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Technology Solutions

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SMARTLINK 3G BTS USER MANUAL (BAND 4 VARIANT)



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1 WARNINGS AND CAUTIONS

1.1 WARNINGS

(1) **ELECTRIC SHOCK HAZARD. THE SMARTLINK BTS IS POWERED BY AN EXTERNAL DC SUPPLY, WHICH IF MIS-USED MAY CAUSE ELECTRIC SHOCK OR SERIOUS BURNS. DO NOT CONNECT OR DISCONNECT THE POWER SUPPLY WITH THE SMARTLINK BTS SWITCHED 'ON'. OBSERVE THE WARNINGS FOR THE DC POWER SUPPLY BEING USED.**

(2) **PROTECTIVE EARTH HAZARD. DO NOT OPERATE THE TRACO TEX 120-124 POWER SUPPLY WITHOUT THE PROTECTIVE EARTH (PE) CORRECTLY CONNECTED. WHEN POWERING FROM MAINS, USE ONLY THE SUPPLIED EXTERNAL MAINS CABLE ASSEMBLIES, PART NO. X72-1-9317-147 OR PART NO. X72-1-9317-136.**

(3) **EQUIPMENT DAMAGE. THE EQUIPMENT DETAILED IN THIS MANUAL IS INTENDED TO BE USED AND MAINTAINED ONLY BY QUALIFIED PERSONNEL WHO HAVE ATTENDED THE TRAINING ON THE SMARTLINK NETWORK.**

(4) **PERSONAL INJURY/HEAVY WEIGHT. THE SMARTLINK BTS WEIGHS 6.6 KG. WHEN LIFTING HEAVY EQUIPMENT ENSURE THAT THE CORRECT PERSONAL PROTECTIVE EQUIPMENT (PPE), STEEL TOE CAPPED BOOTS IS USED TO PREVENT CRUSH INJURIES.**

(5) **RADHAZ DANGER. THE MINIMUM SAFE WORKING DISTANCE FOR THE 3G ANTENNA OF 0.32 METRES IS TO BE OBSERVED WHEN OPERATING AND MAINTAINING THIS NETWORK.**

(6) **COOLING FAN OBSTRUCTION. ENSURE THAT THE COOLING FANS ARE CLEAR OF OBSTRUCTIONS AND KEEP FINGERS CLEAR OF ROTATING FANS DURING TESTING AND GENERAL OPERATION. ENSURE THAT GOOD AIR FLOW IS MAINTAINED AROUND THE SMARTLINK EQUIPMENT.**

(7) **LIGHTNING STRIKE DANGER. A LIGHTNING STRIKE ON THE ANTENNAS COULD RESULT IN BURNS OR ELECTRIC SHOCK. CONSIDERATION MUST BE GIVEN WHEN DEPLOYING THE EQUIPMENT WHERE THERE IS THE RISK OF ELECTRIC STORMS.**

(8) **HAZARDOUS SUBSTANCES, LITHIUM ION BATTERIES. THE LAPTOP PC, TABLET AND MOBILE PHONES LITHIUM ION BATTERIES CONTAIN ORGANIC SOLVENTS AND LITHIUM SALT, WHICH WILL IRRITATE SKIN, IS FLAMMABLE AND TOXIC. DO NOT INCINERATE, PUNCTURE OR DAMAGE BATTERIES. IF GAS OR LIQUID IS LEAKING FROM THE BATTERY, DO NOT HANDLE IT. SECURE THE AREA AND ENSURE GOOD VENTILATION. WAIT UNTIL THE BATTERY HAS FINISHED VENTING AND HAS COOLED DOWN. WEAR FULL PPE (SAFETY GLASSES, RUBBER GLOVES AND COVERALLS) WHEN HANDLING THE DAMAGED BATTERY, AND SEAL IT IN A HEAVY DUTY POLYTHENE BAG. DISPOSE OF THE BATTERY IN ACCORDANCE WITH APPROPRIATE LOCAL REGULATIONS.**

(9) **ELECTROSTATIC CHARGING HAZARD. TO PREVENT ELECTROSTATIC CHARGE OCCURRING, DO NOT ATTEMPT TO CLEAN THE SURFACES OF THE**

TRACO TEX 120-124 POWER SUPPLY WITH A DRY CLOTH. CLEAN ONLY WITH A DAMP CLOTH.

1.2 CAUTIONS

- (1) EQUIPMENT FAILURE.** The correct mounting position for optimal cooling performance of the power supply must be observed. Leave a free space of a minimum of 50mm (2 in.) above and below the power supply.
- (2) EQUIPMENT FAILURE.** The internal fuse of the SMARTLINK BTS is not accessible to the user to replace. Return the unserviceable equipment to the manufacturer for Level 4 repair.
- (3) EQUIPMENT DAMAGE.** When equipment connectors are not in use, ensure that the dust covers are connected to maintain the degree of protection.
- (4) EQUIPMENT DAMAGE.** When using the TRACO TEX 120-124 power supply use only the External Mains Cable assemblies, Part No. X72-1-9317-147 or Part No. X72-1-9317-136.
- (5) CABLE DAMAGE.** Ensure that cables are not bent, deformed or snagged to cause damage to the internal wiring or the connector ends.

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2 PURPOSE AND PLANNING INFORMATION

2.1 INTRODUCTION

This section provides the purpose and planning information for the SMARTLINK 3G Base Transceiver Station (BTS).

The information in this Document relates to SmartLink **Release 1.0.5** and higher.

2.2 EQUIPMENT IDENTITY

Table 1 details the equipment covered in this manual.

Table 1 Equipment Identity

Serial (1)	Equipment Asset (2)	Description (3)	NSN/Part No. (4)
1	N/A	SMARTLINK BTS	X72-1-9317-069

2.3 WARNINGS AND CAUTIONS

2.3.1 WARNINGS

(1) ELECTRIC SHOCK HAZARD. THE SMARTLINK BTS IS POWERED BY AN EXTERNAL DC SUPPLY, WHICH IF MIS-USED MAY CAUSE ELECTRIC SHOCK OR SERIOUS BURNS. DO NOT CONNECT OR DISCONNECT THE POWER SUPPLY WITH THE SMARTLINK BTS SWITCHED 'ON'. OBSERVE THE WARNINGS FOR THE DC POWER SUPPLY BEING USED.

2.3.2 CAUTIONS

(1) EQUIPMENT FAILURE. The correct mounting position for optimal cooling performance of the power supply must be observed. Leave a free space of a minimum of 50mm (2 in.) above and below the power supply.

(2) EQUIPMENT FAILURE. The internal fuse of the SMARTLINK BTS is not accessible to the user to replace. Return the unserviceable equipment to the manufacturer for Level 4 repair.

2.4 ROLE AND PURPOSE

The SMARTLINK BTS is a rapidly deployable cellular network-in-a-box solution, designed to operate on the ground when all other communications networks fail and capable of operating in the most demanding operational environments. The network comprises a SMARTLINK BTS and ancillary devices, which are housed in a transportable container.

As well as SMARTLINK providing a standard voice and data network, applications to improve mission effectiveness are available. The User has access to all the features of a standard cellular network enabling voice, image and video sharing, even in the most harsh and remote locations.

SMARTLINK provides a communications bubble out to a maximum distance of 5km and is expandable up to 15km networking with the use of additional units. User scenarios include dismounted soldiers, communications on the move, forward command and reconnaissance positions and unmanned ground sensor connectivity.

2.5 PHYSICAL DATA

With reference to Table 2 and Figure 1, the SMARTLINK BTS Kit 1 comprises the following items:

Table 2 SMARTLINK BTS Kit 1 – main items

Ser (1)	Description (2)	Dimensions (3)	Weight (4)	Qty (5)
1	SMARTLINK BTS	360mm x 260mm x 150mm	6.6kg	1
2	3G Antenna ¹	-	-	2
3	GPS Antenna	-	-	1
4	TRACO TEX 120-124 Power Supply	174mm x 93mm x 56mm	1kg	1
5	External Mains Power Cable Assy	2000mm	-	1
6	External Power Cable Assy	2000mm	-	1
7	Ethernet Cable Assy	2000mm	-	1
8	USIM	-	-	16

¹ The 3G antenna supplied may not match that shown in the figure.



- 1 - SMARTLINK BTS
- 2 - 3G Antenna
- 3 - GPS Antenna
- 4 - DC Power Supply
- 5 - Ext Mains Power Cable Assy
- 6 - Ext Power Cable Assy
- 7 - Ethernet Cable Assy
- 8 - USIM

Figure 1 SMARTLINK EQUIPMENT – main items

2.6 PERFORMANCE DATA

Table 3 details the SMARTLINK BTS performance data:

Table 3 SMARTLINK BTS - performance data

Ser (1)	Description (2)	Value/Limit/Standard (3)
1	3GPP Release	6
2	Number of connected Users	100
3	Number of simultaneously active Users in call	16
4	Maximum User speed	120kph (70mph)
5	Backhaul and Reachback Interface	Ethernet/IP
6	Maximum Downlink Data Rate	8 Mbps
7	Maximum Uplink Data Rate	1.5 Mbps
8	Standard Frequency Bands	UMTS Band IV
9	Transmit Power	33dBm +/- 2dB under normal operating conditions
10	Total Power Consumption	<75W
11	Input Voltage Range	10 – 33V DC
12	Nominal Input Voltage	24V DC

2.7 ENVIRONMENTAL DATA

Table 4 details the operating temperature and the environmental standards for the SMARTLINK BTS.

Table 4 SMARTLINK BTS - environmental data

Ser (1)	Description (2)	Value/Limit/Standard (3)
1	Operational Temperature Range	-31°C to +49°C
2	Storage Temperature Range	-40°C to +70°C
3	IP Rating (Protected from ingress of dust and water immersion)	IP67, NEMA 4X
4	Environmental Compliance	MIL-STD 810G (Pending) Method 501.5 - High temp, Hot Dry A1; Method 502.5 - Low Temp, Basic Cold C1; Method 505.5 - Solar Radiation, Procedure 1, Hot Dry A1, Heating Effect only; Method 514.6, Vibration Cat 4, Cat 20, wheeled Vehicle; Method 516.6 - Shock, procedure I.
5	EMC Compliance	MIL-STD 461F

2.8 TRANSPORTATION DATA

Transportation data is as follows:

- Air transportation data. No special instructions.

2.9 MANNING REQUIREMENTS

The SMARTLINK Network is capable of being operated under normal conditions by one person.

2.10 MAINTENANCE POLICY

The SMARTLINK BTS maintenance policy is defined as Level 1 to Level 4.

- Level 1 maintenance tasks are carried out by the User and covers the replacement of all items that are Line Replaceable Units (LRUs) and external knock off items, such as fan units and dust caps. No internal maintenance of the LRUs is possible. The SMARTLINK Network maintenance includes pre and post use inspection and cleaning of the LRUs.
- Level 4 maintenance is carried out by the manufacturer to rectify all defects on returned repairable LRUs.

3 UNPACKING AND DEPLOYING THE SMARTLINK BTS

3.1 INTRODUCTION

The unpacking and inspection of SMARTLINK equipment should ideally be carried out in a suitably dry environment.

Bringing the equipment into service comprises three stages:

- Unpacking and inspection.
- Assembly and powering up.
- Functional checks.

3.1.1 WARNINGS AND CAUTIONS

The following WARNINGS and CAUTIONS are to be observed when carrying out the procedures detailed in this section.

3.1.1.1 Warnings

(1) ELECTRIC SHOCK HAZARD. THE SMARTLINK BTS IS POWERED BY AN EXTERNAL DC SUPPLY, WHICH IF MIS-USED MAY CAUSE ELECTRIC SHOCK OR SERIOUS BURNS. DO NOT CONNECT OR DISCONNECT THE POWER SUPPLY WITH THE SMARTLINK BTS SWITCHED 'ON'. OBSERVE THE WARNINGS FOR THE DC POWER SUPPLY BEING USED.

(2) PROTECTIVE EARTH HAZARD. DO NOT OPERATE THE TRACO TEX 120-124 POWER SUPPLY WITHOUT THE PROTECTIVE EARTH (PE) CORRECTLY CONNECTED. WHEN POWERING FROM MAINS, USE ONLY THE SUPPLIED EXTERNAL MAINS CABLE ASSEMBLIES, PART NO. X72-1-9317-147 OR PART NO. X72-1-9317-136.

(3) EQUIPMENT DAMAGE. THE EQUIPMENT DETAILED IN THIS MANUAL IS INTENDED TO BE USED AND MAINTAINED ONLY BY QUALIFIED PERSONNEL WHO HAVE ATTENDED THE TRAINING ON THE SMARTLINK NETWORK.

(4) PERSONAL INJURY/HEAVY WEIGHT. THE SMARTLINK BTS WEIGHS 6.6 KG. WHEN LIFTING HEAVY EQUIPMENT ENSURE THAT THE CORRECT PERSONAL PROTECTIVE EQUIPMENT (PPE), STEEL TOE CAPPED BOOTS IS USED TO PREVENT CRUSH INJURIES.

(5) RADHAZ DANGER. THE MINIMUM SAFE WORKING DISTANCE FOR THE 3G ANTENNA OF 0.32 METRES IS TO BE OBSERVED WHEN OPERATING AND MAINTAINING THIS NETWORK.

(6) COOLING FAN OBSTRUCTION. ENSURE THAT THE COOLING FANS ARE CLEAR OF OBSTRUCTIONS AND KEEP FINGERS CLEAR OF ROTATING FANS DURING TESTING AND GENERAL OPERATION. ENSURE THAT GOOD AIR FLOW IS MAINTAINED AROUND THE SMARTLINK EQUIPMENT.

(7) LIGHTNING STRIKE DANGER. A LIGHTNING STRIKE ON THE ANTENNAS COULD RESULT IN BURNS OR ELECTRIC SHOCK. CONSIDERATION MUST BE GIVEN WHEN DEPLOYING THE EQUIPMENT WHERE THERE IS THE RISK OF ELECTRIC STORMS.

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(9) ELECTROSTATIC CHARGING HAZARD. TO PREVENT ELECTROSTATIC CHARGE OCCURRING, DO NOT ATTEMPT TO CLEAN THE SURFACES OF THE TRACO TEX 120-124 POWER SUPPLY WITH A DRY CLOTH. CLEAN ONLY WITH A DAMP CLOTH.

3.1.1.2 Cautions

(1) EQUIPMENT FAILURE. The correct mounting position for optimal cooling performance of the power supply must be observed. Leave a free space of a minimum of 50mm (2 in.) above and below the power supply.

(2) EQUIPMENT FAILURE. The internal fuse of the SMARTLINK BTS is not accessible to the user to replace. Return the unserviceable equipment to the manufacturer for Level 4 repair.

(3) EQUIPMENT DAMAGE. When equipment connectors are not in use, ensure that the dust covers are connected to maintain the degree of protection.

(4) EQUIPMENT DAMAGE. When using the TRACO TEX 120-124 power supply use only the External Mains Cable assemblies, Part No. X72-1-9317-147 or Part No. X72-1-9317-136.

(5) CABLE DAMAGE. Ensure that cables are not bent, deformed or snagged to cause damage to the internal wiring or the connector ends.

3.2 UNPACKING AND INSPECTION

The equipment should be unpacked and inspected in the following order:

1. Power Supply.
2. SMARTLINK BTS.
3. Antennas.
4. Cabling.

The SMARTLINK equipment is housed in a carrying case as shown in Figure 2 to Figure 5; SMARTLINK equipment and ancillaries are located in the lower level of the case and cables are located in the lid. An additional upper level is supplied to house Customer-supplied User Equipments (mobiles and/or tablet) and Laptop.

To unpack and inspect the power supply, carry out the following sequence:

1. Remove the power supply from the carrying case.
2. Inspect the power supply connector pins ensuring no corrosion or discoloration is visible.
3. Inspect the power supply case, ensuring no dents or cracks in the enclosure are visible.
4. Inspect the warranty label to ensure it is intact.

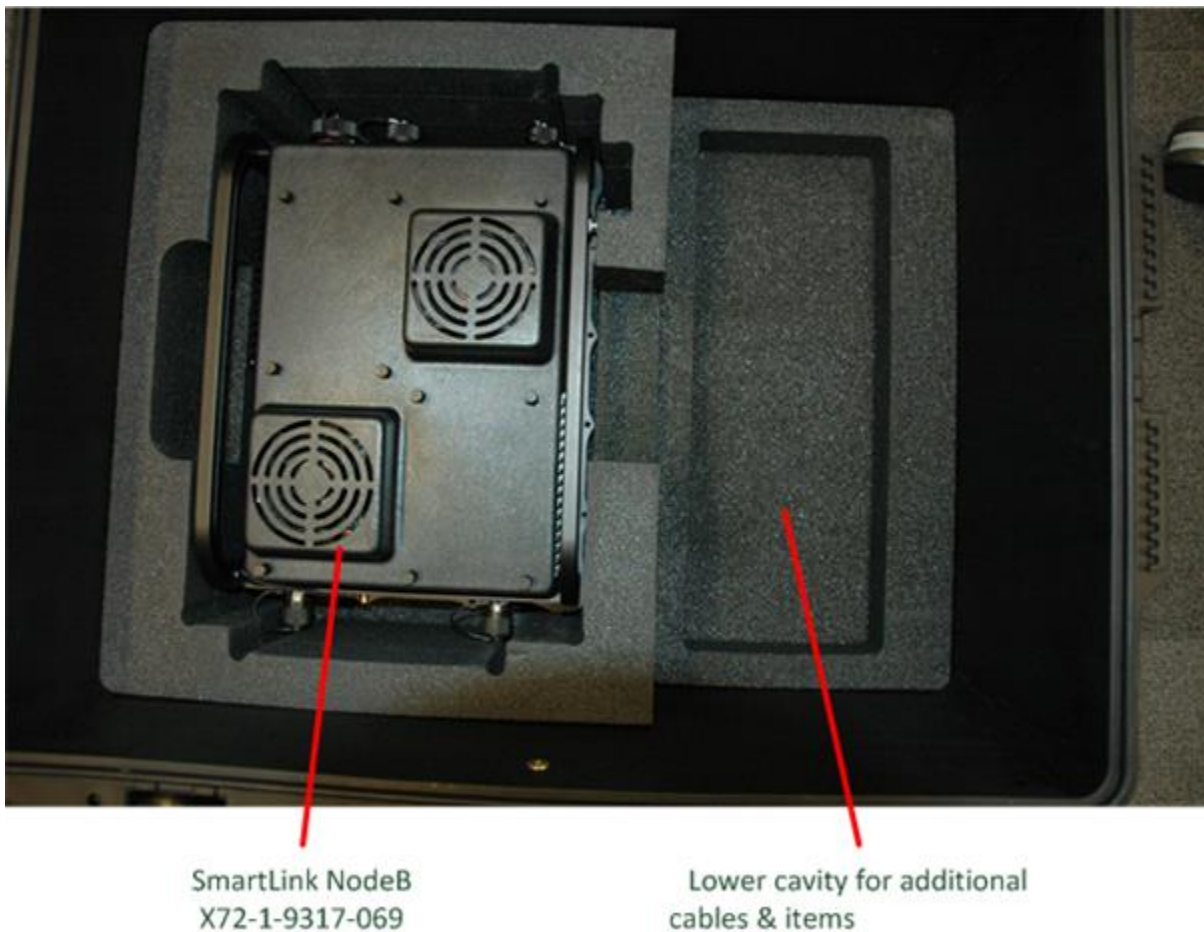
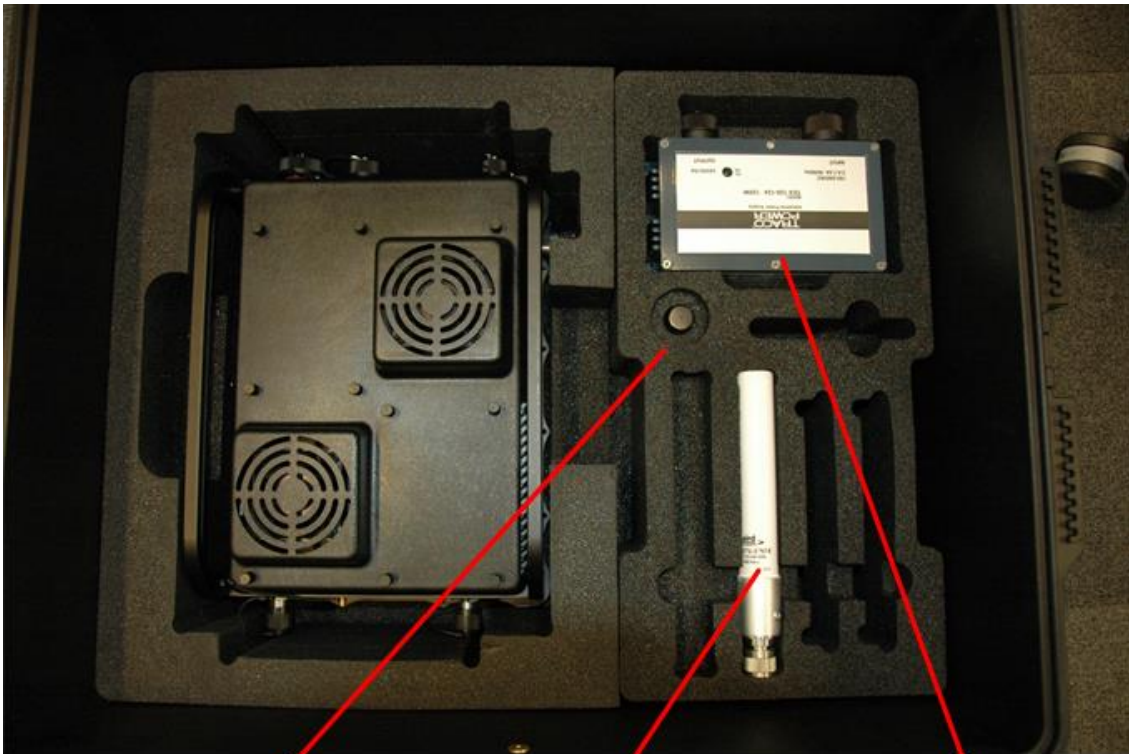


Figure 2 Carrying case – lower level SMARTLINK insert



Q201424
Antenna, GPS - Passive,
SMA-M, Maxtena,
M1575HCT-22P-MR

Q201659
Antenna, Monopole - 806-960/
1710-2700 MHz, N-Type M,
Laird Technologies, OC80271-
FNM

Q201790
Power Supply, Adaptor - AC/
DC, DIN Rail Mount, Traco
Power, TEX120-124

Figure 3 Carrying case lower level – ancillaries insert

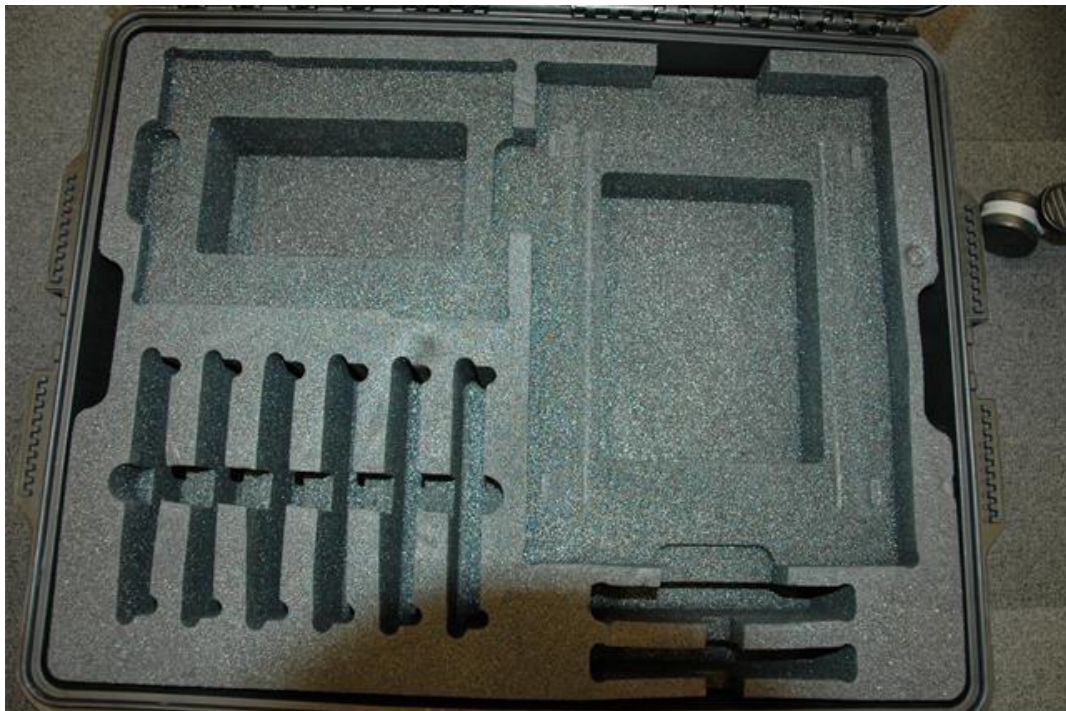


Figure 4 Carrying Case Upper Level –Empty



X72-1-9317-136
External Power Cable
Assembly (2m)

Q201789
Cable, Ethernet Cat. 6a, M-M, 2 m,
RJ45-RJ45, Polamco,PC4D0024BT-
19NX-1-ZN-H-BL2000-A

X72-1-9317-147
External Mains Cable
Assembly (UK, 2m)

Figure 5 Carrying case Lid –Cables

To unpack and inspect the SMARTLINK BTS, carry out the following sequence:

1. Remove the SMARTLINK BTS from the carrying case.
2. Inspect the SMARTLINK BTS connector pins ensuring no corrosion or discoloration is visible.
3. Inspect the SMARTLINK BTS case, ensuring no dents or cracks in the enclosure are visible.
4. Inspect the warranty label to ensure it is intact.

To unpack and inspect the Antennas, carry out the following sequence:

1. Remove each Antenna in turn from the carrying case.
2. Inspect each Antenna connector pins ensuring no corrosion or discoloration is visible.
3. Inspect each Antenna case, ensuring no dents or cracks in the enclosure are visible and that the Antennas are not bent or deformed.

To unpack and inspect the cabling, carry out the following sequence:

1. Remove each cable in turn from the carrying case.
2. Inspect the connector pins on each cable, ensuring no corrosion or discoloration is visible and the pins are straight.
3. Inspect each cable along its length ensuring no damage to the out insulating jacket is present.

3.3 ASSEMBLY/INSTALLATION

To assemble a SMARTLINK BTS for deployment, carry out the following:

1. Ensure the power supply is not connected to the mains supply.
2. Connect an earth strap to the SMARTLINK BTS. This needs to be connected to a suitable earth point.
3. Connect the 3G and GPS antennas onto the SMARTLINK BTS as shown in Figure 6, or if remote antennas are to be used, connect the remote antennas to the SMARTLINK BTS using coaxial cables. Note that the 3G antenna should be connected to the 3G TX/RX port. The 3G RX port can be left unconnected.
4. Mount any remote antennas at the location specified by the Network Administrator.
5. If the SMARTLINK BTS is to be mounted on a mast, connect the masthead mounts to the SMARTLINK BTS as shown in the accessories manual.

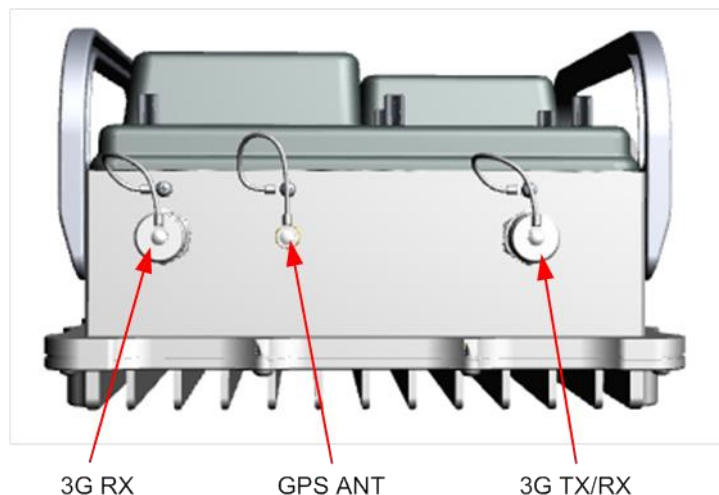


Figure 6 SMARTLINK BTS – top view

6. Mount the SMARTLINK BTS in a vertical position with the 3G and GPS antennas up. Ensure there is a space of 100mm around the SMARTLINK BTS and room for natural convection cooling.

7. Connect the External Power Cable (Part No. X72-1-9317-136) to the SMARTLINK BTS (Power connector, see Figure 7).
8. Connect the External Ethernet Cable (Part No. X72-1-9317-148) to the SMARTLINK BTS (Ethernet connector, see Figure 7) and the other end to a suitable network point.

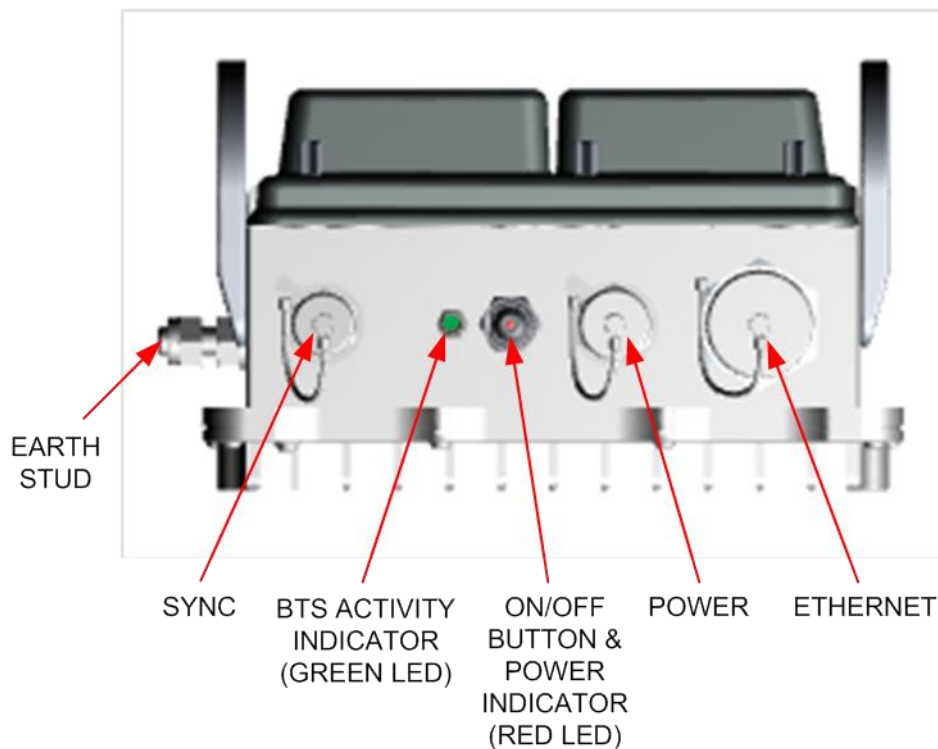


Figure 7 SMARTLINK BTS – bottom view

9. With reference to Figure 8, connect the other end of the External Power Cable (Part No. X72-1-9317-136) to the DC power supply.
10. Connect the External Mains Cable to the DC power supply (see Figure 8). Note that, as supplied, connecting the AC supply at this point will cause the SMARTLINK BTS to start-up immediately and begin to transmit in the default configuration.

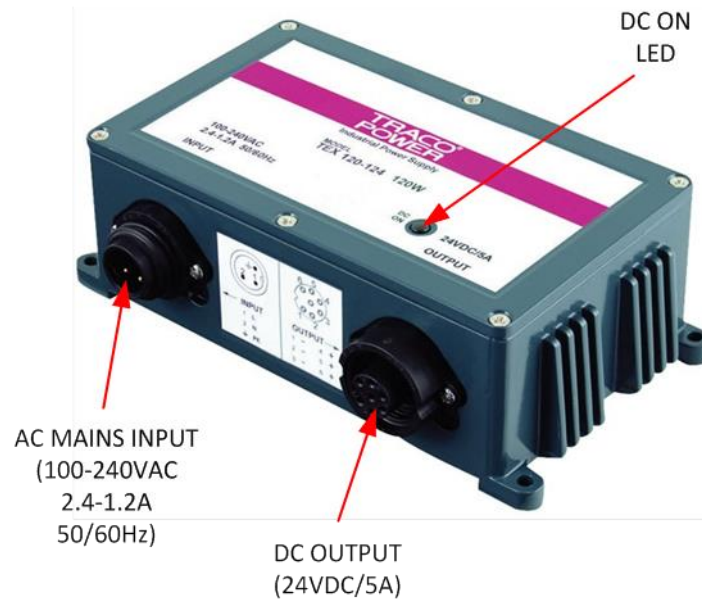


Figure 8 DC Power supply

3.4 POWER UP AND FUNCTIONAL CHECKS

To power up a SMARTLINK BTS and carry out a basic functional check, carry out the following:

1. Ensure that appropriate antennas are connected to the 3G Tx/Rx, 3G Rx and the GPS terminals of the SMARTLINK BTS.
2. Switch ON the SMARTLINK BTS by connecting the power source.
3. If the SMARTLINK BTS is configured to boot on power, then after 5 seconds the power LED will flash to indicate that the unit is starting up. If the SMARTLINK BTS is configured to NOT boot on power, then the unit will go to standby on application of power. The power button must be briefly depressed to trigger power on. Once the button is depressed, the power LED will flash to indicate that the unit is starting up.
4. The SMARTLINK BTS should now undertake its boot up sequence and after 2 minutes the SMARTLINK BTS will be powered up and ready to connect via the Ethernet port. Once the boot sequence is complete, the power LED will be continuously ON.
5. If the SMARTLINK BTS is configured to start a cell following boot-up, then after a few seconds, the GREEN 'BTS Activity Indicator' LED will start to flash. Once the cell is transmitting the GREEN LED will move to a fast flash and when GPS lock is obtained the GREEN LED will be continuously ON.

4 GETTING STARTED WITH A SMARTLINK BTS

4.1 INTRODUCTION

This section provides a guide for operation of a single SMARTLINK BTS assuming that it has been brought into service as detailed in Section 3.

In general, a SMARTLINK NETWORK comprises:

- A single SMARTLINK BTS operating as a MASTER.
- Zero or more SMARTLINK BTSes operating as SLAVES.

The simplest SMARTLINK NETWORK therefore comprises only a single SMARTLINK BTS operating as a MASTER. This is the default configuration for all SMARTLINK BTSes as shipped.

The initial configuration of a SMARTLINK NETWORK involves the following steps:

1. Configuring an IP network for use with the SMARTLINK BTS.
2. Starting up the SMARTLINK Management Console and resolving any issues.
3. Configuring the Mobile Phones for use with the SMARTLINK NETWORK².
4. Verifying Connectivity.

Additionally we here describe how to:

5. Power off the SMARTLINK BTS.
6. Boot the SMARTLINK BTS after Power-Off

4.2 CONNECTING THE SMARTLINK BTS TO AN IP NETWORK

The simplest setup for the SMARTLINK BTS is to connect to an IP network via DHCP (the default setting) as shown in Figure 9. (It is also possible to configure the SMARTLINK BTS to use a static IP address, as described in Section 5.4.)

² Note that Mobile Phone configuration is only required the first time a Mobile Phone is connected to the SMARTLINK NETWORK. The settings remain in the phone indefinitely.

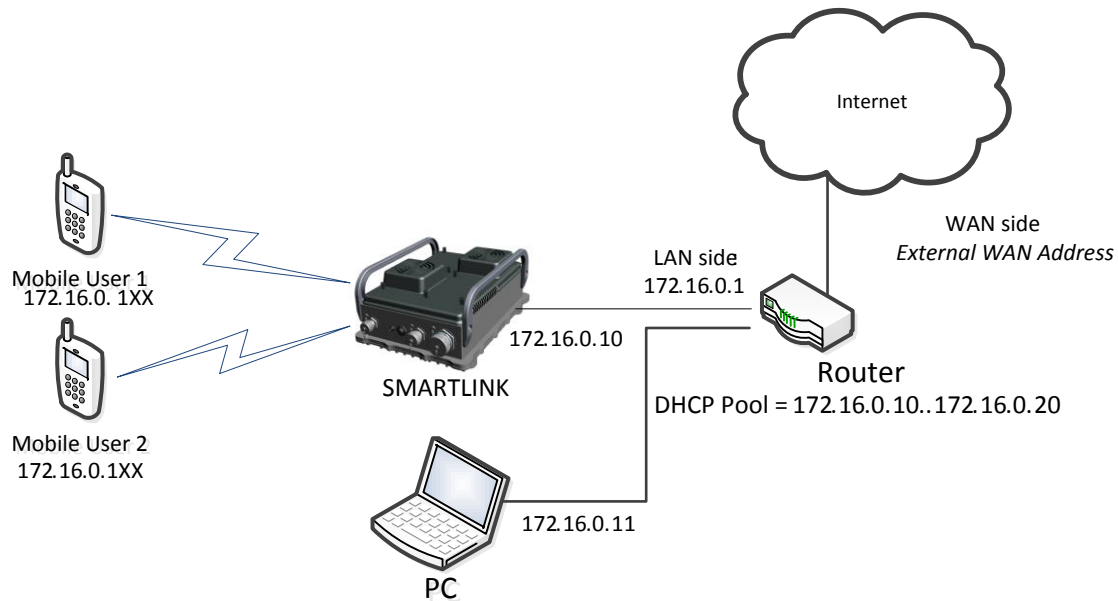


Figure 9 Network for Getting Started Example

In this example:

- The external router is configured to:
 - Have a LAN IP address on the 172.16.0.0/24 subnet.
 - Do NAT translation from the 172.16.0.0/24 address range to the internet.
- The DHCP server on the router:
 - Can allocate addresses in the range 172.16.0.10 ... 172.16.0.20.
 - Has allocated the address 172.16.0.10 to the SMARTLINK BTS.
 - Has allocated the address 172.16.0.11 to the PC.
- The SMARTLINK BTS is configured with default settings such that it:
 - Obtains its own IP address via DHCP;
 - Provides support for the Mobile Users with SIM cards shipped with the SMARTLINK BTS³.

If the Router is configured with an IP address range different to that of the Mobile Users, the SMARTLINK BTS supports the RIPv2 protocol, so this must be enabled on the Router. See Section 6.3.3.

³ Note that the default IP address range for Mobile Users is 172.16.0.100 to 172.16.0.199, which is on the same subnet as the router and will therefore be routed on the network, but is outside the range of addresses allocated by the DHCP server so that no clashes will be introduced.

4.3 STARTING UP THE SMARTLINK MANAGEMENT CONSOLE AND RESOLVING ANY ISSUES

In this section, a brief introduction will be provided to demonstrate how to log in to the SMARTLINK Management Console. The SMARTLINK Management Console is described in detail in Section 5.

4.3.1 LOGGING IN

The SMARTLINK Management Console is accessible using a web browser on the PC.

1. Verify that the SMARTLINK BTS is powered on and that the red light on the front panel is on continuously.
2. Open a browser window on the PC and navigate to the IP address for the SMARTLINK BTS. The SMARTLINK Management Console will now appear on the screen (see Figure 14).

Figure 10 Management Console Login Screen

3. Enter your user name and password. The SMARTLINK BTS is supplied with the default username and password settings shown in Table 5.
4. Following log-in you will be taken to the SMARTLINK Dashboard.

Table 5 Default User Account Settings

Parameter	Setting
Username	Admin
Password	Password

4.3.2 DASHBOARD

The Dashboard is described in detail in Section 5.3, for here we simply note the colour of the boxes on the status diagram (the area at the top of the main page).

If the SMARTLINK BTS has started up properly and all networking is correctly configured, then the Dashboard will appear as shown in Figure 11. *Move on to Section 4.4.*

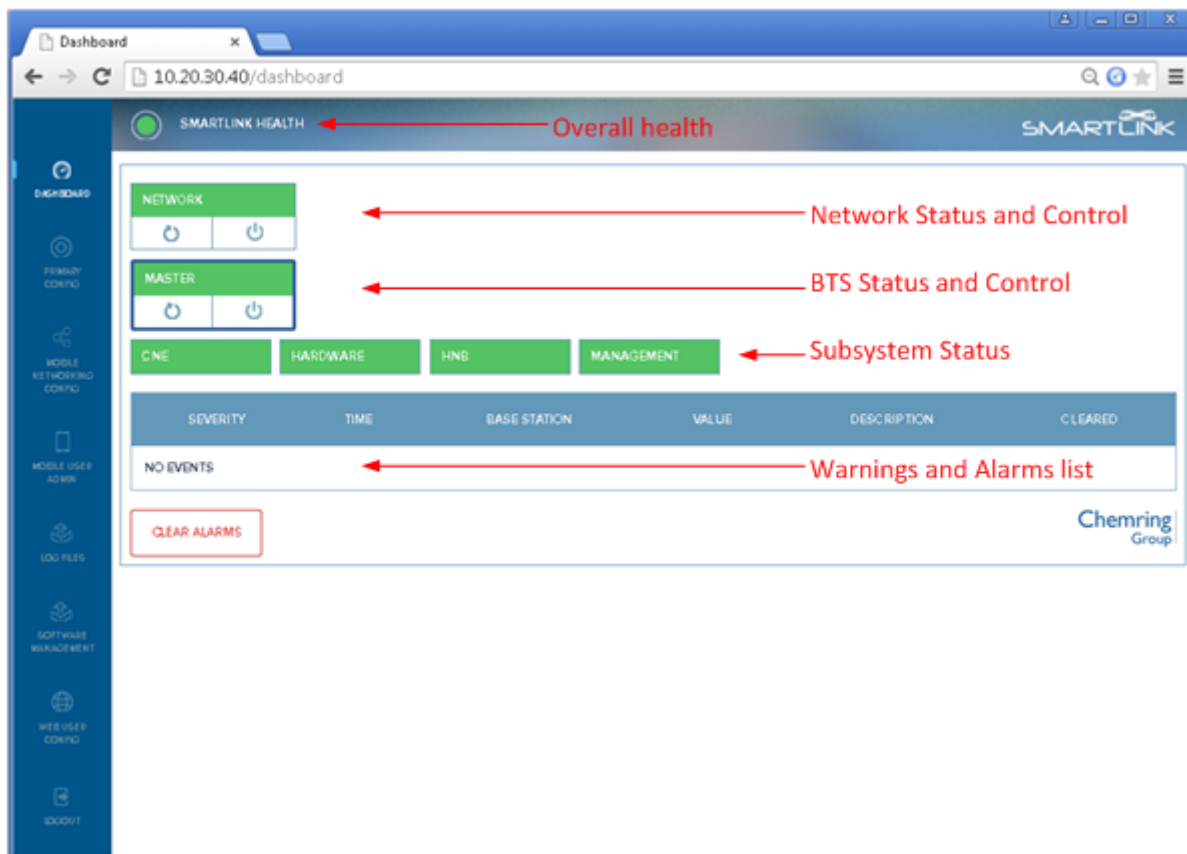


Figure 11 Dashboard with no ALARMS or WARNINGS

If any box is not green, this indicates:

- Amber: Uncleared WARNINGS; some functionality of the SMARTLINK BTS may be limited.
- Red: Uncleared ALARMS; the SMARTLINK BTS is not functioning properly.

In either of the above cases:

1. Click on the item that is not green to review the uncleared events list associated with this item (see Section 5.3.4);
2. Review the event description and take remedial action if appropriate;
3. Review the troubleshooting guide in Section 8.2 to resolve any remaining issues.

4.4 CONFIGURING MOBILE PHONES FOR USE WITH THE SMARTLINK NETWORK

The mobile phones that will be used on the SMARTLINK NETWORK must be installed with a SMARTLINK SIM card before use.

The supplied Universal Subscriber Identity Module (USIM), which has been pre-configured, must be installed into a mobile phone. There are two settings to be added to a mobile phone before operation with the network is possible:

- The correct Access Point Names (APN) settings are necessary to connect to the SMARTLINK Mobile Network for voice communication.
- The Short Message Service (SMS) settings are necessary to allow a text message to be sent to other mobile phones on the SMARTLINK Network.

4.4.1 INSERTING USIM INTO MOBILE PHONE

Carry out the following steps:

1. Ensure that the mobile phone is powered OFF.
2. Remove the back cover, locate and remove existing SIM card from the SIM card holder, if fitted.
3. Remove the battery from the mobile phone, lifting the battery contacts from the mobile phone contacts.
4. Insert the supplied USIM card into the SIM card holder.
5. Place the battery into the mobile phone, matching the battery contacts with the mobile phone contacts, and press the battery into place.
6. Place the back cover onto the mobile phone and press it into place.

4.4.2 USIM FINAL CONFIGURATION

The APN and SMS may now be manually set up.

4.4.2.1 APN configuration

The following generic procedure may be used to manually set up a new APN⁴:

1. With the mobile phone powered up, select the '**settings**' icon.
2. Select the '**Connections**' tab and navigate to '**Mobile Networks**' and to '**Access point Names**'.

⁴ The detailed steps will change based on the exact model and operating system of Mobile Device selected.

3. Now select the **'Menu'** key and **'New APN'**.
4. Select **'Name'** and key in **'SMARTLINK'** and select **'OK'**.
5. Select **'APN'** and key in **'SMARTLINK'** and select **'OK'**.
6. Select the **'Menu'** key and select **'Save'**.
7. Select the **'Home'** key to end the session and return to the Home screen.

4.4.3 SMS CONFIGURATION

The following generic procedure may be used to manually set up SMS text messaging⁵:

1. With the mobile phone powered up, select **'Messaging'**.
2. Select the **'Menu'** key and select **'Settings'**.
3. Select **'Message Centre'** and key in **'01'** and press **'OK'**.
4. Select the **'Home'** key to end the session and return to the Home screen.

Different mobile phone operating system variants will require a different set of steps.

4.5 VERIFYING 3G CONNECTIVITY

4.5.1 MOBILE PHONE CONNECTION

The fully configured mobile phone will now connect to the SMARTLINK Network as follows:

1. Verify that both the red light and the green light on the front panel are on continuously.
2. Switch on the mobile phone by using the 'power' button, as required.
3. The mobile phone automatically detects the active SMARTLINK BTS, assuming that the steps in Section 4.4 have been carried out.
4. Once the connection has established (this can take up to a minute), the SMARTLINK BTS should be visible from the mobile phone: The signal bars indication (see Figure 12 (a)) is visible at the top of the home screen. An H or 3G symbol indicates that data connectivity has been established.
5. The network ID (see Figure 12 (b)) may be visible at the bottom of the screen when swiping down upon the interface (depends on Mobile Phone model).

⁵ The detailed steps will change based on the exact model and operating system of Mobile Device selected.



(A) Signal Indicator at top of screen



(B) Network ID located at bottom of screen

Figure 12 Signal Indicator and Network ID

4.5.2 MOBILE USER ADMIN ON THE SMARTLINK MANAGEMENT CONSOLE

It is helpful to review the parameters for the active users on the Mobile User Admin page on the SMARTLINK Management Console. To do this:

1. Return to the SMARTLINK Management Console on your browser, logging back in, if necessary (Section 4.3.1).
2. Click on the Mobile User Admin link on the left hand side of the page.

An example Mobile User Admin page is as shown in Figure 13. Yours may be populated differently based on the SIM cards shipped with the SMARTLINK BTS.

If the SMARTLINK BTS is functioning properly (Section 4.3.2) and that the Mobile Phones have been configured as described in Sections 0 and 4.3, then the ALLOCATED IP and LAST HEARD columns should be populated for the Mobile Devices you have powered on. From these columns you can determine for a Mobile device with a given SIM card:

- The IP address that has been allocated by the SMARTLINK NETWORK. Presence of a value in this column also indicates that there is an active data session.
- The last time a Mobile was connected to the SMARTLINK NETWORK.

IMSI	PHONE NUMBER	DATA BEARER	ENABLED	STATIC IP ADDRESS	DELETE	ALLOCATED IP	LAST HEARD
001010123450020	0020	HSPA	TRUE	172.16.0.130	■		
001010123450021	0021	HSPA	TRUE	172.16.0.131	■		
001010123450022	0022	HSPA	TRUE	172.16.0.132	■		
001010123450023	0023	HSPA	TRUE	172.16.0.133	■		
001010123450024	0024	HSPA	TRUE	172.16.0.134	■		
001010123450025	0025	HSPA	TRUE	172.16.0.135	■		
001010123450026	0026	HSPA	TRUE	172.16.0.136	■		
001010123450027	0027	HSPA	TRUE	172.16.0.137	■		
001010123450028	0028	HSPA	TRUE	172.16.0.138	■		
001010123450029	0029	HSPA	TRUE	172.16.0.139	■		
001010123450030	0030	HSPA	TRUE	172.16.0.140	■		
001010123450031	0031	HSPA	TRUE	172.16.0.141	■		
001010123450032	0032	HSPA	TRUE	172.16.0.142	■		
001010123451986	1986	HSPA	TRUE	172.16.0.107	■		
001010123451987	1987	HSPA	TRUE	172.16.0.108	■		
001010123451988	1988	HSPA	TRUE	172.16.0.109	■		
001010123451989	1989	HSPA	TRUE	172.16.0.110	■		
001010123451990	1990	HSPA	TRUE	172.16.0.111	■		
001010123453419	3419	HSPA	TRUE	172.16.0.129	■		

Figure 13 Example Mobile User Admin Page

4.5.3 MAKING CALLS AND SENDING TEXTS

Having used the above information to identify the phone numbers for the Mobile Users that are attached to the cell, it is now possible to make calls and send text messages between the Mobile Users.

4.5.4 PROVING DATA CONNECTIVITY

To prove data connectivity on a given Mobile Phone:

1. Verify that the Mobile Phone has the H or 3G symbol displayed in the status bar (Figure 12 a).
2. Open the web browser on the Mobile Phone and navigate to <http://172.27.0.2:8080>. The login page for the SMARTLINK Management Console should appear. This demonstrates end to end data connectivity across the 3G air interface.


3. Provided that the router has been configured as described in Section 5, it should be possible for Mobile Users to access resources on the WAN. A simple test is to now use the web browser on the Mobile Phone to navigate to www.google.com.

If this works, then all internet data services should be possible.

If this test fails then there is a need to verify that routes have been setup between the various parts of the network. See Section 6 for more detailed information about IP Network Configurations.

4.6 POWERING-OFF THE SMARTLINK BTS

The two possible methods to power off a given SMARTLINK BTS are:

1. Via the button on the front panel:
 - a. Press the '**On/Off**' button located at the bottom of the SMARTLINK BTS.
 - b. Wait for the RED LED to stop flashing and go OFF.
2. Via the SMARTLINK Management Console:
 - a. Access the management console and select '**DASHBOARD**' see Section 5.3.
 - b. Locate, and press the Power button  for the appropriate SMARTLINK BTS, as described in Section 5.3.
 - c. Wait for the RED LED to stop flashing and go OFF.

There are no special actions required with the Mobile Phones, however it makes sense to turn them off when the SMARTLINK NETWORK is turned off to conserve batteries.

4.7 BOOTING THE SMARTLINK BTS AFTER POWER-OFF

If the SMARTLINK BTS has been powered off as described in Section 4.6 it can be powered up again by briefly pressing the button on the front panel. Alternatively, if the SMARTLINK BTS is configured to Boot on Power (Section 5.4) it will boot up again if the DC power is removed and re-applied.

The SMARTLINK BTS will go through the boot up process and start-up with the previous configuration.

4.7.1 RECONNECTING MOBILE PHONES

No special actions are required to get the Mobile Phones to re-connect to the SMARTLINK BTS once it has booted. They typically acquire the SMARTLINK NETWORK signal not later than 30 seconds after the green light has gone solid on the front panel, indicating that the GPS signal has been acquired.

If a given Mobile Phone is not connecting to the SMARTLINK NETWORK it is worth putting it in and out of flight mode (refer to manufacturer's instructions). Power cycling may occasionally be necessary if the Mobile Phone has got itself into an indeterminate state.

If no phones will connect to the SMARTLINK NETWORK, log into the SMARTLINK Management Console, review any ALARMS and WARNINGS, and follow the steps in Section 8.2 to resolve any issues.

5 SMARTLINK MANAGEMENT CONSOLE

5.1 CONNECTING TO THE SMARTLINK MANAGEMENT CONSOLE

The SMARTLINK Management Console is accessible using a web browser.

1. Verify that the SMARTLINK BTS is powered on and that the red light on the front panel is on continuously.
2. Open a browser window on the PC and navigate to the IP address for the SMARTLINK BTS. The SMARTLINK Management Console will now appear on the screen (see Figure 14).

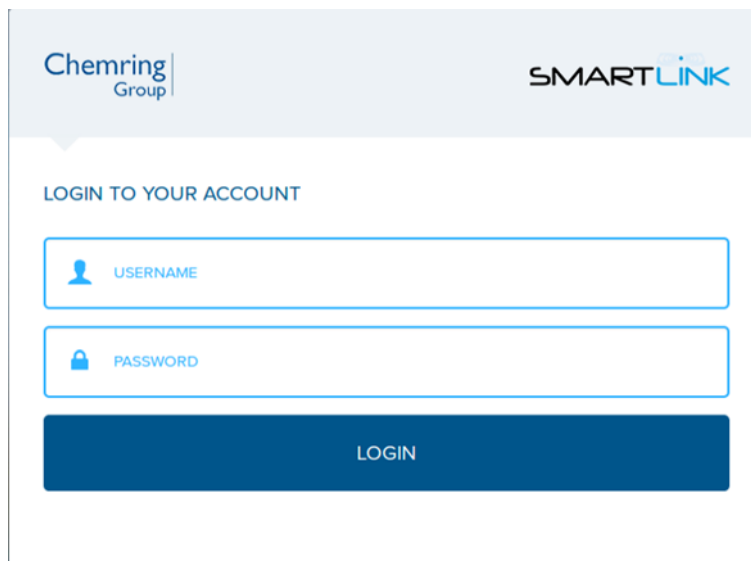


Figure 14 SMARTLINK Management Console Login Screen

3. Enter your user name and password. The SMARTLINK BTS is supplied with the default username and password settings shown in Table 6. It is recommended that you change these settings (as described in Section 5.9).

Table 6 Default User Account Settings

Parameter	Setting
Username	Admin
Password	Password

4. Following log-in you will be taken to the SMARTLINK Dashboard.

5.2 SMARTLINK MANAGEMENT CONSOLE OVERVIEW

All UI pages consist of three main areas as shown in Figure 15. These are:

- **Status bar:**
 - The icon on the left provides the health of the SMARTLINK NETWORK:
 - Green: BTS functioning normally with no alarms or warnings.
 - Amber: BTS has active warnings but no alarms.
 - Red: BTS has active alarms.
 This icon matches the SMARTLINK NETWORK status on the Dashboard.
 - Status messages. Status messages are also provided in the notification area to provide user feedback.
- **Sidebar:** Provides links to allow navigation to the following UI pages:
 - **Dashboard:**
High level control of the system, including power-on, reboot, power-off. Status reporting for each element in the SMARTLINK Network.
 - **Primary Config:**
IP network settings and hardware configuration for the individual SMARTLINK BTS.
 - **Mobile Networking Config:**
Mobile Network Settings (Network codes, base station settings, etc.)
 - **Mobile User Admin:**
Administration of Mobile Users.
 - **Log Files:**
Allows downloading of log files for use in support enquiries.
 - **Software Management:**
Used to update the software on the base station (all functionality disabled in Release 1.0.5).
 - **Web User Config:**
Administer web user accounts.

- **Logout:**
End current session and logout.
- **Main Panel:** The main area for user interaction for any given page.

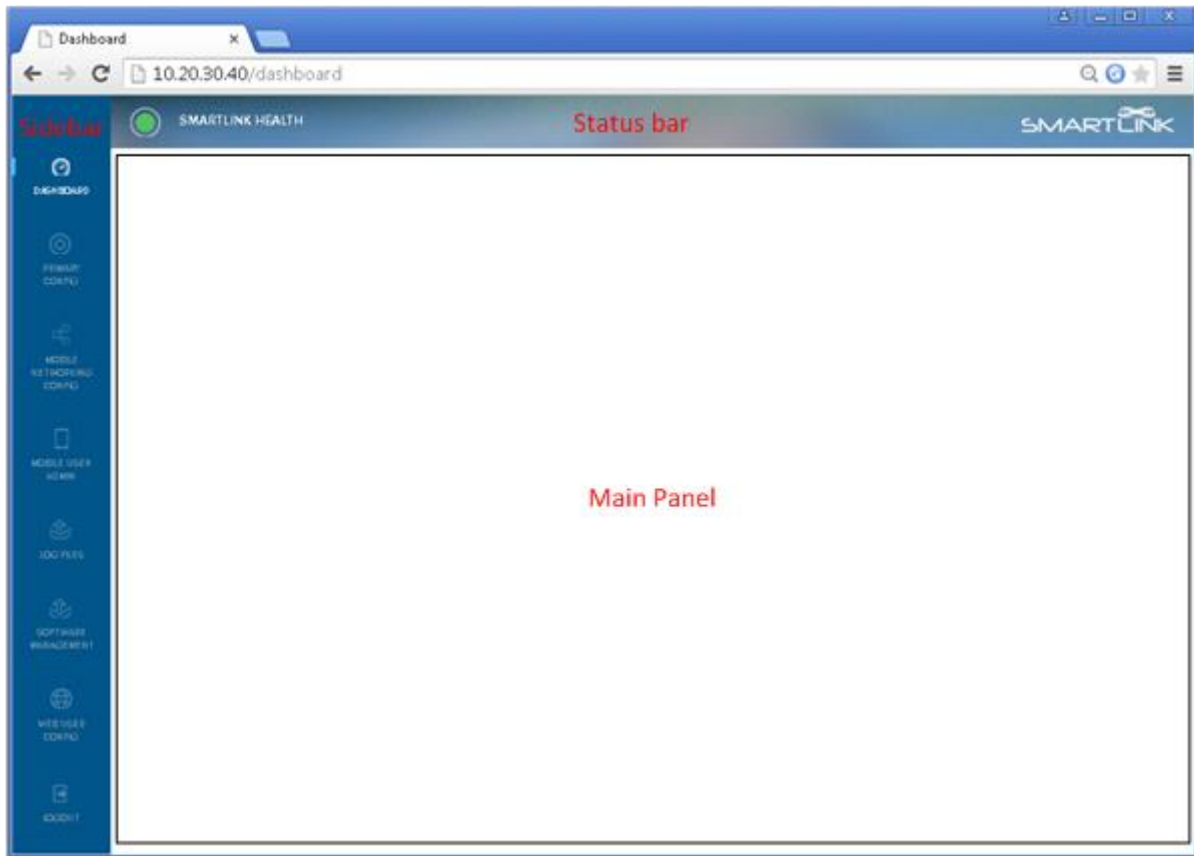


Figure 15 SMARTLINK UI Overview

5.3 DASHBOARD

The key operational page for a SMARTLINK BTS and for the overall SMARTLINK NETWORK is the Dashboard. This is shown in Figure 16 for a SMARTLINK BTS with no active alarms or warnings.

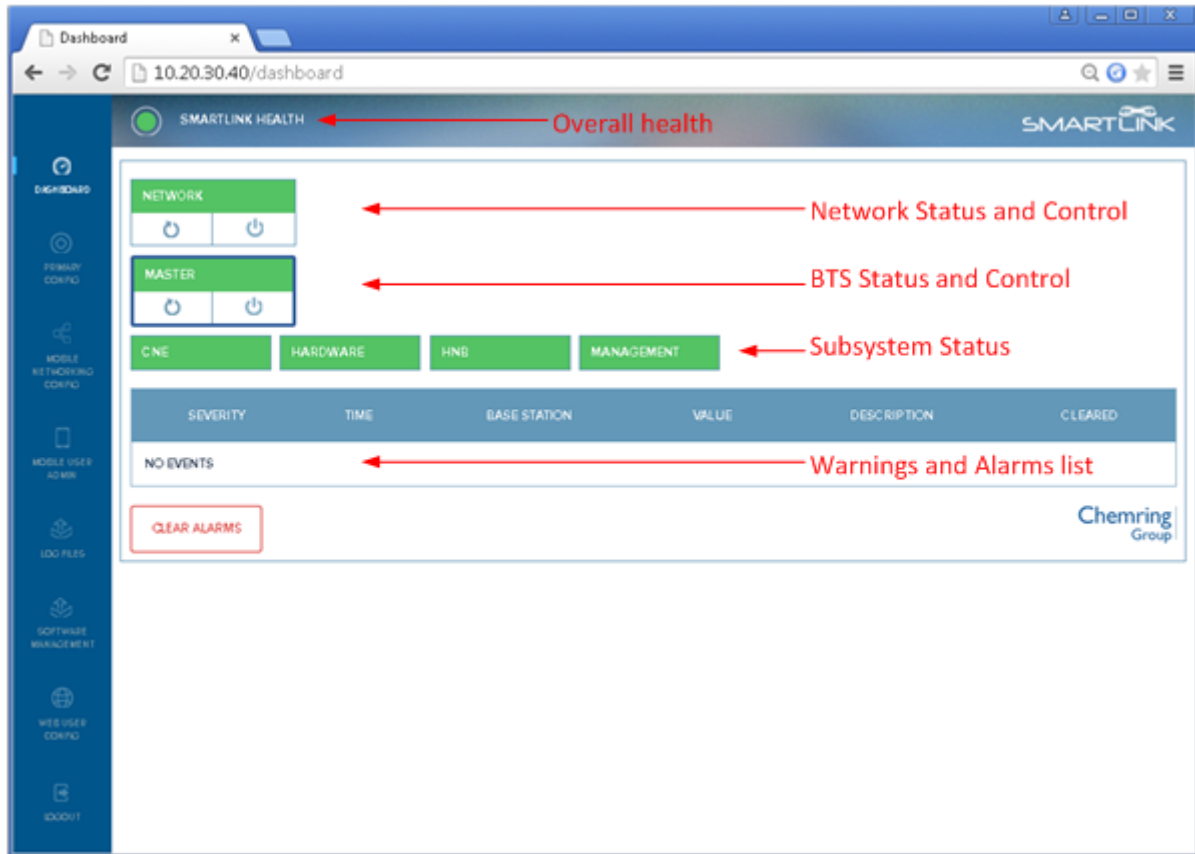


Figure 16 SMARTLINK Dashboard with no ALARMS or WARNINGS

5.3.1 PROPAGATION OF STATUS INFORMATION TO THE MASTER

The Dashboard of the MASTER BTS displays events and status from all SMARTLINK BTSes on the SMARTLINK NETWORK.

Each SLAVE BTS displays its own events only on its Dashboard. The SLAVE BTS has no knowledge of the status of the other parts of the network.

5.3.2 EVENTS: NORMALS, WARNINGS AND ALARMS

To understand the Dashboard, you need to know that elements of a SMARTLINK Network report their status to the UI via events. These events can be NORMALS, WARNINGS or ALARMS as follows:

NORMAL: Element is operating within normal parameters.

WARNING: An abnormal condition has been detected; the element continues to function, potentially in a degraded state. (e.g.

Loss of GPS lock, temperature high/low, loss of backhaul network.)

WARNINGS will be cleared automatically by the system once a NORMAL event is received to indicate that the abnormal condition is resolved.

WARNINGS are an indication that the user may need to take some action in order to ensure that long term stability of the SMARTLINK NETWORK.

ALARM: An abnormal condition has been detected; some functionality has been disabled or the equipment shut-down completely in order to maintain safe conditions. (e.g. Temperature outside operational limits, Critical hardware failure.)

ALARMS can only be cleared manually by the user, typically via a system restart.

ALARMS are an indication that the user needs to take action in order to bring the SMARTLINK NETWORK into full operation.



5.3.3 STATUS DIAGRAM



At the top of the main panel of the Dashboard is a hierarchical status summary for each element in the SMARTLINK NETWORK. In each case, the icon may be coloured as follows:

- Green: Element functioning normally with no ALARMS or WARNINGS.
- Amber: Element has active WARNINGS but no ALARMS.
- Red: Element has active ALARMS.

See Section 5.3.2 for the definition of ALARM, WARNING and NORMAL events.

The levels of hierarchy are as follows:

- **NETWORK:** The overall SMARTLINK NETWORK status is shown at the top of the panel.
 - The overall SMARTLINK NETWORK status is the worst case status of any BTS on the SMARTLINK NETWORK:
 - Click the NETWORK icon to cause the event table at the bottom of the page to show all active ALARMS and WARNINGS for the complete SMARTLINK NETWORK.
 - Click the  icon to restart all BTSes in the SMARTLINK NETWORK.
 - Click the  icon to power off all BTSes in the SMARTLINK NETWORK.

- **BTS:** Below the NETWORK Status an icon is displayed for each BTS in the SMARTLINK NETWORK with the name of the BTS displayed on the icon (in Figure 16 the network consists of a single BTS called "Master").
 - The overall BTS status is the worst case status of all of its SUBSYSTEMs.
 - BTSes are displayed in order of their Base Station ID. The BTS displayed on the left has a Base Station ID of 1 and is always the MASTER (see Section 5.4 for instructions for configuring a SMARTLINK BTS as the MASTER and Section 5.5 for instructions for setting the parameters for all SMARTLINK BTSes on the network).
 - Click a specific BTS icon to:
 - Filter the event table at the bottom of the page to show all active ALARMS and WARNINGS for this SMARTLINK BTS only.
 - Show the status of each of this BTS's subsystems in the level below.
 - Click the  icon to restart this BTS only. Note that restarting the Master will involve the complete network being restarted.
 - Click the  icon to power off this BTS only. Note that powering off the Master will result in the complete network ceasing to function.
- **SUBSYSTEM:** Clicking on a given BTS will cause the status of its subsystems to be displayed at the subsystem level. The subsystems are as follows:
 - **CNE:** (Applies to MASTER only.)

The CNE (Core Network Emulator) comprises all the core 3G processing that is shared over the whole network.

An ALARM or WARNING on this SUBSYSTEM indicates a software issue and is likely to result in restricted functionality or a restart of the SMARTLINK NETWORK.
 - **HNB:**

The HNB comprises all the 3G radio processing that is specific to the individual SMARTLINK BTS.

An ALARM or WARNING on this SUBSYSTEM indicates a software issue and is likely to result in restricted functionality or a restart of the individual SMARTLINK BTS without affecting the rest of the network.
 - **HARDWARE:**

Status of the SmartLink hardware, such as power supplies and temperature sensors.

- **MANAGEMENT:**

- Status of control elements, such as configuration ALARMS and WARNINGS, GPS lock WARNINGS, etc.

5.3.4 EVENT LIST

The event list at the bottom of the Dashboard shows any current events and warnings on the SMARTLINK NETWORK.

Figure 16 shows the case where there are no uncleared WARNINGS or ALARMS.

Figure 17 shows the case where there is a warning displayed in the Management SUBSYSTEM of the MASTER BTS. In this case the MASTER BTS has been clicked by the user and is highlighted with a thick border. This causes events to be filtered such that only events for this BTS will be displayed in the event list. The warning icon can be seen in the severity column, and it is clear that the warning status propagates up through the Management SUBSYSTEM, the MASTER BTS and to the NETWORK.

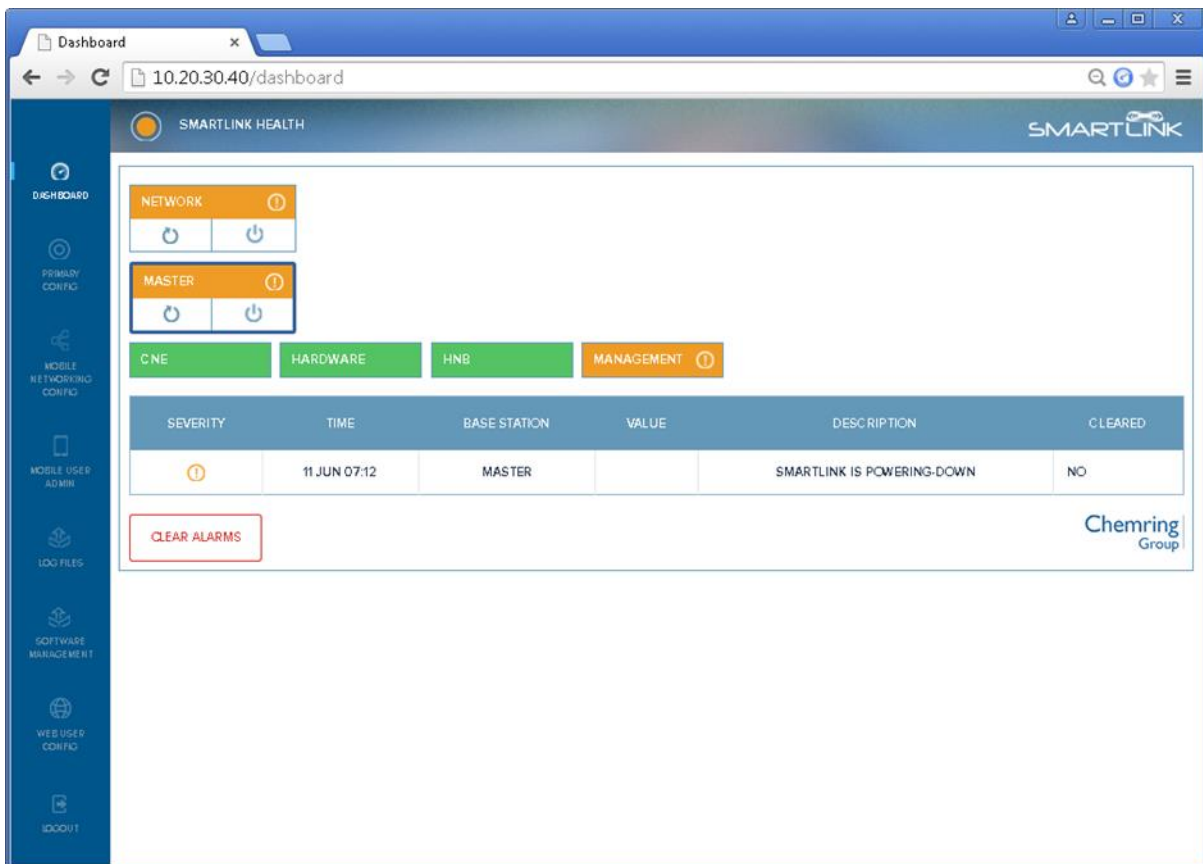


Figure 17 SMARTLINK NETWORK with uncleared WARNINGS

Figure 18 shows the Dashboard for a SMARTLINK BTS with uncleared ALARMS. In this case, there are ALARMS in both the MANAGEMENT and HARDWARE subsystems, but the user has clicked the MANAGEMENT SUBSYSTEM so the event list is filtered to show only the MANAGEMENT events.

The ALARM icon is shown in the table, as is the fact that the ALARM status propagates up through the hierarchy.

Also shown on this figure is a cleared WARNING. The MANAGEMENT subsystem shows a GPS locked warning, but this warning has been cleared, because the GPS signal has since been detected in lock. The warning icon is not shown any longer in the event table and the "CLEARED" column indicates "YES".

The screenshot shows the SMARTLINK HEALTH dashboard. The top navigation bar includes 'SMARTLINK HEALTH' and the SMARTLINK logo. The main content area displays several status indicators: NETWORK (red with warning icon), MASTER (red with warning icon), CNE (green), HARDWARE (red with warning icon), HNB (green), and MANAGEMENT (red with warning icon). Below these indicators is a table of events:

SEVERITY	TIME	BASE STATION	VALUE	DESCRIPTION	CLEARED
	10 JUN 16:19	MASTER	SATELLITES=2, TIME=235953.006,050180	GPS LOCKED	YES
⚠	10 JUN 15:44	MASTER		STARTUP FAILED - PLEASE CHECK LOGS	NO

A 'CLEAR ALARMS' button is located at the bottom left of the dashboard. The Chemring Group logo is visible in the bottom right corner.

Figure 18 SMARTLINK NETWORK with unclesd ALARMS

5.3.5 HANDLING WARNINGS

Some WARNINGS are likely to occur in normal usage of the SMARTLINK BTS. Most WARNINGS about temperature or loss of connectivity should be addressed by the user by re-siting the unit or providing an improved IP network connection. Other types of WARNINGS will be resolved automatically (e.g. temporary loss of GPS signal).

5.3.6 HANDLING ALARMS

ALARMS should not occur in normal usage of the SMARTLINK BTS. If an ALARM does occur, it is likely because the SMARTLINK UNIT is being used outside its Operational Envelope (typically temperature or airflow).

Generally when an ALARM event has occurred, the user should:

1. Review the ALARM description to determine whether any action needs to be taken.
2. If necessary, download any logs from the SMARTLINK BTS (see Section 5.7).
3. Take any action suggested by the ALARM description.
4. Restart the SMARTLINK NETWORK.


It is possible to clear all alarms currently on the SMARTLINK NETWORK by clicking the CLEAR ALL ALARMS button. This does not remove ALARMS from the event list, but it marks them as cleared and removes the ALARM status from the subsystem. In general, unless the user has taken actions to resolve the problem, the ALARM will simply reappear as the SMARTLINK NETWORK keeps running.

5.4 PRIMARY CONFIG

The Primary Config page shown in Figure 19 provides:


- IP network settings to connect the SMARTLINK BTS to the network and determine the location of the SMARTLINK NETWORK parameters;
- Hardware configuration; and
- Internal IP network settings.

The various possible settings are summarised in Table 7 along with their descriptions. The default settings shown in the figure are ideal for a single cell SMARTLINK NETWORK operating connecting to the outside network via DHCP.

Contextual help may be shown for each setting by hovering over the adjacent  button.

Once the desired settings have been chosen, select the SAVE button at the bottom of the page to store them on the unit, or CANCEL to revert to the initial settings.

Once the settings have been saved, a message appears in the Status bar stating that SMARTLINK BTS needs to be restarted in order for the settings to take effect.

To restart the SMARTLINK BTS, select the link to the Dashboard and click on the  button for this BTS.

BASE STATION ID	<input type="text" value="Master (ID=1)"/>	
IP ADDRESS MODE	<input type="text" value="DHCP"/>	
BOOT ON POWER	<input checked="" type="checkbox"/>	
LED ENABLE	<input checked="" type="checkbox"/>	
DC VOLTS HIGH WARNING THRESHOLD	<input type="text" value="30.0"/>	
DC VOLTS HIGH CUTOFF THRESHOLD	<input type="text" value="33.0"/>	
DC VOLTS LOW WARNING THRESHOLD	<input type="text" value="10.5"/>	
DC VOLTS LOW CUTOFF THRESHOLD	<input type="text" value="10.0"/>	
FAILSAFE IP ADDRESS	<input type="text" value="10.20.30.40/24"/>	
INTERNAL SUBNET	<input type="text" value="10.0.0.0/16"/>	

Figure 19 Primary Config Page

Table 7 Primary Config Settings

Setting	Description	Possible values
Master / Slave Parameters		
Base Station ID	Base Station Identifier (1-4). Each SMARTLINK BTS on the SMARTLINK NETWORK must have a unique ID. The MASTER has a Base Station ID of 1. All networks must include one MASTER.	ID=1 to 4
Master IP Address	IP address of MASTER SMARTLINK BTS. <i>Only displayed if Base Station ID is not equal to 1.</i>	Valid IP address
Master / Slave Fallback	Allows SLAVE to Fallback to form a local network if the link to the MASTER is lost. <i>Only displayed if Base Station ID is not equal to 1.</i>	On / Off
IP Network Parameters		
IP Address Mode	Selected IP address allocation method. Either Static or DHCP.	DHCP or Static
Static IP Address	Static IP Address of SmartLink Unit. Includes NetMask in CIDR notation. <i>Only displayed if IP Address mode is "Static".</i>	Valid IP address with NetMask, i.e XXX.XXX.XXX.XXX/NN
Gateway IP Address	Default gateway used for Reachback connections. <i>Only displayed if IP Address mode is "Static".</i>	Valid IP address
DNS Server Address	Address of DNS server. <i>Only displayed if IP Address mode is "Static".</i>	Valid IP address
Hardware Parameters		
Boot on Power	Enables auto power on when DC power is connected to the unit. If Boot On Power is Off, the SMARTLINK BTS will wait for the button to be pressed before powering up. If Boot On Power is On, the SMARTLINK BTS will power up as soon as power is connected to the power connector (for situations where the button is inaccessible, or there are frequent power cuts).	On / Off
LED Enable	Enables power and activity LEDs on the front of the unit.	On / Off

Setting	Description	Possible values
Battery Thresholds		
DC Volts High Cutout Threshold	High battery voltage at which the Base Station shuts down.	26 – 33 V
DC Volts High Warning Threshold	High battery voltage at which the Base Station issues a warning.	26 – 33 V
DC Volts Low Warning Threshold	Low battery voltage at which the Base Station issues a warning	10 – 22 V
DC Volts Low Cutout Threshold	Low battery voltage at which the Base Station shuts down	10 – 22 V
Additional IP Settings		
Failsafe IP Address	IP address for use where other IP settings have been lost. It is advisable to leave this at the default setting of 10.20.30.40, but can be changed if the default conflicts with the attached network settings.	Valid IP address, i.e XXX.XXX.XXX.XXX
Internal Subnet ⁶	Defines an internal subnet for use by SmartLink. Must be consistent for all units in the SmartLink network and not conflict with other network assets. It is advisable to leave this at the default setting, but can be changed if the default conflicts with the attached network settings.	Valid subnet definition, i.e XXX.XXX.XXX.XXX/NN

⁶ **The Internal Subnet control is currently ignored. See Issue 1 in Section 7.**


5.5 MOBILE NETWORK CONFIG (MASTER BTS ONLY)

The Mobile Network parameters (code selection, etc) for the entire SMARTLINK NETWORK are stored on the MASTER SMARTLINK BTS. Therefore the Mobile Network Config page shown in Figure 20 is only displayed on a MASTER SMARTLINK BTS.

The various possible settings are summarised in Table 7 along with their descriptions. Many good references are available that explain the various parameters of a 3G Cellular Network and such an explanation is beyond the scope of this brief User Manual. Chemring is able to provide further support in configuring a 3G Cellular Network upon request.


The top of the page specifies the full set parameters that apply to all base stations. Below this, up to four sets of base station parameters can be specified for the MASTER and up to three SLAVES.

Base Stations can be added and removed using the corresponding buttons on the UI.

Contextual help may be shown for each setting by hovering over the adjacent  button.

Once the desired settings have been chosen, select the SAVE button at the bottom of the page to store them on the unit, or CANCEL to revert to the initial settings.

Once the settings have been saved, a message appears in the Status bar stating that SMARTLINK BTS needs to be restarted in order for the settings to take effect.

To restart the SMARTLINK BTS, select the link to the Dashboard and click on the  button for this BTS.

MOBILE COUNTRY CODE	<input type="text" value="001"/>	?
MOBILE NETWORK CODE	<input type="text" value="01"/>	?
CELL ID BASE	<input type="text" value="10"/>	?
PRIMARY SCRAMBLING CODE BASE	<input type="text" value="200"/>	?
LOCATION AREA CODE	<input type="text" value="6000"/>	?
ROUTING AREA CODE	<input type="text" value="86"/>	?
SERVICE AREA CODE	<input type="text" value="13512"/>	?
* MOBILE ADDRESSING MODE	<input type="text" value="Static"/>	?
HANDOVER ENABLE	<input checked="" type="checkbox"/>	?

BASE STATIONS ADD BASE STATION

HNB	<input type="text" value="Master (ID=1)"/>	?
* BASE STATION NAME	<input type="text" value="Master"/>	?
* RADIO STATE	<input type="text" value="Active"/>	?
UMTS BAND	<input type="text" value="4"/>	?
* DOWNLINK CHANNEL	<input type="text" value="1587"/>	?
FREQUENCY	2122.4 MHz	?
TRANSMIT POWER	<input type="text" value="2"/>	?
INCLUDE IN STATUS	<input checked="" type="checkbox"/>	?

Figure 20 Mobile Network Config

Table 8 Mobile Network Config Settings

Setting	Description	Possible values
Overall Network		
Mobile Country Code	Country Code. Must match the MCC stored in Users' SIM cards.	String (001 to 999)
Mobile Network Code	Network Code. Must match the MNC stored in Users' SIM cards.	String (01 to 99)
Cell ID Base	Base index from which select the Cell IDs. For advanced users only (use default if unsure).	Integer (0 to 65535)
Primary Scrambling Code Base	Base index from which select the Primary Scrambling Code. For advanced users only (use default if unsure).	Integer (0 to 511)
Location Area Code	Location Area. For advanced users only (use default if unsure).	Integer (1 to 65535)
Routing Area Code	Routing Area. For advanced users only (use default if unsure).	Integer (0 to 255)
Service Area Code	Service Area. For advanced users only (use default if unsure).	Integer (0 to 65535)
Mobile Addressing Mode	Selected Mobile User IP address allocation method.	Static or Dynamic
Mobile Subnet Address	Address range for allocation of Mobile User IP addresses. <i>Only displayed if Mobile Addressing Mode is set to Dynamic.</i>	Valid subnet definition. Netmask can take values from 16 to 27.
Mobile Subnet Address Offset	Start address within the Mobile User subnet. Addresses will be allocated dynamically starting at the start of the Mobile Subnet Address, plus this offset. <i>Only displayed if Mobile Addressing Mode is set to Dynamic.</i>	Must fit within the Mobile Subnet
Handover Enable	Permit handover of Mobile Users between BTSes on the SMARTLINK NETWORK	On / Off

Setting	Description	Possible values
Base Station Parameters	One set for each BTS.	
Base Station Name	Friendly base station name for display on Dashboard	String
Radio State	Turns the cell on or off: "Active" or "Inactive".	Active or Inactive.
UMTS Band	UMTS frequency band.	Integer: 4
Downlink Channel	Downlink Channel Number, sets the base station band and transmit frequency. Can be any of: Band 4: 1537-1738	Integer in ranges: (Band 4: 1537-1738)
Transmit Power	Rated Transmit Power in Watts	2W, 1W, 0.5W,0.25W
Include in Status	True to include in network health on Dashboard. This field can be used to filter out BTSes that have been temporarily lost their connection to the SMARTLINK NETWORK from the reporting. If you clear this flag for a given BTS, the status information will be excluded from the Network Status in the Dashboard.	

5.6 MOBILE USER ADMIN (MASTER BTS ONLY)

The Mobile User parameters (IMSI, ISDN, etc.) are configured for the entire SMARTLINK NETWORK on the MASTER SMARTLINK BTS. Therefore the Mobile User Admin page shown in Figure 21 is only displayed on a MASTER SMARTLINK BTS.

Additional Mobile Users can be added individually from the Mobile User Admin Page by selecting the Add User button, which brings up the Add User Page (see Section 5.6.1).

Mobile Users can be deleted by selecting the minus icon in the Delete column in the table shown in Figure 21.

However the simplest way to add users is to import from a CSV file. Care must be taken to ensure that the file is correctly formatted as described in Section 5.6.2.

Mobile Users can be Added and Deleted without restarting any part of the SMARTLINK NETWORK.

The two right hand columns shown in Figure 21 provide feedback about the status of a given user on the SMARTLINK NETWORK:

- **Allocated IP** shows the IP address allocated to a given Mobile User with a given IMSI. This shows when a data connection is set up for a given user and also is helpful when using dynamic addressing for the Mobile Users.
- **Last Heard** provides status information about the last time a Mobile User had an active CS or PS bearer.


IMSI	PHONE NUMBER	DATA BEARER	ENABLED	STATIC IP ADDRESS	DELETE	ALLOCATED IP	LAST HEARD
001010123450020	0020	HSPA	TRUE	172.16.0.130	=		
001010123450021	0021	HSPA	TRUE	172.16.0.131	=		
001010123450022	0022	HSPA	TRUE	172.16.0.132	=		
001010123450023	0023	HSPA	TRUE	172.16.0.133	=		
001010123451840	1840	HSPA	TRUE	172.16.0.127	=		
001010123451841	1841	HSPA	TRUE	172.16.0.128	=		
001010123451979	1979	HSPA	TRUE	172.16.0.100	=		
001010123451980	1980	HSPA	TRUE	172.16.0.101	=		
001010123451981	1981	HSPA	TRUE	172.16.0.102	=		
001010123451982	1982	HSPA	TRUE	172.16.0.103	=		
001010123451983	1983	HSPA	TRUE	172.16.0.104	=		
001010123451984	1984	HSPA	TRUE	172.16.0.105	=		
001010123451985	1985	HSPA	TRUE	172.16.0.106	=		
001010123451986	1986	HSPA	TRUE	172.16.0.107	=		
001010123451987	1987	HSPA	TRUE	172.16.0.108	=		
001010123451988	1988	HSPA	TRUE	172.16.0.109	=		
001010123451989	1989	HSPA	TRUE	172.16.0.110	=		
001010123451990	1990	HSPA	TRUE	172.16.0.111	=		
001010123453419	3419	HSPA	TRUE	172.16.0.129	=		

ADD MOBILE USER
DOWNLOAD CSV
UPLOAD CSV

Figure 21: Mobile User Admin

5.6.1 ADD MOBILE USER PAGE

The Add Mobile User page is shown in Figure 22 with the various parameters summarised in Table 9.

Contextual help may be shown for each setting by hovering over the adjacent  button.

Once the desired settings have been chosen, select the SAVE button at the bottom of the page to store them on the unit, or CANCEL to return to the Mobile User Config page without saving.

Mobile Users can be Added and Deleted without restarting any part of the SMARTLINK NETWORK.









* IMSI	<input type="text"/>	
* PHONE NUMBER	<input type="text"/>	
ENCRYPTION ON	<input type="text" value="On"/>	
DATA BEARER	<input type="text" value="HSPA"/>	
CS ENABLED	<input type="text" value="On"/>	
STATIC IP ADDRESS	<input type="text" value="172.27.1.100"/>	
SHARED KEY	<input type="text"/>	
ENABLED	<input checked="" type="checkbox"/>	
	<input type="button" value="SAVE"/>	<input type="button" value="CANCEL"/>

Figure 22 Add Mobile User Page

Table 9 Mobile User Settings

Setting	Description	Possible values
IMSI	Individual Mobile Subscriber Identity from SIM card.	Must be 15 digits
Phone Number	Mobile Phone Number.	Between 4 and 10 digits long
Encryption On	"On" for air interface encryption; "Off" for unencrypted air interface.	On or Off
Data Bearer	Data bearer type selected for user.	Any of: "None" – indicating data disabled; "64k/64k" – indicating 64K DCH in both DL and UL; "HSDPA/64k" – indicating HSDPA in DL and 64K DCH in UL; "HSPA" – indicating full HSPA bearer.
CS Enabled	CS voice calls can be turned on or off on a per user basis.	On or Off
Static IP Address	Static IP Address of Mobile. (Only used if Mobile Addressing Mode is "Static".)	Valid IP address
Shared Key	Shared Secret Key for Mobile User. Known only to SIM card and Network.	Must include 32 integer elements. Default value is: 0 0 0 1 0 2 0 3 0 4 0 5 0 6 0 7 0 8 0 9 0 10 0 11 0 12 0 13 0 14 0 15
Enabled	True to enable user; false otherwise.	Boolean

5.6.2 IMPORTING MOBILE USERS FROM A CSV FILE

Entering in User Data on the Web Page is time-consuming and error prone so an alternative mechanism has been provided for loading and saving large amounts of user data.

The cleanest way to do this is to download an existing CSV file, and then modifying or appending to the contents. This should be done with care, to preserve the CSV formatting of the original.

5.7 LOG FILES

In the event of issues arising a mechanism has been provided to extract log files from the SMARTLINK BTS. This is done using the Log Files page shown in Figure 23.

Clicking the PREPARE LOGS button, causes the SMARTLINK BTS to compress and encrypt its last 150MB of log files and drop the resultant archive into a download location. Once the log file is available, a message appears in the status bar as shown in Figure 24 and the log file appears on the log file page.

The log file can be downloaded by clicking the hyperlink. The log file can be deleted from the SMARTLINK BTS download directory by clicking on the minus icon in the Delete column.

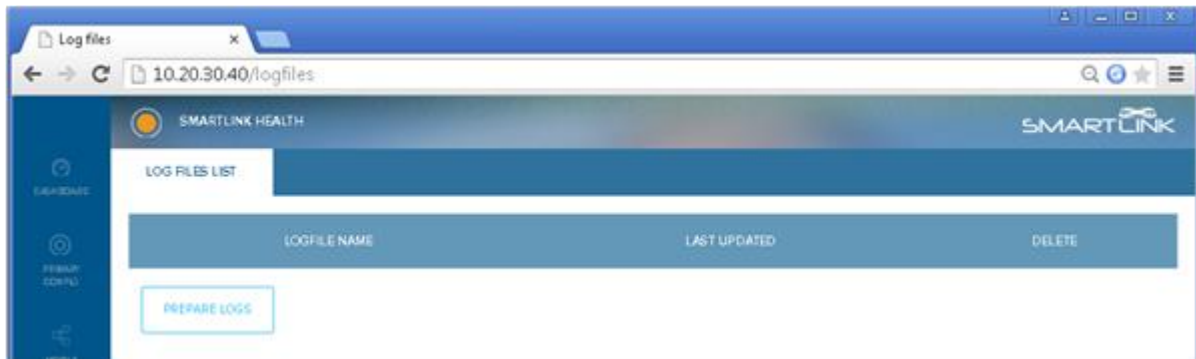


Figure 23 Log Files Page

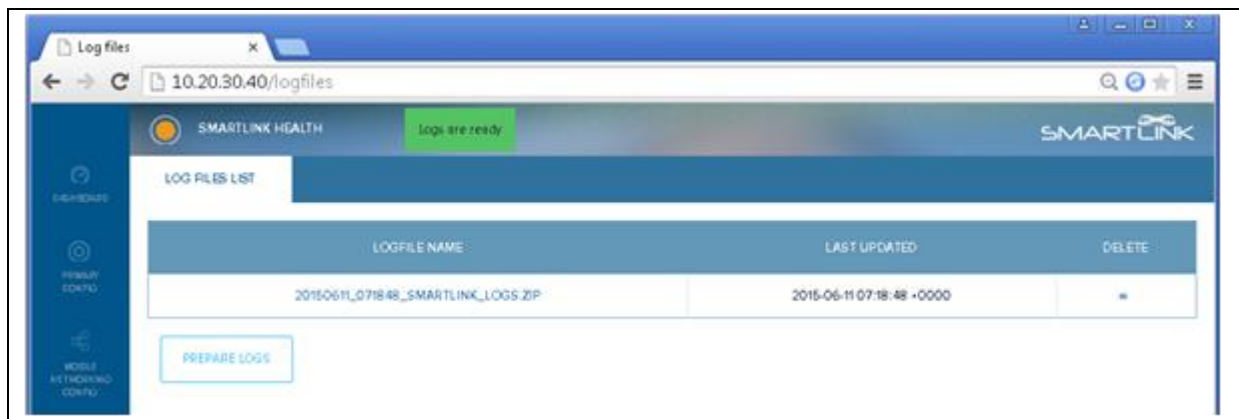


Figure 24 Log Files Page - Logs ready

5.8 SOFTWARE MANAGEMENT

The software management page, though included in the current build is not yet functional.

5.9 WEB USER ADMIN

The Web User Admin page shown in Figure 25 can be used to add and delete users from the web interface and to modify the passwords of existing web users. Clicking on ADD USER or EDIT USER brings up the Web User Edit page shown in Figure 26 and allows the username and password to be updated.

If there is more than one web user on the SMARTLINK BTS, then an additional DELETE icon will appear on the Web User Admin page. It is not possible to delete the last web user from the SMARTLINK BTS.

It is strongly recommended that you change the user name and password from the default values. Note that user names and passwords should be stored in a secure location since if they are lost then restoring access is a Level 4 support task.

USERNAME	
ADMIN	EDIT USER

ADD USER

Figure 25 Web User Admin

USERNAME ⓘ

PASSWORD ⓘ

PASSWORD CONFIRMATION ⓘ

SAVE CANCEL

Figure 26 Web User Edit

5.10 LOGOUT

This link prompts for confirmation, then logs the user out of the SMARTLINK BTS UI.

6 IP NETWORKING GUIDE

6.1 INTRODUCTION

The SMARTLINK BTS is a highly flexible IP networking device that allows data to be passed between Mobile User devices and across to the Internet. It has been designed to support the widest range of IP network structures and, in order to achieve this, requires careful configuration of both the SMARTLINK BTS and the wider network infrastructure.

This section provides the following:

1. Connection of the SMARTLINK BTS to an IP Network.
2. A description of the IP Networking approach adopted with SMARTLINK.
3. A number of example network configurations that cover the major expected requirements for SMARTLINK end-users.

6.2 CONNECTION OF THE SMARTLINK BTS TO AN IP NETWORK

6.2.1 FACTORY DEFAULT SETTINGS

The SMARTLINK BTS ships with the Default IP Network Settings shown in Table 10.

Table 10 Default IP Network Settings

Parameter	Setting
IP Address Mode	DHCP
Failsafe IP Address	10.20.30.40/24

These factory default settings can be restored as described in Section 8.1.

A SMARTLINK BTS cannot be connected to any IP network that uses addresses in the 172.27.0.0/24, 172.27.1.0/24, 172.27.2.0/24, 172.27.3.0/24, 172.27.4.0/24 and 172.27.253.0/24 ranges. See Issue 1 in Section 7.

6.2.2 USING DYNAMIC IP ADDRESSING

The simplest way to connect to the SMARTLINK BTS via an IP network is using the default DHCP method:

1. Connect the SMARTLINK BTS via the Ethernet cable to a network that includes an external DHCP server (typically DHCP services are provided as part of a network router functionality).

2. The SMARTLINK BTS should detect the external DHCP server and obtain an IP address on start-up.
3. The address allocated to the SMARTLINK BTS can be retrieved by querying the external DHCP server (refer to manufacturer's instructions).
4. Confirm connectivity (if required) by pinging the IP address allocated by the DHCP server from a network-connected PC.

A SMARTLINK BTS cannot be connected to any IP network that uses addresses in the 172.27.0.0/24, 172.27.1.0/24, 172.27.2.0/24, 172.27.3.0/24, 172.27.4.0/24 and 172.27.253.0/24 ranges. See Issue 1 in Section 7.

6.2.3 USING THE USER-CONFIGURED STATIC IP ADDRESS

If:

- No DHCP server is available; and
- You have previously configured the SMARTLINK BTS with a known static IP address (see Section 5.4 for instructions on how to do this),

It is possible to connect to the SMARTLINK BTS using this static IP address, as follows:

1. Connect a network cable between the SmartLink unit and network-connected PC.
2. Configure the PC to have an address on the same subnet as your configured IP static address (avoiding the address you have allocated to the SMARTLINK BTS).
3. Confirm connectivity (if required) by pinging the address you have selected.

A SMARTLINK BTS cannot be connected to any IP network that uses addresses in the 172.27.0.0/24, 172.27.1.0/24, 172.27.2.0/24, 172.27.3.0/24, 172.27.4.0/24 and 172.27.253.0/24 ranges. See Issue 1 in Section 7.

6.2.4 USING THE FAILSAFE IP ADDRESS

If:

- The SMARTLINK BTS has been configured to use DHCP but no DHCP server is available; or
- The SMARTLINK BTS has been configured with a static IP address but the static IP address has been forgotten.

It is possible to connect to the SMARTLINK BTS at the failsafe IP address using the following procedure:

1. Connect a network cable between the SmartLink unit and a network-connected PC.
2. Configure the PC to have an address on the 10.20.30.0/24 subnet (avoiding the 10.20.30.40 address allocated to the SMARTLINK BTS).

3. Confirm connectivity (if required) by pinging the failsafe IP address.

Note that:

1. You can only access a SMARTLINK BTS via the failsafe IP address if it is the only SMARTLINK BTS on the network with this failsafe IP address.
2. It is possible to change the failsafe IP address, to accommodate networks that are already using the 10.20.30.0/24 subnet. In general, this should not be necessary.
3. If you have changed the failsafe IP address but cannot remember it you can restore the factory configuration as described in Section 8.1.

6.3 DETAILS OF IP NETWORKING

6.3.1 BACKGROUND

A SMARTLINK BTS configured as a MASTER contains a complete self-contained cellular core network including a Gateway General Packet Radio Service (GPRS) Support Node (GGSN) which allocates IP addresses to Mobile Users and routes packets to and from the Ethernet interface.

To devices on the same Ethernet segment as the SMARTLINK Master, SMARTLINK appears as if it is a multi-homed networking device where IP packets from the Mobile Phones all have the same originating Ethernet Media Access Control (MAC) address.

6.3.2 MOBILE USER IP ADDRESSING

The IP addresses allocated to mobiles can be statically assigned to each SIM card, or dynamically allocated from a pool. Dynamic addressing is simplest since it saves keeping track of the IP addresses for multiple users. Static addressing is useful if a server application (such as a webcam) is required to be run on a particular Mobile Device.

Mobile Users cannot be allocated addresses in the 172.27.0.0/24, 172.27.1.0/24, 172.27.2.0/24, 172.27.3.0/24, 172.27.4.0/24 and 172.27.253.0/24 ranges. See Issue 1 in Section 7.

6.3.2.1 Configuring Static Mobile User IP Addressing

To configure static Mobile User IP addressing, using the SMARTLINK Management Console:

1. In 'Mobile Networking Config' set 'Mobile Addressing Mode' to 'Static'.
2. In 'Mobile User Admin' configure each user with a static IP address.

6.3.2.2 Configuring Dynamic Mobile User IP Addressing

To configure dynamic Mobile User IP addressing, using the SMARTLINK Management Console:

1. In the 'Mobile Networking Config' menu set 'Mobile Addressing Mode' to 'Dynamic'.
2. Then select the desired 'Mobile Subnet Address' (in the form 1.2.3.4/5).
3. In this mode, the static IP addresses configured in 'Mobile User Admin' will be ignored.

In dynamic Mobile User addressing mode, the 'Mobile Networking Config' -> 'Mobile Subnet Address Offset' parameter allows the same subnet to be used for mobile users as is used by the main SmartLink IP address.

As an example, if:

- The Master is connected to a DHCP server, which provides IP addresses in the range 172.16.0.10/24 to 172.16.0.20/24; and
- The Mobile Users are required to also be on the same subnet.

Then:

- 'Mobile Networking Config' -> 'Mobile Subnet Address' could be set to 172.16.0.0/24; and
- 'Mobile Networking Config' -> 'Mobile Subnet Address Offset' could be set to '100'.

This would cause Mobiles to be allocated addresses 172.16.0.100, 172.16.0.101 etc., which are on the same subnet but do not clash with the router's DHCP pool.

Mobile User IP addresses could be allocated statically to achieve the same effect.

6.3.3 AUTOMATIC USE OF RIPV2

If the Mobile Users use a different IP subnet from that used by the main SMARTLINK IP address, then SMARTLINK will enable the Routing Information Protocol version 2 (RIPv2), which will be used to announce that the SMARTLINK Master is providing a route to this subnet. For this to be useful, the neighbouring routers must have RIPv2 enabled.

Care should be taken that the IP addresses allocated to mobile users do not clash with any IP addresses on the network to which SMARTLINK BTS is attached.

6.3.4 DNS SERVER ADDRESS

The DNS server address provided to Mobile Users will be either that provided by the DHCP server (if 'Primary Config' -> 'IP Address Mode' is set to 'DHCP', or the 'DNS Server Address' provided in 'Primary Config' if 'Primary Config' -> 'IP Address Mode' is set to 'Static'.

6.3.5 RESERVED IP ADDRESSES

SMARTLINK uses an internal IP subnet which is not exposed on the Ethernet interface. It is not possible to use addresses in this range for:

- Main IP address,
- Mobile User IP addresses, or
- Failsafe address.

The reserved subnets are: **172.27.0.0/24, 172.27.1.0/24, 172.27.2.0/24, 172.27.3.0/24, 172.27.4.0/24 and 172.27.253.0/24.**

NOTE:

In future releases these reserved subnets will be configurable.

6.4 EXAMPLE NETWORK CONFIGURATIONS

6.4.1 REACHBACK TO THE INTERNET

In this configuration (see Figure 27) Mobile Users connected to SMARTLINK can access the Internet via a gateway router. The mobiles can also access each other.

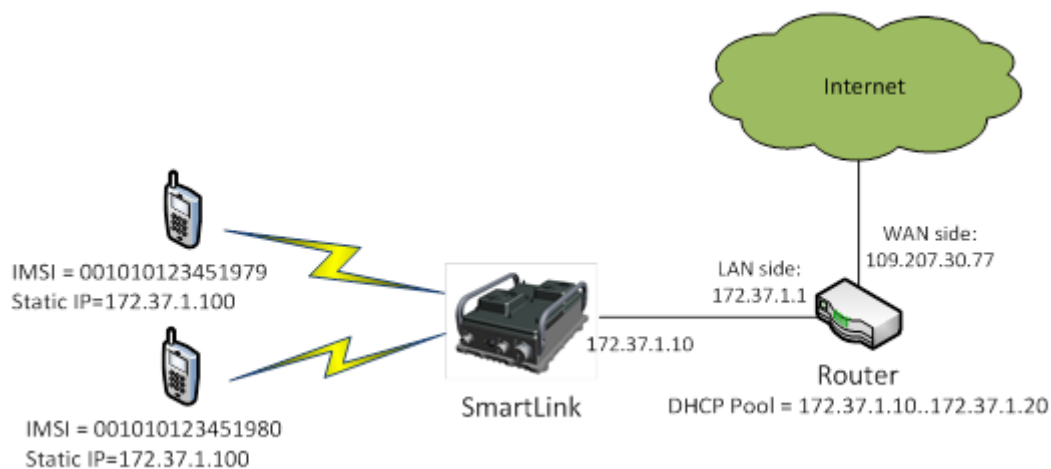


Figure 27 Mobile access via gateway router

In this example the router supports DHCP, so the simplest SMARTLINK configuration is:

1. In 'Primary Config' set 'IP Address Mode' to 'DHCP' (see Figure 28).



Figure 28 Primary Config – set IP Address Mode

- In 'Mobile User Admin' with a unique static IP address (see Figure 29) from the same subnet used by the router (ensuring that they do not conflict with any addresses already allocated by the router).

The screenshot shows the 'MOBILE USER LIST' table with the following data:

IMSI	PHONE NUMBER	DATA BEARER	CS ENABLED	ENABLED	ENCRYPTION ON	STATIC IP ADDRESS	REMOVE_USER
001010123451979	9845001979	HSDPA/64K	ON	TRUE	TRUE	172.371.100	
001010123451980	9845001980	HSDPA/64K	ON	TRUE	TRUE	172.371.101	

Figure 29 Mobile User Admin – unique static IP address

NOTE:

Some simple routers will only, by default, perform network address translation for the LAN subnet. So putting the Mobile Users on the same subnet as the router avoids the need to perform any extra configuration on the router.

If the router does not support DHCP then, in 'Primary Config', set 'IP Address Mode' to 'Static' and configure the 'Static IP address', 'Gateway IP Address', 'DNS address' and 'Net Mask' fields.

NOTE:

In this case the router has a DNS proxy, so the DNS address is the same as the router's address. For phones to have full Internet connectivity then the DNS server must be set-up correctly.

6.4.2 ADDING A LOCAL APPLICATION SERVER

In this example (see Figure 30) a local application server is added.

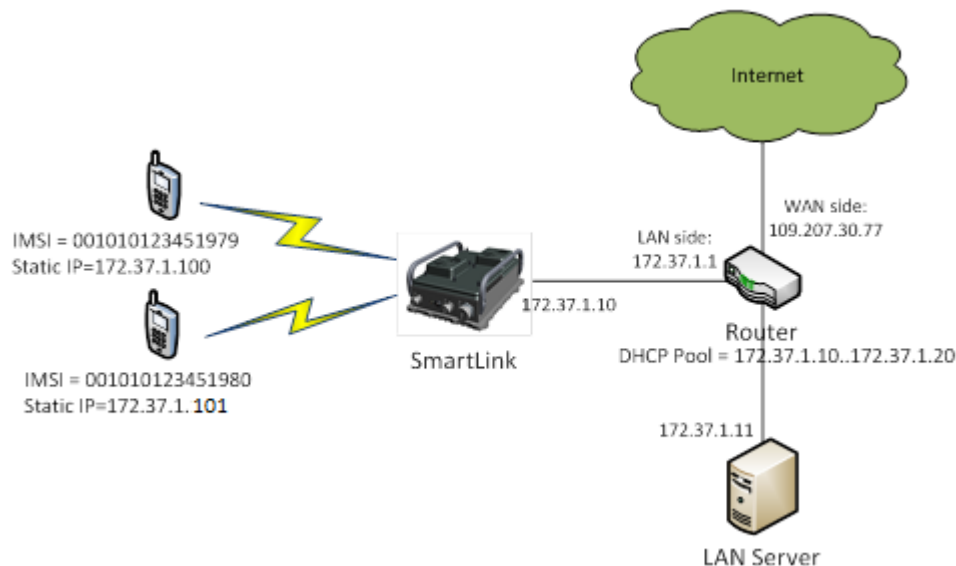


Figure 30 Adding a local application server

The SMARTLINK configuration is the same as in the previous example. Mobile users will be able to access IP applications running on the server.

NOTE:

With some routers the LAN server may require configuring with a static route back to SMARTLINK. The routing protocol (RIPv2) used by SMARTLINK helps the router direct packets back to SMARTLINK, but support for this depends upon the model of router used. This can be avoided by configuring the mobile users to use the same subnet as the LAN server. If a different subnet is required for the mobiles, then a static route can be added as described below:

Example: If the mobile users are on the 172.17.1.0/24 subnet and the SMARTLINK main IP address is 172.37.1.10 then a static route on the LAN server could be configured using:

```
$ route add -net 172.17.1.0/24 via 172.37.1.10 dev eth0
```

on Linux, or

```
C:\ROUTE ADD 172.17.1.0 MASK 255.255.255.0 172.37.1.10
```

on Windows.

6.4.3 NO REACHBACK REQUIRED/DIRECT CONNECTION TO APPLICATION SERVER

In this configuration Mobile Users connected to SMARTLINK can access a LAN server directly (see Figure 31) connected to the SMARTLINK's Ethernet port. The mobiles can also access each other. No reachback to other networks is required, so there is no need for a router.

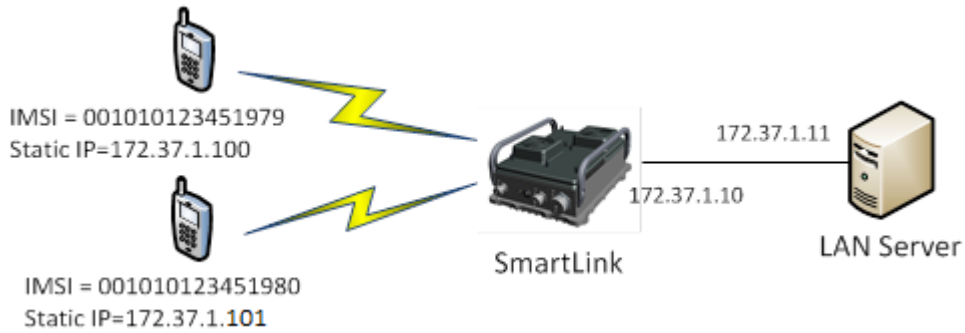


Figure 31 Direct connection to application server

1. The 'Mobile User' configuration remains unchanged
2. The 'Primary Config' -> 'IP Address Mode' must be set to 'Static' since there is no DHCP server.

With reference to Figure 32, the static parameters 'Gateway IP Address', 'DNS Server Address' and 'Net Mask' should be set as follows:

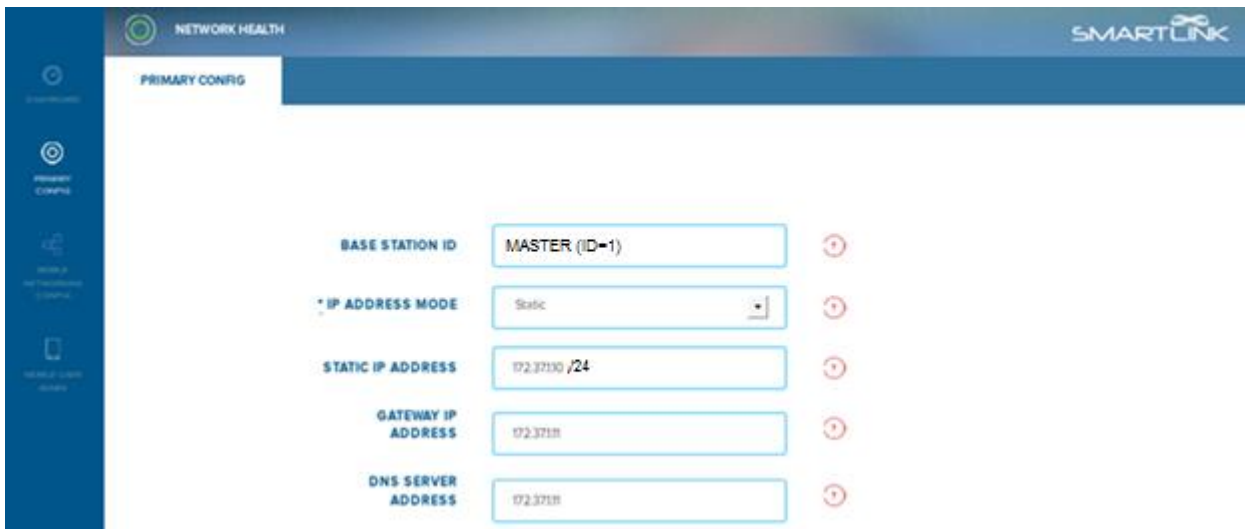


Figure 32 Primary config – static parameters

Note:

Even though there is no gateway/DNS server present, these fields need to be filled out with syntactically correct values.

6.4.4 MASTER/SLAVE CONFIGURATION

In order to increase coverage, up to four SMARTLINKs can be connected together with one unit configured as a MASTER and the others as SLAVES.

In this example (see Figure 33) a SLAVE is connected to a MASTER. Both MASTER and SLAVE are located behind NATed firewalls running DHCP servers. The mobiles connected to either SMARTLINK BTS can connect to any servers that are reachable from the MASTER, and can also connect to each other.

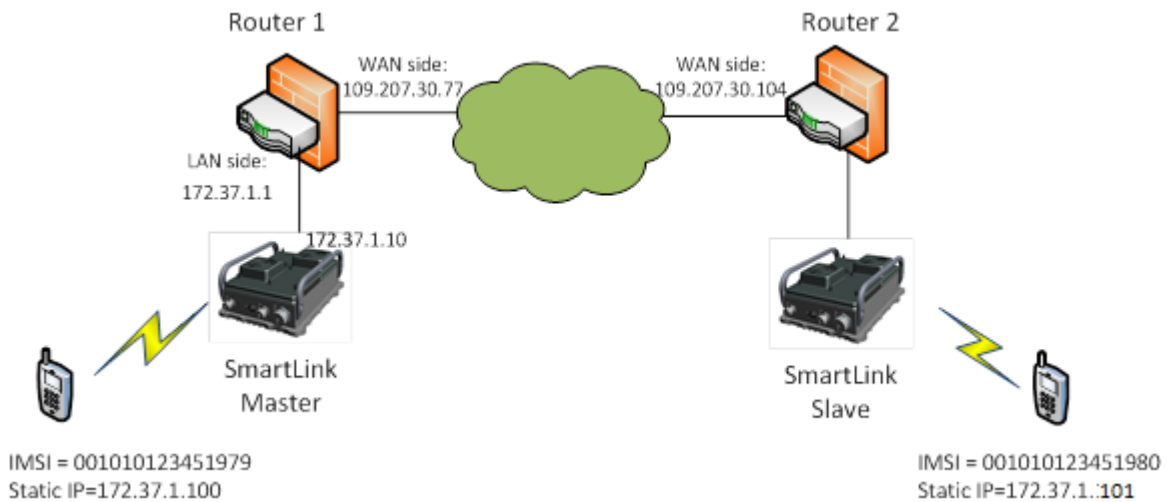


Figure 33 Master/Slave configuration

The MASTER's configuration will be the same as in the previous examples.

On the SLAVE:

1. In Primary Config, configure the 'Master IP address' and set the Base Station ID to '2'.

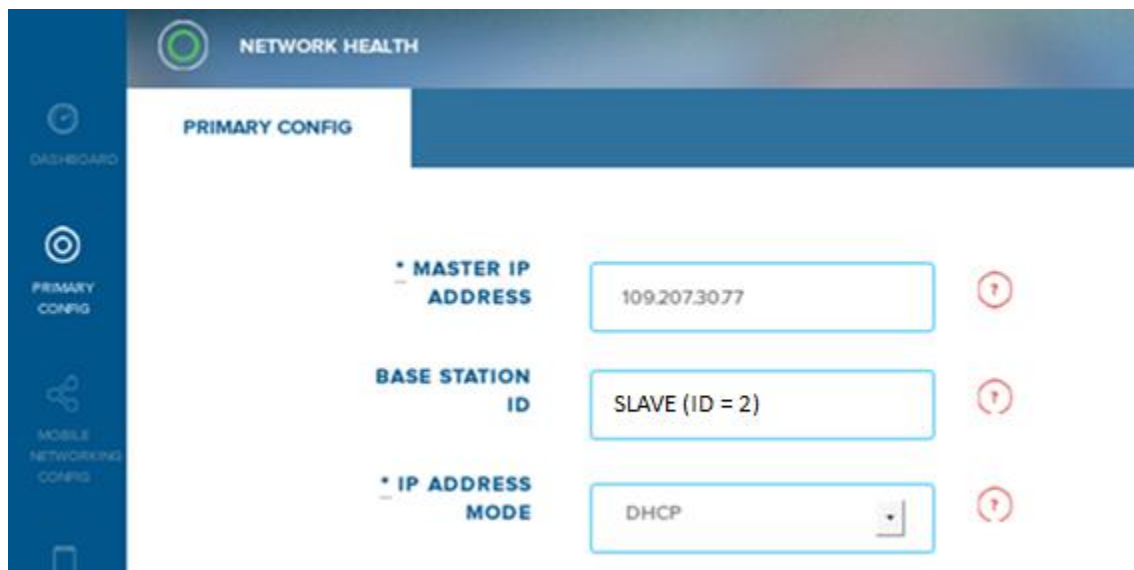


Figure 34 Primary config – base station ID

2. Since Router 1 is NAT'ing the Master's IP address, the address configured in the Slave must be the public IP address of Router 1.

Port forwarding must be enabled in Router 1 in order for the IPsec tunnels to be established between the Slave and Master. The ports to be forwarded are 'UDP/500' and 'UDP/4500' and they should both be forwarded to the Master's IP address '172.37.1.10'.

NOTES:

- (1) Port forwarding is only required if the Master is behind a NAT'ed firewall.
- (2) The firewalls on any routers between Slave and Master must be configured to allow traffic on ports 500 and 4500.

7 KNOWN ISSUES AND LIMITATIONS

SMARTLINK BTS Release 1.0.5 has the following known limitations:

1. The Internal Subnets used by SMARTLINK are fixed to **172.27.0.0/24, 172.27.1.0/24, 172.27.2.0/24, 172.27.3.0/24, 172.27.4.0/24 and 172.27.253.0/24.**
 - a. A SMARTLINK BTS cannot be connected to any IP network that uses addresses in these ranges.
 - b. Mobile Users cannot be allocated IP addresses in these ranges.
 - c. The failsafe IP address cannot be allocated in these ranges.
 - d. The Internal Subnet control on the Primary Config SMARTLINK Management Console page is disabled / ignored.

In a future release, this Internal Subnet will be parameterised.

2. The Software Management Page on the SMARTLINK Management Console is not yet functional.
3. The SMARTLINK BTS has been seen to, very occasionally, restart itself during tests which involve high uplink data rates from multiple phones.
4. SMSs sent simultaneously from multiple phones may be delayed, or fail to send.
5. Multiple SMSs sent in quick succession from a single phone may get delayed, or fail to send.

8 MAINTENANCE INSTRUCTIONS

8.1 RESTORING THE FACTORY DEFAULT CONFIGURATION

A SMARTLINK BTS is shipped with a factory default configuration that includes:

- The specific software build at shipping; and
- The complete set of Primary Configuration, Mobile Network and Mobile User settings.

To restore these factory default settings:

- Power down the SMARTLINK BTS using one of the methods described in Section 4.6, and leave the SMARTLINK BTS connected to the DC power supply.
- Hold down the front panel button on the SMARTLINK BTS for more than 10 seconds, then release.
- The SMARTLINK BTS will power up and re-install the factory default settings. This may take longer than a typical power-up.

Note that, for security reasons, the factory default settings DO NOT include the default Web User names and passwords. Restoration of the factory web user accounts is a Level 4 support task.

8.2 FAILURE DIAGNOSIS

8.2.1 GENERAL

Fault diagnosis and troubleshooting is limited to basic checking of equipment set-up and to checking of electrical connections for security and serviceability, and installation of the hardware.

Table 11 describes the physical troubleshooting which can be performed via visual inspection by the user.


Table 12 describes the Software/Hardware Management Console Warning  Reporting that is displayed on the network application.

Table 13 describes the Software/Hardware Management Console Alarm  Reporting that is displayed on the network application.

8.2.2 FAULT FINDING

Table 11 Troubleshooting

Ser (1)	Defect (2)	Cause (3)	Remedy (4)
1	Physical damage to the SMARTLINK BTS, Antennas or Cable Connectors.	Debris or collision with hard object.	Where possible, conduct battlefield repair to the damaged item using materials available. Alternatively, contact the manufacturer for support.
2	SMARTLINK BTS does not power up.	a) Assembly Disconnect. b) Battery supply voltage out of specified voltage range. NOTE: It is possible to specify the battery cut-out thresholds using the management interface. These should be modified with	a) Ensure that the correct power cable has been used and that all connectors have been tightened by rotating the connector ends. b) Connect alternative power source, with voltage inside indicated range. The supplied main power provides 24V and the unit should always be able to power up with this unless there is an internal fault.

Ser (1)	Defect (2)	Cause (3)	Remedy (4)
		<p>care to ensure that the unit can be powered with all appropriate power sources.</p> <p>c) SMARTLINK built-in test has detected a defect on the power supplies and gone into an error state indicated by both front panel LEDs and slowly flashing.</p> <p>d) Temperature is too low.</p>	<p>c) If SMARTLINK BTS fails to boot, replace with alternative SMARTLINK BTS and return faulty unit for Level 4 repair.</p> <p>d) SMARTLINK BTS will not power up at ambient temperatures below -30degC. Wait for temperature to rise, apply external heat.</p>
3	SMARTLINK BTS takes a long time to boot up / start transmitting.	<p>a) Low temperature.</p> <p>b) Settings misconfigured leading to Cell startup failure.</p>	<p>a) At ambient temperatures below 0degC, the SMARTLINK BTS will take time to warm up before transmitting. Wait for SMARTLINK BTS to warm up.</p> <p>b) Login to SMARTLINK Management Console and review ALARMS and WARNINGS.</p>
4	Decreased Range	<p>a) Antenna placement issue.</p> <p>b) Antenna gain issue.</p>	<p>a) Ensure that the transmit antenna is tightly connected and is sufficiently elevated. Also ensure that no metallic objects are in close proximity to the antenna.</p> <p>b) Ensure that Mobile Users are located within the beamwidth of any high gain antennas used⁷.</p>
5	Spurious Output.	Interference	Ensure that the SMARTLINK BTS is not located within 1m of an RF source operating at a similar frequency.

⁷ Using a high gain antenna with a highly elevated antenna may cause connections problems for users directly under the antenna. A different antenna type or position may be required to resolve this.

Ser (1)	Defect (2)	Cause (3)	Remedy (4)
6	SMARTLINK boots up but does not transmit.	a) SMARTLINK BTS in alarm state. b) SMARTLINK BTS is configured to start in non-transmitting mode.	a) Log into SMARTLINK BTS via management interface and review dashboard for Warnings and Alarms. b) Log into SMARTLINK BTS via management interface and review dashboard for Warning to indicate that SMARTLINK BTS is in a non-transmitting mode. Change the settings and restart the BTS.
7	SMARTLINK BTS is powered up but it is not possible to connect the SMARTLINK BTS via Ethernet interface.	Operator has entered invalid network settings.	Connect to SMARTLINK BTS using the failsafe IP address, log into Management Console and modify IP network settings on the Primary Configuration as directed by Network Administrator. NOTE: SMARTLINK BTS units are shipped with the failsafe IP address set to 10.20.30.40. This failsafe IP address can be modified by the customer in the Primary Configuration in the case where 10.20.30.40 conflicts with the customer's own IP network. A factory default mode has been produced such that, if the SMARTLINK unit is powered up with the power button depressed for 10 seconds or more then, on power-up the failsafe IP address will revert to the 10.20.30.40 address.
8	Mobile Network Config and Mobile User Admin icons not visible on the SMARTLINK Management Console.	SMARTLINK BTS is configured as a SLAVE.	Either: a) Navigate to the Primary Config page on the SMARTLINK Management Console and change the SMARTLINK BTS to be the MASTER (ID = 1). OR

Ser (1)	Defect (2)	Cause (3)	Remedy (4)
			b) Connect the SLAVE to a MASTER SMARTLINK BTS.
9	iPhone will not connect to SMARTLINK NETWORK, despite being correctly configured.	iPhones must be connected to iTunes before they will connect to any Cellular Network.	Enable Wi-Fi on the iPhone and connect to the Wi-Fi network. Login to iTunes. Follow the online instructions.
10	Mobile phone drops data connection when no uplink data is required. This means that UE cannot be used as a data server.	This is a normal feature for a 3G Network in order to save capacity and battery.	If a Mobile Phone is required to act as a data server (for instance to provide web camera facilities), either: a) Install an application that will keep the data connection alive. An example of this is the ping application that can run in the background. b) Configure the application to provide a keep alive signal. Some SIP clients are able to do this.
11	Data rate for a given Mobile User is lower than the quoted rates.	a) Quoted data rates are aggregate across all Mobile Users connected to a given SMARTLINK BTS in ideal radio conditions. b) Quoted data rates have been demonstrated with Samsung Galaxy S4s. Mobile Phones of other types may have limited functionality and/or data rates.	a) Reduce the user count or increase the capacity of the network by adding more SMARTLINK BTSes. b) Try the test with an alternative Mobile Phone model. Contact Chemring for further discussion.
12	It is not possible to connect to the SMARTLINK Management Console on the expected IP address.	a) Software error. b) Network settings have been mislaid. c) Critical configuration issue.	Restart the SMARTLINK BTS by pressing the button on the front of the unit. If it is still not possible to connect to the SMARTLINK BTS, restore the factory default configuration as described in Section 8.1.
13	Uplink data rates are lower than configured once more than 8 Mobile Users are connected to the cell.	Each SMARTLINK BTS supports 8x full HSPA Mobile Users and a further 8x HSDPA-only users. If the number of Mobile Users attached to a given SMARTLINK BTS exceeds 8, any new users will be allocated a 64kbps uplink bearer, restricting their uplink	Manage capacity by either: a) Allocating lower priority users to the HSDPA / 64k user class. or b) Reduce the user count or increase the capacity of the network by adding more

Ser (1)	Defect (2)	Cause (3)	Remedy (4)
		data rate.	SMARTLINK BTSes.

Table 12 Software/Hardware Management Console Warning Reporting

NOTE:

If the main SMARTLINK BTS LRU is unserviceable, before powering off download the log file if possible, as described in Section 5.7. The downloaded log file should be sent back at the earliest opportunity to the Level 4 maintenance facility for analysis.

Ser (1)	Event/Defect (2)	Cause (3)	Remedy (4)
1	Time since GPS lock (value in sec) Cell phones may not connect to network while GPS is not locked.	GPS lost lock: a) No line of sight. b) RF interference. c) GPS Antenna damaged. d) Internal failure.	a) Ensure GPS antenna is in open space for satellite reception. b) Check for possible sources of RF interference. c) Replace the damaged antenna. d) Switch off and re-boot to confirm failure. If problem persists, replace the SMARTLINK BTS (see Note).
2	Unable to start warning	a) Configuration problem. b) Software fault.	a) Check that the network has been correctly configured and review dashboard for any active Alarms and Warnings. Take action to address any configuration warnings/errors and restart the BTS. b) Review dashboard for active Alarms and Warnings. Switch off and re-boot to confirm failure. Retrieve logs and send to Level 4 maintenance facility for analysis (see Note). If fault persists then replace the SMARTLINK BTS.

Ser (1)	Event/Defect (2)	Cause (3)	Remedy (4)
3	Gateway status or Backhaul status warning. (value in msec)	a) Network incorrectly configured on SMARTLINK unit. b) Fault in wider network.	a) Review overall network settings and settings on SMARTLINK unit with Network Administrator. b) Check all Ethernet cables are undamaged and correctly connected. Check the networking equipment for faults, damage or configuration problems.
4	Temperature (°C) High temperature warning	Hardware overheating.	Check that fan assemblies are unobstructed, in clear air and operating. Relocate SMARTLINK BTS to a cooler area, preferably away from direct sunlight.
5	Voltage (V) PSU failure warning	Hardware fault; PSU failure.	Monitor the Warning. If problem persists, check external power connector and power supply source is serviceable. Switch off and re-boot to confirm failure. Replace the SMARTLINK BTS (see Note).
6	Temperature (°C) PSU high temperature warning	Hardware fault; PSU overheating.	Check that fan assemblies are unobstructed, in clear air and operating. Relocate SMARTLINK BTS to a cooler area, preferably away from direct sunlight.
7	Temperature (°C) PA temperature warning	Hardware fault; RF fault.	Check that fan assemblies are unobstructed, in clear air and operating. Relocate SMARTLINK BTS to a cooler area, preferably away from direct sunlight.
8	Power (dBm) RF power fault warning	a) 3G Tx/Rx antenna damaged or incorrectly connected, or 3GTx/Rx antenna cable damaged or incorrectly connected.	a) Check 3G antenna and any cables for damage and obstruction.

Ser (1)	Event/Defect (2)	Cause (3)	Remedy (4)
		b) Hardware fault.	b) Switch off and re-boot to confirm failure. If problem persists, replace the SMARTLINK BTS (see Note).
9	VSWR VSWR warning	a) 3G Tx/Rx antenna damaged or incorrectly connected, or 3GTx/Rx antenna cable damaged or incorrectly connected. b) Hardware fault.	a) Check 3G antenna and any cables for damage and obstruction. b) Switch off and re-boot to confirm failure. If problem persists, replace the SMARTLINK BTS (see Note).
10	Loading (%) CPU failure warning	CPU1 and/or CPU2 overloaded. Software problem.	Review dashboard for active Alarms and Warnings. Retrieve logs and send to Level 4 maintenance facility for analysis (see Note). No immediate other actions required unless BTS moves to an alarm state.
11	Temperature (°C) High temperature warning.	Hardware fault; PSU overheating.	As other temperature warnings: Check that fan assemblies are unobstructed, in clear air and operating. Relocate SMARTLINK BTS to a cooler area, preferably away from direct sunlight.
12	IMSI/TMSI Radio link failure Warning	Radio link failure caused by: a) Interference issue. b) Out of coverage area. c) Antenna damage or poor connection.	a) Check for possible sources of interference. b) Check that cell phone is inside coverage area. c) Check 3G antenna for: i) Damage and connectivity. ii) Best position to maximise coverage.

Ser (1)	Event/Defect (2)	Cause (3)	Remedy (4)
		d) Hardware failure. (Only indicated if Radio link failures happen repeatedly across multiple phones.)	d) Switch off and re-boot to confirm failure. If radio link failures occur constantly across multiple phones, retrieve logs (see Note) and send to Level 4 maintenance facility for analysis. If fault persists then replace the SMARTLINK BTS.

Table 13 Software/Hardware Management Console Alarm Reporting

NOTE:

If the main SMARTLINK BTS LRU is unserviceable, before powering off download the log file if possible, as described in Section 5.7. The downloaded log file should be sent back at the earliest opportunity to the Level 4 maintenance facility for analysis.

Ser (1)	Event/Defect (2)	Cause (3)	Remedy (4)
1	Network fault. Unable to start process alarm.	Software fault Or Hardware fault.	Check that the network has been correctly configured. Switch off and re-boot to confirm failure. Retrieve logs (see Note) and send to Level 4 maintenance facility for analysis. If fault persists then replace the SMARTLINK BTS.
2	Gateway ping time Ping time to Master Ping time to Slave (value in msec). Network failure alarm.	a) Network incorrectly configured. b) Networking Hardware fault.	a) Review overall network settings and settings on SMARTLINK unit with Network Administrator. b) Check all Ethernet cables are undamaged and correctly connected. Check the networking equipment for faults/damage.
3	Temperature (°C) High temperature alarm.	Hardware overheating.	Check that fan assemblies are unobstructed, in clear air and operating. Relocate SMARTLINK BTS to a cooler area, preferably away from direct sunlight. If overheating continues, switch off and re-boot to confirm failure. If fault persists then replace the SMARTLINK BTS (see Note).

Ser (1)	Event/Defect (2)	Cause (3)	Remedy (4)
4	Voltage (V) PSU failure alarm.	Hardware fault; PSU failure.	Check external power connector and power supply source is serviceable. Switch off and re-boot to confirm failure. Replace the SMARTLINK BTS (see Note).
5	Temperature (°C) PSU temperature alarm.	PSU overheating.	Check that fan assemblies are in clear air and operating. Relocate SMARTLINK BTS to a cooler area, preferably away from direct sunlight. If overheating continues, switch off and re-boot to confirm failure. If fault persists, then replace the SMARTLINK BTS (see Note).
6	Supply failure alarm.	Hardware fault; PSU failure.	Check external power connector and power supply source is serviceable. Switch off and re-boot to confirm failure. If fault persists, then replace the SMARTLINK BTS (see Note).
7	RF failure alarm.	Hardware fault. Lineariser error.	Switch off and re-boot to confirm failure. If fault persists, then replace the SMARTLINK BTS (see Note).
8	Current (mA) RF failure alarm.	Hardware fault. LNA current.	Switch off and re-boot to confirm failure. If fault persists, then replace the SMARTLINK BTS (see Note).
9	Temperature (°C)	PA overheating.	As other temperature faults.

Ser (1)	Event/Defect (2)	Cause (3)	Remedy (4)
	PA high temperature alarm.		
10	Power (dBm) RF power failure alarm.	a) 3G Tx/Rx antenna damaged or incorrectly connected, or 3GTx/Rx antenna cable damaged or incorrectly connected. b) Hardware fault.	a) Check 3G antenna and any cables for damage and obstruction. b) Switch off and re-boot to confirm failure. If problem persists, replace the SMARTLINK BTS (see Note).
11	VSWR failure alarm. VSWR alarm.	a) 3G Tx/Rx antenna damaged or incorrectly connected, or 3GTx/Rx antenna cable damaged or incorrectly connected. b) Hardware fault.	a) Check 3G antenna and any cables for damage and obstruction. b) Switch off and re-boot to confirm failure. If problem persists, replace the SMARTLINK BTS (see Note).
12	Loading (%) CPU failure alarm.	CPU1 and/or CPU2 overloaded. Software problem.	Review dashboard for other active Alarms and Warnings. Retrieve logs and send to Level 4 maintenance facility for analysis (see Note). Switch off and re-boot to confirm failure. Replace the SMARTLINK BTS.
13	Temperature (°C) CPU high temperature alarm.	CPU1, CPU2 and DSP over temperature.	Check that fan assemblies are in clear air and operating. Relocate SMARTLINK BTS to a cooler area, preferably away from direct sunlight. Switch off and re-boot to confirm failure. Replace the SMARTLINK BTS (see Note).

8.3 REPAIR INSTRUCTIONS

The following repair instructions cover the spared LRUs for the SMARTLINK Network:

- SMARTLINK BTS.

NOTE:

If the main SMARTLINK BTS LRU is unserviceable, before powering off download the log file if possible, as described in Section 5.7. The downloaded log file should be sent back at the earliest opportunity to the Level 4 maintenance facility for analysis.

- Fan Cover.
- Fan Assembly.
- Carry Handle Assembly.
- 3G Antenna.
- GPS Antenna.
- TRACO TEX 120-124 Power Supply.
- External Mains Power Cable Assembly.
- External Power Cable Assembly.
- Ethernet Cable Assembly.
- Connector dust covers.

Before carrying out any repairs to the SMARTLINK Network read the following WARNINGS and CAUTIONS.

8.3.1 WARNINGS

(1) ELECTRIC SHOCK HAZARD. THE SMARTLINK BTS IS POWERED BY AN EXTERNAL DC SUPPLY, WHICH IF MIS-USED MAY CAUSE ELECTRIC SHOCK OR SERIOUS BURNS. DO NOT CONNECT OR DISCONNECT THE POWER SUPPLY WITH THE SMARTLINK BTS SWITCHED 'ON'. OBSERVE THE WARNINGS FOR THE DC POWER SUPPLY BEING USED.

(2) PROTECTIVE EARTH HAZARD. DO NOT OPERATE THE TRACO TEX 120-124 POWER SUPPLY WITHOUT THE PROTECTIVE EARTH (PE) CORRECTLY CONNECTED. WHEN POWERING FROM MAINS, USE ONLY THE SUPPLIED EXTERNAL MAINS CABLE ASSEMBLIES, PART NO. X72-1-9317-147 OR PART NO. X72-1-9317-136.

(3) EQUIPMENT DAMAGE. THE EQUIPMENT DETAILED IN THIS MANUAL IS INTENDED TO BE USED AND MAINTAINED ONLY BY QUALIFIED PERSONNEL WHO HAVE ATTENDED THE TRAINING ON THE SMARTLINK NETWORK.

(4) PERSONAL INJURY/HEAVY WEIGHT. THE SMARTLINK BTS WEIGHS 6.6 KG. WHEN LIFTING HEAVY EQUIPMENT ENSURE THAT THE CORRECT PERSONAL PROTECTIVE EQUIPMENT (PPE), STEEL TOE CAPPED BOOTS IS USED TO PREVENT CRUSH INJURIES.

(5) RADHAZ DANGER. THE MINIMUM SAFE WORKING DISTANCE FOR THE 3G ANTENNA OF 0.32 METRES IS TO BE OBSERVED WHEN OPERATING AND MAINTAINING THIS NETWORK.

(6) COOLING FAN OBSTRUCTION. ENSURE THAT THE COOLING FANS ARE CLEAR OF OBSTRUCTIONS AND KEEP FINGERS CLEAR OF ROTATING FANS DURING TESTING AND GENERAL OPERATION.

(7) LIGHTNING STRIKE DANGER. A LIGHTNING STRIKE ON THE ANTENNAS COULD RESULT IN BURNS OR ELECTRIC SHOCK. CONSIDERATION MUST BE GIVEN WHEN DEPLOYING THE EQUIPMENT WHERE THERE IS THE RISK OF ELECTRIC STORMS.

(8) HAZARDOUS SUBSTANCES, LITHIUM ION BATTERIES. THE LAPTOP PC, TABLET AND MOBILE PHONES LITHIUM ION BATTERIES CONTAIN ORGANIC SOLVENTS AND LITHIUM SALT, WHICH WILL IRRITATE SKIN, IS FLAMMABLE AND TOXIC. DO NOT INCINERATE, PUNCTURE OR DAMAGE BATTERIES. IF GAS OR LIQUID IS LEAKING FROM THE BATTERY, DO NOT HANDLE IT. SECURE THE AREA AND ENSURE GOOD VENTILATION. WAIT UNTIL THE BATTERY HAS FINISHED VENTING AND HAS COOLED DOWN. WEAR FULL PPE (SAFETY GLASSES, RUBBER GLOVES AND COVERALLS) WHEN HANDLING THE DAMAGED BATTERY, AND SEAL IT IN A HEAVY DUTY POLYTHENE BAG. DISPOSE OF THE BATTERY IN ACCORDANCE WITH APPROPRIATE LOCAL REGULATIONS.

(9) ELECTROSTATIC CHARGING HAZARD. TO PREVENT ELECTROSTATIC CHARGE OCCURRING, DO NOT ATTEMPT TO CLEAN THE SURFACES OF THE TRACO TEX 120-124 POWER SUPPLY WITH A DRY CLOTH. CLEAN ONLY WITH A DAMP CLOTH.

8.3.2 CAUTIONS

(1) EQUIPMENT FAILURE. The correct mounting position for optimal cooling performance of the power supply must be observed. Leave a free space of a minimum of 50mm (2 in.) above and below the power supply.

(2) EQUIPMENT FAILURE. The internal fuse of the SMARTLINK BTS is not accessible to the user to replace. Return the unserviceable equipment to the manufacturer for Level 4 repair.

(3) EQUIPMENT DAMAGE. When equipment connectors are not in use, ensure that the dust covers are connected to maintain the degree of protection.

(4) EQUIPMENT DAMAGE. When using the TRACO TEX 120-124 power supply use only the External Mains Cable assemblies, Part No. X72-1-9317-147 or Part No. X72-1-9317-136.

(5) CABLE DAMAGE. Ensure that cables are not bent, deformed or snagged to cause damage to the internal wiring or the connector ends.

8.3.3 DISASSEMBLY AND REASSEMBLY PROCEDURES

8.3.3.1 SMARTLINK BTS

To disassemble the SMARTLINK BTS, carry out the following:

NOTE:

If the main SMARTLINK BTS LRU is unserviceable, before powering off download the log file if possible, as described in Section 5.7. The downloaded log file should be sent back at the earliest opportunity to the Level 4 maintenance facility for analysis.

1. Switch off the equipment by pressing the '**On/Off**' button and wait for the RED power LED to be extinguished.
2. Disconnect and lay aside the 3G and GPS antennas from the SMARTLINK BTS or if the antennas are mounted on a mast disconnect the coaxial cables.
3. Disconnect the External Power Cable (Part No. X72-1-9317-136) from the SMARTLINK BTS.
4. Disconnect the External Ethernet Cable (Part No. X72-1-9317-148) from the SMARTLINK BTS.
5. Disconnect the earth strap from the SMARTLINK BTS.

To reassemble the SMARTLINK BTS, with reference to Figure 6 and Figure 7, carry out the procedure as detailed in Section 3.3 and then refer to Section 4 to carry out the following:

- Network Initiation.
- Testing of core functionality of the network.
- Configuring the RF parameters.
- Connecting mobile phones.

8.3.3.2 Fan Cover

With reference to Figure 35, to disassemble a fan cover, carry out the following:

1. Ensure that the power to the SMARTLINK BTS has been isolated.

2. Undo the 10 thumbscrews securing the fan cover.
3. Remove and lay aside the fan cover.

With reference to Figure 35, to reassemble the fan cover, carry out the following:

1. Refit the fan cover in the correct orientation onto the SMARTLINK chassis. Ensure that the fan cabling is tucked inside the fan cover.
2. Tighten the 10 thumbscrews securing the fan cover to the SMARTLINK BTS.



Figure 35 SMARTLINK BTS – fan cover

8.3.3.3 Fan Assembly

With reference to Figure 36, to disassemble a fan assembly, carry out the following:

1. Carry out the fan cover disassembly procedure as detailed in section 6.2.2.2.
2. With reference to Figure 37, press down with a screwdriver on the electrical connector to release the fan cable connector.
3. Undo, remove and retain four M4 screws and washers securing the fan to the chassis.
4. Remove the fan and lay aside.

With reference to Figure 36 and Figure 37, to reassemble the fan, carry out the following:

1. Line up the fan in the correct orientation onto the SMARTLINK chassis.

2. Fit the four M4 screws and washers securing the fan to the chassis and using a torque screw driver tighten the screws to 2.0 Nm (17.7 lbf in).
3. Reconnect the fan cable connector.
4. Carry out the fan cover reassembly procedure as detailed in Section 6.2.2.2.

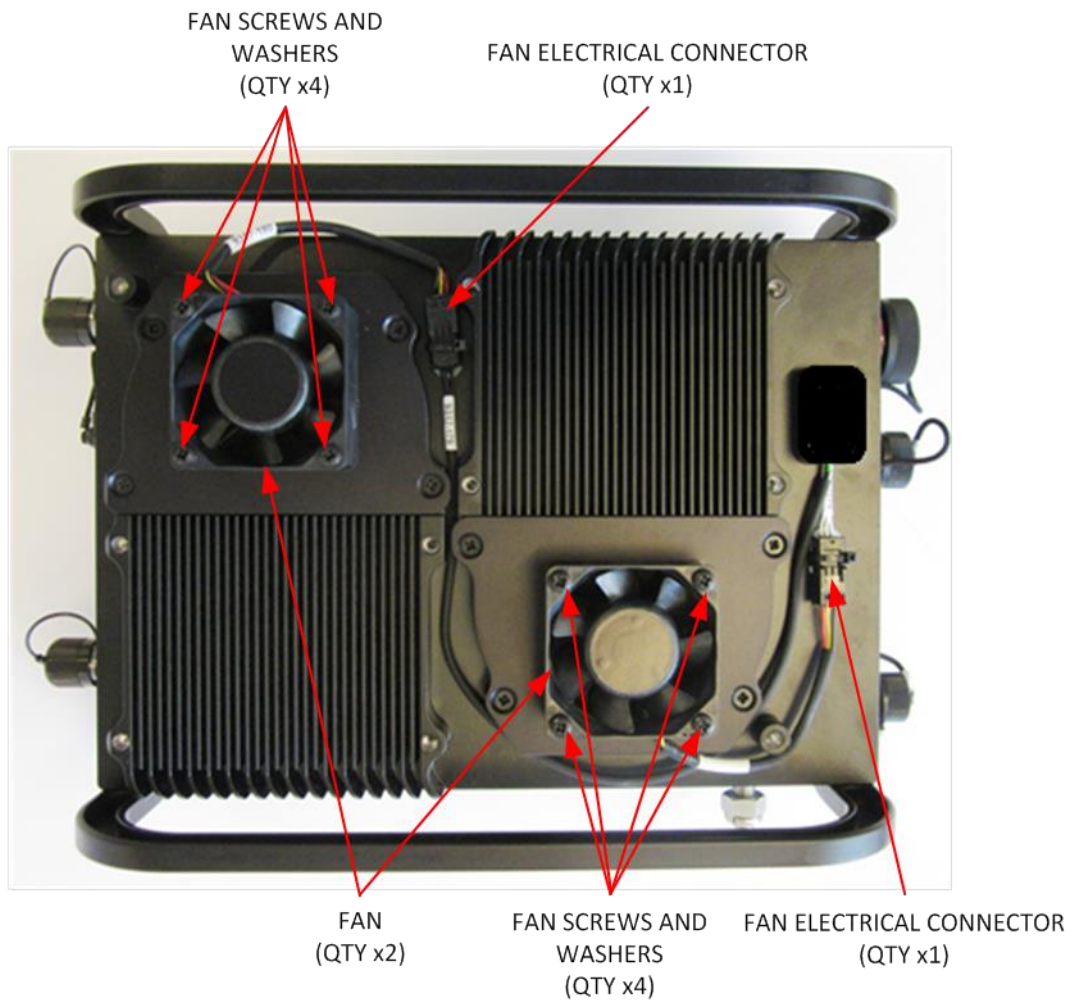


Figure 36 SMARTLINK BTS – fan assemblies

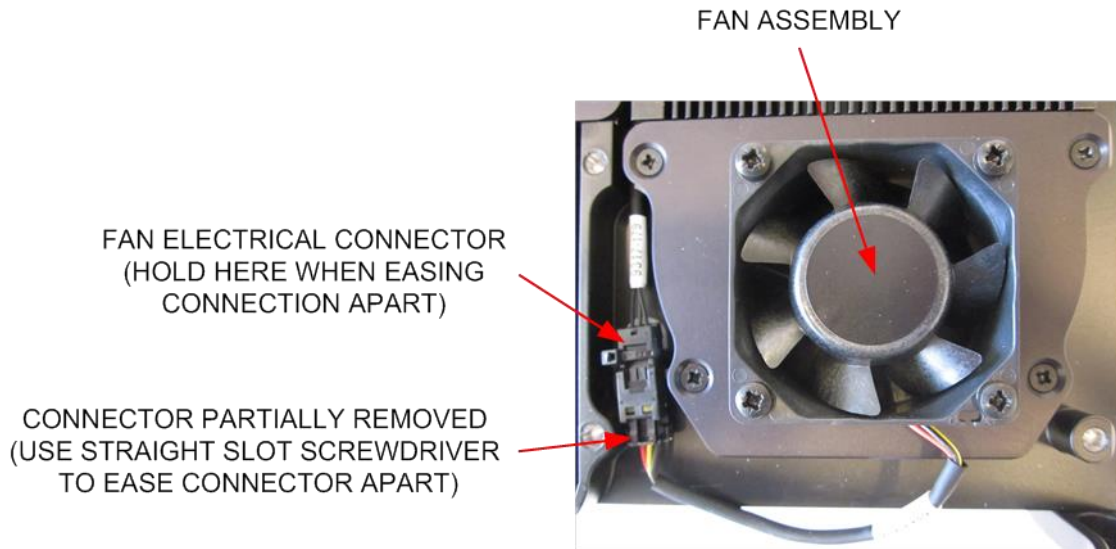


Figure 37 SMARTLINK BTS – fan electrical connector

8.3.3.4 Carry Handle

With reference to Figure 38, to disassemble a carry handle, carry out the following:

1. Undo, remove and retain two M6 screws and spring washers securing the carry handle to the SMARTLINK BTS.
2. Lay aside the carry handle.

With reference to Figure 38, to reassemble a carry handle, carry out the following:

1. Line up the carry handle onto the SMARTLINK chassis.
2. Fit the two M6 screws and spring washers to secure the carry handle to the chassis and using a torque screw driver tighten the screws to 5.0 Nm (44.2 lbf in).

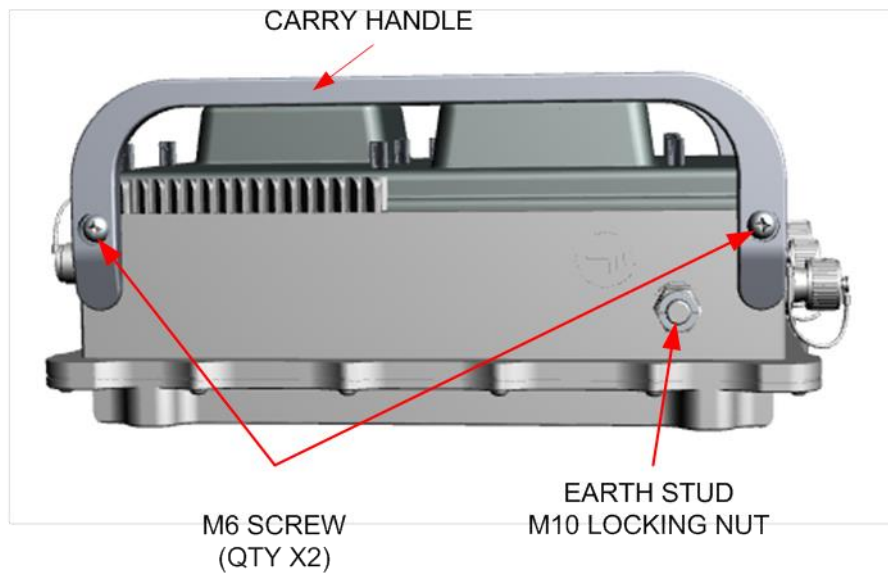


Figure 38 SMARTLINK BTS – carry handle

8.3.3.5 3G Antenna

With reference to Figure 39, to disassemble a 3G antenna from a SMARTLINK BTS, carry out the following:

1. Switch OFF the SMARTLINK BTS by pressing the '**On/Off**' button.
2. Unscrew the N-type 3G antenna connector and lay aside.

With reference to Figure 39, to reassemble a 3G antenna to a SMARTLINK BTS, carry out the following:

1. Attach the N-type 3G antenna onto the equipment and hand tighten only.
2. Carry out the network Start-up procedure, as per Section 6.2.



Figure 39 SMARTLINK BTS with Antennas connected

8.3.3.6 GPS Antenna

With reference to Figure 39, to disassemble a GPS antenna from a SMARTLINK BTS, carry out the following:

1. Switch OFF the SMARTLINK BTS by pressing the '**On/Off**' button.
2. Unscrew the SMA-type GPS antenna connector and lay aside.

With reference to Figure 39, to reassemble a GPS antenna to a SMARTLINK BTS, carry out the following:

1. Attach the SMA-type GPS antenna onto the equipment and hand tighten only.
2. Carry out the network Start-up procedure, as per Section 6.2.

8.3.3.7 TRACO TEX 120-124 Power Supply

With reference to Figure 8, to disassemble a TRACO TEX 120-124 Power Supply, carry out the following:

1. Switch OFF the SMARTLINK BTS by pressing the '**On/Off**' button.
2. Ensure that the AC mains supply has been isolated.
3. Disconnect the External Mains Cable to the DC power supply from the AC mains supply end.
4. Disconnect the other end of the External Mains Cable from the DC power supply (AC mains input socket) and lay aside.

5. Disconnect the External Power Cable from the DC power supply (DC power output socket).

With reference to Figure 8, to reassemble a TRACO TEX 120-124 Power Supply, carry out the following:

1. Connect the External Power Cable to the DC power supply (DC power output socket).
2. Connect the External Mains Cable to the DC power supply (AC mains input socket).
3. Connect the other end of the External Mains Cable to the AC mains supply end.
4. Ensure that the AC mains supply is available.
5. Carry out the network Start-up procedure, as per Section 6.2.

8.3.3.8 External Mains Power Cable Assembly

To disassemble an External Mains Power Cable Assembly, carry out the following:

1. Switch OFF the SMARTLINK BTS by pressing the '**On/Off**' button.
2. Ensure that the AC mains supply has been isolated.
3. Disconnect the External Mains Cable to the DC power supply from the AC mains supply end.
4. Disconnect the other end of the External Mains Cable from the DC power supply (AC mains input socket, see Figure 8) and lay aside.

To reassemble an External Mains Power Cable Assembly, carry out the following:

1. Connect the External Mains Cable to the DC power supply (AC mains input socket).
2. Connect the other end of the External Mains Cable to the AC mains supply end.
3. Ensure that the AC mains supply is available.
4. Carry out the network Start-up procedure, as per Section 6.2.

8.3.3.9 External Power Cable Assembly

To disassemble an External Power Cable Assembly, carry out the following:

1. Switch OFF the SMARTLINK BTS by pressing the '**On/Off**' button.
2. Ensure that the AC mains supply has been isolated.

3. Disconnect the External Cable from the DC power supply (AC mains input socket, see Figure 8) and lay aside.
4. Disconnect the other end of the External Cable from the SMARTLINK BTS.

To reassemble an External Power Cable Assembly, carry out the following:

1. Connect the External Mains Cable to the SMARTLINK BTS.
2. Connect the other end of the External Mains Cable to the DC power supply (DC output socket).
3. Ensure that the AC mains supply is available.
4. Carry out the network Start-up procedure, as per Section 6.2.

8.3.3.10 Ethernet Cable Assembly

To disassemble an Ethernet Cable Assembly, carry out the following:

1. Log OFF of the SMARTLINK management console application.
2. Disconnect the Ethernet cable from the WLAN connector on the SMARTLINK BTS.
3. Disconnect the other end of the Ethernet from the network hub or laptop.

To reassemble an Ethernet Cable Assembly, carry out the following:

1. Connect the Ethernet cable to the network hub or laptop.
2. Connect the other end of the Ethernet cable to the WLAN connector on the SMARTLINK BTS.
3. Log ON to the SMARTLINK management console application.
4. Once logged in, ensure that there are no 'Warnings' and that any visible 'Alarms' are acknowledged. Refer to Section 8.2 for Failure Diagnosis for fault finding information as required.

8.3.3.11 Dust Covers

To replace a dust cover:

1. Undo the dust cover from the connector.
2. Undo, remove and retain the M3 pan head screw securing the dust cover lanyard to the equipment.
3. Secure replacement dust cover to the equipment using the retained M3 pan head screw and tighten using a torque screw driver tighten the screw to 0.8 Nm (7.1 lbf in).

9 SCHEDULED MAINTENANCE

9.1 INTRODUCTION

The SMARTLINK Network supports Level 1 Operator Maintenance, whereby the operator is able to maintain the equipment and keep in good running order. No equipment repair is expected as part of Level 1 Maintenance.

The maintenance frequencies outlined are designed to help ensure that this network installation is maintained in accordance with statutory and client requirements for:

- Equipment reliability.
- Safety of operation.

9.1.1 DEFINITIONS

As far as this document is concerned, the following definitions apply:

- **Examine.** Carry out a survey of the condition of an item without dismantling, unless specifically instructed to do so in the relevant task requirements. The condition of an item may be impaired by the following:
 - Insecurity of attachment.
 - Cracks or fractures.
 - Corrosion, contamination or deterioration.
 - Distortion.
 - Loose or missing fasteners.
 - Chafing, fraying, scoring or wear.
 - Faulty or broken locking devices.
 - Loose clips or packing, obstruction of, or leakage from pipelines.
 - Discoloration due to overheating or leakage of fluids.
- **Check.** Make a comparison of measurement of time, pressure, temperature, resistance, dimension or other quantity, with known figure.
- **Operate.** As far as possible, ascertain that a component or network functions correctly without the use to test equipment or reference to measurement.
- **Replenish.** Refill a container to a predetermined level, pressure or quantity. This includes any necessary cleaning of orifices, examination of caps, covers, gaskets and washers, renewal of locking devices and clearing of vents.
- **Replace.** Remove an item and then fit a new or reconditioned item.

9.1.2 WARNINGS AND CAUTIONS

Before any maintenance task is carried out, the WARNINGS and CAUTIONS preceding the task must be read and understood.

9.1.2.1 Warnings

(1) ELECTRIC SHOCK HAZARD. THE SMARTLINK BTS IS POWERED BY AN EXTERNAL DC SUPPLY, WHICH IF MIS-USED MAY CAUSE ELECTRIC SHOCK OR SERIOUS BURNS. DO NOT CONNECT OR DISCONNECT THE POWER SUPPLY

WITH THE SMARTLINK BTS SWITCHED 'ON'. OBSERVE THE WARNINGS FOR THE DC POWER SUPPLY BEING USED.

(2) **PROTECTIVE EARTH HAZARD. DO NOT OPERATE THE TRACO TEX 120-124 POWER SUPPLY WITHOUT THE PROTECTIVE EARTH (PE) CORRECTLY CONNECTED. WHEN POWERING FROM MAINS, USE ONLY THE SUPPLIED EXTERNAL MAINS CABLE ASSEMBLIES, PART NO. X72-1-9317-147 OR PART NO. X72-1-9317-136.**

(3) **EQUIPMENT DAMAGE. THE EQUIPMENT DETAILED IN THIS MANUAL IS INTENDED TO BE USED AND MAINTAINED ONLY BY QUALIFIED PERSONNEL WHO HAVE ATTENDED THE TRAINING ON THE SMARTLINK NETWORK.**

(4) **PERSONAL INJURY/HEAVY WEIGHT. THE SMARTLINK BTS WEIGHS 6.6 KG. WHEN LIFTING HEAVY EQUIPMENT ENSURE THAT THE CORRECT PERSONAL PROTECTIVE EQUIPMENT (PPE), STEEL TOE CAPPED BOOTS IS USED TO PREVENT CRUSH INJURIES.**

(5) **RADHAZ DANGER. THE MINIMUM SAFE WORKING DISTANCE FOR THE 3G ANTENNA OF 0.32 METRES IS TO BE OBSERVED WHEN OPERATING AND MAINTAINING THIS NETWORK.**

(6) **COOLING FAN OBSTRUCTION. ENSURE THAT THE COOLING FANS ARE CLEAR OF OBSTRUCTIONS AND KEEP FINGERS CLEAR OF ROTATING FANS DURING TESTING AND GENERAL OPERATION.**

(7) **LIGHTNING STRIKE DANGER. A LIGHTNING STRIKE ON THE ANTENNAS COULD RESULT IN BURNS OR ELECTRIC SHOCK. CONSIDERATION MUST BE GIVEN WHEN DEPLOYING THE EQUIPMENT WHERE THERE IS THE RISK OF ELECTRIC STORMS.**

(8) **HAZARDOUS SUBSTANCES, LITHIUM ION BATTERIES. THE LAPTOP PC, TABLET AND MOBILE PHONES LITHIUM ION BATTERIES CONTAIN ORGANIC SOLVENTS AND LITHIUM SALT, WHICH WILL IRRITATE SKIN, IS FLAMMABLE AND TOXIC. DO NOT INCINERATE, PUNCTURE OR DAMAGE BATTERIES. IF GAS OR LIQUID IS LEAKING FROM THE BATTERY, DO NOT HANDLE IT. SECURE THE AREA AND ENSURE GOOD VENTILATION. WAIT UNTIL THE BATTERY HAS FINISHED VENTING AND HAS COOLED DOWN. WEAR FULL PPE (SAFETY GLASSES, RUBBER GLOVES AND COVERALLS) WHEN HANDLING THE DAMAGED BATTERY, AND SEAL IT IN A HEAVY DUTY POLYTHENE BAG. DISPOSE OF THE BATTERY IN ACCORDANCE WITH APPROPRIATE LOCAL REGULATIONS.**

(9) **ELECTROSTATIC CHARGING HAZARD. TO PREVENT ELECTROSTATIC CHARGE OCCURRING, DO NOT ATTEMPT TO CLEAN THE SURFACES OF THE TRACO TEX 120-124 POWER SUPPLY WITH A DRY CLOTH. CLEAN ONLY WITH A DAMP CLOTH.**

9.1.2.2 Cautions

(1) **EQUIPMENT FAILURE. The correct mounting position for optimal cooling performance of the power supply must be observed. Leave a free space of a minimum of 50mm (2 in.) above and below the power supply.**

(2) EQUIPMENT FAILURE. The internal fuse of the SMARTLINK BTS is not accessible to the user to replace. Return the unserviceable equipment to the manufacturer for Level 4 repair.

(3) EQUIPMENT DAMAGE. When equipment connectors are not in use, ensure that the dust covers are connected to maintain the degree of protection.

(4) EQUIPMENT DAMAGE. When using the TRACO TEX 120-124 power supply use only the External Mains Cable assemblies, Part No. X72-1-9317-147 or Part No. X72-1-9317-136.

(5) CABLE DAMAGE. Ensure that cables are not bent, deformed or snagged to cause damage to the internal wiring or the connector ends.

9.1.3 MAINTENANCE INTERVALS

Table 14 SMARTLINK Network Maintenance

WARNINGS and CAUTIONS must be read and understood before commencing these maintenance tasks.

Ser (1)	Description (2)	Service Interval (3)		
		Before Use	After Use	Daily/Weekly/ 3 Monthly
1	Carry out a functional test of the SMARTLINK Network (Refer to Section 4). Use troubleshooting guide if problems occur (Refer to Section 8.2).	*	*	Daily
2	Test core functionality of the SMARTLINK Network (Refer to Section 6.2). Use troubleshooting guide if problems occur (Refer to Section 8.2).	*	*	Daily
3	Clean tablet display, laptop display and keyboard using cleaning fluid and anti-static lint-free cloth wipe.	*	*	Monthly
4	Examine cable assemblies: (a) Check that there is no obvious damage to cables. (b) Check that cables in use are correctly terminated.	*	*	Monthly
5	Examine the SMARTLINK BTS external fins, fan units and connectors, to remove build-up of corrosion, dust and dirt etc.	*	*	3 Monthly

6	Examine the network earth points for connectivity, to remove build-up of corrosion and dirt etc.	*	*	3 Monthly
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9.1.3.1 Cleaning

The following cleaning should be carried out monthly and as required before and after use.

Obtain the following items:

- Soft cloth moistened with water or a non-alkaline detergent.
- Soft dry lint-free cloth – no alcohol or detergents.
- Glass cleaner - non-ammonia, non-alcohol based.
- Adhesive tape.
- Silicon grease.
- Stiff brush.

The following items may also be required:

- Air gun.

9.1.3.1.1 SMARTLINK BTS

General	1) Switch off the unit.
Chassis	2) Remove heavy build-up of dust and dirt using stiff brush. 3) Use a soft cloth moistened with water or a non-alkaline detergent to wipe the exterior, taking care to avoid water ingress on pins and connectors.
Fan units	4) Follow the procedure described in Section 8.3.3.2 to remove the fan cover prior to cleaning. A low pressure air gun is recommended to remove the dust and dirt from the fan blades. Use a soft cloth moistened with water or a non-alkaline detergent to remove dirt build up from the fan blades.
Connectors	5) An air gun is recommended for cleaning water and dust. Check all connectors and dust caps for metallic particles and dust and remove using the air gun.

9.1.3.1.2 General Cables

General	1) Use a soft cloth moistened with water or a non-alkaline detergent to wipe the exterior, taking care to avoid water ingress on pins and connectors.
	2) Check all connectors for metallic particles and dust and remove

	using the low power air gun.
Dust caps	3) Use a soft cloth moistened with water or a non-alkaline detergent to ensure that the interior and exterior of dust caps are free from dust and dirt.

9.2 EQUIPMENT STORAGE

The SMARTLINK equipment should be cleaned and inspected after every operation or training session.

9.2.1 POST CLEANING OF EQUIPMENT

Ensure that the equipment is cleaned and dried before packing into the shipping container.

10 COMMERCIAL PARTS LIST

This section details a breakdown of the main component assemblies which form the SMARTLINK Network.



Figure 40 SMARTLINK Equipment – main items

Table 15 SMARTLINK Network – Parts List

Figure 40 Item	Item Name	Part Number / Drawing	No. Off	Qty
0	SMARTLINK EQUIPMENT	-	-	-
1	SMARTLINK BTS	X72-1-9317-069	EA	1
2	. Fan Cover Plate	X72-2-9317-174	EA	1
3	. Fan Assembly	X72-1-9317-181	EA	2
4	. Carry Handle	X72-2-9317-172	EA	2
5	3G Antenna	Q201658	EA	2
6	GPS Antenna	Q201424	EA	1
7	TRACO TEX 120-124 Power Supply	Q201790	EA	1
8	External Mains Power Cable Assy (2m)	X72-1-9317-147	EA	1
9	External Power Cable Assy (2m)	X72-1-9317-136	EA	1
10	Ethernet Cable Assy (2m)	X72-1-9317-148	EA	1
11	Pre-configured micro SIM	-	EA	16

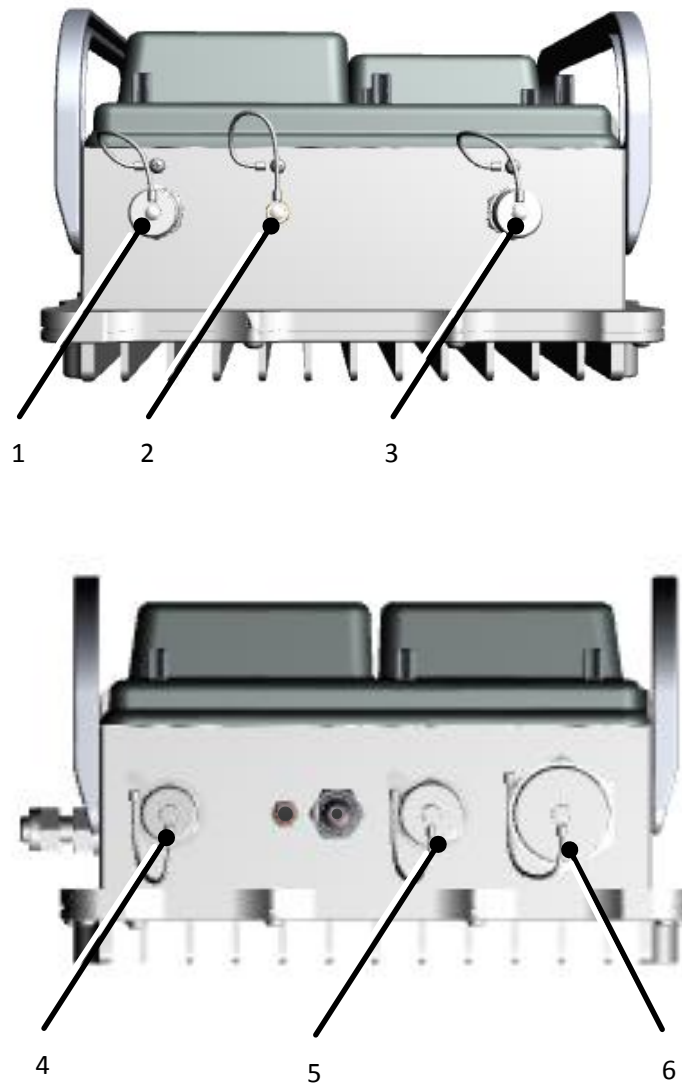


Figure 41 SMARTLINK BTS – minor items

Table 16 SMARTLINK BTS – Parts List

Figure 41 Item	Item Name	Part Number / Drawing	No. Off	Qty
0	SMARTLINK BTS	X72-1-9317-069	-	-
1	. 3G RX, Protection Cap and Lanyard, Brass, Zinc Plated, Black, N Type F	Q201731	EA	1
2	. GPS ANT, Protection Cap and Lanyard, Brass, Zinc Plated, Black, SMA F	Q201323	EA	1
3	. 3G TX/RX, Cable Accessory, Protection Cap and Lanyard, Brass, Zinc Plated, Black, N Type F	Q201731	EA	1
4	. SYNC, Cable Accessory, Protection Cap and Lanyard, Aluminium, Zinc Nickel, Black	Q201766	EA	1
5	. POWER, Cable Accessory, Protection Cap and Lanyard, Aluminium, Zinc Nickel, Black	Q201765	EA	1
6	. ETHERNET, Cable Accessory, Protection Cap and Lanyard, Aluminium, Zinc Nickel, Black	Q201729	EA	1

11 MODIFICATION INSTRUCTIONS

The manufacturer is responsible for producing and issuing modification instructions for the SMARTLINK BTS. All modifications are recorded in this section as detailed in the Modification Instruction Index.

MODIFICATION INSTRUCTION INDEX

Priority (Pty) is shown as: Immediate: I Routine: R

Instr No. (1)	Pty (2)	Subject (3)	Remarks (4)
1			
2			
3			
4			
5			
6			
7			
8			

APPENDIX A

A.1 ACRONYMS AND ABBREVIATIONS

3G	Third Generation UMTS Cellular Phone Standard
A	Ampere
AC	Alternating Current
APN	Access Point Names
BTS	Base Transceiver System
dBm	Decibel-milliwatts
CPU	Central Processing Unit
°C	Degrees Celsius
DC	Direct Current
DNS	Domain Name System
DSP	Digital Signal Processing
FM	Frequency Modulation
GPS	Global Positioning System
IMSI	International Mobile Subscriber Identity
in.	inch
IP	Internet protocol
kg	kilogram/s
kph	kilometres per hour
LED	Light Emitting Diode
LNA	Low Noise Amplifier
LRU	Line Replaceable Unit
mA	MilliAmpere
Mbps	Megabit per second
MHz	Mega Hertz
m	Metre
mm	Millimetre
MMS	Multimedia Messaging Services
mph	miles per hour
msec	millisecond
NAT	Network Address Translation
Nm	Newton metres
PA	Power Amplifier
Lbf in	Pounds force inch
PSU	Power Supply Unit
Qty	Quantity
RF	Radio Frequency
RX	Receiver
3G	Third Generation
SIM	Subscriber Identity Module
SMS	Short Message Service
TMSI	Temporary Mobile Subscriber Identity
Tx	Transmitter
UE	User Equipment
UMTS	Universal Mobile Telecommunications System
USB	Universal Serial Bus
USIM	Universal Subscriber Identity Module
V	Voltage

VSWR	Voltage Standing Wave Ratio
W	Watts
WB	Wide Band
WLAN	Wireless Local Area Network
WCDMA	Wideband CDMA (alternative name for 3G standard)

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