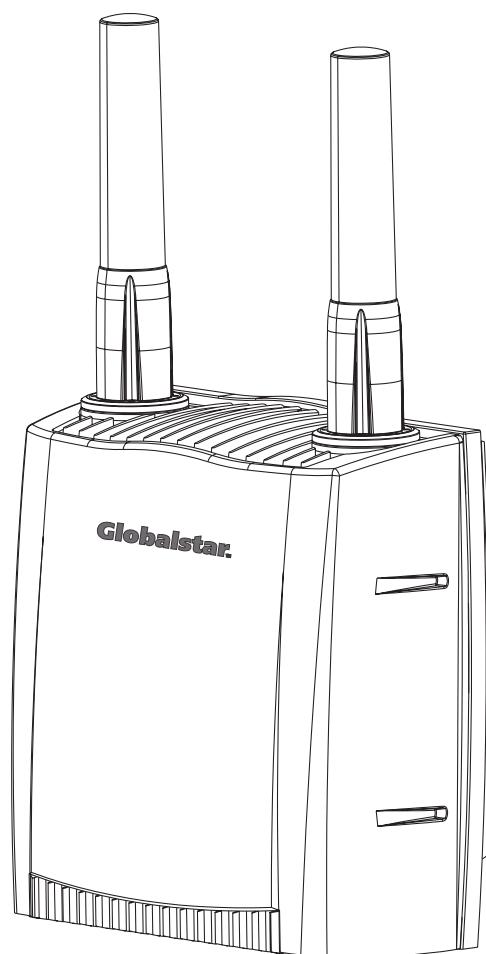




Fixed Access Unit (FAU) for Globalstar Systems



FAU200 SAT

Installation Handbook

 The product described in this manual conforms to the 98/13/EC Telecommunications Terminal Equipment (TTE) and Satellite Earth Station Equipment (SESE) Directive, the 89/336/EEC EMC Directive and the 73/23/EEC Low Voltage Directive.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

First Edition: August 1999

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Publication number: EN/LZT 123 5050 R1A

Printed in United Kingdom

SAFETY



DANGER:
EARTH LEAKAGE CURRENTS

Under no circumstances should the FAU be operated without a protective earthing conductor.



DANGER:
HAZARDOUS VOLTAGES

Hazardous voltages will be present within the FAU once power has been applied.



DANGER:
HAZARDOUS VOLTAGES

Avoid electrical contact with the telephone wires, hazardous voltages may be present.

Warnings



WARNING:
DANGER TO PERSONNEL

The FAU may fall down if it is incorrectly mounted on pole.



WARNING:
HOT COMPONENTS

The FAU case will become hot when working and care must be taken when handling a unit that has just been switched off.



WARNING:
DANGER TO PERSONNEL

Ensure the FAU is securely mounted before powering-up.

Contents

General	1
Definitions and Abbreviations	1
Product Description	2
Globalstar System	2
Fixed Access Unit (FAU)	2
Pre-Installation	3
Pre-Installation Planning	3
<i>Planning the Location for the FAU</i>	4
<i>Radio Interference Sources (for Guidance Only)</i>	5
<i>Cable Routing</i>	5
<i>Lightning Protection</i>	6
<i>Switched DC Power Supply</i>	6
<i>Pole Mounting</i>	7
Preparatory field engineering work	7
Preparation and Configuration of the FAU	7
Installation	9
Assembling the FAU	9
Fitting the FAU	10
FAU Connections	12
<i>Telephone (■)</i>	13
<i>Power (●)</i>	13
<i>Data (▲)</i>	14
<i>PDI (✕)</i>	14
<i>SAFETY - Earth/Ground</i>	14
Commissioning	15
Power-Up	15
Making a test call	15
Receiving an Incoming Test Call	15
Data Calls	15
Fault Finding	16
Technical Data - FAU	17
Power requirements	18
Environmental	18
Interfaces	18
<i>Air interface</i>	18
Installation	18
Standards	19
Physical	19
Technical Data - PSU	19
Technical Data - Cables	19
<i>Cable between FAU and PSU</i>	19
<i>Cable between FAU and cross-connect</i>	20

General

The FAU is a device to enable the end user to make and receive telephone calls via the Globalstar satellite network. This handbook describes how to plan the installation, fit the FAU and prepare it for use. Please read the safety information carefully. This issue covers the residential and PABX versions of the FAU only.

Definitions and Abbreviations

ac	Alternating Current
AMPS	American Mobile Phone System
BER	Bit Error Rate
BTS	Base Transmitting Station
CDMA	Code Division Multiple Access
dB	Decibels
dBm	Decibel referred to 1 mW
dc	Direct Current
DCE	Data Communications Equipment
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi-Frequency
FAU	Fixed Access Unit for Globalstar network
GAI	Globalstar Air Interface
GEO	Geostationary Earth Orbit
GSM	Global System for Mobile Communication
GUM	Global User Modem
IP	Ingress Protection
LD	Loop Disconnect
LEO	Low Earth Orbit
LNA	Low Noise Amplifier
MMI	Man Machine Interface
MSS	Mobile Satellite Services
NVM	Non-volatile Memory
PABX	Private Automatic Branch Exchange
PDI	Production & Development Interface
PIN	Personal Identity Number
PLMN	Public Land Mobile Network
POT	Plain Ordinary Telephone
PSTN	Public Switched Telephone Network
RTS	Request to Send
SIM	Subscriber Identity Module
TTE	Telecommunications Terminal Equipment

Product Description

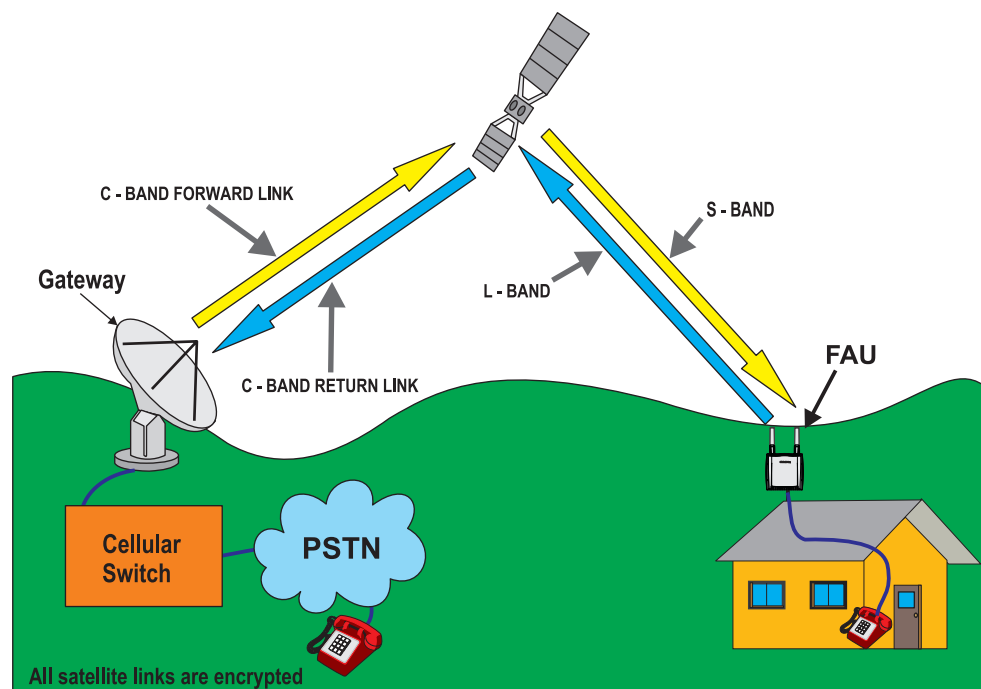
Globalstar System

Globalstar is a low earth orbit (LEO) satellite-based telecommunications network offering wireless telephone services worldwide. The Fixed Access Unit (FAU) provides an interface for the end-user to access the Globalstar satellite network.

The FAU communicates using the Globalstar Air Interface (GAI) via the satellite constellation to a number of groundstations or Gateways.

The gateway interconnects the Globalstar satellite network through a Cellular Switch directly into the local Public Switched Telephone Network (PSTN). A diagram of the Globalstar network is shown below.

The FAU is installed outdoors to provide an unobstructed view of the orbiting satellite constellation, and cabling is run from the unit to a conventional telephone socket mounted indoors, for easy connection of a telephone.



Typical Satellite Link

Fixed Access Unit (FAU)

The FAU comprises a single unit formed from a die-cast aluminium case enclosed on four sides by moulded polycarbonate sunshields. Access to the single circuit board contained within the aluminium case, is via the removable aluminium backplate. The plate is secured using tamper-proof fixings.

Twin antennas - transmit and receive - attach to the top of the case using tamper-proof screw fixings. The receive antenna incorporates a Low Noise Amplifier (LNA).

The mechanical design of the FAU is common to two applications and provides the end user with an interface for connecting a standard telephone:

- Residential FAU - allowing connection of a telephone.
- PABX FAU - allowing connection of a range of PABXs.

Pre-Installation

The following activities will need to be carried out, before installation and commissioning of the FAU at the subscriber's site:

- Pre-installation Planning.
- Preparatory Field Engineering Work.
- Preparation and configuration of the FAU at the Engineering Depot.

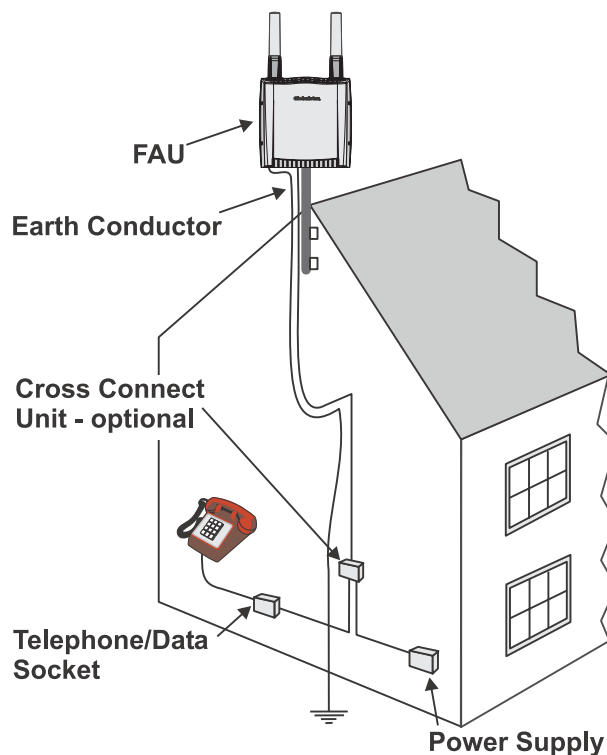
Pre-Installation Planning

Pre-installation planning activities may include:

- Survey of subscriber location, address and mains voltage.
- Identify mounting location for FAU and type of pole/mast/wall fixing.
- Confirm position of the FAU is acceptable with customer/service provider.
- Identify position of possible interfering transmissions. This could be fixed service microwave transmissions, radar pulses or a cellular base station.
- Identify position for FAU safety earthing system.
- Identify location for 48 V DC power supply.
- Identify position of cross-connect unit and telephone jack.
- Determine and gain appropriate planning approval for the following cable routes:

FAU - subscribers premises.

FAU - power supply.

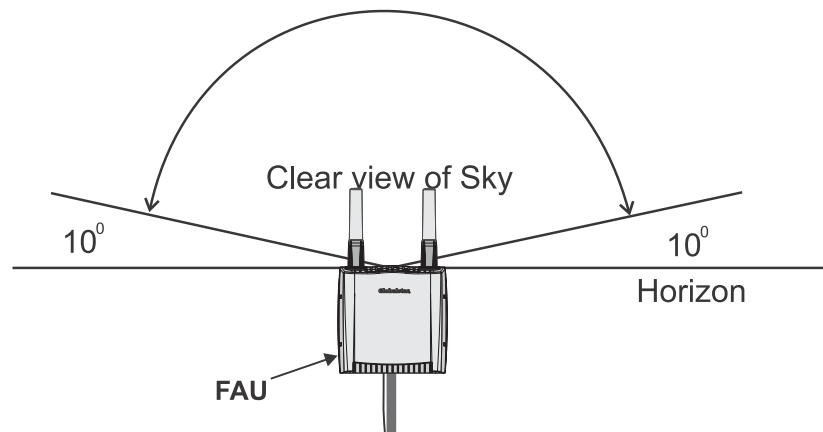


Typical FAU installation

Planning the Location for the FAU

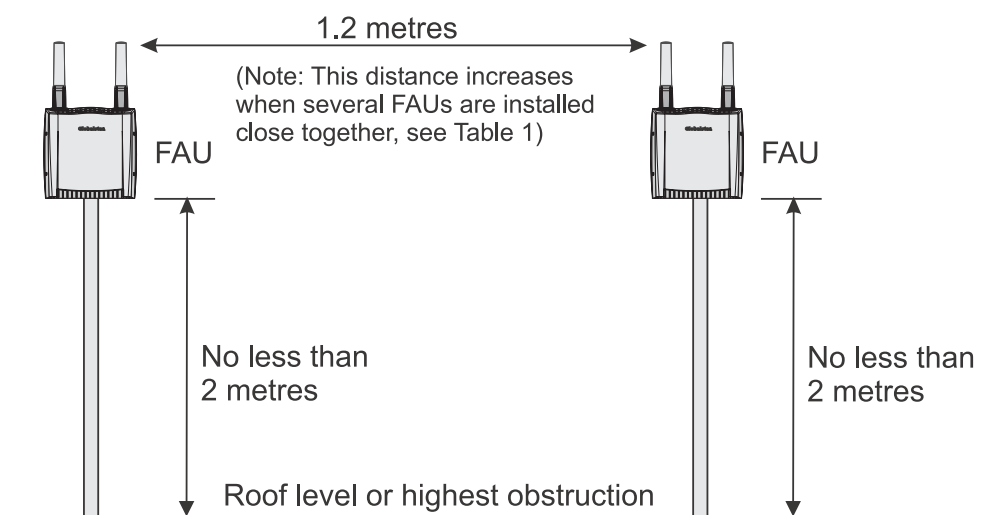
When deciding on the location for the FAU attention should be paid to the following planning recommendations:

- The FAU should be mounted to have a clear view of the sky, away from any interfering sources or obstructions, see Figure below.
- The installation must be planned to place all equipment, cables, etc., out of reach of the general public.



Clear View for Satellite Communication

- If the FAU is mounted on a building it must be at a minimum height of 2 metres above the top of buildings with a clear view of the sky.
- Where two or more FAUs are to be mounted in the same area, they should be separated by at least 1.2 metres. Refer to table 1 for recommended separation distances.



FAU Spacing and Clearance

Table 1: FAU Separation Distances

Number of FAUs	Distance from Nearest FAU
2	1.2 m
3	1.2 m
4	1.5 m
5	2.1 m
6	2.1 m
7	2.7 m
8	3.4 m
9	3.9 m
10	4.5 m
11	5.1 m
12	6.0 m

Radio Interference Sources (for Guidance Only)

In general the FAU will be unaffected by radio transmissions operating in the vicinity of an installation. However, there are a small number of situations close to radio transmitters where care should be taken in assessing the suitability of the site for installing an FAU. If due care is not taken possible mis-operation of the FAU may result or, in extreme cases, even damage.

NOTE: The information given is for guidance only. Worst case conditions have been assumed throughout.

General Radar

An FAU may suffer **damage** if placed closer than:

- **250 m** of a general radar station operating near to the FAU receive band
- **150 m** of a general radar station operating in the 5 GHz region

Fixed Radio Services Operating in the FAU Receive Band

An FAU may be rendered **inoperable** if placed closer than:

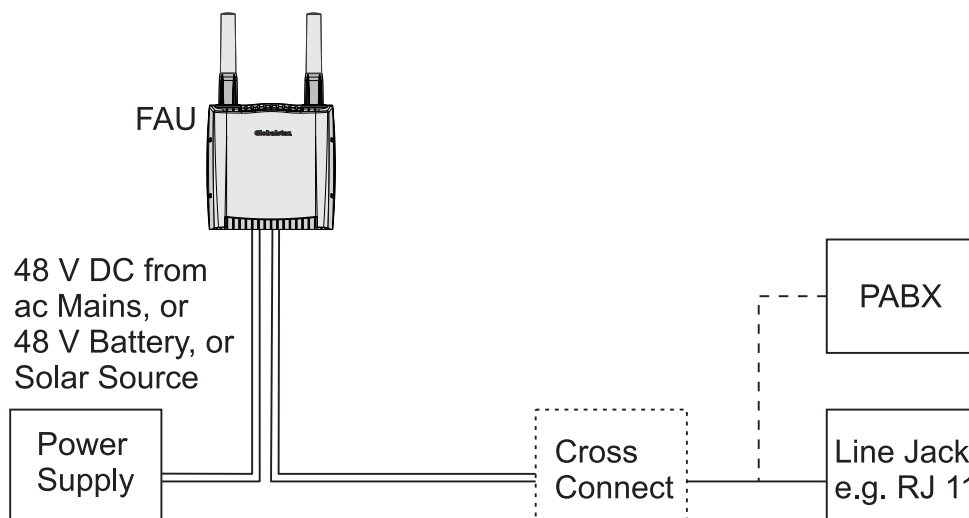
- **150 m** from the centre boresight of a digital point-to-point microwave radio link
- **700 m** of a digital point-to-multipoint base station using an omni-directional antenna

Cable Routing

The recommended cable types for use with the FAU allow the following maximum separations:

Cable between FAU and DC Power Supply

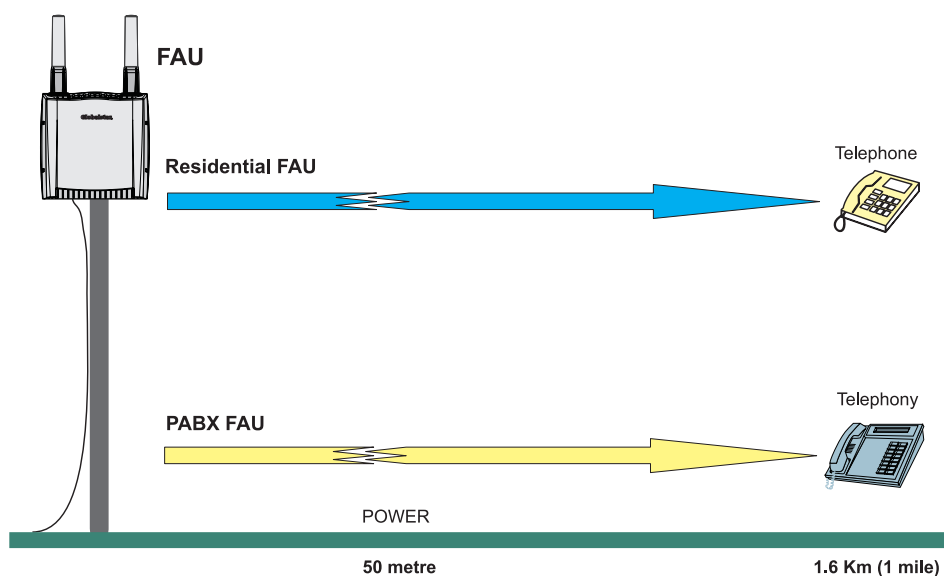
For all applications, the cable between the FAU and its DC power supply should be kept as short as possible, up to a maximum separation of 50 metres using standard power cable. See Technical Data - Cables, for recommended cable types.



FAU Block Diagram

Cable between FAU and Telecommunication Terminal Apparatus

Residential applications	<1.6 km (voice only)
PABX applications	<1.6 km (voice only)



FAU Applications

Lightning Protection

Consideration should be given to protecting all external power and telecommunication cabling against lightning especially where long lengths of overhead cable will be run from the FAU to terminal apparatus.

Where lightning protection is considered necessary all protective devices should be fitted in accordance with local regulations.

Switched DC Power Supply

The unit must incorporate a disconnection device to allow the unit to be isolated from the primary power source.

It is recommended that the DC power supply unit incorporates its own ON/OFF switch to allow the FAU to be powered ON and OFF remotely.

Pole Mounting

The FAU can be mounted on a standard pole, see Technical Data.

The following pole lengths are supported assuming a stub pole attachment conforming to the loading specification Technical Data page 18.

50mm Ø < TBD m

100mm Ø < TBD m

Preparatory field engineering work

The following checklist details some of the main engineering field activities, which may need to have been completed before installing the FAU:

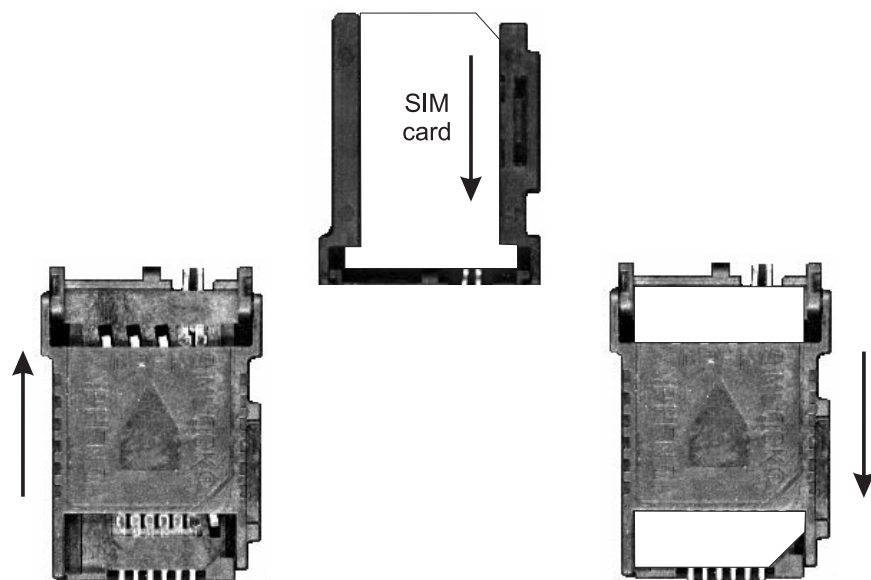
- Erection of mast / pole.
- Installation of the cross-connect box and line-jack socket(s) at the subscribers premises/PABX installation.
- Cabling of AC mains supply to DC Power Supply Unit, if applicable.
- Installation of DC Power Supply Unit and any stand-by power supply.
- Installation of data and telephony cabling from FAU to payphone/residence.
- Installation of power supply cabling from FAU to DC power supply unit.
- Provision of earthing system for FAU.

Preparation and Configuration of the FAU

Preparation and configuration of the FAU at the installer's depot is essential before field installation can take place.

The following checklist details the pre-requisite activities to be carried out for each FAU:

- Unpack the FAU and check all packaged contents, refer to check list enclosed in packaging.
- Allocate SIM card to FAU.
- Place FAU on earthing mat, connect earth lead and attach earthing strap to wrist.
- Remove rear cover plate from FAU.
- Insert SIM into the holder as follows. Click holder up in direction of arrow, swing open, insert SIM into slots notch up as shown, fold back down and click closed.



SIM Card Holder

- Attach PDI terminal and power-up FAU. Refer to FAU installation software 'Getting Started' document. Download application specific software and software configurable parameters to FAU including, SIM PIN and customer specific parameters.
- Record FAU and subscriber details, including: application, software version, telephone number, SIM number, SIM PIN, FAU serial number, IMEI No.
- Disconnect cables, fit rear cover and tighten securing screws to 2.5 Nm torque.
- Re-pack the FAU.

Installation

Check the unit for transit damage and verify that the rear cover is secure. Cross check that the FAU identity number (IMEI number) on the base of the unit, is the one allocated to the subscriber.

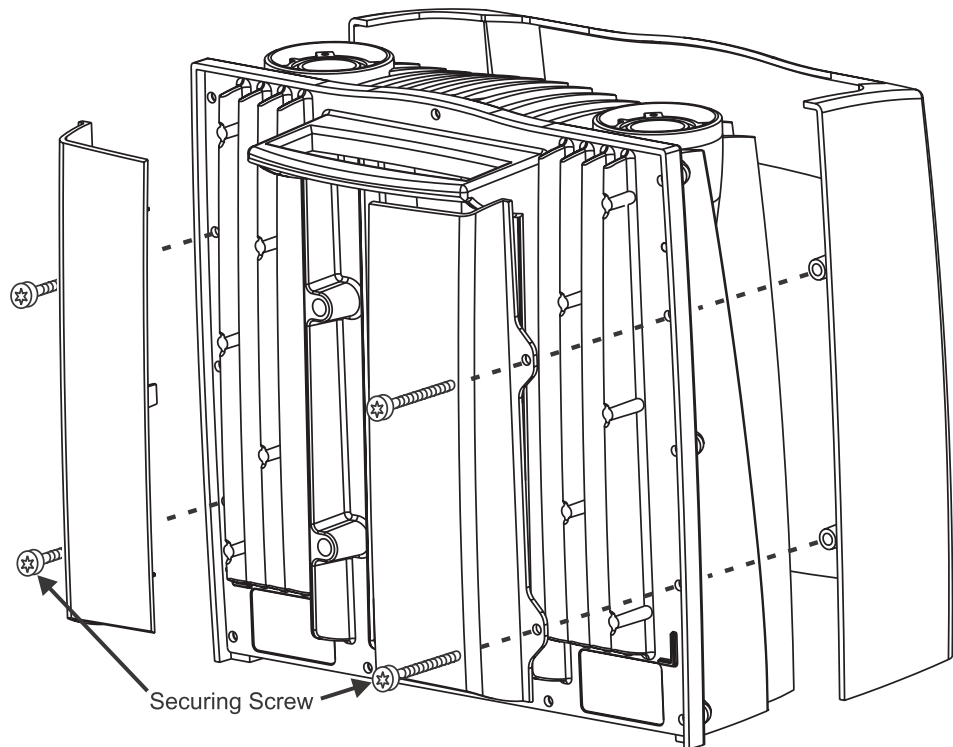
Globalstar Satellite Terminal Fixed Access Unit KRC 118 11 P1C	Serial Number: EP2 xxx	IMEI Number: TTTTFF-SSSSS-P	Manufactured in Sweden by ERICSSON Type Number: 0160101-BV A A A INPUT 44-54V = 1.0A MAX YYWZZ
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FAU Label

Assembling the FAU

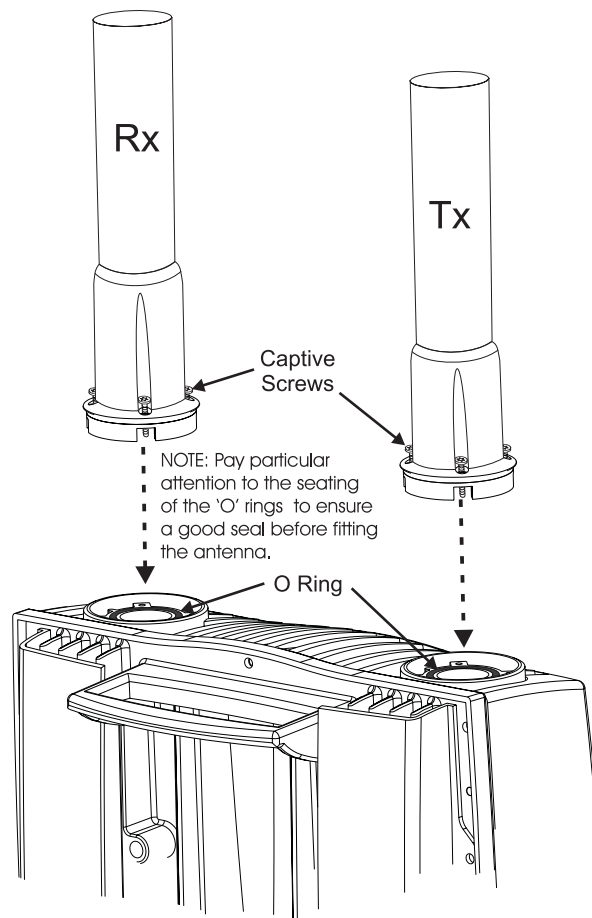
Sun shields and antennas must be fitted to the FAU housing before fitting the unit to a pole.

1. Place front sun shield in position on housing ensuring it locates correctly with screw holes.
2. Position rear sun shields and insert four screws through rear sun shield and housing into front sun shield.
3. Tighten screws in turn to 0.8-1.0 Nm torque.



Fitting Sun Shields

4. Insert sealing 'O' rings into antenna sockets of main housing.
5. Place antenna in position, they are keyed to ensure correct location of each antenna and mating of antenna connectors.
6. Secure antenna using captive screws and tighten to 0.8-1.0 Nm torque.



Fitting the Antenna

Fitting the FAU

The installer will first need to decide the appropriate method for installing the FAU, see Pre-Installation.



WARNING:

DANGER TO PERSONNEL

Do not install the FAU during a lightning storm.



WARNING:

HAZARDOUS VOLTAGES

Use caution when installing or modifying telephone lines as hazardous voltages may be present.

1. Where conditions allow, mount the FAU on a pre-installed stub pole/ mast, by using the handle provided on the FAU. Typically, these situations will arise only where the top of the pole can be reached safely and easily. Connection of cables will then be possible after the FAU has been secured in position.

2. In situations where the top of the pole cannot be reached safely; FAU mounting may be better achieved by mounting the FAU to the stub pole, connecting all cables *and then* erecting and securing to the mast with the FAU in position.

**WARNING:****DANGER TO PERSONNEL**

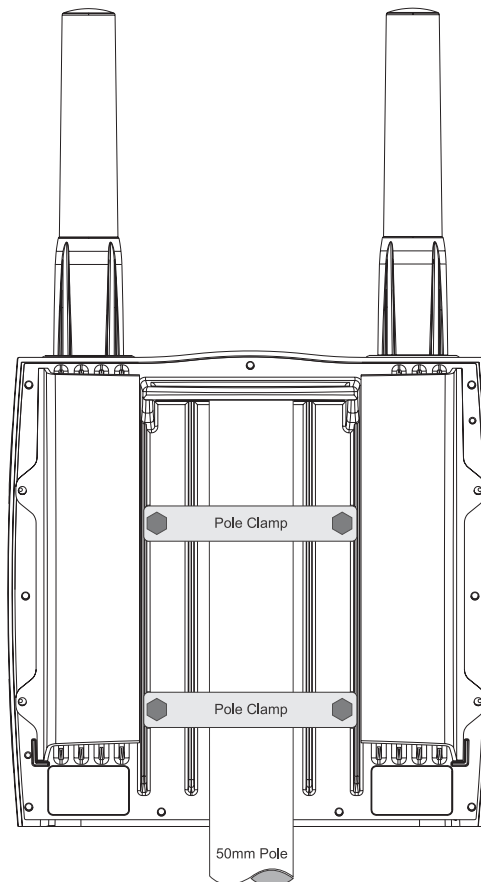
The FAU may fall down if it is incorrectly mounted on pole.

The following procedure may need to be adapted to suit the chosen method of installation:

1. Prepare the FAU for mounting at the top of the pole by loosely fitting the two pole-clamps on the back of the FAU. The screw length will depend on the diameter of the pole, eg. 100 mm nominal pole use 80 mm long screw, 50 mm nominal pole use 25 mm long screw.
2. Lift the FAU over the top of the pole passing the pole through both brackets until the top of the pole butts fully against the FAU handle/stop-plate, see below.
3. Secure the FAU to the pole by tightening the clamp bolts to 3 ± 0.5 Nm torque.

**WARNING:****DANGER TO PERSONNEL**

Ensure the FAU is securely mounted before powering-up.

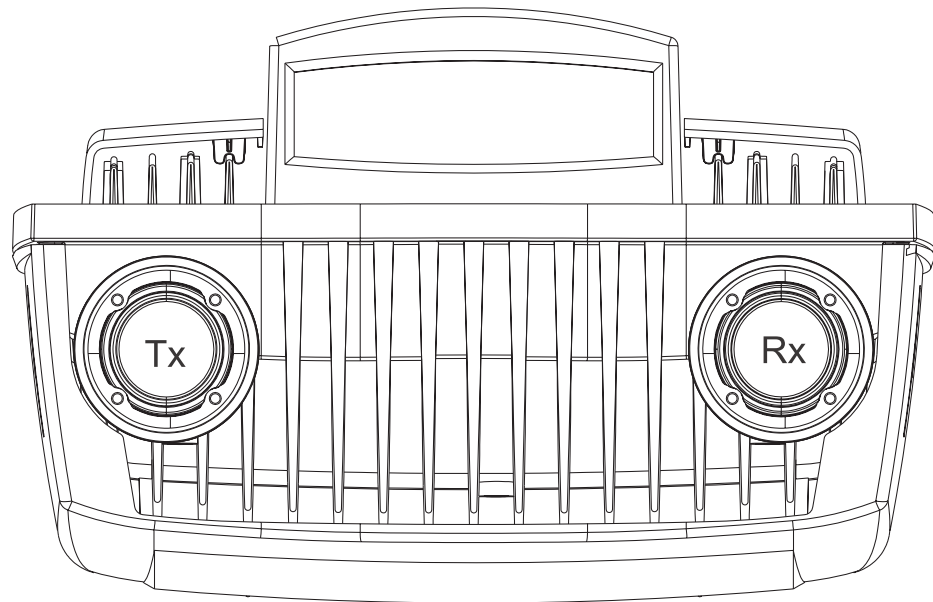


FAU Pole Mounting

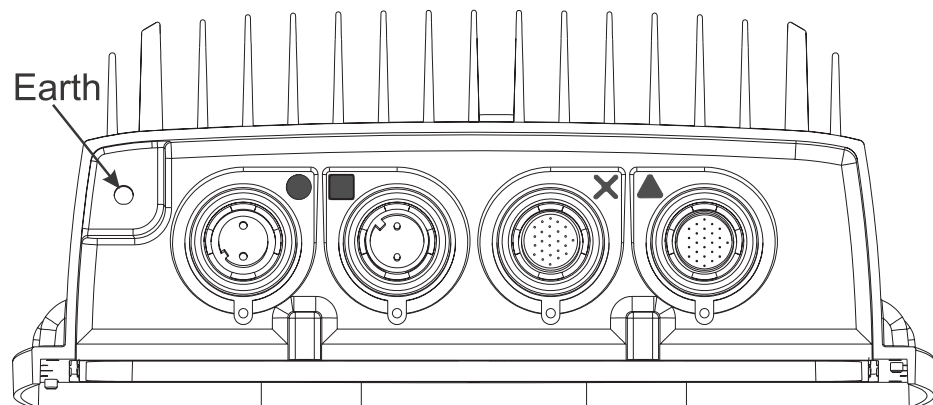
FAU Connections

Each FAU has seven external Connections:

- Antenna Rx.
- Antenna Tx.
- Bolt - Earthing cable.
- Connector - 2-wire telephony cable.
- Connector - data cable - not used.
- Connector - 2-wire DC power feed.
- Connector - PDI cable for configuration and commissioning.



TOP (with Sun Shields)



BOTTOM (without Sun Shields)

Symbols used: ● = Power ■ = Tel X = PDI ▲ = Data

FAU Connections

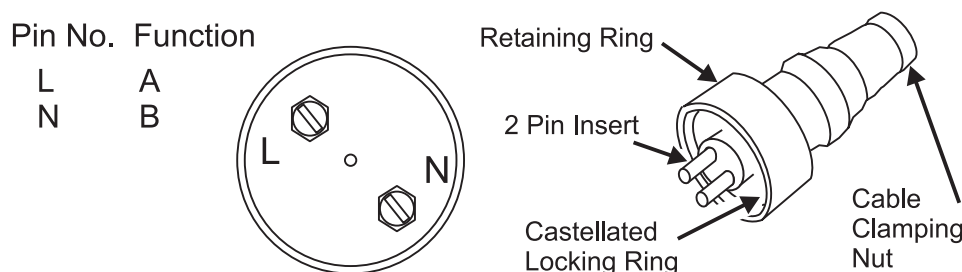
Table 2: Cable Connectors
Manufacturer: Bulgin Type: Buccaneer sealed

Connector	No of ways required	Bulk head Connector	Cable Connector - Flex Mounting (not supplied)
PDI	25-way	Panel Plug - fitted with 25-way crimp pin insert.	Socket - fitted with 25-way crimp pin insert.
Data	25-way	Panel Socket - fitted with 25-way crimp pin insert.	Plug - fitted with 25-way crimp pin insert.
Power	2-way	Panel Plug - fitted with 2-way screw type terminal.	Socket - fitted with 2-way screw type terminal.
Telephone Line (A & B lines)	2-way	Panel Socket - fitted with 2-way screw type terminal.	Plug - fitted with 2-way screw type terminal.

Telephone (■)

The drawing below shows pin connections of socket.

4. Unscrew castellated locking ring on connector to remove the 2-pin insert.
5. Slacken cable-clamping nut and insert cable into connector.
6. Connect appropriate wires to pins L and N of 2-pin insert then tighten securing screws.
7. Replace insert then tighten castellated locking ring and cable clamp.
8. Plug into FAU and tighten retaining ring.



Telephone Line Connections

The telephone cable should be supported at regular intervals along its route according to local regulations. Typically, a fixing every 300 mm or so is common. P-Clips or All Weather Ty-wraps are generally used for this but whatever supports are chosen must be suitable for the cable diameter and chosen to suit the surface or surfaces at that particular site. Waterproof sealant should be used to seal and weather-proof the point of entry of the cable into the building following local installation standards. Ensure the installation is aesthetically pleasing.

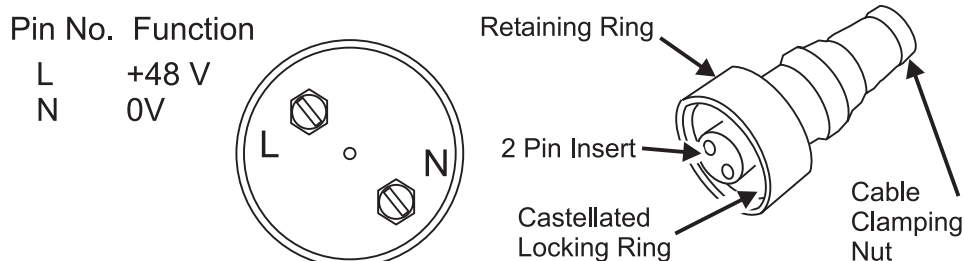
Power (●)

The drawing below shows pin connections of power socket.

1. Unscrew the castellated locking ring on connector to remove the 2-pin insert.
2. Slacken the cable-clamping nut and insert the cable into the connector.
3. Connect appropriate wires to sockets L and N then tighten securing screws.
4. Replace insert then tighten castellated locking ring and cable clamp.
5. Plug into FAU and tighten retaining ring.

The power source should provide +48 volts DC with respect to the FAU case. The power cable should be supported at regular intervals along its route according to local

regulations. Waterproof sealant should be used to seal and weatherproof the point of entry of the cable into the building following local installation standards.



Power Socket Connections

Data (▲)

The data connector is not used in this version of the FAU. Ensure the dust cap is securely fitted to protect the FAU from dust and moisture ingress.

PDI (X)

The PDI cable enters a socket at base of the FAU. When the socket is not in use, ensure the dust cap is securely fitted to protect the FAU from dust and moisture ingress.

SAFETY - Earth/Ground

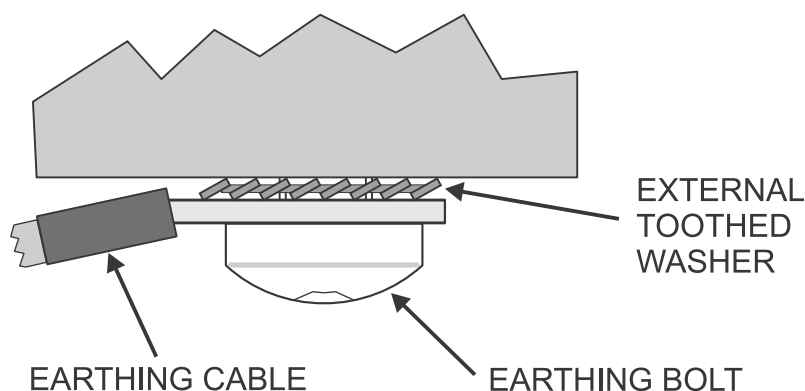


DANGER:

EARTH LEAKAGE CURRENTS

Under no circumstances shall the FAU be operated without a protective copper earthing conductor.

The FAU enclosure must be connected to a single protective earth. A separate copper earth cable must be installed from the FAU to an earth / ground, in accordance with local regulations.



Earthing Stud

Ensure the earthing conductor is attached to the housing as shown above using toothed washer to provide good contact.

Commissioning

The following instructions enable the installation engineer to ensure the system is working correctly before leaving the installation.

After checking that the installation is complete, correct and that all earth connections are good the system must be tested.

Power-Up



DANGER:
HAZARDOUS VOLTAGES

Hazardous voltages will be present within the FAU once power has been applied.



DANGER:
HAZARDOUS VOLTAGES

Avoid electrical contact with the telephone wires, hazardous voltages may be present.

Switch on the DC power supply to power up the FAU and wait one minute for system registration.

If the ambient temperature is between -15° C and -30° C allow the unit 3 minutes to warm up.

Making a test call

- Lift the telephone handset and observe the following,
- Dial Tone should be heard.
- Dial the test call telephone number and finish with the '#' key. If the Equipment Engaged (Busy) tone is heard, replace the handset and try again later.
- When the call is answered, talk for a short period to ensure you can hear and be heard. Press down a button on the telephone keypad. Ensure that the called party hears a clear tone. Ask them to press a button so you can check for a clear tone as well.
- Arrange for the called party to dial the FAU to test incoming calls.
- Hang-up to terminate the call.

Receiving an Incoming Test Call

When the telephone rings, wait for about 3 seconds before picking up the phone. This confirms the ringing circuits of the FAU are OK.

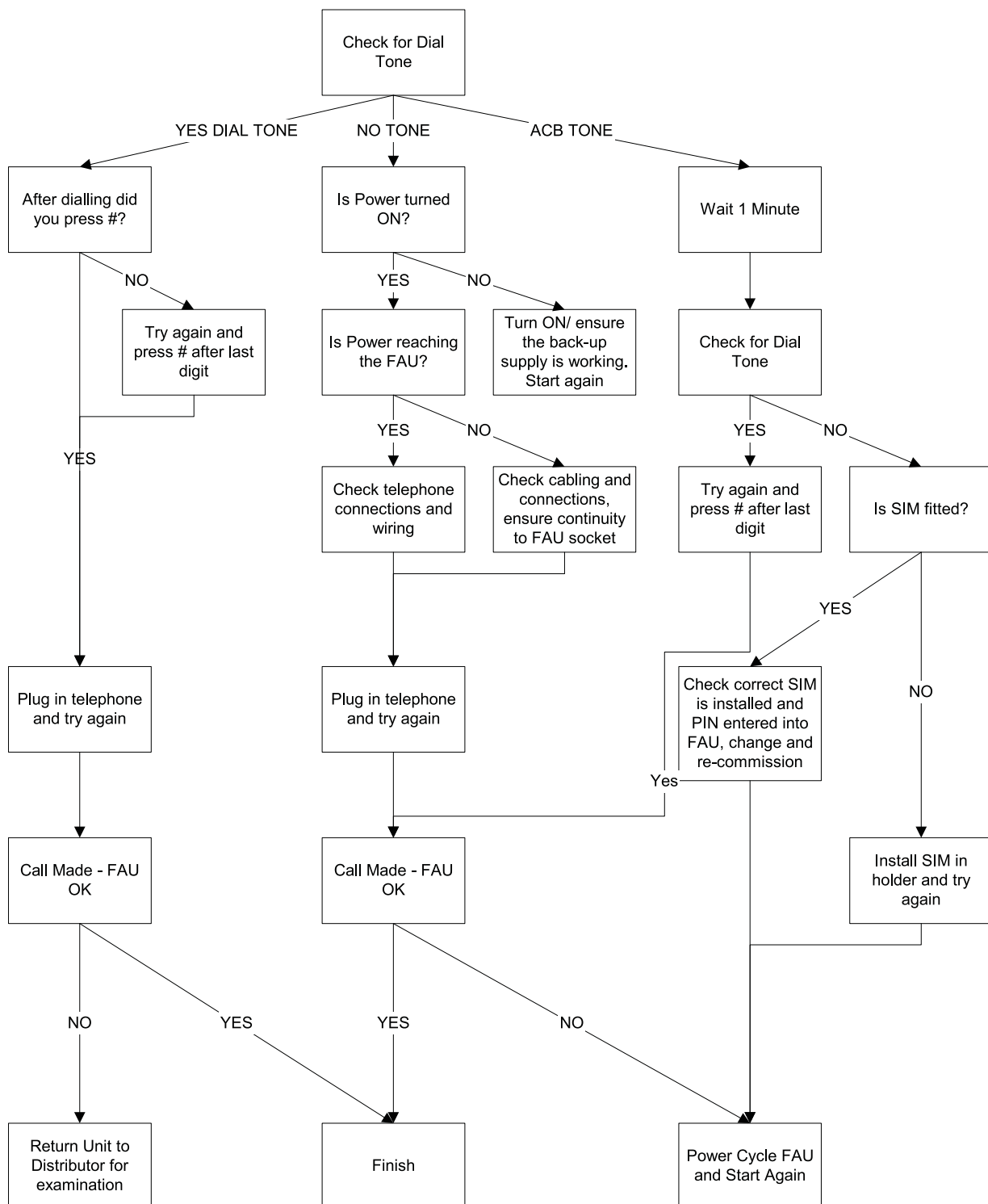
Talk for a short period, ensure that you can hear, and can be heard, then hang-up.

Data Calls

Not supported.

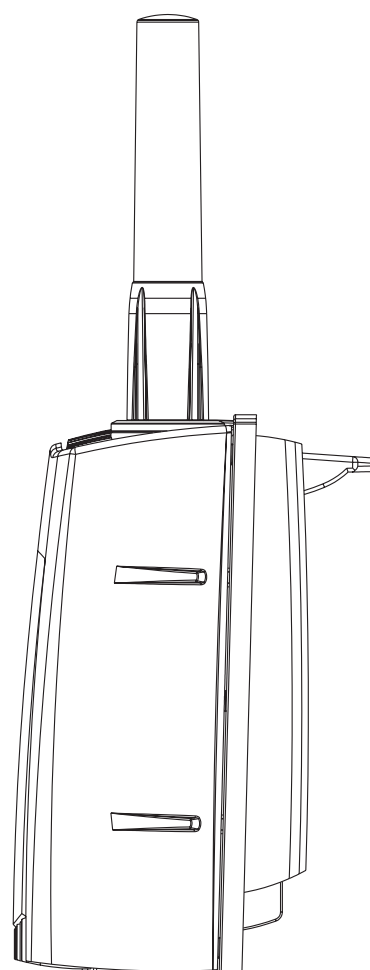
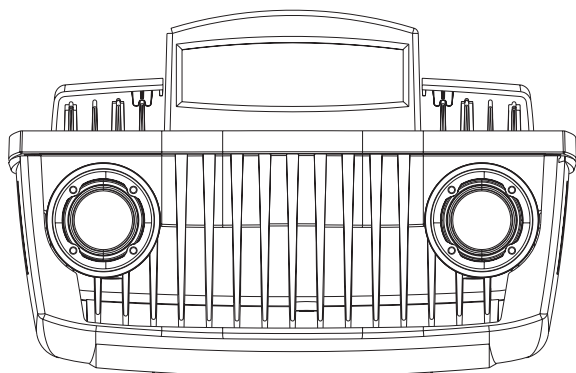
Fault Finding

The following chart will help in finding simple faults when making a test call. Any other faults should be reported to the service provider and the unit returned for internal checking.



Fault Finding Chart

Technical Data - FAU



FAU Outline Drawing

Physical

Colour	Light grey
Dimensions	
Including antennae	W 300 x D 175 x H 525 mm
Excluding antennae	W 300 x D 175 x H 300 mm
Weight	7.3 kg
Degree of ingress protection	EN 60529 IP55

Power requirements

Supply voltage	+48 V DC nominal, +44 to +54 V DC
Supply ripple	200 mVrms maximum
Input current	1.0 A maximum
Power consumption	50 W maximum

Environmental

Storage temperature	-30 to +70° C
Transportation temperature	-30 to +70° C
Operating temperature	-30 to +60° C with 1120W/m ² solar radiation
Relative humidity	Up to 90%
Altitude	Sea level to 5000 m

Interfaces

Telephone port	Analogue subscriber line UK standard, 600 ohms (resistive) (configurable to individual country standards) DTMF ITU-T Q.23 Supports terminal equipment up to REN=3 Loop calling unguarded clearing Line reversal Clear backward
Data port	Not currently supported RS422 levels
PDI port	Connector for configuration and commissioning tool RS232 levels

Air interface

Standards	Globalstar Air Interface (GAI)
Transmit frequency	1610.0 to 1626.5MHz
Receive frequency	2483.5 to 2500.0MHz
Transmit power	+37dBm EIRP maximum
Receiver G/T ratio	-24dB/K minimum

Installation

On pole	With mounting kit supplied for pole diameters 47.8 - 48.8 mm or 100.6 - 102.6 mm
Cable connectors	Bulgin 'Buccaneer' range (not supplied)
Power	Panel Socket - 2-way screw type terminal.
Telephone	Panel Plug - 2-way screw type terminal.
PDI	Sealed Socket - fitted with 25-way crimp pin insert.

Standards

Safety	
European Union	EN 60215, EN 60950
EMC	
European Union	EN 300 733, EN 300 831
US	FCC CFR 47 Part 15B
Environmental	ETS 300 019 Classes 1.2, 2.3 and 4.1 with exceptions

Technical Data - PSU

AC/DC Converter	
Input voltage	95 to 265 V AC, 50 to 60 Hz
Output voltage	+48 V DC to +54 V DC
Output current	1.0 A minimum 3.0 A maximum (can be via external 3.0 A fuse)
Supply ripple	200 mV rms maximum
Environmental	To suit local environmental conditions
Safety	The unit must comply with EN 60950 or equivalent safety standard. The installation must be a SELV source of supply with single fault protection. The installation must incorporate a disconnection device to allow the psu to be isolated from the primary power source.
CE-marking	The unit must be marked with the CE-marking. This means that it complies with the following European Council Directives: 73/23/EEC, concerning electrical safety 89/336/EEC, concerning electromagnetic compatibility

Technical Data - Cables

Cable between FAU and PSU

Number of wires	2 core
Length	50 m maximum
Wire type	Solid or stranded
Wire diameter	20 AWG or equivalent for up to 50 metres length
Outer cable diameter	6.0 mm minimum, 8.1 mm maximum
Insulation material	PVC or PE
Insulation between wires	must withstand 750 Vrms during 1 minute

Temperature	-40 to +80° C (where local conditions allow a lower specification cable may be selected)
Working voltage	100 Vrms

Cable between FAU and cross-connect

Number of wires	2 core twisted pair
Length	1609 m maximum (total length of all cabling to telephones including extensions)
Wire type	Solid or stranded
Wire diameter	0.4 mm minimum (26 AWG)
Outer cable diameter	5.5 mm nominal
Insulation material	PVC or PE
Insulation between wires	Must withstand 750 Vrms during 1 minute
Temperature	-40 to +80° C (where local conditions allow a lower specification cable may be selected)
Working voltage	100 Vrms

CAUTION: To reduce the risk of fire use only No. 26 AWG or larger telecommunication line cord.

Protective Earth Cable (typical)

Wire type	Stranded
Wire diameter	12 AWG Copper
Conductor Size	56/0.3
Conductor Rating	41A
Insulation material	PVC or PE (Colour: Green / Yellow)
Overall diameter	4.4mm

Additional Information

RF (Radio Frequency) Safety

The FAU200 SAT has been tested in accordance with RF safety guidelines on human exposure to RF fields. When installed using the procedures described in this Handbook the FAU200 SAT produces RF exposures well below international safety limits and conforms to the recommendations of the ICNIRP (International Commission on Non-Ionising Radiation Protection) and to international exposure standards, such as:

- CENELEC European Pre-standard ENV50166-2
- US standard ANSI/IEEE C95.1-1992

Maintenance work on the FAU200 SAT antenna during operation will not generate RF exposure levels exceeding the safety limits.

Patents

This product is manufactured under licence to one or more of the patents of Qualcomm Incorporated, other patents pending.

Table 3: Patents

4,901,307	5,416,797	5,566,357	5,627,857
5,056,109	5,426,392	5,568,483	5,629,955
5,099,204	5,442,627	5,572,172	5,629,975
5,101,501	5,452,473	5,574,773	5,633,881
5,103,459	5,461,639	5,576,662	5,638,412
5,107,225	5,469,115	5,577,022	5,640,414
5,109,390	5,475,870	5,577,025	5,642,398
5,228,054	5,479,475	5,581,575	5,644,591
5,257,283	5,485,486	5,588,043	5,644,596
5,265,119	5,487,175	5,590,069	5,646,991
5,267,261	5,490,165	5,590,406	5,652,599
5,267,262	5,497,395	5,590,408	5,654,979
5,283,536	5,499,280	5,592,481	5,655,220
5,289,527	5,504,773	5,592,548	5,657,420
5,307,405	5,506,865	5,594,718	5,666,122
5,309,474	5,509,015	5,596,570	5,673,259
5,339,046	5,511,067	5,600,754	5,675,644
5,341,456	5,511,073	5,602,833	5,687,229
5,373,259	5,528,593	5,603,096	5,689,557
5,383,219	5,544,196	5,604,730	5,691,974
5,392,287	5,546,459	5,617,060	5,692,006
5,396,516	5,561,618	5,621,784	
5,408,697	5,566,000	5,621,853	
5,414,796	5,566,206	5,625,876	

