605-0000-593

AS4000 / AS4020 Base Station Installation and Commissioning Release 7.30

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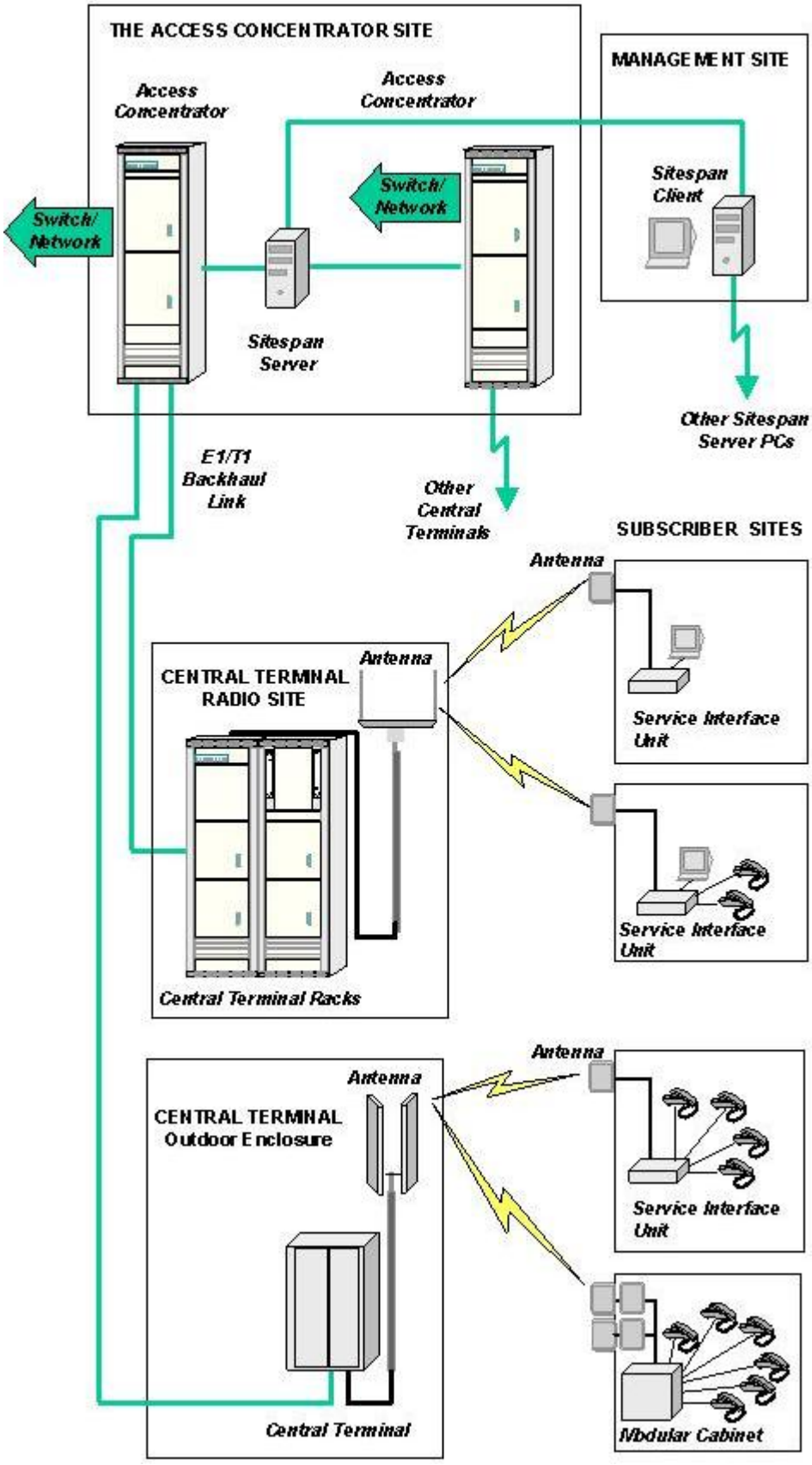
AS4000 System

The system uses Point-to-Multipoint digital radio links between the individual customer's premises and the carriers local "point of presence" typically the Local Exchange premises. If greater flexibility or range is required, the network radio equipment can be located in another suitable building or wayside cabinet.


THE ACCESS CONCENTRATOR SITE
Access Concentrator
Access Concentrator
Switch/ Network
Switch/ Network
Sitespan Server
MANAGEMENT SITE
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Other Sitespan Server PCs
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Service Interface Unit
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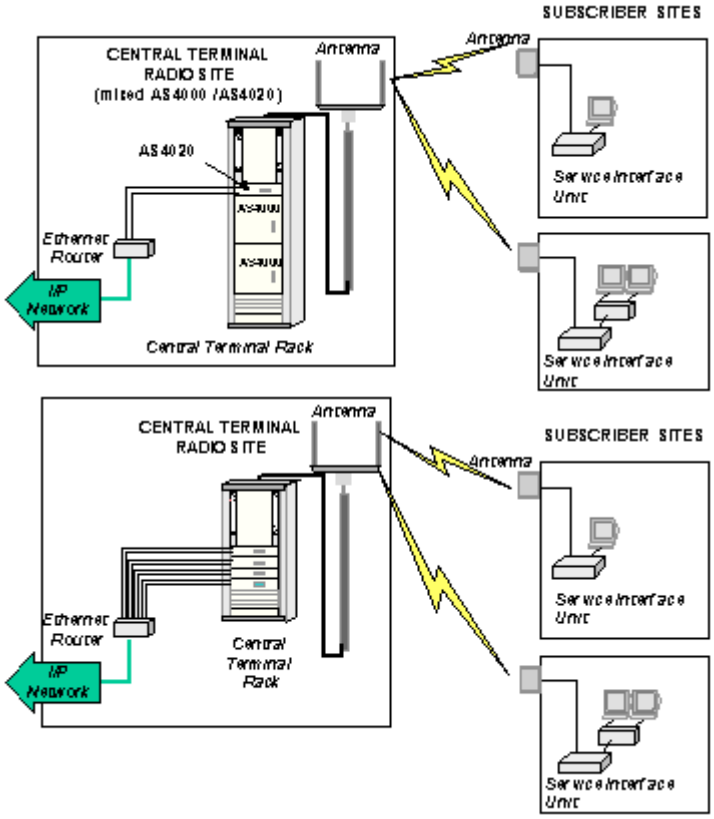
Central Terminal

Overview AS4020

AS4020 System

The system uses Point-to-Multipoint digital radio links between the individual customer's premises and the carriers local "point of presence" typically the Local Exchange premises. If greater flexibility or range is required, the network radio equipment can be located in another suitable building or wayside cabinet.



Preparation

Preparatory Tasks

Installation Tools and Equipment

The following lists of tools and equipment are required to successfully install and test the AS4000 Access Concentrator Racks.

Required Tools

- Combination Spanners: 8 mm, 13 mm, 17 mm, & 19 mm.
- Spirit Level: 18 inch.
- Pozidrive: No 1 x 75 mm.
- No 2 x 100 mm
- ;No 3 x 150 mm.
- Screwdriver, flat blade: 3 mm x 100 mm.
- Screwdriver, flat blade: 5.5 mm x 100 mm.
- Screwdriver, flat blade: 8 mm x 150 mm.
- Hammer, Ball Pein: 1lb.
- Drill Bits, Masonry: 11 mm, 12 mm, 13 mm.
- Ratchet Crimp Tool for red, blue and yellow insulated crimps.
- Crimp Tool type 6A with VQ dies for co-ax connectors and optionally Type 43 connectors
- Cordless Drill/Driver.

Required Equipment

	Description	Recommended Model	Quantity
1	Digital Multimeter	Fluke 77 or similar	1
2	50 ohm Termination 15W	Suhner 6515.17.A	2
3	Test Lead for Management Port	Airspan proprietary item	1
4	RF Power Meter	Amritsu Sitemaster 400A or Marconi 6970	1
5	Power Sensor	Amritsu 560-7N50B or Marconi 6932	
6	Sensor 30dB 5W attenuator for use with Amiritsu Power Sensor	HP8491 N-type	1
7	DA Commissioning Unit and associated cables	Airspan proprietary item	1

Site Readiness

Verify that the site is ready for the installation of the CT Racks.
This preparation will have been covered by a site survey conducted by Airspan Networks or by a survey form completed by the customer. The survey will include a site plan of the facility identifying the floor layout, power outlets, distribution boxes, and cabling runways. A sketch showing the rack support arrangements showing the exact positions of the mounting points on the rack with dimensions, and typical overhead ironwork provision should be included.
Inspect the site, and particularly the equipment room, before unloading or unpacking the equipment to ensure the following:

- Air conditioning is installed and funtional (if required to maintain room environment).
- Adequate grounding is provided.
- Access to the equipment room will be adequate for normal handling and movement.
- Adequate lighting is available for carrying out the installation.

Any non compliance with acceptable standards should be bought to the customers attention and resolved before proceeding with the installation.

Power Availability

From the site survey, confirm the location of the fuse position for the negative battery supply and the return point required for each rack. Also locate the fuse position for the alarm unit power supply.

Site Earth

Confirm the position of the grounding point using the site survey.

Flooring

Ensure that flooring is substantial enough to support the rack and can provide a secure fixing.

Cable Trays

Verify that cable trays are installed to provide routing to the proper destinations and are of adequate strength

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, and the contents of boxes, etc.). Any discrepancy or damage must be reported immediately to ACC for further instructions. In case of severe damage, do not accept the consignment from the carrier. See Material Return and Repair document for further details. The equipment is normally shipped as shown below.
If subsequent to the initial shipment incremental upgrades are made to the system the equipment will be delivered in packaging of size and type suitable for that shipment.

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 Networks International Call Centre for further instructions at the address given in the Contact Information section of this manual or:

TELEPHONE: +44 (0) 1895 467 467
FAX: +44 (0) 1895 467472
Email: support@airspan.com
Dispose of all unnecessary packaging in a safe manner according to the customer's requirements.

During UK working hours, the Airspan Shipping Department can be contacted at:

Tel:+44 1895 467 444 or +44 1895 467 444
Fax:+44 1895 467 438

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

Rack Installation

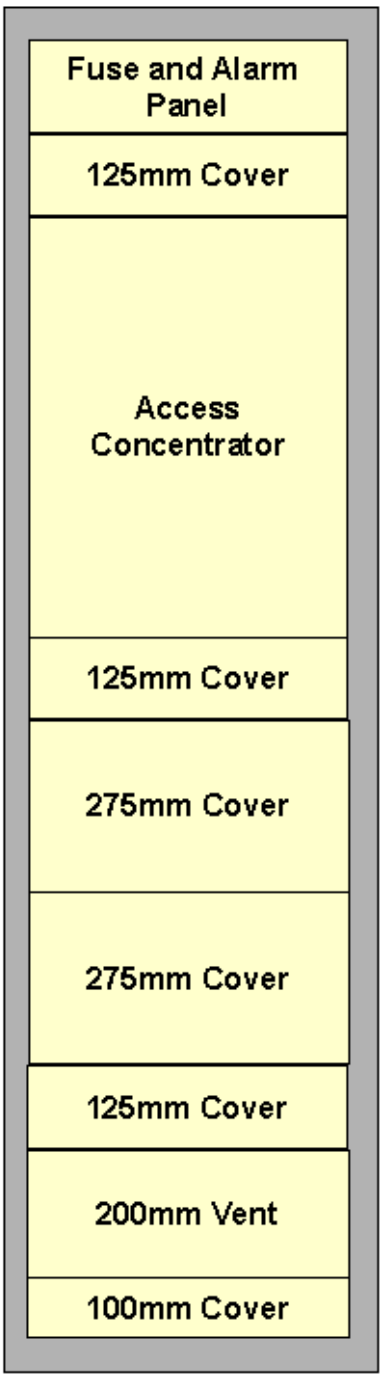
Rack Layouts

AS4000 Racks

AS4000 Central Terminal and Access Concentrator Racks are produced with the following layouts:

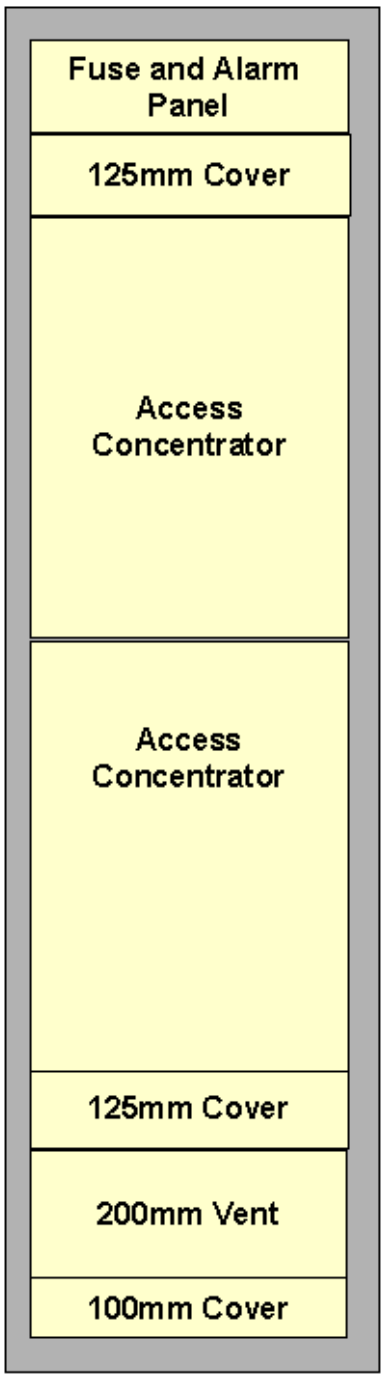
Access Concentrator

- One DA Access Concentrator Shelf and a Fuse and Alarm Panel
- Two Access Concentrator Shelves and a Fuse and Alarm Panel



Access Concentrator Rack

Single Shelf

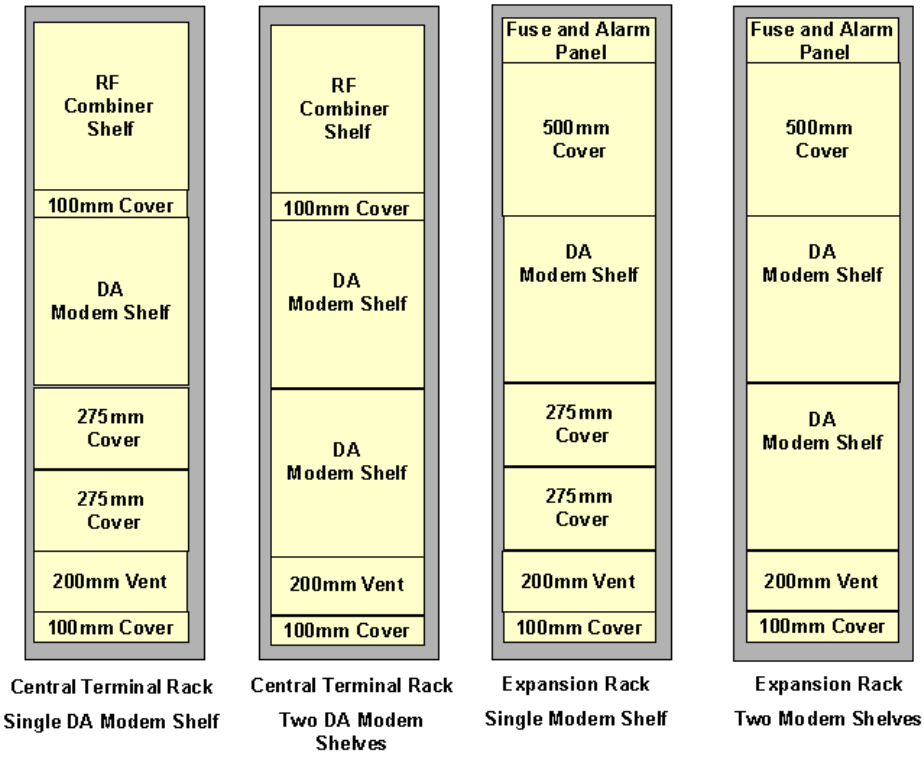


Access Concentrator Rack

Two Shelves

Central Terminal Demand Assignment System

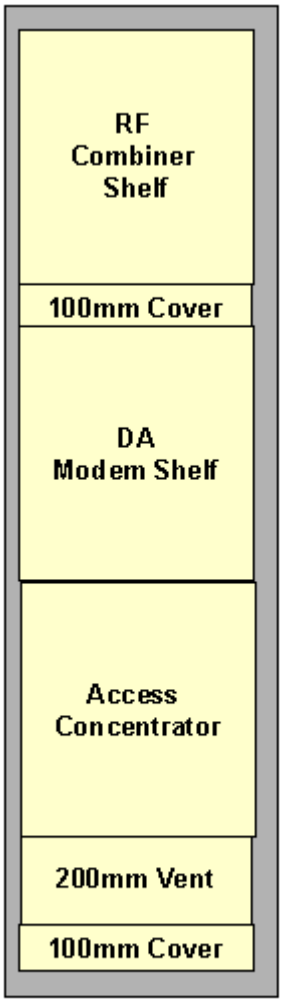
- One DA Modem Shelf with RF Combiner Shelf
- Two DA Modem Shelves with RF Combiner Shelf
- Expansion Rack with one DA Modem Shelf and a Fuse and Alarm Panel. (Connects to an existing Central Terminal Rack)
- Expansion Rack with two DA Modem Shelves and a Fuse and Alarm Panel. (Connects to an existing Central Terminal Rack)



No of Modem Shelves	Central Terminal Rack	Expansion Rack
1	1 Modem Shelf	Not required
2	2 Modem Shelves	Not required
3	2 Modem Shelves	1 Modem Shelf
4	2 Modem Shelves	2 Modem Shelves

Integrated Basestation

The Integrated Basestation incorporates a Combiner Shelf , Modem Shelf and Access Concentrator in a full height equipment rack.



Integrated
Basestation

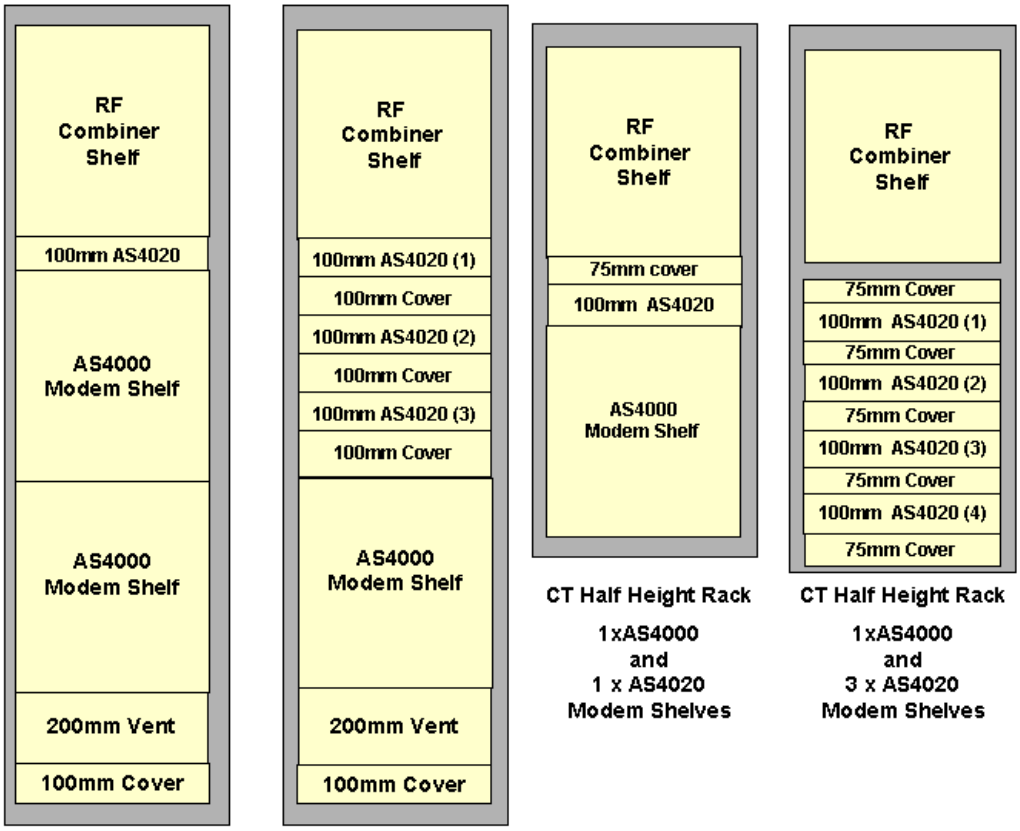
Rack Layouts

AS4020 Racks

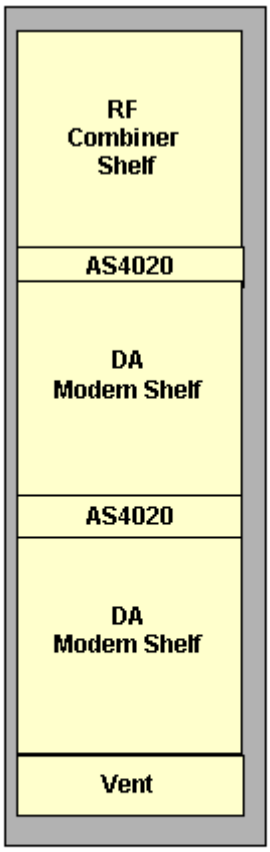
AS4020 Central Terminal racks are produced with the following layouts:

Central Terminal Systems using AS4020

- Full height rack with RF Combiner Shelf. two AS4000 Modem Shelves and one AS4020 Modem Shelf
- Full height rack with RF Combiner Shelf, one AS4000 Modem Shelves and up to three AS4020 Modem Shelves
- Compact rack with RF Combiner Shelf. One AS4000 Modem Shelf and one AS4020 Modem Shelf
- Full height rack with RF Combiner Shelf, up to four AS4020 Modem Shelves
- Full height rack with RF Combiner Shelf. two AS4000 Modem Shelves and two AS4020 Modem Shelves



Full height rack with RF Combiner Shelf. two AS4000 Modem Shelves and two AS4020 Modem Shelves



Central Terminal Rack

Two AS4000 Modem Shelves
and
Two AS4020 Modem Shelves

Rack Installation

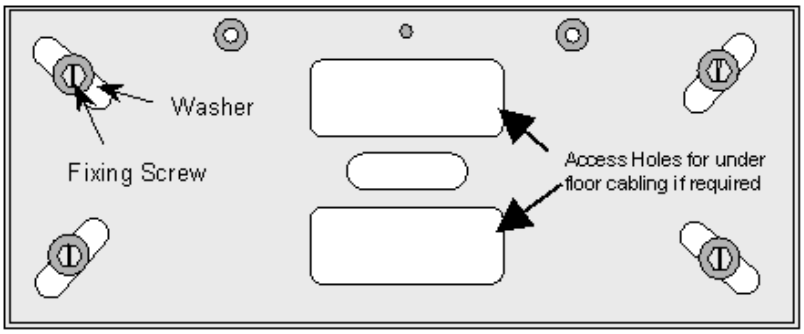
Positioning and Securing Racks

Installing Rack in a Suite

From the site survey, confirm the position of the CT Rack(s). If the racks are to be positioned in a suite, metalwork will be required to secure it to the overhead structure. Either a proprietary system or fabricated steelwork will be required - see site survey. Manoeuvre the racks into position.

Securing Rack Base

Using the base of the rack as a template, mark the floor locating positions through the cutouts in the Rack Frame. Using a 13mm diameter drill bit, drill four holes to a depth of approximately 25mm. Position the rack over the four holes and screw the four (supplied) M12 screws through washers to secure the rack base. If the rack is cabled from under the floor the access holes are required through the floor beneath the rack base.

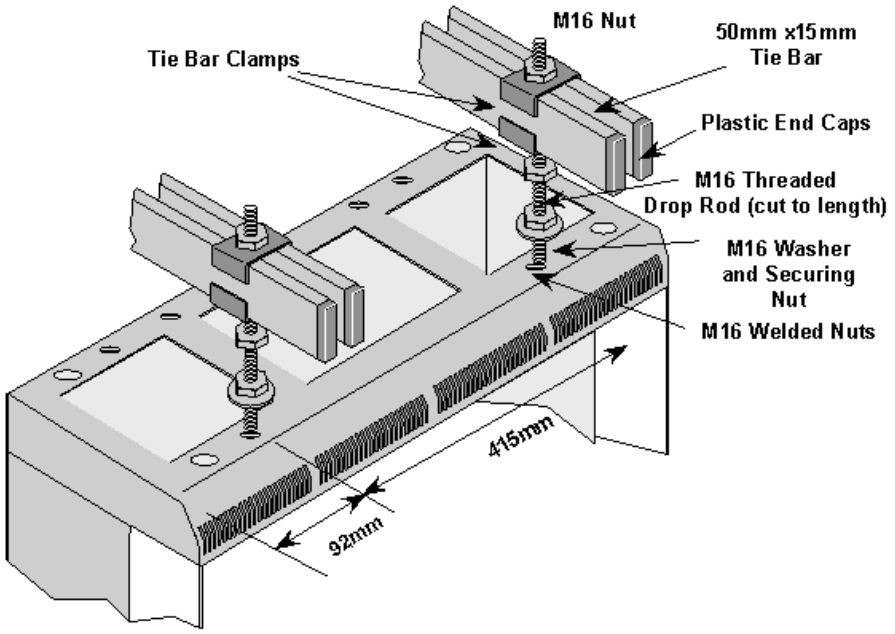


Securing Rack Base

Warning: These screws are provided as locating pins only and must be used in conjunction with the overhead steelwork and not as the only method for securing the rack. Temporarily secure the rack to adjacent racks or steelwork until the overhead support is in place.

Securing the rack using overhead Ironwork

Assemble the overhead steelwork as required and secure the rack to the overhead structure using suitable fixings in compliance with local requirements. Remove all burrs and sharp edges.

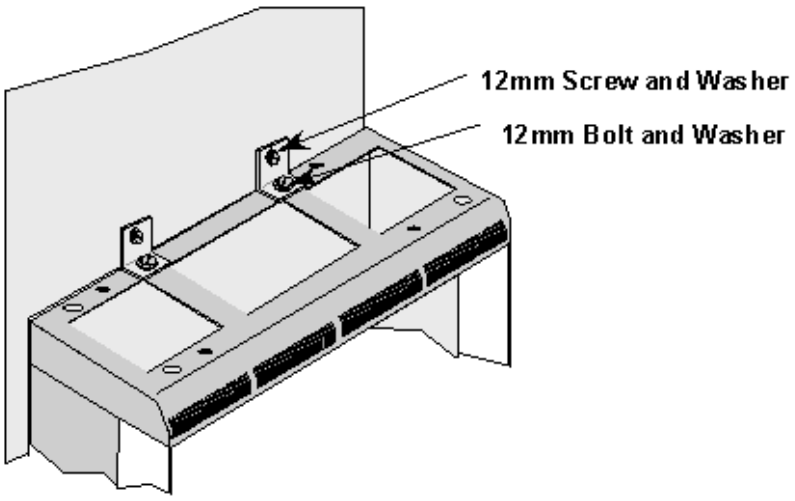


Typical Overhead Ironwork Support

Note: In installations where threaded droprods in excess of 500mm are employed it may be necessary to provide additional support bars to ensure rigidity of the support structure.

Securing a Rack to a Wall

If the rack is to be positioned against a wall, attach two right-angled wall brackets to the top of the rack and finger tighten with the provided M12 screws.
Manoeuvre the racks into position against the wall. Join the racks together with 12mm nuts and bolts placed through the holes at the top and bottom of the side panels and mark the wall through the holes in the top brackets.



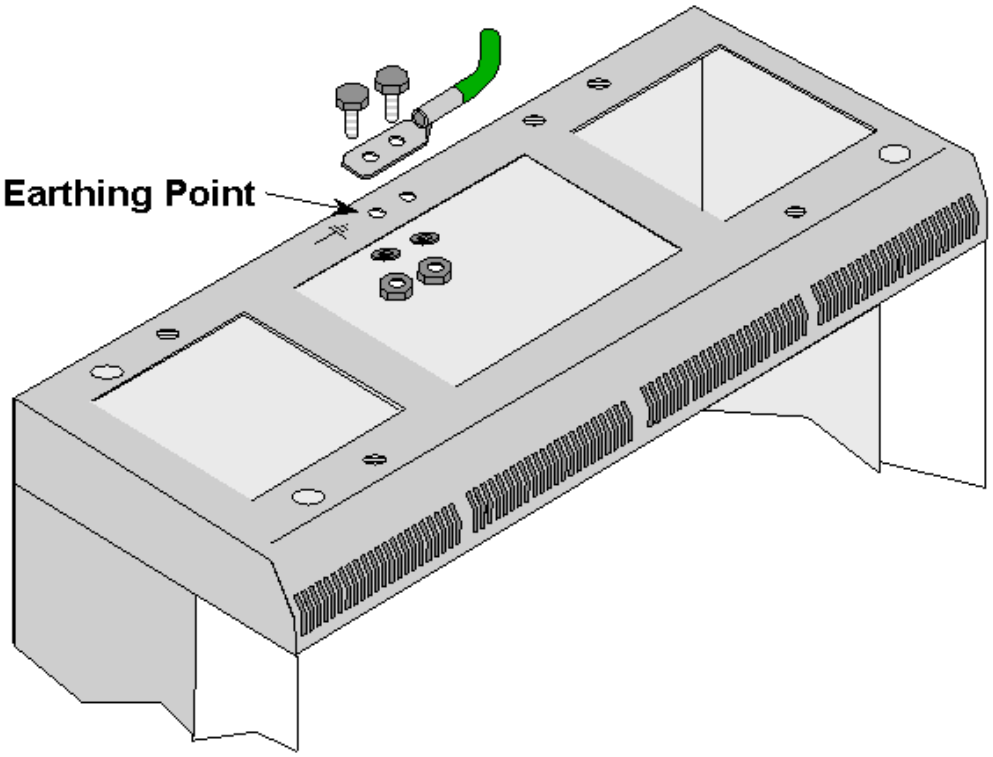
Securing Rack to a Wall

Using an 11mm. drill bit, drill holes in the wall to a depth of 75mm and fit masonry plugs. Fix the hex head screws through the brackets and finger tighten. Check that the rack is in the correct position and tighten all fixings.
Attention should be paid to the fabric of the wall. Where possible, drill directly into the brick and not into mortar. With panelled or partitioned walls, instruction should be taken locally as to how the rack is to be secured. See site survey.
Follow the procedure for the rack base as described above.

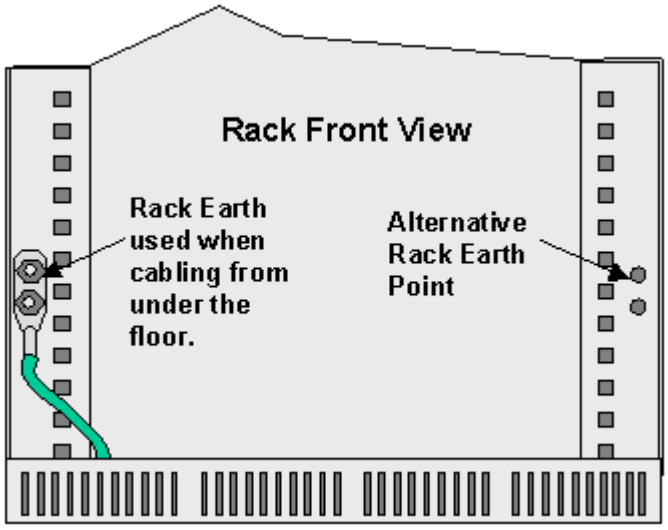
DC Power and Alarm Cabling

Rack Earthing

Using the site survey, locate the building central [safety] grounding point. Run an earth cable rated at 30A to each rack and connect it to the centre earth stud located at the top or at the side of the rack. (only one external earth per rack) See illustrations below. These points are labelled with the IEC Earth symbol.



Rack earthing at top



Rack earthing at base

Other external safety earth connections must not be made to the rack.

Terminate the battery feed and return cables at the isolator/fuse positions, and ensure that the AC rack is isolated until the commencement of commissioning tests.

DC Power

The cables for the negative DC battery feeds, the 0V returns and the Rack Ground are detailed in. Should local requirements specify otherwise, it is acceptable for cables of other colours to be used, however, under no circumstances should the cable sizes be less than that specified in. The length of the cable supplied will be detailed in the site survey. Separate DC sources are desirable for maximum protection.

Function	Colour	Min. Cable Size
Negative Battery Feed -36V to -60V DC	**Blue**	10 AWG; 6.0mm^2
Zero Volt Positive Battery Return	**Black**	10 AWG; 6.0mm^2
Rack Ground	**Green/Yellow**	8AWG; 10.0mm^2

DC Power Cables.

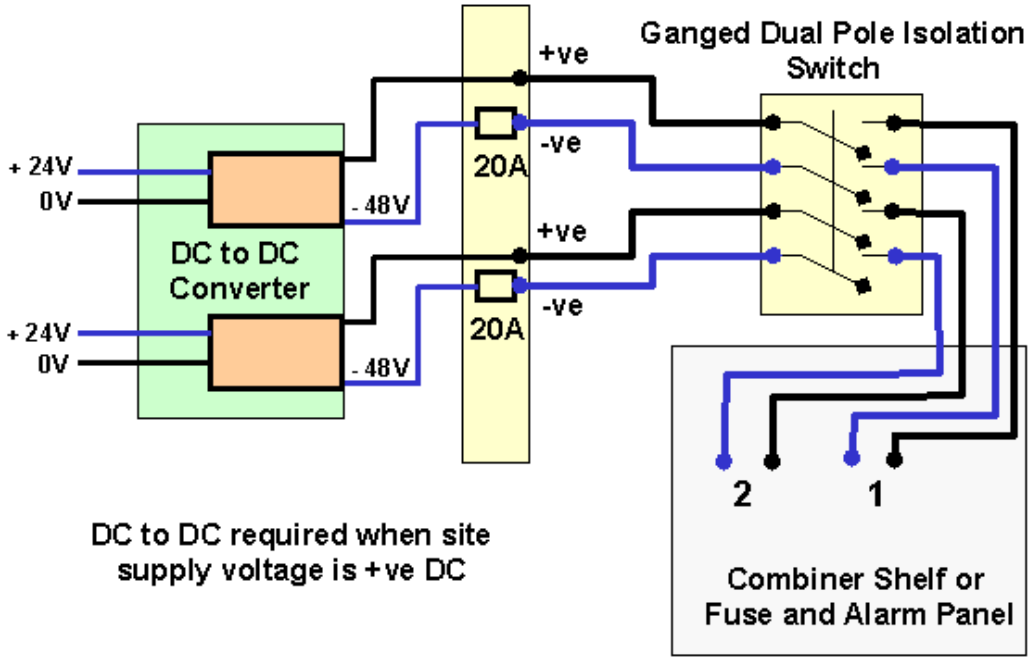

This equipment requires a negative Supply. Ensure that the +ve volt line is connected to ground or that the supply is floating. The –ve battery feed should not be connected to ground or zero volts under any circumstances.


The maximum DC input should not exceed 60 Volts. Voltages in excess of this are considered hazardous.

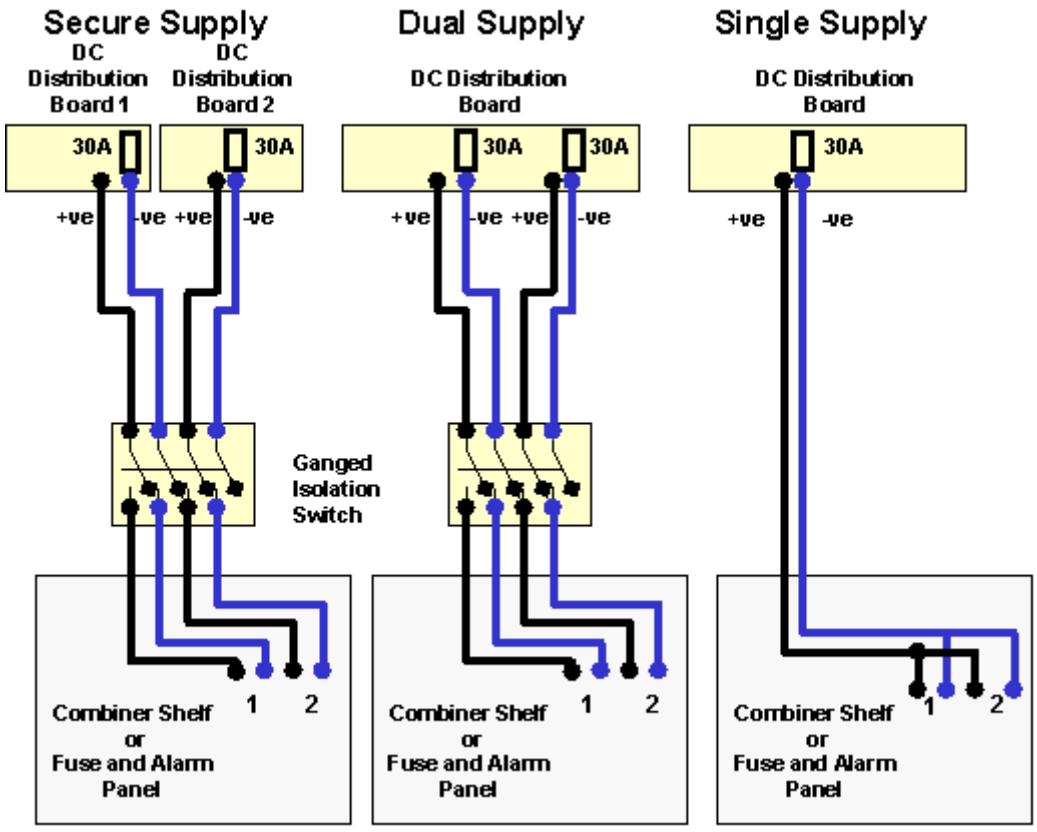
Note 1: Do not insert fuses until instructed to do so in the commissioning stage of installation.

Note 2: If the equipment is installed according to EN 60950 §1.7.9, there should be available a single disconnect device that isolates the whole equipment., A double-pole external isolating switch should be provided to isolate the two supplies and should be wall mounted in the locale of the rack. A label should be included on the unit to direct the user to use the external isolator for isolation.

The Access Concentrator and Central Terminal Shelves are designed to operate from a -48V DC supply. In installations where the nominal supply voltage is +24V DC a DC to DC converter is needed to provide the -48V supply see the schematic diagram below. The DC to DC converter must be rated at 20 amps or greater at -48V DC



Power Supply Configurations



Three alternative methods are possible to connect the DC supply to the rack.

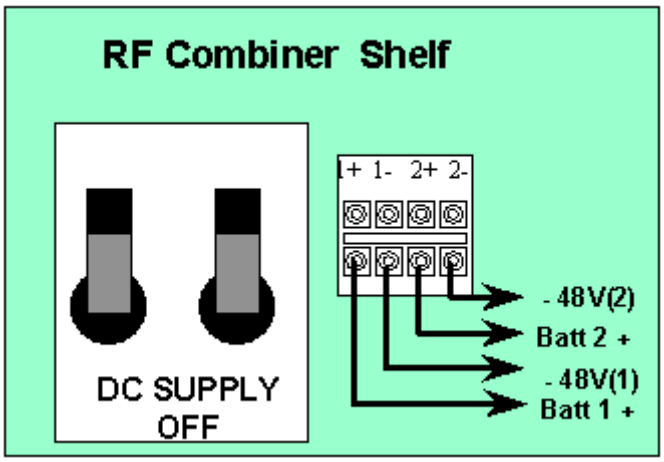
- Secure Supply: This is the preferred method as it provides DC from different sources giving greater resilience of supply than the other methods. (see diagram above and note 2 below) From each Distribution Boards (DB) run and tie in a negative battery feed and a zero volt return to a Dual Pole Isolating switch and then from the isolating switch to the AC/CT rack installed. These supplies should be rated at 30A. Power cables must be run and tied separate from signal cables.

- Dual Supply: Both feeds are fed from the same Distribution Boards (DB) and separately fused so that in the event of one fuse failing the rack is supplied via the other fuse. Run and tie in two negative battery feeds and a two zero volt returns from the Distribution Board to a Dual Pole Isolating switch and then from the isolating switch to the to the AC/CT rack installed. These supplies should be rated at 30A. Power cables must be run and tied separate from signal cables. (see diagram above and note 2 below).
- Single Supply: Is the least preferred option as a blown fuse causes the total loss of supply to the rack but because there is only one supply the fuse can act as an isolation point and there is no need for a separate isolation switch as required on the other options. Run and tie in a negative battery feed and a zero volt return from the Distribution Boards to the AC/CT rack installed. The two inputs to the Combiner Shelf/Fuse and Alarm Panel should be looped together as shown in the diagram above. This ensures that the alarms on the PSU are extinguished when a supply is present.

From the site survey confirm the location of the isolator for the negative battery feed points; then ensure that the supply is isolated. If the location is remote from the AC Rack, take appropriate action to ensure that the supply is not inadvertently reconnected. This may include locking OFF an isolator, removing fuses and ensuring that replacement fuses are not easily installed. Provide a label at the AC Rack to indicate the location of the isolator or fuse positions mentioned above.
To provide security of supply two separate Distribution Boards (DB) should be used to supply DC to each rack (see note 2 below) Run and tie in a negative battery feed and a zero volt return to the AC/CT rack installed from the DB. Run and tie in a second negative battery feed and a zero volt returns to the AC/CT rack installed from a second DB, if a second distribution board is available. If only one source of supply is available the both supplies may be run from the same DB These supplies should be rated at 30A. Power cables must be run and tied separate from signal cables.

DC Cabling Central Terminal Modem Rack/Integrated Basestation

Run the DC cables through the top right hand side of the rack, loosen the screws on the Combiner Shelf and slide the screen to the right. Place the DC cables behind the screening and though to the connection block at the lower right of the Combiner Shelf. Return the screen to its original position. Re-tighten the Combiner shelf screws.
Trim cables and strip 7mm to insert into the termination block. Terminate the cables on the Combiner Shelf at the appropriate connection points. The negative supplies go to Termination Block 2 & 4. The positive battery returns go to 1 & 3.



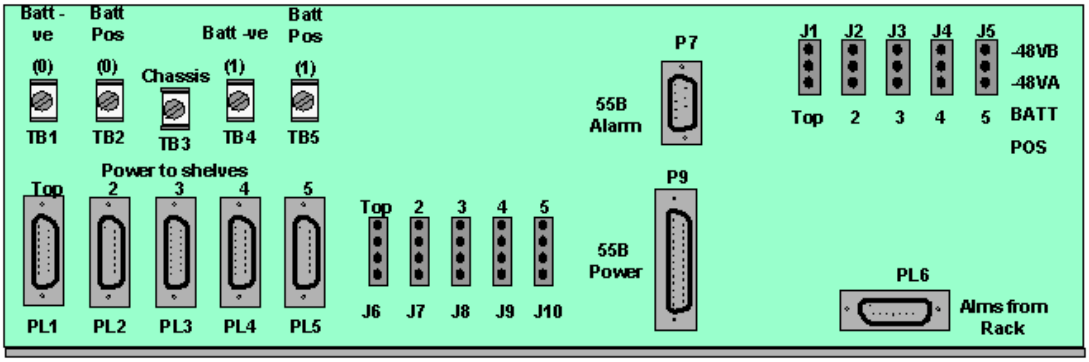
DC Termination on The Combiner Shelf.

DC Termination on Fuse and Alarm Panel (AS4000 Access Concentrator and AS4000 Expansion Rack)

Run the DC cables through the top left hand side of the rack, into the fuse and alarm panel.

Remove clear plastic cover protecting the DC input terminals. Trim cables and strip 7mm. Crimp a spade terminal or terminal ring onto the wire and attach to terminals inside the Fuse and Alarm panel at the appropriate connection points. The negative supplies go to Termination Block 1 & 4. The positive battery returns go to 2 & 5. Replace clear plastic cover protecting the DC input terminals.

DC Termination on Fuse and Alarm Panel.



Station Alarm Connection

For Power and Alarm wiring on AS4020 see '[AS4020 Installation']

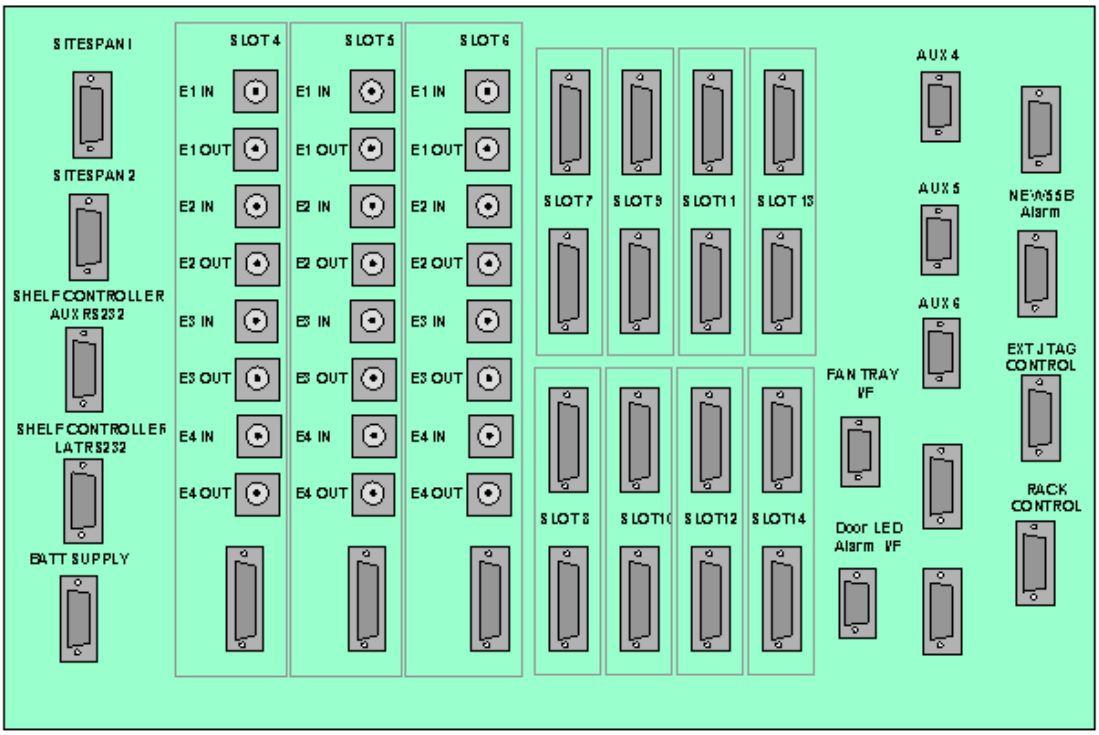
AS4000 AC Rack Cabling and Wiring

AC Rack E1 Cabling 75 ohm

Access Concentrator Interface Panel

All cabling to the access concentrator connects to the interface panel. Slots 4,5 and 6 can be used for 75ohm and 120ohm connections. Slots 7-14 is used for 120ohm connections each slot will support up to 8 E1 connections.

Access Concentrator Interface Panel (1026 Board)



Specification: In installations with 75ohm cabling Braided screened, 75ohm, Coaxial Cable is to be used for interconnection between the AC shelf the DDF and switch/channel bank.

a) E1 Cabling (CT Link)

From the site survey, confirm the location of the Digital Distribution Frame (DDF) if a DDF is to be used or the CT links if the E1 feeds are fed direct to the equipment. The length of E1 feeds should not exceed 100 metres.

Note: This must be a SELV port of an EN 60950 approved product.

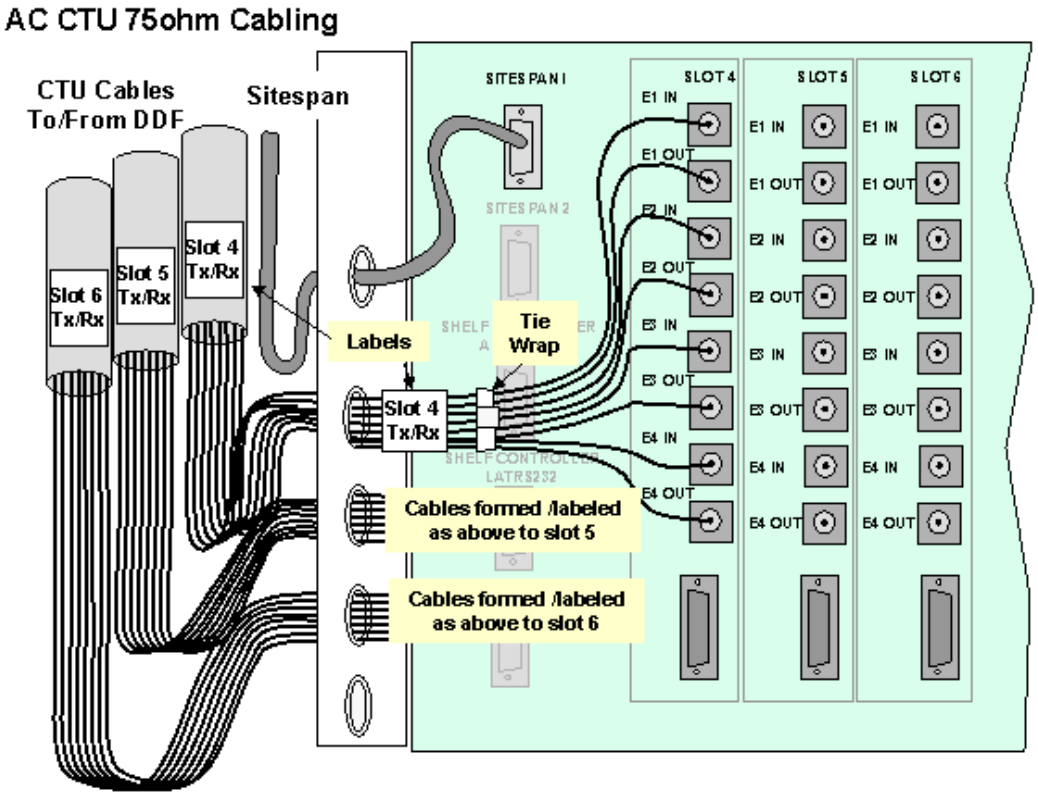
Run the E1 cables from the AC shelf to the allocated positions on the DDF. (8 cables per CTU in normal working,up to 3 CTUs per shelf.).

In partial equipped installations it may be appropriate to run enough cables to cater for a complete rack of equipment. This reduces the need to disturb original installation when adding additional equipment.

Feed the E1 cables through the top hole on the left hand side of rack side of the rack, and down the channel at the side of the rack.

Identify and label each cable at both ends as well as the DDF/Backhaul positions.

Terminate all cables with BNC co-axial connectors (or it is possible to fit type 43 and adapters if BNC connectors are not available).



b) E1 Cabling (Switch Link)

From the site survey, confirm the location of the Digital Distribution Frame (DDF) if a DDF is to be used or the Switch if the E1 feeds are fed directs to the equipment. The length of E1 feeds should not exceed 250 metres.

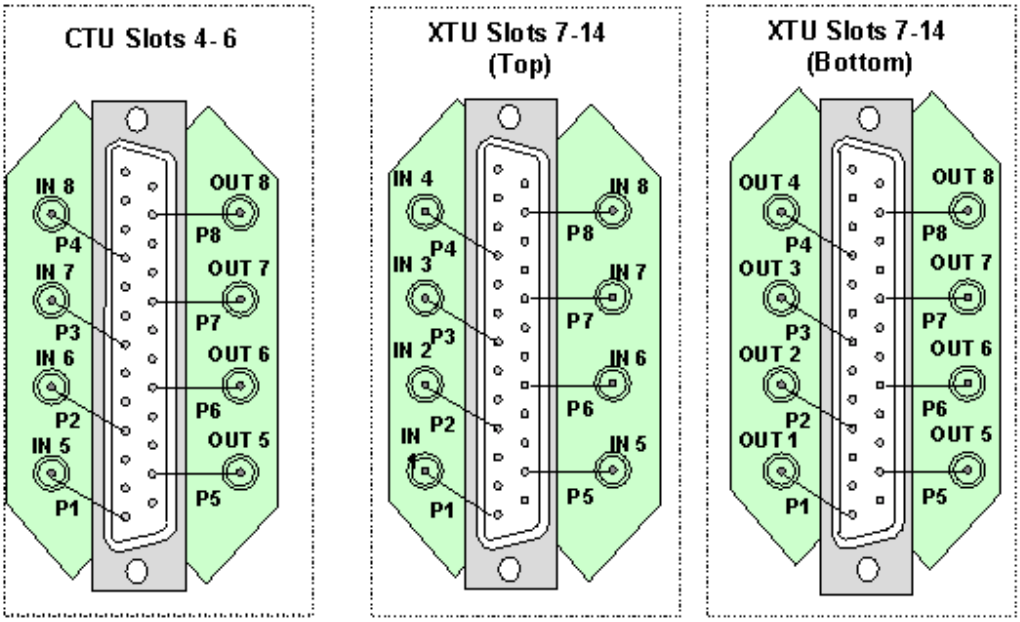
Note: This must be a SELV port of an EN 60950 approved product.

Run the E1 cables from the AC shelf to the allocated positions on the DDF. In partial equipped installations it may be appropriate to run enough cables to cater for a complete rack of equipment. This reduces the need to disturb original installation when adding additional equipment.

Feed the E1 cables through the top hole on the most convenient side of the rack, and down the front of the rack.

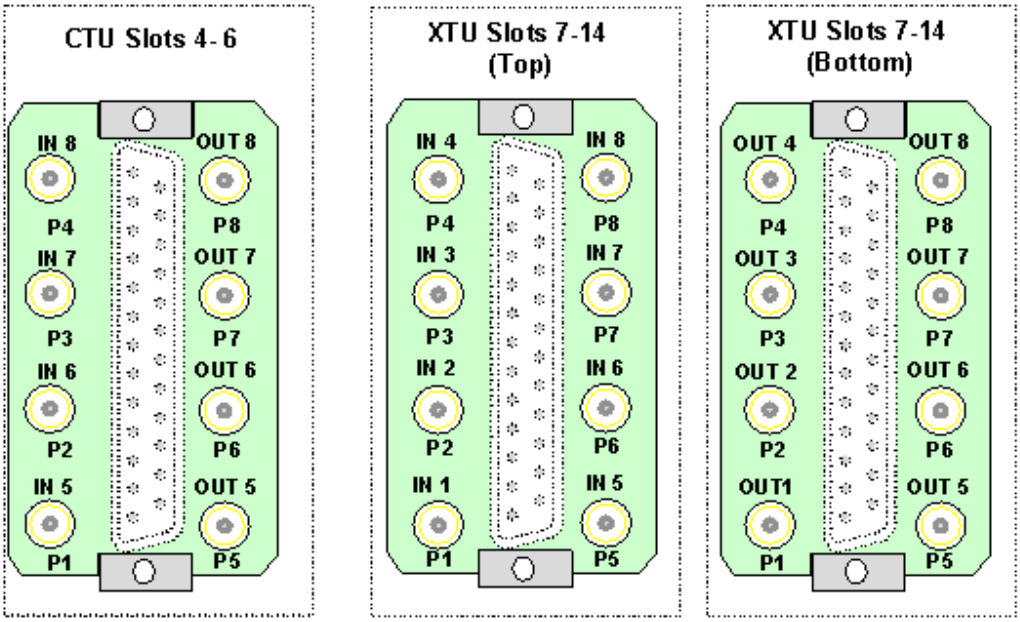
Identify and label each cable at both ends as well as the DDF/Backhaul positions.

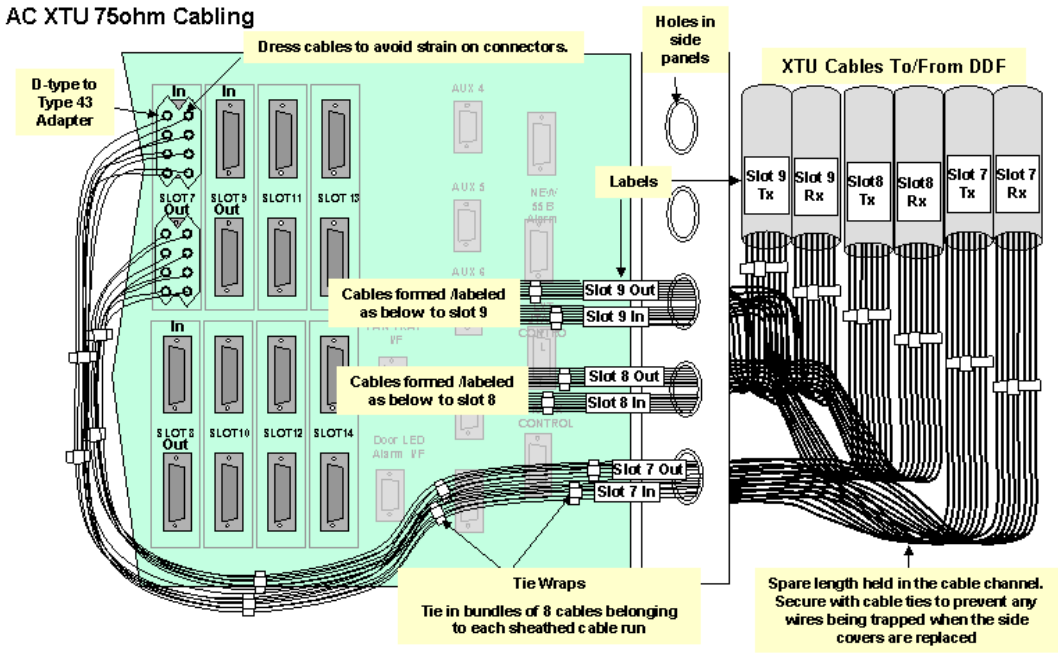
a. Type 43 to 25wayD-type adaptors to the backplane sockets and terminate all cables with Type 43 connectors (75ohm) and fit according to the figure below .



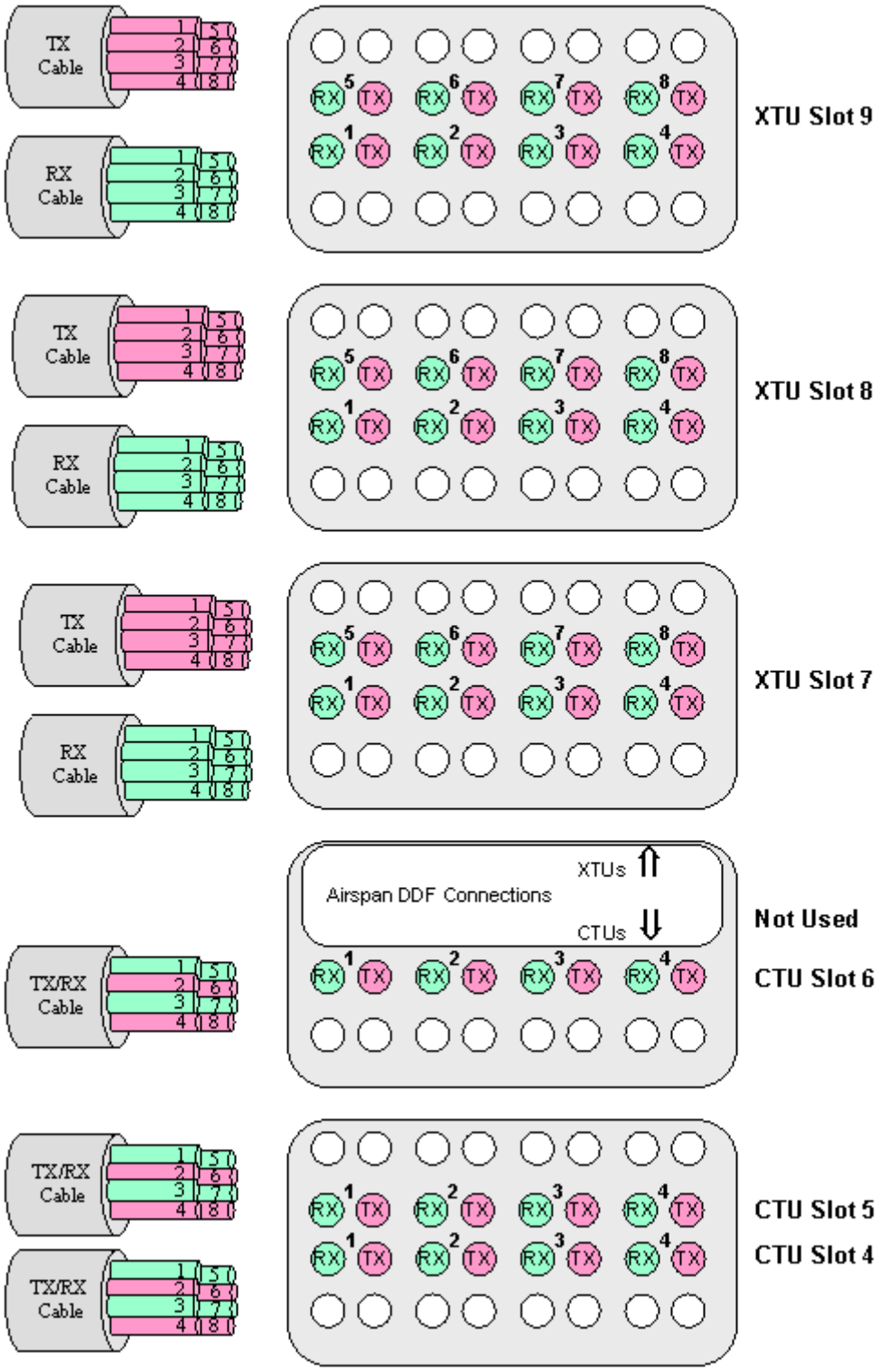
Type 43 Backplane Adapter

b. Siemens 1.5/6.5 Connector. Fit Siemens 1.5/6.5 Connector to 25way D-type adapters 303-1139-900 to the backplane sockets and terminate all cables with Siemens 1.5/6.5 connectors (75ohm) and fit according to the figure below.





Typical 75ohm DDF Layout

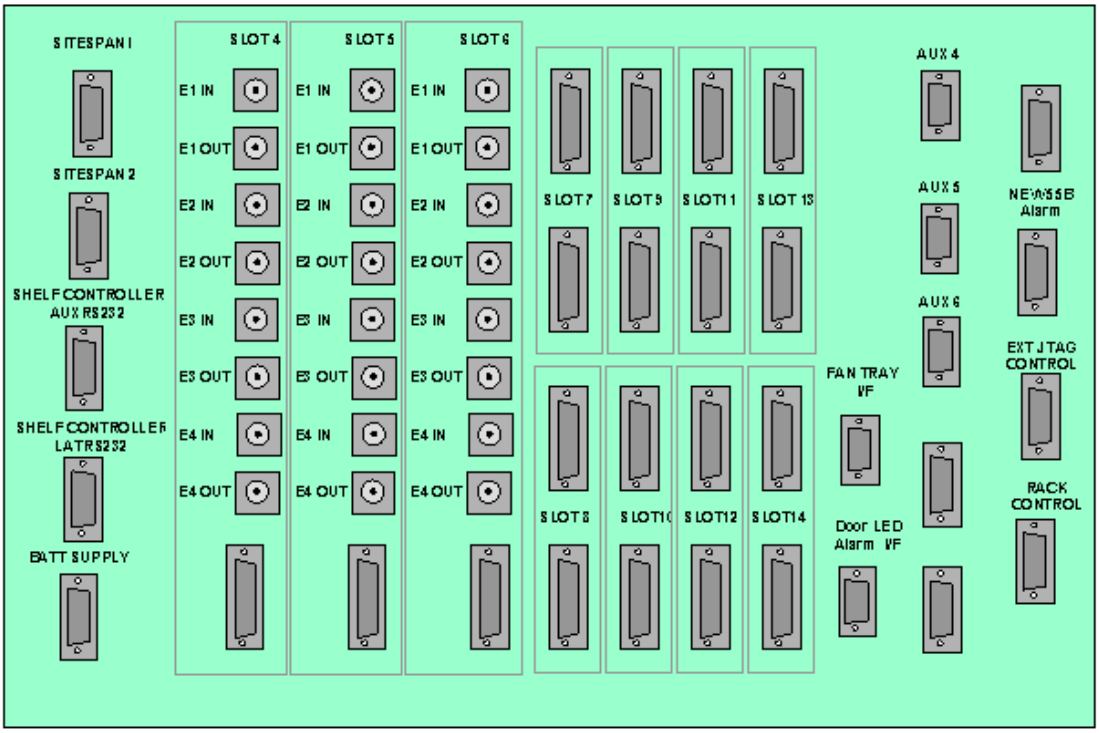

TX Cable
RX Cable
XTU Slot 9
TX Cable
RX Cable
XTU Slot 8
TX Cable
RX Cable
XTU Slot 7
XTUs
Airspan DDF Connections
CTUs
TX/RX Cable
Not Used
CTU Slot 6
TX/RX Cable
TX/RX Cable
CTU Slot 5
CTU Slot 4

AC Rack E1 Cabling 120 ohm

Access Concentrator Interface Panel

All cabling to the access concentrator connects to the interface panel. Slots 4,5 and 6 can be used for 75ohm and 120ohm connections. Slots 7-14 is used for 120ohm connections each slot will support up to 8 E1 connections.

Access Concentrator Interface Panel (1026 Board)



120 ohm Cabling Specification

In installations with 12Oohm cabling Double screened, 120Ohm, 8 twisted pairs. The overall screen should be screened with a foil AND 90% coverage tinned copper braid is to be used for interconnection between the AC shelf, the DDF and switch/channel bank.

a) E1 Cabling (CT Link)

From the site survey, confirm the location of the Digital Distribution Frame (DDF) if a DDF is to be used or the CT links if the E1 feeds are fed direct to the equipment. The length of E1 feeds should not exceed 100 metres.

Note: This must be a SELV port of an EN 60950 approved product.

Run the E1 cables from the AC shelf to the allocated positions on the DDF. (8 Pairs per CTU in normal working,up to 3 CTUs per shelf.).In partial equipped installations it may be appropriate to run enough cables to cater for a complete rack of equipment. This reduces the need to disturb original installation when adding additional equipment.

Feed the E1 cables through the top hole on the left hand side of rack side of the rack, and down the channel at the side of the rack. Identify and label each cable at both ends as well as the DDF/Backhaul positions. Terminate all cables with RJ45 plugs and fit adapter 303-1112-900 (See RJ45 terminations below) or use D-type connectors (See D-type terminations below) at the rack .Terminate as appropriate at the DDF.

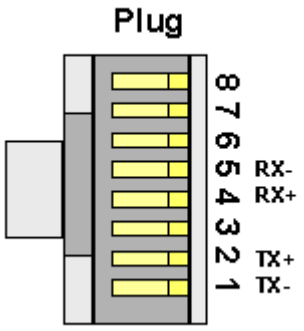
b) E1 Cabling (Switch Link)

From the site survey, confirm the location of the Digital Distribution Frame (DDF) if a DDF is to be used or the Switch if the E1 feeds are fed directs to the equipment. The length of E1 feeds should not exceed 250 metres.

Note: This must be a SELV port of an EN 60950 approved product.
Run the E1 cables from the AC shelf to the allocated positions on the DDF. In partial equipped installations it may be appropriate to run enough cables to cater for a complete rack of equipment. This reduces the need to disturb original installation when adding additional equipment.
Feed the E1 cables through the top hole on the most convenient side of the rack, and down the front of the rack. Identify and label each cable at both ends as well as the DDF/Backhaul positions. Terminate all cables with RJ45 plugs and fit adapter 303-1113-900 (See RJ45 terminations below) or use D-type connectors (See D-type terminations below) at the rack .Terminate as appropriate at the DDF.

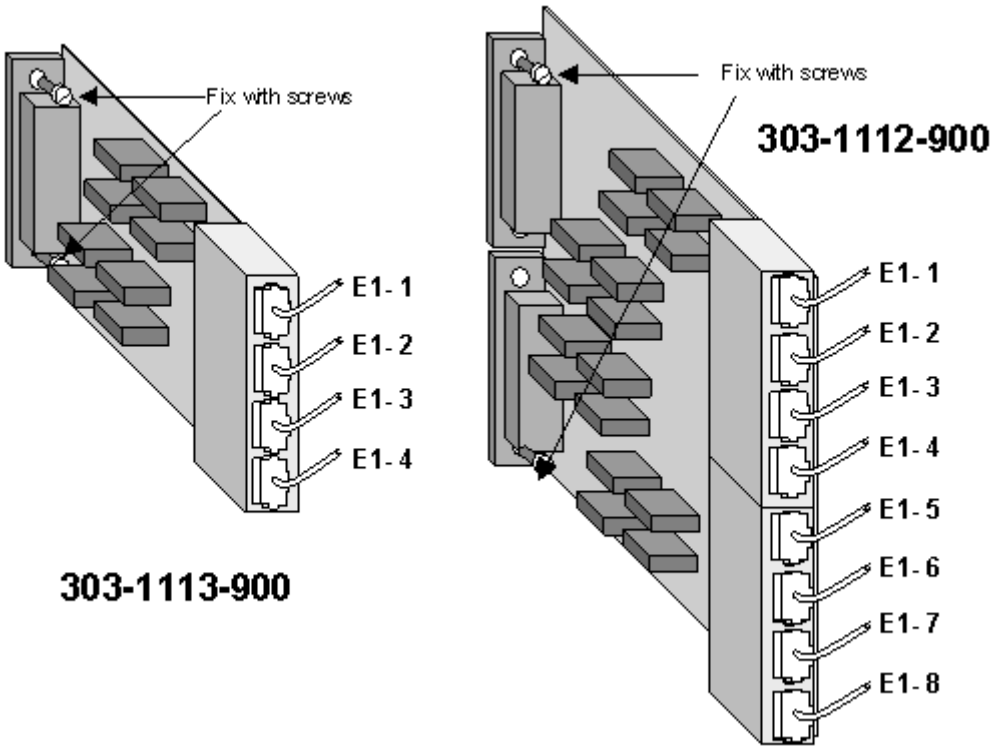
RJ45 Terminations

Terminate all cables with RJ45 connectors at the rack and as appropriate at the DDF.



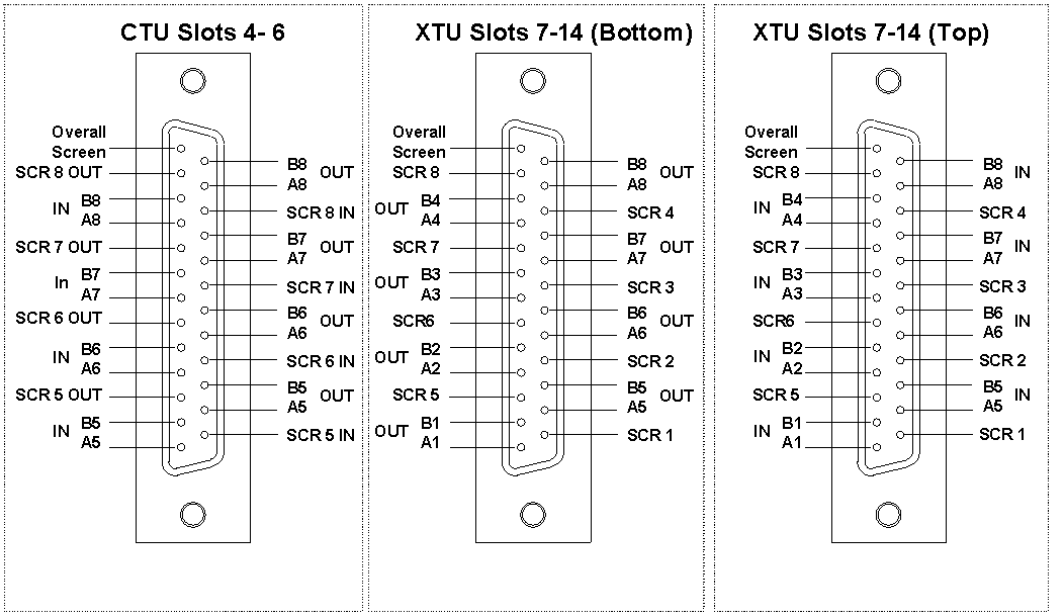
RJ45 connector termination

Fit the RJ45 adapter 303-1113-900 (Slots 4,5 and 6) and 303-1112-900 (slots 7-14) and secure to the Backplane using screws in the top and bottom holes of the adapter.



D-Type Terminations: Terminate all cables with 25 pin D-type connectors (120Ohm) according to the tables below or fit RJ45 adapter to the D-Type Plugs on the AC Interface Panel. .

Note: On D-Type connectors the screen connects to pin 13



Pair	Designation		Pin	Pair	Designation		Pin
1	A1	In	1	5	A5	Out	15
	B1	In	2		B5	Out	16
	Screen		14		Screen		3
2	A2	In	4	6	A6	Out	18
	A3	In	5		B6	Out	19
	Screen		17		Screen		6
3	A3	In	7	7	A7	Out	21
	B3	In	8		B7	Out	22
	Screen		20		Screen		9
4	A4	In	10	8	A8	Out	24
	B4	In	11		B8	Out	25

	Screen		23		Screen		12
Overall Screen			13				

120 ohm connections slots 4-6

Pair	Designation		Pin	Pair	Designation		Pin
1	A1	In	1	5	A5	Out	15
	B1	In	2		B5	Out	16
	Screen		14		Screen		3
2	A2	In	4	6	A6	Out	18
	A3	In	5		B6	Out	19
	Screen		17		Screen		6
3	A3	In	7	7	A7	Out	21
	B3	In	8		B7	Out	22
	Screen		20		Screen		9
4	A4	In	10	8	A8	Out	24
	B4	In	11		B8	Out	25
	Screen		23		Screen		12
Overall Screen			13				

120 ohm connections slots 7-14 (In)

Pair	Designation		Pin	Pair	Designation		Pin
1	A1	In	1	5	A5	In	15

	B1	In	2		B5	In	16
	Screen		14		Screen		3
2	A2	In	4	6	A6	In	18
	A3	In	5		B6	In	19
	Screen		17		Screen		6
3	A3	In	7	7	A7	In	21
	B3	In	8		B7	In	22
	Screen		20		Screen		9
4	A4	In	10	8	A8	In	24
	B4	In	11		B8	In	25
	Screen		23		Screen		12
Overall Screen			13				

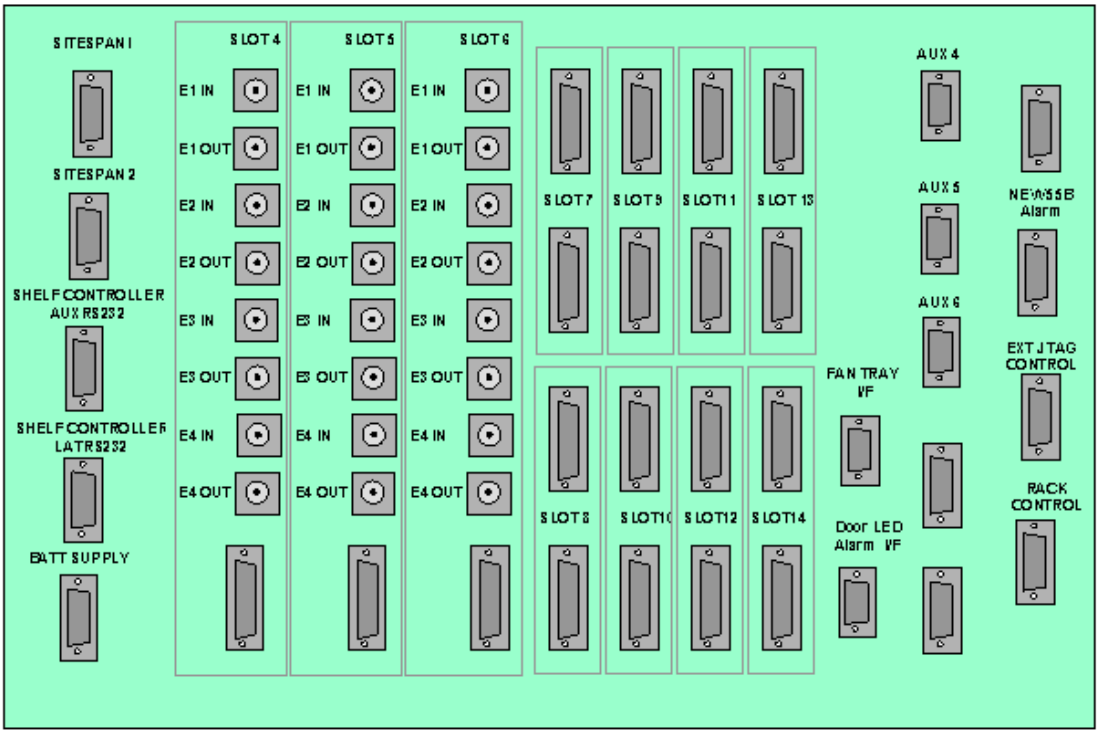
120 ohm connections slots 7-14 (Out)

Pair	Designation		Pin	Pair	Designation		Pin
1	A1	Out	1	5	A5	Out	15
	B1	Out	2		B5	Out	16
	Screen		14		Screen		3
2	A2	Out	4	6	A6	Out	18
	A3	Out	5		B6	Out	19
	Screen		17		Screen		6

3	A3	Out	7	7	A7	Out	21
	B3	Out	8		B7	Out	22
	Screen		20		Screen		9
4	A4	Out	10	8	A8	Out	24
	B4	Out	11		B8	Out	25
	Screen		23		Screen		12
Overall Screen			13				

AC Rack T1 Cabling

All cabling to the Access Concentrator connects to the interface panel. Slots 7, 8, and 9 can be used for T1 CTU connections. Slots 10-14 are used for T1 XTU connections each slot will support up to 8 T1 connections. (Exceptionally slots 4, 5, and 6 can be used for XTU connections using an adapter 303-1113-900 connected to the D- type below the BNCs for the relevant slot. Only T1 5-8 are available for T1 connections.) Slots 8 and 9 can also be used for XTU's but it is normal to reserve these for future CTUs if possible.



Cabling Specification

In installations Cat 5 FTP screened (foil & braid) twisted pair should be used.

a) T1 Cabling (CT Link)

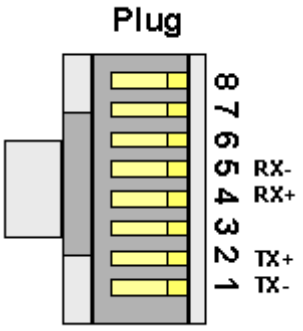
From the site survey, confirm the location of the Digital Distribution Frame (DDF) if a DDF is to be used or the CT links if the T1 feeds are fed direct to the equipment. The length of T1 feeds should not exceed 100 metres.

Run the T1 cables from the AC shelf to the allocated positions on the DDF. (8 Pairs per CTU in normal working, up to 3 CTUs per shelf.). In partial equipped installations it may be appropriate to run enough cables to cater for a complete rack of equipment. This reduces the need to disturb original installation when adding additional equipment.

Feed the T1 cables through the top hole on the left hand side of rack side of the rack, and down the channel at the side of the rack.

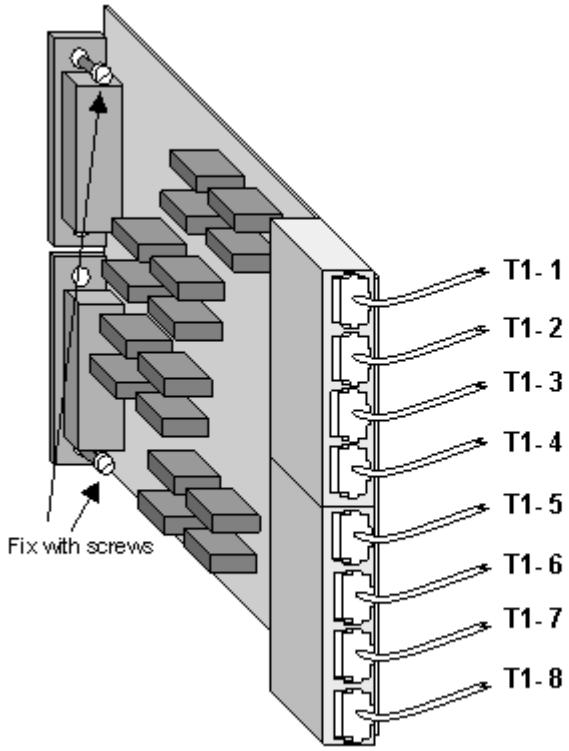
Identify and label each cable at both ends as well as the DDF/Backhaul positions.

Terminate all cables with RJ45 connectors at the rack and as appropriate at the DDF.



T1 RJ45 connector termination

Fit the RJ45 adapter 303-1112-900 and secure to the Backplane using screws in the top and bottom holes of the adapter.



RJ45 adapter 303-1112-900

b) T1 Cabling (Switch Link)

From the site survey, confirm the location of the Digital Distribution Frame (DDF) if a DDF is to be used or the Switch if the T1 feeds are fed directs to the equipment. The length of T1 feeds should not exceed 100 metres.

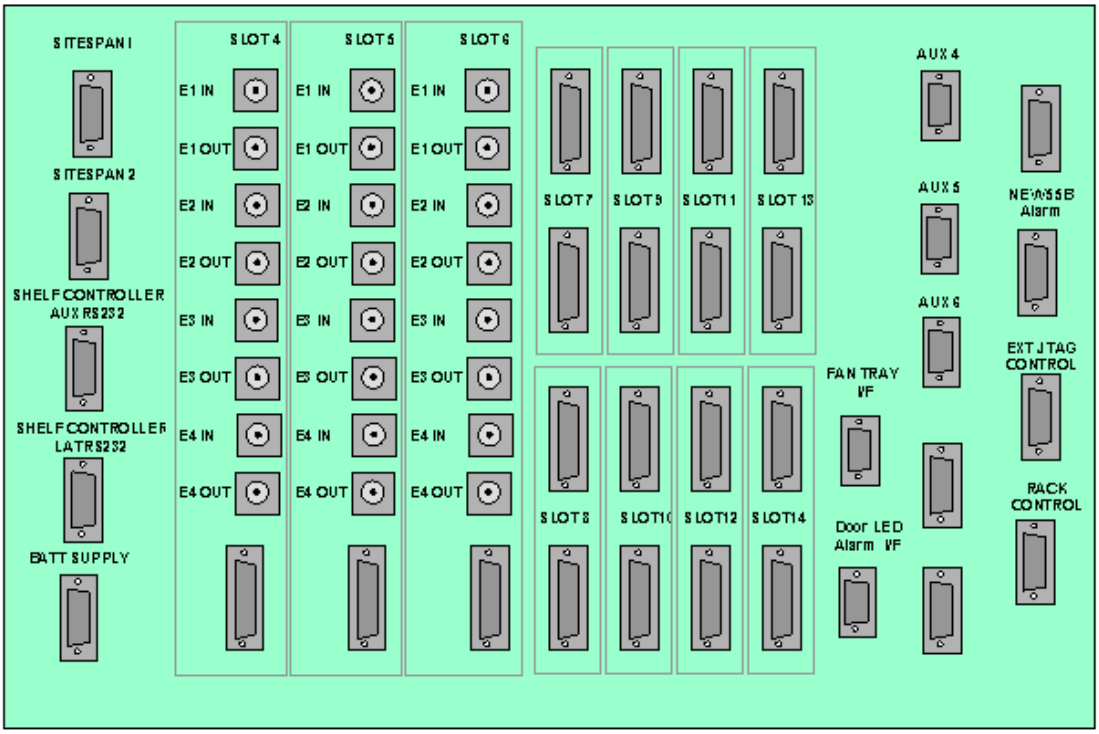
Run the T1 cables from the AC shelf to the allocated positions on the DDF. In partial equipped installations it may be appropriate to run enough cables to cater for a complete rack of equipment. This reduces the need to disturb original installation when adding additional equipment.

Feed the T1 cables through the top hole on the most convenient side of the rack, and down the front of the rack.

Identify and label each cable at both ends as well as the DDF/Backhaul positions.

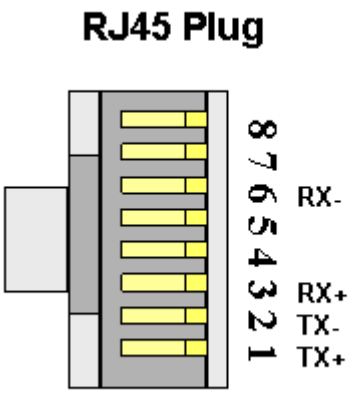
Terminate all cables with RJ45 connectors as shown above and fit RJ45 adapter to the D-Type Plugs on the AC Interface Panel as shown above

PTU to Host Cabling



RJ45 to DB25 Adaptor

To connect the 100baseT cable to the AC Shelf interface panel a RJ45 to DB25 adaptor must be fitted. Fit the RJ45 to DB25 adaptor and screw to the backplane. The RJ45 to DB25 adaptor currently must be connected onto the lower of the two 25-way AC connectors allocated to each slot (even though the activity lights work if connected to the top).



Patch Cable

A standard Cat 5 Ethernet patch cable with 8-way RJ45 plugs at each end has all pins connected straight through. The Tx and Rx pairs are pins 1&2 and 3&6. With plug towards you, cable away from you, pins on the top, pin 1 is on your right. Clearly Tx at one end must talk to Rx at the other.

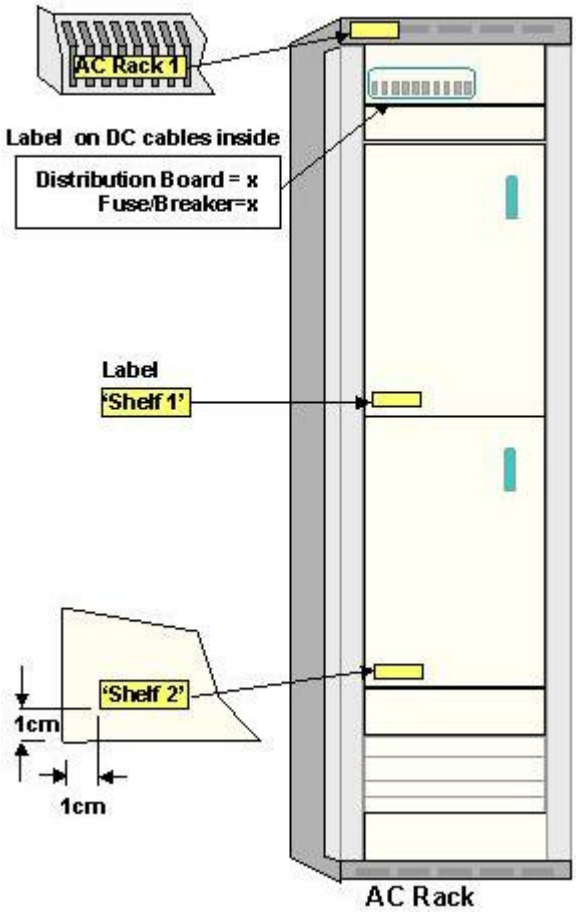
A Hub (and Router) Ethernet port will have a built in crossover, often denoted by a 'X' printed on the box, so a PC to a Hub uses a straight through standard patch cable, and so does a Router to the PTU.

To connect a PC to PC or a PC to PTU (for demo, tests, etc.), use a crossover cable, with Pin 1 to Pin 3 and Pin 2 to Pin 6.

AC Rack Labeling

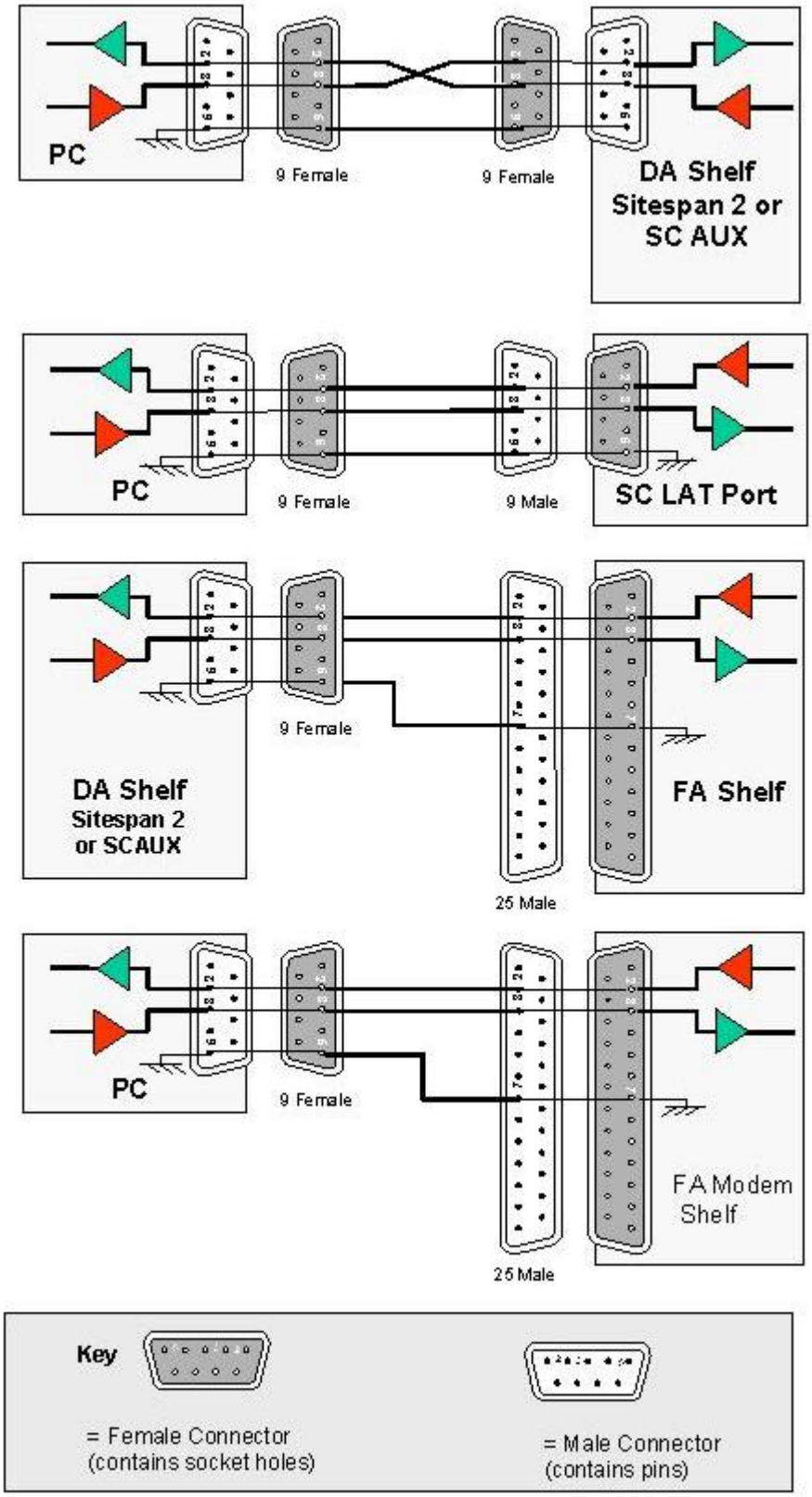
The racks should be labelled as shown below.

Access Concentrator Rack



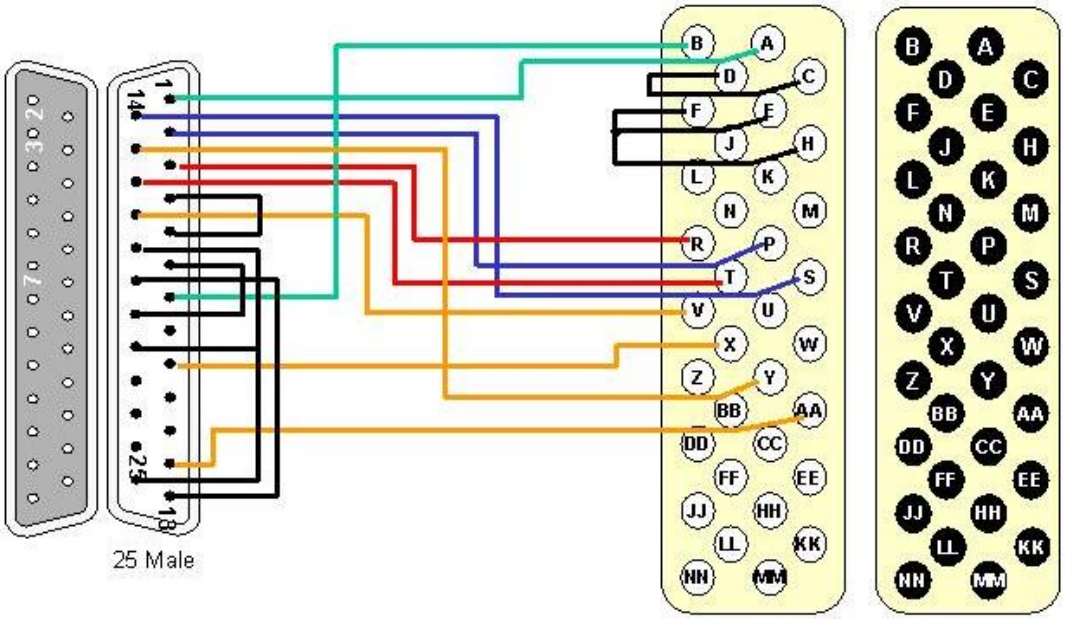
Interface Connections

This page contains miscellaneous interface and connector details.

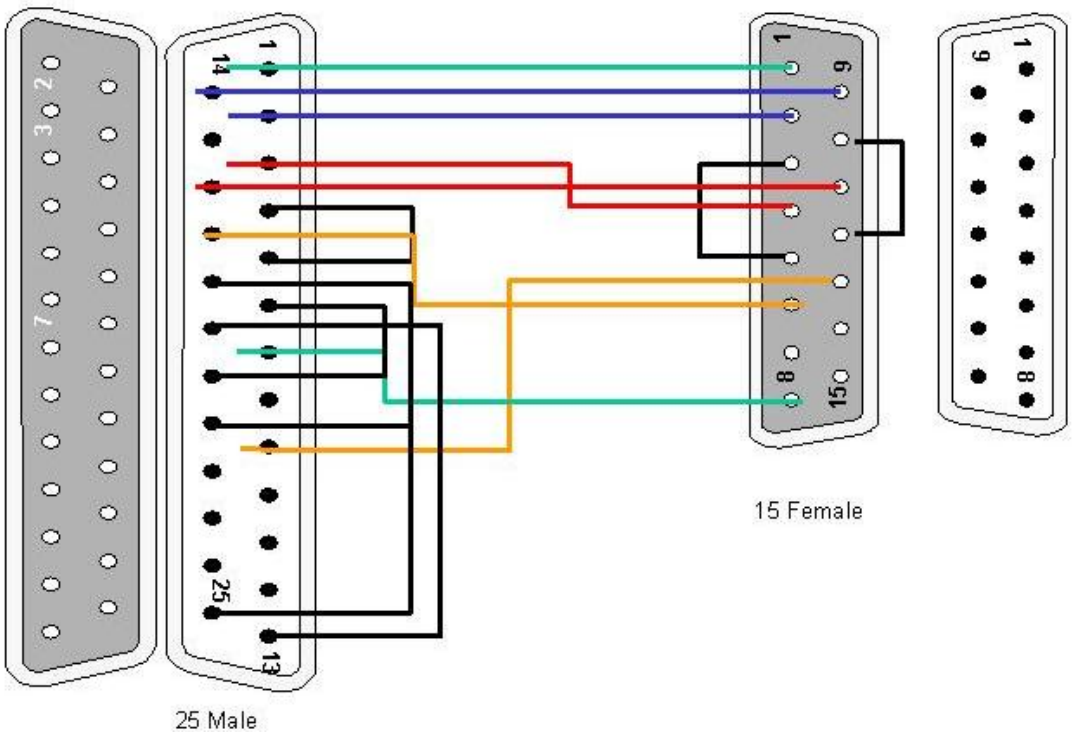


120 Ohm Interface Connections on DA Access Concentrator Backplane

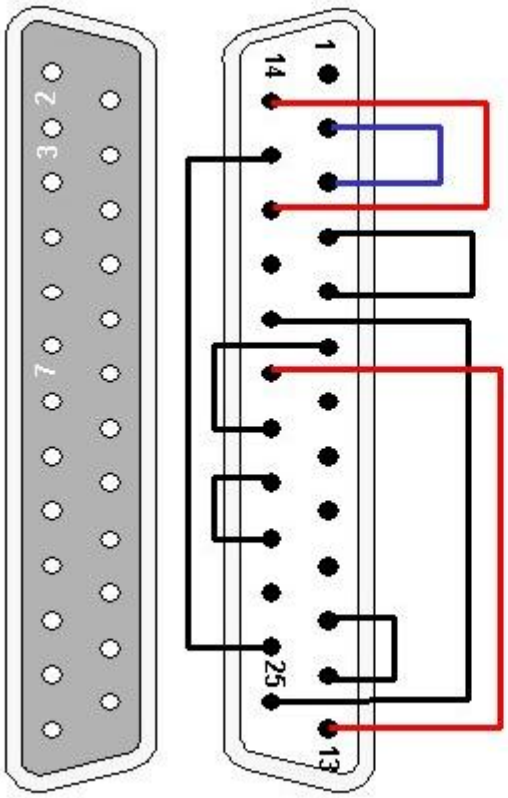
Interface Adaptor EIA 530 to V35



Interface Adapter EIA 530 to X21



EIA 530 loopback Connector

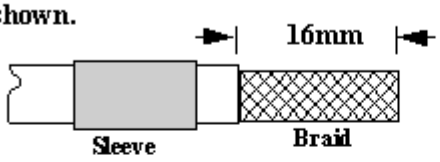


25 Male

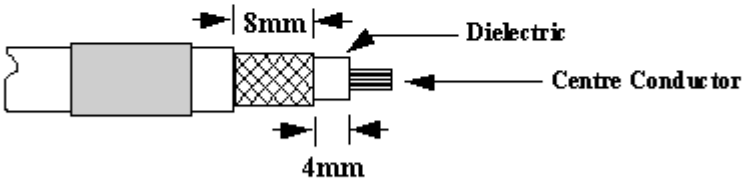
Connect	
From	To
02	03
04	05
06	20
11	12
13	19
14	16
15	24
18	25
21	22

BNC Terminations to Coax

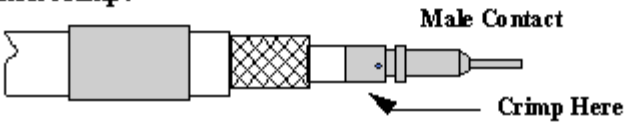
1. Slide metal crimp sleeve over cable,trim outer sheath from cable as shown.



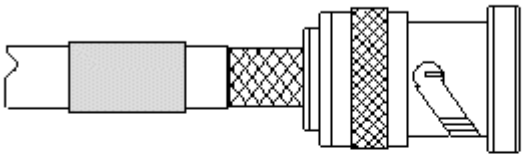
2. Trim back braid and dielectric to the dimensions as shown.



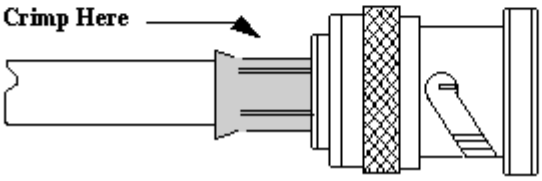
3. Fit contact over the centre conductor to butt against the dilectric, then crimp.



4. Press sub-assembly into body, until contact clicks into place and ensuring that the knurled ferrule is inserted between the dilectric and braid

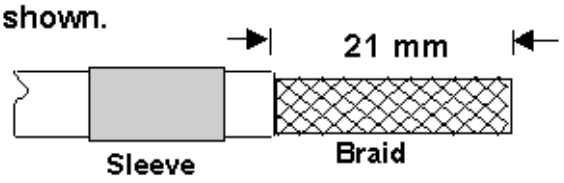


5. Slide the sleeve along the cable, until it butts against the body sub-assembly. Crimp using VQ die.

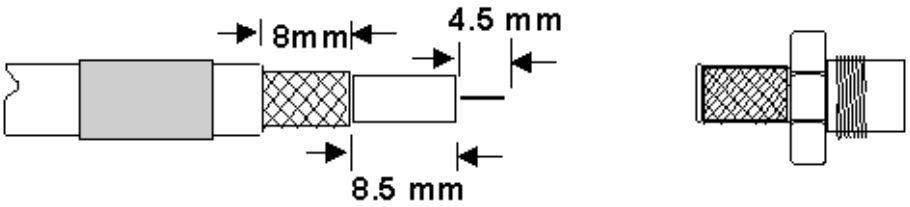


Type 43 Terminations to Coax

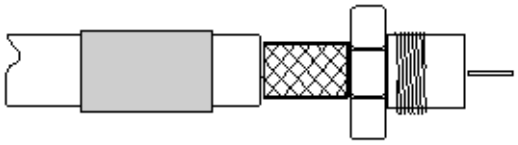
1. Slide metal crimp sleeve over cable,trim outer sheath from cable as shown.



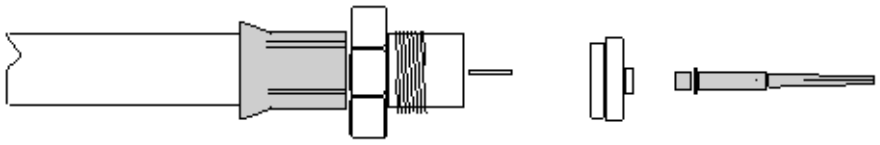
2. Trim back braid and dielectric to the dimensions as shown.



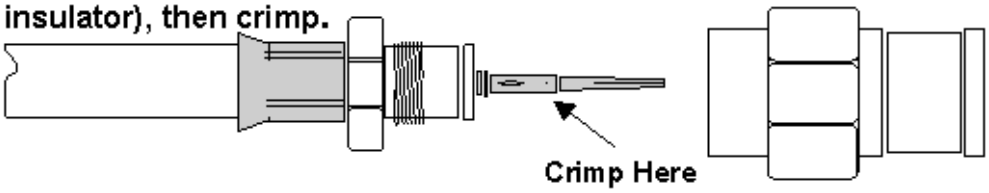
3. Press sub-assembly into body, ensuring that the knurled ferrule is inserted between the dilectric and braid



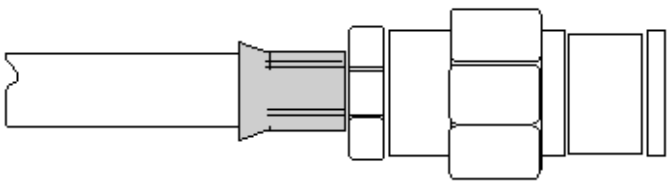
4. Slide the sleeve along the cable, until it butts against the body sub-assembly. Crimp using VQ die.



5. Fit plastic insulator to butt against the body and place contact over the centre conductor (ensure contact locates into the insulator), then crimp.



6. Engage body of the connector and tighten clamp nut.



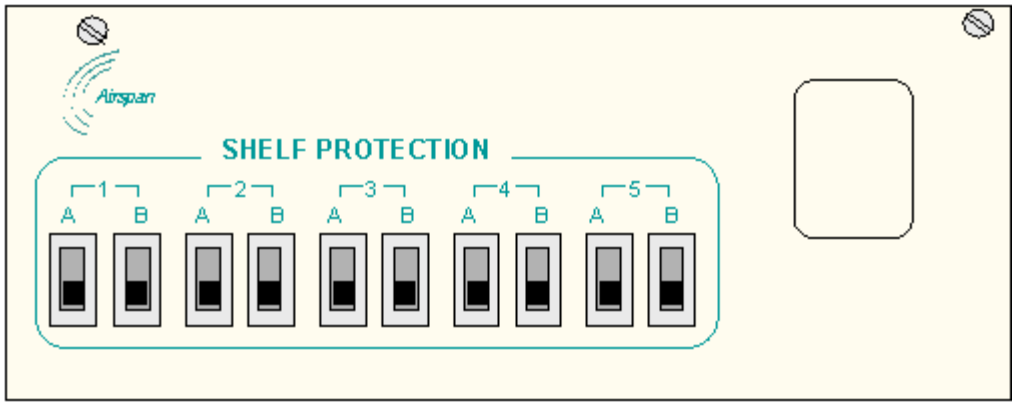
Access Concentrator Card Installation

The AC rack is shipped with shelves fitted to customer requirements and internal cabling complete.

Warning: Before handling any cards or modules, observe full anti-static precautions. See Operations an Maintenance Guide

Preliminary

In a new installation ensure that the AC Circuit on the Fuse and Alarm panel are set to the OFF position (down).
Warning: Isolation of power from the rack is only achieved by ensuring that both circuit breakers are in the off position.

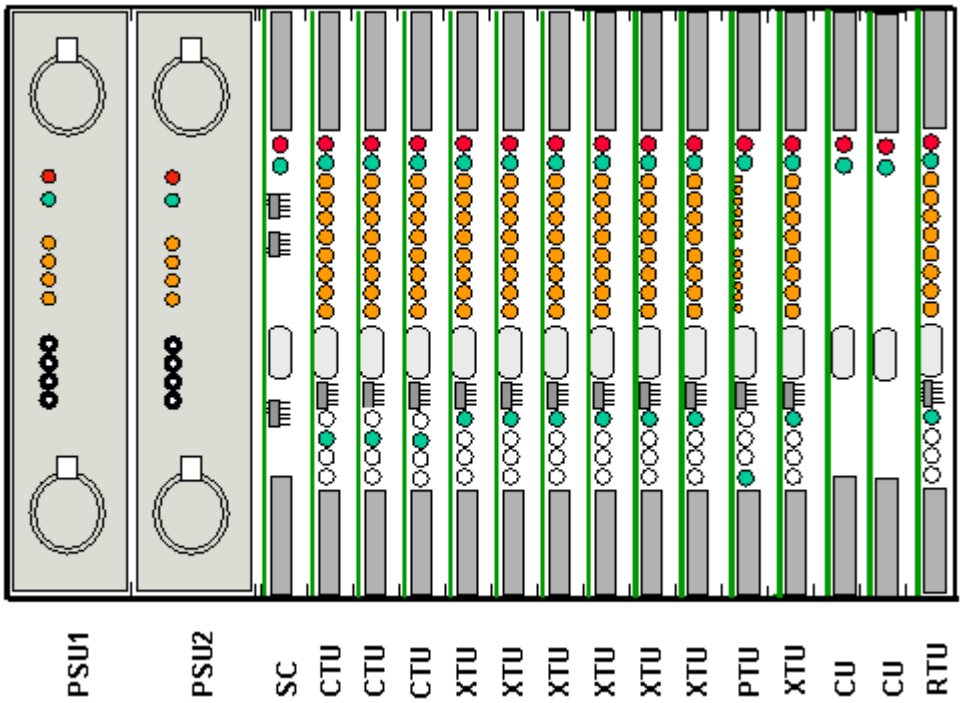


Access Concentrator Rack Fuse and Alarm Panel

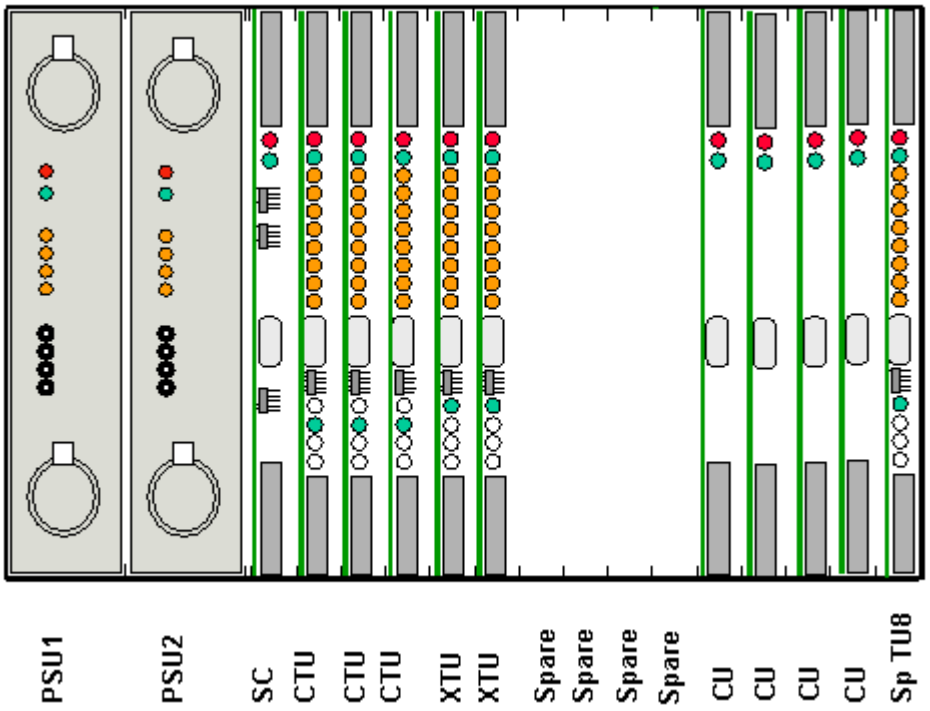
Ensure that the end of suite fuses are adequately rated and insert these into the respective fuse holder positions.

Card Insertion E1 Systems

Insert the cards into the shelves, recording the serial numbers and revision status in the test results form. The actual cards provided will depend upon the customer configuration.



The maximum 64k build configuration (V5.1/CAS/ISDN) is shown above. The XTU functions are configured using Sitespan. V5.1 does not support Data XTUs.



The maximum 32k build configuration for V5.2 is shown above. The XTU functions are configured using Sitespan.

a. The load sharing PSUs go in slots 1&2.

b. The Shelf Controller goes in slot 3.

c. All other slot positions are configurable via Sitespan.

d. 3 CTUs are supported. Each CTU supports four CT modem shelves. Each CTU may be cabled for four 120Ω E1s or four 75Ω E1s. and are placed in slots 4, 5, and 6

e. XTUs (CAS, Data, ISDN, V5.1, V5.2 and PTU) are supported. Each XTU may be cabled for eight 120Ω E1s. These can be placed in slots 5-14.(It is preferable to build from slot 7 leaving 5 and 6 available for additional CTUs if required)

f. CU cards may go in any unused slot. (slots 15& 16 are preferred as they have no E1 connections.

g. RTU card can go in slot 9 *or* 17 for card redundancy using a spare TU8 card (not PTU), the redundant card is selected via Sitespan.

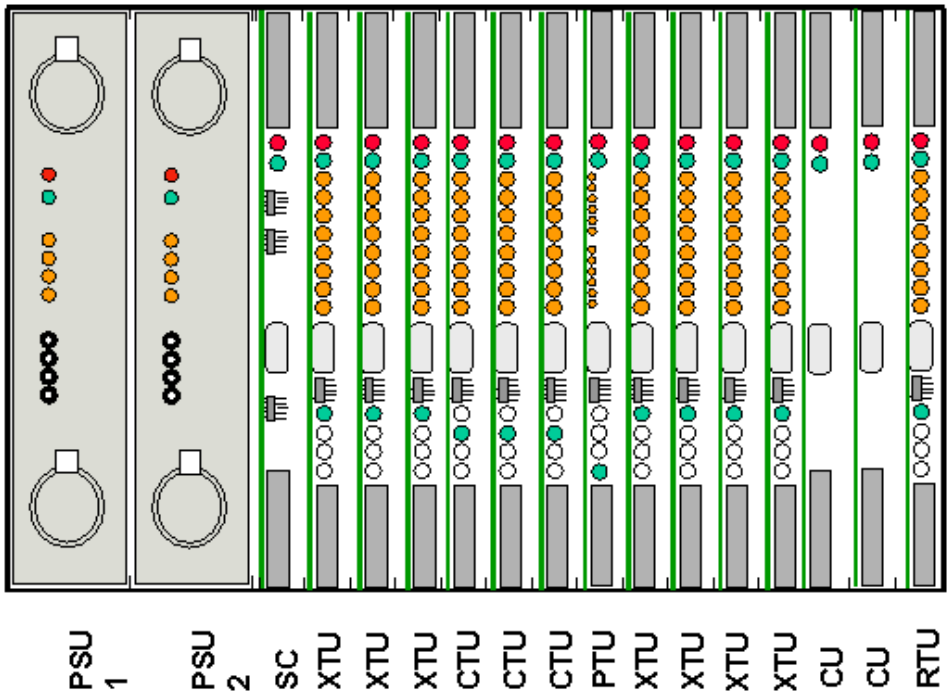
Note If installing a PTU the D-type on the backplane must be fitted with a D-Type to RJ45 adapter. The RJ45 to DB25 connector currently must be connected onto the lower of the two 25-way AC connectors (even though the activity lights work if connected to the top).
The preferred E1 options are shown below

Card/Slot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
PSU	M	M															
SC			M														
CTU				P	P	P											
XTU							P	P	P	O	O	O	O	O			
PTU													P	P			
CU													O	O	P	P	
RTU																	P

M= Mandatory P= Preferred O= Optional

Card Insertion T1 Systems

Insert the cards into the shelves, recording the serial numbers and revision status in the test results form. The actual cards provided will depend upon the customer configuration.



a) The load sharing PSUs go in slots 1&2.

b) The Shelf Controller goes in slot 3.

c) All other slot positions are configurable via Sitespan.

d) 3 CTUs are supported. Each CTU supports four CT modem shelves. Each CTU may be cabled for eight 120Ω T1s. and are placed in slots 7, 8, and 9

e) XTUs (GR303, CAS, Data, ISDN, V5.1, V5.2 and PTU) are supported. Each XTU may be cabled for eight 120Ω E1s. These can be placed in slots 8-14.(It is preferable to build from slot 10 leaving 8 and 9 available for additional CTUs if required) and in slots 4,5 and 6.

f) CU cards may go in any unused slot. (slots 15& 16 are preferred as they have no T1 connections.

g) RTU card can go in slot 9 or 17 for card redundancy using a spare TU8 card (not PTU), the redundant card is selected via Sitespan.

Note If installing a PTU the D-type on the backplane must be fitted with a D-Type to RJ45 adapter. The RJ45 to DB25 connector currently must be connected onto the lower of the two 25-way AC connectors (even though the activity lights work if connected to the top).

The preferred card positions are shown in the table below.

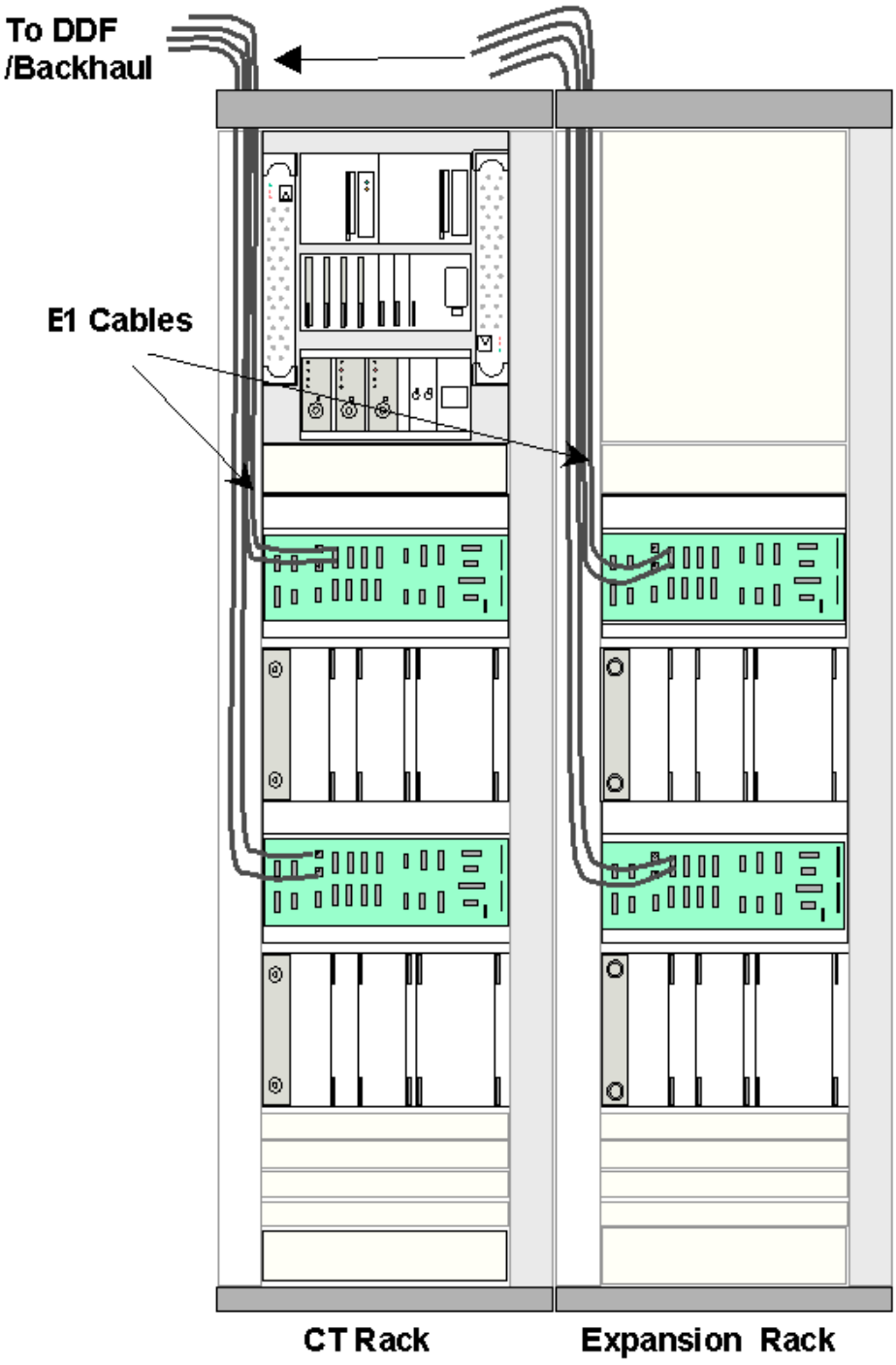
Card/Slot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
PSU	M	M															
SC			M														
CTU							P	P	P								
XTU				O	O	O	O	O	O	O	O	P	P	P			
PTU										P	P						
CU						O									P	P	
RTU																	P

M= Mandatory P= Preferred O= Optional

AS4000 CT Shelf Cabling and Wiring

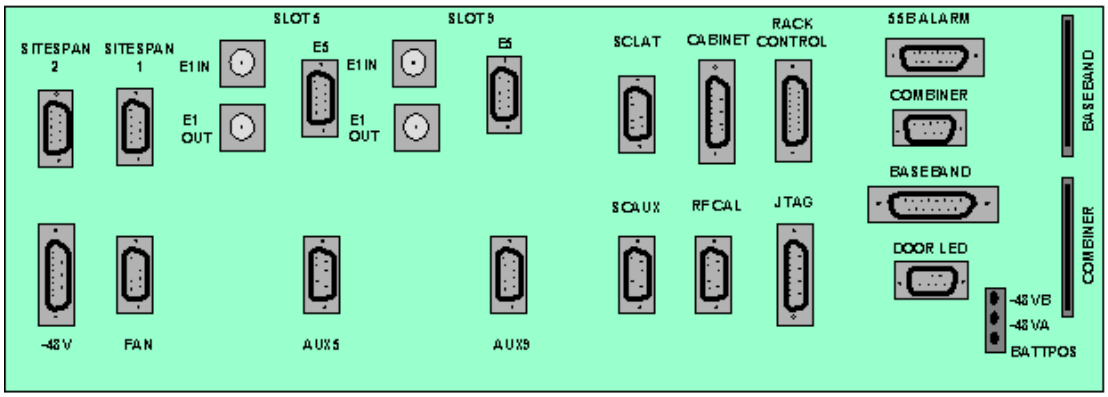
Central Terminal Rack E1 Cabling 75 ohm

From the site survey, confirm the location of the Digital Distribution Frame (DDF) if a DDF is to be used or the Backhaul/Access Concentrator if the E1 feeds are fed directs to the equipment. The length of E1 feeds should not exceed 250 metres
Note: This must be a SELV port of an EN 60950 approved product.



E1 Rack Cable Runs

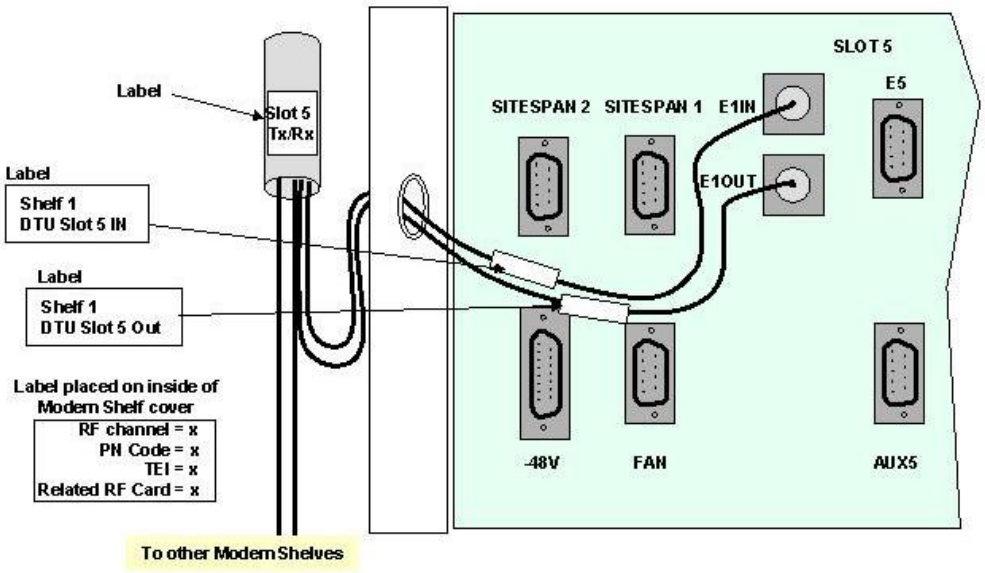
CT Modem Shelf interface connections to shelf backplane 303-1001-900



75 Ohm Shelf Interface Connections

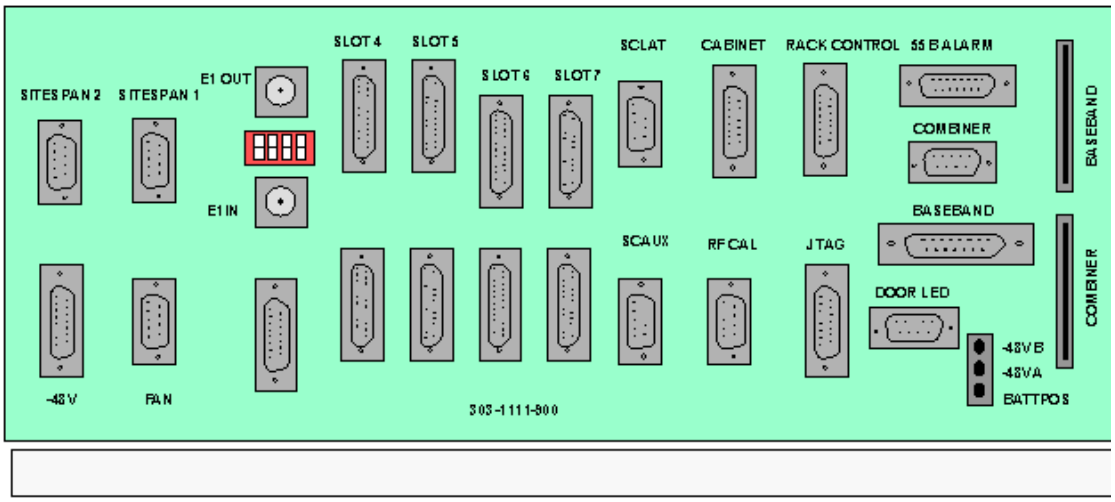
Run the E1 co-axial cables from the modem shelf to the allocated positions on the DDF/Backhaul. (Two cables per shelf in normal working, four cables per shelf in protected mode). In partial equipped installations it may be appropriate to run enough cables to cater for a complete rack of equipment. This reduces the need to disturb original installation when adding additional equipment.
Feed the E1 cables through the top left hand side of the rack, and down the front of the rack.
Identify and label each cable at both ends as well as the DDF/Backhaul positions.
Terminate all cables with BNC co-axial connectors.
Connect the E1 ports on the DDF to E1IN Slot 5 and E1OUT Slot 5 BNC connectors on shelf interface connections located on the modem shelf interface panel.

CT Modem Shelf 75ohm Cabling



Ensure that the respective E1 ports have been configured on the DDF/Backhaul
Tie in cables as necessary using suitable cable ties, trim, leaving no sharp edges.

CT Modem Shelf interface connections to shelf interface panel 303-1111-900



Shelf Interface Panel 303-1111-900

75 Ohm Shelf Interface Connections

Run the E1 co-axial cables from the modem shelf to the allocated positions on the DDF/Backhaul. (Two cables per shelf in normal working, four cables per shelf in protected mode). In partial equipped installations it may be appropriate to run enough cables to cater for a complete rack of equipment. This reduces the need to disturb original installation when adding additional equipment.

Feed the E1 cables through the top left hand side of the rack, and down the front of the rack.

Identify and label each cable at both ends as well as the DDF/Backhaul positions.

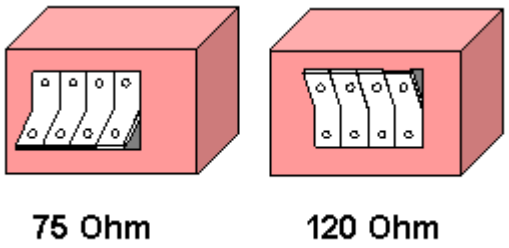
Terminate all cables with BNC co-axial connectors.

Connect the E1 ports on the DDF to E1IN Slot 5 and E1OUT Slot 5 BNC connectors on shelf interface connections located on the modem shelf interface panel.

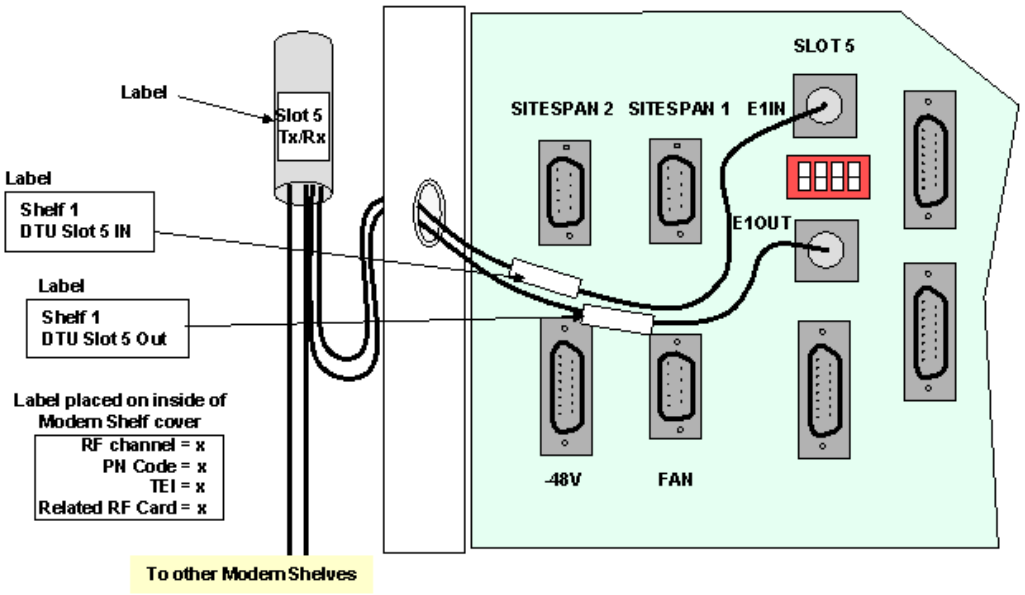
Ensure that the respective E1 ports have been configured on the DDF/Backhaul

Tie in cables as necessary using suitable cable ties, trim, leaving no sharp edges.

For 75ohm working the switches below the E1 out BNC connector should be set as shown below

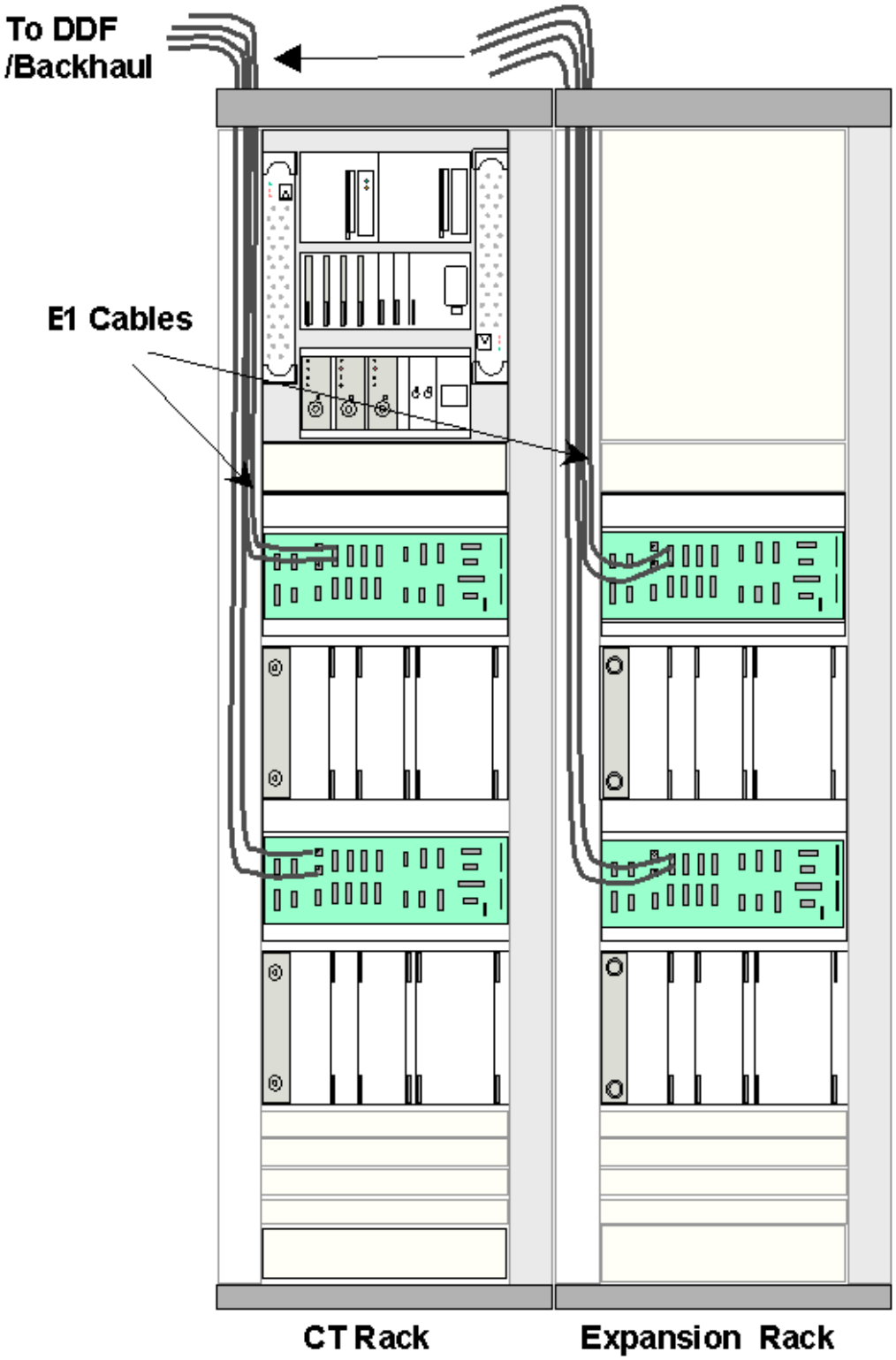


Cable connections to Shelf Interface

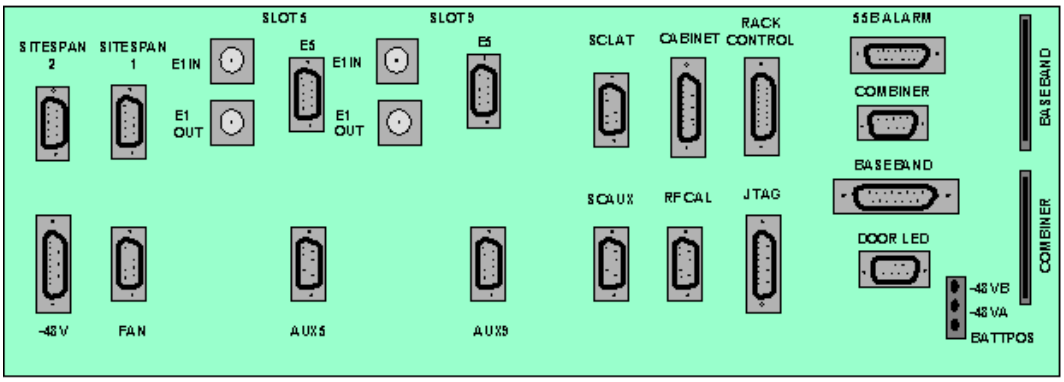

Label
Slot 5
Tx/Rx
Label
Shelf 1
DTU Slot 5 IN
Label
Shelf 1
DTU Slot 5 Out
Label placed on inside of
Modem Shelf cover
RF channel = x
PN Code = x
TEI = x
Related RF Card = x
To other Modem Shelves
SLOT 5
SITESPAN 2
SITESPAN 1
E1IN
E1OUT
-48V
FAN

CT Rack E1 Cabling 120 ohm

From the site survey, confirm the location of the Digital Distribution Frame (DDF) if a DDF is to be used or the Backhaul/Access Concentrator if the E1 feeds are fed directs to the equipment. The length of E1 feeds should not exceed 250 metres
Note: This must be a SELV port of an EN 60950 approved product.

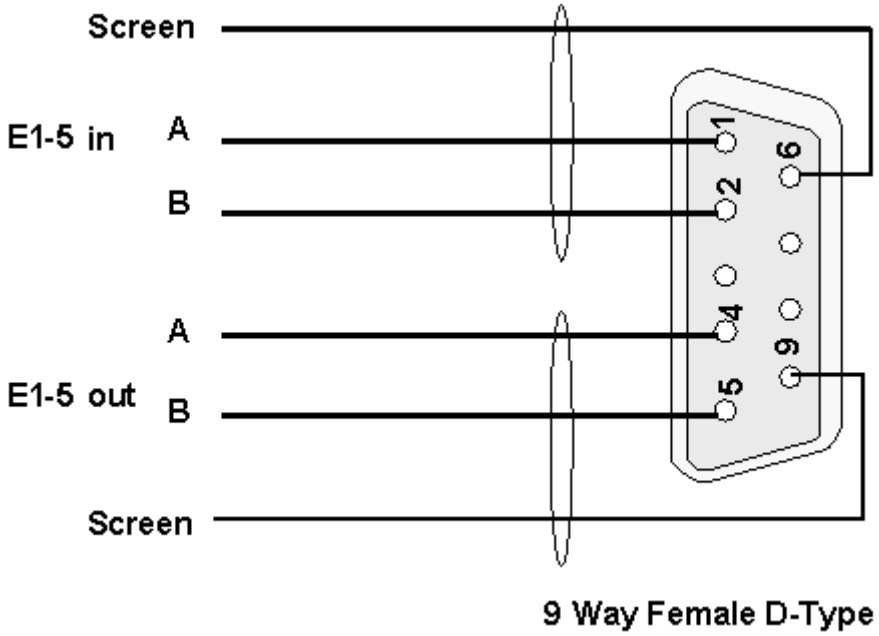


CT Modem Shelf interface connections to shelf backplane 303-1001-900



120 Ohm Shelf Interface Connections

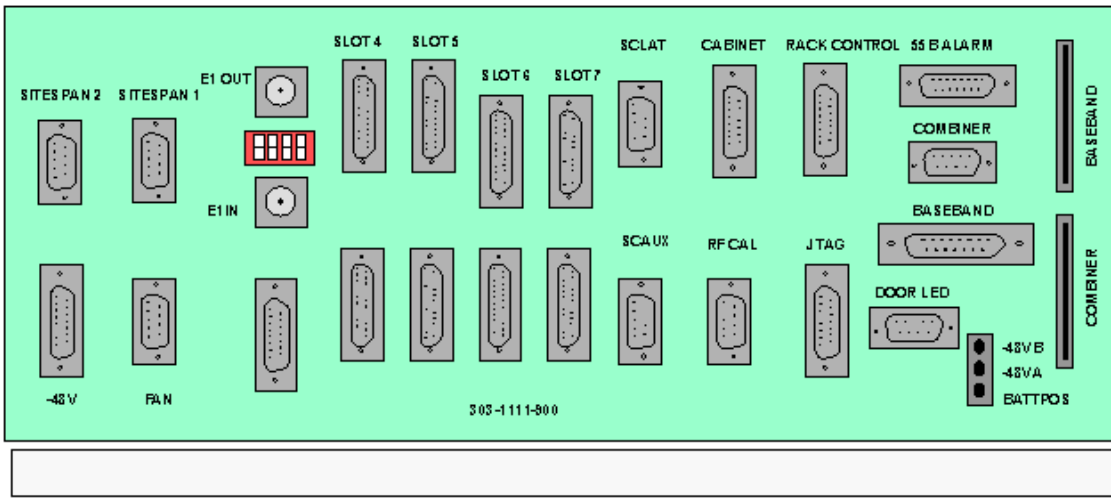
Run the E1 120 ohm cables from the modem shelf to the allocated positions on the DDF/Backhaul. In partial equipped installations it may be appropriate to run sufficient cables to cater for a complete rack of equipment. This reduces the need to disturb original installation when adding additional equipment.
Feed the E1 cables through the top left-hand side of the rack, and down the front of the rack. Identify and label each cable at both ends as well as the DDF/Backhaul positions.
Terminate all cables at the modem shelf end with 9 pin D-Type connectors. Terminate as detailed in below.



9 Way Female D-Type

Connect the E1 ports on the DDF to E1 slot 5 connectors on shelf interface connections located on the modem shelf interface panel.
Ensure that the respective E1 ports have been configured on the DDF/Backhaul
Tie in cables as necessary using suitable cable ties, trim, leaving no sharp edges.

CT Modem Shelf interface connections to shelf interface panel 303-1111-900



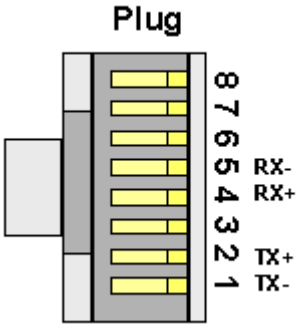
Run the E1 cables from the modem shelf to the allocated positions on the DDF/Backhaul. In partial equipped installations it may be appropriate to run sufficient cables to cater for a complete rack of equipment. This reduces the need to disturb original installation when adding additional equipment.
Feed the E1 cables through the top left-hand side of the rack, and down the front of the rack. Identify and label each cable at both ends as well as the DDF/Backhaul positions.

Impedance Switch settings

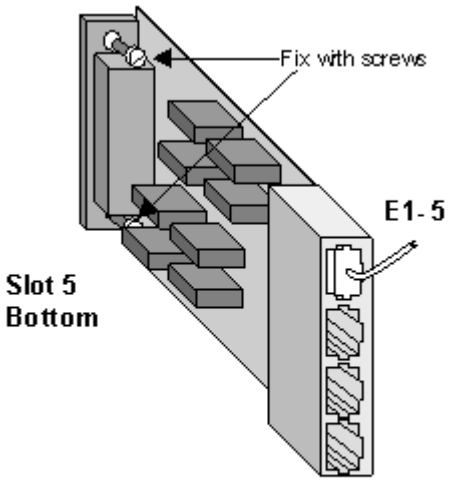
Set the switches below the E1 out BNC connector to 120 ohm as shown below

E1 Shelf Interface Connections To RJ45

Terminate all cables with RJ45 Connectors. Terminate as detailed below.



The illustration below shows the adapter (Slot 5) and backhaul connections

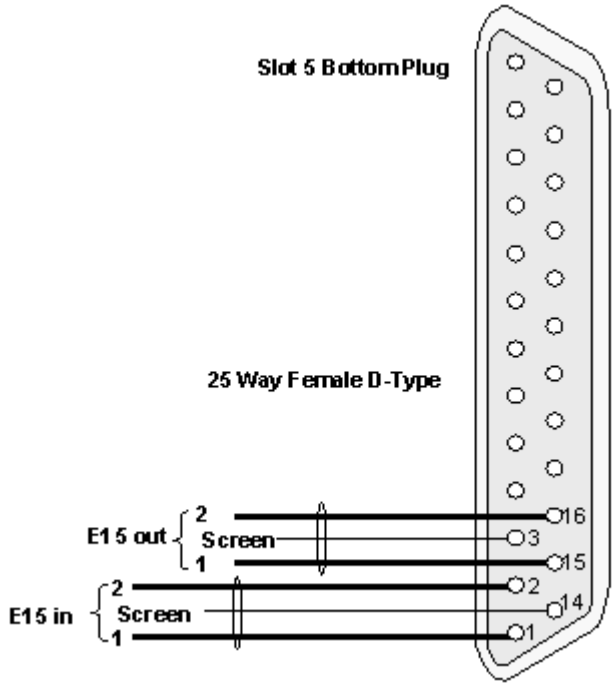


303-1113-900

Tie in cables as necessary using suitable cable ties, trim, leaving no sharp edges.

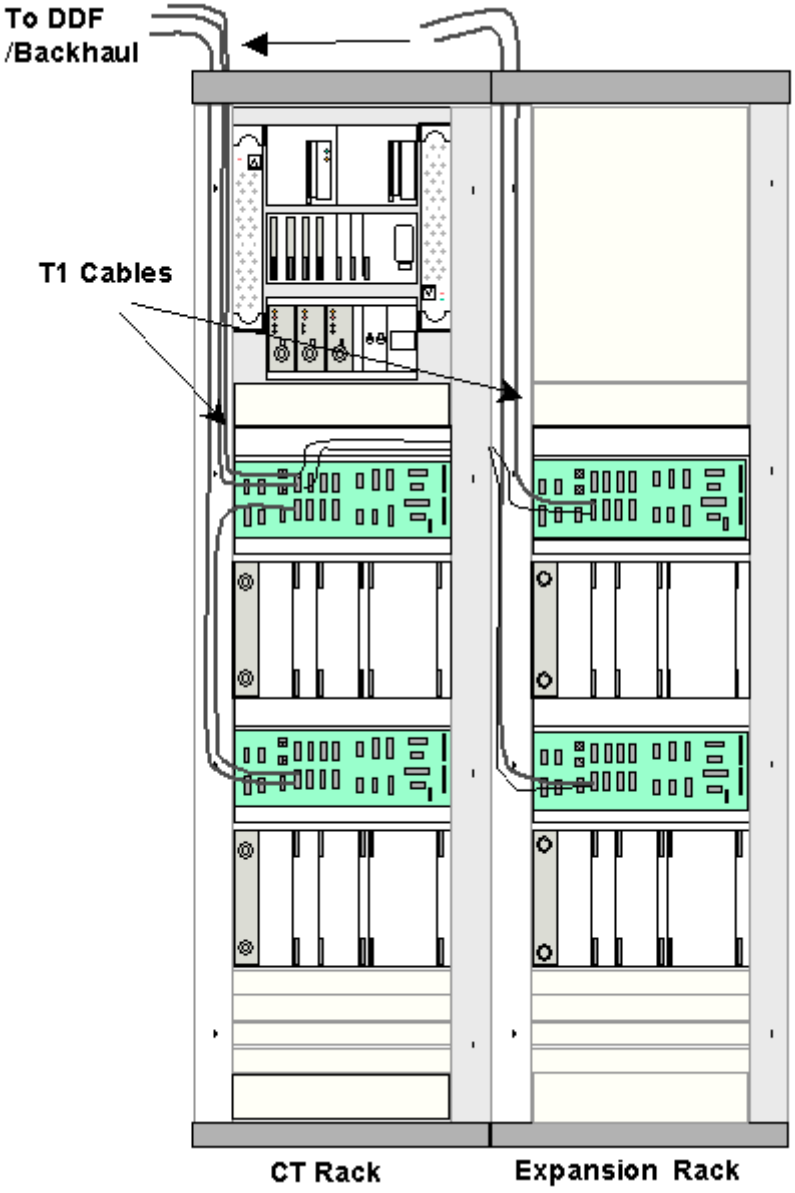
E1 Shelf Interface Connections To D-Type Plug

Terminate all cables at the modem shelf end with 25 pin D-Type connectors. Terminate as detailed below.

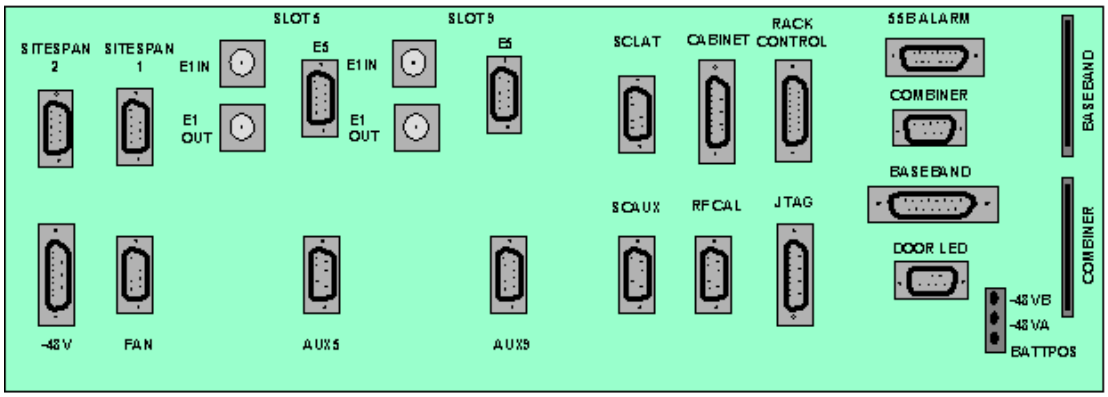


CT Rack T1 Cabling

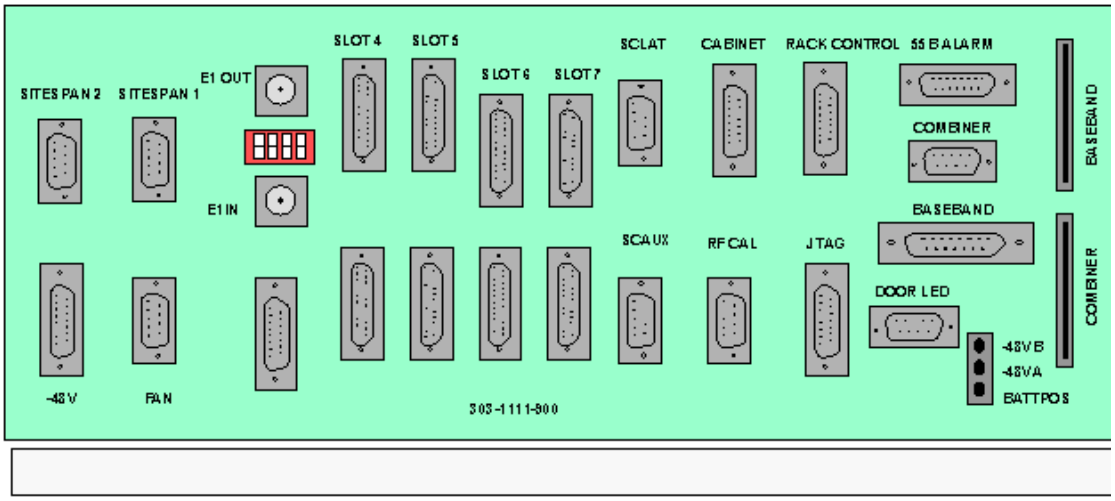
From the site survey, confirm the location of the Digital Distribution Frame (DDF) if a DDF is to be used or the Backhaul/Access Concentrator if the T1 feeds are fed directs to the equipment. The length of T1 feeds should not exceed 100 metres. Cat 5 FTP screened (foil & braid) twisted pair cable should be used.



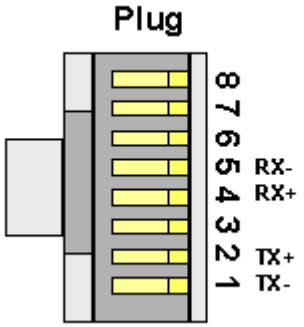
CT Modem Shelf interface connections to shelf backplane 303-1001-900



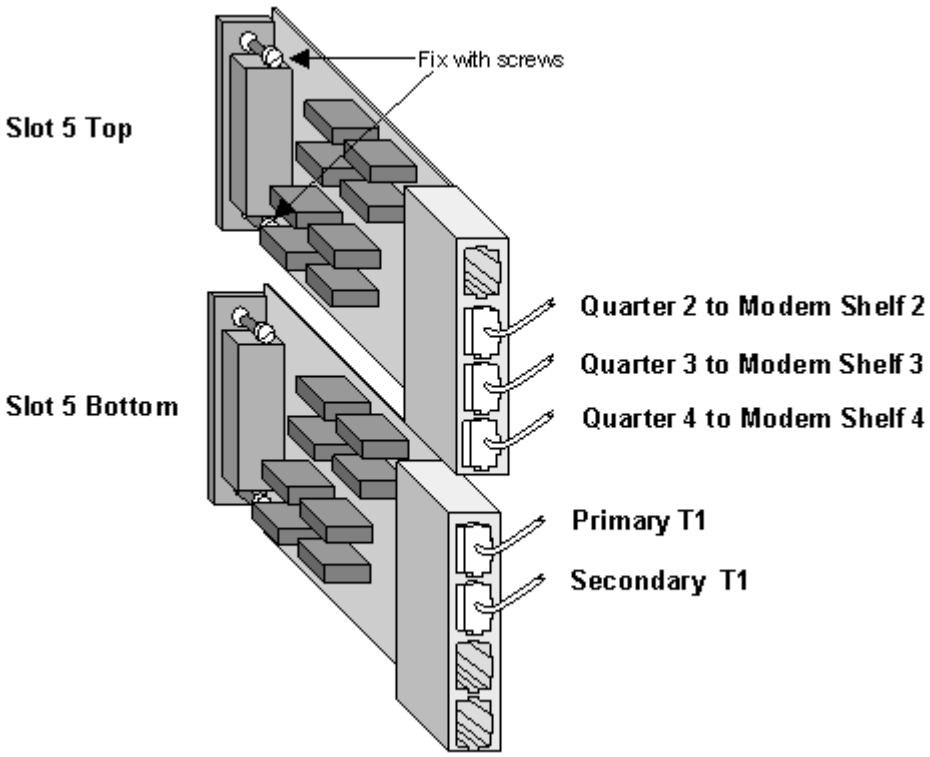
T1 (RJ45) interface connections to 303-1111-900 shelf interface panel



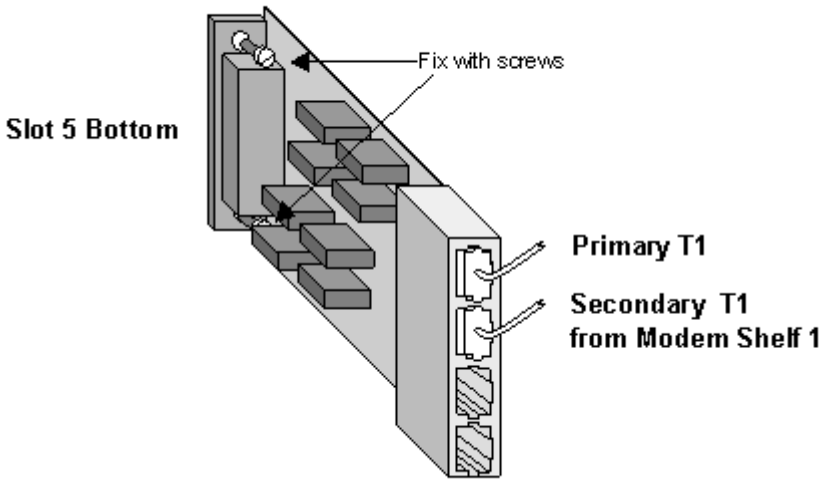
Run the T1 cables from the modem shelf to the allocated positions on the DDF/Backhaul. In partial equipped installations it may be appropriate to run enough cables to cater for a complete rack of equipment. This reduces the need to disturb original installation when adding additional equipment.
Feed the T1 cables through the top left-hand side of the rack, and down the front of the rack. Identify and label each cable at both ends as well as the DDF/Backhaul positions.
Terminate all cables with RJ45 Connectors. Terminate as detailed below.



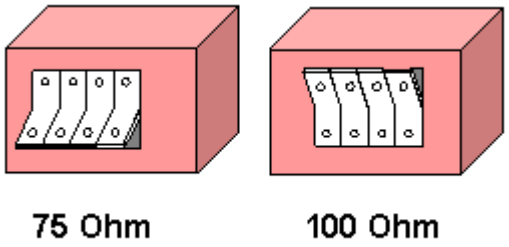
Connect the T1 ports on the DDF to the T1 RJ45 adapter fitted to the slot 5 connector on the shelf interface panel. Ensure that the respective T1 ports have been configured on the DDF/Backhaul. The Primary T1 should connect to port 5 and the Secondary T1 to port 6. The first Modem Shelf in the rack distributes the secondary T1 quarters to the other modem shelves in the CT and expansion Rack if used.
The illustration below shows the connections to Slot 5 Modem Shelf 1using two adapters 303-1113-900.



The illustration below shows connections to Modem Shelves 2,3 and 4 using adapter 303-1113-900



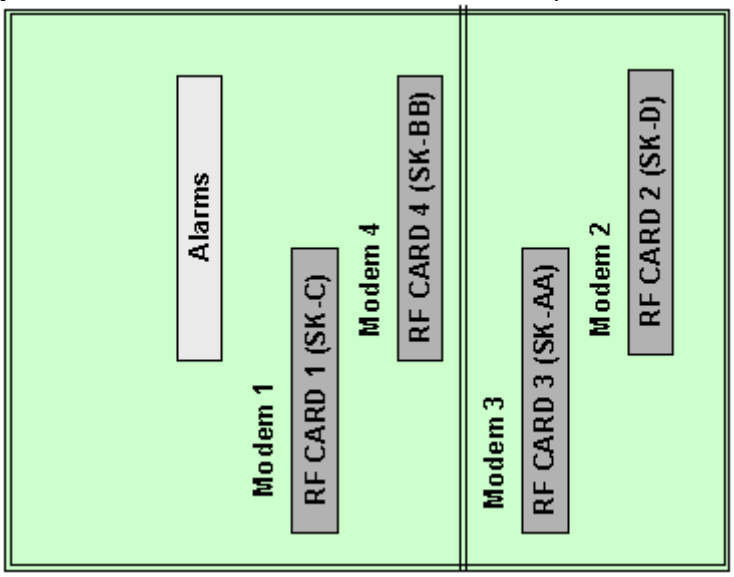
Tie in cables as necessary using suitable cable ties, trim, leaving no sharp edges.
Ensure that the switches below the BNC on the Shelf Interface Panel are set for 100ohm working



Baseband connections between CT and Expansion Racks

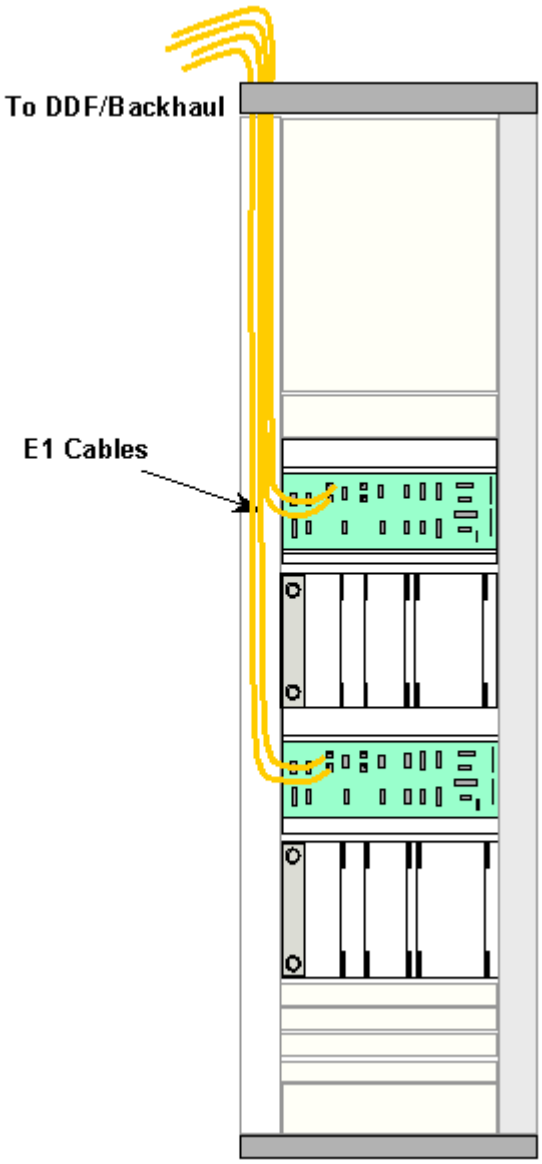
Inter-rack Baseband connections to Expansion Rack

Remove the blank panel located immediately below the combiner shelf on the CT Rack
Run a Baseband ribbon cable from each modem shelf in the Expansion Rack to the combiner shelf via the hole created by the removal of the breakout sections during the rack installation. Insert the connector into the Baseband socket on the Modem Interface shelf (see) and into the appropriate socket on the Combiner Shelf backplane (the sockets are located behind the switches). If using a Hybrid Rack these connections will differ from the illustration below. (see Hybrid Rack Modification for Directional Antenna)



Combiner Shelf Ribbon Connections
Run the alarm bus ribbon from the Alarm and Breaker panel to the Alarm Bus socket in the CT Rack wiring loom.

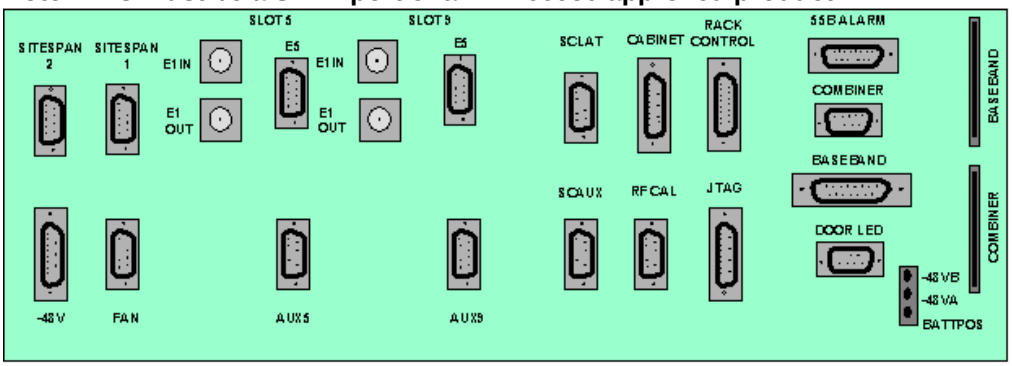
Central Terminal Expansion Rack Cabling



2Mbit/s Cabling

From the site survey, confirm the location of the Digital Distribution Frame (DDF) if a DDF is to be used or the Backhaul/Access Concentrator if the 2Mbit/s feeds are fed direct to the equipment. The length of 2Mbit/s feeds should not exceed 250 metres

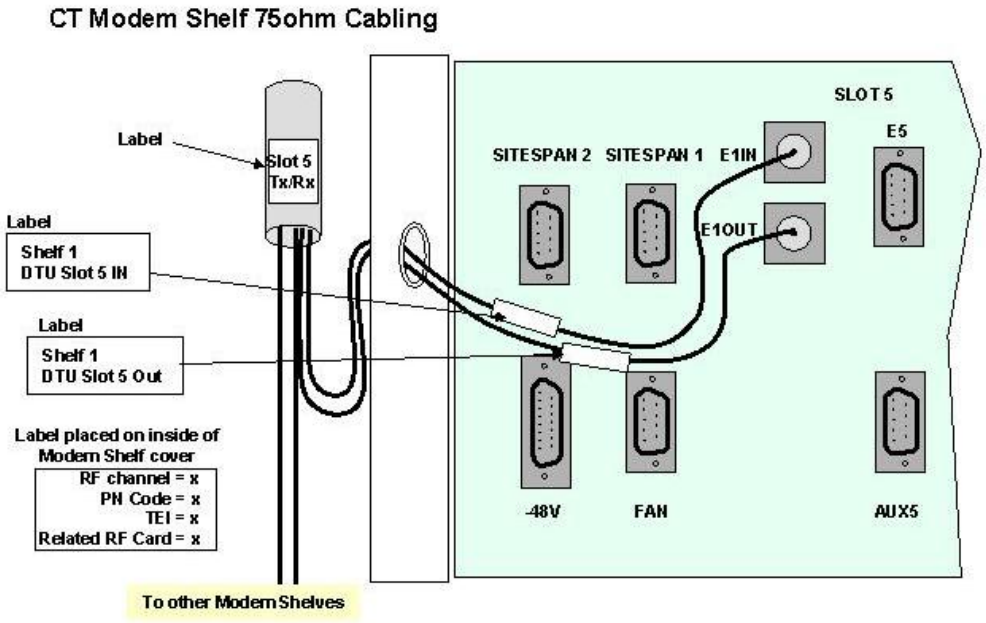
Note: This must be a SELV port of an EN 60950 approved product.



1. **Shelf Interface Connections.**

75 Ohm Connections

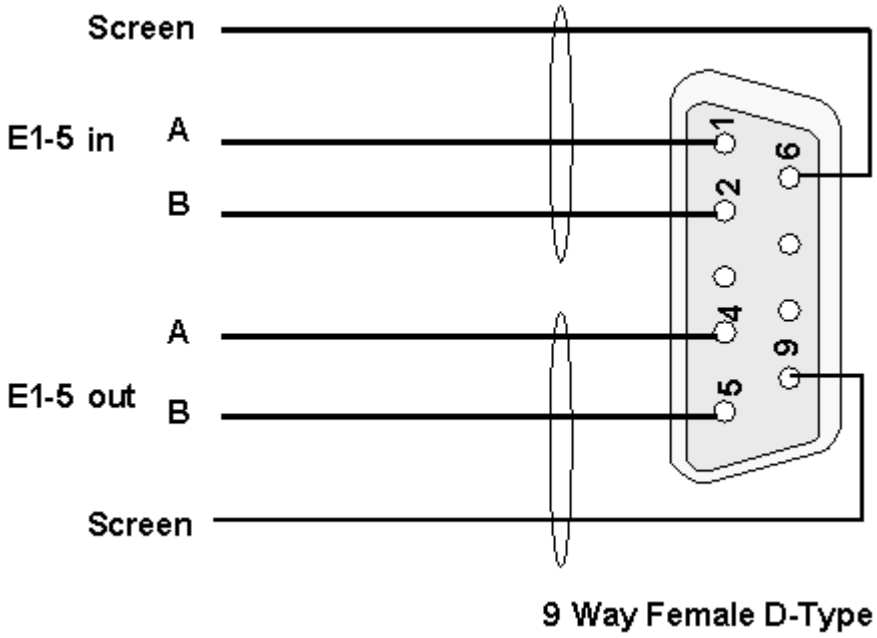
Run the 2Mbit/s co-axial cables from the modem shelf to the allocated positions on the DDF/Backhaul. (Two cables per shelf in normal working, four cables per shelf in protected mode). In partial equipped installations it may be appropriate to run enough cables to cater for a complete rack of equipment. This reduces the need to disturb original installation when adding additional equipment.
Feed the 2Mbit/s cables through the top left-hand side of the rack, and down the front of the rack.
Identify and label each cable at both ends as well as the DDF/Backhaul positions.
Terminate all cables with BNC co-axial connectors.
Connect the 2Mbit/s ports on the DDF to E1IN Slot 5 and E1OUT Slot 5 BNC connectors on shelf interface connections located on the modem shelf interface panel.



Ensure that the respective 2Mbit/s ports have been configured on the DDF/Backhaul
Tie in cables as necessary using suitable cable ties, trim, leaving no sharp edges.

120 Ohm Connections

Run the 2Mbit/s 120 ohm cables from the modem shelf to the allocated positions on the DDF/Backhaul. In partial equipped installations it may be appropriate to run enough cables to cater for a complete rack of equipment. This reduces the need to disturb original installation when adding additional equipment.
Feed the 2Mbit/s cables through the top left-hand side of the rack, and down the front of the rack.
Identify and label each cable at both ends as well as the DDF/Backhaul positions.
Terminate all cables with 9 pin D-Type connectors. Terminate as detailed below.



120 ohm connection to CT modem shelf.

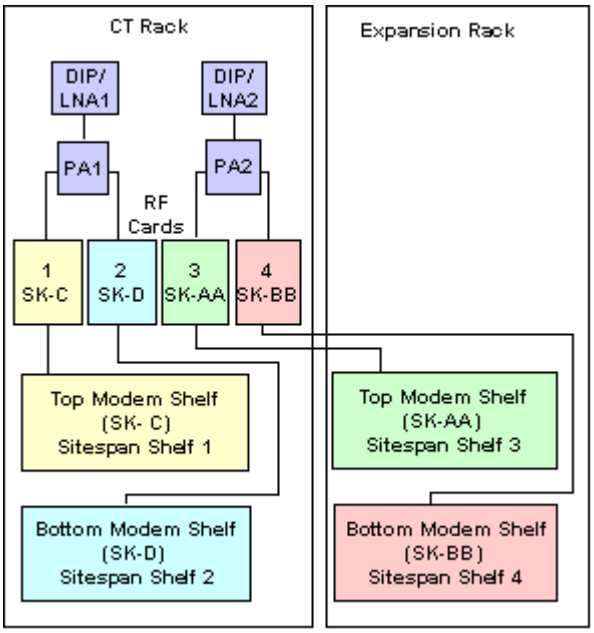
Connect the 2Mbit/s ports on the DDF to E5 slot 5 connectors on shelf interface connections located on the modem shelf interface panel. If using protected mode connect the other 2Mbit/s cables to E5 slot 9 connectors on the same panel.
Ensure that the respective 2Mbit/s ports have been configured on the DDF/Backhaul
Tie in cables as necessary using suitable cable ties, trim, leaving no sharp edges.

Antenna Configurations

AS4000

This section describes the various antenna configurations and modifications needed to the baseband wiring if the AS4000 CT rack is configured so that the two modem shelves serve separate directional antenna. and the subsequent connection arrangements when an expansion rack is fitted.

1. **Standard configuration for Antenna (omni or sectored) using 2 RFs on one Antenna initially and 2 RFs per antenna when an Expansion Rack and second Antenna are added**



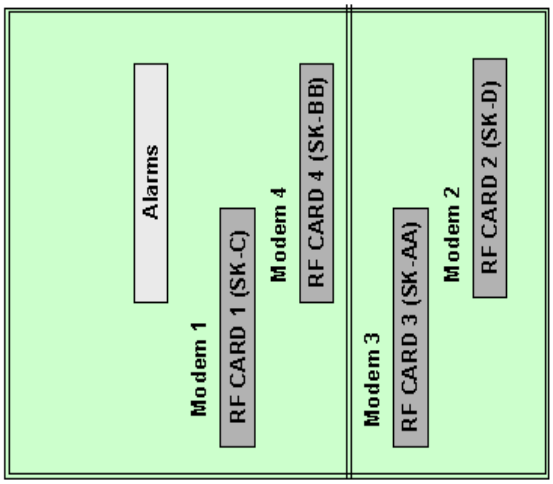


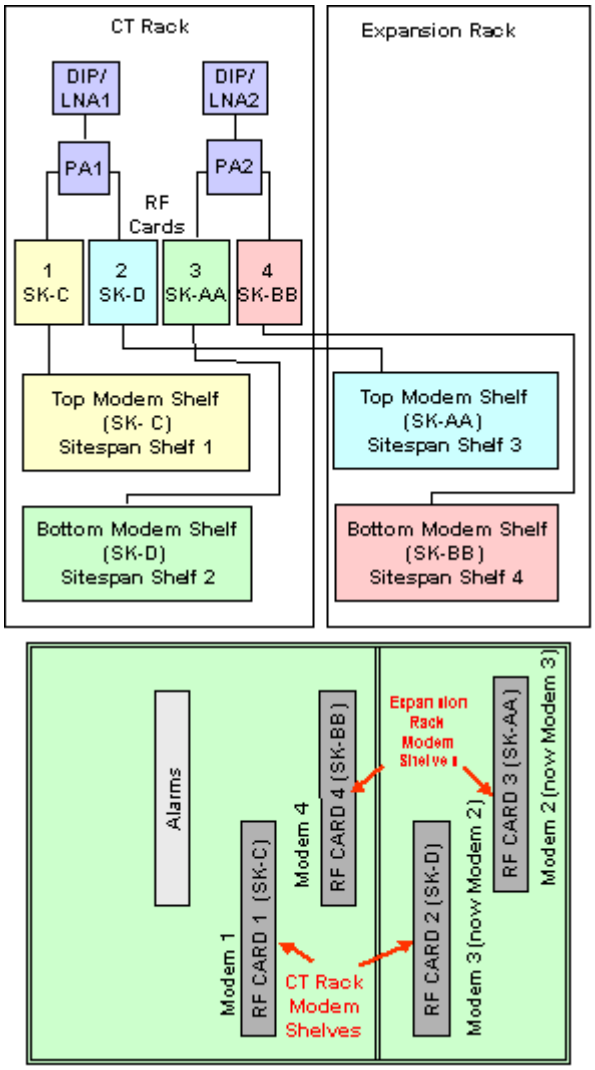
Figure 1 Combiner Shelf Ribbon Connections Before Modification

2. Rack Modification for two separate directional Antenna using 1RF per Antenna initially and 2 RFs per sector when an Expansion Rack is added

The modification consists of re arranging the baseband cables from the modem shelves such that the bottom shelf in the CT rack now connects to RF Card 3 and consequently will feed into the antenna connected to DIP/LNA 2. If an expansion Rack is fitted then the top shelf connects to RF Card 2 and will feed into the antenna connected to DIP/LNA 2. A block diagram of the system after modification is shown below.

Modification to CT Rack

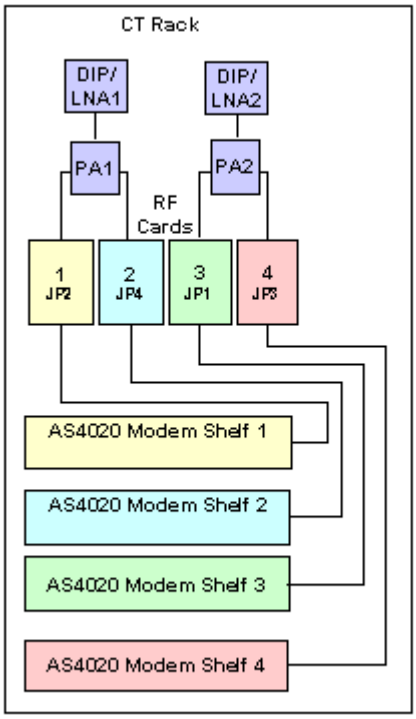
1. Remove the blank panel located immediately below the Combiner Shelf on the DA Rack.
    1. Swap the baseband connectors from Modem Shelves 2 and 3 on the Combiner Shelf backplane (the sockets are located behind the switches on the Combiner Shelf).

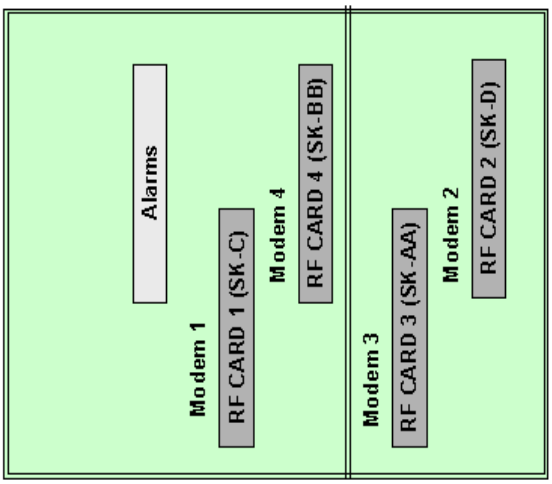


AS4020

This section describes the various antenna configurations and connections needed to the baseband wiring

1. Standard configuration for antenna (omni or sectored)

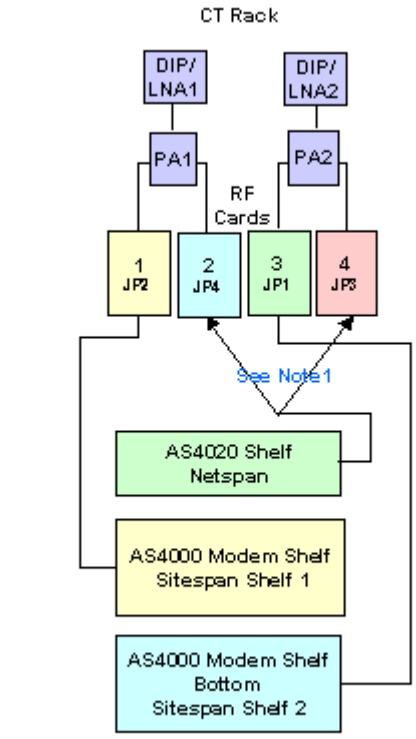




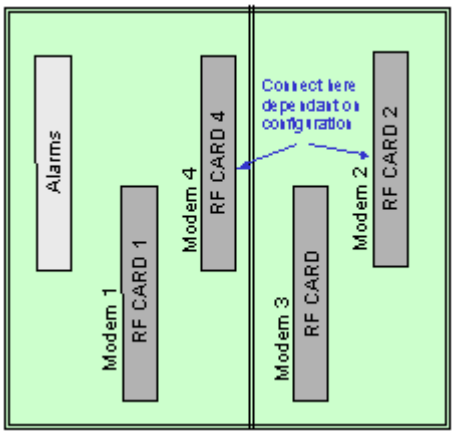
Combiner Shelf Ribbon Connections Standard Config

Mixed AS4000 / AS4020

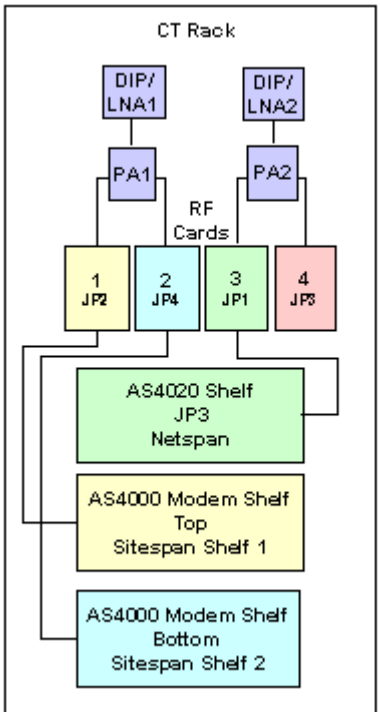
Configuration for AS4020 where AS4000 exists on sectored /dual omni antenna

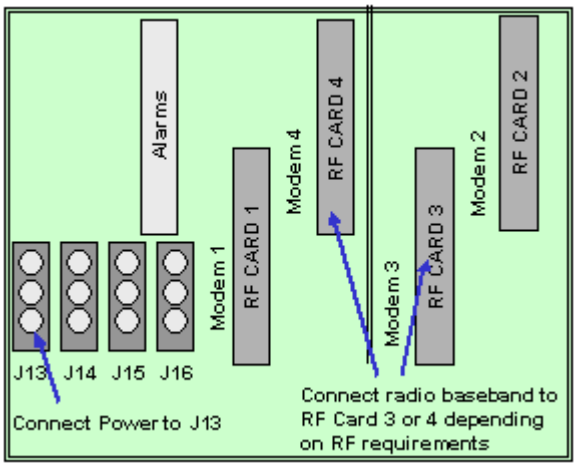


Note1: Either 2 or 4 Dependant on configuration



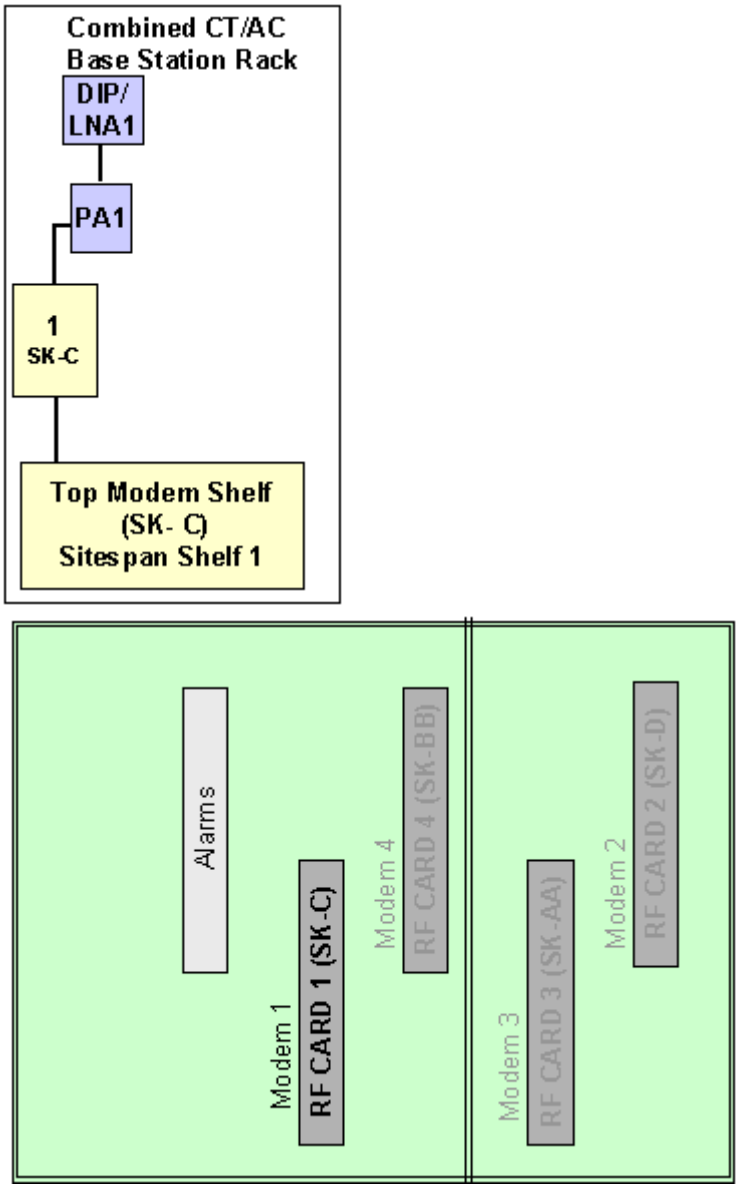
Configuration for AS4020 where AS4000 exists on single omni and additional antenna added





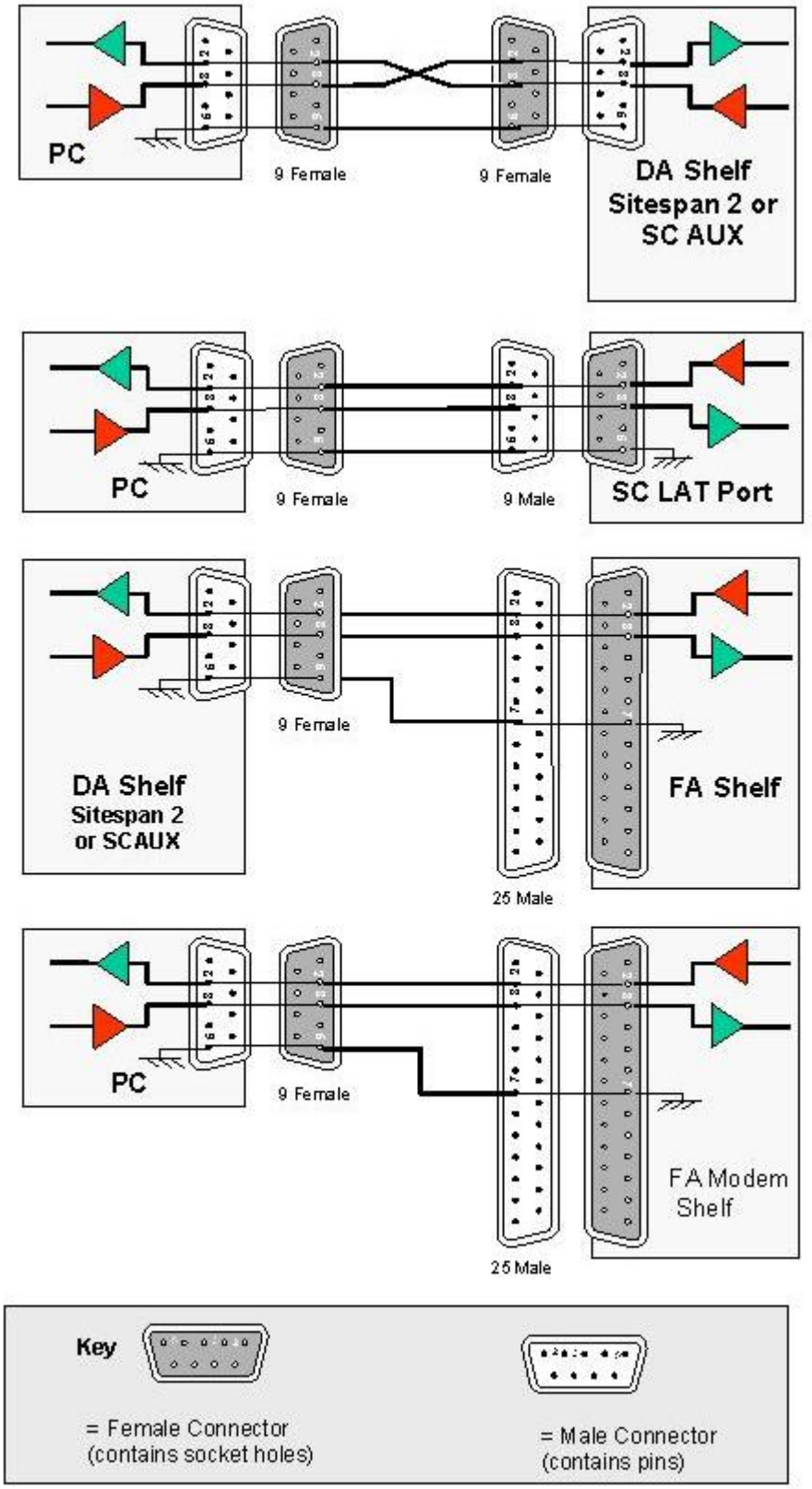
Integrated Base Station Rack

The antenna is configured as shown in the diagrams below.


Combined CT/AC
Base Station Rack
DIP/
LNA1
PA1
1
SK-C
Top Modem Shelf
(SK- C)
Sitespan Shelf 1
Alarms
Modem 1
RF CARD 1 (SK-C)
Modem 4
RF CARD 4 (SK-BB)
Modem 3
RF CARD 3 (SK-AA)
Modem 2
RF CARD 2 (SK-D)

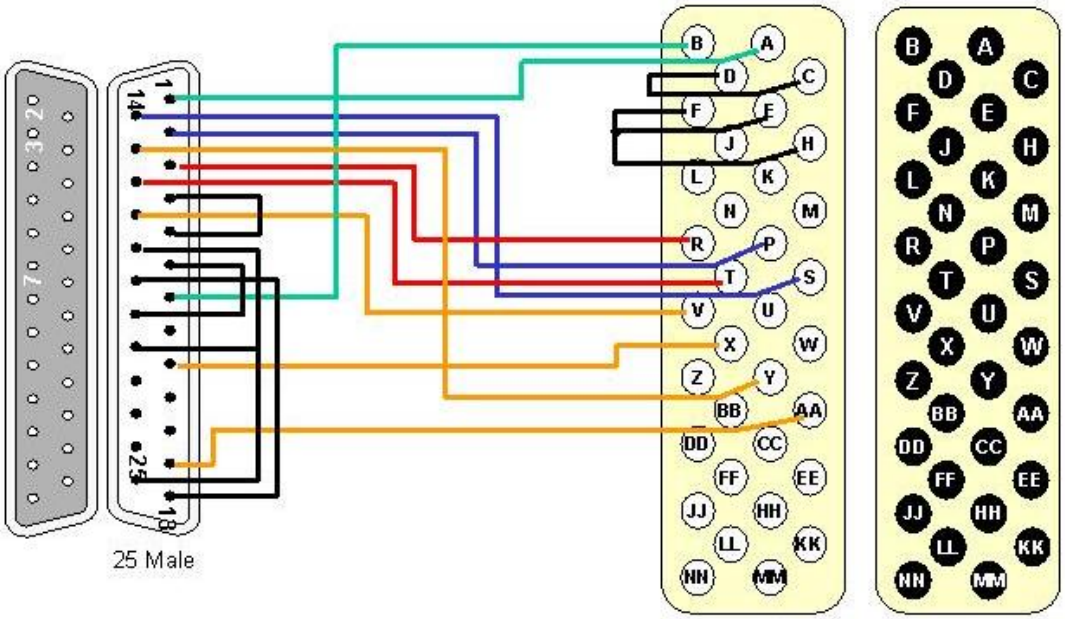
Interface Connections

This page contains miscellaneous interface and connector details.

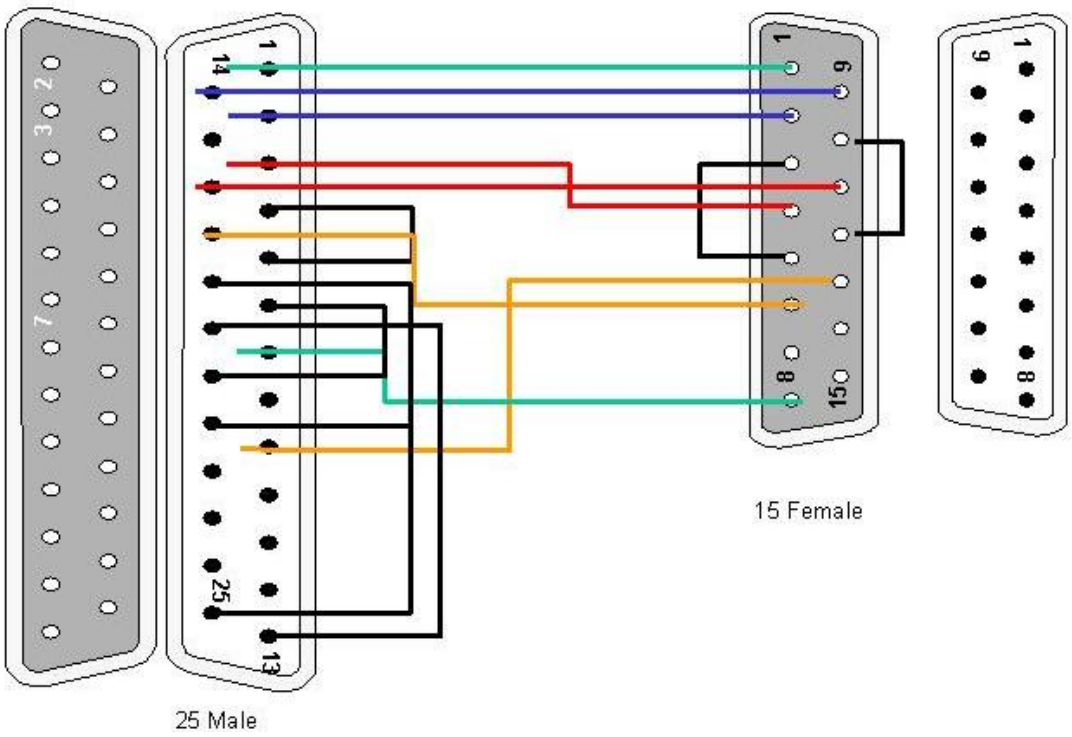


120 Ohm Interface Connections on DA Access Concentrator Backplane

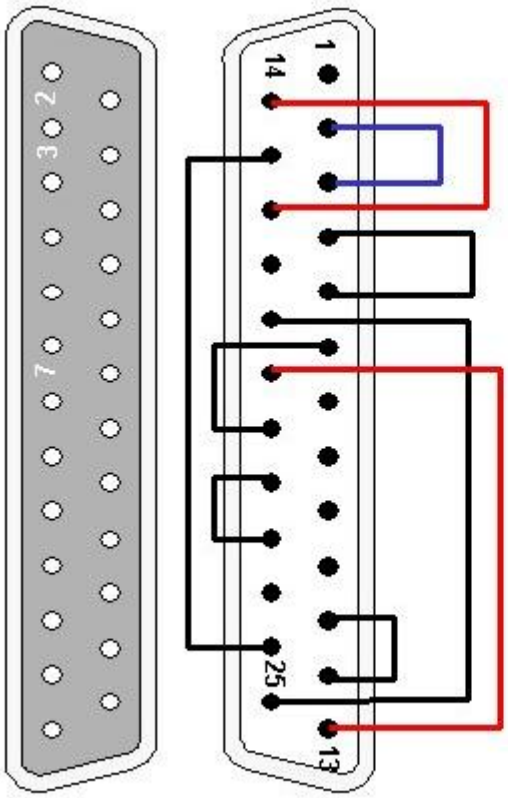
Interface Adaptor EIA 530 to V35



Interface Adapter EIA 530 to X21



EIA 530 loopback Connector

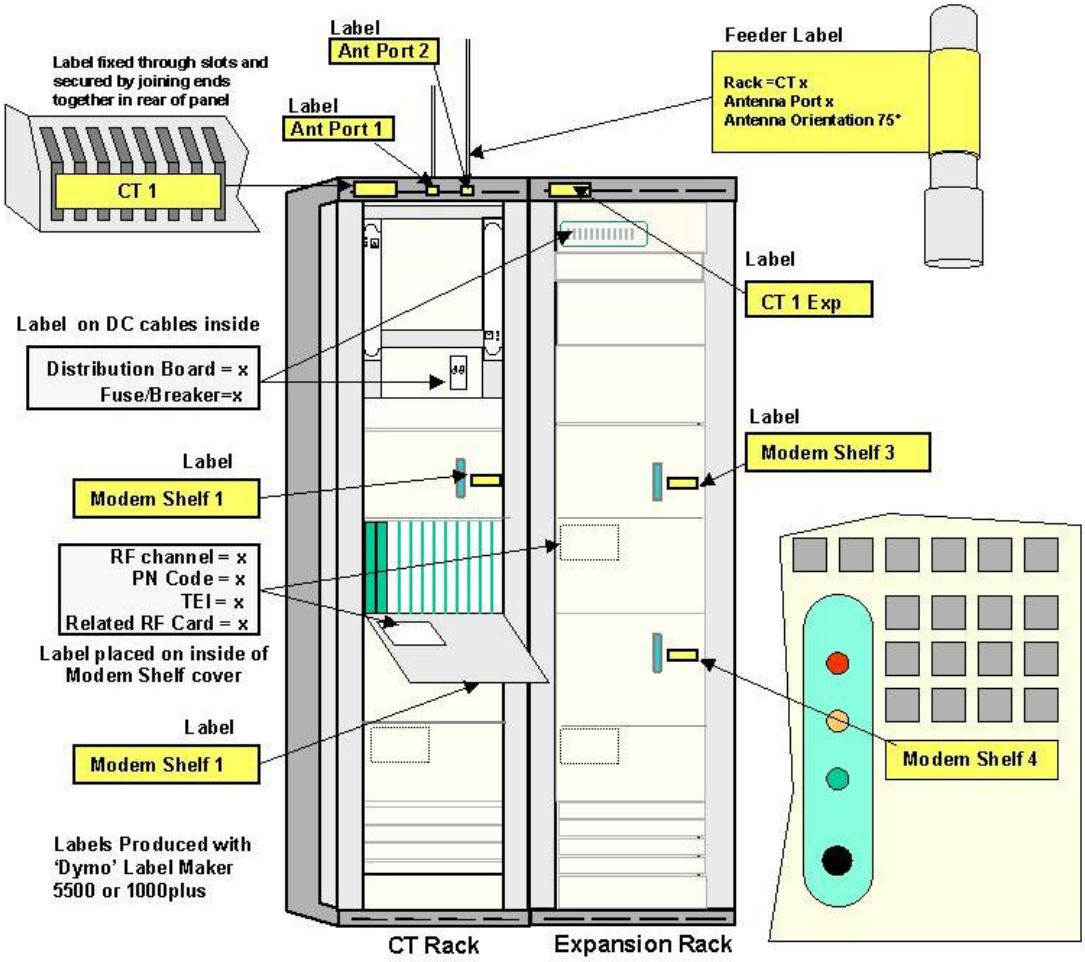


25 Male

Connect	
From	To
02	03
04	05
06	20
11	12
13	19
14	16
15	24
18	25
21	22

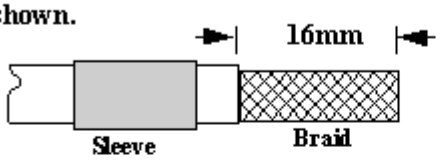
CT Rack Labelling

Central Terminal Rack

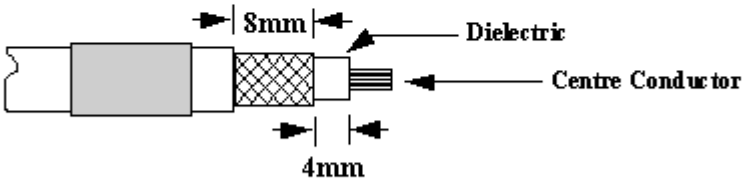


BNC Terminations to Coax

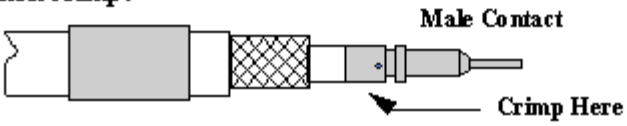
1. Slide metal crimp sleeve over cable,trim outer sheath from cable as shown.



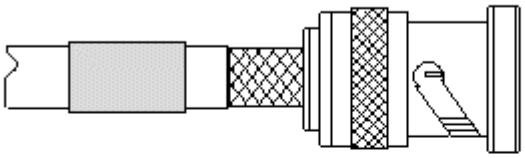
2. Trim back braid and dielectric to the dimensions as shown.



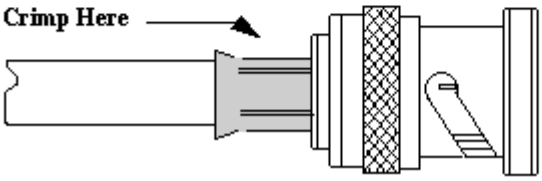
3. Fit contact over the centre conductor to butt against the dilectric, then crimp.



4. Press sub-assembly into body, until contact clicks into place and ensuring that the knurled ferrule is inserted between the dilectric and braid

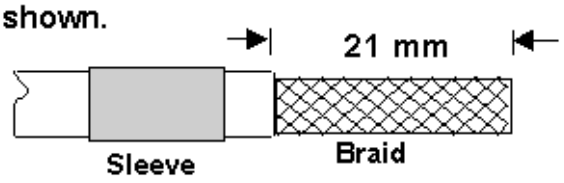


5. Slide the sleeve along the cable, until it butts against the body sub-assembly. Crimp using VQ die.

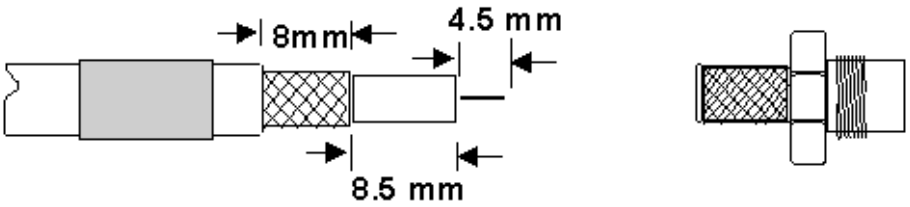


Type 43 Terminations to Coax

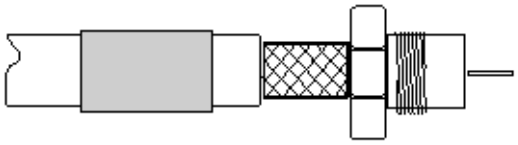
1. Slide metal crimp sleeve over cable,trim outer sheath from cable as shown.



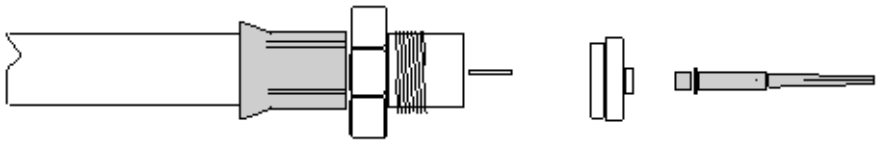
2. Trim back braid and dielectric to the dimensions as shown.



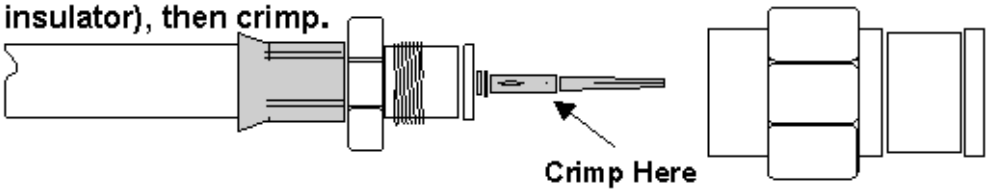
3. Press sub-assembly into body, ensuring that the knurled ferrule is inserted between the dilectric and braid



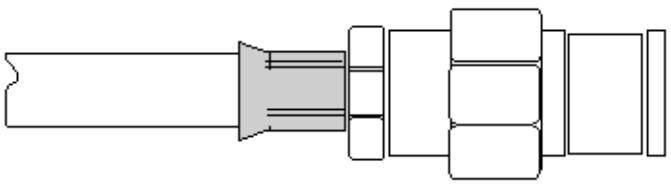
4. Slide the sleeve along the cable, until it butts against the body sub-assembly. Crimp using VQ die.



5. Fit plastic insulator to butt against the body and place contact over the centre conductor (ensure contact locates into the insulator), then crimp.



6. Engage body of the connector and tighten clamp nut.



Central Terminal Card Installation

The CT rack is shipped with shelves fitted to customer requirements and internal cabling complete.

Preliminary

In a new installation ensure that the CT Circuit Breakers located on the lower assembly of the Combiner Shelf are set to the OFF position (Down). See and that the breakers on the Fuse and Alarm panel of the Expansion Rack are switched are set to the OFF position (down) See.

Warning: Before handling any cards or modules, observe full anti-static precautions

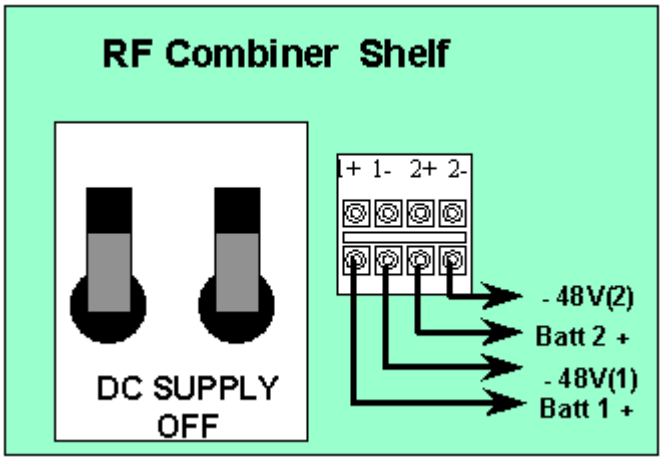
CAUTION PA INSERTION

Care should be taken when installing PAs to ensure that the card connector mates with the backplane connector correctly. Any attempt to ram the card home or force the card into he slot may cause damage to the connector. Insert the card until the connectors engage, ease the card into the backplane until fully engaged. Lock top and bottom with a screwdriver. If resistance is met, remove the card and reinsert. If difficulty persists contact the Airspan service centre.

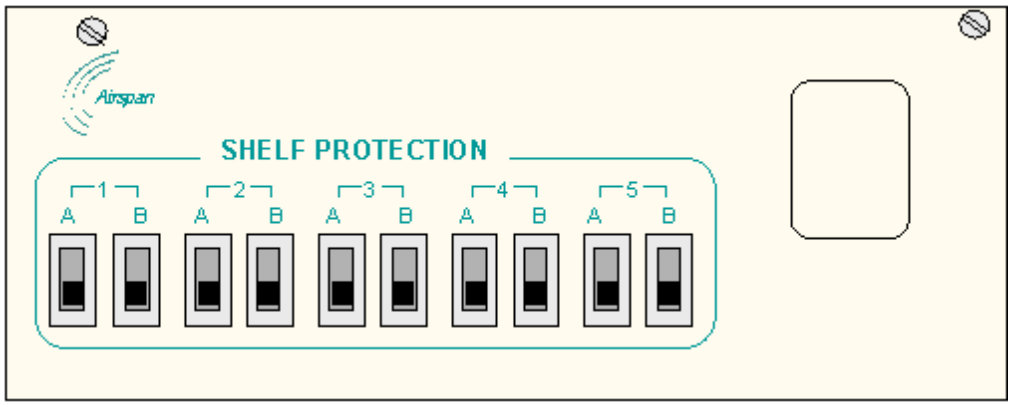
CAUTION DIP/LNA INSERTION

Care should be taken when installing DIP/LNAs to ensure that the card connector mates with the backplane connector correctly. Any attempt to ram the card home or force the card into he slot may cause damage to the connector. The board extractor levers may be used to assist with insertion, when the card is home press the body of the DIP/LNA to ensure that the connector is fully engaged. If resistance is met remove the card and reinsert. If difficulty persists contact the Airspan service centre.

WARNING: Isolation of power from the rack is only achieved by ensuring that both circuit breakers are in the off position.



Part of RF Combiner Shelf showing Circuit Breakers.

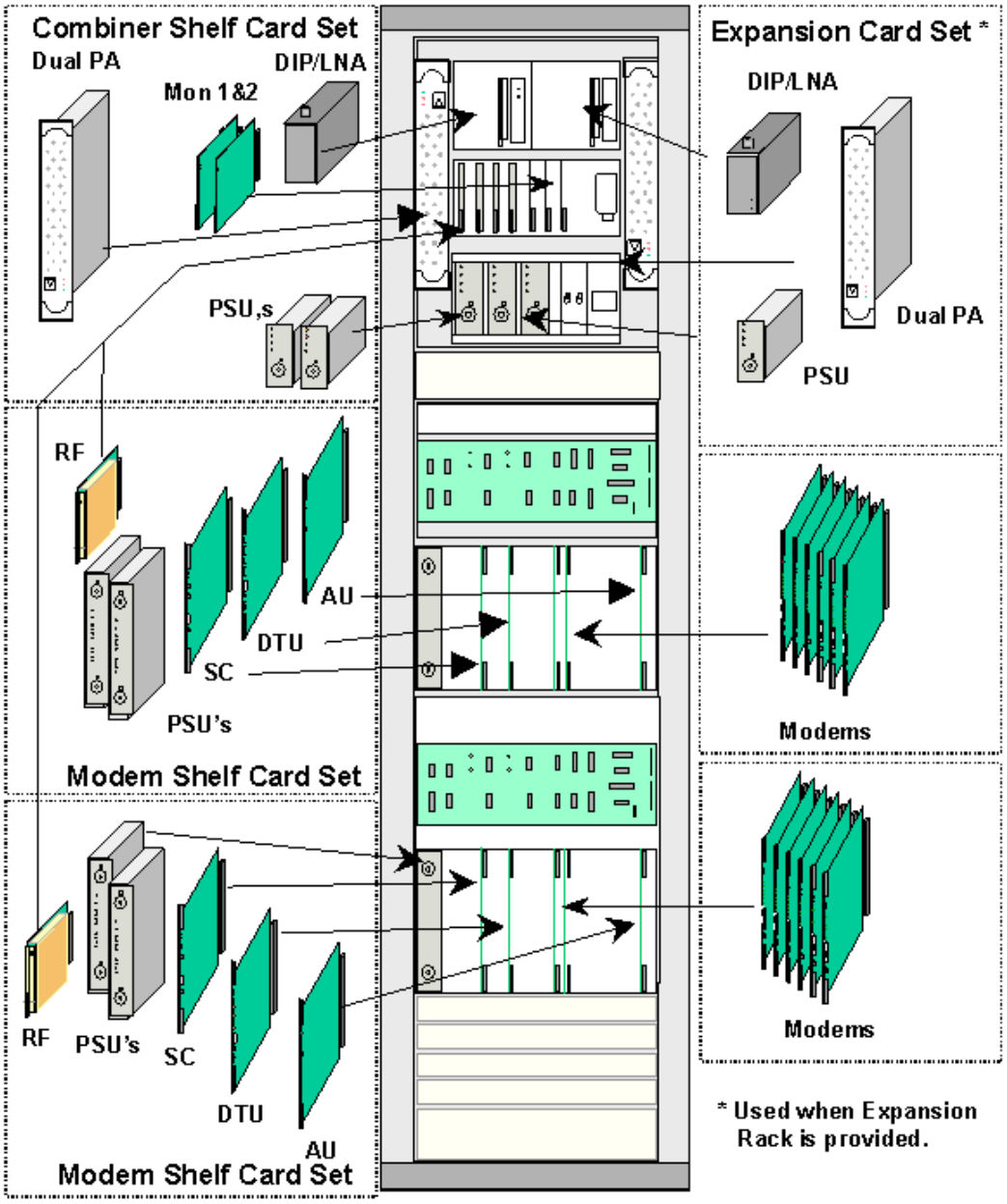


Expansion Rack Fuse and Alarm Panel

Ensure that the end of suite fuses are adequately rated and insert these into the respective fuse holder positions.

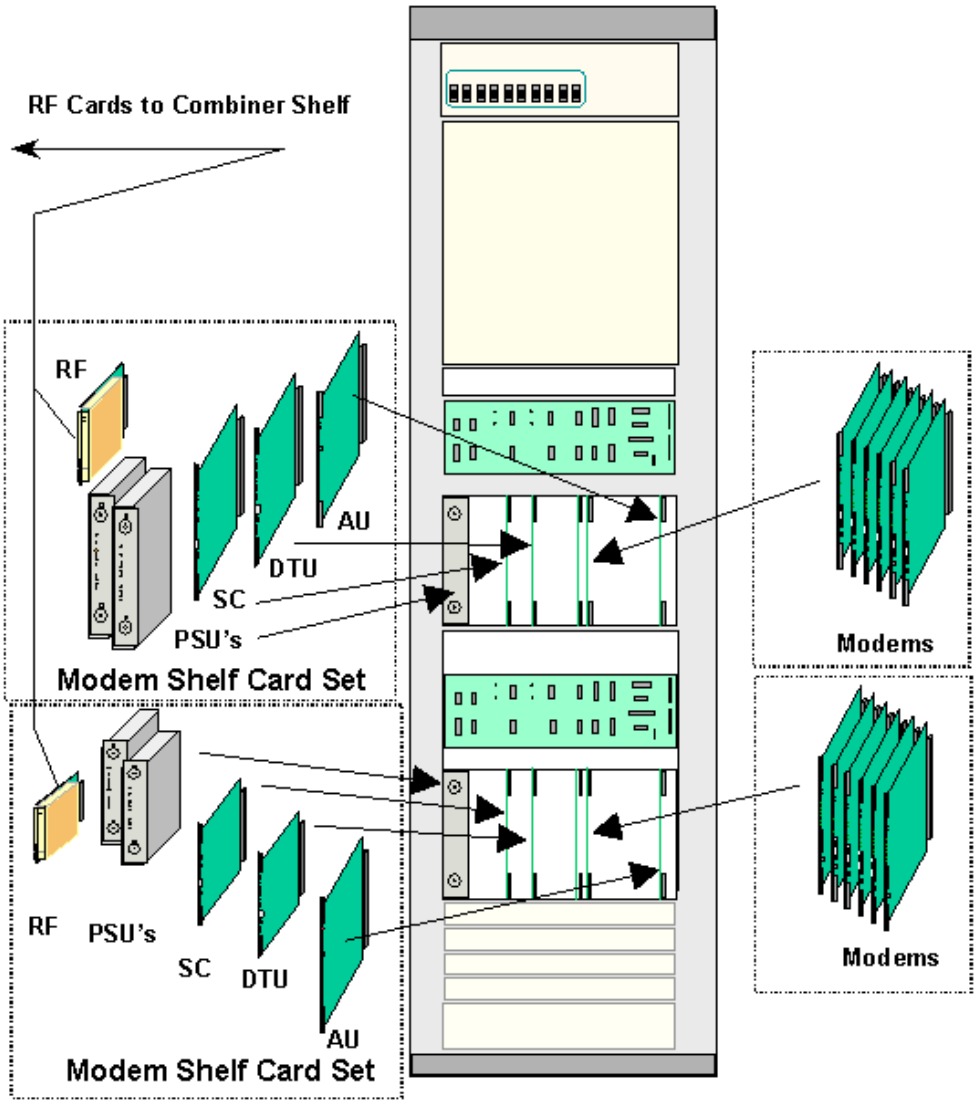
Card Insertion

Insert the cards into the shelves, recording the serial numbers and revision status in the test form.



Card Insertion DA Rack

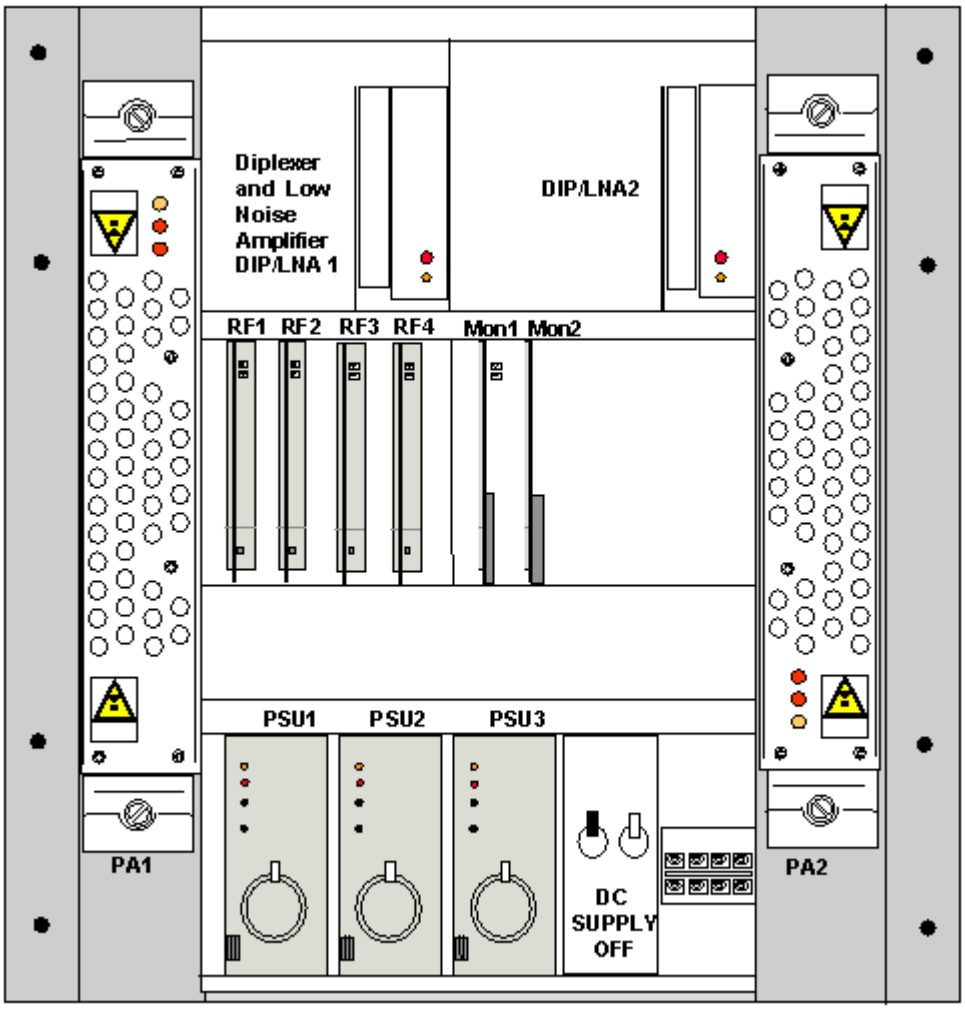
Card Insertion Expansion Rack



Card Provision for New Installation

With the initial installation it is advisable to install the cards in both the combiner shelf and the modem shelves with the power switched off.

Fit Cards in RF Combiner Shelf



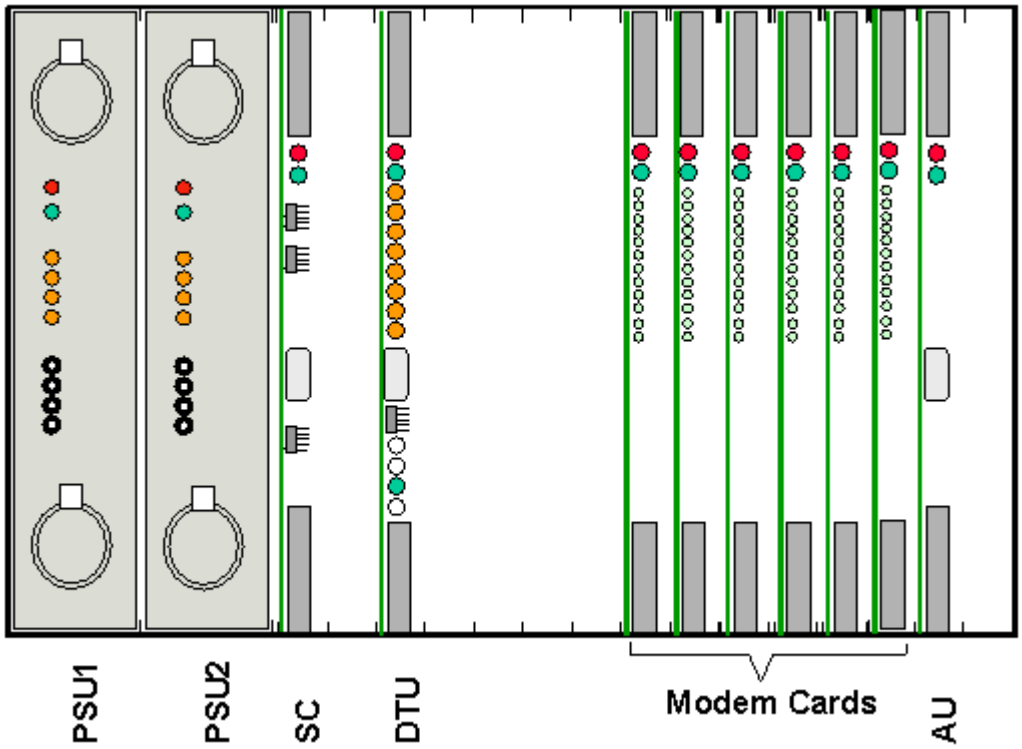
Insert the following modules and secure:-

- 1 RF Power Amplifier Module (2 PA's) in the left hand position in the combiner shelf
- 1 x Low Noise Amplifier + Diplexer (DIP/LNA 1) (Terminate output with 50ohm termination.)
- 2 x PSU's
- 2 x Combiner Monitor Card (Monitor 1 303-043-900 & Monitor 2 303-043-901)
- For each modem shelf provided install 1 x RF Card (RF)

If an Expansion Rack has been installed also insert the following modules in the RF combiner shelf located in the DA CT Rack and secure:-

- 1 RF Power Amplifier Module (2 PAs per module) in the right hand position in the combiner shelf - note the orientation of this module.
- 1 DIP/LNA (Terminate output with 50ohm termination.)
- 1 x PSU
- For each modem shelf provided install 1 x RF Card (RF)

Fit Cards in Modem Shelf



Insert the following cards into each Modem Shelf: -

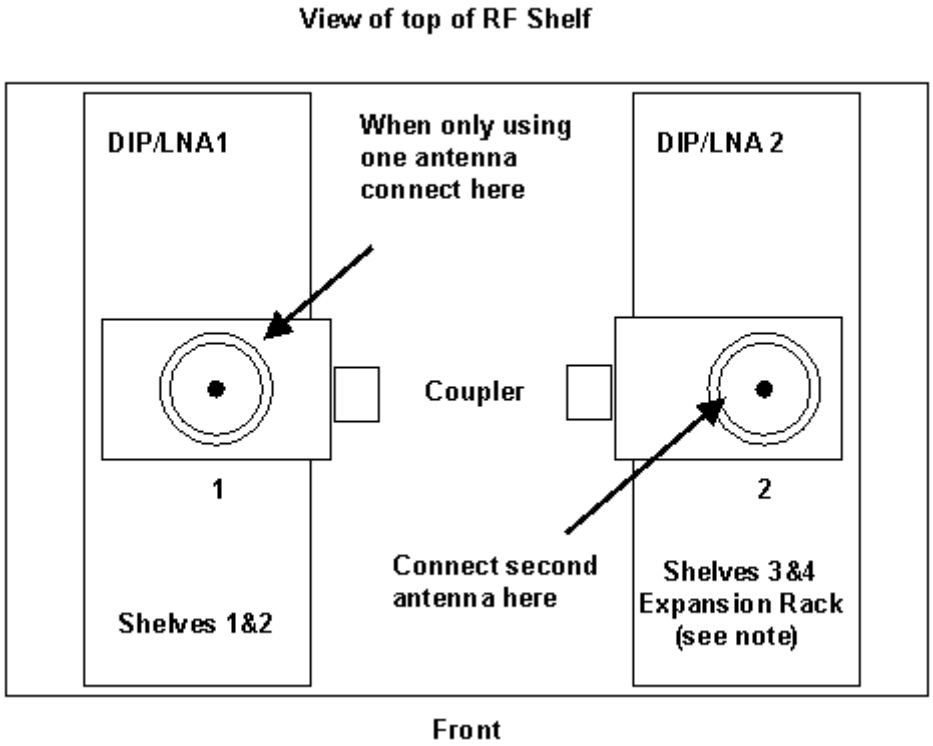
- 2 x PSUs Slots 1 and 2.
- 1 x Analogue Card (AU) Slot 16.
- 1 x Demand Assignment Tributary Card (DTU). Slot 5.
- 1 x Shelf Controller (SC) Slot 3.
- Modem Cards Slots 10 to 15.

Fit RF Coupler for using a DACU

Fit RF Coupler for connection of systems to the DA Control Unit for commissioning.
A 30dB coupler should be fitted to the male N-Type connector at the top of the DIP/LNA1 and the DIP/LNA2 (if fitted). Port J1 fits onto the DIP/LNA module and the antenna feed fits on to port J2. The coupler should be orientated as shown in so that the SMA port faces to the right side of the rack (when viewed from the front) to allow easy access for test leads. Note some 3.4-3.6GHz systems may not have couplers fitted.

Connect Antenna

If the Rack is fitted with couplers connect antenna at this stage. Do not connect antenna at this stage on systems without couplers fitted.
Note: See Antenna and Feeder Installation and Commissioning Procedure, 605-0000-503 for details of feeder grounding.



Some Installations may use directional antennas and use two DIP/LNAs for a two shelf system. in this situation Shelf 1 connects to DIP/LNA 1 and Shelf 2 to DIP/LNA 2. See Hybrid Rack Modification for Directional Antenna

Two Antenna Installations

In new installations the protective boots of the antenna feeder tails free ends should be kept in position until the tail is actually connected. Form one of the tails carefully (avoid tight bends, minimum bend radius is 125mm), to connect with the N-Type sockets on the Coupler on top of the DIP/LNA module in the Combiner Shelf. If PA2 and the DIP/LNA2 units are fitted the second antenna should be connected to the DIP/LNA2.

Single Antenna Installations

If modem shelves 3 and 4 are not installed it is possible to install only 1 antenna and connect the feeder to the output port of DIP/LNA1 Unit.
If the Combiner Shelf is not equipped with DIP/LNA2, it is recommended that the second antenna should be terminated with a 50ohm termination. The termination can be made either at the base of the dipole if only one feeder is fitted, or at the base of the second feeder if the second feeder has been provided in readiness for future shelf expansion.

Card Provision into existing installation

a) Shelf 3 (Top shelf of expansion Rack)
When installing cards into an existing installation the power is already connected to the DA CT Rack and the cards should be inserted in the order listed below.
Insert the following cards into the Combiner Shelf (located in the DA CT Rack):-

- 1 RF Power Amplifier module (2 PAs per module) in the right hand position in the combiner shelf located in the combiner rack.- Note orientation of the PA module.
- 1 DIP/LNA2 (Terminate output with 50ohm termination.)
- 1 x PSU's
- 1 x RF Card (RF) (Third Slot)

Insert the following cards into the Modem Shelf:-

- 2 x PSUs. Slots 1 and 2.
- 1 x Shelf Controller Card
- 1 x Analogue Card (AU). Slot 16.
- 1 x Demand Assignment Tributary Card (DTU). Slot 5.
- Modem Cards Slots 10 to15.

b) Shelf 2 (CT Rack) or Shelf 4 (Expansion Rack)

When installing cards into an existing installation the power is already connected and the cards should be inserted in the order listed below.

Insert the following cards into the Combining Shelf:-

- 1 x RF Card (RF)(in slot 2 for modem shelf 2 or slot 4 for modem shelf 4)

Insert the following cards into the Modem Shelf:-

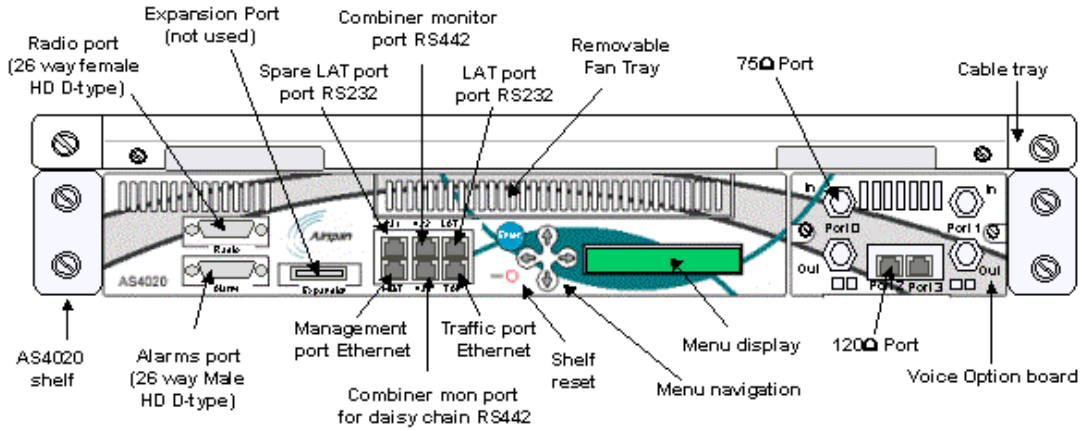
- 2 x PSUs Slots 1 and 2.
- 1 x Shelf Controller Card
- 1 x Analogue Card (AU) Slot 16.
- 1 x Demand Assignment Tributary Card (DTU).Slot 5.
- Modem cards Slots 10 to15.

AS4020 CT Shelf Installation and Cabling

Shelf Connections

AS4020 comprises of a single 65mm (approximately 1.5u) high shelf, which can be fitted in an ETSI rack, 19" rack or 21" rack. AS4020 is flexible in its deployment, although is must remain within a couple of meters of the radio sub-system. Initially the AS4020 CT shelf is fitted within the AS4000 CT rack with the Radio sub-system, and optionally alongside up to two AS4000 CT shelves. Alternatively a half-height AS4000 CT rack can fit four AS4020 shelves and a radio sub-system.

All connections to the AS4020 shelf are through the front of the unit, except DC power, which is fed from the RF combiner shelf to the rear of the unit. the illustration below shows a the interfaces available on the front of the AS4020 CT shelf. All connections are made to the front panel with the exception of the power connection at the left hand side of the shelf.



All cables should enter via the cable tray above the shelf. Cable entry to the main panel is via the left hand opening and via the right hand opening to the option panel as this avoids the possibility of cables obscuring the menu.

The AS4020 CT shelf is cooled using fans that are hot-pluggable in the event of failure. An AS4020 CT shelf can only be installed in a weather-protected location.
The AS4020 CT shelf provides a terminal connection for initial configuration of the Ethernet ports, a method for commissioning the system, and menus for basic systems diagnostics. In addition to the terminal interface, AS4020 contains an LCD screen to provide alarm details and limited status information.
Full configuration of AS4020 is via the management system, which can be a local Ethernet connection, or via the network Ethernet interface.
The AS4020 CT shelf provides the switching functionality of the system, as well as managing radio access on both the uplink and downlink. The shelf is also responsible for the radio interface architecture, namely BDM, dynamic modulation, and RTS/CTS signalling.

When adding shelves to an existing AS4000 system use the following diagrams to determine the points to connect the radio port and combiner monitor connections.

- Adding one AS4020 shelf
- Adding two AS4020 shelves
- Adding three AS4020 shelves
- Adding four AS4020 shelves
- Adding Two AS4020 Shelves to an existing Two AS4000 shelf rack

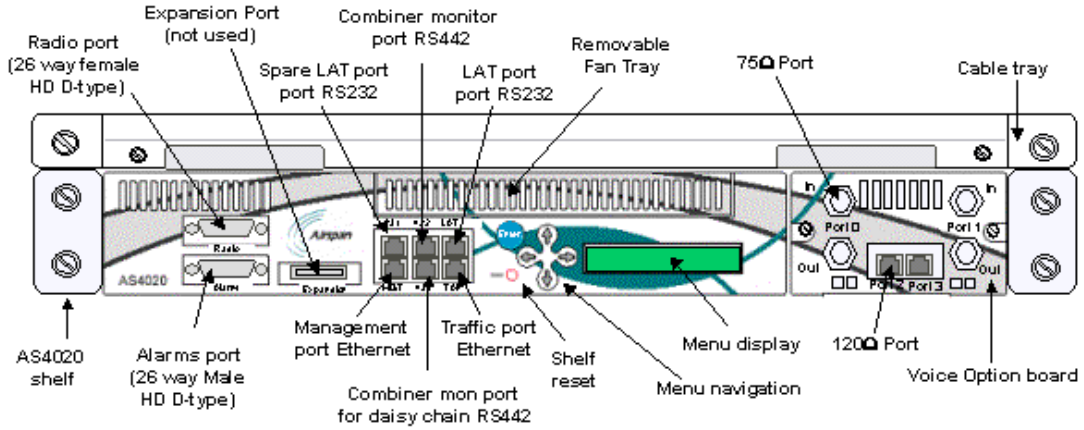
Installing the Voice Option Board

Units are shipped with the option board installed if specified, but options boards may be added to existing shelves.

1. Remove the blanking plate by removing the two screws that secure it to the chassis
2. Carefully slide the option board into the shelf ensuring that the connector mates with the backplane.
3. Secure with screws to the chassis.

AS4020 Shelf Installation upgrade into AS4000 Rack

This topic covers the installation of AS4020 shelves as an upgrade into an existing AS4000 rack.
The AS4020 fits immediately below the combiner shelf in the central terminal rack. If more than one AS4020 is to be installed existing modem shelves will need to be removed. The AS4020 installation wiring diagrams in this manual should be used in conjunction with this topic.



Parts required.

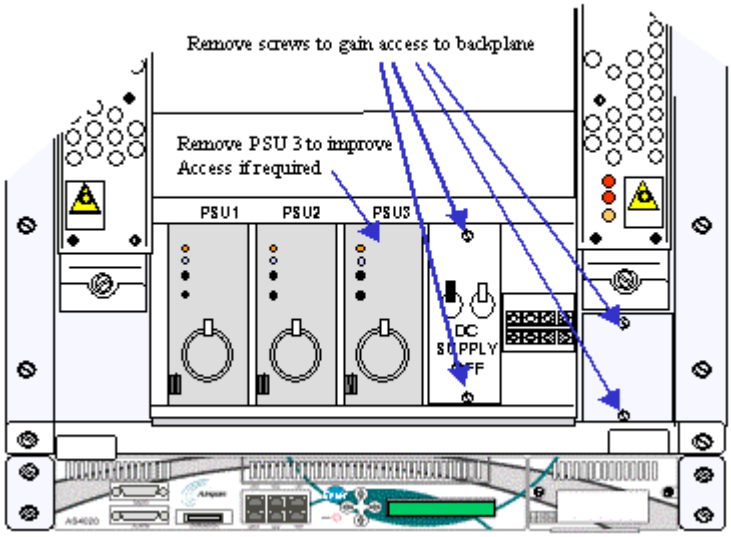
	1 shelf	2 shelves (1 x AS4000 exists)	2 shelves (2 x AS4000 exists)	3 shelves	4 shelves
AS4020 shelf.	1	2	2	3	4
Cable tray and cover + 2 x cage nuts, screws and washers.	1	2	2	3	4
Baseband connecting lead (part no 454-0010-135).	1	2	2	3	4
Power connecting lead (part no 454-0010-136).	1	2	2	3	4
Alarm connecting lead (454-0010-134).	1	2	2	3	4
Alarm Breakout connector (454-0010-137).	1	1	2	2	2
Ethernet connecting lead (as required).					

Installing an AS4020 shelf into an existing CT rack.

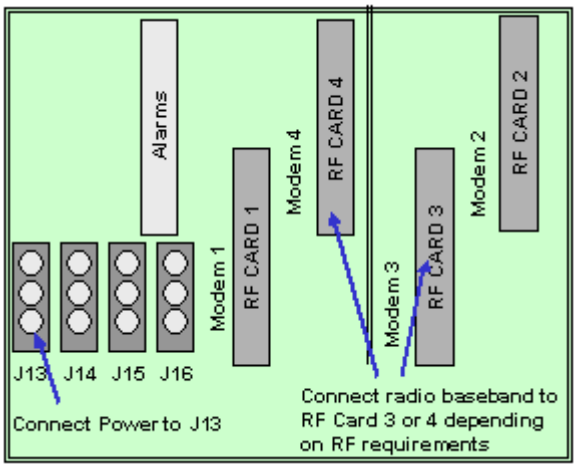
1. If possible power down the rack. Note: It is possible to connect the AS4020 shelf without removing the rack from service. However if the AS4020 is connecting via an existing PA the service using the other RF channel in the PA must be taken out of service to set TX sensitivity.
2. **Remove the cover from the combiner switch panel and plate below the right hand PA.**
3. Remove the side panels from the rack.
4. Remove existing 100mm cover from below the combiner shelf.
5. Run the power connecting lead (part no 454-0010-136) from the combiner shelf backplane (socket J13) to the left hand side of the shelf position for the AS4020. In a 4 Shelf loom this socket may have a plug inserted but it should not be connected to any equipment and can be removed.
   In order to connect the lead it is best to remove the switch from the combiner shelf. If the rack is still in service the power plug can be removed and the new one

inserted in J13 by removing the PSU from the third position and carefully inserting the hand into the gap. If there is difficulty removing the plig it is possible to loosen the switch assembly with the power still on but extreme care must be taken to avoid short circuiting the DC supply wiring.

6. If the rack is powered down remove the two screws retaining the supply switch panel on the combiner self to gain access to the combiner shelf back plane. Remove the plate on the right hand side of the combiner. To improve access the third PSU may also be removed.



7. Thread up connecting lead (part no 454-0010-135) from the shelf position to the backplane of the combiner shelf . Connect to the IDC connector corresponding to the RF card to be used.



8. Remove the Alarm Connector from JP4(Alarm) on the AS4000 shelf 1 backplane and insert the connector 454-0010-137 between JP4 and the connector
9. Connect the combiner monitor connecting lead (454-0010-134) into the port labeled '442' (there are two ports labelled '442' the top one should be used. (the other port labelled '442 ' is used when daisy chaining the monitor to other AS4020 shelves).
10. The AS4020 is installed at the bottom of the 100mm gap created by the removal of the blanking panel. Before inserting the shelf connect the power lead to the 15 way D-type socket at the rear of the shelf. and ease into position. It is not possible to connect the power to the shelf once the shelf is in position.
11. Secure the shelf with four cross head screws and locking washers.

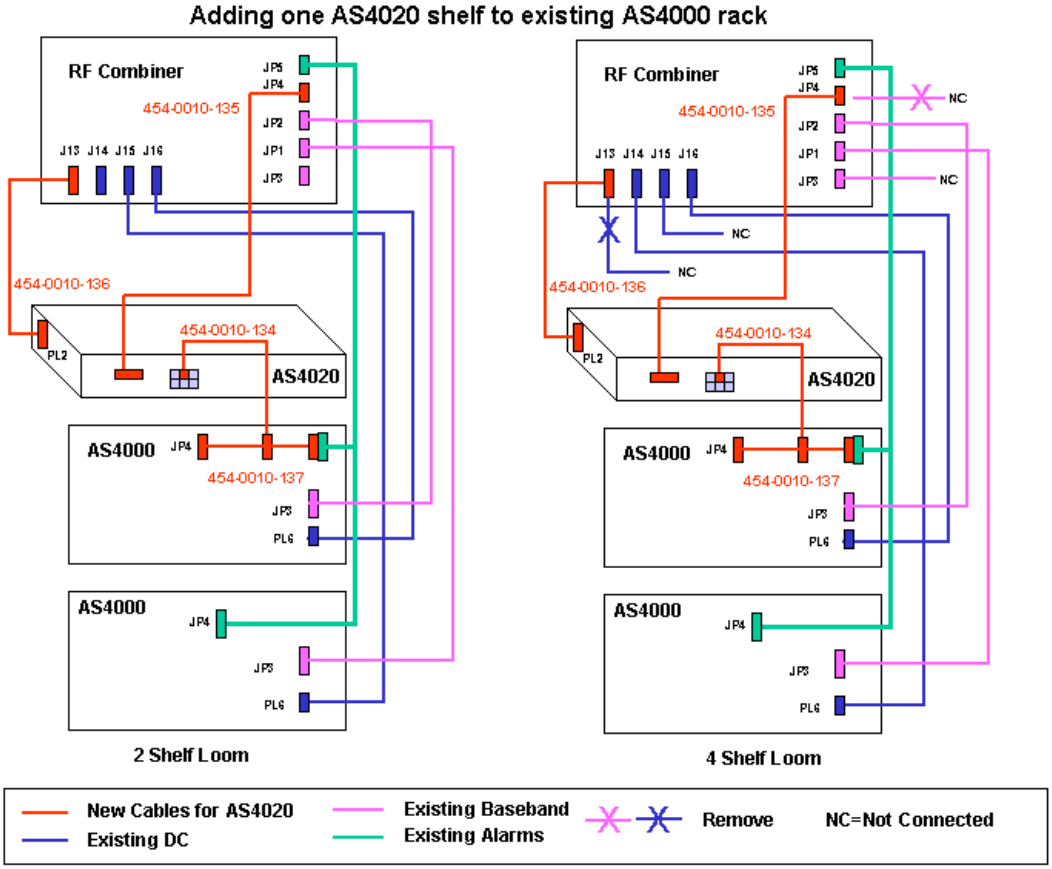
12. Fit the cable tray immediately above the AS4020 shelf. Fix the shelf with two cross head screws and locking washers.
13. Connect the IDC end of the combiner monitor connecting lead (454-0010-134) to the IDC connector in the cable assembly 454-0010-137 added in step 8.
14. Connect part no 454-0010-135 to the 26way high density D-type labeled 'Radio' on the front panel of the AS4020
15. For additional shelves connect cables as shown in the AS4020 installation diagrams and follow the steps above where applicable.
16. Use a straight connected Ethernet cables to connect the patch panel /router/ IP network/ etc to the Management Port and Traffic Ports.
17. Replace the covers removed from the combiner shelf.
18. Attach the front cover to the shelf tray(s)
19. Replace the side panels on the rack and secure with four retaining screws.

The unit is now ready for commissioning.
For details of interface connections see AS4020 Interface Connections

Note if installing more than one shelf the same instructions apply as above but the connections will differ see the accompanying diagrams.

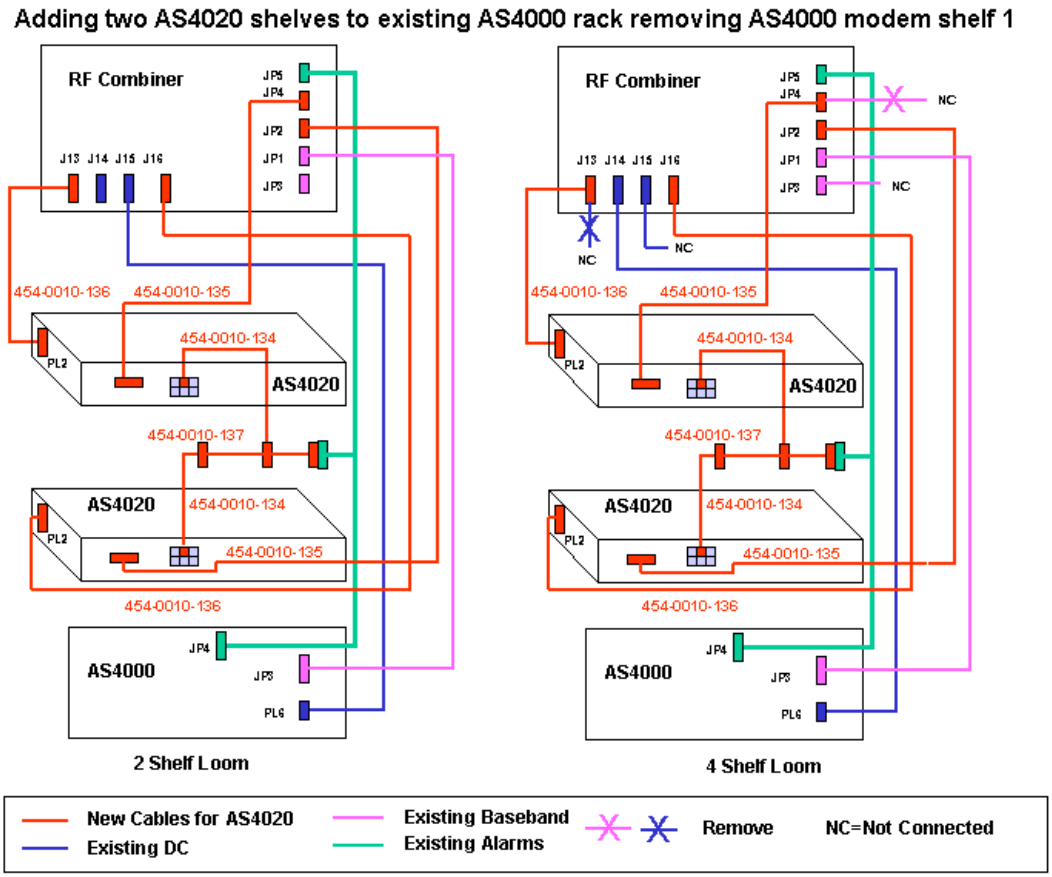
Adding one AS4020 shelf to existing rack

The following installation diagrams show the additions to wiring that need to be made when adding 1 AS4020 shelf into existing rack.



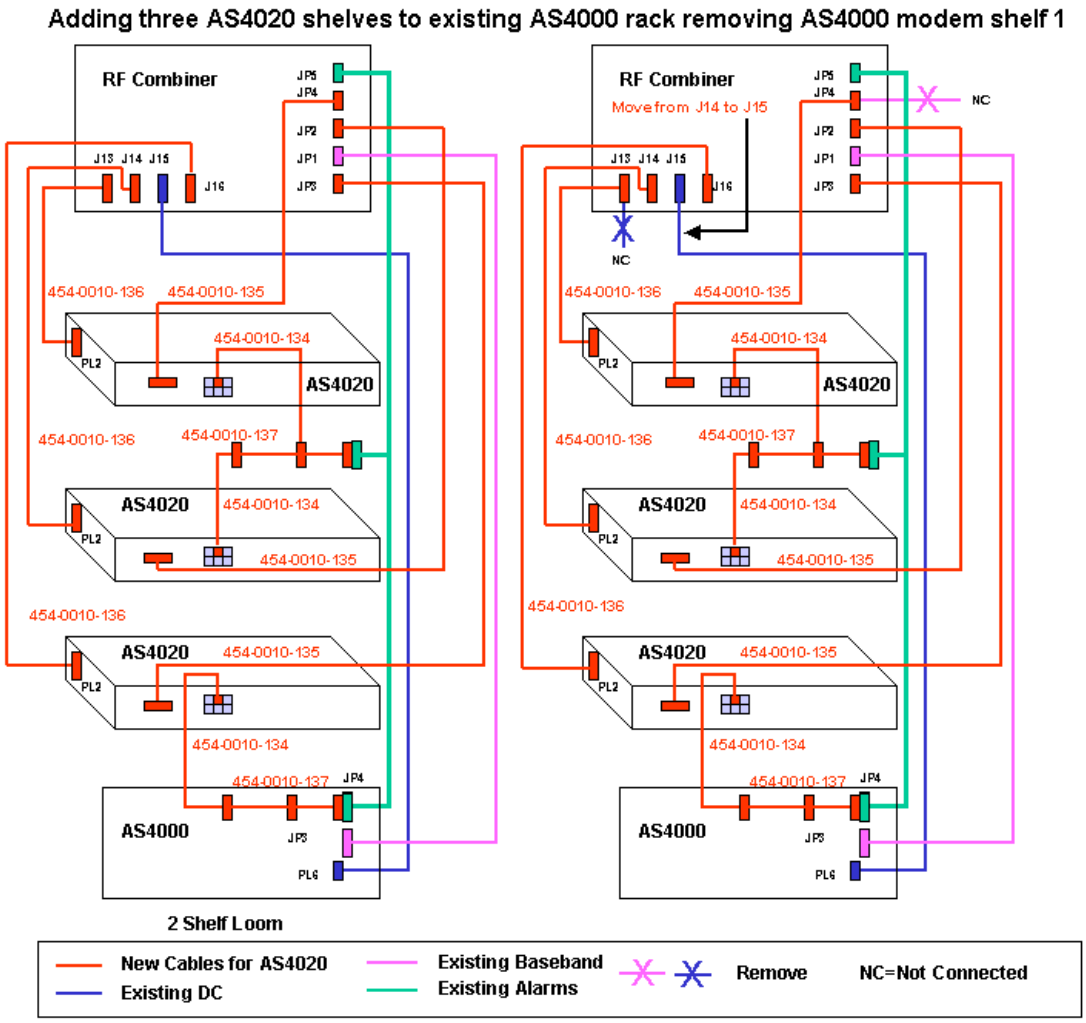
Adding two AS4020 shelves to existing rack

The following installation diagrams show the additions to wiring that need to be made when adding 2 AS4020 shelves into existing rack.



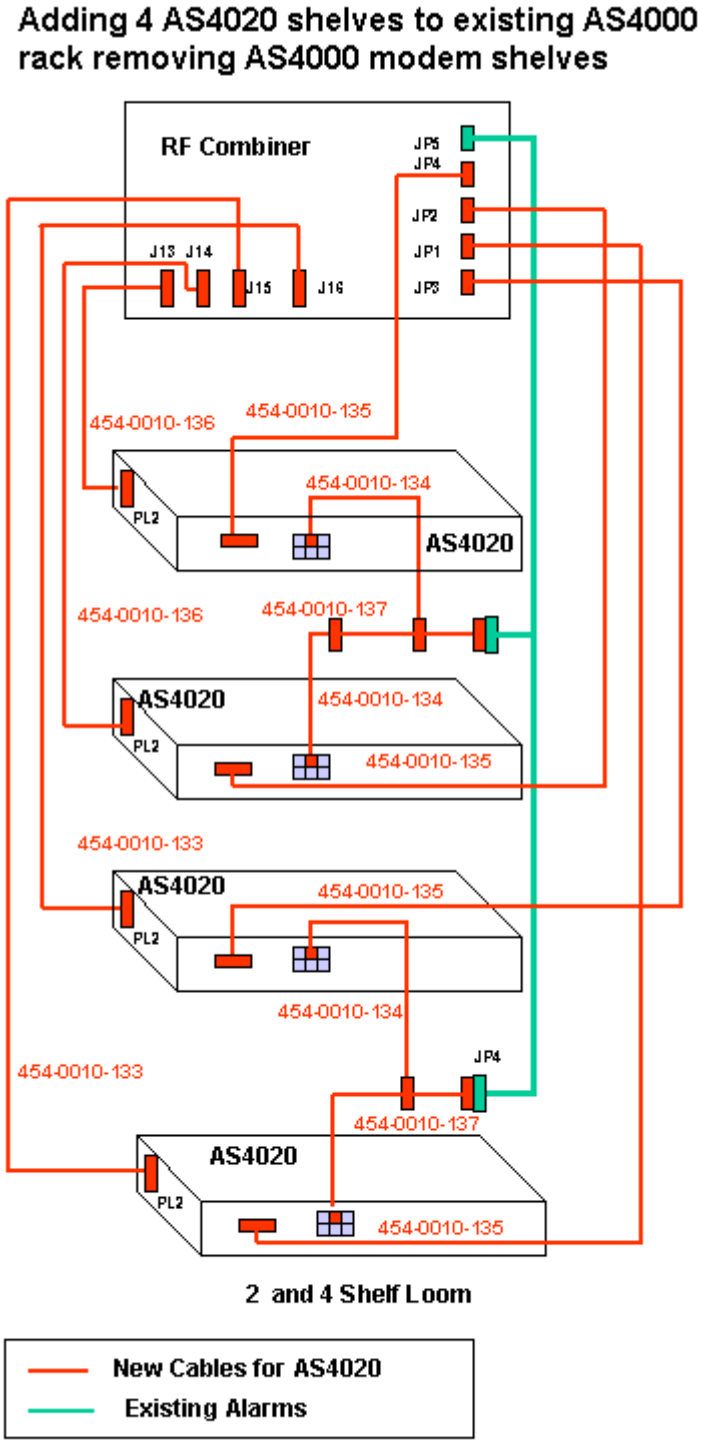
Adding three AS4020 shelves to existing rack

The following installation diagrams show the additions to wiring that need to be made when adding 3 AS4020 shelves into existing rack.



Adding four AS4020 shelves to existing rack

The following installation diagrams show the additions to wiring that need to be made when adding 4 AS4020 shelves into existing rack.



Adding two AS4020 with two AS4000

If it is required to put two AS4020 shelves into an existing two shelf AS4000 installation the first AS4020 shelf should be placed between the combiner shelf and the top AS4000 shelf. To provide the second AS4020 shelf it is necessary to remove the bottom vent panel and move the lower AS4000 shelf down to accommodate the second AS4020 shelf below the top AS4000 shelf.

The shelves should be cabled as shown below. The actual connections to the RF cards at the combiner shelf may differ from the diagram dependant on the antenna configuration.

AS4020 Interface Connections

Alarm Wiring 26way High Density Male D-type.

Pin	Description
1	DC 3.3V
2	Reset
3	Reset
5 & 22	Service
7 & 24	Attention
9 & 26	Fail
17	Reset
18	Earth
19	Reset

LAT Socket

Pin	Description
6	Earth
7	Tx Out
8	Rx In

RS442

Pin	Description
1	RX +
2	RX -
3	TX +
6	TX -

Traffic

Pin	Description
1	TX+
2	TX -
3	RX+
6	RX -

Management Port

Pin	Description
1	TX+
2	TX -
3	RX+
6	RX -

Option Unit

Pin	Description
1	RD+ (input to option card from AC)
2	RD-
4	TD+ (output from option card to AC)
5	TD -

System Testing

This section sets up the parameters for the system and the connection to Netspan
Refer to the Netspan, document no. 605-0000-509 for the detailed configuration and set up procedures of Netspan and the AS4020 System.

General

The following procedures need to be carried out in order to verify the functionality and operation of all cards fitted into the Central Terminal prior to placing the AS4000/4020 system into service.
It is preferable to connect the As4000/AS4020 to a ISP when commissioning. This allows the CT to be connected and test calls made over the system during the commissioning process.
If during testing, a fault occurs preventing the continuation of the test, the faulty module or card should be replaced and the test repeated for the new card module and any other tests that are affected by the performance of that card.
All results must be entered on the Commissioning Test Result Sheets (Copies are included in this manual and should be printed as required). Test forms should be photocopied as needed, ensure that sufficient copies of all sheets are available prior to the commencement of commissioning tests.
There are two activities required; a) the network management centre should create the sites and equipment in the database (frequency and PN),using Netspan b) the field engineer should commission the equipment to the recommended parameters (output power and system receiver sensitivity).

Pre-Commissioning at the Network Management Centre

For a completely new installation, the NMC administrator should create the sites and equipment racks in each site (with the frequency, PN etc entered, in preparation of the actual equipment installation and commissioning. When expanding the system with additional CT sites, the administrator should add the extra CT equipment using Netspan.
During field commissioning, the field engineer will use a local laptop running copy of STMON to control the test ST.

AS4000 AC Setup and Test

Access Concentrator: Turn-Up and DC measurements

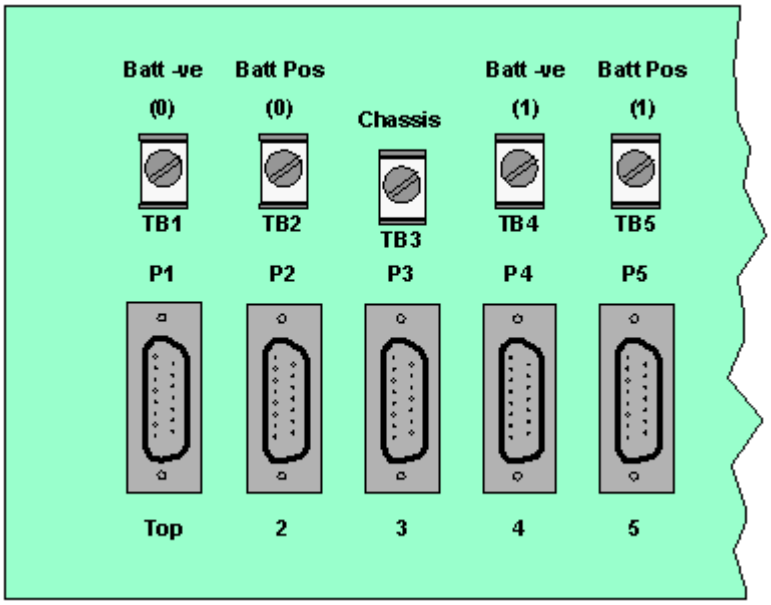
Pre-Checks

Before commencing the turn-up of the rack check that the serial number and Rev levels of all card have been entered into the test form and that the SC boot chip version is recorded.

DO NOT power up or plug any cards fully into their slots at this stage.
Router Port Availability. If the Sitespan Server is located at the NMC and connected via a router confirm the IP address for the router at the AC and the port for connection (typically a RJ45 cabled to the AC from the back of the router.
Apply a loopback on the designated router port (pins 3 to 6 on an RJ45).
Check that the router at the AC can be pinged and the loopback seen from the Sitespan Server PC at the NMC by using a simple communication application as hyper terminal at the COM port intended for Sitespan use.
Isolate all E1/T1 cables from the AC by removing the links at the DDF.
Disconnect all cards from the backplane by pulling forward in the card guides so that the power will not be applied to the cards when the shelf is switched on.

Rack Turn-Up and Measuring Input Voltage (Test 1a)

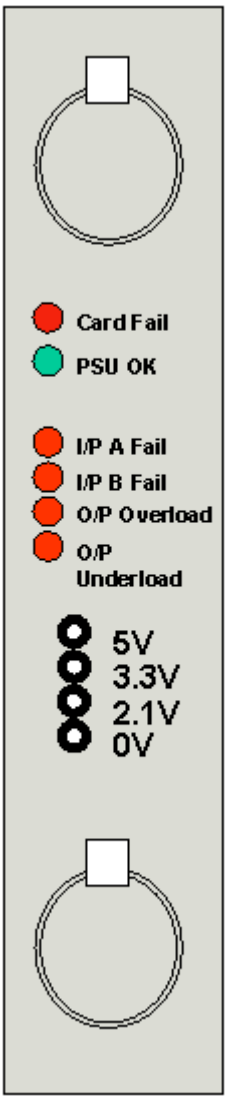
This section describes the procedure for measuring and connecting DC to the rack, checking that the cards have the correct alarm indications on power-up and measuring the PSU output voltages.
Unscrew retaining screws on the face of the Fuse and Alarm Panel. Hinge forward the panel and using the DMM measure and record the Exchange DC voltage supply across the input terminals (TB1(-); TB2+;.for Supply 1 and TB4(-); TB5(+) for supply 2). Check that the polarity is correct. Ensure that the voltage measured complies with the site nominal voltage and is within the limits specified on the test results sheet.



Test Voltage
Record the measured voltage on the test results sheet.

3. Turn-Up AC Shelves: (Tests 1b)

Place one PSU in the shelf . Switch the Rack ON by placing one breaker on. The two breakers duplicate power to each shelf and the shelves will still function if one power supply fails though the LED indicators on the power supplies will not be on. The PSU should show a green LED and one supply fail LED. Switch on the second breaker and the Red LED should extinguish.
Switch off and place the second PSU in the shelf and repeat the process described in the paragraph above.



Access Concentrator Shelf PSU

Place a SC Card into the shelf to provide a load. Switch both breakers on and measure and record the DC voltage at the o/p of each PSU.
Ensure that the voltages measured are within the limit shown below. Record the results in test form.

Voltage	Upper Limit	Lower Limit
5V DC	5.25V	4.75V
3.3V DC	3.3V	3.0V

2.1V DC	2.1V	2V

Access Concentrator Shelf PSU Voltages.

Switch Rack off and plug in all the remaining cards in their respective positions on the shelf
Repeat Test 1b for the other AC shelves if fitted.

Setting Up the Access Concentrator

The Access Concentrator is setup using Sitespan in stand alone mode and Netspan does not need to be connected for the AC to be set up

Setting the TEI and Baud Rate for Netspan Connection

1. Connect PC using AS7030 SiteStart software to the LAT port on the front of the shelf controller of the Shelf being commissioned..
2. Set the TEI to the value designated during system planning. The TEI number must be unique to the Network managed by Netspan.
3. Set the Baud Rate for connection. The same rate must be set when setting up AC Shelf Properties later in this commissioning process.

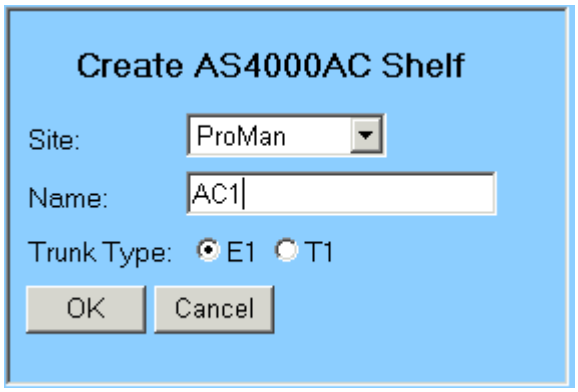
 To commission the AC Shelf the Shelf must be connected via an RS232 interface to a Sitespan server. However the settings made during the setup process must be transferred to the NMS Netspan before it server is connected or values set within the shelf during this process will be overwritten by Netspan when it is connected. Alternatively if Netspan is available the setting up can be done using Netspan

Creating AC Shelf/Rack on Sitespan

1. Connect the Field Engineer Laptop to the AC shelf Sitespan port.
2. Run Sitespan Server software on the laptop.
3. Open Sitespan Client application.
4. Create the Server to make connection to (usually the name of the PC).
5. Connect to the Server.
6. Create Site.
7. Highlight the site, click right mouse button and select Create Child Element
8. Select *Airspan AC Rack*
9. Highlight the rack in Object List, click right mouse button and select create *Airspan DA AC shelf*
10. Select the position for the AC shelf.
11. From the Object List, Shelf select the Access Concentrator, click right mouse button and select *Element View*
12. Select AS4000 (DA) AC Shelf.
13. Continue with 'Setting up AC Rack and Shelf Configuration' below

Creating AC Rack and Shelf configuration on Netspan

1. Click the + sign on the 'Create Node' menu to show the sub menu items
2. Select AS4000 AC and click the left mouse button.



3. Select the site.
4. Enter name. The name must be unique within the network or an error message is displayed and the shelf is not created.
5. Click OK to add shelf to the database.
6. The shelf is displayed on the tree view
7. Move mouse pointer to the shelf icon and right click. Select configure from the menu.
8. Continue with 'Setting up AC Rack and Shelf Configuration' below

Setting up AC Rack and Shelf configuration

1. Click right mouse button over AUX card position 4 select and create a CTU card.
2. Create additional CTU cards in slots 5 and 6 if required.
3. Position mouse over CTU card position, click right mouse button and select Airspan CTU Properties
4. Set up the CTU properties as detailed in the Netspan Section
5. Repeat for other CTU cards.
6. Click OK

Assign Access Concentrator Card Slots

1. Click right mouse button over AUX card positions 7-17 to create other AUX cards as required (XTUs RTU and PTU and Compression Unit.
2. Select the card type to be created.
3. Repeat steps 1 to 3 for all cards to be installed in the shelf.

Configure AC Cards

1. For details on configuring the cards see the relevant topic in the Netspan section of this manual

Configure AC Shelf properties

1. Make sure the SC software is at the correct release, and all cards can be seen on the AC Shelf equipment view. If required download the appropriate software by following the software download procedure (see Software Download)
2. Re-boot the Shelf by clicking the *Reset Shelf* button on the shelf controller view.

Check Boot Sequence

1. SC card boots-up and displays the following LED sequence:

   a. Red & green LEDs both ON

   b. All LEDs OFF

   c. Green LED FLASHING

   d. Green LED ON

   e. The red LED temporarily comes ON

2. All the cards on the shelf now boot-up.

3. The TU cards display the following LED sequence:
   Note: The boot-up procedure for these cards takes approximately 7 minutes.

   a. Red LED, amber LEDs & green surface mount LEDs all ON. Green LED FLASHING

   b. Red LED ON, green LED FLASHING, amber LEDs OFF & green surface mount LEDs showing download progress. Building up in a column from the bottom as the code is download.

   c. Green LED ON, green surface mount LEDs indicate card configuration as shown below

LED	**CTU**	**XTU**
1 Top	OFF	ON
2	ON	OFF
3	OFF	OFF
4 Bottom	OFF	OFF

4. The rest of the cards display the following LED sequence:
   Note: The boot-up procedure for these cards takes a few minutes and will depend on the specific card type.
   a. Red LED ON & green LED FLASHING
   b. Green LED ON

5. If the cards do not boot-up correctly, i.e. any of the cards display a flashing red or continuous red LED only, follow the procedure in case of Card boot-up failure

6. The boot sequence is complete when the Sitespan reports the shelf as connected ready. This can take some additional minutes after the LED indications on the shelf have stabilised. Note The duration of the connection process to Sitespan will increase depending on the size of the subscriber database and the number of cards fitted.

Alarm and Status Indications (Test 3)

1. Verify that the alarms and status indications (LEDs) on the system comply with those detailed in the following tables.

Note: The following tables are set in order of appearance on the front of the card reading from top to bottom.

XTU			
Position	Colour	Description	Status

TOP 1	Red	Card failure LED, which shall be alight if the card self test fails, or if commanded by the SC.	OFF
2	Green	Card busy LED, to indicate live traffic is present and should not be removed.	ON
3	Red/yellow	E1/T1 port 1 Alarm	*
4	Red/yellow	E1/T1 port 2 Alarm	*
5	Red/yellow	E1/T1 port 3 Alarm	*
6	Red/yellow	E1/T1 port 4 Alarm	*
7	Red/yellow	E1/T1 port 5 Alarm	*
8	Red/yellow	E1/T1 port 6 Alarm	*
9	Red/yellow	E1/T1 port 7 Alarm	*
10	Red/yellow	E1/T1 port 8 Alarm	*

LED Yellow if 2Mbit/s is being received with some other alarm condition. (e.g. remote alarm or sync fail) being sent, Red if 2Mbit/s not received..

PTU			
Position	**Colour**	**Description**	**Status**
TOP 1	Red	Card failure LED, which shall be alight if the card self test fails, or if commanded by the SC.	OFF
2	Green	OK card is active.	ON
3 to 8		Not used	OFF
9	Orange	100 Mbit/s	See Note
10	Orange	Active (Ethernet Present)	OFF
11	Orange	Full (12 RWs allocated)	OFF
12	Green	Packets being Received	OFF
13	Green	Packets Transmitted	OFF
14	RED	Ethernet Collisions	ON

Note the LED is on when connected at 100Mbit/s and off at 10Mbit/s

CU			
Position	**Colour**	**Description**	**Status**
TOP 1	Red	Card failure LED, which shall be alight if the card self test fails, or if commanded by the SC.	OFF

2	Green	Card busy LED, to indicate live traffic is present and should not be removed.	OFF

SC			
Position	**Colour**	**Description**	**Status**
TOP 1	Red	Card failure LED, which shall be alight if the card self test fails	OFF
		OK Card is Active.	

PSU			
Position	**Colour**	**Description**	**Status**
TOP 1	Red	FUSE FAIL: Illuminated if either input fuse has blown.	OFF
2	Green	OK Card is Active.	ON
3	Red	I/P A FAIL input voltage A (BATTNEG0) not present	OFF
4	Red	I/P B FAIL input voltage B (BATTNEG1) not present	OFF
5	Red	O/P OVERLOAD.	OFF
6	Red	O/P UNDERLOAD	OFF

Access Concentrator Shelf Card LED Indications.

Self Test (Test 4)

1. Select CTU card on shelf view double click the card, or click right mouse button and select Airspan (card type) View
2. Execute the self test function (using Netspan) on each CTU card and ensure that it passes. Replace any faulty cards.

Test CTU cabling to the DDF E1 Cards

1. Using Netspan create a CT rack with a dummy modem shelf.
2. From the Edit AC Shelf Properties screen assign E1-1 to the newly created CT shelf.
3. A red alarm should appear on the CTU card for the E1 activated.
4. Loopback TX to RX for the E1 (T1) at the DDF. Check that the alarm clears (the amber remote alarm is lit for several seconds before clearing).
5. Reassign the CT shelf to E1-2, E1-3 and E1-4 in turn and repeat steps 3 and 4 (E1-5 to E1-8 for 120ohm connection).
6. Repeat steps 1 to 5 for CTUs in slots 5 and 6 if fitted.

Test CTU cabling to the Distribution Frame (DDF) GR303 Cards.

1. Using Sitespan create a CT rack with a dummy modem shelf.
2. From the Edit AC Shelf Properties screen assign T1-1 to the newly created CT shelf.
3. A red alarm should appear on the CTU card for the T1 activated.
4. Loopback TX to RX for the T1at the DDF. Check that the alarm clears (the amber remote alarm is lit for several seconds before clearing).
5. Reassign the CT shelf to T1-2*, T1-3, T1-4, T1-5, T1-6, T1-7 and T1-8 in turn and repeat steps 3 and 4.
6. Repeat steps 1 to 5 for CTUs in slots 8 and 9 if fitt

Test XTU cabling to the DDF

1. Test one XTU at a time.
2. Activate all E1s/T1s for the chosen XTU card.
3. Check that 8 red LEDs appear on the front of the card (Netspan should also indicate the E1/T1 alarm.)
4. Loopback each E1 in turn and check that the corresponding alarm for that channel is cleared. (Note: the amber remote alarm is illuminated for several seconds before clearing.)
5. Remove all jumper links and disable all E1s/T1s.
6. Repeat steps 2-5 for each XTU fitted.

Connecting the AC to the Network

(this section applies only if the AC has been configured using a local Laptop PC)

1. Ensure the NMC administrator has entered all the AC shelf configuration in the Netspan/Sitespan Server.
2. Within the AC Shelf Properties window, enter the

- Port: (should be the NMC PC COM port the AC shelf is connected to)
- TEI: (should be set to the pre-determined setting allocated at the planning stage)
- Leave other data fields unchanged.

3. Select OK to complete the configuration process.

4. DISCONNECT THE LAPTOP PC CONNECTION TO THE AC SHELF AND RECONNECT THE NMC CONNECTION TO THE SHELF.

5. Call in the NMC and ensure the AC shelf is seen at the NMC system. From the Shelf Object List view, the AC shelf should be in CONNECTED and DOWNLOADING state.

Connect E1s/T1s to the Switch or Cross-Connect at the DDF

1. If V5.1 interface is being used then the NMC administrator should enable the V5.1 interface. From the AC shelf equipment view, select the XTU card and use Edit->AS4000 DA V5.1 XTU
2. Connect the required E1s/T1s to the Switch or Cross-Connect using jumper cables at the DDF.
3. All the E1/T1links should be enabled on Netspan at the NMC.
4. From the AC shelf equipment view, double click on the XTU card. This will open the card view window. Check the E1/T1 connection to the switch is working; E1/T1-Loss of Signal and E1/T1- Loss of FA alarms are cleared.

5. On V5.1 cards, from the corresponding E1/T1, select Switch to New and then Re-establish to activate the V5.1 interface with the switch. If the V5.1 interface is not indicated as active in the XTU Card View the switch authority must be contacted .
6. On V5.2 cards from the corresponding E1/T1, select Switch to New. If the V5.2 interface is not indicated as active in the XTU Card View the switch authority must be contacted.
7. On CAS systems check alarms are clear.

This concludes the setting up at the access concentrator. The CT site can now be commissioned.

Access Concentrator Rack Commissioning Test Results

Please photocopy test results sheet for use with each system

CUSTOMER:

SITE LOCATION:

RACK ID:

ENGINEER:

DATE:

1. Commissioning Test Results

Test Equipment Calibration

Item	Description	Model	Serial No	Calibration Date
1	Digital Multimeter			

Serial Number and Rev Level Record

Rack ID			
AC Shelf 1	**Card Type**	**Serial Number**	**Rev Level**
PSU 1	PSU		
PSU 2	PSU		
SC	SC		
AUX 1			
AUX 2			
AUX 3			
AUX 4			
AUX 5			
AUX 6			
AUX 7			
AUX 8			
AUX 9			
AUX 10			
AUX 11			
AUX 12			

AUX 13			
AUX 14			

Rack ID			
AC Shelf 2	**Card Type**	**Serial Number**	**Rev Level**
PSU 1	PSU		
PSU 2	PSU		
SC	SC		
AUX 1			
AUX 2			
AUX 3			
AUX 4			
AUX 5			
AUX 6			
AUX 7			
AUX 8			
AUX 9			
AUX 10			
AUX 11			
AUX 12			
AUX 13			
AUX 14			

Test Results

Rack ID				
TEST #	**TEST**		**LIMIT**	**RESULT**
Site Inspection & Verification				
	T1/E1	Shelf 1		

	Cabling	Shelf 2		
System Commissioning Tests				
Test 1a	Exchange DC Voltage Supply 1		-21.8 to -60.0V DC	
	Exchange DC Voltage Supply 2			
Test 1b	Exchange DC Voltage Supply 1		-21.8 to -60.0V DC	
	Exchange DC Voltage Supply 2			
Test 2	AC Shelf 1 PSU1		5V DC ± 250mV	
			3.3V DC +0mV-300mV	
			2.1V DC+0mV-100mV	
	AC Shelf 1 PSU2		5V DC ± 250mV	
			3.3V DC +0mV-300mV	
			2.1V DC+0mV-100mV	
	AC Shelf 2 PSU1		5V DC ± 250mV	
			3.3V DC +0mV-300mV	
			2.1V DC+0mV-100mV	
	AC Shelf 2 PSU2		5V DC ± 250mV	
			3.3V DC +0mV-300mV	
			2.1V DC+0mV-100mV	

TEST #	**TEST**		**LIMIT**	**RESULT**
Power Up and Self Test				
Test 3	AC Shelf 1 Alarms and Indications	PSU 1 PSU 2 SC Card AUX Cards (if fitted)		Pass /Fail
	AC Shelf 2 Alarms and Indications	PSU 1 PSU 2 SC Card AUX Cards (if fitted)		

Rack ID

TEST #.	TEST		RESULT
Test 4	AC Shelf 1 System Configuration Self test from Netspan	SC Card	
		AUX 1	
		AUX 2	
		AUX 3	
		AUX 4	
		AUX 5	
		AUX 6	
		AUX 7	
		AUX 8	
		AUX 9	
		AUX 10	
		AUX 11	
		AUX 12	
		AUX 13	
		AUX 14	
	AC Shelf 2 System Configuration Self test from Sitespan	SC Card	
		AUX 1	
		AUX 2	
		AUX 3	
		AUX 4	
		AUX 5	
		AUX 6	
		AUX 7	
		AUX 8	
		AUX 9	
		AUX 10	
		AUX 11	
		AUX 12	
		AUX 13	
		AUX 14	

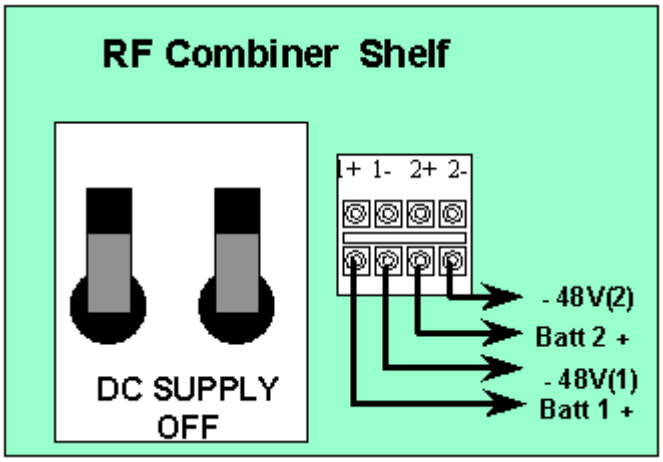
AS4000 CT Setup and Test

Turn-Up and DC measurements

Before commencing the turn-up of the rack, check that the serial number and Rev levels of all cards have been entered into the test form.
Disconnect the Antenna.

Rack Turn-Up and Measuring Input Voltage (Test 1a)

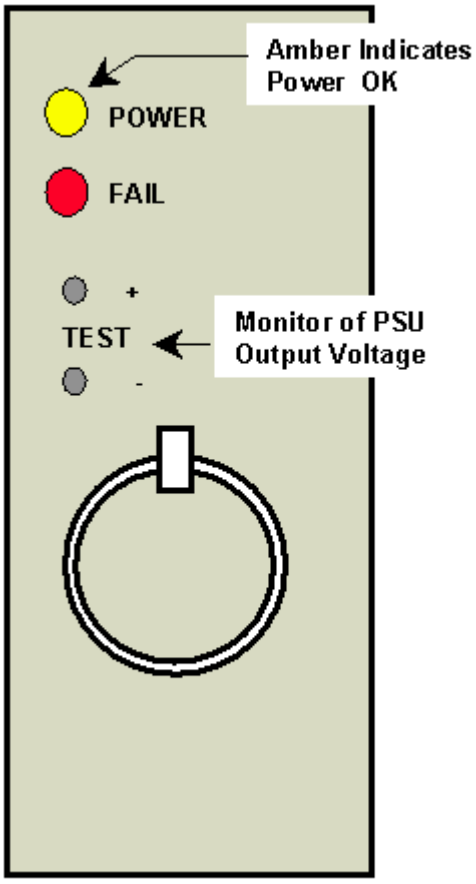
This section describes the procedure for measuring and connecting DC to the rack, checking that the cards have the correct alarm indications on power-up and measuring the PSU output voltages.
Using the DMM measure and record the Exchange DC voltage supply across the input terminals (1(+) & 2 (-).for Supply 1 and 3(+) & 4 (-).for supply 2). Check that the polarity is correct and ensure that the voltage measured complies with the site nominal voltage and is within the limits specified on the test results sheet.



Switching on the racks. (Test 1b)

CT Rack: Combiner Shelf

Place one PSU in the shelf. Switch the CT Combiner Rack ON by placing one breaker on. The two breakers duplicate power to each shelf and the shelves will still function if one power supply fails though the LED indicators on the power supplies will not be on. The PSU should show a amber LED and the fail LED. Switch on the second breaker and the Red LED should extinguish.
Switch off and place the second PSU in the shelf and repeat the process described in paragraph 1.
Using the DMM check that the DC voltage supply across the input terminals (1+ & 1- for Supply 1 and 2 + & 2- for supply 2) is still within the specified limits and record on the test results sheet.
Measure the DC voltage at the front panel test points on each of the PSUs on the RF Combiner Shelf. Ensure that the voltage measured is +13.5V DC +/- 500mV. Switch both breakers off. Record the result.
Place a PA into the shelf to provide a load. Switch both breakers on and measure and record the DC voltage at the o/p of each PSU.
Using the DMM, measure a the DC voltage at the front panel test points on each of the PSUs on the RF Combiner Shelf. (Figure 35)
Ensure that the voltage measured is +13.5V DC +/- 500mV.



Combiner Shelf PSU.

Commissioning the Central Terminal

Setting up Site Configuration on Netspan

This procedure is used to set-up the Central Terminal for commissioning and does not require the back-haul to the Access Concentrator Site to be installed.

 To commission the AC Shelf the Shelf must be either

- connected via an RS232 interface to a Sitespan server on a Laptop PC. However the settings made during the setup process must be transferred to the NMS Netspan before it server is connected. or values set within the shelf during this process will be overwritten by Netspan when it is connected as the values stored at the AC will be written into the SC Shelf Controller of the shelf.
- connected via an RS232 interface to a Sitespan server located with and connected to the Netspan Server Machine.
- connected via the backhaul to the AC that is connected to the Sitespan Server.
-


Physically inspect the rack and check that the details of the serial numbers and rev levels have been recorded when the cards were installed. Check that cards have not changed since installation. If cards have changed add details to the test form.
Before the commissioning of the CT racks, the system should be built using Netspan or Sitespan Version 7.15 or later be installed on the dedicated PC (Laptop).

For details on setting up Netspan and the Sitespan server interface see topic in the Netspan section. Note Always check that the version of Netspan matches the revision level of the Netspan at the management system and is suitable for the version level of the SC card application and boot code in the shelves to be commissioned.

Setting the TEI and Baud Rate for Sitespan Connection

1. Connect PC using AS7030 SiteStart software to the LAT port on the front of the shelf controller of the Shelf being commissioned..
2. Set the TEI to the value designated during system planning. The TEI number must be unique to the Network managed by Sitespan.
3. Set the Baud Rate for connection. The same rate must be set when setting up CT Shelf Properties later in this commissioning process.
4. Build the system using Sitespan or Netspan (see Sitespan/Netspan user guide)

- Create Site and Rack
- Create Modem Shelves
- Create DTU Card
- Configure Modem Shelf
- Connect Netspan to the Modem shelf under test.

Check that Sitespan is communicating with the shelf. The SC alarm on Sitespan clears and shows downloading and then connected ready. In the shelf view all cards should be green.

CT Shelf Controller Software Downloads

1. Verify that the required software is loaded onto the CT shelf

2. If required download the appropriate software by following the software download procedure (see Software Download)
3. Re-boot the Shelf by clicking the Reset Shelf button on the shelf controller view.

Check Boot Sequence

1. SC card boots-up and displays the following LED sequence:

   a. Red & green LEDs both ON

   b. All LEDs OFF

   c. Green LED FLASHING

   d. Green LED ON

   e. The red LED temporarily comes ON

2. All the cards on the shelf now boot-up.
3. The DTU cards should display the following LED sequence:

   Note: The boot-up procedure for these cards takes approximately 15 minutes.

   a. Red LED, amber LEDs & green surface mount LEDs all ON. Green LED FLASHING

   b. Red LED ON, green LED FLASHING, amber LEDs OFF & green surface mount LEDs showing download progress.

   c. Green LED ON, green surface mount LEDs indicate card configuration as shown below

LED	DTU
1 Top	OFF
2	OFF
3	ON
4 Bottom	OFF

The rest of the cards display the following LED sequence:

Note: The boot-up procedure for these cards takes a couple of minutes

a. Red LED ON & green LED FLASHING

b. Green LED ON

- If the cards do not boot-up correctly, i.e. any of the cards display a flashing red or continuous red LED only, follow the procedure in case of Card boot-up failure

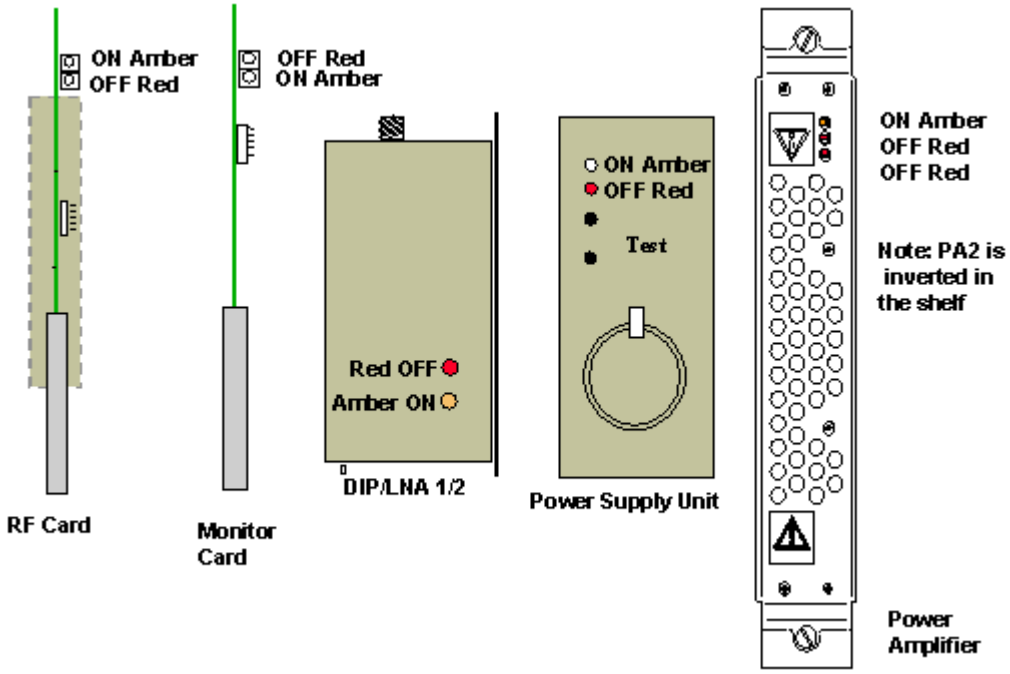
Note. Some early demo system and field trial T1 TU cards may fail to boot on initial power up, and it may be necessary to unplug and re-insert the card to initiate the boot sequence. If the card does not reboot then the Eprom in the card should be re-blown.

Alarm and Status Indications (Test 3)

1. Verify that the alarms and status indications (LEDs) on the system comply with those detailed in the following tables.

   Note: The following tables are set in order of appearance on the front of the card reading from top to bottom.

RF Combiner Shelf



Low Noise Amplifier			
Position	Colour	Description	Status
Top 1	Amber	Power/Module Status OK	ON
2	Red	Power Fault	OFF

RF Card [RF]			
Position	**Colour**	**Description**	**Status**
Top 1	Amber	Power/Module Status OK	ON
2	Red	Power Fault	OFF

Shelf Monitor			
Position	**Colour**	**Description**	**Status**
Top 1	Red	Power Fault/PA Module Fault	OFF
2	Amber	Power/Module Status OK	ON

Power Amplifier[PA]			
Position	Colour	Description	Status

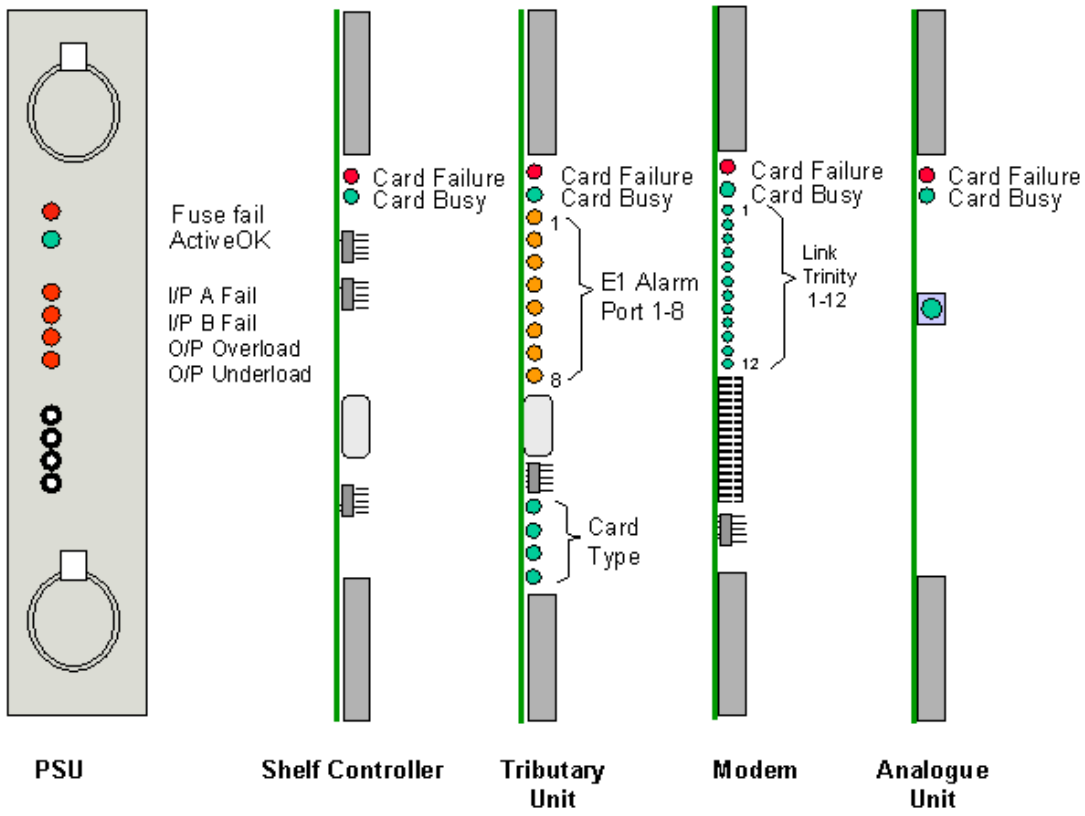
Top 1	Amber	Power/Module Status OK	ON
2	Red	Power Fault/PA Module 1 Fault	OFF
3	Red	Power Fault/PA Module 2 Fault	OFF

* PA 2 is inserted inverted and the alarm indicators are also inverted

Power Supply Unit [PSU]			
Position	**Colour**	**Description**	**Status**
Top 1	Amber	Power OK	ON
2	Red	Power Fail	OFF

Table. RF Combiner Shelf Card LED Indications.

Modem Shelf Card LEDs.



In normal state all LEDs will

MODEM			
Position	**Colour**	**Description**	**Status**
TOP 1	Red	Card failure LED, which shall be alight if the card self test fails, or if commanded by the SC.	OFF
2	Green	Card busy LED, to indicate live traffic is present and should not be removed.	ON

3	Green	Link failure Trinity 1	OFF
4	Green	Link failure Trinity 2	OFF
5	Green	Link failure Trinity 3	OFF
6	Green	Link failure Trinity 4	OFF
7	Green	Link failure Trinity 5	OFF
8	Green	Link failure Trinity 6	OFF
9	Green	Link failure Trinity 7	OFF
10	Green	Link failure Trinity 8	OFF
11	Green	Link failure Trinity 9	OFF
12	Green	Link failure Trinity 10	OFF
13	Green	Link failure Trinity 11	OFF
14	Green	Link failure Trinity 12	OFF

DTU			
Position	**Colour**	**Description**	**Status**
TOP 1	Red	Card failure LED, which shall be alight if the card self test fails, or if commanded by the SC.	OFF
2	Green	Card busy LED, to indicate live traffic is present and should not be removed.	ON
3	Red/Yellow	E1/T1 port 1 Alarm	*
4	Red/Yellow	E1/T1 port 2 Alarm	*
5	Red/Yellow	E1/T1 port 3 Alarm	*
6	Red/Yellow	E1/T1 port 4 Alarm	*
7	Red/Yellow	E1/T1 port 5 Alarm	*
8	Red/Yellow	E1/T1 port 6 Alarm	*
9	Red/Yellow	E1/T1 port 7 Alarm	*
10	Red/Yellow	E1/T1 port 8 Alarm	*

LED Yellow if T1/E1 signal is being received with some other alarm condition. (e.g. remote alarm or sync fail) being sent, Red if T1/E1 signal not received.

AU			
Position	**Colour**	**Description**	**Status**

TOP 1	Red	Card failure LED, which shall be alight if the card self test fails, or if commanded by the SC.	OFF
2	Green	OK Card is Active..	ON

SC			
Position	**Colour**	**Description**	**Status**
TOP 1	Red	Card failure LED, which shall be alight if the card self test fails	OFF
		OK Card is Active.	

PSU			
Position	**Colour**	**Description**	**Status**
TOP 1	Red	FUSE FAIL which shall be alight if either input fuse has blown.	OFF
2	Green	OK Card is Active.	ON
3	Red	I/P A FAIL input voltage A (BATTNEG0) not present	OFF
4	Red	I/P B FAIL input voltage B (BATTNEG1) not present	OFF
5	Red	O/P OVERLOAD.	OFF
6	Red	O/P UNDERLOAD	OFF

Self Test (Test 4)

Execute the self test function (using Netspan) on the DTU cards and ensure that they pass. Replace any faulty cards.

System Soak

It is necessary that the system is powered up for at least two hours to allow for temperature stabilisation before proceeding with the measurement of the TX power commissioning
Note: If proceeding to commissioning the DACU should be powered up and allowed to warm up for 30 mins prior to setting the RX sensitivity.

Measuring Central Terminal TX Power

The recommended single user TX output power is +18dBm for 3.4-3.6GHz, +20dBm for 1.8-1.9GHz, and +21dBm for all other bands. This procedure is used to measure the TX output power when set up for 3 Users.
Note: If proceeding to commissioning the DACU should be powered up and allowed to warm up for 30 mins prior to setting the RX sensitivity..

This procedure is for setting up AS4000 shelves only.

Tools and equipment needed.

Item	Description	Recommended Model	Quantity
1	50 ohm Termination 10W	ArraN9510	1
2	RF Power Meter	Anritsu Sitemaster S400A or Marconi 6970	1
3	Power Sensor	Anritsu 560-7N50B or Marconi 6932	1
4	Attenuator for use with Anritsu	HP 8491 (N Type)	1

Test TX Output Power (Test 5)

Note: If adding a shelf to a rack that is already in service it is necessary to remove any shelf sharing the power amplifier from service in order to make power measurements. This is best done when traffic loading is at its lowest


In order to commission the output power of the rack, a Power Meter must be connected via a power sensor to the N-Type connector on the DIP/LNA at the top of the rack. Protect the meter by connecting a 30dB attenuator (HP 8491) to the output of the DIP/LNA as the output power can exceed 33dBm.

1. Note: The output from shelves 1 and 2 is measured on DIP/LNA1. The outputs from shelves 3 and 4 are measured on the DIP/LNA2. The port not under test should be terminated with a 10W termination.

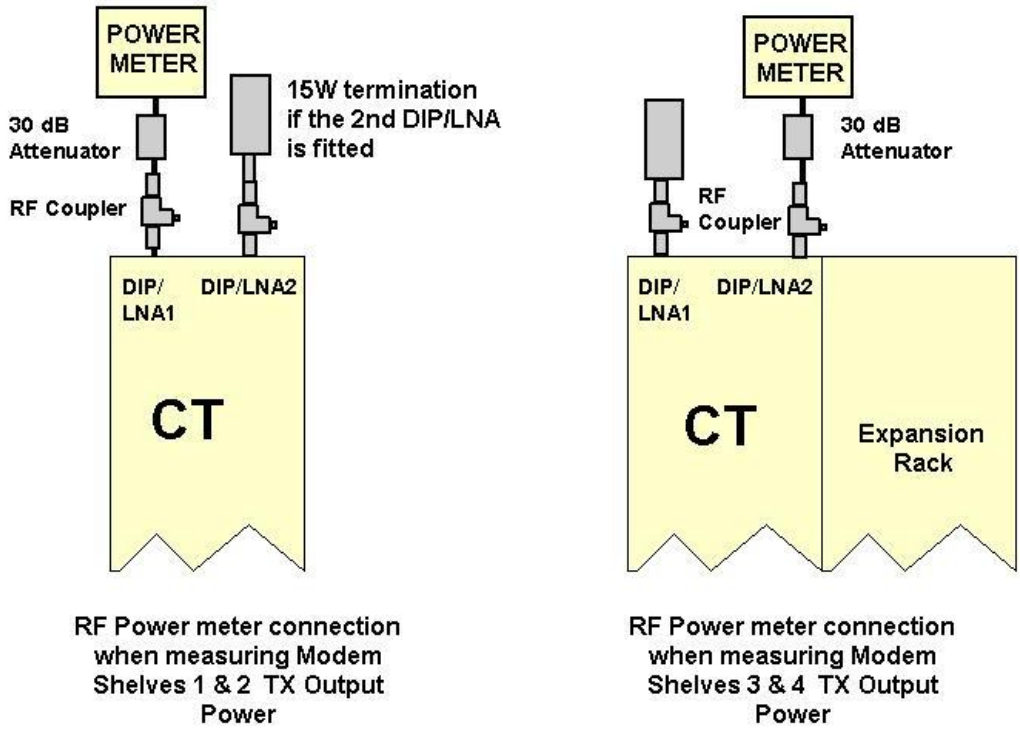
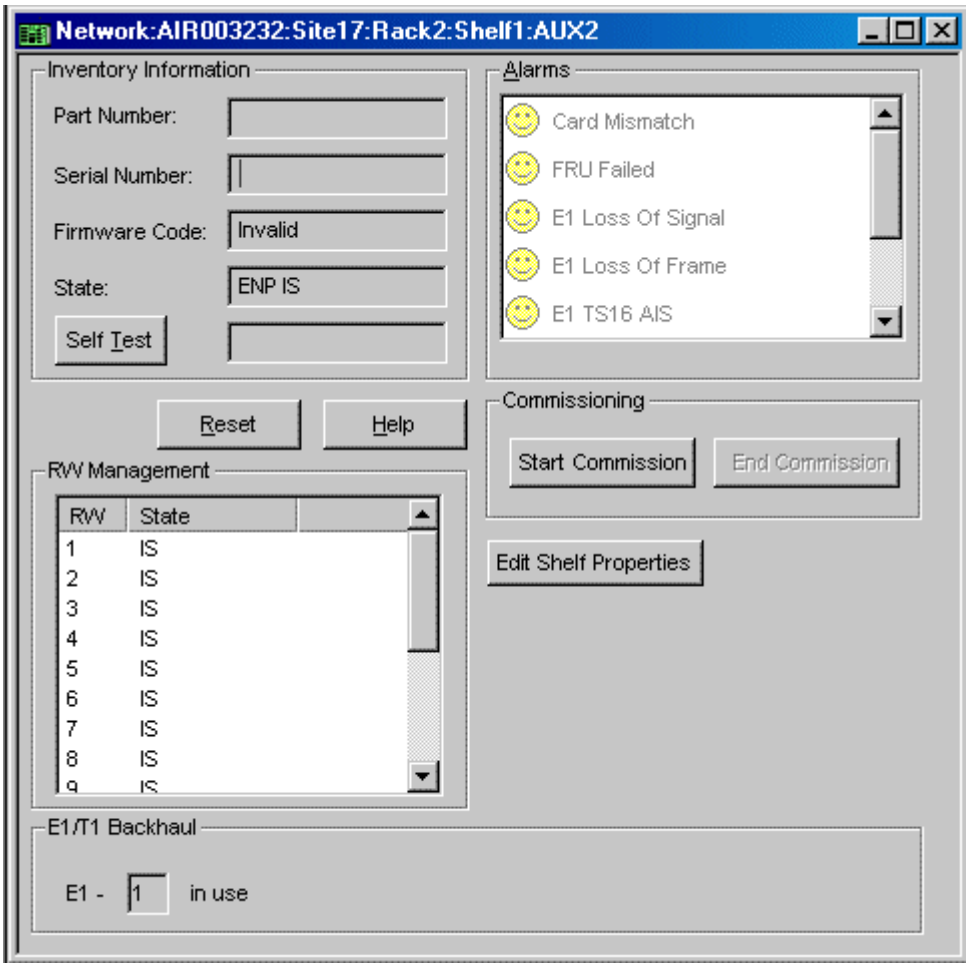


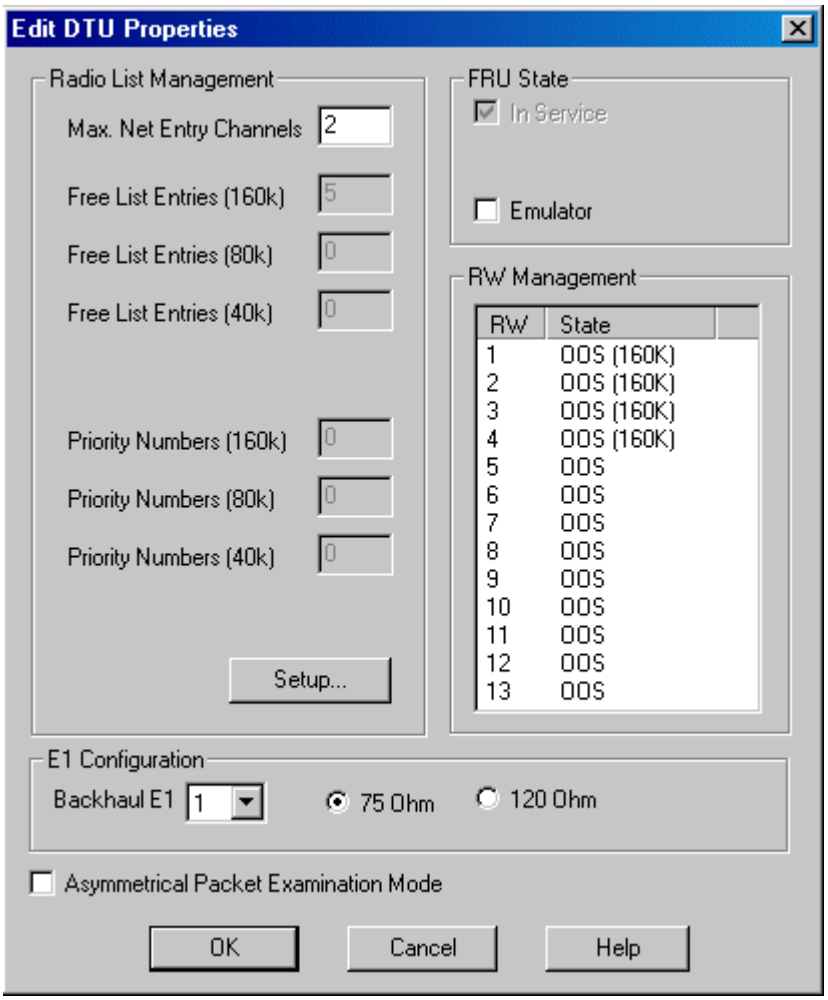
Figure Power Level measurement Test Set-Up

Measure the output of shelf 1. (This test is repeated for other installed shelves)

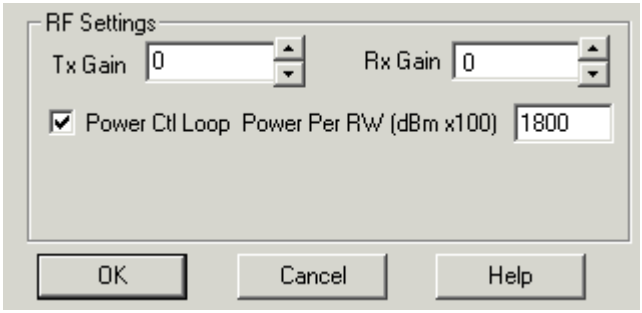
1. Remove the RF cards for all but the shelf being commissioned
2. Connect Sitespan to the shelf under test. See Connection to Sitespan
3. Open The DTU Card View and click the **Commission Button.** This button places the shelf into an internal commissioning test mode. This button is clicked before the commissioning procedure is started. This turns of the Link Acquisition and Call Control Channels off.



4. Open the DTU card properties. Set any 4RWs to OOS160k and the remainder to OOS (These can be selected from the by clicking the mouse on the state to cycle through the options).



5. View the Modem Shelf Properties using Sitespan. Set the TX and RX gain to 0(zero)



6. Ensure that a 30dB attenuator is connected to the power sensor if required to protect the sensor.

7. Calibrate/set-up power meter according to manufacturers instructions.

8. Connect the power sensor at the top of the rack as per diagram

9. Measure O/P power and ensure the level is less than -20dBm

10. Adjust TX Gain for the band of the system under test. Start with the TX gain set to 3300. Adjust the value up or down to obtain a reading as shown in the table below. This is equivalent to 4 users at 160k. Remember to take into account the value of any attenuation used to protect the meter.

Band	**Reading**
1.8-1.9GHz	+26dBm

2.0-2.3GHz	+27dBm
2.3-2.5GHz	+27dBm
3.4-3.6GHz	+24dBm

11. Set RW1 to OOS(160K) and all other RWs OOS
12. Measure the output power: ensure the level is as in the table below

Band	**Reading ±1dB**
1.8-1.9GHz	+20dBm
2.0-2.3GHz	+21dBm
2.3-2.5GHz	+21dBm
3.4-3.6GHz	+18dBm

13. Repeat power reading for single RW OOS(160k), for all other individual RWs
14. Record the result (see Test Results)
15. On the DTU card view click the **End Commissioning** button (this re-activates RWs 14 & 15 and sets all RWs IS.
16. Repeat for all other modem shelves.

Procedure in case of card boot-up failure

Procedure in case of card boot-up failure
If the cards inserted into the shelf do not boot-up, the top red LED on the card will be either continuously ON or FLASHING. The following steps should be followed:

1. Check cards are properly inserted into the shelf, in the correct positions
2. Reset the SC card using Netspan/Sitespan, under the card view.
3. The cards boot-up. If the cards do not boot-up try and reset the shelf backplane configuration. Download the SetTUinv.txt to the SC. Ensure they are available before continuing.
4. Disconnect Netpan from the shelf containing cards that will not boot-up.
5. Connect the LAT cable to the SC card
6. Send the text files for the correct shelf, one after another using Terminal.
7. Once completed, type the following:
   TI 118

   EA 118:0/119:0

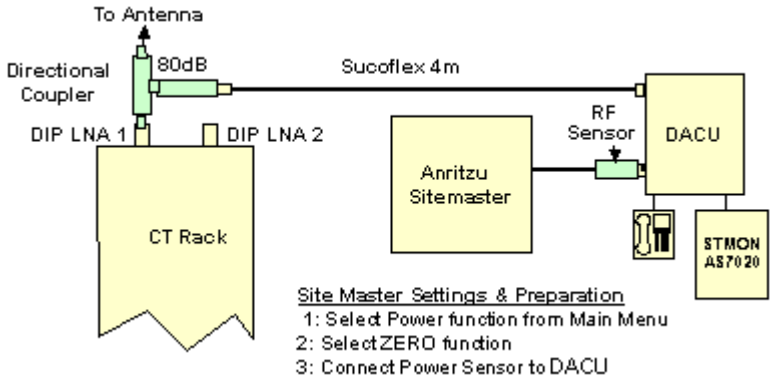
   ES 0
8. Wait 2 – 3 minutes for the process to complete.
9. Reset the SC by shorting Pins 2 & 3
10. Wait for 3 minutes: After 3 minutes the Shelf Controller has a green LED ON, and all the other cards have FLASHING red LEDs
11. Re-Connect Netspan /Sitespan
12. The cards on the shelf boot-up. If the cards do not boot-up, then it is likely that one of the cards is faulty. Try replacing one of the cards and starting the procedure again.

Setting RX sensitivity using DACU 2.0-2.3GHz & 3.4-3.6GHz Band

(Test 6) If a DACU is not available use Setting RX Sensitivity without DACU

Preparation for commissioning at the Central Terminal

1. The DACU should be powered up and allowed to warm up for 30 mins to achieve stability prior to setting the RX sensitivity. For details on setting up the DACU see Connecting the DACU
2. Enter the loss values in the DACU calibration chart for the relevant frequency See chart below.
3. Calculate/determine total path loss and required DACU output power and hence power meter reading.
4. Connect cables and equipment as per diagram below



5. Ensure that the commissioning button is off. This should have been done at the end of the TX Gain set-up but it is prudent to ensure that it has been switched off. Switching off resets the DTU card, reactivates RW14&15 for link acquisition, and sets all RWs in service. Note: The DTU card view shows all of the RW codes, and their current state within the system (i.e. OOS or IS).

6. Create an ST on Netspan. See Netspan Section

7. Configure test ST using AS7020STMON according to modem shelf properties to the correct frequency, PN code and ID number.

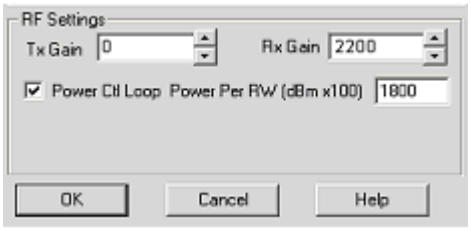
8. Allow test ST to acquire link and net enter to “warm” state

9. Using the ST Line List, set loopback mode on both lines to enable 160k high rate operation.

10. Measure the DACU o/p level

11. On Modem Shelf Properties, set RX gain to achieve required ST o/p level as calculated in step 4 for –98dBm receiver sensitivity Adjust the 'RX Gain' by increasing and decreasing the values.

12. Note: To start with, set the RX gain to around 2200. (if value is reduced power goes UP). The values may be set by typing in a new value or by using the up and down arrows at the side of the box. The ST power changes in steps of approximately 0.7dB and the nearest value to the required value. A single step on the gain value may not produce any change so start with larger values and through a number of iterations home in on the correct setting. Note: Levels are updated only when the OK button is clicked. Check the output power of the DACU, and repeat until the output power matches that in the DACU Calibration Table.



14. Record results in test results sheet

15. Power off the DACU.

16. Put all RWs back in service.

Restoring shelf connections

1. Remove the test equipment and connecting cables.
2. Replace the Shelf covers and the protective cap on the coupler.
3. Do not remove the Sitespan connection at this time.

Entering Test values into Netspan

The values of the TX Transmit and RX gain must be set into the Netspan at the Network management Centre before the backhaul is connected to the CT, failure to do this results in the TX power and RX sensitivity values being overwritten by the value stored in the Netspan Server.

Connecting CT, AC and NMC

At this point, ensure the NMC has the site equipment created in the master database and the V5.1 interface activated. It should show an alarm on the E1 connection to the CT shelf.

1. Contact the NMC administrator, and pass the CT shelf Transmit Power and Receiver Level settings to the administrator for updating the master database.

   Warning: When Netspan is reconnected to the CT the values of the TX and RX levels stored at the NMC will be written to the SC of the modem shelf and Netspan should not be reconnected until the NMC has updated its database with the correct Transmit and receive level settings.

2. The CT shelf connected to the LAPTOP should be in ‘UNCONNECTED’ state. This is because the shelf is expected to get its data from the remote management system.

3. Reconnect the E1/T1 links to the CTUs/DTUs.

4. At the AC Connect Netspan backhaul to the NMC. If using a router fit RS232 9 way to Async RJ45 adapter to the Netspan port used to backhaul to the server. Connect Sitespan Port 1 (AC Backplane) to Management Network (ports allocated on Cisco Router).

5. Call the NMC and ensure the commissioned shelf is in ‘connected’/ ‘downloading’ state and the E1/t1 alarm on the CTU is cleared.

6. Remove Modem card and check that the alarm is seen in Netspan’

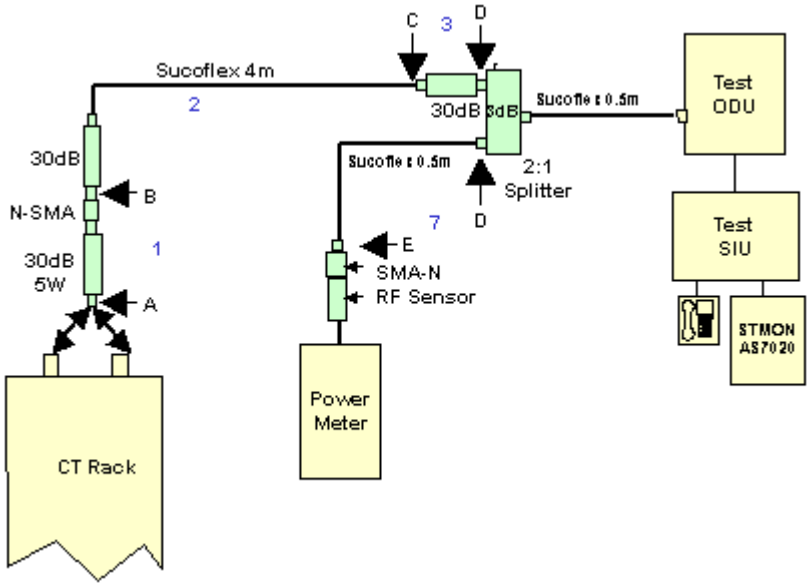
Setting RX Sensitivity without DACU

Tools and equipment needed.

Item	Description	Recommended Model	Quantity
1	Digital Multimeter	Fluke 77	1
2	ST Test Unit,	SIU with Modified Antenna at appropriate band	1
3	30dB Attenuators; 5W	Mini Circuits: BN-N30W5	2
4	30dB Attenuators; 2W	M/A-COM:2082 6044 30:2W	2
5	Two Way Power Divider	Mini Circuits: ZAPD-4-S	1
6	50 ohm Termination 10W	Arra N9510	1
7	Adaptor; N-SMA	Huber & Suhner 33N-SMA-50-1	1
8	Adaptor; N-SMA	Huber & Suhner 31N-SMA-50-1	1
9	Co-ax Cables	Huber & Suhner Sucoflex 104; 0.5m	2
10		Huber & Suhner Sucoflex 104; 4.0m	1
11	Cable SMA-MCX	Huber & Suhner 30-05918-10	1
12	RF Power Meter	Marconi 6970	1
13	Power Sensor	Marconi/RFI 6970&5 6932/900	1

RX Sensitivity (Test 6)

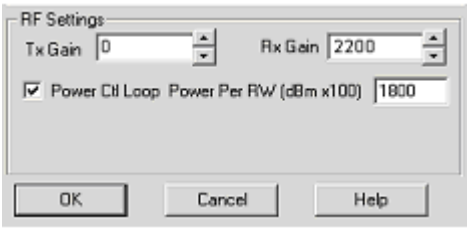
1. To set the receive sensitivity, first set up a test network for the band under test as shown below. The figure below show the test equipment connected directly to the outputs of the DIP/LNA and DIP/LNA2 as would be the case for systems without a RFcoupler.



Test Set-up

2. Measure and calibrate the loss of all components as per diagram above:
3. Measure (1)A-B, (2)B-C, (3)C-D and (7)D-E.
4. Enter values in calibration chart for the relevant frequency.
5. Calculate/determine overall path loss and required ST output power and hence required power meter reading.
6. Connect cables as per diagram above.
7. Ensure that the commissioning button is off. This resets the DTU card, reactivates RW14&15 for link acquisition, and sets all RWs in service
8. Create ST on AC ST list
9. Configure test ST using AS7020STMON according to modem shelf properties to the correct frequency, PN code and ID number.
10. Allow test ST to acquire link and Net Enter to “warm” state
11. From ST properties, set loopback mode to enable 160k high rate operation
12. Measure ST TX o/p level
13. On Modem Shelf Properties, set RX gain to achieve required ST o/p level as calculated in step 4 for –98dBm receiver sensitivity

    Note: To start with, set the RX gain to around 2200 and click right mouse button at the side of the RX Gain Box to increase and decrease reading at the power meter. Check the output power of the ST, and repeat until the output power reaches the required level



14. Record results in test results sheet

BER Test

The BER test is best done from the network management centre but if a management centre backhaul has not yet been established the test may be performed at the AC site and should be set up by connecting Local Netspan/Sitespan to AC Rack, building site locally and create subscriber.

Setting up system tests at the Access Concentrator.

Create CAS XTU in a spare slot (slot 10 if spare).

Create CAS subscriber in Sitespan. Note the timeslot and E1 link used.

Fit CAS TU card to the shelf in the configured slot. Fit CAS TU card to the shelf in the configured slot.

Setting up Test ST.

To perform overall system tests a test ST should be set up. The ST should be located 1 to 5 km from the CT in the centre of the lobe served by the CT. Set up using details to match the RF channel, PN code and ST-ID for the CT sector to be tested.

Screen captures of the RF analysis may be taken and pasted into a document for confirmation of the relative signal strengths.

Check for the ST to acquire a link and use STMON to ensure that the frequency acquired is that of the CT and not that of an adjacent signal. (see STMON User Guide for details of checking the channel.)

For Information on setting up a subscriber terminal see 605-0000-505. Subscriber Terminal installation and commissioning.

Measuring BER

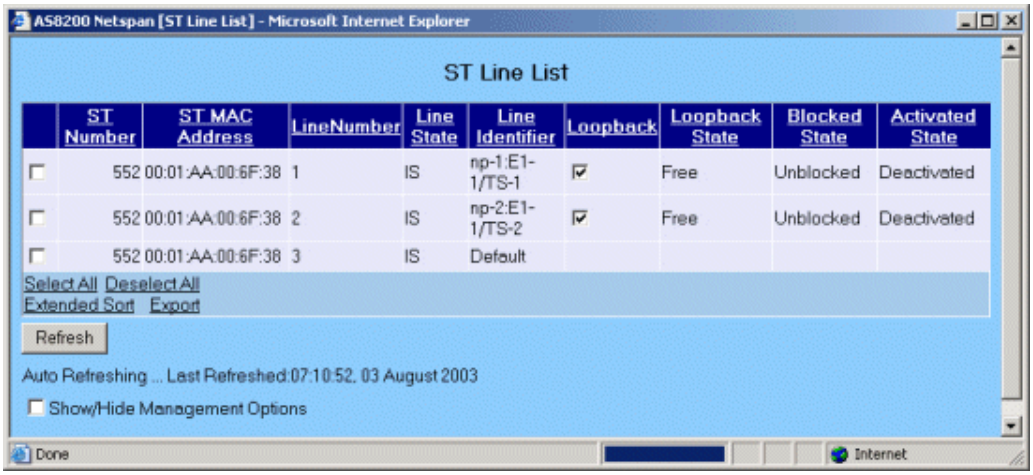
This process can be carried out at the Access Concentrator and loopback at the ST or if using a Data ST the test may be performed at the L series ST and a loop applied at the Exchange

a) Testing at the Access Concentrator

Connect BER Tester to E1 in link on the shelf backplane (or Type 43 converter module if used) set above and inject a 64K Pseudo Random Pattern 215-1in the timeslot set above.

Put a Loop on the ST from Netspan (In the ST Line List. check the Loopback box and click OK).

Note: The loopback is dropped if the link fails or the ST power is cycled To reapply the loopback the loopback tick box should be cleared and the OK button clicked. The loopback should then be re-applied by re-checking the loopback tick box and clicking the OK button.



The presence of the loopback should be seen at the BER test set. Inject 1 error into the test signal and observe it on the incoming signal to check that errors are detected. Start and stop the test to clear the injected error.

Observe the return signal on the T1/E1 out to establish that the link is error free. Run BER test for 1 Hour.

On completion of the test remove the loopback (open the Edit DA ST window and click the Loopback box to remove the tick and click OK.)

Delete CAS subscriber in Sitespan, and delete CAS XTU.

b) Testing at the Subscriber Terminal if L Series SIU used.

An alternative method of testing the BER of a link from a CT to an ST is to provide a hard wired loopback on a selected E1/T1 port on a Data XTU Card at the AC site. By using an ST-L128 or ST-l64, 128kbit/s or 64kbit/s data rates may be tested using a BER tester at the ST location. The advantage of this method is that there is no need to have a person at both the AC site and the ST test location

Note. A suitable data cable from the BER test set is required. Most BER test sets provide V.35 or X.21 synchronous interface options.

Power for a prolonged test may be a problem in field locations . An inverter running from a vehicle 12V supply may be used for tests of up to 1 hour with the ST powered directly from the Vehicle battery Place a physical loop on the E1/T1 at the AC/Exchange.

At the AC site: Loopback E1 link on Data XTU card. (loop on shelf backplane or DDF)

At the Subscriber Terminal: Connect BER test set to the ST.

The presence of the loopback should be seen at the BER test set. Inject 1 error into the test signal and observe it on the incoming signal to check that errors are detected. Start and stop the test to clear the injected error.

Observe the return signal on the E1/T1 out to establish that the link is error free. Run BER test for 1 Hour.

On completion of the test remove the loopback and re-connect the E1/T1.

Delete test data subscriber in Netspan.

Setting the System into Service

Checking alarms and connections to Netspan

At the AC Test the RS232 disconnect alarm by disconnecting the adapter on Sitespan port I. Pull card and check alarm is visible at NMC.
At the NMC set the free list entries. For details on setting free list entries see the Netspan Help File
Note System Optimisations to the configuration that improve Net entry time

- Ensure that the number of net-entry channels is set to around 6 for a shelf running medium/ large deployments of voice service. The only constraint to be borne in mind is that each channel used for net-entry is not available for traffic, so you need to be careful about not over-provisioning the number of net entry channel if the shelf has a large proportion of data / ISDN STs (which operate in a fixed-assigned mode).
- Make certain that any STs that are created in the database before deployment are marked 'out-of-service'. If they're not, on every cycle through the database, the system is trying to net-enter STs that don't exist.

Test Call

1. Connect the AC port to Switch (ensure V5.1 link and cards configured).
2. Create a V5.1 DA Subscriber Terminal using Netspan and place the ST in service. Check L3 address unblocked and define phone number.
3. Configure the test ST with the ST Id PN number RF channel and phone number (as set at NMC).
4. Wait for ST to acquire a link (STMON can be used to monitor progress). Check for dialtone.
5. Using a telephone make test call from the test ST over the system. Check for both way transmission and absence of noise and interference.
6. Solicit an incoming call from the NMC or another phone and again check the quality of the call

The tests should be completed for all other shelves commissioned on the same base station.

At the completion of all tests remove all test cards from the shelf

BER Tests

See Topic BER Tests

Packet Testing

See Topic Packet System Testing

Site inspection and test card removal

When the BER and call tests are completed for all other CT shelves relating to an AC site (may have 1 or more AC shelves) remove all test cards from the AC shelf and delete all test STs from Netspan
At the AC and CT sites check all work areas are free of debris i.e. cable off-cuts, braid, dust and packaging and that the site is as found.

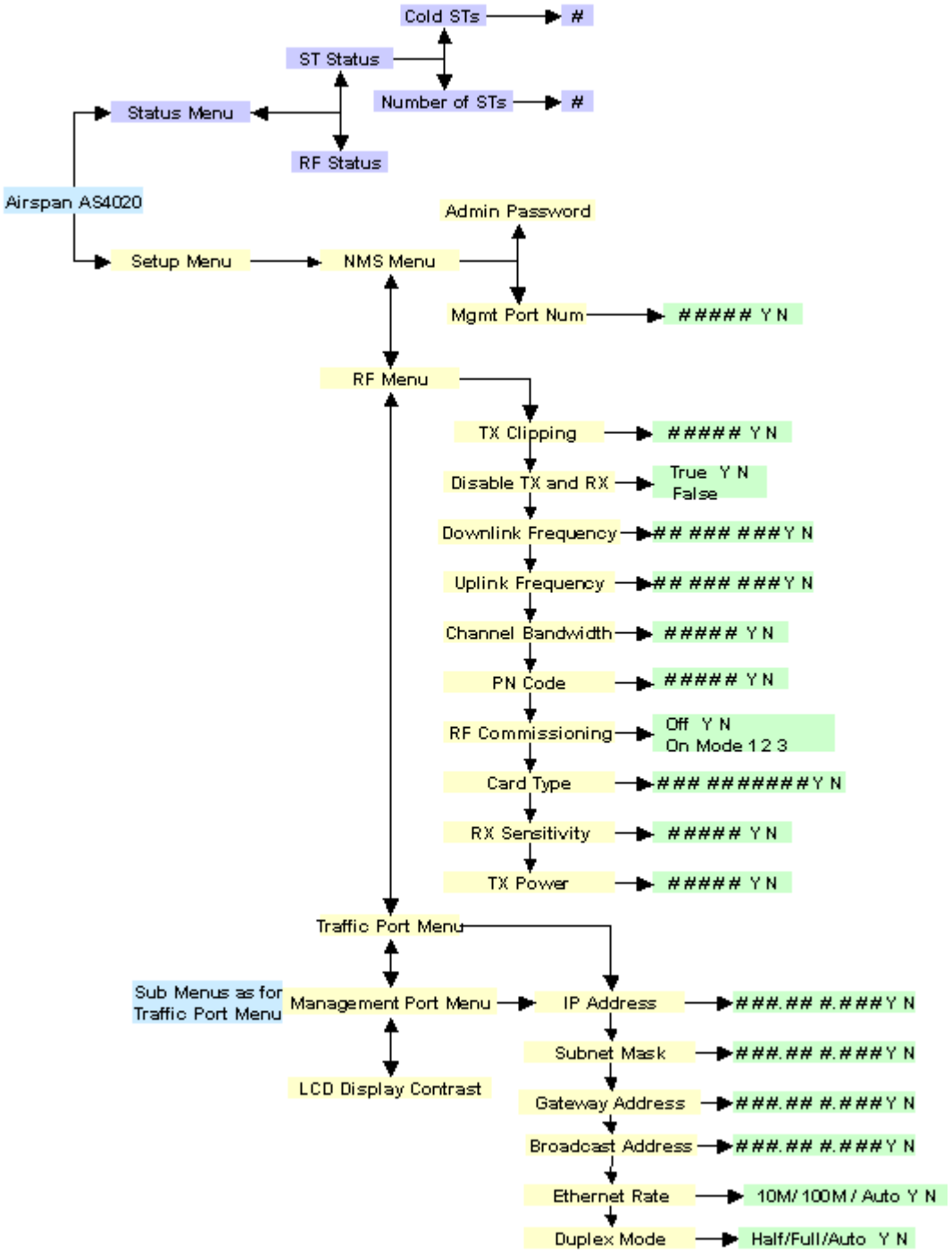
This completes the system commissioning

AS4020 CT Setup and Test

AS4020 Menu Map

The system parameters are set from the front panel of the AS4020

The chart below shows the menu layout


Cold STs
#
ST Status
Number of STs
#
Status Menu
RF Status
Airspan AS4020
Admin Password
Setup Menu
NMS Menu
Mgmt Port Num
Y N
RF Menu
TX Clipping
Y N
Disable TX and RX
True Y N
False
Downlink Frequency
###Y N
Uplink Frequency
###Y N
Channel Bandwidth
Y N
PN Code
Y N
RF Commissioning
Off Y N
On Mode 1 2 3
Card Type
########Y N
RX Sensitivity
Y N
TX Power
Y N
Traffic Port Menu
Sub Menus as for
Traffic Port Menu
Management Port Menu
IP Address
###.## #.###Y N
Subnet Mask
###.## #.###Y N
LCD Display Contrast
Gateway Address
###.## #.###Y N
Broadcast Address
###.## #.###Y N
Ethernet Rate
10M/100M/Auto Y N
Duplex Mode
Half/Full/Auto Y N

AS4020 error messages

The List below shows error message codes that are reported to the front panel of the AS4020

Code	Meaning
0	the image being loaded has a magic number that identifies it, this number has been corrupted.
1	the image has a build information header, (not the Airspan file header), attached containing which has an associated checksum, this is corrupted.
2	the image being loaded has a checksum calculated that is different to the one stored in the header.
3	the image has been built for the wrong architecture.
4	the image being loaded is not a kernel image.
5	the image has been compressed using an unrecognised method.
6	the image is of the wrong type, not a standalone or multi-image.
7	the image loader has exited due to internal error.
8	shutdown initiated from boot code.
9	the flash file system is corrupted.
10	the image being loaded is not a RAMDISK.
11	CPU fan failure detected.
12	router fan failure detected.
13	over temperature detected. see Note 1
14	kernel panic

Note 1
If a "system halted, code=13" message on the LCD this can mean more than just a cpu fan failure, to determine which fan/thermal error caused the halt, run up system while logging the output from the front panel port marked 232, the last message before the system stops should be one of these :-
"cpu temp = XXXdegC, shutting system down...."
"router temp = XXXdegC, shutting system down...."
"summer temp = XXXdegC, shutting system down...."
"psu temp = XXXdegC, shutting system down...."
"cpu fan slow, shutting system down...."
Additionally, if a chassis fan is misbehaving the following message is displayed :-
"chassis fan X slow, setting all other fan pwms to max"
where XXX is some appropriate value.

Set Traffic/Management Ports

The traffic port connects to the Ethernet connecting to the internet service provider and the management port connects to the Netspan server.

Enter the following parameters from the front panel of the AS4020. The values are determined by the server that the network is connected to.

IP address = in the form xxx.xxx.xxx.xxx i.e 192.254.130.030
Subnet mask = in the form xxx.xxx.xxx.xxx i.e 255.255.000.000
Gateway address = may be used if management is on another network else set to 000.000.000.000
Broadcast Address = used for broadcasts and would usually be the network address and mask so for the IP network above would be 195.254.255.255 but this information should be provided by the network administrator.
Ethernet Rate. Set to the rate dictated by the network, if in doubt set to Auto
Duplex Mode

Set NMS Menu

Management Port Num

Port Number used to connect to Netspan

Admin Password

Password protection for the AS4020. When set only authorised persons can make changes to the AS4020 configuration. If changes are made Via Sitespan a password is requested if set. If no password is set Netspan still requests a password but any entry will be successful in allowing access to the configuration.

Set TX Power

The recommended single user TX output power (QPSK/16QAM) is +18dBm for 3.4-3.6GHz, +20dBm for 1.8-1.9GHz, and +21dBm for all other bands. This procedure is used to measure the TX output power when set up in commissioning mode 1.

System Soak

It is necessary that the system is powered up for at least two hours to allow for temperature stabilisation before proceeding with the measurement of the TX power

Tools and equipment needed.

Item	Description	Recommended Model	Quantity
1	50 ohm Termination 10W	ArraN9510	1
2	RF Power Meter	Anritsu Sitemaster S400A or Marconi 6970	1
3	Power Sensor	Anritsu 560-7N50B or Marconi 6932	1
4	Attenuator for use with Anritsu	HP 8491 (N Type)	1

Test TX Output Power (Test 5)

Note: If adding a shelf to a rack that is already in service it is necessary to remove the RF card for any shelf sharing the power amplifier in order to make power measurements. This is best done when traffic loading is at its lowest

 In order to commission the output power of the rack, a Power Meter must be connected via a power sensor to the N-Type connector on the DIP/LNA at the top of the rack. Protect the meter by connecting a 30dB attenuator (HP 8491) to the output of the DIP/LNA as the output power can exceed 33dBm.

Note: The output from RF cards 1 and 2 is measured on DIP/LNA1. The output from RF cards 3 and 4 is measured on the DIP/LNA2. If the AS4020 shelf has been added to an existing rack then the RF card used must be inserted prior to measuring the shelf power. The port not under test if not connected to an antenna should be terminated with a 10W termination.

Measure the output of AS4020. (This test is repeated for other installed AS4020 shelves)
Connect RF meter via a 30dB attenuator on the antenna port to protect the power sensor from damage.
Configure the AS4020 using the menus on the front panel. From the Top Menu >Setup Menu >RF Menu set the following values:
Note: The PN code should always be set prior to entering commissioning mode.

RF Menu	
TX Clipping	00101
Disable TX and RX	False
Downlink Frequency	Enter DL frequency kHz with leading 0 e.g 03522751

Uplink Frequency	Enter UL frequency kHz with leading 0 e.g 03522651
Channel Bandwidth	00002 (=3MHz)
PN Code	PN code as supplied**
RF Commissioning	Mode 1 **Note:** If in commissioning mode the top menu displays RF commissioning alarm
Card Type	enter card type (See number on RF card)
RX Sensitivity	02500
TX Power	03000

** The commissioning procedure described in this document is not restricted to any particular RF channel or PN code. However the user should make sure that both the CT and ST are programmed with identical RF channel and PN code. At the CT end, the RF channel and PN code can be selected from the front panel in RF menu. In system operating Release 7.2x once the user changes the PN code he needs to re-enable the commissioning mode in order for this change to take effect properly. Release 7.30 however fixes this problem and the user should be able to change the PN code without the need to re-enable the commissioning mode.

RF Card Cross Reference Chart

RF Card Part Number	AS4020 Card Type	Band
605-0010-296	303-0087-904	3.4-3.6 Plan 13 X6
605-0010-092	303-0087-920	3.4-3.6 Plan 1 X1
605-0010-093	303-0087-920	3.4-3.6 Plan 1 X1
605-0010-102	303-0087-922	3.4-3.6 Plan X3
605-0010-103	303-0087-922	3.4-3.6 Plan X3
605-0010-237	303-0087-923	3.4-3.6 Plan 2 X4
605-0010-238	303-0087-923	3.4-3.6 Plan 2 X4
605-0010-294	303-0087-924	3.4-3.6 Plan 13 X6
605-0010-322	303-0087-925	3.4-3.6 Plan 10 X7A
605-0010-073	303-0093-900	2.0-2.3 Plan C2
605-0010-074	303-0093-900	2.0-2.3 Plan C2
605-0010-069	303-0093-902	2.0-2.3 Plan C1
605-0010-070	303-0093-902	2.0-2.3 Plan C1
605-0010-077	303-0093-904	2.0-2.3 Plan C3
605-0010-078	303-0093-904	2.0-2.3 Plan C3
605-0010-081	303-0093-906	2.3-2.5 Plan S1
605-0010-082	303-0093-906	2.3-2.5 Plan S1
605-0010-075	303-0093-920	2.0-2.3 Plan 2 C2
605-0010-076	303-0093-920	2.0-2.3 Plan 2 C2
605-0010-071	303-0093-922	2.0-2.3 Plan 1 C1
605-0010-072	303-0093-922	2.0-2.3 Plan 1 C1
605-0010-079	303-0093-924	2.0-2.3 Plan C3
605-0010-080	303-0093-924	2.0-2.3 Plan C3
605-0010-352	303-0093-925	2.0-2.3 Plan 5 C4
605-0010-083	303-0093-926	2.3-2.5 Plan S1
605-0010-084	303-0093-926	2.3-2.5 Plan S1
605-0010-163	303-1041-900	1.8-1.9 Plan P
605-0010-122	303-1041-920	1.8-1.9 Plan P
605-0010-295	303-1041-921	1.7-1.8 Plan P
605-0010-330	303-1070-920	3.4-3.6 Plan X1
605-0010-394	303-1070-	3.4-3.6 Plan 10 XHi
605-0010-396	303-1070-924	3.4-3.6 Plan 13 XLo
605-0010-399	303-	2.0-2.3GHZ, Plan 5 C4

Go to Top Menu >Setup Menu >RF Menu>TX Power

TX power
To set the CT to transmit at QPSK or 16QAM adjust the TX Power until the output of the transmitter by increasing or decreasing the value until the level tabulated below is reached. If the CT is required to operate with a downlink of 64QAM then the output should be backed off by 3dB. **Note:** This will affect the system coverage and should be taken into account at the radio planning stage.

Band	Power Meter Reading QPSK and 16QAM	Power Meter Reading for 64QAM
P	See Below	N/A
X	21.4dBm	18.4dBm
All other	24.4dBm	21.4dBm

P Band
To comply with FCC requirements for Spurious Emissions at Block Edges, the transmit power of the CT should be reduced for channels 180, 181, 214 and 215 as detailed below.

Channel	Downlink (MHz)	Uplink (MHz)	Power Commissioning mode 1
180	1932.00	1852.00	18.9 dBm
181	1933.00	1853.00	22.4 dBm
182 to 213	-	-	23.4dBm
214	1987.00	1907.00	22.4 dBm
215	1988.00	1908.00	19.4 dBm

Record the value and output level.

Set commissioning mode to Off, then set to commissioning mode 3. Check that the power meter reading increases by 8.7dB (+/- 1dB). If the reading is lower RF compression may be occurring.

Note if it is required to measure the output power with all the RWs enabled set the CT commissioning mode to **off** and then set the commissioning mode to 2. This sets all 13 RWs active. To return to commissioning mode 1 set the CT commissioning mode to off and then set the commissioning mode to 1. (Note the setting to off is important and it is not possible to go directly between 1 and 2.)

Set RX sensitivity using a DACU without Calibrated Coupler

This procedure should be used to commission the CT if using a DACU. At the end of this test a label with the calibrated value should be attached to the coupler. Calibrated attenuators and cables are provided with the DACU for this test.

The RX sensitivity is set according to the required CT RX level. It is important to note that the lower the modulation rate the further the geographical spread. For maximum range the AS4020 should use QPSK 1/2. Higher data rates may be achieved using higher orders of modulation but the range will lessen as the modulation rate increase. This level is determined as part of the planning function and takes into consideration the highest modulation rate to be offered and the noise floor predicted in the planning stage.

The RX Level is set dependant on the highest operational modulation rate as follows. By undertaking an appropriate level of RF planning the level is optimised in order to balance uplink data rate and system range.

Typical levels are shown below for two network configuration scenarios:
For networks where only a single RF Channel is operating, or only adjacent + one RF Channels are used (no co or adjacent channel interference), the following CT Rx levels apply:

Modulation Code	Rate	Rx Level (dBm / RW)		Session ids for LAT TE command in Mode 3
		Below 3GHz	Above 3GHz	
QPSK	1/2	-105 dBm	-103dBm	58 or 59
QPSK	3/4	-103 dBm	-101dBm	56 or 57
16QAM	1/2	-97 dBm	-95dBm	54 or 55
16QAM	3/4	-93 dBm (see note 1)	-91dBm	52 or 53
64QAM	3/4	Not supported on the uplink		

Table 1

Note 1: Note, 16QAM ¾ is only supported on the uplink with up to 7RW codes active.

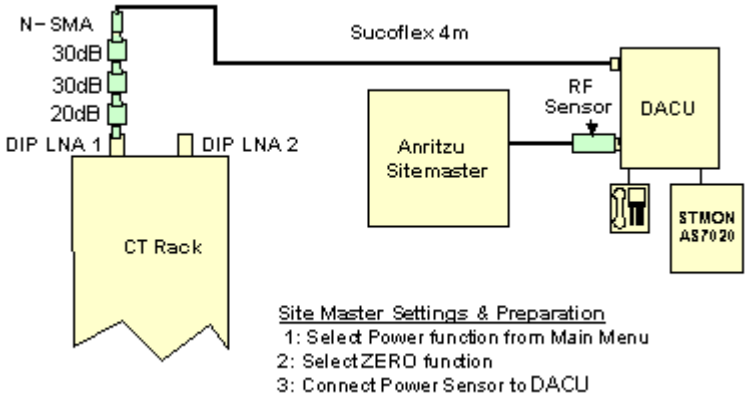
For networks where co or adjacent frequencies are reused to provide “cellular type” network coverage with limited available spectrum (ie. A relatively high level of co and adjacent channel interference), the following CT Rx levels apply:

Modulation Code	Rate	Rx Level (dBm / RW)		Session ids for LAT TE command in Mode 3
		Below 3GHz	Above 3GHz	
QPSK	1/2	-103 dBm	-100dBm	58 or 59
QPSK	3/4	-101 dBm	-98dBm	56 or 57
16QAM	1/2	-94 dBm	-92dBm	54 or 55
16QAM	3/4	-90 dBm (see note 1)	-88dBm	52 or 53
64QAM	3/4	Not supported on the uplink		

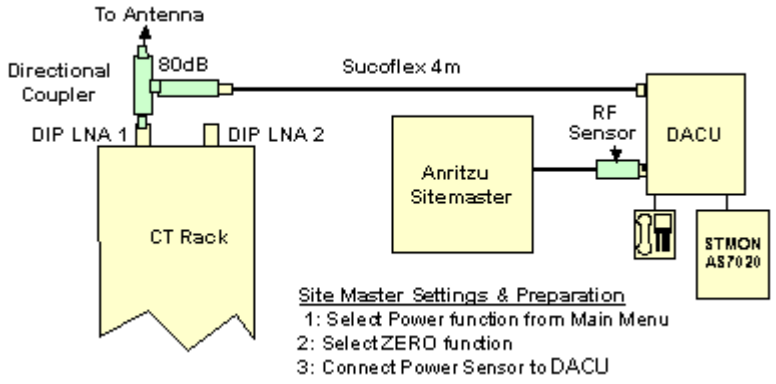
Table 1a

1. The DACU should be powered up and allowed to warm up for 30 mins to achieve stability prior to setting the RX sensitivity. For details on setting up the DACU see Connecting the DACU
2. Enter the loss values in the DACU calibration chart for the relevant frequency See chart below

3. Calculate/determine total path loss and required DACU output power and hence power meter reading.
4. Connect cables and equipment as per diagram below using 30+30+20dB calibrated attenuators. If coupler calibration known set up as in step 9 and go to step 6



5. Zero power meter. Calibrate and apply measurement offset for operational frequency if applicable.
6. On the AS4020 go to Top Menu >Setup Menu >RF Menu>RX Sensitivity. Set RX to 2500
7. Put AS4020 Shelf into test mode **Off** and then into test mode 3. (from AS4020 menu select Setup Menu/RF Menu/RF Commissioning)
8. Configure the DACU using AS7020STMON according to modem shelf properties to the correct frequency, PN code and ID number prior to entering test mode. If the frequency can be entered using STMON then the FP command in the step 12 is not necessary). If coupler calibration known go to step 11. The commissioning procedure described in this document is not restricted to any particular RF channel or PN code. However the user should make sure that both the CT and ST are programmed with identical RF channel and PN code.
9. Using the values of the calibrated attenuators and cable calculate the loss of the attenuators and cable between the DACU and CT as per diagram above: Note the power meter reading.



10. Replace the calibrated attenuators with the coupler and note the power meter reading. If the power meter is more than the previous one then the difference should be added to the sum of the attenuator values and of less it is subtracted from the sum of the attenuator values. This new value represents the attenuation of the coupler. Attach a label with loss value to the coupler.

a	Sum of calibrated attenuator losses	
b	Power meter reading with calibrated	

	attenuators	
c	Power meter reading with coupler	
d	Difference between readings	
e	**Coupler loss** if [c] is greater than [b] then subtract [d] from [a] if [c] is less than [b] then add [d] to [a]	

Table 2

11. Populate the table below with values obtained from calibrated components and planned levels to calculate/determine overall path loss and required ST output power and hence required power meter reading.

RF Channel No:		
RF Section	Cable Loss**(1)**	
	Coupler loss loss.**(2)**	
	Loss Antenna- CT(DACU RF Module).**(3)**	
	Sub Total **(4)** = **1+2+3**	
	Required CT RX Level **(5)** See table 1 above.	
	DACU RF Power **(6)**=4+5	
RF Section	Loss Antenna - Power Meter **(7)**	
	Power Meter **(8)** = 6-7	

Table 3

12. Make the test ST transmit by sending the following LAT commands from a terminal emulator connected to the DACU
    TE<space> 0<space> 4<space> 59 (this code sets the uplink modulation rate for the ST for other required modulations replace the 59 with the session ids shown in table 1 above and should be set to the maximum modulation rate required)
    FP <space>channel number (in decimal)
    W<space> 0400003C

13. The terminal emulator should receive 0000000B for the uplink if the ST has acquired a link.
14. On the AS4020 top panel go to Top Menu >Setup Menu >RF Menu>RX Sensitivity
15. Set RX gain by increasing/decreasing the value of RX sensitivity to achieve required ST o/p level calculated as (8) in the table above for the required RX Level measured on the power meter.
16. Record the value set in the test results

Link check

1. Enable the equalizer by typing the following LAT commands
   ADE 1 10 (this enables the downlink channel equalizer and it should converge within 10 seconds)
   ADS (this command displays the equalizer stats).
   When the equalizer is adapting the stat reports Enabled = 1 Converged = 0
   When the equalizer is adapting the stat reports Enabled = 0 Converged = 1 (the 0 for

enabled does not mean that the equalizer is disabled but that the training of the equaliser is finished.)
Check that the equalizer converges OK.

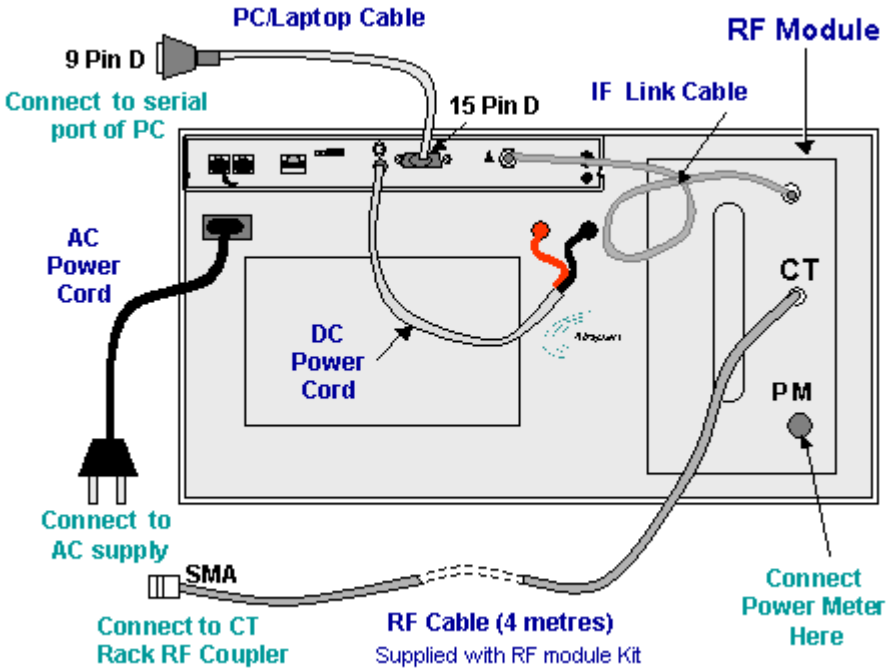
2. From the ST LAT type TE1 to exit commissioning mode
3. From the AS4020 front panel exit commissioning mode by selecting RF Commissioning = Off.

Connecting the DACU

The following cables are provided with the DACU.

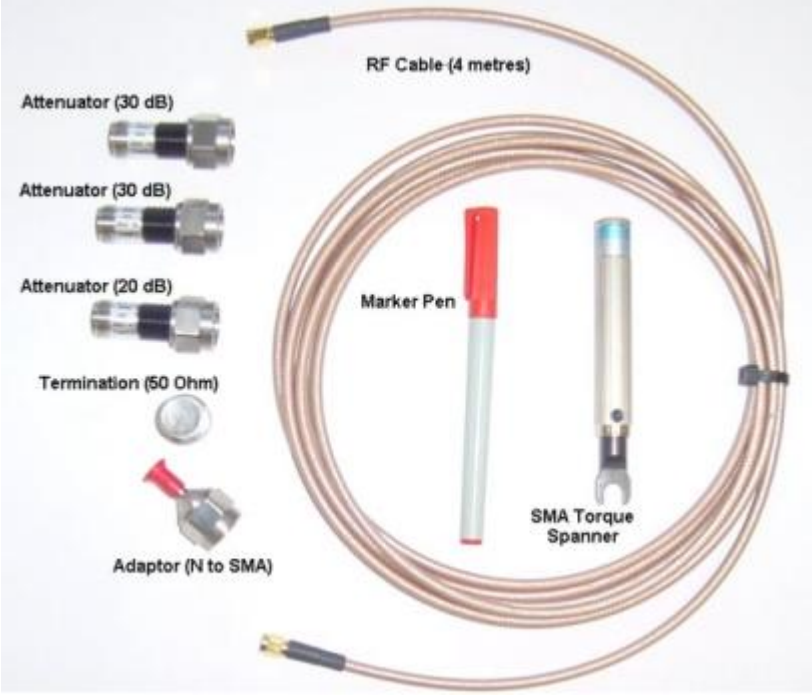
Airspan DACU Kitting List		
Description	Qty	Comment
DC Power Cord	1	Connects the dc power supply from the red and black 4mm sockets on the DACU, labelled “+” and “-“ to either the IDU dc power jack, labelled “12V ---- 1.5A”, or an external IDU dc power jack
AC Supply Cable	1	Supplies mains to the C7 style (figure of 8) mains input on the main DACU chassis, labelled “AC”
PC Laptop Cable	1	Connects the 15-way D-Type socket on the IDU, labelled “MAINTENANCE”, to the 9-way serial port socket on a PC or laptop
IF Link Cable	1	Connects the IF socket on the IDU, labelled with an antenna symbol, to the IF socket on the RF Module, labelled “IF”
Hexagonal Key		Used to remove/replace the battery cover or RF Module from the main DACU chassis
Laminated Kitting / Connection sheet	1	A sheet showing a labelled photograph of all the DACU Kit items, underneath which there is diagram showing how all the interfaces are connected up.

Connect the cables as shown in the illustration below



Fit the RF Module

The RF module is inserted into the compartment on the right of the DACU. it is secured using two hexagonal headed screws.



Airspan RF Module Kitting List		
Description	Qty	Comment
RF Cable (4 metres)	1	Connects the coupler on the CT rack to the SMA socket on the RF Module, labelled “CT”
Attenuator (20dB), 5W	1	Direct to combiner (first in line)

Attenuator (30dB), 5W	2	Second and third in line from combiner
Adaptor (N to SMA)	1	Needed to connect N-type pads to 4m cable
SMA Torque spanner	1	To tighten SMA's
Termination (50 Ohm)	1	Terminates an unused power meter port
Laminated Kitting / Calibration sheet (front)	1	A sheet showing a labelled photograph of all the RF Module Kit items, underneath which there is a table to fill out all the calibration details.
Laminated Pro-forma worksheet (on reverse of above)	1	To calculate overall insertion losses between CT and DACU RF Module
Marker Pen	1	To fill in calibration details on laminates

Set RX Sensitivity without a DACU

Tools and equipment needed.

Item	Description	Recommended Model	Quantity
1	Digital Multimeter	Fluke 77	1
2	ST Test Unit,	SIU with Modified Antenna at appropriate band	1
3	30dB Attenuators; 5W	Mini Circuits: BN-N30W5	2
4	30dB Attenuators; 2W	M/A-COM:2082 6044 30:2W	2
5	Two Way Power Divider	Mini Circuits: ZAPD-4-S	1
6	50 ohm Termination 10W	Arra N9510	1
7	Adaptor; N-SMA	Huber & Suhner 33N-SMA-50-1	1
8	Adaptor; N-SMA	Huber & Suhner 31N-SMA-50-1	1
9	Co-ax Cables	Huber & Suhner Sucoflex 104; 0.5m	2
10		Huber & Suhner Sucoflex 104; 4.0m	1
11	Cable SMA-MCX	Huber & Suhner 30-05918-10	1
12	RF Power Meter	Marconi 6970	1
13	Power Sensor	Marconi/RFI 6970&5 6932/900	1

RX Sensitivity (Test 6)

The RX sensitivity is set according to the required CT RX level. It is important to note that the lower the modulation rate the further the geographical spread. For maximum range the AS4020 should use QPSK 1/2. Higher data rates may be achieved using higher orders of modulation but the range will lessen as the modulation rate increase. This level is determined as part of the planning function and takes into consideration the highest modulation rate to be offered and the noise floor predicted in the planning stage.

The RX Level is set dependant on the highest operational modulation rate as follows. By undertaking an appropriate level of RF planning the level is optimised in order to balance uplink data rate and system range.

Typical levels are shown below for two network configuration scenarios:
For networks where only a single RF Channel is operating, or only adjacent + one RF Channels are used (no co or adjacent channel interference), the following CT Rx levels apply:

Modulation Code	Rate	Rx Level (dBm / RW)		Session ids for LAT TE command in Mode 3
		Below 3GHz	Above 3GHz	
QPSK	1/2	-105 dBm	-103dBm	58 or 59
QPSK	3/4	-103 dBm	-101dBm	56 or 57
16QAM	1/2	-97 dBm	-95dBm	54 or 55
16QAM	3/4	-93 dBm (see note 1)	-91dBm	52 or 53
64QAM	3/4	Not supported on the uplink		

Table 1

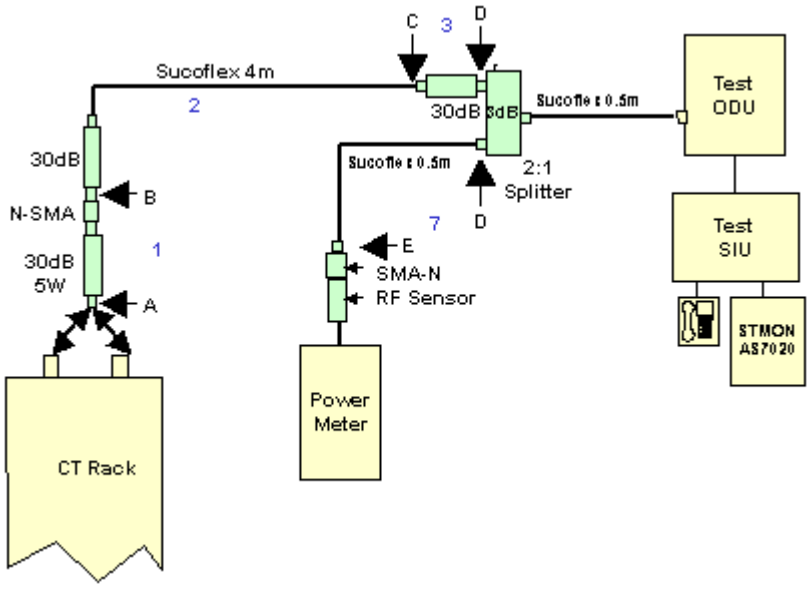
Note 1: Note, 16QAM ¾ is only supported on the uplink with up to 7RW Codes Active.

For networks where co or adjacent frequencies are reused to provide cellular type network coverage with limited available spectrum (ie. A relatively high level of co and adjacent channel interference), the following CT Rx levels apply:

Modulation Code	Rate	Rx Level (dBm / RW)		Session ids for LAT TE command in Mode 3
		Below 3GHz	Above 3GHz	
QPSK	1/2	-103 dBm	-100dBm	58 or 59
QPSK	3/4	-101 dBm	-98dBm	56 or 57
16QAM	1/2	-94 dBm	-92dBm	54 or 55
16QAM	3/4	-90 dBm (see note 1)	-88dBm	52 or 53
64QAM	3/4	Not supported on the uplink		

Table 1a

1. To set the receive sensitivity, first set up a test network for the band under test as shown below. The figure below shows a typical test setup with test equipment connected directly to the outputs of the DIP/LNA and DIP/LNA2 as would be the case for systems without a RF coupler.



Test Set-up

2. Zero power meter. Calibrate and apply measurement offset for operational frequency if applicable.
3. On the AS4020 go to Top Menu >Setup Menu >RF Menu>RX Sensitivity. Set RX to 2500
4. Put AS4020 Shelf into test mode **Off** and then into test mode 3. (from AS4020 menu select Setup Menu/RF Menu/RF Commissioning)
5. Configure the Test SIU using AS7020STMON according to modem shelf properties to the correct frequency, PN code and ID number prior to entering test mode. The commissioning procedure described in this document is not restricted to any particular RF channel or PN code. However the user should make sure that both the CT and ST are programmed with identical RF channel and PN code. If the frequency can be entered using STMON then the FP command in the step 12 is not necessary)
6. Measure and calibrate the loss of all components shown in the diagram above. To measure the losses of components use the TX output as a reference source. Measure the TX output and place figure in table below.. Connect each component in

turn between the TX output and the power meter and measure the loss added as the component is inserted. Measure (1)A-B, (2)B-C, (3)C-D and (7)D-E.

7. Calculate and enter values in calibration chart for the relevant frequency.

RF Channel No:		
Ref TX output		
RF Section	A-B Atten.**(1)**	
	B-C Atten.**(2)**	
	C-D Atten.**(3)**	
	Sub Total **(4) 1+2+3**	
	Required CT RX Level **(5)** see table 1	
	ST TX Power **(6**)=4+5	
RF Section	D-E Atten **(7)**	
	Power Meter **(8)** = 6-7	

8. Calculate/determine overall path loss and required ST output power and hence required power meter reading.
9. Connect cables as per diagram above. Try to ensure that the network is set to reduce the amount of radiated pick up. To ensure that it is the receive path that is being measured and not pickup place an attenuator (6dB) into the network and check that the meter falls by a corresponding amount. If it fails to do so additional screening of the test network is probably required.
10. Connect a terminal emulator to the ST.
11. Make the test ST transmit by sending the following LAT commands from a terminal emulator connected to the ST
    TE<space> 0<space> 4<space> 59 (this code sets the uplink modulation rate for the ST see table 1)
    FP <space>channel number (in decimal)
    W<space> 0400003C
12. The terminal emulator should receive 0000000B for the uplink if the ST has acquired a link.
13. On the AS4020 go to Top Menu >Setup Menu >RF Menu>RX Sensitivity
14. Set RX gain by increasing/decreasing the value of RX sensitivity to achieve required ST o/p level as calculated in step 8 for the required RX Level.
15. Record ST o/p level and value set.

Link Check

9. When the link has successfully acquired enable the equalizer by typing the following LAT commands
    ADE 1 10 (this enables the downlink channel equalizer and it should converge within 10 seconds)
    ADS (this command displays the equalizer stats).
    When the equalizer is adapting the stat reports Enabled = 1 Converged = 0
    When the equalizer is adapting the stat reports Enabled = 0 Converged = 1(release 7.2x) or Enabled = 1 Converged = 1(release 7.3x)
    Check that the equalizer converges OK.
10. From the ST LAT type TE1 to exit commissioning mode

11. From the AS4020 front panel exit commissioning mode by selecting RF Commissioning = Off.

Packet System Testing

Data Tests

To pass Ethernet traffic through the AS4020 system, it will be necessary to transfer data between a Server connected to the “Traffic” Ethernet port of the AS4020 CT, and a PC connected to an ST. To test basic functionality, the following throughput speed tests are performed.

Test Method & Results:

Windows 2000 has a built-in FTP server. This is simple to use, free, and readily available, therefore ideal for setting up a test system to measure AS4020 performance. However this must be installed and activated before use. Also, some suitable test files must be added to the FTP “home directory”, appropriately sized for transferring through the AS4020 system. The FTP command-line client program (also included with Windows 2000) can be used for the transfers.

The following tests assume that the FTP server has been set up, test files are available, and that the method of measuring download speed used is as described in Annex A. The modulation scheme in use can be found in the “ST Packet Line Classes” section of the “Global Setup” tree, on the left hand side of the main NetSpan window.

The downloads can be automated into a batch file for ease of use – this way the test can be run simply by double-clicking on the batch file, which is more convenient than downloading “by hand”.

Equipment Required

2 PC’s with NIC cards enabled.
FTP Software (Windows FTP or use DOS prompt)
Windows 2000 Server Software
Access to the CT over the radio interface from a ST

Setting up FTP Server PC

1. Open the Control Panel (Start -> Settings -> Control Panel);
2. Open the “Add/Remove Programs” tool;
3. Click on the “Add/Remove Windows Components” button, found on the left side of the window;
4. Select “Internet Information Services (IIS)” and click on the “Details” button;
5. Make sure that the tick boxes are selected for the following subcomponents : “Common Files”, “File Transfer Protocol (FTP) Server” and “Internet Information Services Snap-In”. It is not necessary to install (or uninstall) any other subcomponents, as they are independent from the FTP Server;
6. Click “OK” on this dialog box, and then click on the “Next >” button. Installation will start, and may take a few minutes to complete.

Note: The Installer program will probably need to copy some files from a Windows 2000 Installation CD. If you do not have a CD, it is possible that the installation files will have been previously copied to the hard drive of the PC. If this is the case, search the hard drive for a directory called “i386” and Browse to this directory when prompted for a CD by the installer wizard.If necessary fit NIC card to PC.

Configuration of the FTP Server:

The FTP Server needs a home directory – this is where the "root" of the FTP server will be located, and where the files will be downloaded from. These steps detail configuring the directory location, and additionally some other required parameters such as access rights:
1. Right-Click on the "My Computer" icon on the desktop, and choose the option "Manage". Note: It is possible that the icon will have been renamed, but is usually the blue computer icon positioned at the top-left of the desktop.
2. In the "Computer Management" window that will appear, on the left side is a tree view. Near the bottom of the tree view, expand the "Services and Applications" branch.
3. Under the "Services and Applications" branch, expand the "Internet Information Services" branch.
4. Right-click on the "Default FTP Site" icon that will appear, and choose the "Properties" option.
5. Working through all of the options, set up the FTP site as follows. Note, not all available options are described here - where an option isn't described below, it is not relevant to this configuration. If you change an option as a result of following this table, you may want to make a note of it so that the PC can be returned to the original settings when you have finished testing:

FTP Site Tab:

IP Address	(All Unassigned)
TCP Port	21
Connection Limited to:	10
Connection Timeout	900
Enable Logging	Disabled. Do not tick the box.

Security Accounts Tab:

Allow Anonymous Connections	Enabled. Tick this box. Warning: Anonymous FTP access: The above instructions will allow all computers to have Anonymous read, and more importantly write, access to the directory used for the root of the FTP Server. This is clearly not a desirable mode in which to leave the PC when testing is completed. Airspan recommends as a minimum to turn off "write" access, via the "Home Directory" Tab.

Home Directory Tab:

A directory located on this computer	Select this option, as we will be downloading files from this PC.
Local Path	The drive must be a local hard disk, and have 40Mbyte free space (100Mbyte recommended). Make a note of the path, as it is required in the next section. For convenience you may wish to record it here:
Read / Write / Log Visits	Enable Read and Write, Disable Log Visits. Warning: Anonymous FTP access: The above instructions will allow all computers to have Anonymous read, and more importantly write, access to the directory used for the root of the FTP Server. This is clearly not a desirable mode in which to leave the PC when testing is completed. Airspan recommends as a minimum to turn off "write" access, via the "Home Directory" Tab.

Creating suitable download / upload test files:

Due to the high transfer rates possible with the AS4020 system, suitably sized test files should be transferred. The recommended test file sizes are of the order of 1Mbyte (uploading) and 10Mbyte (downloading).
We must also ensure that any file compression does not result in files appearing to be transferred faster than they actually are. The recommended method for performing the transfer tests (described in the next section) uses an FTP method that transfers files in binary mode, without compression. However, as other utilities may not do this, the test files should not be compressible.
To assist with this, Airspan provides a utility for generating uncompressible files of varying sizes. Inside the .zip file embedded below are two files – "filegen.exe" and "generate.bat". If you do not have an electronic copy of this document, you can request the embedded .zip file by email. Send your request to support@airspan.com

Instructions:

1. Unzip the embedded .zip file. The files "filegen.exe" and "generate.bat" should be placed into the FTP Site Directory that was recorded in the previous section.
   Note: Use Windows Explorer to check that the files are in the correct location. Do not use the "right-click" option to "Extract to folder …\FTP test file generation", because a new subdirectory will be created and the files placed there. You can use Windows Explorer to move the files to the correct location if you have used this method to extract the files, or have extracted them elsewhere on the hard disk.
2. Defragment the partition of the hard disk which contains the FTP Site Directory:
   a. Opening Windows Explorer select the Drive letter containing the FTP Site Directory;
   b. Right-Click on the drive letter and choose "Properties";
   c. Select the "Tools" Tab at the top;
   d. Press the "Defragment Now…" Button;
   e. When the defrag program opens, press the "Defragment" button.
   Note: This may take many minutes to run, and may require some disk space to be freed if there is less than 15% free disk space.
3. When the defragmentation is complete, navigate to the FTP Site Directory using Windows Explorer.
4. Double-click on the "generate.bat" file.

Note: For information - The "filegen.exe" program takes the command line parameters denoting the filename and size in Kbytes, and creates files containing random data (hence the files cannot be compressed at all, they will grow in size if "zipped"). The "generate.bat" batch file repeatedly calls the "filegen.exe" to create a set of uncompressable files of varying sizes. You may wish to edit this file if you need different file sizes. The batch file will generate the following files:

File Name	File Size (Bytes)
100K	102,400
200K	204,800
500K	512,000
1M	1,048,576
2M	2,097,152
5M	5,242,880
10M	10,485,760

These numbers follow the binary data store convention of 1KB = 2^10 Bytes, 1MB = 2^20 Bytes.
The file generation process will take approximately 30 seconds to complete, depending on the specification of the Server PC.

Using the FTP Client, and automating the transfers:

To perform the data transfers, an FTP Client running on a PC connected to an ST will download and upload data files to the FTP Server running on a computer connected to the same network as the Traffic Port of the AS4020. To avoid the influence of other network traffic, all other computers on the network should be disconnected. If this is not possible, disconnect from the network, and connect the FTP Server directly to the Traffic Port of the AS4020 using a crossed Ethernet cable.

The Traffic Port should be set to 100Mbit/sec, half-duplex mode. The FTP Server PC's Ethernet port should be set to "Auto Speed, Auto Duplex", or alternatively to 100Mbit/sec, half-duplex.

It is recommended to use the command-line FTP Client which is included with all versions of windows, as this will already be available on the PC (as it is installed at the same time as the TCP stack) and gives a speed result at the end of the transfer.
The FTP Server PC and the FTP Client PC must have IP addresses in the same subnet. If the PCs can "ping" one another, then they will be able to perform FTP transfers between them. Note that when measuring uplink speeds (i.e. in the direction from the ST to the AS4020), it is not necessary to run an FTP Server on the ST. Instead the FTP Client on the PC connected to the ST will perform an FTP upload to the Server.

Note: It is possible that an FTP download could be cancelled or aborted part way through (a number of reasons could cause this). If this is the case, the partly transferred file will reside on the hard disk, and will have the correct name but will not have the expected file size. Therefore the file sizes should be checked before any transfers are made. The files can easily be rebuilt simply by running the "generate.bat" batch file described in the previous section. Alternatively, when transferring files, make sure to choose a different destination filename – i.e. when downloading a file called "1M", save it as "1M_downloaded". This is described in more detail below.
The following instructions for performing the transfers assume that the IP addresses of the Client and Server PC are in the same subnet and can ping one another through the AS4020 system.

Create a working directory containing test files:

1. Create a working directory: Make a new directory on a hard drive with at least 40MB free disk space. You can do this with Windows Explorer by selecting the hard drive letter and choosing "File -> New -> Folder". Rename the folder as appropriate (e.g. "FTPtests").
2. Copy the "Filegen.exe" and "generate.bat" files into this directory and run the "generate.bat" batch file (this is described in greater detail in the previous section). This will create a set of files which can be used for upload measurements.
3. Performing a manual file transfer: Open a command prompt window. This can be achieved by following the menu "Start -> Programs -> Accessories -> Command Prompt", or by opening the "run" box (Press the "Windows" keyboard key and the letter "R" simultaneously) and typing in "cmd" and pressing Enter.
4. Navigate to your working directory, for example if the new folder created in step 1 was "C:\FTPtests", enter the following commands (all commands shown below should have either the "Return" or the "Enter" key pressed after typing them):
   c:
   cd \FTPtests
   The command prompt will show the directory in which you are working.
5. Run the FTP Client and instruct it to connect to the IP address of the FTP Server. For example of your FTP Server IP address is 10.0.60.1, enter:
   ftp 10.0.60.1

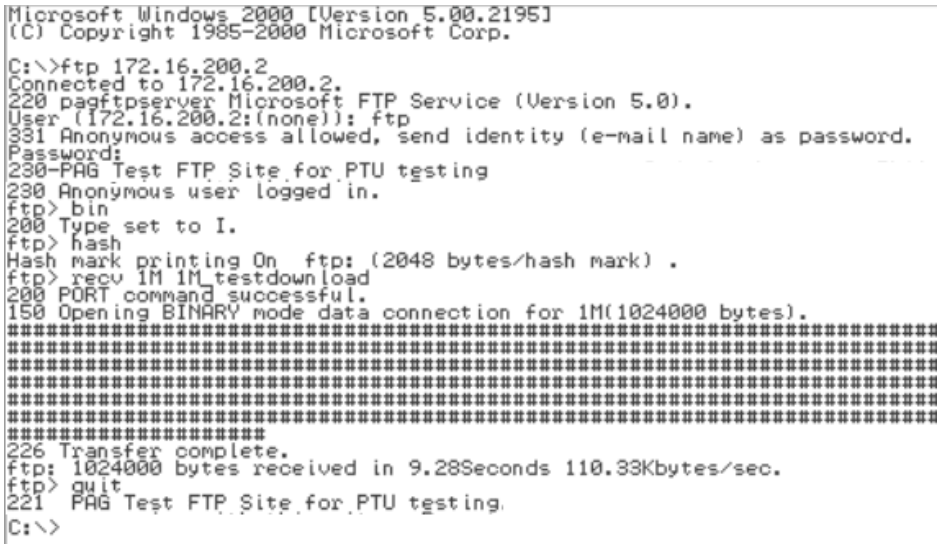
6. The Server will ask for a username and password. Enter the username “ftp”, and the password can be anything, even left blank if the FTP Server is set up as described earlier.

   Note: A blank anonymous password will not work on all types of FTP server, some may require a correctly formatted email address (e.g. a@b.com) as the password. Also, the username ftp is equivalent to typing the username anonymous.

7. Switch the transfer mode to binary, by entering the command bin;

8. Turn on “hash marking”, by entering the command “hash”. This will print “#” symbols across the screen when the transfer is in progress.

9. Transfer a file: The command to receive a file is “recv”, and to send is “send”. Following the command you must enter the name of the file to transfer, and optionally also the name to call the file when it has arrived.
   For example, to send a file called “500K”, enter:
   send 500K
   And to receive a file called “2M”, and locally rename it to “2M_downloaded”, enter:
   recv 2M 2M_downloaded
   Note: Some FTP servers are case-sensitive, this is a common reason for a failed download. Remember that Windows does not always display file names with their names in the correct case. To see a list of files in the current directory of the FTP Server, and their exact case sensitive names and file sizes, enter the command “ls –l” (short for: list directory contents, using long format). You can use this command to make sure the files you are intending to transfer are the correct length for the test you wish to perform.
   a. Wait for the transfer to complete. You will see “#” symbols scrolling across the screen, at a rate proportional to the file transfer speed. You can cancel the transfer by pressing CTRL + C, although the system will take a few seconds to take action and close down the transfer.
   When the transfer is complete, the session will show you the transferred speed. An example transcript from Airspan’s Product Applications Laboratory is shown in the screenshot below:



Note: As the FTP Client shows the speed at which the data in the file was transferred, it will not show you the actual data throughput over the air interface. This is because an allowance of 3.7% must be made to include the protocol headers encapsulating the data. A description of these overheads and the 3.7% calculation is shown in the technical note at the end of this section, along with details of other overheads to consider. Referring to the transfer speed in the screenshot above, the data transfer above resulted in an Ethernet frame throughput to the FTP Client of:
110.33KBytes/sec * 1.037 = 114.4KBytes/sec, or 915.3KBits/sec.

Please refer to the technical note at the end of this section, explaining why the figure will be less than the theoretical maximum data rate available.

10. To exit from the FTP program, type “quit” at the prompt

Creating batch files for automatic File Transfers:

As mentioned earlier, it will be much more convenient to have test batch files which will automatically perform a file transfer, and then pause to show the results. The command-line FTP program described above can be instructed to use a script file with a set of commands, thus preventing the need to type them every time.
Included in the embedded .zip file below are sample files to perform a 10Mbyte download, and a 1Mbyte upload. They are explained below, and if you use them you will need to unzip them into your working FTP directory, and then edit them to use an appropriate IP address for your FTP Server. The files are very small and easy to create, if you do not have a paper copy of this document

The FTP program can be invoked using the syntax:
ftp –s:filename Where “filename” specifies a text file containing FTP commands; the commands will automatically run after FTP starts.
The commands will be almost identical to those used in the “manual” method above, the difference is the use of the “open” command to connect the FTP program to the FTP server. A worked example (note text after the // are comments and must not be included in the file):

Contents of “10MB_Download.bat”

```
ftp -s:10M_Download_Script.txt      // invoke the FTP program using a script
pause                               // wait for a key press, so you can see the results
```

Contents of “10M_Download_Script.txt”

```
Open 10.0.60.1                      // Server IP address: change this to match yours
ftp                                 // Username for anonymous access
dummypassword@xyz.com               // A password, in “email” format
bin                                 // Change to Binary mode
hash                                // Turn on “hash marking”
recv 10M 10M_ downloadedfile        // Get the file “10M” and rename it locally
quit                                // Exit the program
```

To automatically send a file, you will also need another batchfile to call the FTP program with a different script file. The script file will be the same as the one above, except the “recv 10M 10M_downloadedfile” command will be replaced with, e.g. “send 1M 1M_uploadedfile”.
Technical Note: An explanation of Ethernet, and Airspan protocol overheads in FTP transfers:
The structure and relative sizes of the different portions of an Ethernet frame vary, but a full sized FTP data transfer Ethernet Frame is 1514 Bytes, consisting typically of:

1. 14 Bytes Data Link Control (layer 2 of the OSI 7 Layer model): Containing 6 bytes each of source & sestination MAC addresses, and 2 bytes Ethertype – in this case IP;
2. 20 Bytes Network Layer (layer 3 – in this case IP):Containing source and destination IP addresses, and other information such as IP version, Length, TTL, protocol, checksum, and several flags;
3. 20 Bytes Transport Layer (layer 4 – in this case TCP):Containing source & destination Port numbers, sequence and ACK numbers, TCP Receive Window size, User Data offset position, a checksum, and some flags;
4. 1460 Bytes Application Layer (layer 7 – in this case FTP) – the actual file contents being transferred.

Therefore the “Ethernet” overhead is 100*1514/1460 = 3.7%

Additionally, there is an overhead associated with Airspan’s air interface. The data is sent in small blocks, transmitted every 4ms on multiple RW channels simultaneously. Additionally, an ST can receive up to 4 blocks simultaneously. Each block has a 4 byte overhead.

The number of bytes in a block depends on the modulation scheme being used, as per the table below (showing the total bytes/block, including the 4 byte overhead):

Modulation	Total Bytes/Block
QPSK ½	64
QPSK ¾	96
16QAM½	128
16QAM¾	192
64QAM ¾	288

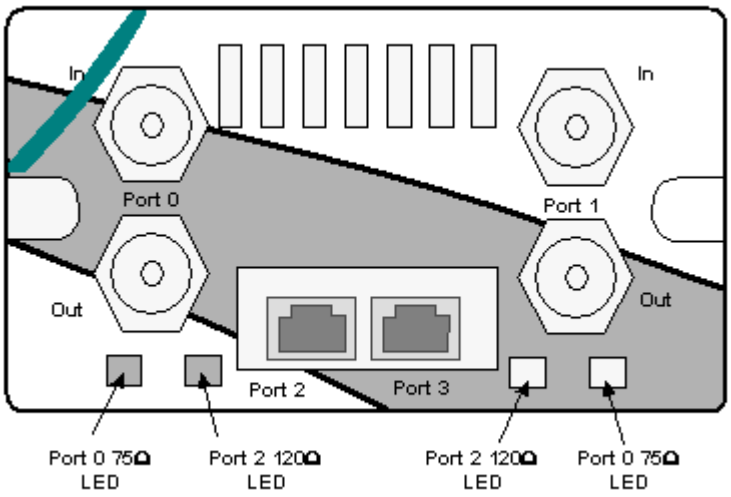
As the Ethernet frame size is unlikely to be an exact multiple of the useable Bytes/Block, there will be an additional overhead, as the block containing the last section of an Ethernet frame will have some unused bytes, not completely filled by the end of the frame.

Adding the overheads together results in the target throughput figures quoted in the test plan. These numbers have been chosen as realistic figures that should be achieved under laboratory test conditions.

Voice Option Testing

Option Module Test

It is only possible to fully test the voice module if the installation of the AC and the backhaul connections to the switch are in place. Netspan also needs to be connected. The card is set for 120ohm or 75ohm dependant on the type of backhaul selected on Netspan. When connected to the AC using the correct impedance port the relevant LED should be green. A red LED signifies link disconnection, and an amber LED signifies link present but faulty. Check that the module responds to disconnection of a link. If a switch test is to be undertaken the CT should be connected to a DACU and a voice call made from the DACU to the switch.



Central Terminal Rack Commissioning Test Results

Please photocopy test results sheet for use with each system
CUSTOMER:
SITE LOCATION:
RACK ID:
ENGINEER:
DATE:

Test Equipment Calibration

1.

Item	Description	Model	Serial No	Calibration Date
1	Digital Multimeter			
2	RF Power Meter			
3	Power Sensor			
6	Test ST/DACU			
7	60dB Variable Attenuator			
8	3dB Attenuator; 2W			
9	30dB Attenuator; 1W			
10	30dB Attenuator; 1W			
11	30dB Attenuator; 2W			
12	30dB Attenuators; 2W			

DACU Calibration

Item	Description	Output/loss	Serial No	Calibration Date
1	DACU			
2	RF Coupler Loss			
3	RF Cable loss from DACU to coupler			

Note: The cable supplied with each DACU is calibrated for a range of frequencies. If a cable other than the original cable is used then an adjustment to the DACU output power to 98dB at the receiver must be made. i.e. If the substitute cable has a 1dB less loss than the original cable the output power for 98dB at the CT shown on the DACU needs to be reduced by 1dB from the value shown on the DACU calibration label

Serial Number and Rev Level Record

Rack ID		
Card Type	**Serial Number**	**Rev Level**
Combiner Shelf		
RF DIP/LNA1		
RF DIP/LNA2		
RF Card 1		
RF Card 2		
RF Card 3		
RF Card 4		
PA1		
PA2		
MON1		
MON2		
PSU1		
PSU2		

PSU3		
Modem Shelves		
AS4020 shelf 1		
AS4020 shelf 2		
AS4020 shelf 3		
AS4020 shelf 4		

Rack ID				
TEST #	**TEST**		**LIMIT**	**RESULT**
Site Inspection & Verification				
	T1/E1Cabling	Modem Shelf 1		
		Modem Shelf 2		
		Modem Shelf 3		
		Modem Shelf 4		
System Commissioning Tests				
Test 1a	Exchange DC Voltage	CT Rack Supply 1	-36.0 to -60.0V DC	
		CT Rack Supply 1		
		Extn Rack Supply 1		
		Extn Rack Supply 2		
Test 1b	Exchange DC Voltage	CT Rack Supply 1	-36.0 to -60.0V DC	
		CT Rack Supply 2		
		Extn Rack Supply 1		
		Expn Rack Supply 2		
Test 2	PSU 1 Output Voltage		13.5 VDC ; +/-500mV	
	PSU 2 Output Voltage		13.5 VDC ; +/-500mV	
	PSU 3 Output Voltage		13.5 VDC ; +/-500mV	

AS4000- ACCESS CONCENTRATOR ACCEPTANCE FORM
CONTRACT OR CUSTOMER'S REF. NO:

AIRSPAN NETWORKS REF. NO:
SITE IDENTITY:

The Customer accepts that the following equipment has been supplied, installed and tested.

Customer Representative
Name:_____ **Position:**_____
Date:_____ **Signature:**_____
Airspan Representative
Name:_____ **Position:**_____
Date:_____ **Signature:**_____

Airspan COPY

AS4000- ACCESS CONCENTRATOR ACCEPTANCE FORM

CONTRACT OR CUSTOMER'S REF. NO:

AIRSPAN NETWORKS REF. NO:

SITE IDENTITY:

The Customer accepts that the following equipment has been supplied, installed and tested.

Customer Representative
Name:_____ **Position:**_____
Date:_____ **Signature:**_____
Airspan Representative
Name:_____ **Position:**_____
Date:_____ **Signature:**_____

CUSTOMER COPY

Customer Material Repair and Return Procedures

Introduction

This document describes the procedures, responsibilities, and terms and conditions for the repair and replacement services offered by Airspan Communications Limited (Airspan) to its customers and approved contractors. It shall apply only to Field Replaceable Units (FRUs) manufactured or supplied by Airspan Communications Limited.
For the purpose of this document, FRUs comprise those units and Printed Circuit Boards (PCBs) normally replaceable at the site by disconnection/reconnection, but excluding consumables and frame assemblies.
Where the contents of this document conflict with the contract of purchase, the requirements of the contract of purchase shall govern.

Purpose of Document

The purpose of this document is to describe the actions that a customer needs to return a suspect faulty unit is returned to Airspan for repair or replacement. It details what actions need to be taken by Airspan and their Customers to ensure a clean flow of product.

Forms Required

The following forms are used when returning material for repair:

- Return and Repair Tag
- Defective Equipment Information Form

Responsibilities

Airspan is responsible for:

a. Informing the customer of any FRU that is not repairable due to misuse, miscarriage or expiry of the warranty agreement.
b. Handling returns and replacements and performing all repair work to established quality procedures.
c. Carrying out repair or replacement within the time-scales defined in this document.
d. Ensure a sufficient rotapool stock is maintained to support FRUs for up to 10 years after they cease to be in production.

The customer is responsible for:

a. Ensuring that any FRU containing Electrostatic Sensitive Devices (ESDs) are handled and packaged according to the requirements of specification BS EN100015 or an equivalent standard applicable in the customer's country.
b. Providing with the FRU the documentation detailed below.
c. Ensuring that the operating environment of any FRU has not exceeded the manufacturer's recommended environmental specifications.
d. Ensuring that any electrical apparatus connected to a unit meets the necessary BS EN 41003: 1993 specification or an equivalent standard applicable in the customers country.
e. Ensuring that the manufacturer's installation and handling procedures have been followed correctly.

General

The customer bears the risk associated with any FRU returned for repair or replacement until Airspan receives the item. The customer bears the cost of delivery of the FRU for repair
Airspan bears the risk associated with the return of a repaired FRU or replacement until the customer has taken delivery of it. The title for any repaired or replaced unit passes to the customer on delivery, providing that the appropriate payment has been made to Airspan.
Airspan reserves the right to charge the customer the full repair charge or the full list price of the FRU, as appropriate in the circumstances, if the customer has violated any applicable standards and precautionary measures.
Airspan reserves the right to modify or update these repair and return procedures.

Definition of Warranty

In-Warranty

Airspan warrants that the Equipment it supplies will be free from defects in materials and faulty workmanship and that the Software it licenses to the customer will conform in all material respects to Airspan's published specifications therefor for a period of twelve (12) months from date of shipment by Airspan to the customer (the "Warranty Period"). In no event will Airspan be obliged to provide on-site maintenance under its warranty. Airspan shall, at its option, offer to repair or replace any itemFRU within the Warranty Period without additional charge provided that:

a. Inspection by Airspan Goods In confirms that the returned item has been packaged securely and according to all applicable standards, and that the item is of a recognised build standard.
b. Inspection of the returned goods by Airspan indicates that the defect was not caused by maintenance, repair, or alterations by other than Airspan or their authorised agents, or by abuse or improper use.
c. Notice of the claimed defect is given in writing to Airspan within one (1) year after delivery.
d. The necessary fault information detailed below is enclosed with the returned item.

If any of the conditions in sections a, b, and c above are not met, Airspan reserves the right to charge the customer the full standard repair charge for that item.

Out-of-Warranty

Any FRU supplied or manufactured by Airspan shall be deemed to be out of warranty if a period of more than twelve months from date of delivery to the customer has elapsed or:

a. Inspection by Airspan indicates that the returned item has not been packaged securely and according to all applicable standards (in particular BS CECC-00015:part1: 1991), or that the item has been changed and is not of a recognised build standard.
b. Inspection of the returned goods by Airspan indicates that the defect was caused by maintenance, repair, or alterations by other than Airspan or their authorised agents, or by abuse or improper use.
c. Notice of the claimed defect was not given in writing to Airspan within one (1) year after delivery.

Warranty Period on Repaired FRUs

Normal Repair In-warranty

The warranty period for an FRU repaired or replaced by Airspan under warranty shall be ninety (90) days from the date of shipment by Airspan or until the end of its original Warranty Period, whichever is the greater.

Normal Repair Out-of-warranty

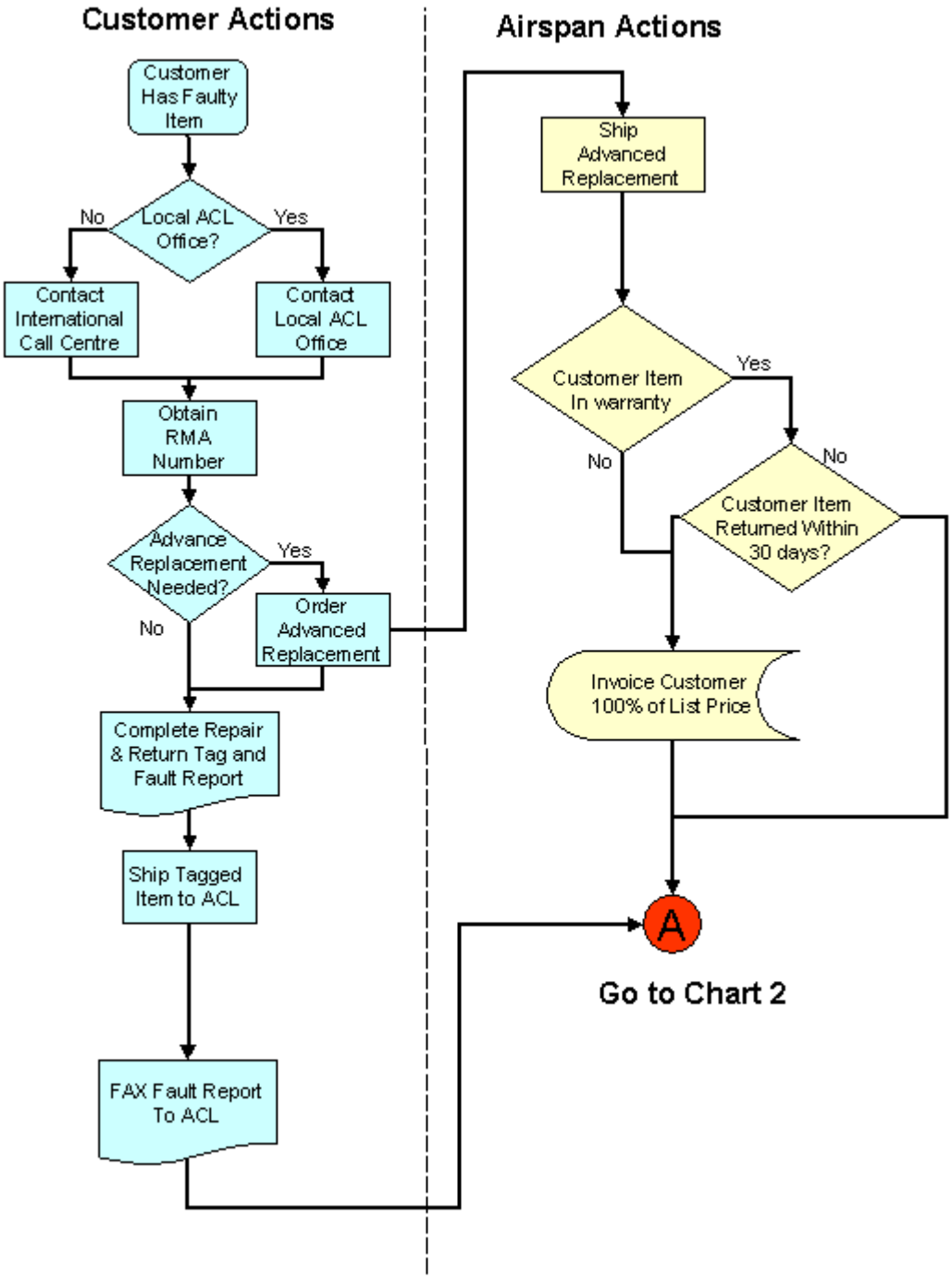
a. The warranty period for a FRU repaired or replaced out of warranty shall be ninety (90) days from the date of shipment of the item by Airspan to the customer.

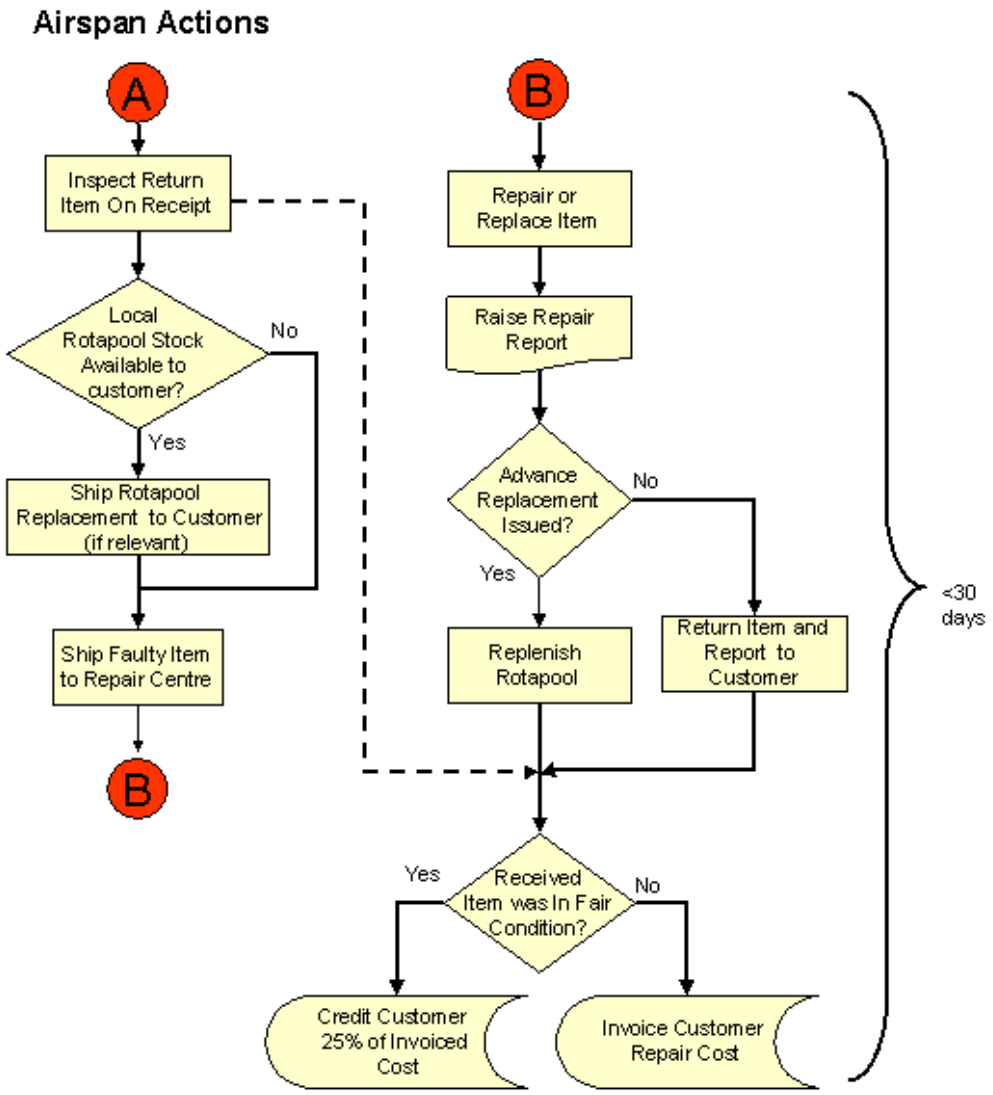
The normal process is for the customer to obtain a Return Material Authorisation (RMA) number, and then return the suspect faulty item to Airspan for repair. Airspan will repair the FRU, or replace it if appropriate, and return it to the customer. This RMA number should be quoted on all subsequent correspondence concerning the item.

For an additional charge, and providing suitable alternative is available, Airspan will provide an Advance Replacement.

Outline Flowchart of Material Return Process

The flowchart below outlines the various actions involved in the material return process.


Customer Actions
Airspan Actions
Customer Has Faulty Item
Local ACL Office?
No
Yes
Contact International Call Centre
Contact Local ACL Office
Obtain RMA Number
Advance Replacement Needed?
Yes
No
Order Advanced Replacement
Complete Repair & Return Tag and Fault Report
Ship Tagged Item to ACL
FAX Fault Report To ACL
Ship Advanced Replacement
Customer Item In warranty
Yes
No
Customer Item Returned Within 30 days?
No
Invoice Customer 100% of List Price
A
Go to Chart 2



Action Taken by Customer Requesting a Repair Return

Whenever a customer has a query, or determines that they have a suspect faulty FRU that they wish to return, they should take the following action:

a. Contact either the local Airspan office or the 24-hour Airspan International Call Centre. The minimum information to be provided includes:
   - Company Name and Address
   - Contact Name and Telephone Number
   - Original Purchase Order No in the case of an in-Warranty return, or an authorised Purchase Order Number for a non-warranty return
   - Description, part numbers, serial numbers and quantity of items to be returned

b. Airspan will fax to the customer an RMA No, which should be quoted on all subsequent correspondence.

c. For each item, complete a Return and Repair Tag (Appendix 1) and attach it to the item.

d. Return the item to Airspan in accordance with the shipping instructions.

e. If practicable, complete the Defective Equipment Information Form (Appendix 2) to assist subsequent diagnosis and repair, and fax the completed form to Airspan.

Contact Addresses

The Call Centre operates 24-hours a day, and is contacted at:

Tel:+44 1895 467 467

During UK working hours, the Customer Service Help Desk can be contacted at:

Tel:+44 1895 467 239
Fax:+44 1895 467 472

Unless instructed otherwise, customers should ship the return item to the following address:

Customer Service
Airspan Communications Ltd
Airspan House
Cambridge House
Oxford Rd
Uxbridge
Middlesex
UB8 1UN
England

The local Airspan Account Team will provide details of any alternative local office contact numbers and addresses.

Information to be Provided

The customer should provide the following information as a minimum with each item returned:

- RMA No.
- Customer Name, Address, and contact person.
- Description of Item.
- Part No of Item.
- Serial No of Item.
- Fault Description.

This information can be placed on the **Return and Repair Tag** , which is attached to the item being returned. Failure to provide this information could result in delays in the return of the repaired items.

The customer is encouraged to complete and return the **Defective Equipment Information Form** to provide more comprehensive information on the symptoms of the reported fault. The more information that is provided concerning the nature of the suspected fault, the better will Airspan be able to diagnose any fault and effect a repair.

Action Taken by Airspan

a. On receiving a request for a repair return, the Call Centre or Local Office will arrange for the customer to be provided with an RMA number and shipping instructions.
b. On receipt of the item at the Uxbridge Repair Centre, Airspan will inspect it to confirm that it has been packaged securely and according to all applicable standards, and that it is of a recognised build standard.
c. Carry out fault diagnosis, confirming that any defect was not caused by maintenance, repair, or alterations by other than Airspan or their authorised agents, or by abuse or improper use.
d. Repair the FRU, or if it is beyond economic repair, replace it with an item of equivalent fit, form and function.
e. Return the item to the customer with a brief report on the work carried out.

Replacement of FRUs

FRUs returned to the customer as replacements become the property of customer, and the original item becomes the property of Airspan.

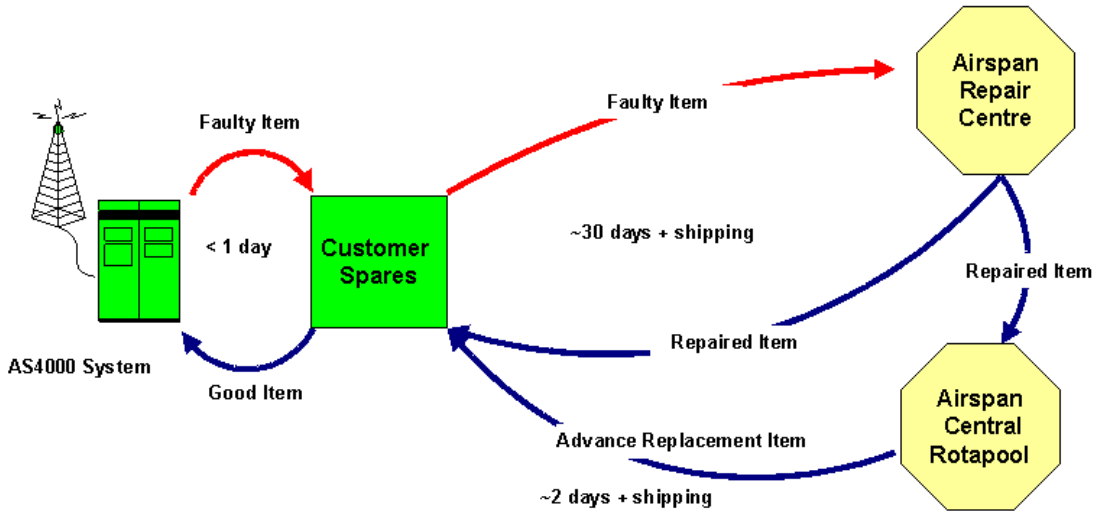
Replacements will be functionally equivalent to the original FRU and will be drawn from Airspan's Rotapool inventory.

Advance Replacement

In-Warranty Advance Replacement
If a FRU is under warranty, and is critical to the customer's system, Airspan will despatch a suitable replacement, if available, from the rotapool in advance of receiving the suspect item.
Airspan will ship the replacement item from the nearest location holding rotapool stock of that item.
Out of Warranty Advance Replacement
If an FRU is no longer under warranty, as defined above, the customer may request an advance replacement item. Airspan will issue a quotation to the customer for a replacement.
Airspan will issue a quotation to the customer for a replacement. This service is additional to the standard terms and conditions, and is wholly dependent on the availability of spares at the time of request
Return FRU
The customer should ship the return FRU to Airspan within 30 days of receiving the advance replacement, to avoid being charged the full cost of that advance replacement.

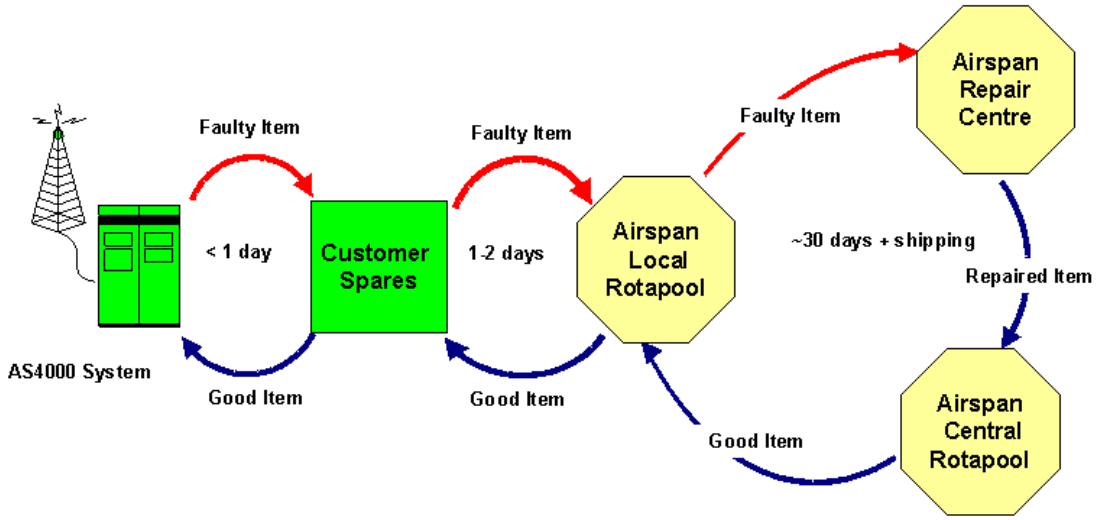
Service Turn Around Times

Airspan shall endeavour to repair and return FRUs, or replace them if appropriate, within 30 working days of receipt of the item from the customer.



Advance Replacements, if available, should be shipped within 2 days.

Rotapool Spares
For an additional charge, Airspan will maintain a Rotapool of critical FRUs for the customer in region that can be used as a buffer stock to significantly reduce the replenishment time for customer spares stocks.



In Warranty Charges

Providing the "in-warranty" conditions are met, Airspan will carry out all repairs or replacements free of charge.

Out of Warranty Charges

For FRUs that are out of warranty, repairs shall be carried out at the standard rate for that item, as listed in the Repair Price Schedule.
Airspan will provide prices on application for FRUs not listed in the Repair Price Schedule.

Beyond Economic Repair

Should a repair be uneconomical, Airspan reserves the right to replace the FRU with a functional equivalent. Airspan will notify the customer accordingly and determine the customer's wishes regarding the disposition of the 'non-repairable' item.
For non-warranty repairs, Airspan may subsequently invoice the customer for return shipping plus a handling charge.

No Fault Found

Should a returned FRU be found to have no defects, or only require the replacement of consumable parts, the standard repair rate for that item shall be charged.
Consumable parts shall include, but are not limited to, fuses, bulbs, batteries, etc.

Advance Replacements

The standard charge for advance replacement of "in-warranty" FRUs is $200 per item.
If the return item is not received at Airspan within 30 days from the date of shipment of the replacement , Airspan shall charge the customer the current list price of the replacement unit.
For the advance replacement of "out-of-warranty" items, Airspan shall charge the customer the current list price for the replacement FRU and credit 25% once the return item is received.

Warranty on Repaired Items

Normal Repair In-warranty

The warranty for an item repaired or replaced in warranty shall be 90 days or the remainder of the original outstanding warranty period for the returned item, whichever is the greater.

Normal Repair Out-of-warranty

The warranty for an item repaired or replaced out of warranty shall be 90 days from delivery of the item to the customer.

Airspan provides a tag to be attached to each item being returned. When completed, the tag provides sufficient information for the item to be tracked throughout the repair and return process.

RETURN AND REPAIR TAG

Airspan

RMA NO. _

CUSTOMER _

DESCRIPTION _

PART NO. _

SERIAL NO. _

FAULT DESCRIPTION

_ _

_ _

_ _

_ _

_ _

_ _

Defective Equipment Information Form

RMA Number (provided by Airspan)				
Card/Assembly Description				
Part Number and Revision (if Applicable)				
Serial Number				
Date Commissioned				
Date Fault Reported				
Location of Assembly in CT	**Rack**		**Shelf**	
Location of Subscriber Terminal				

SUBSCRIBER TERMINAL INFORMATION

Power Supply Type (e.g. I, II or IV)				
RX AGC Voltage				
TX PC Voltage				
ST Programming Code				
Description of Fault				
Comm Port OK?				
Line Voltage	**Line 1?**		**Line 2?**	

CENTRAL TERMINAL INFORMATION

Card Type	
Modem (Number)	
TU	
Analogue card	
RF Card	
Other (Specify Type)	
Description of Fault	
Sitespan Information	

Circuit Board Assemblies

Circuit board assemblies must be individually boxed in Airspan-approved shipping containers, to properly protect them from static electricity damage.

Static Control Rules

Airspan uses state-of-the-art semiconductors to obtain the fastest, most reliable operation. These components are highly sensitive, and can be damaged by a static discharge as low as 250V. Individuals may generate enough static to damage a component without noticing the discharge, so must take precautions to control static.

Static Electricity Control

All sensitive Printed Circuit Boards (PCBs) must be handled at a static-safe work area. The minimum requirement is a workbench with a grounded work surface, a grounded floor mat, and a wrist strap. When a board is changed at the switch, a portable field service grounding kit must be used.
Figure 1 shows the grounded workbench.

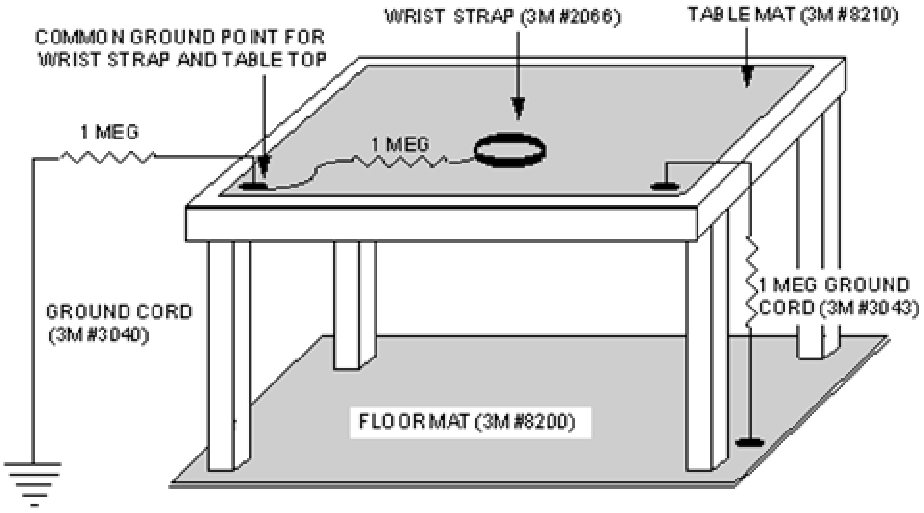


Figure 1. Printed Circuit Card Workstation

All boards must be transported in a static-shielding bag.
The following procedures reduce the possibility of static discharge damage:

a. Wearing a wrist strap while handling PCBs.
b. Attach the string of the Airspan Return and Repair Tag to the ejector/injector of the PCB.
c. Insert PCBs into approved static shielding bags with repair tags remaining outside the shielding bag. Do not insert repair tags into static shielding bags.
d. Pack/unpack PCBs at a static-safe workbench.
e. Transfer boards in a static-shielding bag or non-conductive board container.
f. Properly ground storage shelves.
g. Properly ground personal wrist straps while transferring boards to the storage shelves.

Shipping Boxes

WARNING:;A box of boards must not contain other heavy items that could cause part damage.
PCBs

Individually boxed PCBs must be placed into a larger packing case for shipment. Board boxes alone do not sufficiently protect against shipping damage.
Empty space in shipping cases must be filled with additional shipping boxes to prevent part movement and damage during handling.

Power Supplies And Peripherals

Each type of assembly must be shipped in its specifically-designed packing box. Retain individual shipping containers for these items.
To prevent damage, all mechanical movable parts (such as disk heads and rotor) must be in the locked/secure position before handling/shipping.
All handling must be done using only the handles and/or handholds so the equipment is not damaged.
All items must be accompanied by a completed Airspan Return and Repair Tag.

Shipment To Airspan

The customer should ship the item to the Customer Service Centre at Uxbridge unless Airspan has provided an alternative shipping address.
The cost of shipping returns to Airspan for repair shall be borne by the customer, and all risks associated with the shipping remain the responsibility of the customer.
Items under repair, and their subsequent return to the customer shall be the responsibility of Airspan.
Should the customer specify expedited shipping for the return of a repaired FRU or an advance replacement, all costs incurred shall be borne by the customer.

Damaged Shipment

If a shipment is received with visible damage to the container, the receiving party should document the damage and report it to the Airspan Customer Service Centre.
If concealed damage is found after the shipment is accepted, , the receiving party should document the damage and report it to the Airspan Customer Service Centre. Airspan will arrange for the freight company to inspect the damaged shipment and file an inspection report so that a claim can be initiated.

Specifications

Central Terminal

The following tables provide technical specifications for the Central Terminal.

PHYSICAL CHARACTERISTICS		
CT Rack Dimensions, (without brackets):	Full Height	Compact
Width	600mm	600mm
Height	2175mm	1500mm
Depth	300mm	300mm
Shipping Weight**:**		
Rack Frame	60 kg	
Air Inlets/Outlets	16.5 kg	
Combiner Shelf	30 kg	
Power Amp	4.5 kg (each)	
LNA	1 kg Frequency Dependant	
TX filter	1 kg Frequency Dependant	
PSU	1.5 kg (each)	
AS4020 Shelf	3.5kg (each)	

ENVIRONMENTAL		
	Minimum	Maximum
Operating Temperature	-5° C	+45° C
Relative Humidity, non-condensing	0%	95%
Storage Temperature	-40° C	85° C

Storage Humidity, non-condensing	Less than 100%	
Air Pressure	70 kPa	106 kPa

POWER REQUIREMENTS	
DC Input Voltage Operating Range. (N.B. This supply to be a guaranteed SELV from an EN60950 approved source.)	Maximum Range, -36.0V DC to -60.0V DC @ 540W
DC Input Current (Fully populated CT Rack)	11.5 Amps max. @ -48V DC 9 Amps max. @ -60V DC
Recommended Power Distribution Fusing (With a readily accessible disconnect device which will isolate all poles.)	-36.0V DC to -60V DC 30Amps High Inrush
Power Distribution CT Fusing	--36.0V DC to -60V DC 30Amps each feed

Warning. The maximum DC input should not exceed 60 Volts. Voltages in excess of this are considered hazardous.

Copyright Information

Contact Information

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Document Purpose

General Purpose of Document

This document describes the installation and commissioning of the Airspan AS4020 Central Terminal (CT) Racks and associated shelves to Release 7.21 specifications.

Prerequisite skills

Personnel installing and commissioning Airspan products must have a basic knowledge of telephony and radio communications, and have experience in installing telecommunications products. Airspan Networks provides a range of comprehensive training courses specifically aimed at providing operators/users of AS4020 products with the prerequisite skills to install, commission and or maintain the product. The courses can be tailored to provide the level of training required by the operator/user.
This manual is intended for use by persons familiar with the AS4000/AS4020 product having attended the Airspan Central Terminal Installation and Commissioning training course prior to performing the procedures in this practice.

Installation Tasks

The installation procedures are arranged as a series of tasks and are generalised to cover the majority of applications and configurations. If your particular system application is not covered, call Airspan for assistance at the following number: Call +44 (0) 1895 467100

Warnings and Cautions

SAFETY

1. Read and follow all warning notices and instructions marked on the product or included in this manual
2. Do not allow anything to rest on the power cord and do not locate the product where persons could step or walk on the power cord.
3. When installed in the final configuration, the product must comply with the applicable Safety Standards and regulatory requirements of the country in which it *is* installed. If necessary, consult with the appropriate regulatory agencies and inspection authorities to ensure compliance.
4. No hazardous *RF* radiation is emitted from the equipment.

WARNING - HAZARDOUS VOLTAGES

1. On AC installations, hazardous voltages exist. Use caution when verifying or working with AC power. Remove metal jewellery that could come into contact with AC power.
2. On *DC* sections, short circuiting the low voltage, low impedance circuits can cause severe arcing that may result in burns or eye damage. Remove rings, watches etc. to avoid shorting DC circuits.

CE

The CE Marking on an Airspan product signifies that it has been certified according to the EMC directive 89/336/EECand the low voltage directive 73123/EEC or the Radio & Telecommunications Terminal Equipment Directive 1999/5/EC . The product fulfills the requirements according to the following standards:
EN300385 for EMC
including.
EN55022 Group 1 Class A for the Central Terminal Emissions.
EN55022 Group 1 Class B for the Subscriber Terminal Emissions.
EN60950 Safety

NOTES

1. The Subscriber Terminal equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.
2. Airspan products do not contain hazardous substances (as defined in UK ‘Control of Substances Hazardous to Health Regulations 1989’, and the ‘Dangerous Substances Regulations 1990’). At the end of any Airspan product’s life cycle, the customer should consult with Airspan to ensure that the product is disposed of in conformance with the relevant regulatory requirements
3. Airspan products do not contain hazardous substances (as defined in UK ‘Control of Substances Hazardous to Health Regulations 1989’, and the ‘Dangerous Substances Regulations 1990’). At the end of any Airspan product’s life cycle, the customer should consult with Airspan to ensure that the product is disposed of in conformance with the relevant regulatory requirements

CAUTION: any modifications to this device not expressly authorised by the manufacturer could void the user's authority to operate this device.
The following products are FCC compliant:

	AS4000 Central Terminal
	AS4000 Access

	Concentrator
	AS4000 R series SIU

Responsible party for compliance is:
Charles Blackham, Airspan Networks Inc.,Cambridge House, Oxford Rd, Uxbridge, Middlesex, England, UB8 1UN. Telephone (44) 1 895 467450.

 **CAUTION:** European Directive 1999/519/EC details basic restrictions and reference levels on human exposure to electromagnetic fields as advised by the ICNIRP. The directive states that adherence to these recommended restrictions and reference levels should provide a high level of protection as regards the established health effects that may result from exposure to such fields.
By the very nature of the system design and installation users will not find them selves within close proximity of the Central Terminals Antenna.
Standards EN50383 and EN50385 are the applicable harmonised standards for EM fields generated by fixed wireless equipment.
The Electromagnetic fields generated by the Central Terminal antenna are below the recommended safe levels at all distances greater than 65 cm from an approved Airspan antenna.
The safe distance from a non-approved antenna of length D and Sector Angle δ may be calculated using the formula:
Safe distance, r = 36 / (π * D * δ)
If in doubt, please contact airspan_compliance@airspan.com

Issue Status

Issue	Date	Notes
Rev A	December-2002	Release 7.10
Rev B	July 2003	Release 7.11
Rev C	September-2003	Release 7.20
Rev D	September-2003	Release 7.20 changes to DACU.
Rev E	October 2003	Release 7.21
Rev F	January 2004	Release 7.22
Rev G	January 2004	Release 7.22 Updated AS4020 test

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

CPE: Customer Premises Equipment

CT: Central Terminal

CTU: Concentrated Tributary Unit

CU: Compression Unit

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
IS: In Service
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
PROM: Programmable Read Only Memory
PSTN: Public Switched Telephone Network
PSU: Power Supply Unit

R

RF: Radio Frequency
RX: Receive

S

SC: Shelf Controller
SIU: Subscriber 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

X

XTU: Exchange Tributary Unit