605-0000-595 Subscriber Terminal Installation and Commissioning

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AS4020 Subscriber Terminal Overview

The AS4020 Subscriber Terminal (ST) portfolio includes subscriber terminal types for voice, and packet data. In general, the customer has access to the same range of facilities that are supported by a conventional copper pair.

Type 42 subscriber terminals have the majority of the electronics in the Service Interface Unit (SIU) located inside the customer premises. This is connected to the outdoor unit by an IF drop cable. The ODU contains the RF components.

The iST subscriber terminal have the majority of the electronics in the Outdoor Unit (ODU) and they are connected via a drop cable to the Indoor Unit (IDU) that contains the power supply and the customer interfaces.

When an AS4020 system is planned, for overall RF capacity purposes an assumption will be made of either the average modulation rate to be achieved across all subscribers or a specific mix of modulation rates will be assumed across the subscribers. This introduces a new factor into ST installation procedures: a check needs to be made of the actual modulation rate achieved against the planned modulation. If this check is not carried out, the assumptions made for modulation at the planning stage are not verified, with the potential result of the achieved overall RF capacity being much less than the planned capacity, resulting in a reduced level of service for subscribers.
In addition to establishing modulation rates for each subscriber, the RF Planning process will ensure that adequate fade margins are present in order to achieve adequate link availability figures. Fade margins are associated with two parameters – SNR and Receive (downlink) /Transmit (uplink) Level. In an interference free, or island deployment, these two parameters will be closely matched. However, in a deployment limited by interference levels (through external interference or aggressive frequency reuse), The two parameters will be influenced by different factors.
The output of an RF Planning exercise will generate the following requirements relating to an individual ST deployment:

- Expected Modulation Modes (uplink & downlink) – based on the Rx SNR predicted
- Required SNR Margin above Modulation Mode switching threshold – to maintain planned overall system throughput under shallow fade conditions.

Where average overall system throughput is a concern, a 0dB SNR Margin is considered adequate for standard internet access services – this is because as some users SNR degrades, others will improve maintaining an average system throughput. For a conservative approach to system planning, a 2dB SNR margin would be adequate. However, if a particular ST requires guaranteed high bandwidth for services such as video conferencing, then the SNR margin would be increased.
The fade margin required to maintain link availability will depend on the actual availability level required plus the propagation conditions. This is typically between 6 and 12dB.

Telephony

For normal telephony services, these could typically include:

- multi-frequency or loop-disconnect dialling
- subscriber private metering
- intrusion tone
- malicious call interception.
- caller line identification
  Note. Line reversal is not supported.

All tones, tone cadences and announcements which are generated by the local exchange are passed transparently over the AS4020 system. Line feed voltage, ringing current and ringing cadence are generated by the ST equipment.
The Customer Premises Equipment (CPE) is connected to the line interface sockets on the internal SIU.

The specific impedance of the NTU allows tests to be performed by the SIU to detect the presence of any attached *CPE*.

Packet Data

Packet Data using 10/100baseT Ethernet links

The Type 42 P1 and iST offer an Ethernet service, which allows applications such as home Internet access and Virtual Private Networks (VPN) for business users. It is designed to operate with downlink speeds of up to 2Mbit/s and uplink up to 1Mbit/s, although the typical configured uplink rates will depend on the number of STs on the system.
The system uses Ethernet bridging, which has the advantage of relaying frames based on their MAC address, and so allows higher level protocols such as TCP/IP and IPX to pass transparently across the system. In this manner, the system is easy to configure, and provides a link that is transparent to devices on the LAN at each end of the bridge.
The system links Ethernets using self learning MAC bridging and supports the following features:

- Ethernet IEEE 802.3 10baseT RJ45 connector
- Transparent Bridging allows the use of TCP/IP, IPX and other protocols over the link.
- Supports up to 480 P1V2 Subscriber Terminals per RF channel
- RF packet throughput capacity up to 8.5Mbit/s downstream, 5.7 Mbit/s upstream

IEEE 802.1q VLAN s
The 802.1Q standard (VLAN tagging) is also supported by the system, which is a secure means of segmenting a network. The traffic between VLAN's is restricted, thereby providing secure boundaries and limiting the propagation of broadcast and multicast traffic. This means that any equipment supporting VLAN tagging will be able to connect to the Type 42 P1 , and present each VLAN id on a separate Ethernet segment for connection into the appropriate network.
IEEE 802.1q VLAN support on the AS4020 and Router provides security isolation is required between these corporate customers by creating Corporate Virtual Private Networking and allows independent LAN traffic to be carried over a single physical interface. 802.1q VLAN adds an identifier to each ethernet packet to identify which VLAN it belongs to.
A router supporting 802.1q provides multiple VLAN subinterfaces (and IP addresses) on a single physical Ethernet interface. VLAN security allows independent assignment (including duplication) of IP addresses between VLAN groups.
VLAN security is used together to provide total security isolation of grouped Ethernets.

Ethernet linking is via MAC bridging providing protocol transparency. The user interface is 10baseT on RJ45 socket.

Overview of ST operation working on AS4020

Block Data Mode

BDM is used on the radio interface and transmits blocks of data using a connectionless protocol
BDM transfers data across the air interface in discrete sized blocks. The payload for a given destination may be contained within a single block (size permitting), or across multiple blocks. The data field spreading factor, modulation and coding rate may be allocated by the system on a per block basis to match the signal to noise ratio of the channel.

In the uplink an ST is allocated up to 4 RWs for voice and up to 4RWs for packet to transmit on by the CT on a per slot basis.

The block duration is fixed throughout the system.

RW Codes

Each RF channel is composed of 16 RW codes: Each RW uses can de either 128kbit/s or 2 X 64kbit/s
RW code 15 is used for initial ST link acquisition and for downlink transmission of the internal CTS channel which is used to signal to STs the availability of channels to use for uplink transmissions. The remaining RW codes are used for voice and/or data. The voice/data boundary is dynamic with RW codes only being used for voice when this is required due to voice calls in progress. This maximises the data carrying capacity of the system as RWs not being used for voice are automatically made available for data.

Each ST has a permanent always-on RTS/CTS channel. When an ST wishes to send uplink traffic, it signals this on the RTS channel and receives in return a reply from the AS4020 CT on the CTS channel informing the ST of which RW(s) can be used for the uplink voice/data transmission. The AS4020 is thus able to arbitrate between RTS requests from all STs and decide on a priority basis which STs are allowed to make an uplink transmission.

For the maximum ST load of 480 STs per AS4020,One or two RWs are reserved in the uplink direction for RTS channels. Note that the downlink part of each of these RWs is free to carry user data traffic. This means that a data only AS4020 application has 15 RWs available in the downlink and 13 or 14RWs available in the uplink for user data. The carrying capacity in bit/s will depend on the modulation type and FEC code used for transmission to each ST.

A voice only AS4020 application has 13 or 14 RWs free in both the uplink and downlink directions for user voice calls.

AS4020 delivers data services to individual STs at various data rates depending on the modulation and forward error correction (FEC) mode it is operating in. The mode used is dependant on the RF link quality which is measured as a ratio of received signal strength to noise level (signal to noise ratio – SNR). The higher the SNR, the higher the mode of operation and hence, the higher the data rate to the ST. Various factors influence the level of noise seen by the system. These include:
· Thermal (background and intra-system) Noise
· Interference (co and adjacent frequency channels)
· Excessive Multipath (signals received from reflections)
AS4020 dynamically adjusts its mode of operation on a per ST basis depending on a continually updated measure of SNR. This measure of SNR includes all factors as listed above.

AS4020 Subscriber Terminal Products

AS4020 Compatible Subscriber Terminal Types

There is a range of STs available, each supporting different services and numbers of lines.

The type 42 ST is compatible with Release 7.10 Netspan code or later and with Release 7.10 rack code or later.

The iST is compatible with release 7.21 or later

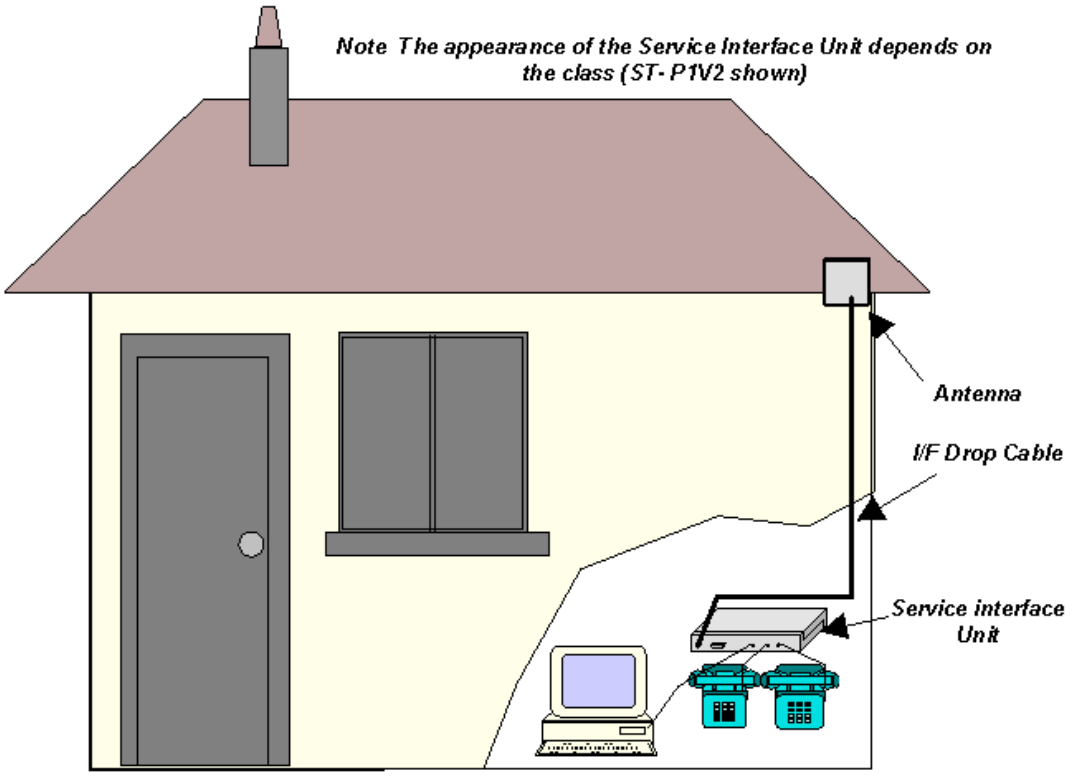
Subscriber Terminal	Type	Function
P1/V2	Type 42	Two line voice 32kbit/s ADPCM or 64kbit/s PCM + 10BaseT Ethernet
P1/V4	Type 42	Four line voice 32kbit/s ADPCM or 64kbit/s PCM . + 10BaseT Ethernet
V2	Type 42	Two line voice 32kbit/s ADPCM or 64kbit/s PCM
V4	Type 42	Four line voice 32kbit/s ADPCM or 64kbit/s PCM .
W	Type 42	Two line voice 32kbit/s ADPCM or 64kbit/s PCM + wireless LAN interface uses IEEE 802.11b 10BaseT Ethernet
iST	iST	Two line voice 32kbit/s ADPCM or 64kbit/s PCM + wireless LAN interface uses IEEE 802.11b 10BaseT Ethernet

Type 42

Type 42 Overview

Type 42

- **P** series for packet data/voice
- **V** series for voice

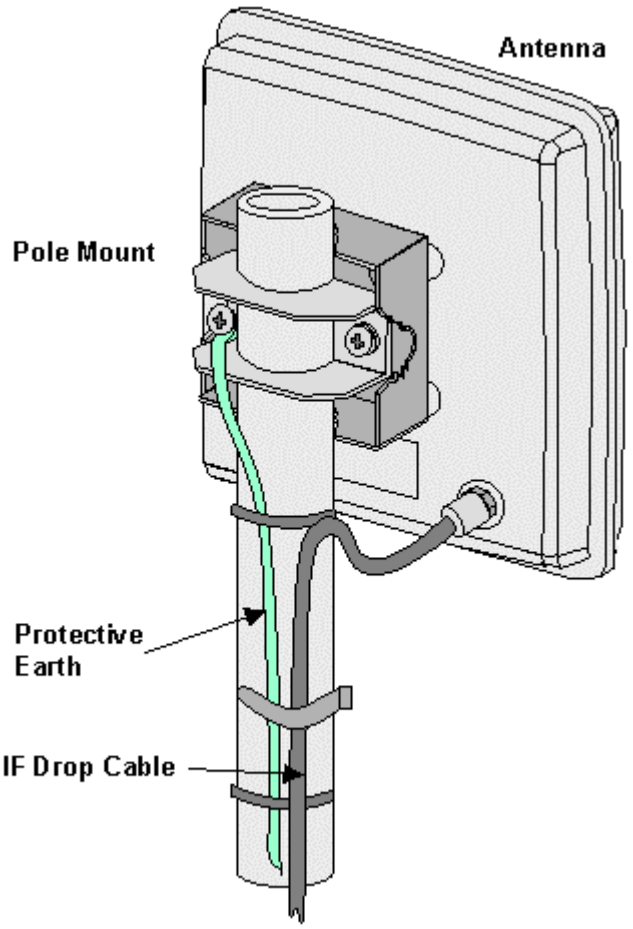


The main elements comprise:

- External Outdoor Unit with antenna (ODU)
- Internal Service Interface Unit (SIU)
- IF drop cable
- Type 7 PSU (for STs requiring battery back-up) or Type 6 socket PSU (for STs not requiring battery back-up)

Outdoor Unit

The outdoor unit is a sealed weatherproof unit that is mounted on the outside of the customer's premises. The unit is normally positioned on an outside wall or a mounting that faces the direction of the CT antenna. The ST should be sited to avoid large obstructions in proximity to and in line of sight from the ST to the CT antenna. See the ST installation and commissioning manual for deployment rules.
The outdoor unit contains a flat plate antenna, Low Noise Amplifier (LNA) and Conversion of incoming RF signal to IF. It connects to the IF drop cable using an F type connector. Power for the LNA is provided via the drop cable.



The Outdoor Unit has two mounting options:

a) Pole Mount
b) Wall Mount

Pole Mounting

The antenna is normally pole mounted on a 38mm(1.5") Pole (provided by the service provider). Adjustment of the antenna (in the azimuth plane) is achieved by rotating the outdoor unit around the pole, the optimum positioning being determined by measuring the strength of the incoming signal, usually in the direction of the CT antenna.

Wall Mounting Bracket

The outdoor unit mounting bracket fixes directly onto the wall of the building and provides adjustment (in the azimuth plane) of the antenna in an arc over 150°, the optimum positioning being determined by measuring the strength of the incoming signal, usually in the direction of the CT antenna.

IF Drop Cable

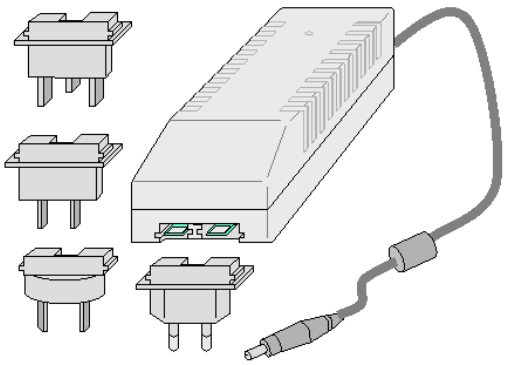
The drop cable connects the internal SIU to the antenna via an environmentally protected F-Type connector that is plugged into the backplate of the antenna. The drop cable come in standard (RG6) or low loss (RG11). The IF drop cable is 50m(RG6) or 75m(RG11) with a 40mm maximum bend radius.

Power Supply Units

Two types of PSU are available. The Type 7 PSU for installations that require battery back-up and the Type 6 PSU for installations that do not require battery back-up.
The, R, S, series SIUs use a Type 6 PSU

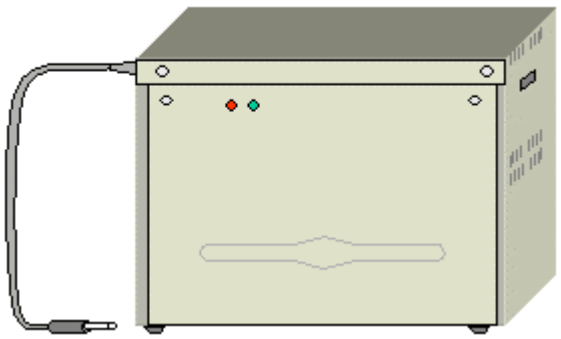
AC Power Supply Unit Type 6

The Type 6 is a socket PSU the plugs directly into the AC supply socket. It is supplied with a range of adapters to ensure compatibility with the socket design in the country of deployment



AC Power Supply Unit Type 7

The type 7 ST PSU cad be used to provide power to all SIUs and has a 7AH battery back-up to maintain the functionality of the ST in the event of a mains supply failure. The PSU may be free standing or wall mounted.



The P Series Subscriber Terminal

The P Series Service Interface Units (SIUs) are designed for packet data and use an outdoor unit and an internal SIU. The STs are powered from the AC mains supply.

The PI/V2 is available in two versions the type 41 (not AS4020 compatible) and the type 42 that must be used for AS4020 Installations
The P1/V4 is only available in type 42.

ST- P1V2/4(type 42)

- P1/V2: Up to 2 voice calls - must share same RW code. Same
  P1/V2: Up to 4 voice calls - must share same RW code.
- up to 4 RW codes per ST - voice independent uplinks.
- Ethernet (10 Mbit/s) 10 baseT - RJ45 connector
- Voice either 32k ADPCM or 64k PCM
- Analogue Fax/Modem supported as for normal voice signal - no additional hardware required
- Phone - 2 RJ11 phone connectors

Downstream

- up to 4 RW codes per ST - shared between packet and voice
- Max 2Mbit/s downstream packet rate.
- When a voice line activates (one voice already active), packet downstream rate is unaffected.

Upstream

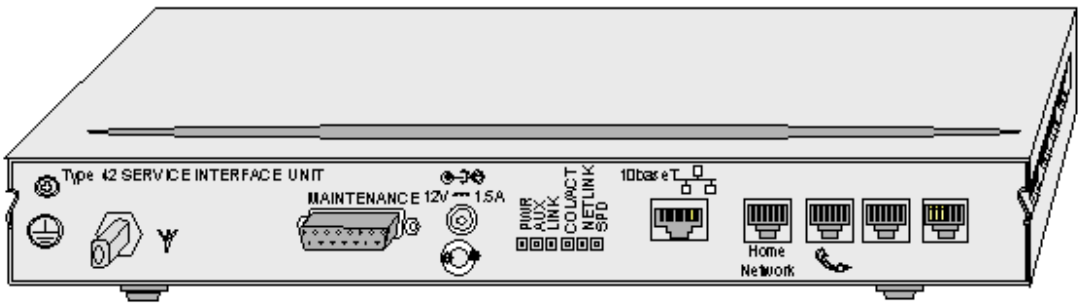
- Upstream packet rate selectable up to 748kbit/s .

The ST Indoor Unit (IDU) is band/frequency independent. This allows changing IDU ST operation frequency at any time by simple reprogramming using STMON or sometimes only by changing parameters of target shelf with AS8200 .

Indoor Units

The **ST-P1/V2** supports two 32kbit/s ADPCM or 64kbit/s PCM analogue telephony line and one packet data line at the end-users premises. Provisioning is by the AS8200 management system and AS7020 STMON. The type 42 PI/V2 is the same as the P1/V4 but two voice ports are disabled.

The **ST-P1/V4** supports four 32kbit/s ADPCM or 64kbit/s PCM analogue telephony line and one packet data line at the end-users premises. Provisioning is by the AS8200 management system and AS7020 STMON.



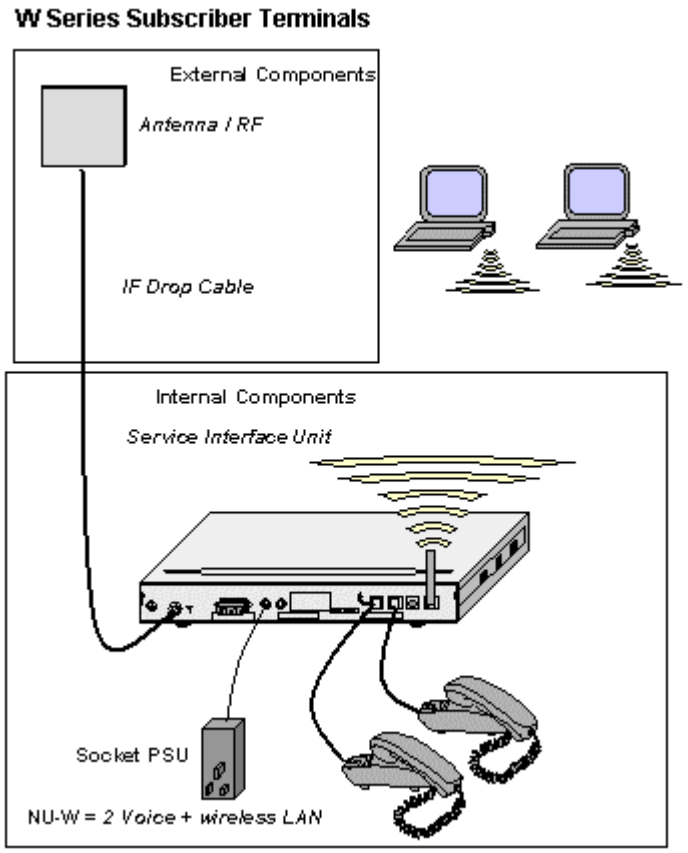
W Series

The ST W is designed for packet data and voice and use an outdoor unit and an internal service interface unit with a wireless LAN antenna attached. The STs are powered from the AC mains supply. The wireless LAN interface uses IEEE 802.11b Standard for high speed wireless LANs.

Note: This SIU should not be installed in environments where the ambient temperature is greater than 35° C

The range of the wireless LAN is dependant on the environment in which the unit is deployed. In ideal conditions and the approximate range is shown in the table below. For increased range the antenna provided with the unit may be disconnected and replaced with a high gain antenna provided by the service provider.

Environment	Speed			
	11 Mb/s	5.5 Mb/s	2 Mb/s	1 Mb/s
Open Environment	160 m (525 ft.)	270 m (885 ft.)	400 m (1300ft.)	550 m (1750ft.)
Semi-open Environment	50m(165ft.)	70m (230 ft.)	90m (300 ft.)	115m (375 ft.)
Closed Environment	25 m(80 ft.)	35 m(115ft.)	40 m (130ft.)	50 m (165ft.)

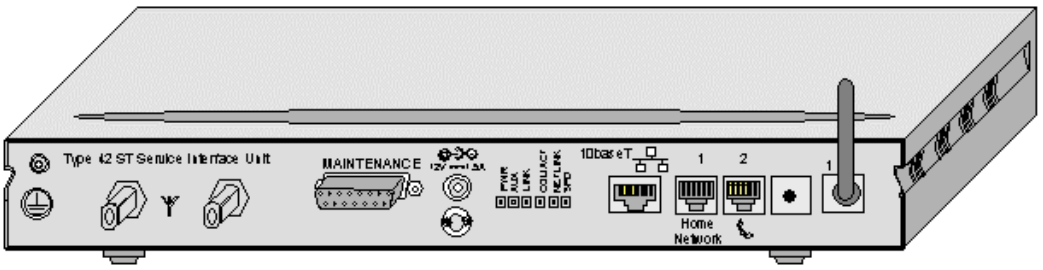


ST –W (type 42)

The ST-W is AS4020 compatible and supports the following features:

- Phone - 2 RJ11 phone connectors
- Up to 2 voice calls - uses independent uplinks
- Voice either 32k ADPCM (max 2 channels) or 64k PCM (max 1 channel)
- Analogue Fax/Modem supported as for normal voice signal - no additional hardware required
- up to 4 RW codes per ST
- 802.11b Wireless LAN data interface. This interface is set from the PC using at the wireless LAN connection.

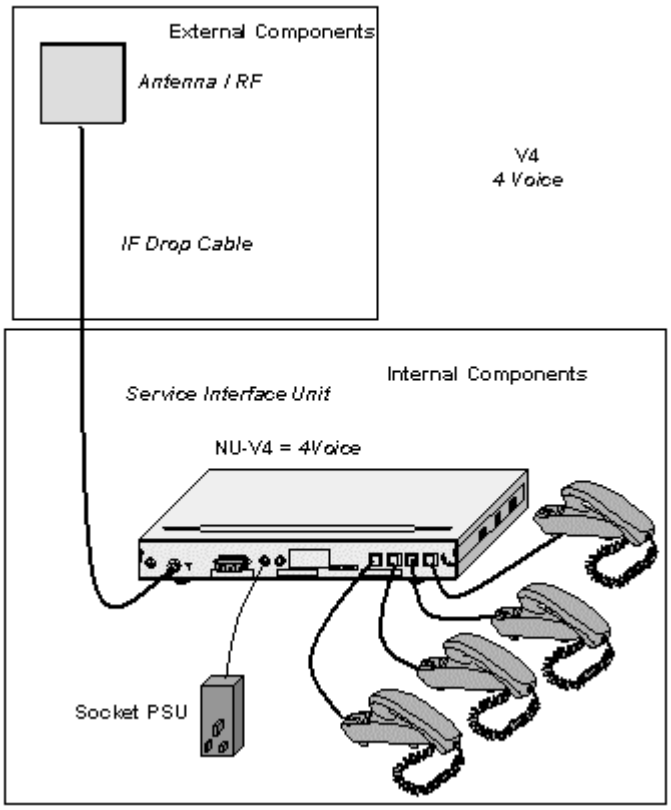
- The ST Indoor Unit (IDU) is band/frequency independent for the Radio Link. This allows changing IDU ST operation frequency at any time by simple reprogramming using STMON or sometimes only by changing parameters of target shelf with AS8100 [see Frequency Agility in AS8100 Sitespan help file].



V Series

The V Series Service Interface Units are designed for Voice and use an outdoor unit and an internal Service Interface Unit. The STs are powered from the AC mains supply.

V Series Subscriber Terminals



ST –V2 (type 42)

The ST-V4 is AS4020 compatible and supports the following features:

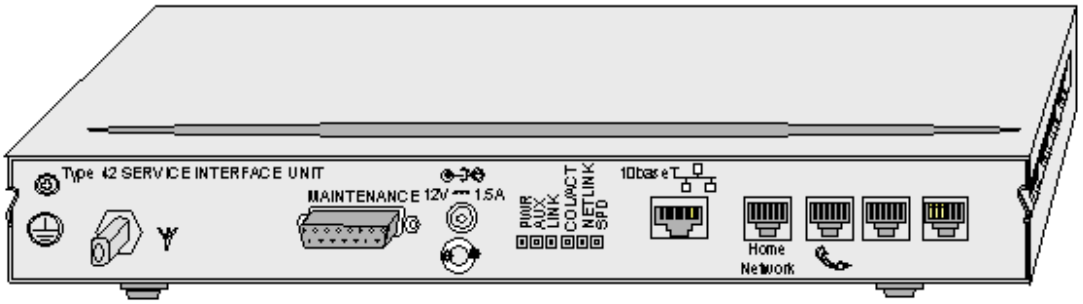
- Phone - 2RJ11 phone connectors
- Up to 2 voice calls - uses independent uplinks
- Voice either 32k ADPCM (max 2 channels) or 64k PCM (max 1 channel)
- Analogue Fax/Modem supported as for normal voice signal - no additional hardware required
- up to 2 RW codes per ST
- The ST Indoor Unit (IDU) is band/frequency independent. This allows changing IDU ST operation frequency at any time by simple reprogramming using STMON or sometimes only by changing parameters of target shelf with AS8100 [see Frequency Agility in AS8100 Sitespan help file]. The type 42 ST is compatible with Release 7.0 Sitespan code and with Release 6.20 rack code or later.
- two voice ports and the 10baseT port is not enabled on this product.

ST –V4 (type 42)

The ST-V4 is AS4020 compatible and supports the following features:

- Phone - 4 RJ11 phone connectors
- Up to 4 voice calls - uses independent uplinks
- Voice either 32k ADPCM (max 2 channels) or 64k PCM (max 1 channel)
- Analogue Fax/Modem supported as for normal voice signal - no additional hardware required
- up to 4 RW codes per ST

- The ST Indoor Unit (IDU) is band/frequency independent. This allows changing IDU ST operation frequency at any time by simple reprogramming using STMON or sometimes only by changing parameters of target shelf with AS8100 [see Frequency Agility in AS8100 Sitespan help file].
- The 10baseT port is not enabled on this product



Specifications

Outdoor Unit

Size: Outdoor Unit without brackets: 210mm W x 210mm H x 80mm D
Weight: Outdoor Unit without brackets: 1.10kg
Operating Temperature: -40°C to +65°C
Relative Humidity: 0 to 100% non - condensing
Storage Temperature:-30°to 70°C
Wind Gusts:200 km/hr
Ice Accumulation of Density: 900 kg/m: 10mm (complete equip. coverage)

Indoor Units

P Series Service Interface Unit
Size: 323mm x 180mm x 40mm
Weight 1.53kg
Operating temperature -5 °C to +45°C

V Series Service Interface Unit
Size: 200mm x 180mm x 60mm
Weight 2.25kg with battery
Operating temperature -5°C to +45°C

W Series Service Interface Unit
Size: 200mm x 180mm x 60mm
Weight 2.3kg with battery
Operating temperature -5°C to +35°C

Power Supply Unit Type 6
AC Input Voltage: Range, 100VAC to 240VAC.
Frequency: 47 to 63 Hz.
AC Input: 0.7 Amp.
Nominal Output Voltage: 12V DC
Power Consumption: 15 Watts
Overload Protection Fuse: 2.0 Amp.

Power Supply Unit Type 7
AC input Voltage: Range, 100VAC to 240VAC. (+6% -10%)
Frequency: 45 to 65 Hz.
AC Input: 1 Amp.
Nominal Output Voltage: 13V *DC* ±1V
Output 2.0Amp Max
Overload Protection Fuse: 2.0 Amp.
Power Consumption: 15 Watts
Insulation: Class II
Battery TBA
Operating Temperature: -5°C to +45°C

Pre-installation

Before the ST is installed, the installation acceptance criteria should be established. These are outputs from RF Planning as listed above. They are in summary:

- Corresponding STID
- RF Channel/Pilot Channel
- PN Code
- Expected Downlink Modulation (FEC Mode)
- Expected Uplink Modulation (FEC Mode)
- Required Fade Margin
- Required Downlink SNR

These parameters can be input to STMon during installation. It is expected that the installer will be informed of these values via a job instruction relating to the particular ST to be installed.

Installation Steps

Before commencing installation read the section 'Preparation' to familiarize oneself with the deployment guidelines etc.

All types except iST

Step	Activity	Notes
1	Provision ST in AS8200	STID, MAC Address & ST Service class details are to be entered into Netspan before the installation can commence. See Netspan User guide
2	Configure ST IDU	AS4000 only STID, RF Channel & PN Code to be programmed. Telephone handset programming will be available with 7.21.

Step	Activity	Mounting				Notes
3	Installing Outdoor Unit (ODU)	Bracket 605-0010-279/280	Bracket 605-0010-283	Pole Mount	IF Unit	IF unit only required if non Airspan Antenna is used.

Step	Activity	Termination				Notes
4	Install Drop Cable	Drop Cable Installation				
5	Drop Cable Termination	RG6 Snap and Seal	RG11 Snap and seal	RG6 Crimp	RG11 Crimp	ST Installation Toolkit 605-0010-313 used for Snap and Seal connectors. ST Installation Toolkit 605-0010-257 for crimp connectors

Step	Activity	Type		Notes
6	Install PSU	Type 6 PSU	Type 7 PSU	

Step	Activity	Series	AS4000	AS4020	Notes
7	Install Service Interface Unit (SIU)	B	Installing B Series SIU		ISDN
		L	Installing L Series SIU		DATA
		M	Installing M Series Module Enclosure		Modular
		N	Installing N Series SIU		Voice
		P	Installing P Series SIU	Installing P Series SIU	Packet/voice

		R	Installing R Series SIU (RU-V1/V2)		Voice
		S	Installing S Series SIU		Voice
		V	Installing V series SIU	Installing V series SIUs	Voice
		W	Installing W series SIU	Installing W series SIU	Wireless CPE connection

Preparation

Site Selection

Site Readiness

Verifying that the site is ready for the installation of the *ST* equipment.
Check access to the building before unloading or unpacking the equipment.

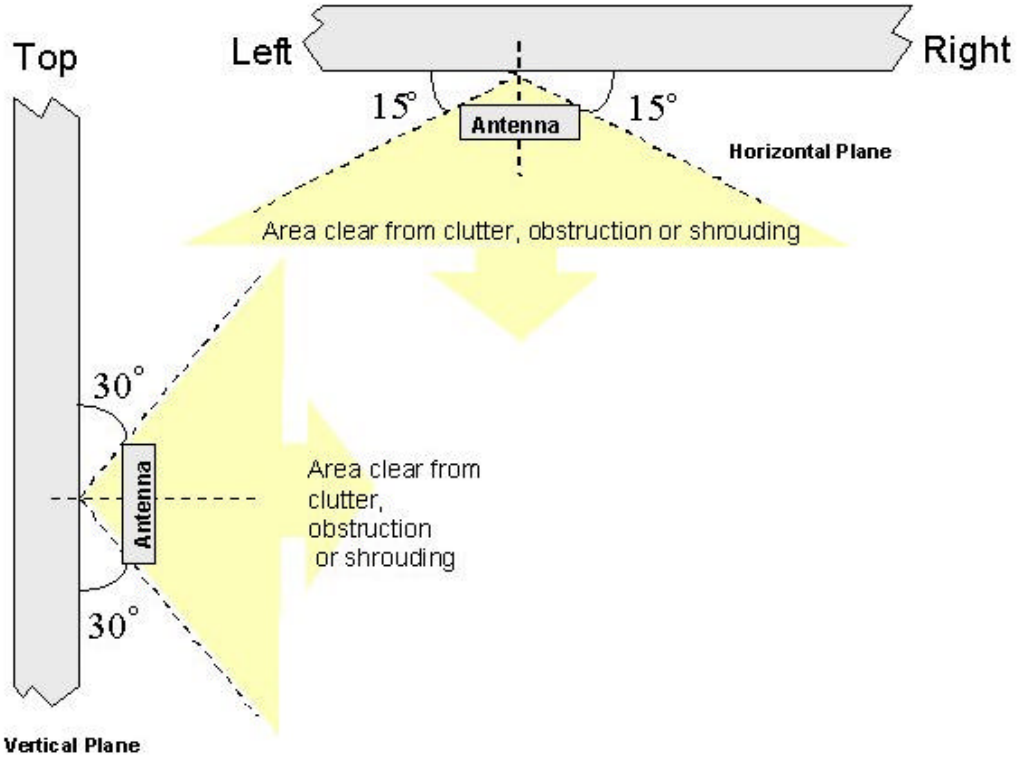
Outdoor Unit Important Installation Considerations

Geographical deployment within guidelines: Just because a ST seems to get a link on an excessively long distance or on a side lobe to a sectored antenna, this doesn't mean it will work reliably. Frequency (Radio) planning is essential for the area covered (including frequency sweep to identify possible interferers).
Clear line of sight: This is the single most likely reason for an installation not to work. Check for:

- Any buildings or large trees, especially ones close to the ST, which obscure the line of sight will significantly reduce the RF power, and could cause problems with reflections. Trees should be at least 50m from ST installation RF path. Although AS4020 can operate through trees,absorption losses for a single tree can increase the path loss 6-9dB and foliage movement due to wind can cause varying path losses degrading BER performance. **Note:** Trees exceeding a distance of 50 metres from the antenna are considered ineffective to the units' performance.
- Place the outdoor unit as high as possible to avoid local clutter caused by people/vehicles/trees. Make sure the outdoor unit is actually pointed at the CT. Mounting height should normally be 5-7 metres above ground level.
- Ensure that the antenna path has sufficient near field clearance (see 'Site Selection' below)
- No other radio broadcasting units are likely to transmit across or into the antenna boresight and have a separation from Airspan equipment of at least 2m.
- For efficient and reliable service it is suggested that the external mounting location of the outdoor unit be chosen such that once 'panned' for optimum signal level it observes the following criteria:-
    - Avoid obstructions such as adjacent walls or overhanging roof eaves, within 15° in the horizontal plane and 30° in the vertical plane (see figure below).
    - Ensure adequate clearance is allowed for 'panning' the outdoor unit.
    - The antenna is capable of being 'panned' with at least 15° of adjustment either side of the direction of the CT antenna.

  These guidelines should not be violated during the outdoor unit panning process.

Physical separation: STs at the same location must have at least 1 metre separation between their outdoor units, to stop coupling between them causing interference.
Correct orientation: The ST outdoor unit has a required orientation, mounting it at 90 degrees to this (e.g. by attaching it to a horizontal rather than vertical mounting bar) will affect the RF performance.



Before installing an outdoor unit a test ST should be used to check that the ST has sufficient fade margin and is able to deliver the target quality of service. The test outdoor unit is usually mounted on a telescopic pole and powered from a vehicle battery a drop cable connects to the SIU and the outdoor unit is pointed in the direction of the CT .Place the outdoor unit up against the building at the position where the outdoor unit is to be fixed and slowly pan the outdoor unit though the path of the CT until a signal is received. Check that the ST can acquire a link and that a make a test call over the system.
Check for both way transmission and absence of noise and interference. If there are any problems with the reception and quality of the call then reposition the outdoor unit and repeat the process until a viable location is found.

Outdoor Unit Positioning

The mounting should be solid and firm, and the outdoor unit placed in a position where objects will not move in front of it, e.g. seasonal variations for trees (leaves, snow covering, growth), people walking across roofs, tall vehicles driving past, a new building being constructed in the line of sight, etc.
Inspect the suitability of the wall structure for the installation position of the outdoor unit mounting.
Typical acceptable structures are:-

- Secure brick walls
- Concrete cladding covered building blocks
- Metal / wooden pole, with suitable bracket.

Check how the drop cable is to enter the site and the internal drop cable run from the antenna to the internal SIU.
Before commencing with the installation, confirm with the customer the following:-

- Suitability of the outdoor unit position.
- Entry point of the drop cable to the site. Keep the drop cable short: As the I/F frequencies are attenuated by the drop cable, any significant unused length should be cut off before termination. Also, use low loss drop cable for potentially marginal installations.
- Internal cable run from entry point to the SIU.

ST W 802.11b Wireless Antenna Positioning

To maximize the wireless coverage, place the unit as centrally as possible (depending on the wireless computer's vicinity)

Power Availability

Check with the customer the suitability of the SIU position - Within 1 metre of the *AC* power outlet and within 50/75 metres of the antenna (lengths of drop cable are 50 metres or 75 metres). Ensure a good power supply for the ST: Do not connected to intermittent supplies , e.g. central heating timers. This will shorten the battery life (if fitted) considerably as it is not designed to be constantly charged and discharged.

Unpacking and Inspection

 **Important: Check Configuration**

Ensure correct software build and configuration: Check this before leaving ‘base’ as it may be time consuming or not be possible to remedy this at the customer’s site.

2. Delivery Inspection

Upon taking delivery of the equipment consignment, check that the consignment agrees in all particulars with the consignment delivery documentation (number of boxes, descriptions, contents of boxes, etc.). Any discrepancy or damage must be reported immediately to Airspan (+44 (0) 1895 467 467) for further instructions. In case of severe damage, do not accept the consignment from the carrier.

3. Unpacking Inspection

The contents of each box must be checked against the relevant part lists provided with the box, for the correct part numbers and quantities, and for damage. Any shortage or damaged items must be reported immediately to Airspan for further instructions at the address given below :

Airspan Communications Limited
Cambridge House
Oxford Rd
Uxbridge
Middlesex
UB8 1UN
Int. Tel: +44 (0) 1895 467 467 Int. Fax: +44 (0) 1895 467 472

Dispose of all unnecessary packaging in a safe manner according to the customer's requirements.

Note: It is recommended that one package carton of each type be retained should it be required to return any faulty or damaged items for repair.

Required Tools and equipment.

1. Required Tools

The following lists of tools and equipment are required to successfully install and test the Subscriber Terminal (ST) equipment.

General Tools

DESCRIPTION	MODEL	SIZE/Part No
Combination Spanner		13mm
Ratchet and Socket		17mm
Spirit Level		18 inch
Screwdriver	Pozidrive	No 1 x 75mm
Screwdriver	Pozidrive	No 2 x 199mm
Screwdriver	Pozidrive	No 3 x 150mm
Screwdriver	Flat Blade	3mm x 100mm
Hammer	Ball Pein	1lb
Drill/driver	Cordless – with depth gauge	Hilti
Drill Bit	Masonry	6mm
Drill Bit	Masonry	10mm
Ladder – Triple	Fully Extended 7 metre minimum	
ST Installation Toolkit 605-0010-313 used for Snap and Seal Connectors consisting of a Toolbox with the following Items:	RG 6 Snap and Seal Crimp Tool	166-8000-027
	RG11 Snap and Seal Crimp Tool	166-8000-030
	Stripping Tool RG6	166-8000-028
	Torque Wrench RG6	166-8000-021
	Torque Wrench RG11	166-8000-033
	Large side Cutters	166-8000-023
	Screwdriver Pozi PH3	166-8000-018
	Laminated Instruction Sheet	166-8000-031
ST Installation Toolkit 605-0010-257 consisting of a Toolbox with the following Items:	RG 6 Round Crimp Tool	166-8000-020
	RG11 Hexagonal Crimp Tool	166-8000-019
	Fixed Torque Wrench	166-8000-021
	Screwdriver Pozi PH3	166-8000-018
	Retractable Trimming Knife	166-8000-022
	Large side Cutters	166-8000-023
	12" Steel Ruler	166-8000-024
	Laminated Instruction Sheet (RG6)	166-8000-025
	Laminated Instruction Sheet (RG11)	166-8000-026

Required Equipment

The table below shows the required equipment.

ITEM	DESCRIPTION	MODEL
01	Digital Multimeter	Fluke 77 or similar
02	Test Telephone	*Note 1
03	Compass	
04 optional	STmeter	
05 optional	STMON	

Note 1: The system needs to be connected to a network switch to fully commission the STs. Installers may not be familiar with the local environment and topographical conditions, it is necessary to provide each installer with a map of the local area. A compass for use when determining the exact bearing of the *CT* location is also necessary.

Optional Equipment

The table below shows the optional equipment.

ITEM	DESCRIPTION	MODEL
optional	STmeter	Airspan Proprietary
optional	STMON	Airspan Proprietary

Installing Outdoor Unit

Installing the Wall Mount Outdoor Unit Using Bracket 605-0010-279/280.

Use this procedure to install the Outdoor Unit. Before installing the Outdoor Unit check that the proposed position meets the site selection guidelines.

Country Specific Requirements

USA: In the USA the Outdoor Unit shall be installed in accordance with articles 725, 800, 810 and 820 of the National Electrical Code
Canada: In Canada the Outdoor Unit shall be installed in accordance with section 54 of the Canadian Electrical Code

The Wall Mounting Kit comprises:

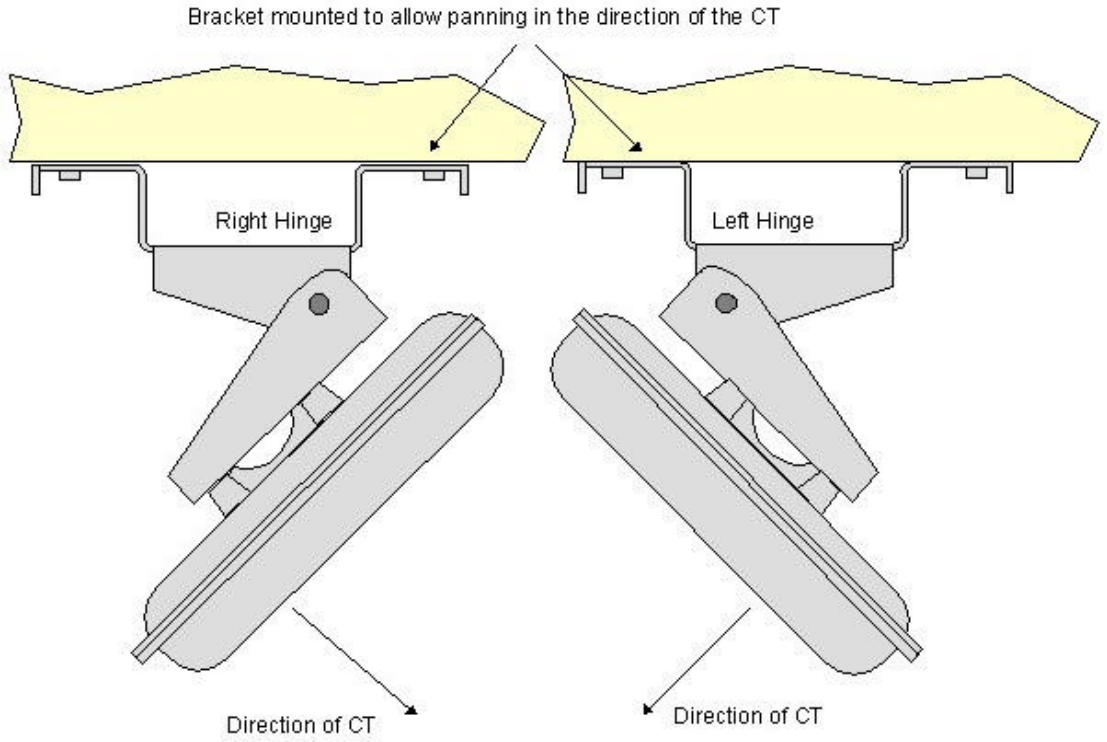
Item	Quantity	Use
Wall mounting Bracket	1	Fixed to Building
Wall Mounting Arm for T6 cable	1	Fixed to Outdoor Unit
or Wall Mounting Arm for T11 low loss cable	1	Fixed to Outdoor Unit
M8 x 20mm Bolts	2	Pivot connecting Arm and Bracket
M8 Coiled Washer	2	
M8 Plain Washer	2	
M8 x 50mm Coach Bolt	4	Fixing to wood
M8 Plain Washer	4	
M6 Dyna Bolt	4	Fixing to brick/block
M6 x 16mm Bolts	4	Mounting Outdoor Unit to arm
M6 Coiled Washer	4	
M6 Plain Washer	4	
Cable Tie	3	Securing IF Drop Cable

Outdoor Unit Positioning and Securing.

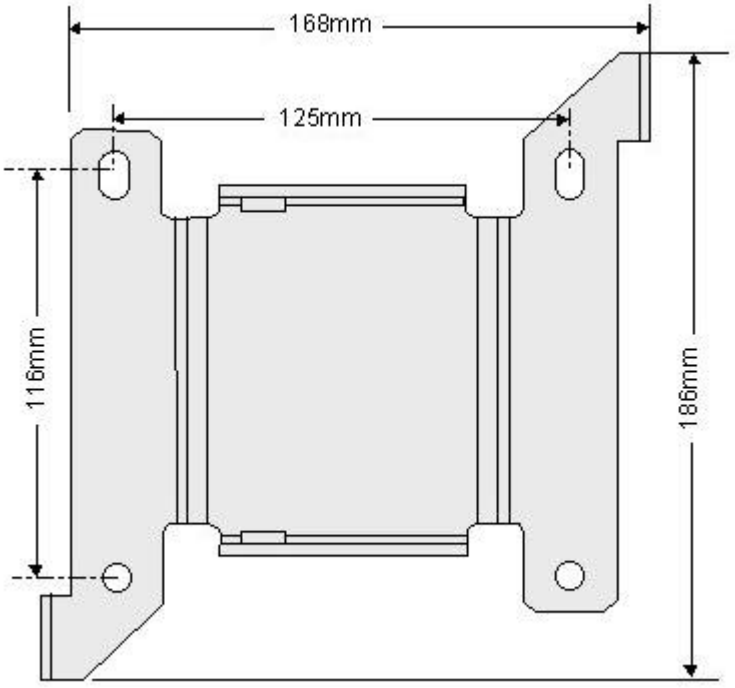
STEP PROCEDURE

1. Confirm the position of the outdoor unit ensuring that there is no obstruction in front and to either side.

2. When multiple STs are deployed at the same site the recommended minimum spacing between each outdoor unit is 1 metre.
3. The Outdoor Unit mounting bracket should be fixed so that panning can take place in the horizontal plane (i.e. pivots top and bottom). Check that line of sight with *CT* antenna does not breach the deployment rules.
4. **Note:** Leave adequate clearance around the outdoor unit wall mounting assembly to allow for the full adjustment range when aligning the antenna.
5. Locate the direction of the CT site using the survey information and decide if the outdoor unit is to hinge from the left or right to allow panning in the directions of the CT antenna. The same bracket is used for left or right hinge, Rotate the bracket to give the required orientation.



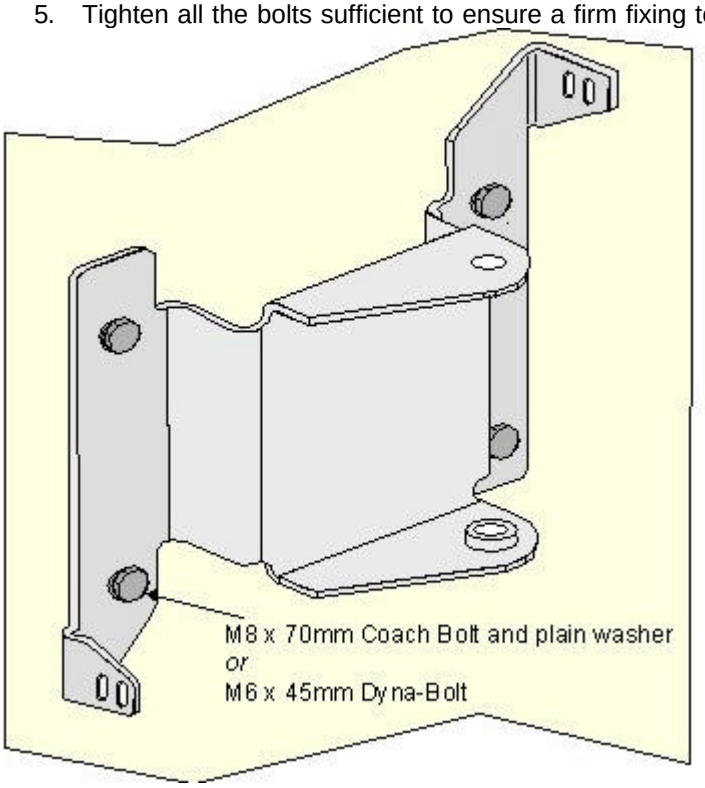
Outdoor Unit Bracket Orientation



Outdoor Unit Wall Bracket Positioning and Securing

Securing Outdoor Unit Wall Bracket to wooden structure

1. Using the wall bracket as a template, mark the first hole position.
2. Drill a first hole pilot, 5mm diameter to a depth of 15mm (use a drilling depth gauge), place the mounting bracket on the wall with the pivot hinge set for correct panning. Screw the M8 coach bolt provided through the mounting bracket into the hole. Tighten sufficiently to secure the bracket to the wall.
3. Using a spirit level, adjust the position of the wall bracket and mark the remaining 3 holes.
4. Drill the remaining pilot holes, 5mm diameter to a depth of 15mm, then fit the hex head M8 coach bolts provided through the mounting bracket into the holes.
5. Tighten all the bolts sufficient to ensure a firm fixing to the wall.



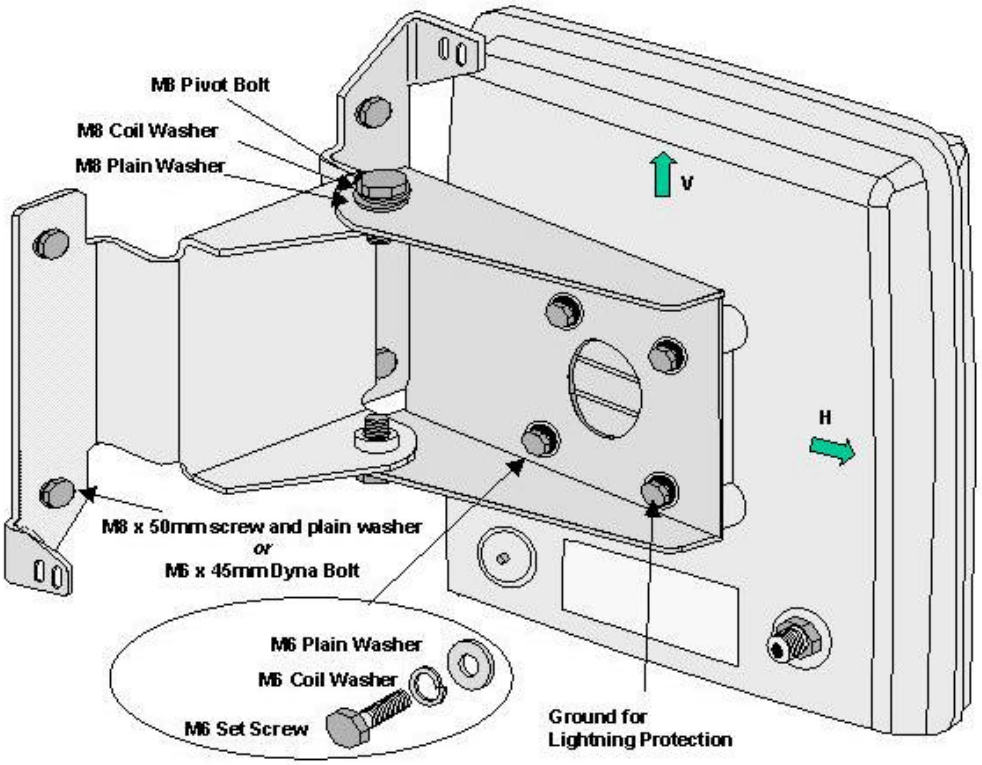
Securing Outdoor Unit Wall Bracket to brick/block structure

1. Using the wall bracket as a template, mark the first hole position. Where the Outdoor Unit is to be mounted to a brick built building, try to ensure that each hole coincides with the middle of a brick and not the mortar course.
2. Drill the first hole, 8mm diameter to a depth of 45mm (use a drilling depth gauge), place the mounting bracket on the wall and then fit the hex head M6 Dyna Bolt provided through the mounting bracket into the hole. Tighten sufficiently to secure the bracket to the wall.
3. Using a spirit level, adjust the position of the wall bracket and mark the remaining three holes.
4. Drill the remaining holes, 8mm diameter to a depth of 45mm, then fit the hex head M6 Dyna Bolt provided through the mounting bracket into the hole.
5. Tighten all the bolts sufficient to ensure a firm fixing to the wall.

Fixed wall mounting bracket

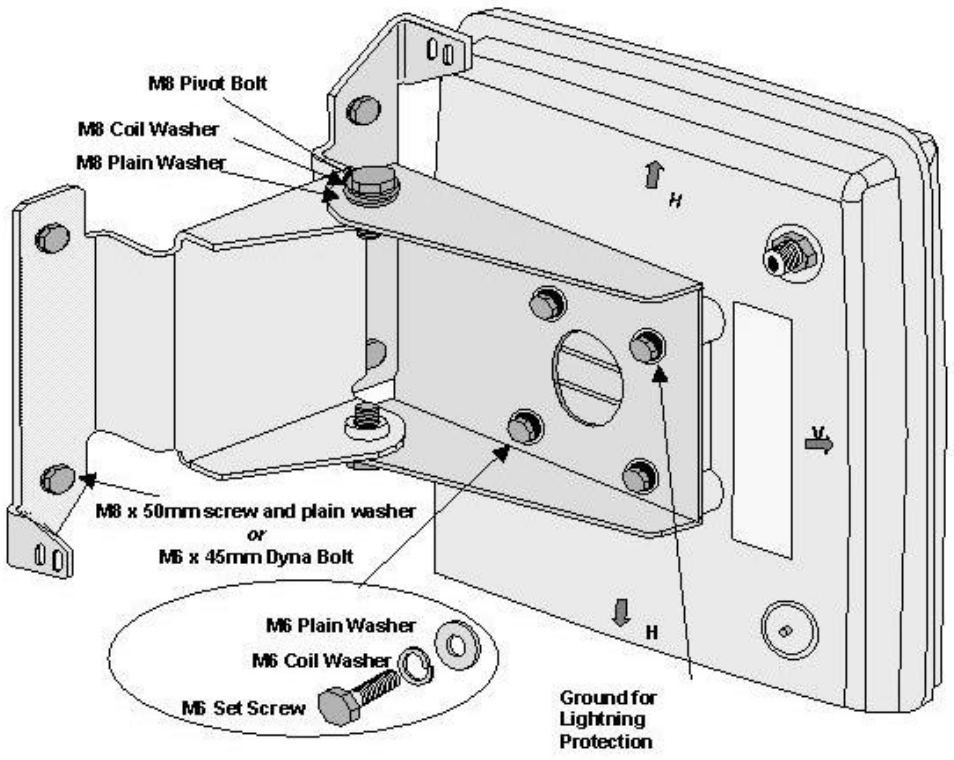
1. Assembling arm and bracket

2. If the outdoor unit is to be fed with the T10 low loss cable it is necessary to fit wall extended mounting arm part to accommodate the larger bend radius of the cable.
3. The outdoor unit should be fitted to the mounting arm. The orientation of the antenna is dependant on the polorisation of the signal. The figure below shows the outdoor unit mounted in the normal position (vertically polarised).The V marked on the outdoor unit should be pointed up. The V is marked on both sides of the outdoor unit to facilitate for left or right pivots on the bracket.
4. If the CT Antenna is horizontally polarised then the outdoor unit is rotated through 90 and mounted as shown in the figure below with the H mark pointed up. . The H is marked on both sides of the outdoor unitto facilitate for left or right pivots on the bracket.



Wall Mounted Outdoor Unit Vertical polarisation

5. If the CT antenna is horizontally polarised then the outdoor unit is rotated through 90 and mounted with the H mark pointed up. . The H is marked on both sides of the outdoor unit to facilitate for left or right pivots on the bracket as shown in the figure below. Secure the outdoor unit radium to the outdoor unit mounting bracket using four M6*20mm hex head set screws, 6mm flat and 6mm coiled washers as shown in the relevant figure mentioned above. Tighten the set screws to a torque of 1.75Nm.

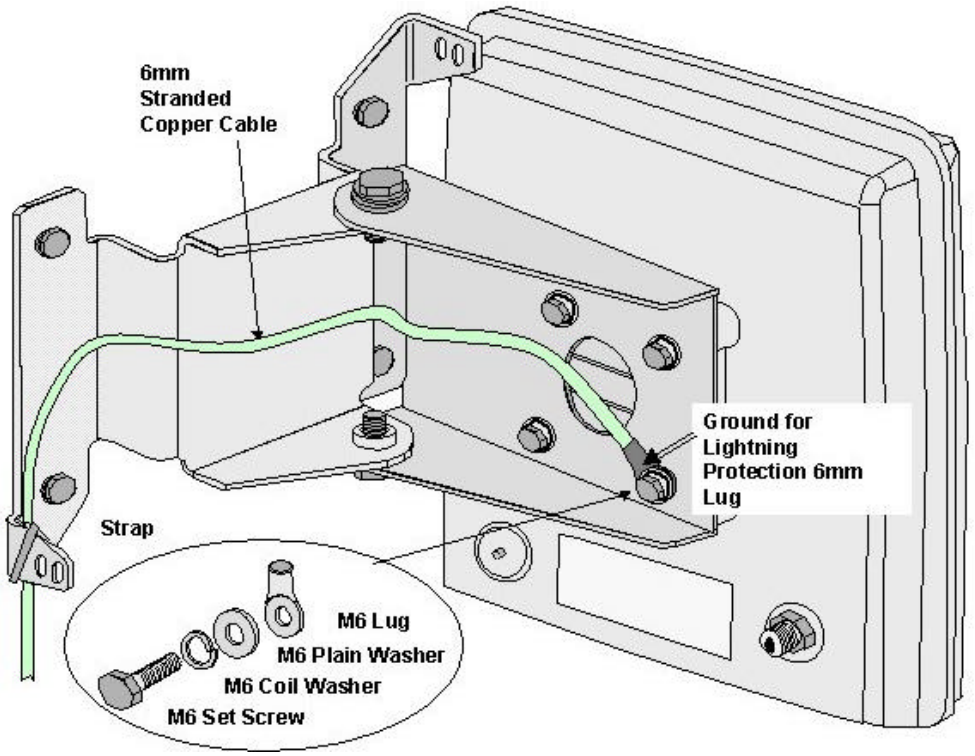


Wall Mounted Outdoor Unit horizontal polarisation

6. Join the two halves of the bracket together using a bolt, spring washer, and plain washer to top and bottom pivots.
7. Rotate the outdoor unit to face in the general direction of the CT. At this stage, only finger tighten the pivot bolts.

Lightning Protection

1. When the outdoor unit is attached to two / three floor dwellings lightning protection should not be needed. If the outdoor unit is situated in an exposed position i.e on the top of a multi-storey building the outdoor unit should be grounded.
2. Run a stranded copper cable from the outdoor unit to a protection earth point i.e building earth halo or earth provided specifically for lightning protection. The earth connection from the antenna shall be a minimum of 10 AWG (6 mm2) copper wire in accordance with UL 96 and 96A. The antenna drop cable shall be run separately from the earth cable and any cables carrying hazardous voltages.
3. Secure the cable to the pole using straps and cleats as required
4. Fit a 6mm lug to the cable at the antenna end. Attach to the pole mount bracket using the lower right M6 set screw as shown in figure below.



Lightning Protection for Exposed Bracket Mounted Outdoor Unit

5. Connect to the earth point in accordance with local practice.

If the above steps are followed any lightning strike on the antenna mounting bracket should be discharged safely to earth. Direct strikes on the outdoor unit may cause damage to the internal components of the antenna and it is also possible that the charge may damage components in the SIU. The addition of a master socket fitted with discharge tubes should protect internal wiring and customers premise equipment from damage.

Installing the Outdoor Unit Using Bracket 605-0010-283

Use this procedure to install the outdoor unit. Before installing the 0utdoor Unit check that the proposed position meets the site selection guidelines.

Country Specific Requirements

USA: In the USA the outdoor unit shall be installed in accordance with articles 725, 800, 810 and 820 of the National Electrical Code

Canada: In Canada the outdoor unit shall be installed in accordance with section 54 of the Canadian Electrical Code

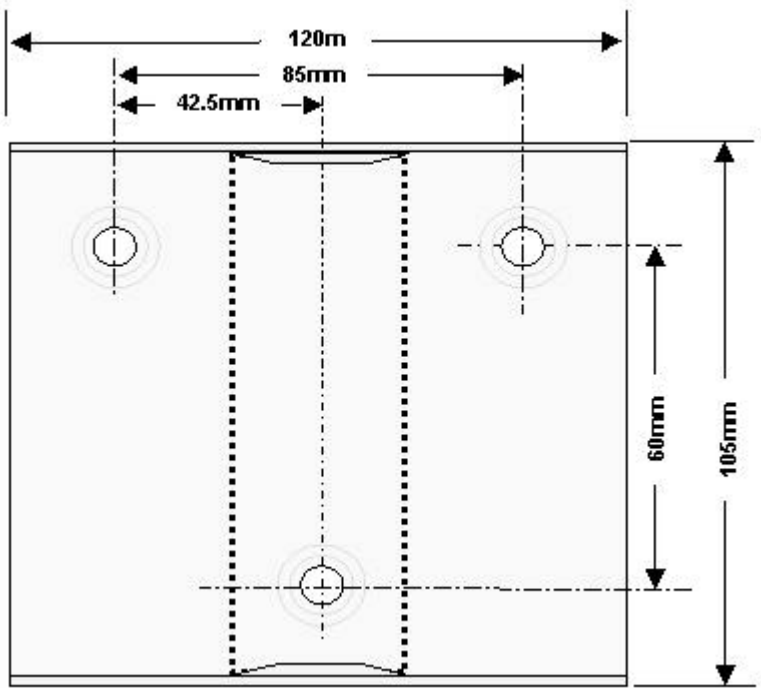
The Wall Mounting Kit comprises:

Item	Quantity	Use
Wall mounting Bracket	1	Fixed to Building
M8 x 50mm Coach Bolt	4	Fixing to wood
M8 Plain Washer	4	
M6 Dyna Bolt	4	Fixing to brick/block
Cable Tie	3	Securing IF Drop Cable

Outdoor Unit Positioning and Securing.

STEP PROCEDURE

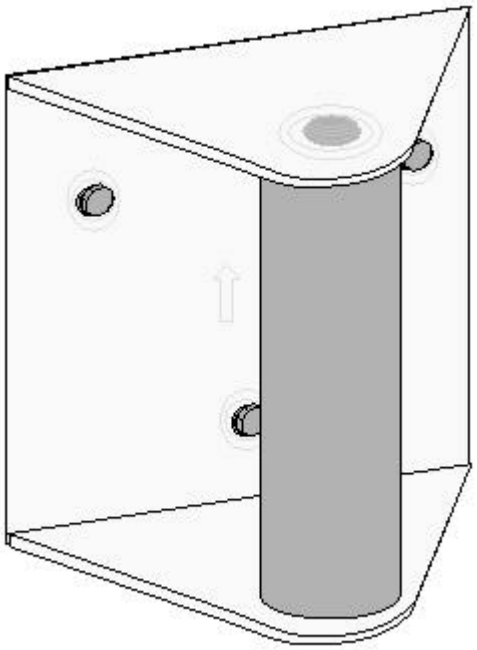
1. Confirm the position of the outdoor unit ensuring that there is no obstruction in front and to either side.
2. When multiple STs are deployed at the same site the recommended minimum spacing between each outdoor unit is 1 metre.
3. The outdoor unit mounting bracket should be fixed so that panning can take place in the horizontal plane (i.e. pole vertical). Check that line of sight with the Central Terminal (CT) antenna does not breach the deployment rules.
4. Note: Leave adequate clearance around the outdoor unit wall mounting assembly to allow for the full adjustment range when aligning the outdoor unit with the CT.



Antenna Wall Bracket Positioning and Securing

Securing Antenna Wall Bracket to a Wooden Structure

1. Remove mini pole from bracket by unscrewing and removing the locating bolt and pulling the pole clear of the bracket. The pole snaps onto the bracket and some force is required to remove it.
2. Using the wall bracket as a template, mark the first hole position.
3. Drill a first hole pilot, 5mm diameter to a depth of 15mm (use a drilling depth gauge), place the mounting bracket on the wall with the arrow embossed on the back plate pointing up. Screw the M8 coach bolt provided through the mounting bracket and screw into the hole. Tighten sufficiently to secure the bracket to the wall.
4. Using a spirit level, adjust the position of the wall bracket and mark the remaining 3 holes.
5. Drill the remaining pilot holes, 5mm diameter to a depth of 15mm, then fit the hex head M8 coach bolts provided through the mounting bracket into the holes.
6. Tighten all the bolts sufficient to ensure a firm fixing to the wall.

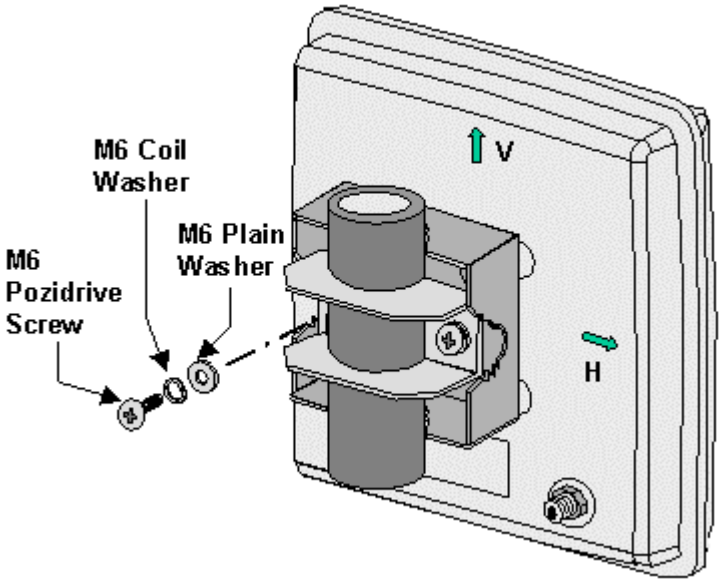


Securing Outdoor Unit Wall Bracket to brick/block structure

1. Remove mini pole from bracket by unscrewing and removing the locating bolt and pulling the pole clear of the bracket. The pole snaps onto the bracket and some force is required to remove it.
2. Using the wall bracket as a template, mark the first hole position. Where the outdoor unit is to be mounted to a brick built building, try to ensure that each hole coincides with the middle of a brick and not the mortar course.
3. Drill the first hole, 8mm diameter to a depth of 45mm (use a drilling depth gauge), place the mounting bracket on the wall and then fit the hex head M6 Dyna Bolt provided through the mounting bracket into the hole. Tighten sufficiently to secure the bracket to the wall.
4. Using a spirit level, adjust the position of the wall bracket and mark the remaining three holes.
5. Drill the remaining holes, 8mm diameter to a depth of 45mm, then fit the hex head M6 Dyna Bolt provided through the mounting bracket into the hole.
6. Tighten all the bolts sufficient to ensure a firm fixing to the wall.

Attaching Antenna to Stub Pole

1. The outdoor unit should be fitted to the mounting pole. The orientation of the outdoor unit is dependant on the polorisation of the signal The figure below shows the outdoor unit mounted in the normal position (vertically polarised). The V marked on the outdoor unit should be pointed up. The V is marked on the top and bottom of the outdoor unit. The polarisation must agree with that of the CT or the ST cannot receive a signal.
2. If the CT Antenna is horizontally polarised then the outdoor unit is rotated through 90 and mounted as shown in the figure below with the H mark pointed up. The H is marked on the top and bottom of the outdoor unit.

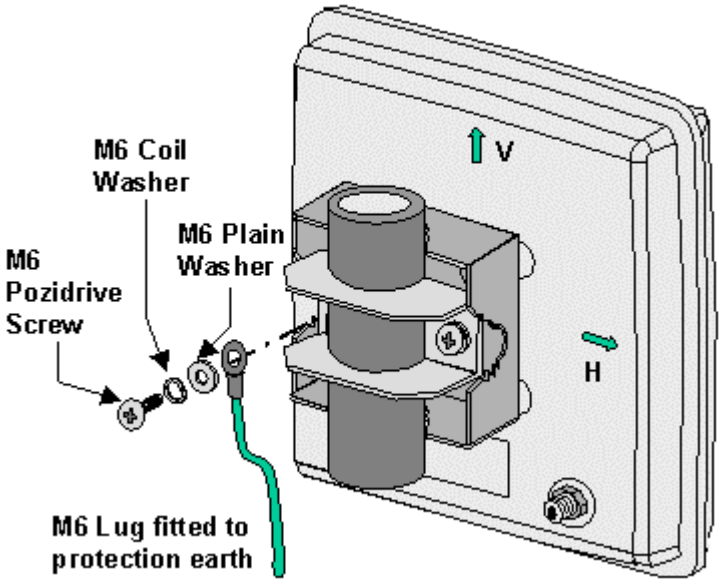


Mounting Outdoor Unit (vertical polarisation)

3. Attach the pole to the bracket as shown in the illustration above. Fully tighten onto the pole.
4. Fix the pole to the bracket. The pole snaps into place and the bracket may need easing slightly to allow the pole to pass over the raised dome, Place the coach bolt through the bracket from the top so that the square shank locates into the square hole in the bracket.
5. Rotate the outdoor unit to face in the general direction of the CT. Place the washer faced self locking nut onto the bolt and tighten sufficiently to secure the pole in place. The nut will be finally tightened when panning at the commissioning stage

Lightning Protection

1. When the outdoor unit is attached to two / three floor dwellings lightning protection should not be needed. If the outdoor unit is situated in an exposed position i.e on the top of a multi-storey building the outdoor unit should be grounded.
2. Run a stranded copper cable from the antenna to a protection earth point i.e building earth halo or earth provided specifically for lightning protection. The earth connection from the outdoor unit shall be a minimum of 10 AWG (6 mm2) copper wire in accordance with UL 96 and 96A. The outdoor unit drop cable shall be run separately from the earth cable and any cables carrying hazardous voltages.
3. Secure the cable to the pole using straps and cleats as required
4. Fit a 6mm lug to the cable at the antenna end. Attach to the pole mount bracket using the lower right M6 set screw as shown in figure below.



Lightning Protection for Exposed Bracket Mounted Outdoor Unit

5. Connect to the earth point in accordance with local practice.

If the above steps are followed any lightning strike on the outdoor unit mounting bracket should be discharged safely to earth. Direct strikes on the antenna may cause damage to the internal components of the outdoor unit and it is also possible that the charge may damage components in the SIU. The addition of a master socket fitted with discharge tubes should protect internal wiring and customers premise equipment from damage.

Installing The Pole Mount Outdoor Unit .

Use this procedure to install the outdoor unit. The mounting pole is not an Airspan supplied item and the pole should be manufactured to suit local requirements. Before installing the outdoor unit check that the proposed position meets the site selection guidelines.

Country Specific Requirements

USA: In the USA the outdoor unit shall be installed in accordance with articles 725, 800, 810 and 820 of the National Electrical Code
Canada: In Canada the outdoor unit shall be installed in accordance with section 54 of the Canadian Electrical Code

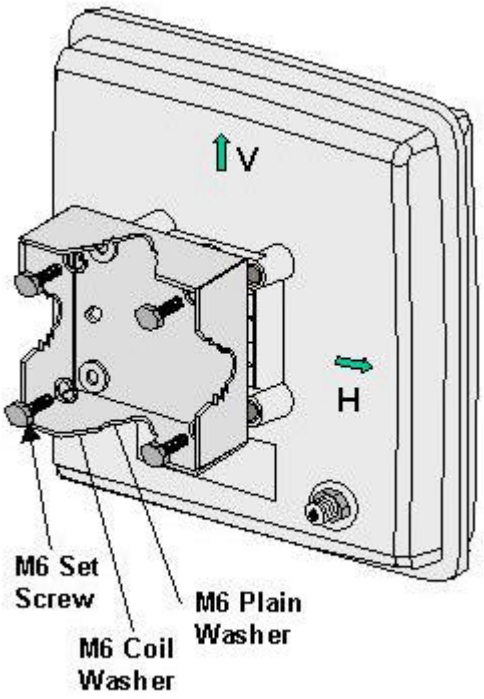
The Pole Mounting Kit comprises:

Item	Quantity
Ooutdoor Unit Bracket	1
Pole Bracket	1
M6 x 50mm Bolts or M6 x 60mm Bolts	4
M6 Coiled Washer	4
M6 Plain Washer	4
Cable Tie	3

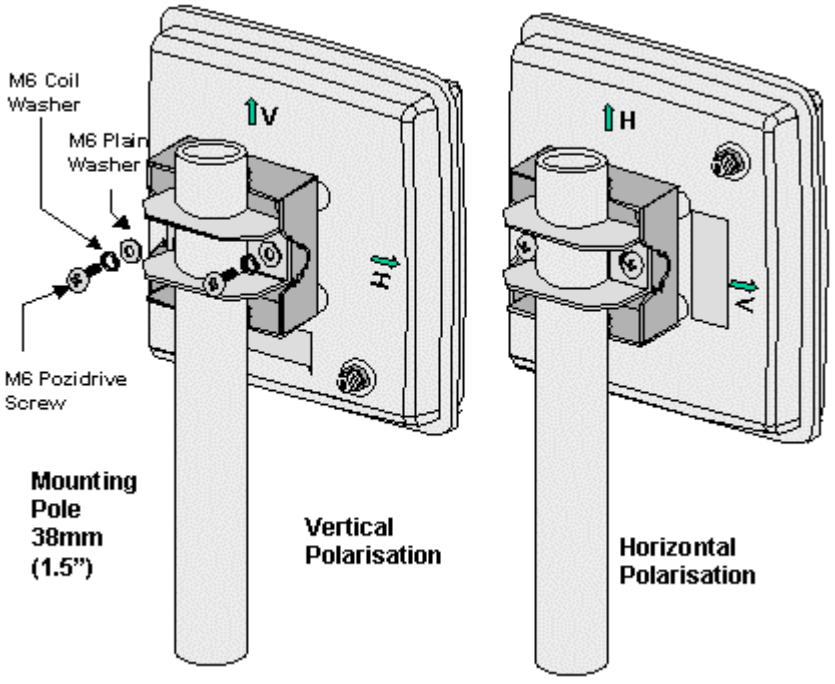
Outdoor Unit Positioning and Securing .

STEP PROCEDURE

1. Confirm the position of the outdoor unit ensuring that there is no obstruction in front and to either side.
2. When multiple STs are deployed at the same site the recommended minimum spacing between each outdoor unit is 1 metre.
3. The outdoor unit mounting pole should be fixed so that outdoor unit panning can take place in the horizontal plane and check that line of sight with *CT* antenna does not breach the deployment rules. The outdoor unit mounting pole is locally provided and should be 38mm or 1.5" in diameter. The pole should be fixed according to the pole manufacturers' instructions.
   Note: Leave adequate clearance around the outdoor unit assembly to allow for the full adjustment range when aligning the outdoor unit.
4. Secure the outdoor unit radium to the mounting pole bracket using the four M6*50mm hex head set screws, 6mm flat, and 6mm coiled washers as shown below. Some outdoor units have the bracket factory fitted.



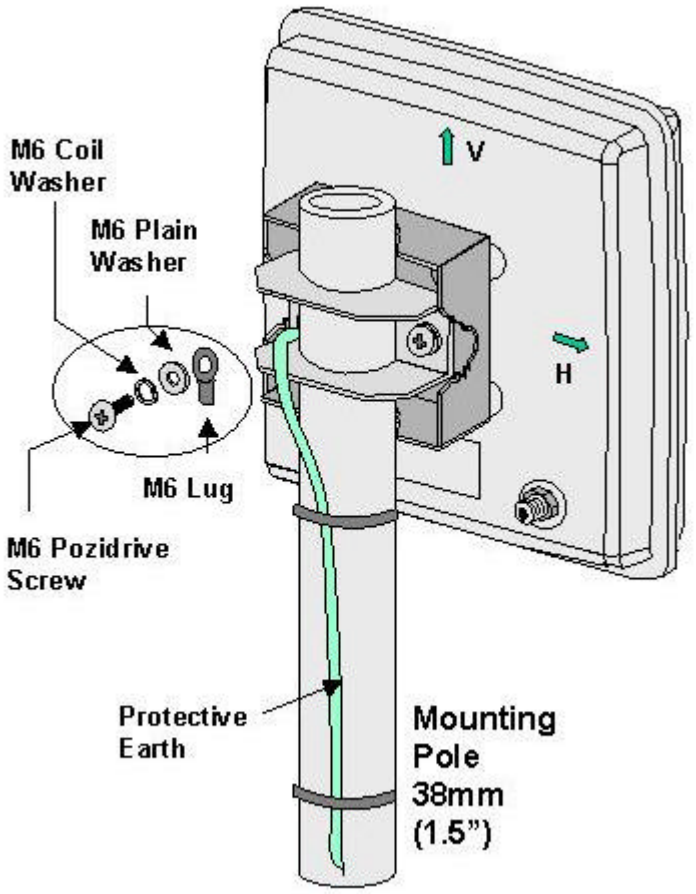
5. For poles 32-38mm secure the antenna radium to the mounting pole using the clamp bracket secured by two M6*50mm Pozidrive screws, 6mm flat, and 6mm coiled washers as shown below. Tighten the set screws to a torque of 1.75Nm.
   For poles 38-45mm secure the antenna radium to the mounting pole using the clamp bracket secured by two M6*60mm Pozidrive screws, 6mm flat, and 6mm coiled washers as shown below. Tighten the set screws to a torque of 1.75Nm.
   Vertical Polarisation
   The V marked on the outdoor unit should be pointed up. The V is marked on both sides of the outdoor unit to facilitate for left or right cable entry.
   Horizontal Polarisation
   The H marked on the outdoor unit should be pointed up. The V is marked on both sides of the outdoor unit to facilitate for top or bottom entry



6. Rotate the outdoor unit to face in the general direction of the CT. At this stage, only tighten the pivot bolts sufficient to stop the outdoor unit sliding down the pole.

Lightning Protection

1. When the outdoor unit is attached to two / three floor dwellings lightning protection should not be needed. If the outdoor unit is situated in an exposed position i.e on the top of a multi-storey building the outdoor unit should be grounded.
2. Run a stranded copper cable from the outdoor unit to a protection earth point i.e building earth halo or earth provided specifically for lightning protection. The earth connection from the outdoor unit shall be a minimum of 10 AWG (6 mm2) copper wire in accordance with UL 96 and 96A. The outdoor unit drop cable shall be run separately from the earth cable and any cables carrying hazardous voltages.
3. Secure the cable to the pole using straps and cleats as required.
4. Fit a 6mm lug to the cable at the antenna end. Attach to the pole mount bracket using the lower right M6 set screw as shown below.
5. Connect to the earth point in accordance with local practice.



Lightning Protection for Exposed Pole Mounted Antenna

If the above steps are followed any lightning strike on the outdoor unit mounting bracket should be discharged safely to earth. Direct strikes on the outdoor unit may cause damage to the internal components of the outdoor unit and it is also possible that the charge may damage components in the SIU. The addition of a master socket fitted with discharge tubes should protect internal wiring and customers premise equipment from damage.

Installing the IF Unit for External Antenna

Use this procedure to install the IF unit when attaching an external antenna (usually not supplied by Airspan). These antennas are used when a) additional gain is required to increase system range. or b) improved isolation to interference is required by narrowing antenna beamwidths. The mounting pole is not an Airspan supplied item and the pole should be manufactured to suit local requirements. Before installing the antenna check that the proposed position meets the site selection guidelines.

Country Specific Requirements

USA: In the USA the antenna shall be installed in accordance with articles 725, 800, 810 and 820 of the National Electrical Code
Canada: In Canada the antenna shall be installed in accordance with section 54 of the Canadian Electrical Code

External antenna specific requirements

Impedance = 50ohms
Outdoor unit connector type = N-type
VSWR (max) =1.5:1
Signal power (max) = 200mw

The IF unit mounting kit comprises:

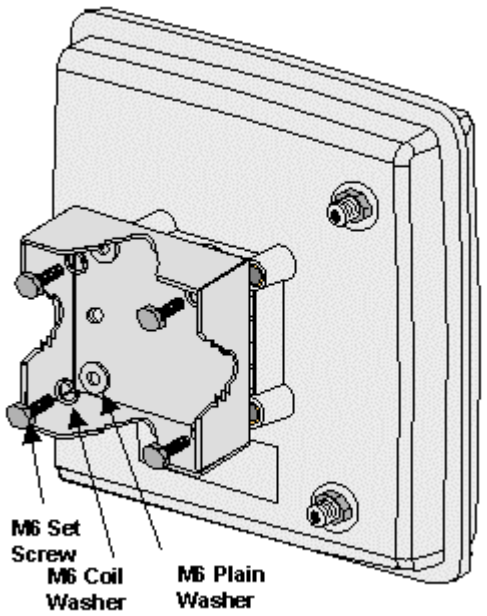
IF Unit

Item	Quantity
Pole Bracket	1
M6 x 50mm Bolts	4
M6 Coiled Washer	4
M6 Plain Washer	4
Rubber Boot	2
Cable Tie	3

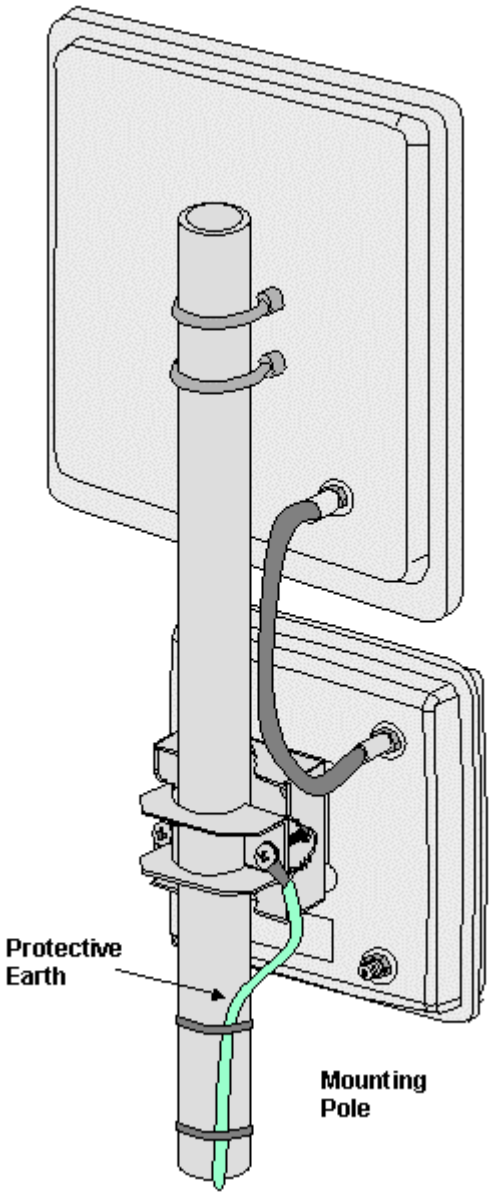
IF Unit Positioning and Securing.

STEP PROCEDURE

1. Confirm the position of the antenna ensuring that there is no obstruction in front and to either side.
2. When multiple STs are deployed at the same site the recommended minimum spacing between each antenna is 1 metre.
3. The antenna mounting pole should be fixed so that antenna panning can take place in the horizontal plane and check that line of sight with CT antenna does not breach the deployment rules. The antenna mounting pole is locally provided and should be 38mm or 1.5" in diameter. The pole should be fixed according to the pole manufacturers' instructions.
4. Note: Leave adequate clearance around the antenna assembly to allow for the full adjustment range when aligning the antenna.
5. Secure the IF unit to the mounting bracket using the pole bracket secured by four M6*50mm hex head set screws, 6mm flat, and 6mm coiled washers as shown in the figure below. Tighten the set screws to a torque of 1.75Nm



6. Secure the IF unit to the pole using the other part of the mounting bracket using M6 Crosshead screws
7. Secure the IF unit to the mounting bracket using the pole bracket using the mounting brackets and instructions provided with the external antenna.
8. Rotate the antenna to face in the general direction of the CT. At this stage, only tighten the pivot bolts sufficient to stop the antenna sliding down the pole. After panning tighten the nuts to the torque specified by the antenna manufacturer
9. Using a connecting cable plug the N-Type connectors into the connector on the rear plate of the antenna and the IF unit. The length of cable between the IF unit and the antenna is dependant on the losses allowable in the link budget. Important Notice: Care should be taken when screwing the N-Type connector into the connector on the rear plate of the antenna to ensure that the connector is not over-tightened as over-tightening will strip the thread. .
10. Use the rubber boot to seal the cable connections at the IF unit and wrap self amalgamating tape over the joint of the mated connectors to the antenna. When using self amalgamating tape, strip back the interleaving and stretch the tape by between one third and one half. Keep the tape under tension and wrap, overlapping successive layers by 50% until the desired build up of insulation is achieved. Finish the wrapping by holding the tape under the thumb and snap by stretching. The high degree of stretch as described above prevents the inclusion of voids and ensures rapid amalgamation



Typical External Antenna Installation

Lightning Protection

1. When the antenna is attached to two / three floor dwellings lightning protection should not be needed. If the antenna is situated in an exposed position i.e. on the top of a multi-storey building the antenna should be grounded.
2. Run a stranded copper cable from the outdoor unit to a protection earth point i.e building earth halo or earth provided specifically for lightning protection. The earth connection from the outdoor unit shall be a minimum of 10 AWG (6 mm2) copper wire in accordance with UL 96 and 96A. The outdoor unit drop cable shall be run separately from the earth cable and any cables carrying hazardous voltages.
3. Secure the cable to the pole using straps and cleats as required
4. Fit a 6mm lug to the cable at the outdoor unit end. Attach to the pole mount bracket using the lower right M6 set screw
5. Connect to the earth point in accordance with local practice.

Installing Drop Cable

Drop Cable Installation

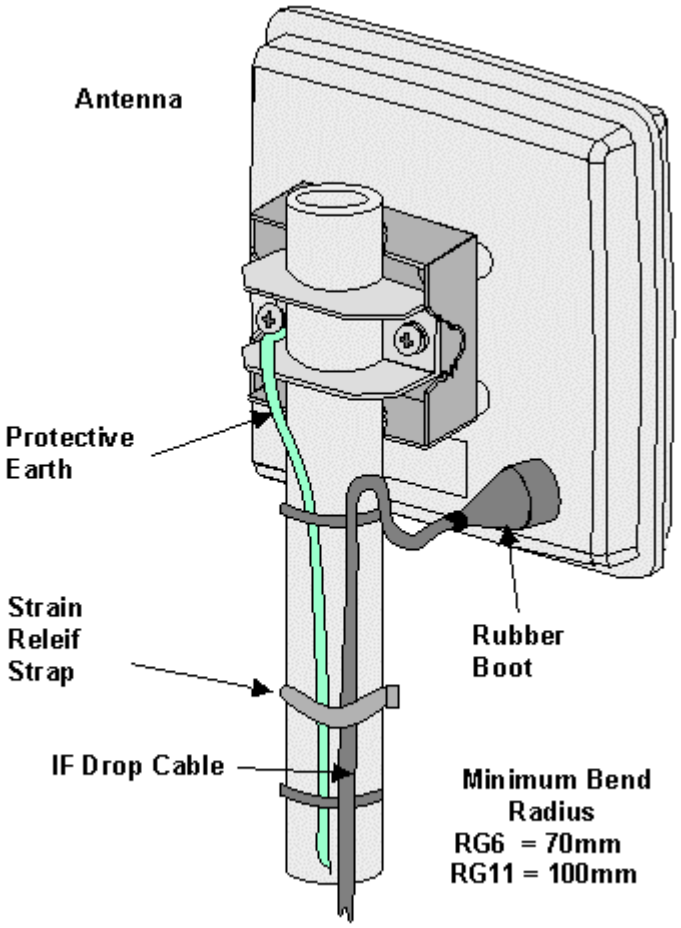
Drop cable is provided in two types 6 Series and 11 Series (low loss). Use this procedure to install the drop cable.

STEP PROCEDURE

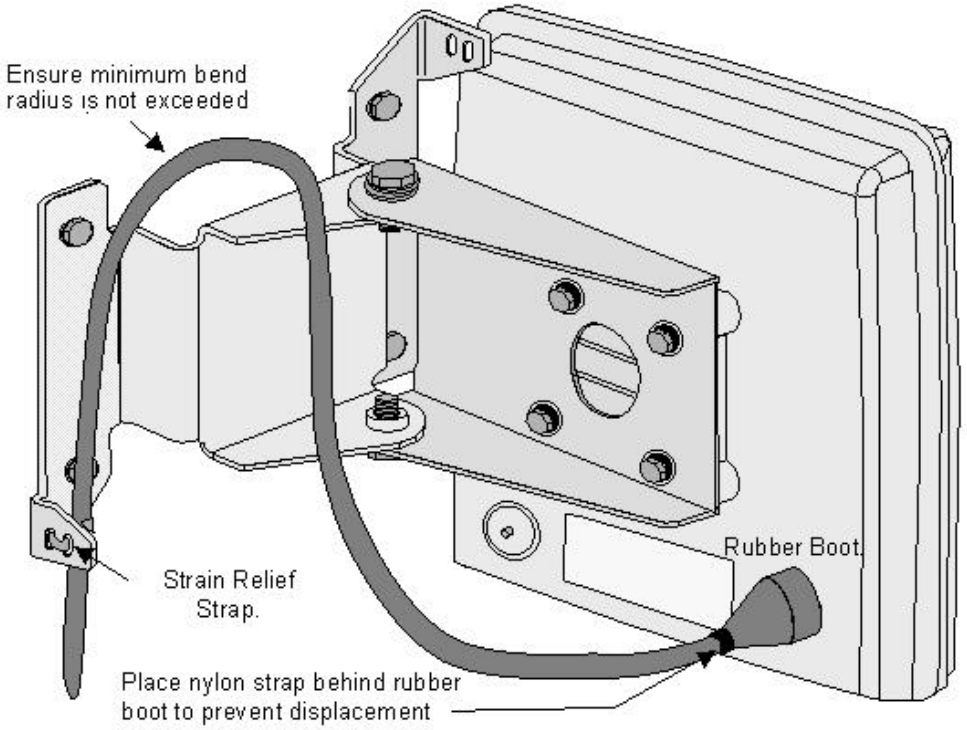
1. The drop cable is normally provided with one end already terminated with an weather proofed F-Type connector for use at the Outdoor Unit. The cable is manufactured in three lengths (25, 50 and 75metres) and an appropriate length should be selected. In some circumstances cable is provided on 300metre drums and both ends of the cable are terminated during installation.
2. If the drop is not pre-terminated and requires an F type terminating at the outdoor unit end. It is suggested that the F-Type connector is terminated to the free end of the cable before running the cable. See Drop Cable Termination (6 series) or Drop Cable Termination (11 series)
3. The cable is installed starting from the antenna end leaving the free end of the cable to be finally dressed into place and cut to length for neat connection with the power supply unit.
4. Run the drop cable from the outdoor unit end to the F-Type connector to the SIU.
5. The maximum drop cable distance between the SIU and the outdoor unit must not exceed the length of the drop cable (50 or 75 metres).
6. The 6 series cable has a minimum bend radius of 70mm. The 11 series cable has a minimum bend radius of 100 mm
7. Secure the drop cable to the antenna mounting bracket or pole using straps. Leave sufficient slack to allow for antenna panning at the commissioning stage.
8. Secure along the drop with 7mm cleats as required. Ensure that a drip loop is formed at the point where the cable enters the building to avoid the ingress of water into the building.
9. Plug the F-Type connector into the connector on the rear plate of the outdoor unit. Important Notice: Care should be taken when screwing the F-Type connector into the connector on the rear plate of the outdoor unit to ensure that the connector is not over-tightened as over-tightening will strip the thread. Use a torque spanner set to 2.3Nm. See figures below for pole mount and for wall mount installation.
10. a) **Use rubber boot** to provide environmental seal if provided as part of the installation kit Push the rubber boot over the connector and ensure that it mates properly with the raised plastic ring on the outdoor unit housing. Once the boot is in place a tie wrap should be placed around the cable behind the boot to ensure that the boot does no become displaced.

    or

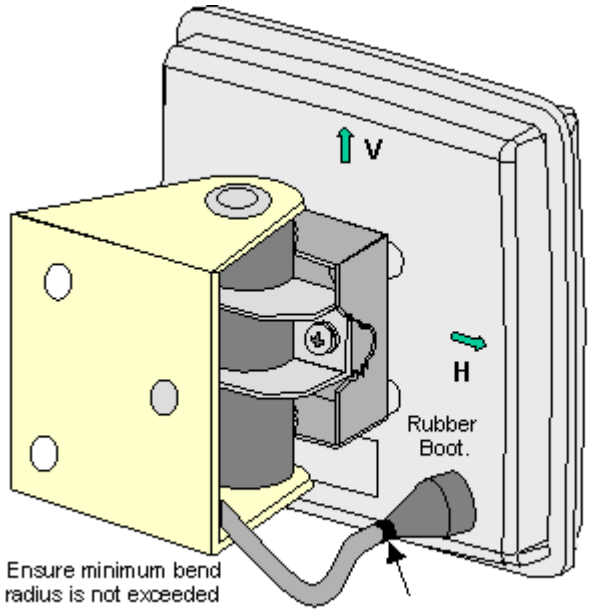
    b) **Wrap self amalgamating tape** over the joint of the mated connector. When using self amalgamating tape, strip back the interleaving and stretch the tape by between one third and one half. Keep the tape under tension and wrap, overlapping successive layers by 50% until the desired build up of insulation is achieved. Finish the wrapping by holding the tape under the thumb and snap by stretching. The high degree of stretch as described above prevents the inclusion of voids and ensures rapid amalgamation.
11. Run cable end up to the SIU. Estimate the length of end required for termination of cable (allow 150mm of conductor for a maintenance re-termination of cable) and cut cable to length.
12. Terminate the drop cable. For termination instructions see Drop Cable Termination (6 Series) or Drop Cable Termination (11 Series)



Outdoor unit and Drop Cable fixed to a Mounting Pole



Outdoor Unit and Drop Cable fixed to a Wall Mounting Bracket

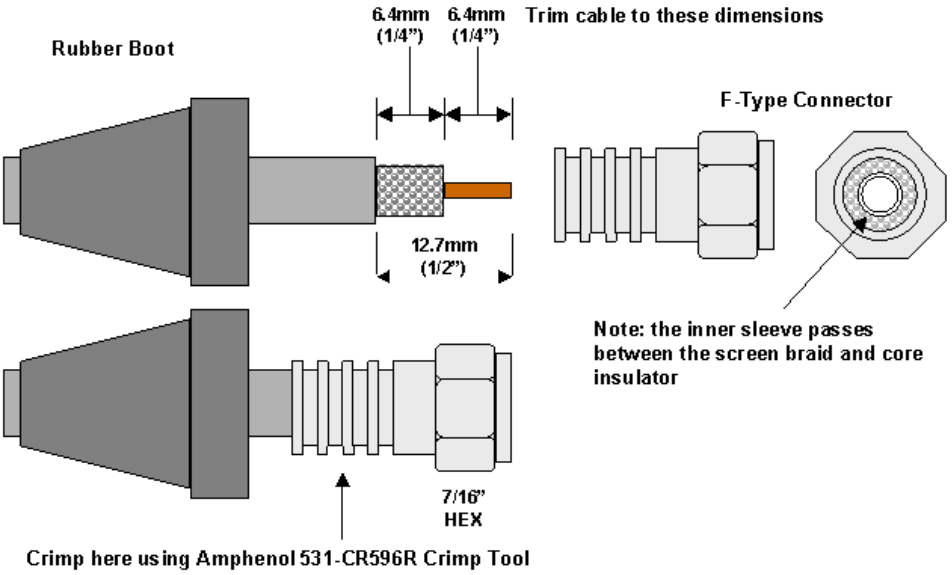


Tie wrap strap behind rubber boot to prevent displacement

Drop Cable Termination Using Crimp Type Connectors

Termination of 6 series drop cable

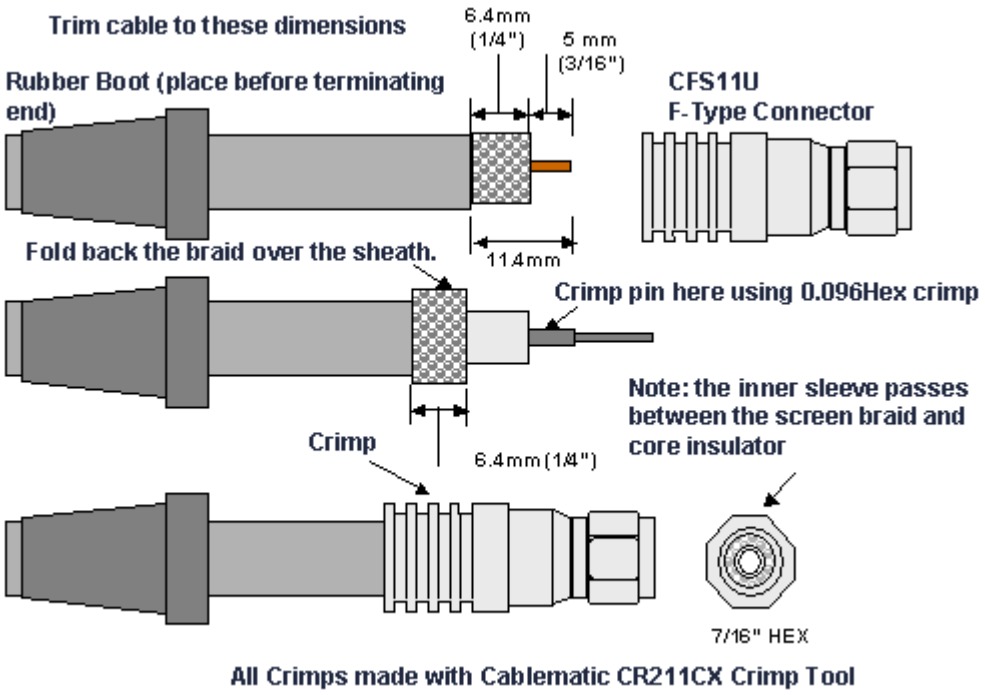
1. If at the antenna end of the drop cable place a rubber boot over the end of the cable. The boot is not required at the SIU.
2. Strip the drop cable using a knife or cable stripping tool to the dimensions shown below.
3. Place the connector over the cable end ensuring that the inner sleeve passes between the inner core and screen braid
4. Crimp the connector using the RG6 round crimp tool contained in the ST installation tool box or a Amphenol 531-CR596R crimp tool.



Terminating F-Type Connectors to 6 Series cable

Termination of 11 series drop cable

1. If at the outdoor unit end of the drop cable place a rubber boot over the end of the cable. The boot is not required at the SIU.
2. Strip the drop cable using a knife or cable stripping tool to the dimensions shown in figure below
3. Fold back the braid against the cable sheath.
4. Ensure that the centre conductor is clean of dielectric residue. Push the crimp pin over the end of the centre conductor until the pin bottoms against the dielectric, then crimp the pin to the centre conductor with the 0.96 Hex crimp on the.RG11 hexagonal crimp tool contained in the ST installation tool box.
5. Insert the cable into the connector ensuring the pin is through the hole of the insulator at the bottom of the nut. Continue inserting the cable into the connector until it bottoms out. Crimp the connector with the 0.475 hex crimp to retain the cable.

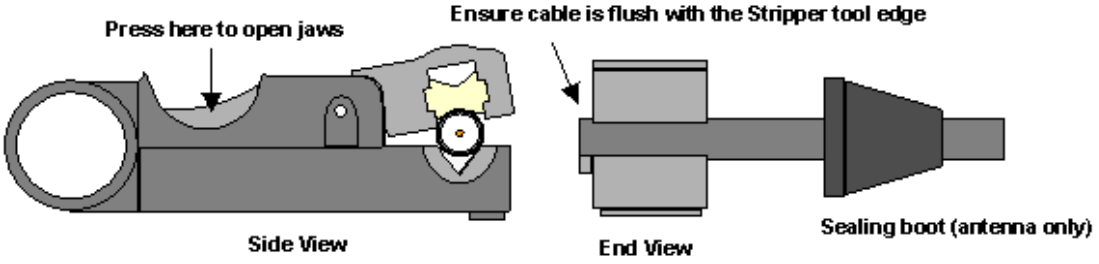


Terminating F-Type Connectors to 11 series cable

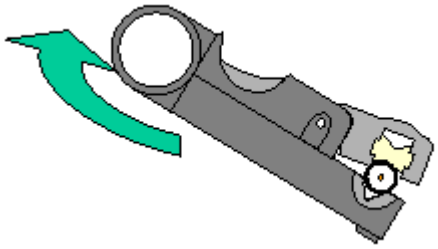
Drop Cable Termination Snap and Seal Connectors

Termination of 6 Series Drop Cable

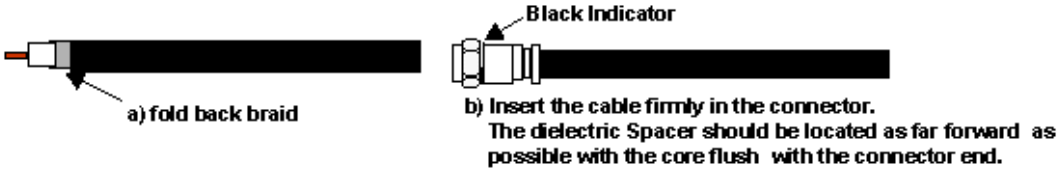
1. Place cable into jaws of the stripper tool (if at outdoor unit end place sealing boot over the cable first).



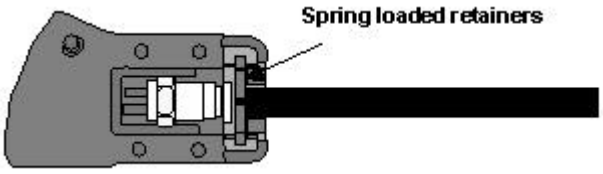
2. Rotate tool 4 turns clockwise then 2 turns anti-clockwise.



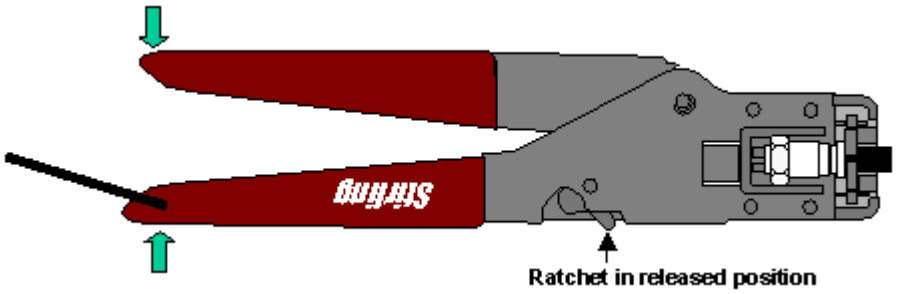
3. a) Remove cable from the stripper tool, discard waste and fold back braid.
   b) insert cable firmly into the connector as far as possible.



4. Place connector in activator tool by pushing firmly against the spring loaded retainers.



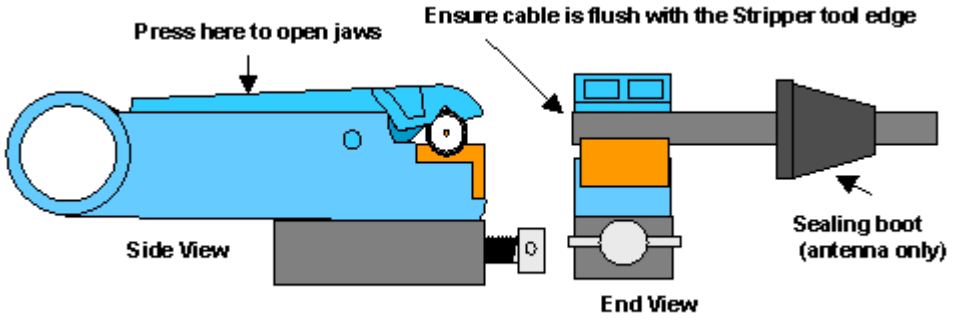
5. Close the handles until the ratchet releases. The black indicator should not be visible if the connector is correctly crimped.



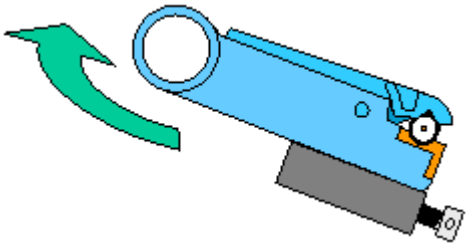
6. Remove cable from the activator tool.

Drop Cable Termination using RG11 Snap and Seal Connectors

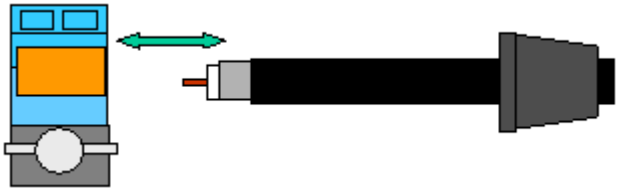
1. Place cable into jaws of the stripper tool (if at outdoor unit end place sealing boot over the cable first).



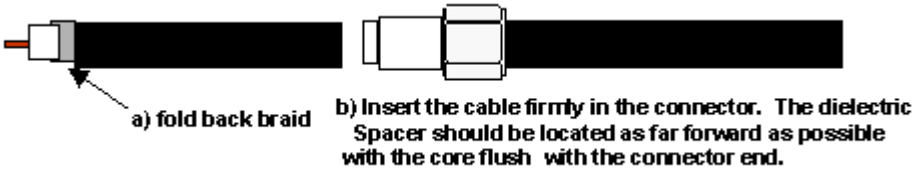
2. Rotate tool 4 turns clockwise then 2 turns anti-clockwise



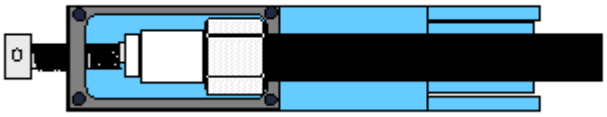
3. Grasp tool firmly and pull cable from the tool to expose braid and centre conductor.



4. A) Fold back braid over the jacket.
   B) insert cable firmly into the connector as far as possible.



5. Place connector in activator tool and turn spindle to a positive stop.



6. Remove cable from the activator tool.

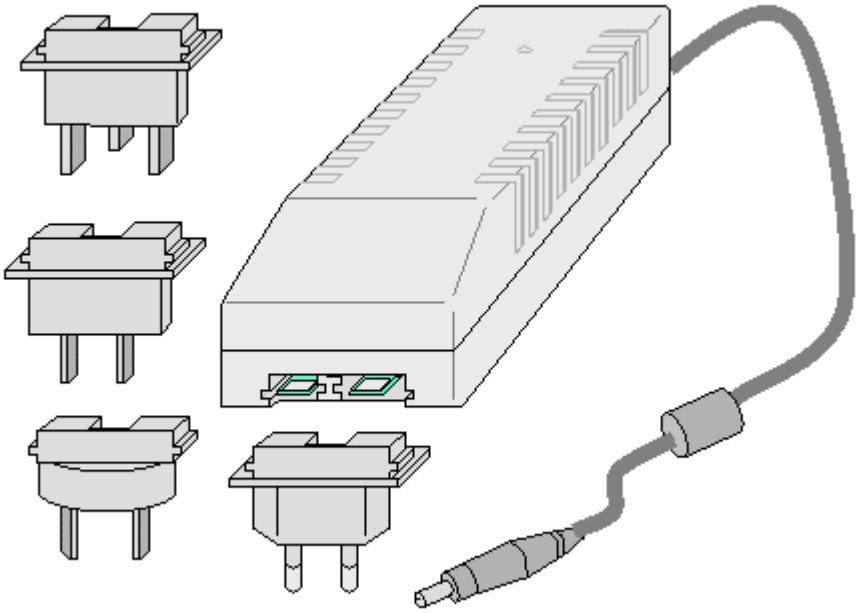
Installing PSUs

Type 6 PSU

AC Power Supply Unit Type 6

Note: Ensure a good power supply for the ST: PSUs have been connected to intermittent supplies before, e.g. central heating timers.

1. The Type 6 is a socket PSU that plugs directly into the AC supply socket. It is supplied with a range of adapters to ensure compatibility with the socket design in the country of deployment
2. **Disconnect Device.** The socket outlet shall be installed near the equipment , easily accessible and will act as the disconnect for the PSU.
3. The ST-W must use the Type 6C+ PSU part number 261-8000-019



Type 7 PSU

Type 7 PSU s an auto-ranging basic power supply with battery back-up facility

The **7A PSU** is an auto-ranging power supply with battery back-up facility. Release 7.15 supports only a 7Ah battery. Connection to the SIU is made using an integral co-axial lead and D-Type plug connector. LEDs on the PSU indicate the following conditions:

PSU State	LED 1 (Green)	LED 2 (Amber)	Connector O/P
Normal operation	On	Off	+V out
Mains fail	Off	On	+V out
Mains & batteryFail	Off	Off	0V

The Type-7A can only be used with ST's that have a 15-way D-type connector.

The **7B PSU** is an auto-ranging power supply with battery back-up facility with extended backup times

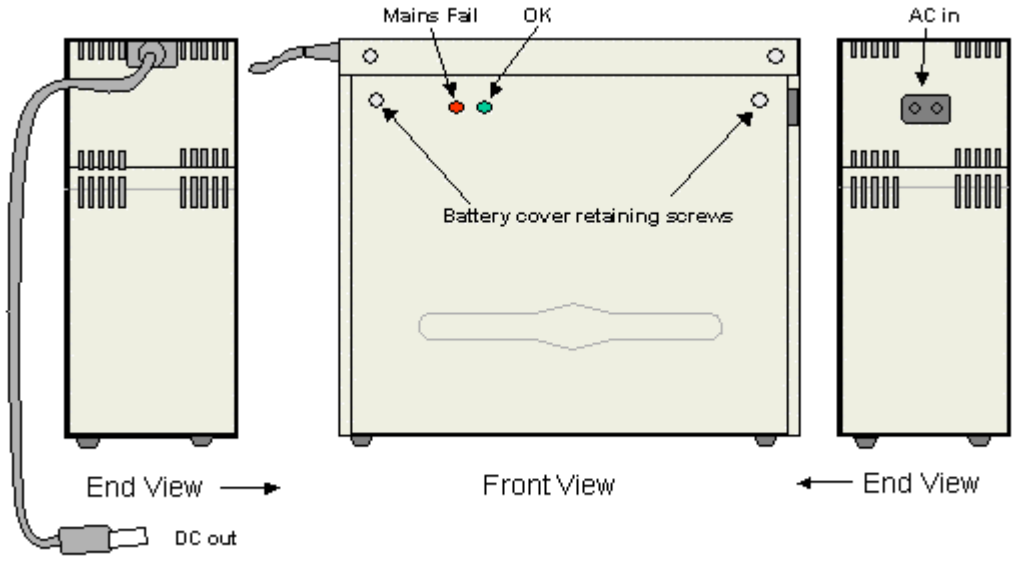
Note: Ensure a good power supply for the ST: PSUs have been connected to intermittent supplies before, e.g. central heating timers. This will shorten the battery life (if fitted) considerably as it is not designed to be constantly charged and discharged.

PSU (Type 7) Positioning and Securing

STEP PROCEDURE

1. Confirm the position of the Type-7 PSU, allow for adequate ventilation and service access.
Note: The life of the battery within the Type-7 PSU will be increased in a low temperature, but standby time is improved in a warm environment. Ideally the location should be cool, as the electronics within the unit will keep it warm enough to ensure a good standby period.

Warning: High voltages exist inside the product do not remove the cover to the main electronics: No user serviceable parts inside.



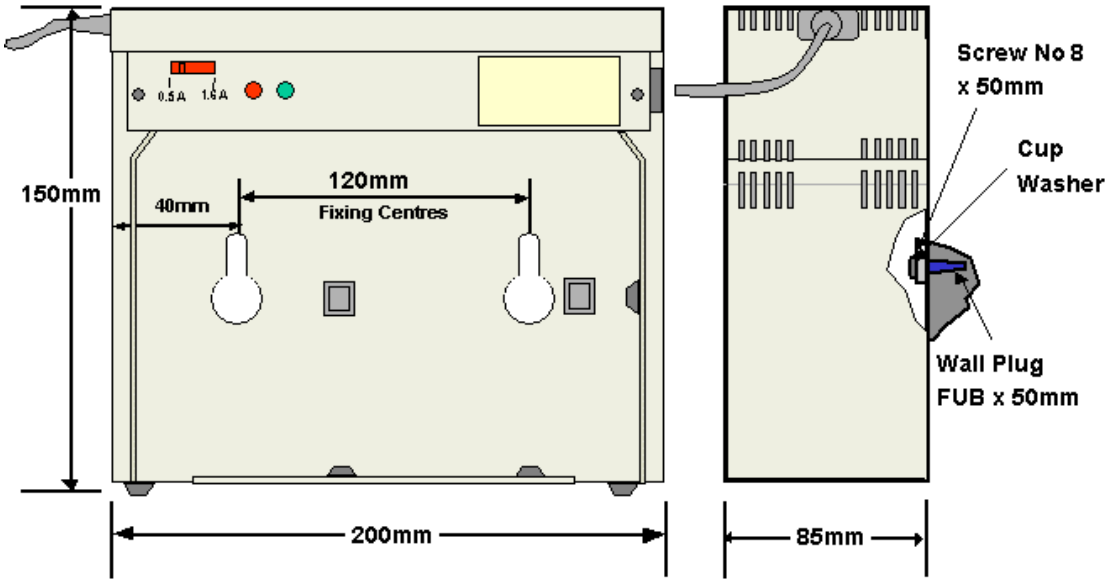
2. Install the Type 7 PSU within 2 metres of an AC power point and 1 metre of the SIU.
3. The PSU may be freestanding or wall mounted. If wall mounting proceed as follows. Remove the PSU front cover. Offer the PSU up into position and mark the two fixing positions onto the wall. The PSU should be fitted with the battery at the bottom and the mains input connector at the top right hand side.
4. Drill the 2 holes, 8mm. diameter to a depth of 50mm. (use a depth gauge) and then fit the FUB x 50mm wall plugs (Part No 128-0000-123) provided.
5. Secure the PSU squarely in position using the No 8 x 50mm screws (Part No 174-0815-002) and cup washers (Part No 192-0080-230) provided.

Installing the Battery

Note: This PSU is suitable for 12 Volt lead acid batteries only.
1. Remove the front cover if not already removed
2. If the SIU is not to be commissioned immediately after installation then do not connect battery until commissioning is about to take place. If the unit is to be commissioned at this time. Place the spade connectors onto the battery terminals in the following order:

- Black lead to –ve terminal
- Red lead to +ve Terminal

3. Position the battery in the enclosure and retain using the Velcro straps.



4. Set the battery charging rate

Yuasa Battery	Charge rate select
NP7-12	1.6A
NP12-12	1.6A

5. Fit the cover ensuring that the bottom of the cover locates into the housing and secure with the two screws at the top of the cover.

CAUTION - Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Lead acid batteries have a high energy capability and are an energy hazard. The battery is housed within the protective metal enclosure of the product. This product is not designed for battery operation outside this enclosure.

AC Power Cord Installation

STEP PROCEDURE

Safety: Electric Shock: Risk of electric shock disconnect mains before opening the PSU cover

Use a supply cord fitted with a mains plug in accordance with local requirements. Plug the AC supply cord into the connector on the Type-7 PSU. Note. Do not connect the plug to the supply socket until instructed to by the 'Commissioning Test Procedure'.

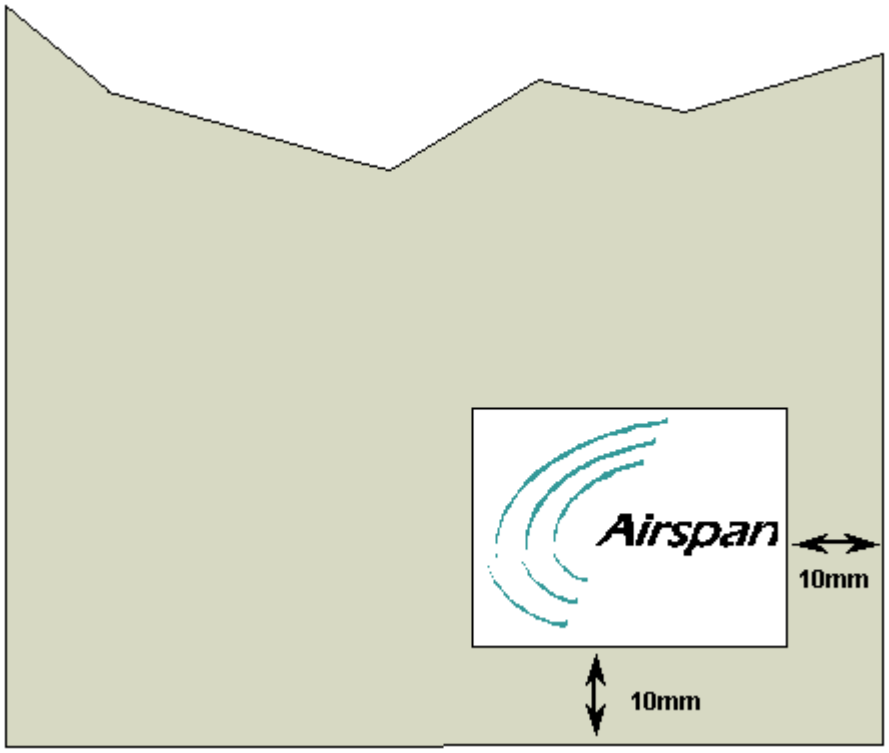
Safety: Battery Handling

Care should be taken when handling lead acid batteries to avoid dropping or short circuiting them. Disposal should be compliant with local codes. Batteries may explode if put into a fire. Install the batteries in the PSU first, then connect them taking care to observe correct polarity. Connect red lead to the +ve terminal and the black lead to the - ve terminal.

Disconnect Device. The socket outlet shall be installed near the equipment , easily accessible and will act as the disconnect for the PSU.

PSU Labelling

If the PSU has been provided with a customer specific logo label, stick the label in the bottom left hand corner of the front of the case as shown.

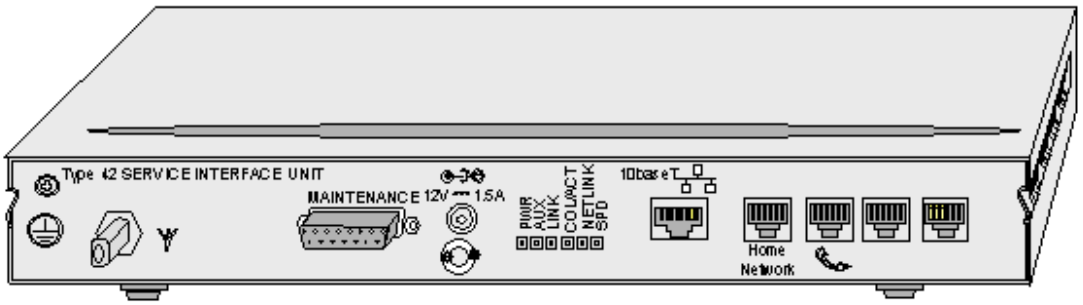


Customer Logo Placement

Installing AS4020 SIUs

Installing P Series SIUs

The P series Service Interface Unit (SIU) is used for packet data and voice can be used as a free standing desk unit, wall mounted or used in the module enclosure to the customers' preference. For details on installing the P series into a module enclosure see 'Installing the M Series.'



The P Series Service Interface Unit (P1V4shown)

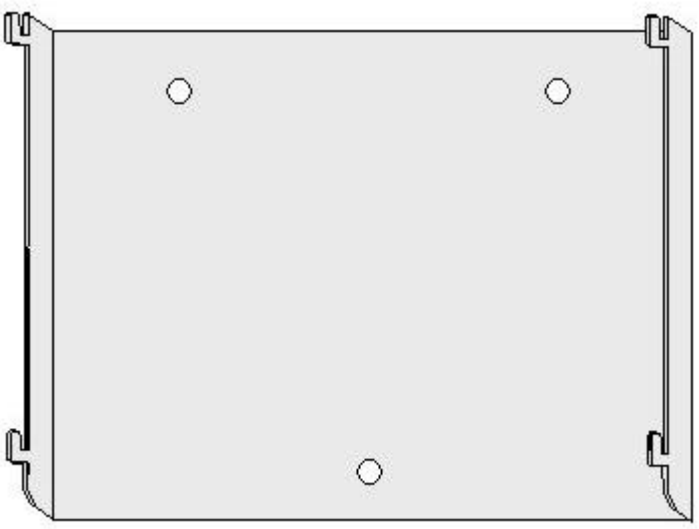
Installing the P Series Service Interface Unit

STEP PROCEDURE

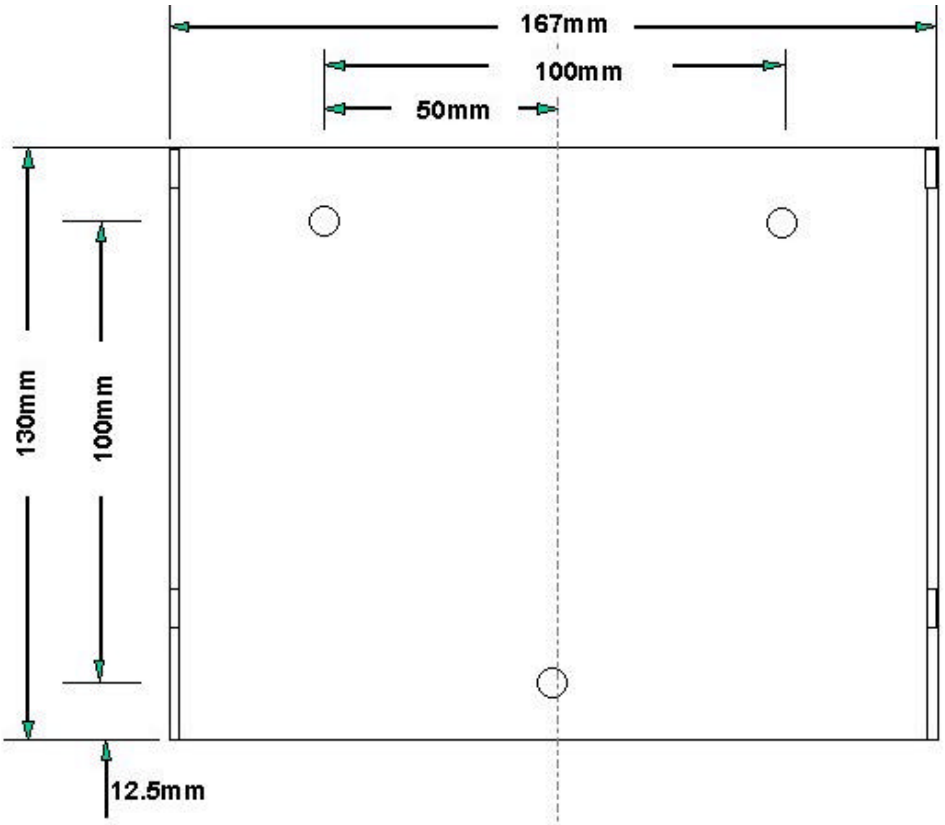
1. Confirm the position of the SIU (allow for adequate ventilation, service access and PSU location).
2. Install the SIU within 1 metre of an AC power point and 50 metres (if using RG6) of the outdoor unit. (75 metres if using RG11 drop cable).

Wall Mounting the Service Interface Unit

1. The wall mounted unit fits onto the SIU wall mounting bracket.



2. Offer the wall mounting bracket up into position and mark the three fixing positions onto the wall. The wall mounting bracket should be fitted with the location lugs pointing upward.



Service Interface Unit Positioning

3. Drill the 3 holes, 8mm. diameter to a depth of 50mm. (use a depth gauge) and then fit the FUB x 50mm wall plugs (Part No 128-0000-123) provided.
4. Secure the wall mounting bracket squarely in position using the No 8 x 50mm screws (part no 174-0815-002) and cup washers (part no 192-0080-230) provided.
5. Attach the SIU to the mounting bracket by locating the bracket lugs in the mounting slots cut into the SIU. The interface connection panel should be at the bottom. Pull down to lock into position.

Connecting the drop Cable and PSU

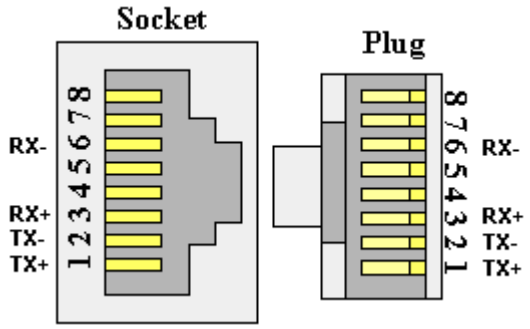
1. Plug the F-Type connector on the drop cable into the F-Type Port on the SIU.
2. Important Notice: Care should be taken when screwing the F-Type connector into the connector on the rear plate of the outdoor unit to ensure that the connector is not over-tightened as over-tightening will strip the thread. Use a torque spanner set to 2.3Nm (20in lb).
3. Plug the *PSU* into the wall socket using the appropriate socket adapter and plug the *DC* output into the SIU.

Protective Earth

For full compliance with EN 60950 and UL 1950, and for UL certification, this product must be provided with a protective earth. The protective earth terminal shall be connected to earth with a conductor no less than 0.75 mm2 and should be either bare or have green/yellow insulation. Terminate the earth lead with a crimp ring tag at the SIU and with an appropriate termination at the earth point.
Note: Independent tests carried out by a notified body have demonstrated that the product is still safe without an earth even though this configuration is not compliant with the standards stated above.

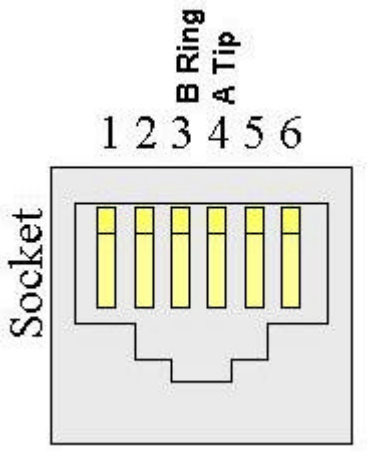
Connecting the Ethernet to the IDU

1. Connect the network card in the *PC* or the line connection from the hub to the RJ45 port on the SIU
2. Configure the hub or network card to the manufacturers instructions.
3. The RJ45 interface as used for 10baseT connection



Connecting the Telephone (s) to the SIU

1. The RJ11 interface as used for the telephone.



RJ11 Telephone / HomePNA Port

System Management Interface

Front Panel LEDs
Type 41

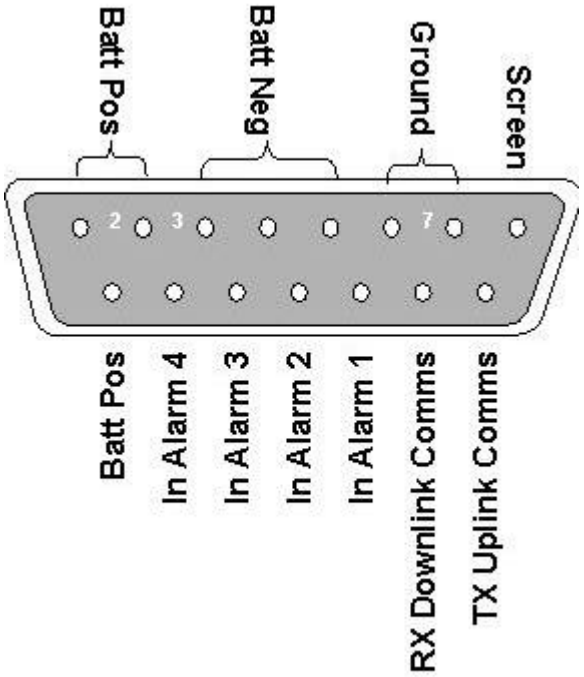
LED	Colour	Off	On	Flashing
Power:	Green	No input	Indicates power OK	Switched to Battery (only for units with integrated battery or for power supply with D-Type connector)
AUX 1	Not defined at present. Illuminates when activity present on the *LAT*			
Link:	Red		Link is active	ST not configured.
Col/Act:	Green		Data is being sent	
	Red		Collision	
Netlink:	Green		Indicates a valid link is present	
SPD:	Green	Connected to	Connected to Ethernet	

		low speed HomePNA.	or high speed HomePNA .	

Type 42

LED	Colour	Off	On	Flashing
Power:	Green	No input	Indicates power OK	Switched to Battery (only for units with integrated battery or for power supply with D-Type connector)
AUX 1	Red		Awaiting LAC downlink acquisition	Awaiting invite for NetEntry
	Green	ST is warm listening to CCC	CCC management poll in progress	NetEntry in progress
	Orange		Voice call on first line in progress	Awaiting TC uplink
Link:	Red	Link OK (unit Net Entered)	Link is Failed	Local (STMON) or remote (Sitespan/Netspan) configuration missing or configuration mismatch detected
Col/Act:	Green	No activity	Indicates activity on the selected network. May flash during power up or when transmit or receive traffic is detected.	
	Red		Collision during TX/RX	
Netlink:	Green	Indicates there is no connection	Indicates a valid connection (Homenet or Ethernet) has been established.	
SPD:	Green	Connected to low speed HomePNA.	Connected to Ethernet or high speed HomePNA .	

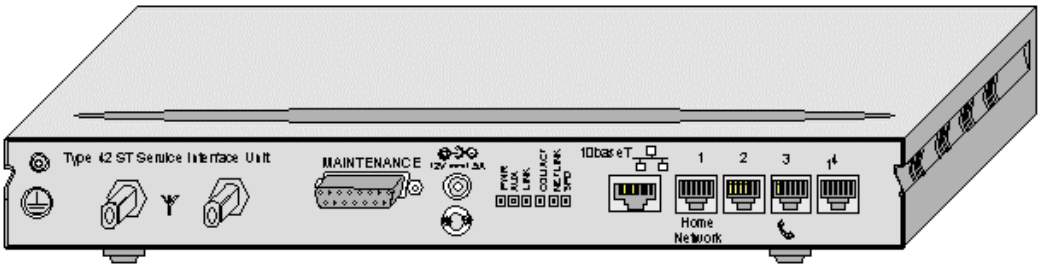
D-type Management Port
The 15 way D-type interface is used for the STMON connection.



15 way D-type Management Port

Installing V Series SIUs

The V series Service Interface Unit (SIU) is used for voice can be used as a free standing desk unit, wall mounted or used in the module enclosure to the customers' preference. For details on installing the V series into a module enclosure see 'Installing the M Series.'



The V Series Service Interface Unit

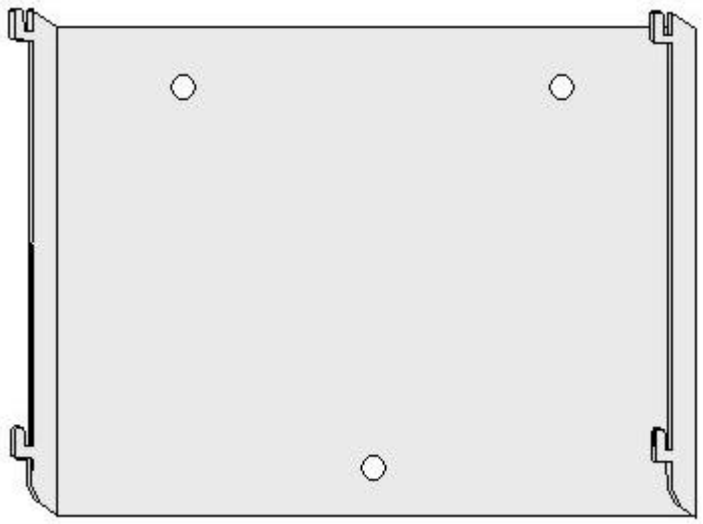
Installing the V Series Service Interface Unit

STEP PROCEDURE

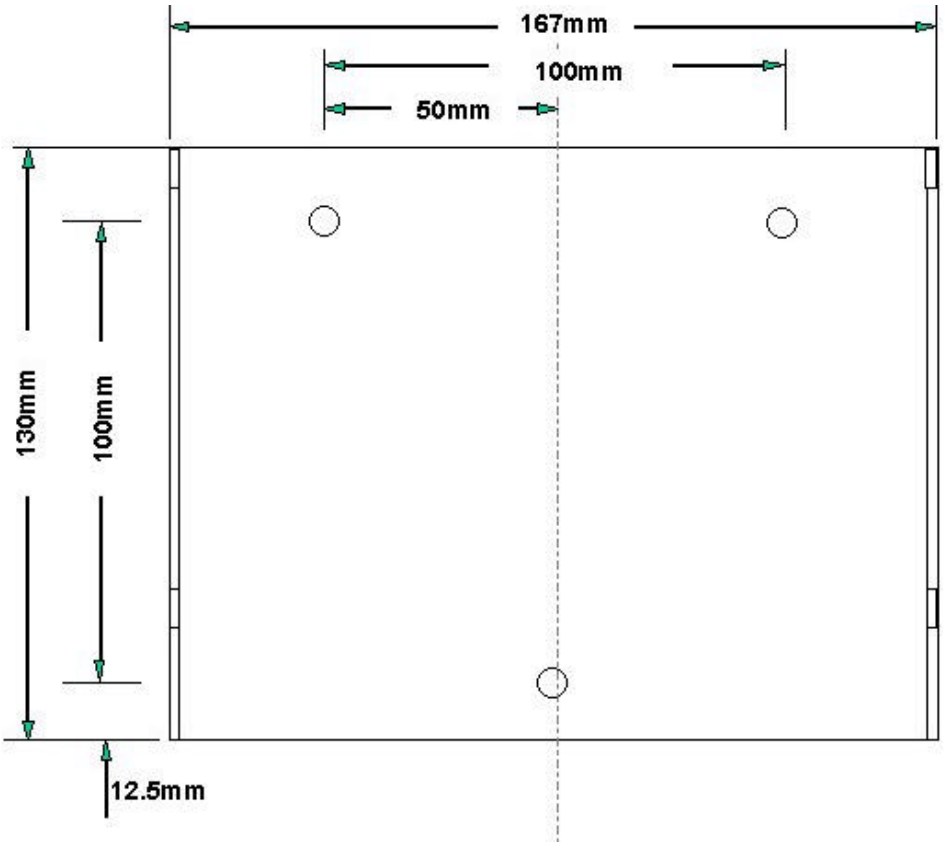
1. Confirm the position of the SIU (allow for adequate ventilation, service access and PSU location).
2. Install the SIU within 1 metre of an AC power point and 50 metres (if using RG6) of the outdoor unit. (75 metres if using RG11 drop cable).

Wall Mounting the Service Interface Unit

1. The wall mounted unit fits onto the SIU wall mounting bracket.



2. Offer the wall mounting bracket up into position and mark the three fixing positions onto the wall. The wall mounting bracket should be fitted with the location lugs pointing upward.



Service Interface Unit Positioning

3. Drill the 3 holes, 8mm. diameter to a depth of 50mm. (use a depth gauge) and then fit the FUB x 50mm wall plugs (Part No 128-0000-123) provided.
4. Secure the wall mounting bracket squarely in position using the No 8 x 50mm screws (part no 174-0815-002) and cup washers (part no 192-0080-230) provided.
5. Attach the SIU to the mounting bracket by locating the bracket lugs in the mounting slots cut into the SIU. The interface connection panel should be at the bottom. Pull down to lock into position.

Connecting the drop Cable and PSU

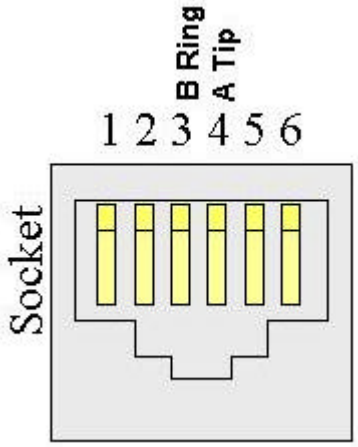
1. Plug the F-Type connector on the drop cable into the F-Type Port on the SIU. Important Notice: Care should be taken when screwing the F-Type connector into the connector on the rear plate of the outdoor unit to ensure that the connector is not over-tightened as over-tightening will strip the thread. Use a torque spanner set to 2.3Nm (20in lb).
2. Plug the *PSU* into the wall socket using the appropriate socket adapter and plug the *DC* output into the SIU.

Protective Earth

For full compliance with EN 60950 and UL 1950, and for UL certification, this product must be provided with a protective earth. The protective earth terminal shall be connected to earth with a conductor no less than 0.75 mm2 and should be either bare or have green/yellow insulation. Terminate the earth lead with a crimp ring tag at the SIU and with an appropriate termination at the earth point.
Note: Independent tests carried out by a notified body have demonstrated that the product is still safe without an earth even though this configuration is not compliant with the standards stated above.

Connecting the Telephone (s) to the SIU

1. The RJ11 interface as used for the telephone connection.



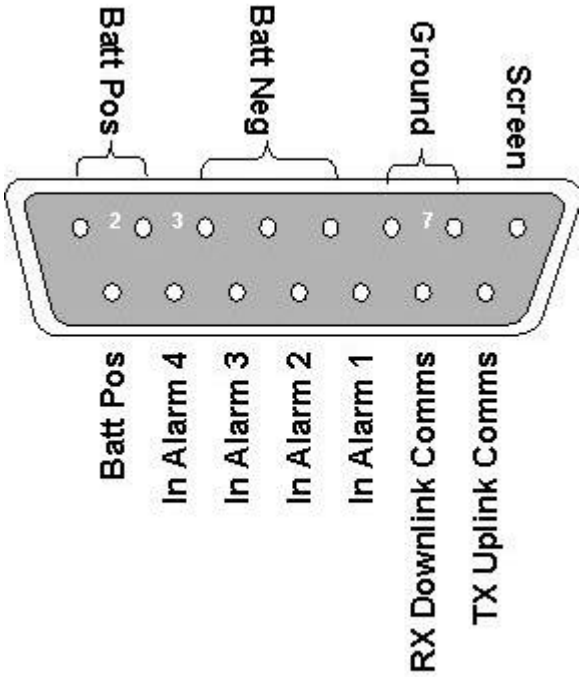
RJ11 Telephone

System Management Interface

Front Panel LED's:

LED	Colour	Off	On	Flashing
Power:	Green	No input	Indicates power OK	Switched to Battery (only for units with integrated battery or for power supply with D-Type connector)
AUX 1	Red		Awaiting LAC downlink acquisition	Awaiting invite for NetEntry
	Green	ST is warm listening to CCC	CCC management poll in	NetEntry in progress
	Orange		Voice call on first line in progress	Awaiting TC uplink
Link:	Red		Link is active	ST not configured.
Col/Act:	Green		Data is being sent	
	Red		Collision	
Netlink:	Green		Indicates a valid link is present	
SPD:	Green	Connected to low speed HomePNA.	Connected to Ethernet or high speed HomePNA .	

D-type Management Port
The 15 way D-type interface is used for the STMON connection.



15 way D-type Management Port

Commissioning Steps

Type 41 and Type 42 AS4000

Step	Activity	Commissioning Tool				Note
		STMON	ST Meter	DVM	Telephone	
1	Pre Commissioning					
2	Configure	Configuring ST (other than type 42) Using AS7020 STMON			Configuring ST using a Test Telephone	STs r up us STM deplo
3	Panning	Panning ODU using AS7020 STMON	Panning ODU Using STMeter	Panning ODU Using a DVM		
5	Fade Margin	Checking for Fade Margin using a Fader Cap				
6	Functional Tests	Functional Tests				

Type 42 AS4020

Step	Activity	Commissioning Tool				Notes
		STMON	ST Meter	DVM	Telephone	
1	Pre Commissioning					
2	Configure	Configuring Type 42 ST using STMON				STs ma using S prior to deploym
3	Panning	Panning Type 42 ODU Using STMON	Panning a Type 42 ODU using ST Meter	Panning ODU Using a DVM		
4	Service Tests	Service Testing				

ST W

Step	Activity	Commissioning Tool				Notes
		STMON	ST Meter	DVM	Telephone	
1	Pre Commissioning	Pre-installation and Commissioning				
2	Setup	Type 42 ST setup using STMON				
3	Panning	Panning ODU using AS7020 STMON	Panning ODU Using STMeter	Panning ODU Using a DVM		

4	Commissioning	Commissioning ST W	
5	Configuring	Configuring the ST W	
6	Managing	Managing the ST W	
7	Reset	Reset Options	
8	Set Up Access Parameters	Set Up Access Parameters	
9	VPNs	VPNs	
10	Encryption	Encryption	
11	Advanced Features	Advanced Features	
12	Service Tests	Service Testing	

Type 42

Pre-installation

Before the ST is installed, the installation acceptance criteria should be established. These are outputs from RF Planning as listed above. They are in summary:

- Corresponding STID
- RF Channel/Pilot Channel
- PN Code
- Expected Downlink Modulation (FEC Mode)
- Expected Uplink Modulation (FEC Mode)
- Required Fade Margin
- Required Downlink SNR

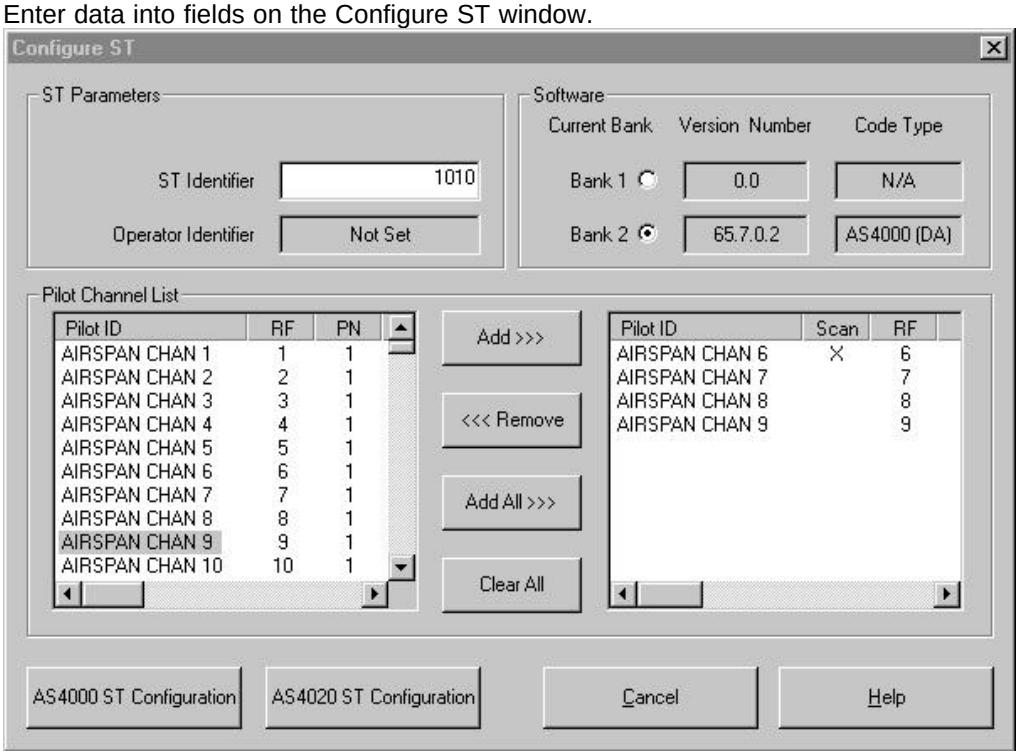
These parameters can be input to STMon during installation. It is expected that the installer will be informed of these values via a job instruction relating to the particular ST to be installed.

Programming Type 42 ST using STMON

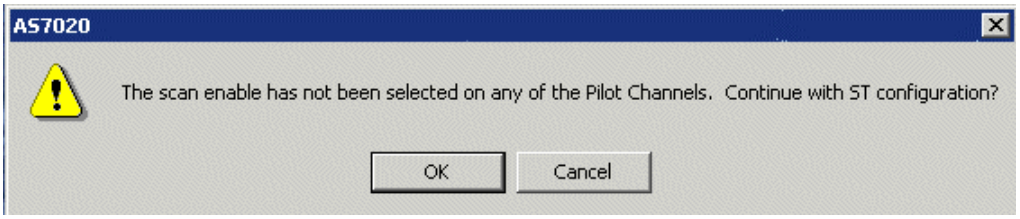
If using STMON software the ST must be powered up and running its application software before attempting to configure a ST. The boot sequence should be complete within 1 minute of power on. Failure to do this results in the corruption of the ST operating software.

Pilot Channels are pre-programmed directly to the ST using STMON as part of the ST installation process. STMON will allow an ST to have only one Pilot channel pre-programmed and this channel has to be within the ODUs operating range. The Target channel must also be within the operating range of the ODU.

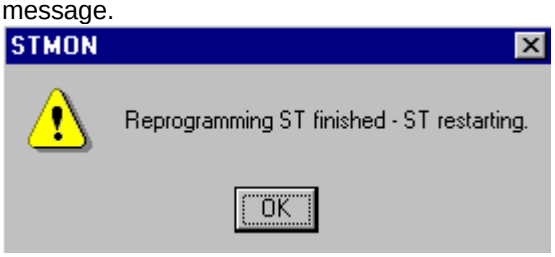
1. Select the Setup tab and load the installation file. (For details on editing and creating installation files see the STMON help file.)
2. Select the **Radio Data** tab and click left mouse button on the Configure *ST* button.
3. Enter data into fields on the Configure ST window.



4. Enter the ST ID, this number must be unique for all STs sharing the same *CT*
5. Select the channels to be made available to the ST in the pilot channel list (left hand list) using the mouse and click the *Add* or click the *Add All* button if all channels are required. A maximum of ten channels may be selected. If an attempt is made to select more than ten then a warning message is displayed. The selected channels appear in the right hand list.
   Note: The channels in the pilot channel list (left hand list) are created using the Installation File Editor (see STMON help file). else the default list of all channels is loaded.
6. Select the scan channels. Double clicking a channel toggles the scan field. An X shows that the field is selected. The ST will only scan those channels where the scan has been enabled. At least one channel needs (exactly one channel for AS4000 configuration) to be enabled or the following message is displayed.

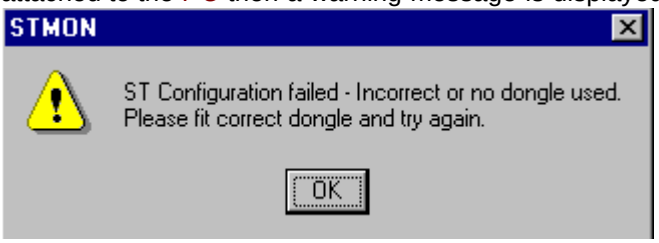


7. Channels may be removed by selecting the channel and clicking the remove button for individual channels or using the clear all button to remove all channels.
8. Select the appropriate software bank to run the correct code version.
9. Select either AS4000 ST configure or AS4020 configure Cancel leaves the configuration unchanged
10. When successfully configured the subscriber Terminal displays a confirmation message.

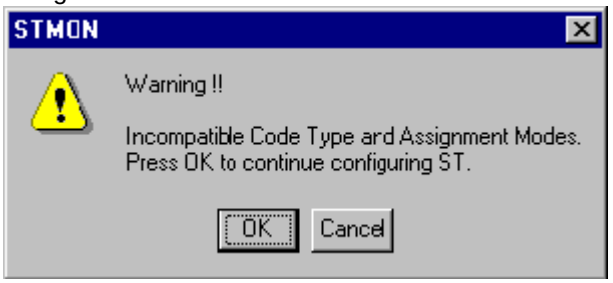


Messages displayed if ST fails to configure.

1. The following messages may be displayed should and conflicting data is entered whilst configuring STMON.
2. Some system administrators use a dongle attached to the serial port of the PC to prevent the installation of STs by unauthorised persons. If the ST has been previously programmed with a dongle different from the dongle attached, or if no dongle is attached to the *PC* then a warning message is displayed.



3. If the Subscriber Terminal fails to configure because of conflicts between the mode of working and the software bank then a warning message is displayed. Check that the Assignment mode and the current bank software are compatible.



4. If the Subscriber Terminal fails to configure for any other reason the following screen is displayed after 30 seconds.

Refer to the STMON manual/topics for diagnostics and further information on ST management

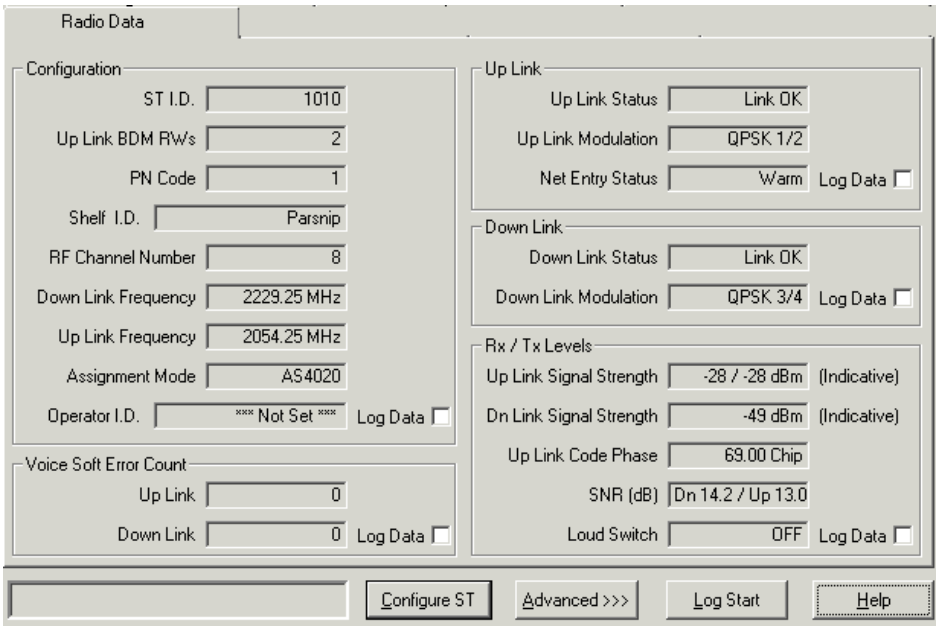
Panning Type 42 Outdoor Unit Using STMON

Antenna Alignment

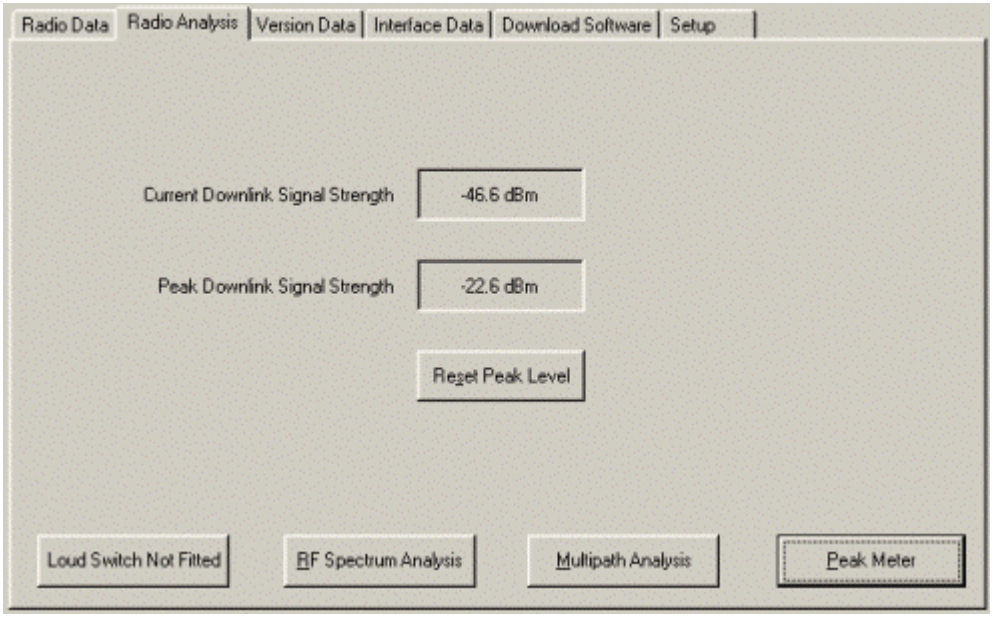
Once configured and installed the ST Antenna /ODU will need to be panned to optimise the RF link quality- SNR, signal strength and fade margin.

STEP PROCEDURE

1. If pole mounted place and tighten a tie wrap immediately underneath the pole bracket to prevent the assembly sliding down the pole.
2. Loosen the outdoor unit fixing bolts sufficient to allow the antenna to rotate around the pole.
3. Using compass bearing point the antenna in the direction of the CT (base station) antenna.
4. Select the *Radio Data* tab to display ST data. For details of the display see STMON Display Descriptions



5. Wait for both an uplink and a downlink to be established. If The ST Fails to acquire check the display to see that the ST has been configured correctly and there is sufficient signal strength and check compass bearing for CT. Check that the antenna does not breach the deployment guidelines.
6. If ST supports voice. Connect a telephone to the ST and make a test call
   With the call in progress read and record the following from STMON:
   a) The receiver power in dBm.
   b) The transmitter power in dBm.
   c) The downlink SNR
7. Click the *Advanced* button. Select the *Radio Analysis* tab. Click the *Peak Meter Butto*n (Alt+p) . The peak meter displays the current downlink signal strength and is used when panning an antenna to find the strongest signal.The peak downlink signal strength displays the maximum downlink signal strength measured since the start of monitoring and can be reset using the *Reset Peak Level* button (alt s).



8. Pan the antenna unit through a ± 10° azimuth and note down the bearing to which the *Current Downlink Signal Strength* is a maximum. This value should be very near to the peak value shown in the *Peak Downlink Signal Strength* box.
9. Using a 10mm spanner or socket torque the pivot bolts to 12Nm.
10. If the ST is located close to the CT (likely to be less than 1.5km is used as a guideline), the receiving signal from the base station is high (likely to be greater than -50dBm). The loud switch may be used to switch in approximately 30dB of attenuation to simulate an increase the path loss, which will prevent the RX signal strength from saturating the ST receiver (saturation of the ST receiver is exhibited as high errors in the radio link).

Optimise SNR

1. To optimise SNR select the 'Radio Data' tab in STMON make a note of the current Uplink and Downlink SNR.
2. Select the 'Radio Analysis' tab and click the 'turn loudswitch on' button to turn on the loudswitch
3. Return to the 'Radio Data' view and observe the change in both the uplink and the downlink SNR. If the SNR has improved then leave the loud switch turned on. If the SNR has deteriorated then return to the 'Radio Analysis' view and turn the loudswitch off.
4. Finally check that the SNR has returned to its previous level.

Link Quality / Modulation rate check

STMON is able to monitor the following link quality parameters:

- Current Downlink Modulation/FEC mode
- Receive SNR Margin
- Receive Fade Margin
- Current Uplink Modulation/FEC mode
- Transmitter Fade Margin

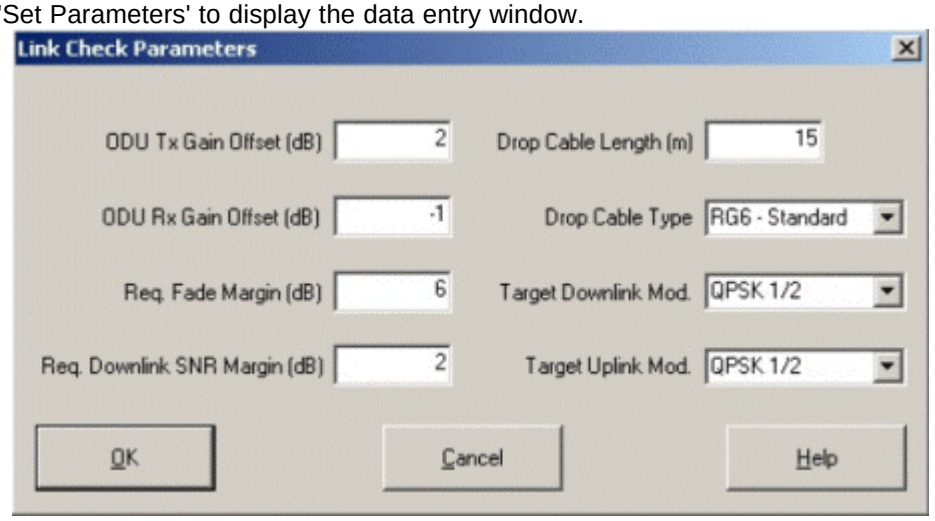
Each of these parameters are compared with the entered installation acceptance criteria and pass/fail indicators displayed on STMON.
In order to enhance the accuracy of the fade margin measurement, the IF Cable type and length (to the nearest metre) should be entered into STMON.
In order to further enhance the accuracy of the fade margin measurement, the Tx & Rx gain offsets for a particular RF channel can be entered into STMON. These are supplied with the

ST ODU on a printed ticket and will typically enhance the accuracy of fade margin measurements made at channels other than the mid channel by approx 2dB.

Open STMON and select Link Check tab.

Link Check Parameters

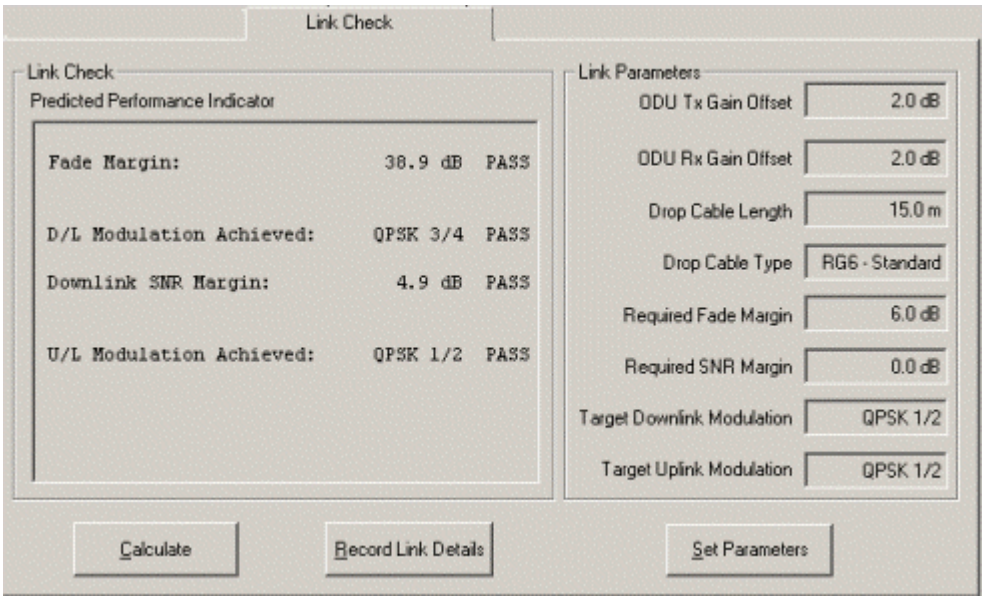
1. Click 'Set Parameters' to display the data entry window.



The table below shows the fade margin required for each modulation rate

Modulation Code	Rate	SNR ratio Minimum
QPSK	1/2	8.3 dB
QPSK	3/4	11.4dB
16QAM	1/2	15.4dB
16QAM	3/4	18.5dB
64QAM		24.8dB

2. Each ST ODU has a TX and RX relative gain recorded on a label placed on the ST. These values are entered as link check parameters. In order to check that there is sufficient fade margin for the target modulation select the modulation required for the uplink and downlink, the values of required fade margin. and the required downlink SNR. In order to enhance the accuracy of the fade margin measurement, the IF Cable type and length (to the nearest metre) should be entered into STMON.
3. In order to further enhance the accuracy of the fade margin measurement, the Tx & Rx gain offsets for a particular RF channel can be entered into STMON. These are supplied with the ST ODU on a printed ticket and will typically enhance the accuracy of fade margin measurements made at channels other than the mid channel by approx 2dB.
4. Click OK.
5. Each of these parameters are compared with the entered installation acceptance criteria and pass/fail indicators displayed on STMON.


Link Check
Link Check
Predicted Performance Indicator
Fade Margin: 38.9 dB PASS
D/L Modulation Achieved: QPSK 3/4 PASS
Downlink SNR Margin: 4.9 dB PASS
U/L Modulation Achieved: QPSK 1/2 PASS
Link Parameters
ODU Tx Gain Offset 2.0 dB
ODU Rx Gain Offset 2.0 dB
Drop Cable Length 15.0 m
Drop Cable Type RG6 - Standard
Required Fade Margin 6.0 dB
Required SNR Margin 0.0 dB
Target Downlink Modulation QPSK 1/2
Target Uplink Modulation QPSK 1/2
Calculate
Record Link Details
Set Parameters

Service Testing

On completion of the installation / panning of the ST perform an in service test to check that the ST is capable of making voice and packet calls.

Voice Calls

1. Connect the test telephone to the SIU
2. **Dial Tone Present.** Lift the telephone handset of Line 1 Off-Hook, and confirm that dial tone is heard in the handset receiver. If a comfort tone has been set check for comfort tone prior to dial tone. Record on the 'Test Result' form.
3. **Outgoing call.** Initiate a call from the subscribers' telephone to a test number provided by the CT Office. Ensure that the call can be successfully set up and that line quality is good.
4. **Incoming call.** Initiate a return call from the CT Office to the subscribers' telephone. Ensure that the call can be successfully set up and that line quality is good.
5. **Test Calls.** Repeat steps 2 to 4 for all other lines.

IP Check to Internet

1. Connect a Laptop/ PC equipped with a NIC card to the Ethernet Port of the ST
2. Connect using an internet browser.
3. Check that packets can be sent and received over the network

IP Check to Server

1. Connect a Laptop/ PC equipped with a NIC card to the Ethernet Port of the ST
2. Open the Command Prompt (start/programs/accessories/command prompt)
3. From the Command Prompt type 'ping xxx.xxx.xxx.xxx' where xxx.xxx.xxx.xxx is the host server network address and check that a reply is received.

Test Results Type 42

All results of testing must be entered on this Test Result Form. Please print and photocopy one for each *ST* to be commissioned.

Customer ID/Ref:	*AC* Rack ID
CT Rack ID	Modem Shelf ID
ST type	ST ID:
Outdoor Unit No.:	Part No.:
IDU(SIU) Serial No.:	Part No.:
Interface (if applicable)	
Details and description of RF Path Profile and local environment	
Details and position of Outdoor Unit	
Details and Position of SIU/ Module Enclosure	

Test Results	
Uplink Signal Strength	dBm
Downlink Signal Strength	dBm
Downlink SNR	dB
Uplink SNR (obtainable via Netspan)	dB
Uplink Code Phase	Chip
Test Call Voice Lines Tick OK	7.20

Internet Access Test	OK
FTP Packet Line Data Transfer Rate	Kbits/s

AS4000 Subscriber Terminal Acceptance Form

1. This section includes the Airspan and customer copies of the 'Subscriber Terminal Acceptance Form'.
2. Photocopy sufficient forms for commissioning, (1 set per *ST*).
3. After completion give the customer a copy and retain one for ACC.

AS4000 SUBSCRIBER TERMINAL ACCEPTANCE FORM

CONTRACT OR CUSTOMER'S REF. NO:
AIRSPAN COMMUNICATIONS LTD REF .NO:
SITE IDENTITY:
The Customer accepts that the following equipment has been supplied, installed and tested.
ODU Serial No:
Part No:
Outdoor Unit Serial No:
Part No:
PSU Serial No:.
Part No:

Customer Representative
Name: ..... Position: .....
Signature: ..... Date: .....
Airspan Representative
Name: ..... Position: .....
Signature: ..... Date: .....

CUSTOMER COPY / AIRSPAN COPY (delete as appropriate)

Notes for Users

Important Notes

In this leaflet you will find information regarding safety. You should read this carefully and adhere to the guidelines when using your Subscriber Terminal Unit.

Safety

This device complies with the relevant safety regulations for telecommunications equipment. If you have any questions regarding the content of this leaflet, contact your sales office or customer service centre.

- Do not attempt to dismantle the unit or remove access covers (with the exception of the battery cover).
- Avoid positioning the unit where there is a risk of liquid spillage (eg. near a water basin). Do not stand beverages on the unit.
- Please ensure that no objects (eg. necklaces, paperclips etc.) or liquids can get into the interior of the device.
- Lay all cables so that nobody can stand on or trip over them.
- Keep air ventilations clear – leave at least 50mm clearance.
- Stand on a flat surface. Do not stand the unit on a carpet or other soft surface where air vents on the underneath of the unit may become blocked.
- Do not stand items with a mass of greater than 10kg on the unit.
- Avoid placing the unit exposing the unit to strong magnetic fields (eg. magnetic paper clip holders and loud speakers).
- Keep this leaflet together with the device. If you pass on the device to third parties, you should also pass on this leaflet.

Cleaning Notes

- Always remove mains power from the Power Supply Unit (PSU) before you clean any part of the unit or power supply.
- Do not clean any interior parts yourself. Leave this job to a service technician.
- Do not use any cleaning agents that contain abrasives or may corrode plastic.
- Ensure that no liquid will run into the unit.
- Do not apply cleaning fluid directly to unit – apply the fluid to a soft cloth.
- Do not use any automatic machinery for cleaning the unit (eg. washing machine or dishwasher)

Wipe the unit housing with a dry cloth. If the unit is particularly dirty, use a cloth which has been moistened in mild domestic detergent and then carefully wrung out.

A

A/D: Analogue/Digital

AC: Access Concentrator

ADPCM: Adaptive Differential Pulse Code Modulation

AGC: Automatic Gain Control

AIS: Alarm Indication Signal or All Ones

AMI: Alternate Mark Inversion

AU: Analogue Unit

B

BER: BIT Error Rate

C

CAS: Channel Associated Signalling

CCC: Call Control Channel

CPE: Customer Premises Equipment

CT: Central Terminal

CTU: Concentrated Tributary Unit

CU: Compression Unit

CUG: Closed User Group

D

D/A: Digital/Analogue

DA: Demand Assignment

DACU: Demand Assignment Commissioning Unit

DC: Direct Current

DIP: Diplexer

DMM: Digital Multi Meter

DSP: Digital Signal Processor

DTE: Data Termial Equipment

DTU: Demand Assignment Tributary Unit

F

FA: Fixed Assignment

FRU: Field Replaceable Unit

H

HDLC: High Level Data Link Control

I

I/0: Input/Output

IP: Internet Protocol

ISDN: Integrated Services Digital Network

ITU-T: International Telecommunications Union -Telecommunications

L

LAT: Local Access Terminal

LED: Light Emitting Diode

LNA: Low Noise Amplifier

M

MF: Multi-Frequency

MODEM: Modulator/Demodulator

MON: Monitor

MSTP: Modem Shelf Termination Panel

MU: Modem Unit

N

NTU: Network Termination Unit

NVRAM: Non Volatile Random Access Memory

O

OOS: Out of Service

P

PA: Power Amplifier

PC: Power Control

PROM: Programmable Read Only Memory

PSTN: Public Switched Telephone Network

PSU: Power Supply Unit

PTU: Packet Tributary Unit

R

RF: Radio Frequency

RTU: Redundant Tributary Unit

RX: Receive

S

SC: Shelf Controller

SIU: Service Interface Unit

SPU: Signalling Processing Unit

ST: Subscriber Terminal

STP: Shelf Termination Panel

T

TCP: Transmission Control Protocol

TEI: Terminal Equipment Identifier

TU: Tributary Unit

TU8: Tributary Unit Eight E1 ports

TX: Transmit

U

UCP: Uplink Code Phase

V

VDU: Video Display Unit

VF: Voice Frequency

VLan: Virtual Local Area Network

X

XTU: Exchange Tributary Unit

1
10BaseT Ethernet 1
A
ADPCM 1
Airspan 212-8000-058 Crimp tool 71
Amphenol 531-CR596R Crimp tool 71
Analogue Fax/Modem 1
Antenna Mounting Bracket 1
Antenna Mounting Pole 1
AS4000 Subscriber Terminals 1
B
B Series Service Interface Unit 1
C
CPE Customer Premises Equipment 1
D
Downlink
  Net Entry 1
Downlink 1
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F-Type Connectors 71
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HomePNA 1
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IF 1
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Installing 113
Interface Units 1
Internal Service Interface Unit 1
ISDN 1
L
L Series Service Interface Unit 1
M
M Series Enclosure 1
MAC 1
Modular Service Interface Unit 1
Modular Unit 1
Module Enclosure 1
Mounting Bracket 1
N
N Series Service Interface Unit 1
Net Entry 1
NTU Network Termination Unit 1
P
P Series Service Interface Unit 1
PacketDrive 1
PacketDrive ST 1
Panel
  SIU Subscriber Interface Unit 113
Payphones 1
Power Supply Units 1
Priority Numbers 1
PSU 1
R
R Series Residential Service Interface Unit
  1
Residential Subscriber Unit 1
RS Auto Trim Termination Tool 197-952 48
RS Standard Cable Stripper 547-442 48
S
S Series Sub Unit Service Interface Unit . 1
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ST Subscriber Terminal 1
Standby Battery 87
Subscriber Terminal Set-up 149
Sub-Unit 1
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System Turn-up 149
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T10 Dropcable 87
TB1 Connection Block 87
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U
Uplink Code Phase 149
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Using AS7020
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V24 1
V35 1
V90 1
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  ST Data 149
Viewing 149
X
X21 1
Y
Yuasa Battery Co 87