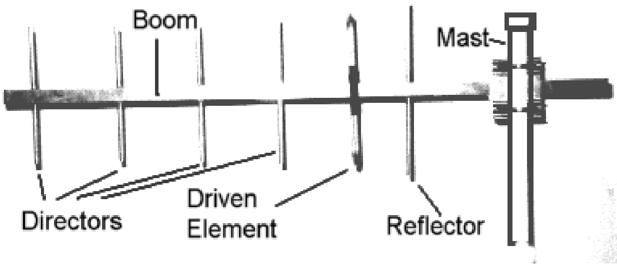


Figure 7: Yagi Antenna

INSTALLATION

1. Pre-Installation Checklist

The following are some items that you will need to ensure are ready prior to the Installation visit

1. **Radio Signal Coverage and Antenna mounting**

   1.1. Is there a sufficient and stable signal? Obtain at least 4 ½ LEDs (20-21 dB) in the left hand bar graph. Check that the signal is STABLE for at least 5 minutes.

   1.2. Is the antenna mounting position optimum and unobtrusive?

2. **Antenna type**

   2.1. Is the selected antenna available?

   2.2. Are mounting brackets, cable, and connectors in available?

3. **ASE Mounting**

   3.1. Will the ASE fit into the mounting space?

   3.2. Do you want to be able to shut the FIP door with the keys inserted?

   3.3. Is the mounting rack of adequate size?

   3.4. Will the ASE be mounted remote to the relay contacts it is monitoring?

   3.5. Considerations to the temperature reached inside the FAS will be necessary.

☠ Warning

The ASE is tested to 45 °C in an environmental chamber. An ASE inside a FIP which is in direct sunlight in summer, can cause temperatures inside the ASE diecast box to reach > 65 °C. Installation in this environment will cause failure of the communications paths back to ADT and may cause catastrophic failure of the ASE itself.

4. **Site Survey**

   4.1. How many of the Sprinklers, valve monitoring devices and sub-panels will come back to ASE?

   4.2. Is it economical to bring these back as circuits on the ASE, or should separate ASE units be installed at these other installations?

   Note: It must be remembered that only one geographical X Y co-ordinate and address can be assigned to each ASE. X Y coordinates cannot be individually assigned to each of the 6 Inputs. The assignment of FASs to inputs may need to done in some cases in consultation with the fire service if they are physically too distant from the designated entry point into the site or building.

5. Power Supply FIP

5.1. Can the existing FIP power supply, supply the extra quiescent and peak current required by the ASE?

5.2. Do the existing FIP batteries have sufficient capacity, or are in they in need of upgrade?

5.3. Will the existing battery box be sufficiently large?

6. 240 V Installation

6.1. Is there an compliant 240V run to the ASE if necessary?

7. New Power Supply installation

7.1. Do you have any power supply units in stock?

7.2. Have you purchased the correct capacity battery for the power supply chosen?

7.3. Is there sufficient room for the power supply and case?

8. Waterproofing

8.1. Does the ASE, power supply and installation require a waterproof enclosure?

9. Telephone Line

9.1. Is there a dedicated dial up PSTN connection installed all the way up to each ASE location?

9.2. What type of socket is available? RJ11?

9.3. Do you have the necessary interconnect cable?

9.4. If the existing dedicated fire cable is AUSTEL approved, can it be reused and connected into the PSTN network?

9.5. If the phone line is a PABX extension (not recommended for mandatory alarms), is the supplied extension capable of being called directly from outside using an indial number?

10. Typical Installation

10.1. Is the installation typical? (See Figure 8)

Figure 8: Typical Fire Indicator Panel Installation

2. Site Monitoring Requirements Examples

Installation of the ASE at an existing site requires some consideration for the specific configuration of the monitored alarm systems at the site. Consider the following examples:

1. An FIP has smoke detectors, a sprinkler system and some valve monitor devices connected to it. A single ASE unit can be used as the solution. One Input would be for the general alarms and one Input for the valve monitor devices.

2. An FIP has smoke detectors and valve monitor devices connected to it. A sprinkler system is located away from the FIP in a pump room. Two ASE units could suit this scenario. One ASE would be located in the FIP for the general alarms and valve monitor devices (using two of the ASE Inputs). The second ASE (and a power supply) would be located in the pump room for the sprinkler.

   The reason for installing the second ASE in the pump room (rather than connecting the sprinkler as a third Input on the FIP ASE), was because the installer assessed that the cost of running the cable from the pump room to the FIP was too high.

4. An FIP has smoke detectors and valve monitor devices connected to it. A sprinkler system is located away from the FIP on the back wall of a warehouse. One ASE unit located in the FIP (using three of the ASE Inputs) could suit this scenario. One Input would be used for general alarms, a second Input for the valve monitor devices and a third input for the sprinkler system.

   The reason that the sprinkler system was connected as a third Input on the FIP ASE was because the installer assessed that the cost of running the cable from sprinkler to the FIP was cheaper than running a power cable and installing a power supply at the sprinkler.

3. Installing The ASE

Install the ASE with consideration given to the dimensions shown in Figure 9.

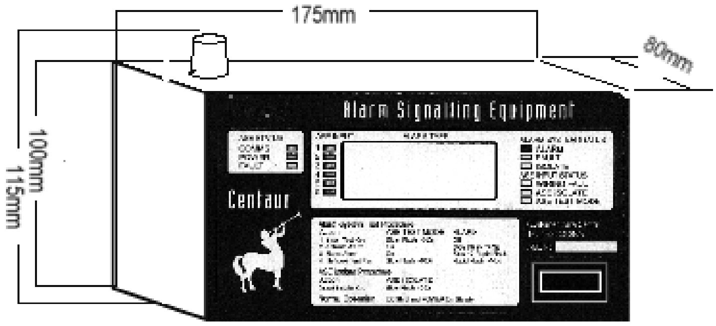


Figure 9: Dimensions of the Centaur ASE.

✉ Please Note	*Allow extra space over and above the 115mm measurement for the male TNC connector and coaxial cable. Other cabling to the power supply, alarm connections etc., enter through holes in the bottom of the unit. Additional space should be allowed for cable entry.*

Special consideration needs to be given to avoid the following:

- Wet conditions.
- Heat. ASE units mounted inside FIPs which are outdoors and exposed to direct sunlight can cause excessive temperatures to build up inside the ASE diecast box. Initially this heat may cause multiple radio link fails, then ASE shutdown and possibly total ASE failure.
- The placement of coaxial cable and other cables near a heat source.
- Corrosive atmospheres.
- Damage from dirty environments.
- Direct exposure to the weather.
- Metal filings and drill swarf
- Ingress of water to connectors. Connectors require self amalgamating tape such as 3M's electrical tape #23.

Keep the ASE and ANTENNA where possible away from:

- Other electrical noise sources that may interfere with ASE functionality eg: Motors, arc welding gear etc.
- Other radio transmitters. CB radios, Professional trunked systems etc.
- Sensitive electronics that may be susceptible to the ASE modem transmitter.

☠ Warning

Open or shorted antenna connections and cables can severely degrade RF performance and in some cases permanently damage the transmitter. Be careful when terminating coaxial cable.

4. Antenna Placement

Signal Strength and Stability is the key criteria

- When installed in a fire indicator panel (FIP), the antenna may be mounted on top of the FIP using a hole drilled through the top of the cabinet (See Figure 8). Any holes through metal work require a grommet to protect the cable from damage. The antenna on a sprinkler system may screw straight onto the top of the ASE, except where surrounding pipe work requires the use of the right-angled bracket with U bolt assembly.

- The radiating part of the antenna should have a reasonable clearance from physical obstructions eg: metal, pipework etc. A minimum of one ¼ wavelength or 90 mm is desirable near non-metallic objects and essential when placed near metal objects. This distance will help to minimise RF radiation pattern distortion due to local objects.

- Moving an antenna as little as 200 mm can mean the difference between a stable and unstable signal. Experiment with location and observe results.

  The antenna should be placed at a height of at least 1800 from the floor, so the RF path will not be affected by people in the near vicinity, or cause injuries to eyes etc.

- The antenna must be mounted vertically.

- Consideration of the direction to the radio base site is important for all types of antennae. If a dipole is used, although considered not directional (or omnidirectional), the base location must still be known so that where possible, obstacles between the ASE and the base can be avoided. The Yagi antenna is even more critical and direction dependant.

- Although most ASE units are successfully installed with internal antennae, external mounting of the antenna is usually preferable due the more stable signal obtained.

- Site/Signal Redundancy

  In many installations when the RSSI reading is taken, two base stations will be within the useable range and RSSI level. Should the signal level of the primary base fade, then the ASE will change to the secondary base.

  If a directional antenna such as a Yagi is used, two base sites may not be obtainable due to the directional characteristics of the Yagi antenna. Signal will be rejected if it is not coming into the front of the Yagi antenna.

  Having said that, it is still preferable to obtain a higher level signal from one base site rather than having to compromise and obtain two weaker signals from two base sites.

The radio network has various levels of redundancy built in at a system level and so is expected to provide the required reliability and availability with single base site connections.

Safety Issues:

☠ Warning

DO NOT place the antenna or transmitter near any explosive gases. RF energy can ignite flammable gases.

DO NOT place the antenna at the highest point on a structure if it is not necessary, due to the increased likelihood of lightning strikes on the antenna and ASE.

5. Flowcharts

The flowcharts in Figure 10a and 10b shows the decision process necessary before fixing the ASE antenna into position. Obtaining a MINIMUM and STABLE signal level is critical.

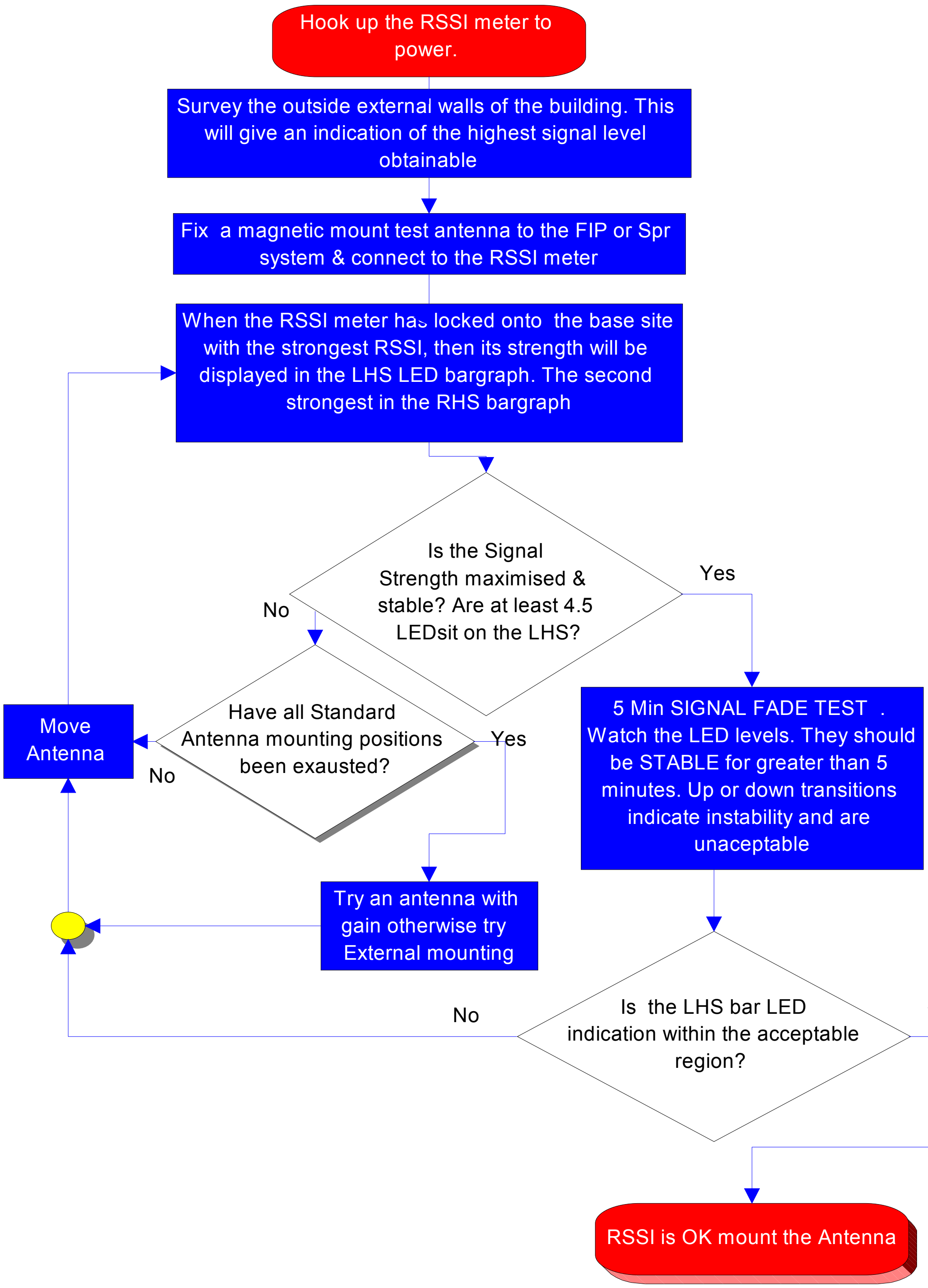


Figure 10a: Antenna mounting flowchart using the RSSI Meter

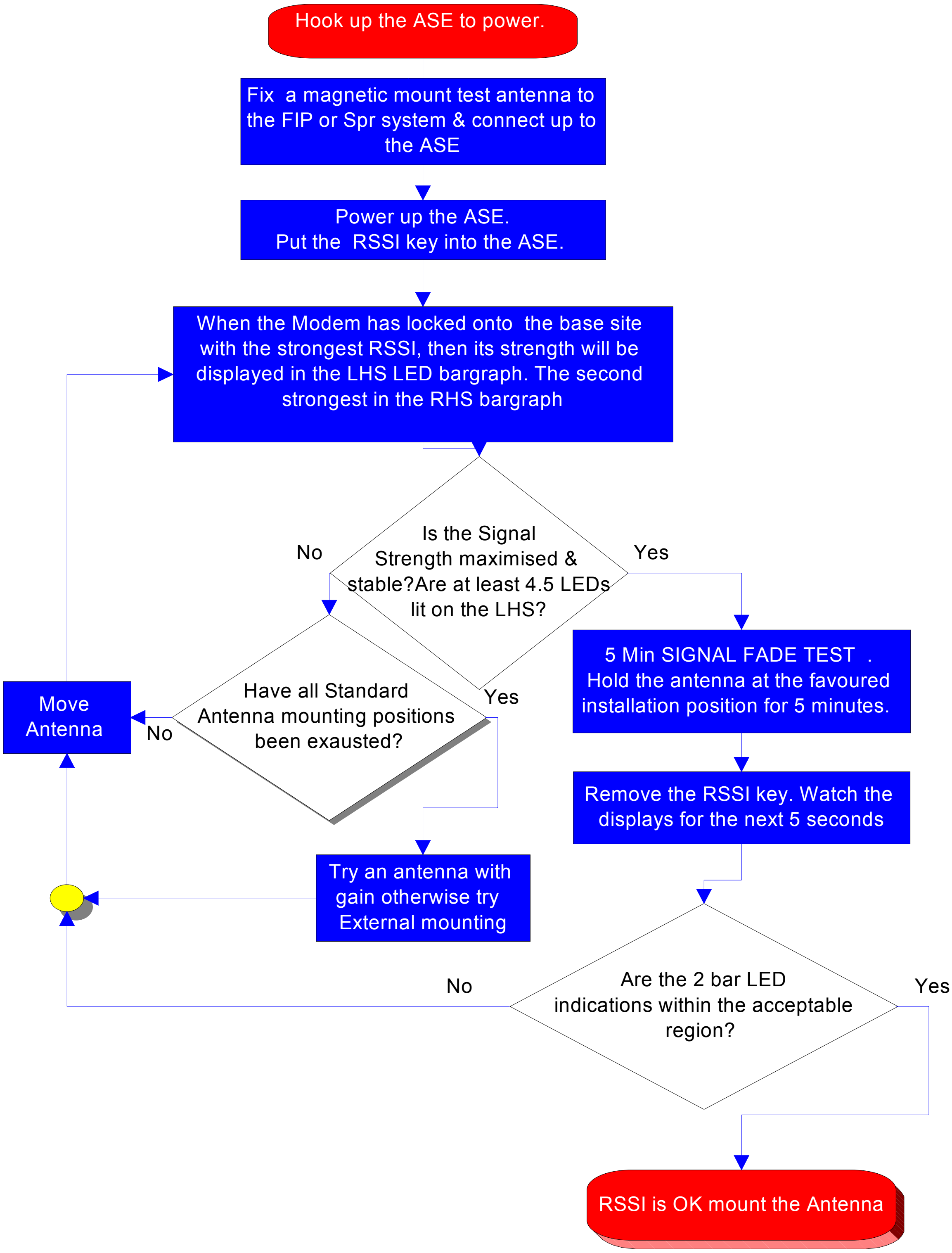


Figure 10b: Antenna mounting flowchart using the site ASE

6. ASE Wiring

6.1. Introduction

There are two ways an alarm system can be connected to the Centaur ASE.

The first is for a Fire Indicator Panel (FIP) that has voltage free relay outputs, capable of signalling common Alarm, common Fault, and common alarm zone Isolate. An additional relay output may be used to indicate that the power supply to the FIP is low.

The second method is for Alarm Systems that have only a common alarm output (e.g. sprinkler system).

The outputs of the alarm system must be voltage-free relay or switch contacts. Optocoupler outputs are not compatible with the Centaur ASE.

If the Centaur is located remotely from the alarm system, the alarm system Input wiring (the twisted white wires) of the Centaur End of Line, can be extended up to 750 m, using 1 mm^2 cable (30 Ω max).

This wiring can not run in close proximity for long distances in a cable tray with 240/415V. Too much electrical noise may be induced into the ASE alarm inputs causing false triggering of alarms

Power supply wiring details are provided below.

6.2. Connection Of A Fire Indicator Panel To The Centaur ASE

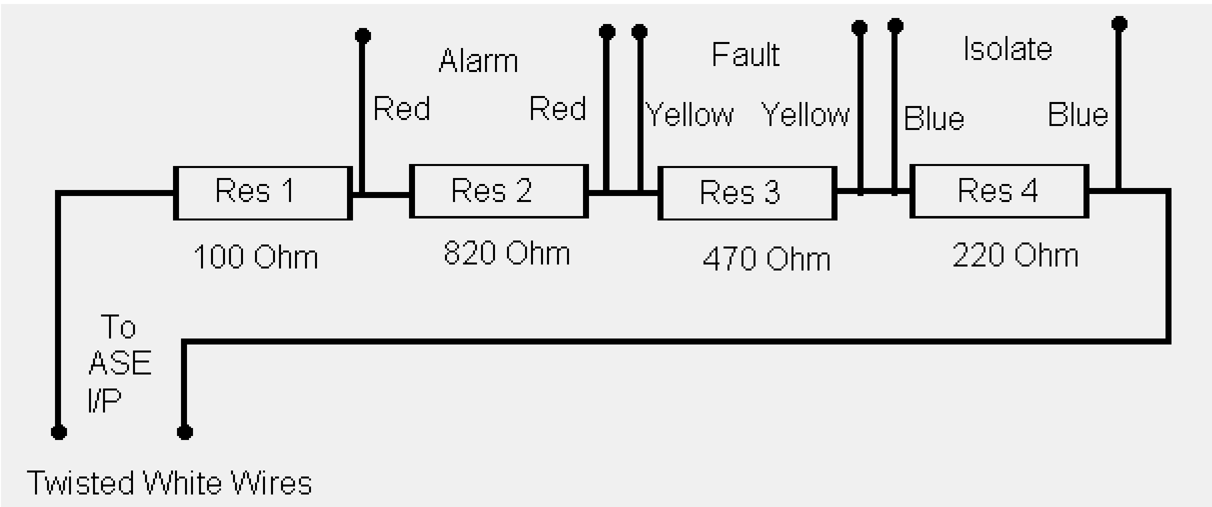


Figure 11a: Internal wiring of an FP0740 END OF LINE Interface Unit

The FP0740 End of Line Interface Unit is used to connect the common Alarm, Fault and Isolate relays on an FIP to one Alarm System input on the Centaur ASE. The Interface Unit converts the two wires used for the Centaur Alarm System Input, to six wires for connection to the three FIP relays (see Figure 11a & 11b).

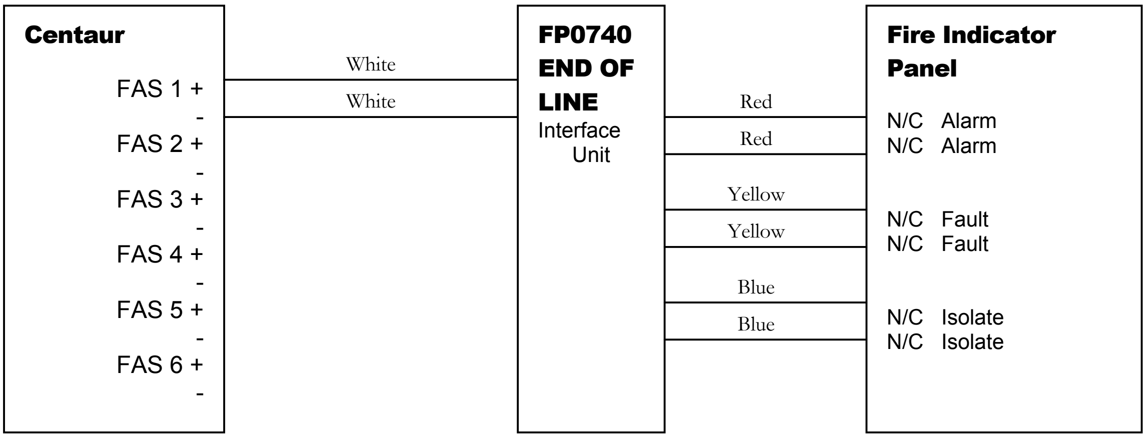


Figure 11b: Connecting Centaur to a Fire Indicator Panel using the FP0740 END OF LINE Interface Unit

The Interface Unit also contains an End-of-Line resistor, which allows the Centaur ASE to detect open and short circuit faults between the ASE and the Interface Unit.

The relay contacts must be electrically isolated from all other circuitry and from each other (i.e. the relay Common contacts must not be wired together).

FIPs with a low battery relay output should be wired into the PF (Power Fail) input of the ASE.

If Fault or Isolate relays are not available for wiring to the Interface Unit, then the unused inputs of the Interface Unit must be shorted together.

☠ Warning

The Interface Unit should be mounted within the alarm system enclosure and only fire rated cable attached to the white wires should be extended beyond the enclosure to the ASE.

The FP0740 End-of-Line Interface Unit is rated to IP51 and so should not be exposed to excessive moisture or heat.

See next page for the DC volts expected under various alarm conditions

ASE Threshold Voltages as Measured at the Input Terminals of the ASE

V_{dc} at ASE I/P		*FAS Output State*
Threshold	**Typical**	**Contact Type N/C**
0.0		
	0.0	S/C
0.196		
	0.38	Normal
0.82		
	1.05	Isolate
1.39		
	1.61	Fault
1.84		
	1.98	Isolate & Fault
2.12		
	2.17	Alarm
2.33		
	2.44	Alarm & Isolate
2.59		
	2.68	Alarm & Fault
2.80		
	2.86	Alarm & Fault & Isolate
3.02		
	5.0	O/C
5.00		

6.3. Connection Of An Alarm System with Alarm Outputs Only

The FP0743 Interface Units (see Figures 13a & 13b) are used to connect alarm systems with no Fault or Isolate relays (e.g. sprinkler system) to Centaur .

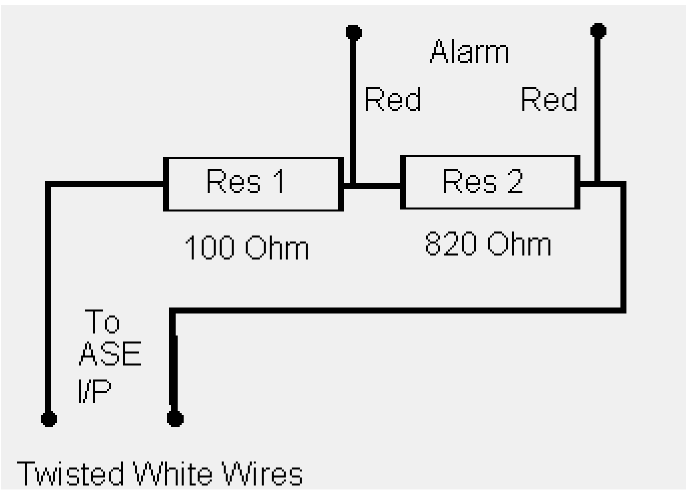


Figure 12a: Internal wiring of an FP0743 END OF LINE Interface Unit

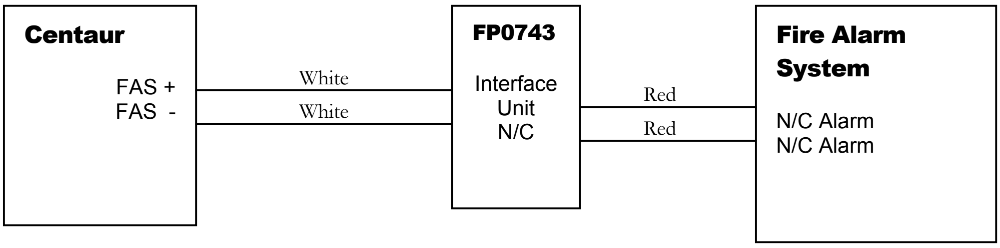


Figure 12b: Connecting Centaur to a N/C Fire Alarm System using the FP0743 Interface Unit

The relay contacts must be electrically isolated from all other circuitry and from each other (i.e. the relay Common contacts must not be wired together).

The Interface Unit also contains an End-of-Line resistor, which allows the Centaur ASE to detect open and short circuit faults between the ASE and the Interface Unit.

The alarm system Input of the Centaur must be configured by ADT as normally closed to match the installation.

☠ Warning

The Interface Unit should be mounted within the Alarm System enclosure and only fire rated cable attached to the white wires should be extended beyond the enclosure to the ASE.

The FP0743 Interface Units have an IP51 rating and so should not be subjected to excessive moisture, or heat.

6.4. Power Supply Connection

The Centaur will operate from a dc voltage in the range of 9.5V to 29V so it can be powered from a 12 V or 24 V fire alarm system without alteration.

A Power Fault (PF) input is provided on the Centaur for connecting to the Power Supply Fault output, if one is available (see Figure 13). This output can be either an Open Collector output or Relay contact that is Normally Open and pulled to 0 V upon a fault condition.

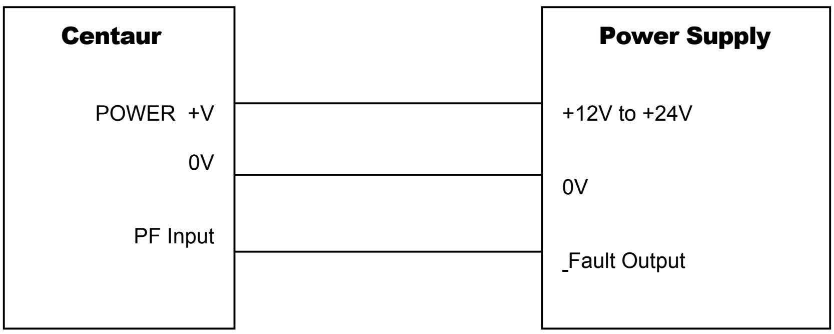


Figure 13: Connecting Centaur to a Power Supply

If the Centaur Power Fault input is not used it should be left open and unconnected.

6.5. About the Power Supply

A 12 V or 24 V power supply should be available on site. This should be AS 4428.5 compliant as a minimum.

If the ASE is installed in a FIP, the FIP's power supply will probably be adequate to power the ASE, although current consumption (see Appendix) and battery and power supply capacity will have to be considered and calculated.

If the current battery capacity is just enough for the existing system then new batteries will have to be purchased to take into account and supply an extra 7 ampere-hour capacity required by the ASE (with either 12 V or 24 V).

The total battery capacity required for the alarm system including the ASE is calculated as follows:

- If the panel manual is available, then follow the procedure for calculating the required battery capacity for the panel. Add the 7 Ah required by the ASE to the total capacity required by the FAS.

  Otherwise follow the procedure below, which will give an approximate value.

- Turn off the FAS mains supply, so that the FAS is powered only by the back up battery supply.

- Using a multi meter switched to amps, measure the current drawn by the panel in quiescent (non-alarm) state. This is I_q.

- Using a multi meter switched to amps, measure the current drawn by the panel in alarm state. This is I_a.

- Put the values obtained into the formula below.

  Battery capacity (ASE+FAS)= 7Ah (ASE capacity) + [(Iq x 24)+(Ia x 0.5)] x 1.25Ah.

In a 12 V system, an allowance of an extra 7 Ah capacity per ASE per single battery is required. In a 24 V system using two 12 V batteries, each 12 V battery should be able to supply an extra 3.5 Ah capacity. This battery capacity will power the ASE for a minimum of 24 hours after a 240 V power failure.

Calculations extracted from the Australian Standards are shown below.

✉ Please Note

Battery capacity shall be derived using-
Battery capacity required at end of life (in Ah) = (Iq x Tq) + (Ia x 0.5) where
Iq= quiescent current
Tq = hours standby requirement
Ia = total current in alarm state
0.5 = hours in alarm

Battery capacity required for new battery >=[(Iq x Tq) + (Ia x 0.5)] x 1.25

6.6. Open Collector Outputs

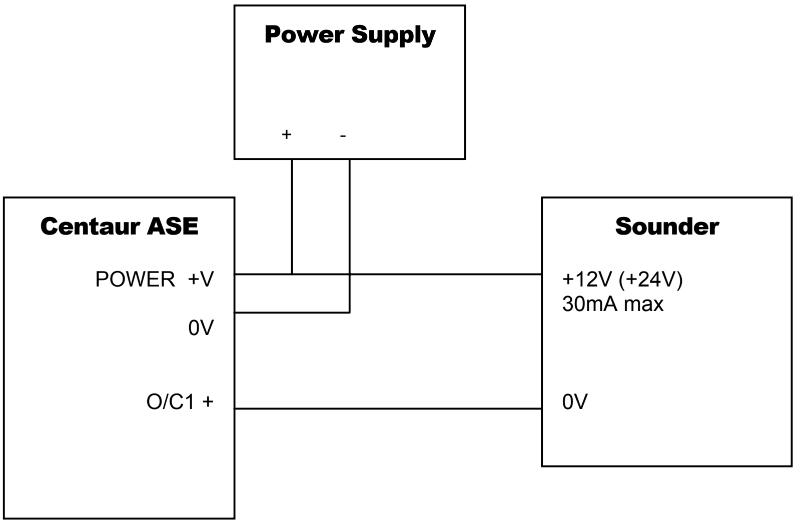


Figure 14: Connecting The Centaur O/C1 Output To A Sounder

The Centaur has an Open Collector output which can be used to operate devices requiring a DC supply voltage of 29 V max and current of 30 mA max. When off, O/C+ is floating and when on, O/C+ is pulled down to O/C- (0V). The outputs have a maximum voltage of 1 V when sinking 15 mA.

The Output is deactivated when the Centaur ASE unit is in Fault (ie the ASE STATUS FAULT indicator is ON) or when there is total communications failure with the CMS (ie the ASE STATUS COMMS indicator is Off).

Output 1 could for instance be used to operate a sounder, visual indicator or activate the fault input of Control and Indicating Equipment (eg: FIP) to cause some form of local warning.

6.7. PSTN Connection

The Centaur has a connection to the Public Switched Telephone Network (PSTN) which is normally used as a backup communication link when the radio link is not available (see Figure 15).

Two conditions need to be satisfied for a successful PSTN connection to be made between the ASE and the CMS and for the Comms LED on the ASE to indicate accordingly.

One is that there is > 10 V DC on the centre two pins of the RJ11 or RJ12 socket. The other criterion is that data must be passed successfully across the telephone line to the CMS and a message is returned to the ASE.

Note: If line voltage is < 10 V for > 1 minute a PSTN Line Fail will register at the ASE and be sent to the CMS.

Factors that affect the passing of data to and from the CMS via the PSTN are:

Ω Whether the ASE can access an outside line. Although not recommended (with mandatory alarms), if the ASE is using a line through a PABX, a leading digit will have to be inserted to access an outside line. Usually a zero. The use of a PABX in mandatory installations is not recommended.

Ω Daily tests and events that can not be delivered via the Primary link cause the ASE to dial up the CMS and deliver the message via that path.

Ω If using a PABX line, the PABX must be equipped with INDIAL. If the primary link is lost, and the CMS requires contact with the ASE, then it will dial it up over the PSTN and use this as the connection path until the primary link is repaired.

Figure 15: Connecting The Centaur to the PSTN Network

For direct lines (ie not through a PABX), the PSTN Earth wire may also be connected to provide additional protection for the Centaur against power surges. This may be subject to the requirements of the telecommunications authority. The PSTN Earth wire is on pin 5 of the RJ11 connector.

Multiple ASE units on a single site cannot share a phone line. Each ASE must have its own phone line and number. If it were necessary for the ADT CMS to call the ASE over the PSTN, all ASE units on that single line would try to answer the ring. Only one would successfully answer the call. The one which answers may or may not be the required ASE.

6.8. RF TNC Connector

The main coaxial cable connector used will be a TNC type.

The cutting dimensions and assembly details are shown in Figures 16 and 17.

If a coax cutter/stripper is used, then the dimensions below are automatically obtained. After termination, the connector should be tested for short circuits between the inner core and the braided outer screen with a multimeter, prior to connection onto the ASE. End to end continuity should also be checked.

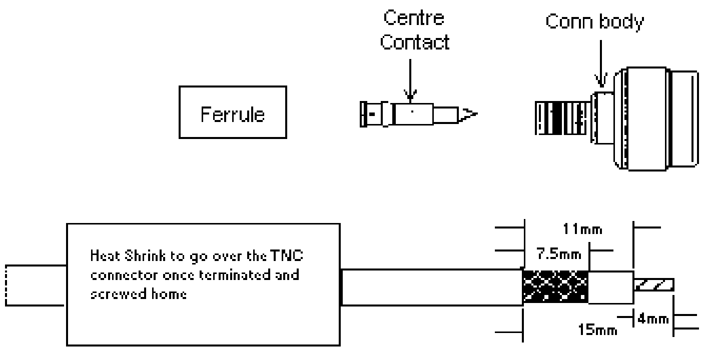


Figure 16: TNC Identification and Cutting Instructions

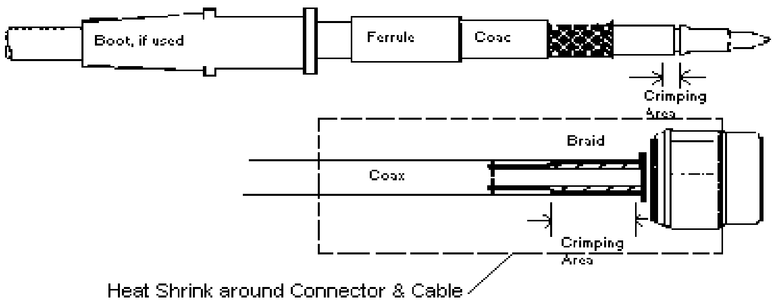


Figure 17: TNC Assembly Instructions

7. Power Up and ASE Status Indicators

The Comms LED flash sequence is made up of 3 or 5 sections as per below. These sections are cyclic with the rapid flash indicating the Start and End of the sequence.

ASE COMMS LED diagnostics	
Start/ End. Rapid Flashes	
Section 1	*Link Configuration*
Number Flashes	
1	Radio Only configured
2	PSTN Only configured
3	Radio & PSTN configured (note 1)
Section 2	*Link Type. (Either Radio Packet Modem or PSTN. Depends on section 1)*
Number Flashes	
1	RPM (Radio Packet Modem) Error (If 1 flash go to section 3)
2	PSTN Error (If 2 flashes go to section 5)
Section 3	*Link Status. RPM is as below. If PSTN only then refer Section 4 below*
Number Flashes	
0	Radio Link OK
1	RPM OK. In contact with Radio Network. No Reply from CMS
2	RPM OK. Out of contact with Radio Network.
3	RPM Failed
Section 4	*Link type. Applicable only if PSTN link is installed*
Number Flashes	
2	PSTN Error
Section 5	*Link Status. Applicable only if PSTN link is installed*
Number Flashes	
0	PSTN Link OK
1	PSTN Modem OK. Line Volts OK. No reply from CMS on General Num.
2	PSTN Modem OK. Line Volts OK. No reply from CMS on Alarm Num.
3	Modem OK. Line Volts Not OK < 10 V on hook
4	Modem Failed
Back to Start	

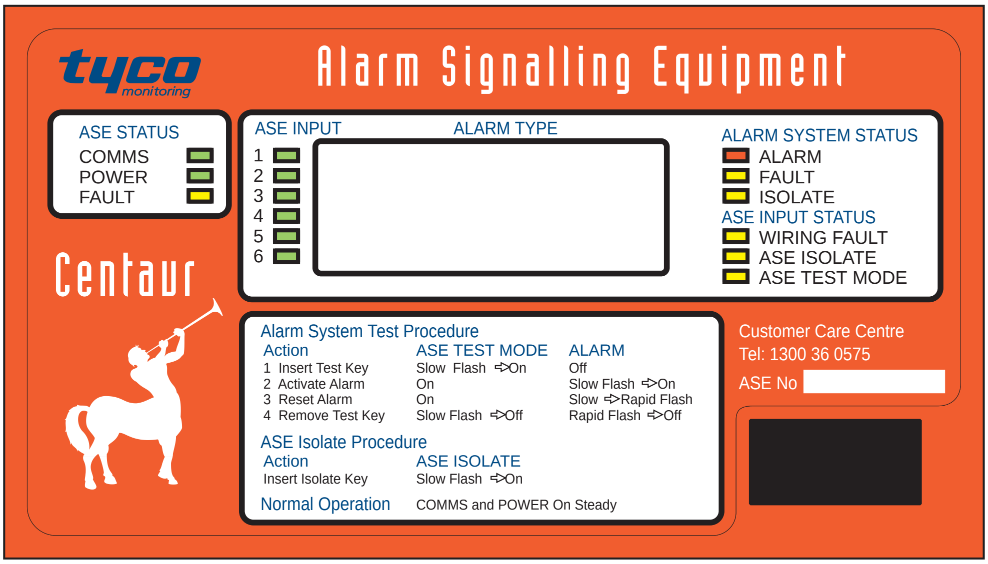
Note 1	If configured for Radio and PSTN then there will be 5 sections. If configured for Radio or PSTN only, there will be 1-3 sections.
Note 2	If the ASE is operating correctly and its configured links are OK, the comms LED indicators will remain steady.
Note 3	If the TEST key is inserted into the ASE then Section 1 (link configuration) becomes active.
Note 4	Flashes indicate problems with a link. No flash indicates all is OK for that particular link.

If the POWER indicator is off or flashing, then there is a problem with the power supply for the Centaur. The I/P voltage is not present or is too low.

If the Fault indicator is on then there is a problem with the ASE itself.

If the Fault LED is double flashing then the event filter is activated.

8. Operating the ASE



8.1. Normal Operation

Normal operation of the Centaur is shown by the COMMS and POWER indicators being on steady.

The ASE INPUT indicators, numbered 1 through 6, correspond to the 6 alarm systems that can be connected.

Centaur monitors each alarm system for Alarm, Fault and Isolate conditions, and also monitors the wiring to each, for open and short circuit Wiring Faults.

On first detecting any non-normal condition, the Centaur will light the corresponding ASE INPUT indicator and flash the appropriate ALARM, FAULT, ISOLATE or WIRING FAULT indicators until the new condition has been acknowledged by the CMS. The indicator will turn on steady.

When the condition returns to normal, the corresponding indicator will flash until the condition is acknowledged by the CMS, then the indication will clear.

If more than one alarm system is non-normal, the Centaur will cycle around the inputs, showing each non-normal Input and its status for two seconds. It takes 12 seconds to cycle through all 6 Inputs.

8.2. Key Insertion

Three uniquely coded keys are available for Centaur - a red TEST key, a blue ISOL (Isolate) key and a green commissioning or RSSI (Radio Signal Strength Indicator) key.

On insertion of the appropriate key, the ASE ISOLATE or the ASE TEST MODE indicator will flash until the key has been verified. If the key is valid then the indicator will turn on steady to show the requested mode (Test or Isolate) has been accepted. If the indicator turns off, then the key has been rejected.

Note that the CMS can override the mode of a valid key. Therefore the Centaur may be in Isolate or Test modes with a different key type inserted, or even when there is no key at all.

8.3. Isolate Mode

Isolate mode stops the Centaur sending any conditions to the CMS. Even though new conditions are not sent to the CMS, they are still shown on the Centaur's ASE INPUT and ALARM SYSTEM STATUS indicators.

Isolate mode can be activated by inserting a valid Isolate key and waiting for the ASE ISOLATE indicator to turn on steady, or by contacting the ADT Customer Care Center and advising them of the ASE and Input number.

In Isolate mode the ASE INPUT indicators will cycle round all enabled Inputs and show the status of each Input, even if there is no non-normal condition present on an Input. When a non-normal condition is detected, the corresponding indicator will turn on, and when the condition is cleared, the indicator will turn off.

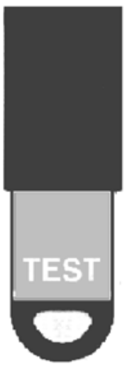
Centaur will remain in Isolate mode for as long as the Isolate key remains inserted (unless overridden by the CMS).

8.4. Test Mode

When the Centaur is in Test Mode any non-normal conditions sent to the CMS are marked as being a Test. This stops the CMS acting on them. The CMS continues to sends an acknowledgment of any status changes to the Centaur. This allows tested conditions to be checked that they can be successfully received by the CMS.

To enter Test Mode, insert a valid Test key and wait for the ASE TEST MODE indicator to turn on steady. Centaur will cycle around all enabled Inputs and show the Alarm System Status of each, even if the Input is normal.

Test Sequence	ASE TEST MODE Indicator	ASE INPUT Indicator
1 Insert valid Test key	Flash	N/A
2 Test key validated by CMS	On	N/A
3 Activate the tested condition (eg Alarm)	On	On
4 Reset the tested condition	On	Rapid flash
5 Remove Test key	Off after 5 seconds	Off



Alarm, Fault and Isolate conditions can be tested for all connected Alarm Systems, as desired.

Check that the ALARM, FAULT and ISOLATE indicators for all inputs are either flashing rapidly or are off before removing the Test key.

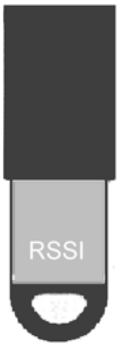
Removal of the Test key, or a 1 hour timeout, will cause Centaur to exit Test Mode, clear any rapidly flashing indicators, and return to normal operation. Any non-normal conditions present on the ASE (such as Alarm) will be reported to the CMS.

Note: When inserting the Test Key, the COMMS Indicator will flash, showing which link(s) have been configured in the particular ASE. These links are available for communication of events back to Tyco.

For a translation of the flash sequence, please refer to the table on page 25.

8.5. RSSI Mode

When the RSSI key is inserted, the COMMS, FAULT (paired) and POWER indicator will flash alternately.



The 6 ASE INPUT indicators on the left and the 6 indicators, on the right of the 'Alarm Type' label, become two vertical bar graphs indicating the relative signal strengths of the two strongest radio base stations.

The left bar graph shows the signal strength of the base the modem is currently logged onto. The right bar graph shows the signal strength of the next strongest base signal. This is the base that the modem would change to, should the primary base fail. Adjust the location of the antenna to satisfy the flowchart requirements (see Figure 10) prior to mounting the antenna.

8.6. Key Removal & Timeout

When the Test or Isolate key is removed, any non-normal conditions that are different from when the key was inserted will be sent to the CMS. However, there is a 5 second period starting from removal of the key, when the key may be re-inserted to stop these conditions being sent to the CMS. During this period, the relevant ASE TEST MODE or ASE ISOLATE indicator will flash rapidly.

8.7. Daily Test

Centaur carries out a test every day to ensure that it is operating correctly. At a pre-set time (which will vary with each Centaur) an internal check is performed.

The Centaur sends a sequence of test messages to the CMS (using the telephone line if it is present).

These tests are carried out automatically with no indication shown on the indicators. However, the COMMS indicator will eventually start a flash sequence if the telephone call to the CMS is unsuccessful.

8.8. ASE Number

To identify the Centaur ASE with a specific site, an ASE Number is used. This uniquely identifies the ASE.

Installation Checklist

Overview of the ASE Connection

1. To ensure a prompt and accurate installation, prepare the following information for all ASE units at the Site prior to calling ADT:

    a) The ASE DTE # (located on a sticker on the front and inside the ASE);

    b) Location of the ASE within the site;

    c) The telephone number to which the ASE is connected (if used);

    d) The MAN of the radio modem (located on the radio modem sticker on the rear of the radio modem);

    e) Building Class – e.g. Office, Factory, etc;

    f) Estimated number of occupants in the building.

2. Please provide the following information for each ASE input:

    a) The type of input (e.g. FIP, SPR, VMA etc);

    b) Location of the device being monitored.

3. Apply power to the ASE using a portable power source/battery.

    On power up, the ASE LED indicators will turn on for one second to allow them to be visually checked.

4. Insert the RSSI key. 2 minutes after power up, the RSSI level will be displayed providing the signal level is above the minimum required for the ASE to log onto the radio network.

    The antenna mounting location is chosen for the optimum and most stable RSSI reading (see fig 10b: Antenna Mounting Flowchart if the antenna position has not already been decided upon at the pre-installation/quote visit).

5. Mount the ASE, connect the End of Line (EOL), power cable, antenna and PSTN connection.

    If open collector output 1 is wired (e.g. connected to a sounder), this output will be locked on until the ASE is further commissioned and the Comms LED goes steady.

6. New ASE units are pre-configured with input 1, type - normally closed contact and inputs 2 to 6 disabled.

    Power down the ASE, insert the Isolate key and power up the ASE. This allows local testing of input 1 prior to bringing the ASE on-line.

    If inputs other than input 1 need to be locally tested, ADT will need to be contacted and can then make the other inputs activate.

Test the configured ASE input 1 by placing the monitored device into Alarm and checking that the appropriate ASE INPUT indicator and the ALARM indicator turns on. Return the monitored device to normal and check that the ASE INPUT and ALARM indicators turns off.

7. If Fault and Isolate FIP outputs are also being monitored, check that when the device is placed in Fault or Isolate that the ASE INPUT and FAULT or ISOLATE indicators turn on.

8. If the ASE power supply is monitored using the ASE PFAIL input, put the power supply into fault and check that the ASE STATUS POWER indicator flashes.

9. Power down the ASE for about 15 seconds and then power up the ASE again. This will clear all the events stored in the ASE due to the previous testing.

10. Complete the Input designation card and insert it behind the ASE window.

11. Complete any other ASE labelling that may be necessary for the attending brigade.

12. Remove the DTE # sticker and write in the ASE number into the "ASE No" field on front of the ASE.

13. The FAS input parameters are then downloaded by ADT to the ASE. The ASE then becomes operational. Check that the ASE STATUS COMMS indicator turns on steady. The open collector output 1 then turns off (if used).

14. If the ASE has a PSTN connection, this will need to be tested during commissioning.

    a) Removal of the antenna will force the ASE to lose its primary link and communicate to ADT via the PSTN (the secondary link).

    b) Approx. 30 seconds after removal of the antenna, the comms LED will single flash, indicating loss of the radio link. The ASE will then dial into ADT and automatically report the loss to the ADT operator.

    c) The CMS will then initiate a test back to the ASE again through the PSTN to confirm that ADT can initiate Comms and to confirm the panel phone number given to the operator by the installer.

    d) After successful tests, reconnect the antenna and wait for the comms LED to become steady.

    e) Connection via the primary link has now been re-established

15. Test all Alarm, Fault and Isolate conditions monitored by each ASE input but this time with the TEST key inserted. The Fire Alarm System is now operational. Any calls will automatically be passed to Intergraph.

16. If the ASE power supply is monitored using the ASE PFAIL input, activate the power supply's fault output.

17. Test all other wiring such as open and short circuit conditions, sonalert etc.

18. Remove the test key (Test results are logged at the CMS).

Compliance to Standards

The ADT Network complies with a suite of Australian Standards, which set the requirements for monitoring fire alarm systems.

The overall performance of the monitoring network is defined in AS 1670.3. This part sets out the requirements for Network Availability, Alarm Transmission Delay and other parameters. ADT holds BCC (Building Control Commission) Certificate of Accreditation number V00/03 parts C & E for the Tyco Fire Alarm Monitoring System.

The telecommunications protocol used to monitor fire alarm systems is defined in AS 4418.2. This is an application of an existing international standard (IEC 60870).

Lastly the ADT Centaur complies with AS 4428.6, as assessed and tested by SSL.

✉ Please Note	*Besides these Standards, there are various other standards, codes and, regulations that also apply to fire alarm systems, power and the installation of the ASE. Although not listed in this document, they are expected to be known and adhered to by installation personnel.*

Glossary of Terms

Alarm Signalling Equipment (ASE) – The electrical equipment that monitors the alarm system and sends alarm and fault signals across the monitoring network.

Carrier – The high frequency electromagnetic wave which is to be modulated with 'Intelligence'or data.

Control and Monitoring System (CMS) – The computer system that monitors Alarm Signalling Equipment (ASE) and controls messages, faults and alarm signals across the monitoring network.

Decibel milliwatt (dBm) – Measure of power relative to a 1 milliwatt reference into 600 ohms.

Effective Radiated Power (ERP) – The amount of total RF power radiated into free air through an antenna.

FAS – Fire Alarm System.

Megahertz (MHz) – Frequency or cycles per second.

Polarisation – The orientation of an antenna. The antenna is usually either vertical or horizontal polarised (oriented). The resultant radio wave therefore propagates through the air in the same direction. The Centaur ASE requires the antenna to be mounted vertically and is therefore classed as vertical polarisation.

Radio frequency (RF) – The frequency of the sinusoidal radio carrier wave.

Radio Packet Modem (RPM) – The ASE has a radio packet Modem mounted on the main ASE board.

Radio Signal Strength Indicator (RSSI) – The measure of the strength of the RF field being received by the ASE receiver.

Voltage Standing Wave Ratio (VSWR) – The ratio of radiated power to reflected power.

Disclaimer

✉ Please Note	*Tyco has taken all due care in preparation of this document but cannot be held responsible for inaccuracies or omissions.*

Appendix A

Centaur Specification

	Min	Typical	Max
Electrical			
Supply Voltage	9.5 V	12 V / 24 V	29V
Quiescent Current			
Without Radio and two alarm system inputs configured as n/o.		50 mA @ 24 V 100 mA @ 12 V	
With NMX400 Radio and two alarm system inputs configured as n/o		100 mA @ 24 V 200 mA @ 12 V	
Peak Current			
NMX400 Radio Transmitting		0.4 A @ 24 V 0.7 A @ 12 V	0.45 A @ 24 V 0.90 A @ 12 V
Average Power Over 24 hours with NMX400 Radio and two alarm system inputs configured as n/o		2.5 W	
Power Supply Battery Requirements With NMX400 Radio and two alarm system inputs configured as n/o		6.5 Ah @ 12 V 3.2 Ah @ 24 V	
Power Fail Input			
Fault Level			0.9 V
Normal Level	3.0 V		29 V
Input Current @ 0 V			0.5 mA
Alarm system Inputs			
Operating Input Voltage Range	0.0 V	5.0 V	9.0 V
Input Current @ 0 V			4.2 mA
“Normal” current n/o		1.8 mA	
“Normal “ current n/c		4.0 mA	
Total Cable Resistance (alarm system Input to Switch/Relay)			30 Ω
Open Collector Outputs			
Output Voltage @ 15 mA			1.0 V
Off Voltage			29 V
On Current Sink			30 mA
Physical			
Dimensions	100 mm H x 174 mm W x 78 mm D		
Weight (with NMX400 Radio fitted)	1.25 kg		
IP Rating of enclosure	IP51		
Colour	Signal Red or Cream		
Environmental			
Temperature	-5 °C to 45 °C		
Humidity	0 to 95 % RH (non-condensing)		
Approvals			
AS4428.6 SSL Approval	Approved		
AS1670.3 Sects C & E. BCC Approval #V00/03	Approved		
Australian Communications Authority (ACA)	Approved		