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TransponderTech

R60 VDES Base Station

Installation Manual

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Broken or unwanted electrical or electronic equipment parts shall be classified and handled as ‘Electronic Waste’. Improper disposal may be harmful to the environment and human health. Please refer to your local waste authority for information on return and collection systems in your area. Saab will accept the return of discarded units produced by Saab (AB) TransponderTech.

iv VALIDITY OF THIS DOCUMENT

This installation manual is valid for R60 VDES base station with following part numbers:

- 7000 120-200, R60 VDES Base Station – Standard
- 7000 120-201, R60 VDES Base Station – Full
- 7000 120-203, R60 Receiver Station
- 7000 120-204, R60 AtoN Station

v CONTACT INFORMATION – TECHNICAL SUPPORT

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1 ABOUT THIS MANUAL

Dear Customer,

The R60 VDES base station from Saab is designed to fulfil the highest industry standards and produced under strict quality control. This shall ensure a problem free ownership for many years ahead.

A proper installation is a key factor for the performance and long term problem free operation. This manual provides information and step-by-step instructions to achieve this.
Please read this manual through before proceeding with the installation. This will help you to understand the installation requirements and avoid potential problems.
You are welcome to contact us with questions about the product and ideas for improvements.

2 DESCRIPTION AND OPERATION

2.1 General

The primary function of the R60 VDES base station is to:

- Receive AIS and ASM and data on the VHF link and distribute this via Ethernet
- Transmit AIS and ASM messages on the VHF link.
- Repeat received messages on the VHF link.
- Receive and transmit data on the Third AIS Channel
- Act as an NTP server

Available functionality is dependent upon R60 variant. For more information, see Product Specification or User Manual.

R60 VDES Base Station

2.2 Physical data

Size:	(WxDxH) 483 × 357 × 89mm (3.51” × 19.02” × 14.06”) 19 inch rack mount, 2U
Weight:	4.5 kg (10 Lbs)
Power:	AC: 100-240V; 50/60 Hz DC: +24V; 2.5A (Rx: 0.8 A Tx: 4.52 A)
Operating temp:	-20°C – +55°C (Ambient)

2.3 System Description

A typical R60 VDES Base Station installation has these typical components:

- 1 pc R60 VDES Base Station (2pc in Hot-standby configuration)
- 1 pc AC Power cable
- 1 pc DC Power cable (needed when 12-24VDC supply is used)
- 1 pc GNSS antenna (including antenna cable and lightning protection)
- 1 pc VHF antenna (including antenna cable and lightning protection)
- 1 pc Grounding cable

The following is included in the standard R60 VDES Base Station delivery from Saab:

- 1 pc R60 VDES Base Station
- 1 pc AC Power Cable

Any additional accessories needed can be supplied according to the standard price lists or as separately quoted.

3 INSTALLATION PLANNING

3.1 General

Make sure to plan the installation carefully and you will save time, effort and materials. More important, you will prepare for a trouble-free operation. Here are the most important items to consider before and during installation. These are described in more detail further on in this manual.

VHF- and GNSS antennas:

- Proper length and routing of cables.
- Safe distance to high–power transmitters and antennas.
- Appropriate height and mounting surface, providing a 360-degree view of horizon.
- Correctly tuned antenna (VSWR)

External equipment:

- Proper length and type of cable(s)
- Hot-standby cable (when connecting to a 2nd R60 VDES Base Station on the same site)

Power:

- AC power source
- DC power source
- Proper length of cable for AC
- Proper length of cable for DC

- ***Note:*** To completely interrupt power supply to the unit, both the DC and the AC connectors shall be disconnected.

Environment:

- Ambient temperature
- Airflow
- Moisture
- Grounding to site ground (grounding points and cable)

4 INSTALLING THE GNSS-ANTENNA

4.1 GNSS antenna location

Installing the antenna is a crucial part of the system installation. How and where you install your antenna, with its cabling and integral preamplifier can greatly affect its sensing efficiency.

4.2 Interference

Stay safely away from interfering high-power RF energy sources like radar and other transmitting radio antennas. Locate the antenna away (> 3m, if possible) from and out of the radiation beam of high-power transmitting antennas.

4.3 Avoid Vertical Obstructions

The GNSS receiver uses satellites that can be just above the horizon, so nothing should block the sky. Ensure that the bottom of the antenna is at least 15 cm above the surface it's mounted on.

Note:	Small diameter obstructions, such as masts and booms do not seriously degrade signal reception, but such objects must not eclipse more than a few degrees of any given bearing.

4.4 Reflecting elements

To minimize the risk for multipath interference the antenna should be located as far away as possible from reflecting elements.

4.5 Cable Lengths

The coaxial cable between the GNSS antenna and the Base Station is of prime importance for proper performance of the system.

The attenuation (length) of the cable shall match the antenna gain to achieve best performance of the GNSS installation.

Recommendations of cable types and lengths can be found in Appendix A.3 – GNSS Cable Selection Guide.

4.6 Avoiding EMI Effects

Try to route the coaxial cable to the antenna as direct as possible, direct paths reduce electromagnetic interference (EMI) effects. Avoid running the cable close to high-power cables, such as radar or radio-transmitter cables. Preferably use double shielded coaxial cable.

5 INSTALLING THE VHF ANTENNA

How and where you install your antenna, with its cabling, greatly affect its efficiency. The communication range will depend on the following parameters:

- Height
- Terrain/obstructions
- Cable attenuation
- Antenna Gain

5.1 Antenna location

Find a location for the antenna, which is free from obstructing objects. Stay safely away from interfering high-power transmitting antennas. (Preferably locate the antenna at least 3 meters away from and out of the transmitting beam of high-power transmitters.)

5.2 Avoid Vertical Obstructions

You should not install the antenna close to any large vertical obstruction. The objective is for the VHF antenna to see the horizon freely through 360 degrees. The larger distance to such objects the less potential risk for interference.

5.3 Cable Lengths

Try to keep the cable as short as possible to minimize attenuation of the signal (Tx and Rx). Cables equal or better than RG214 are recommended. Refer to Appendix A.4 - VHF-cable selection table.

5.4 Avoiding EMI Effects

Preferably, use double shielded coaxial cable to minimize radiation of EMI.

Warning: The safety distance to the equipment antenna is 1 m while transmitting

Do not work in close vicinity of the antenna while the equipment is operating!

6 INSTALLING THE R60 VDES BASE STATION

6.1 Mounting

The R60 VDES Base Station is designed for installation in a 19-inch equipment rack. The height of the unit is 2 U (89 mm). Mount the R60 VDES Base Station securely by attaching four screws through the holes in the front plate into the 19-inch rack.

6.2 Installation environment

The Base Station (IEC 529: IP20) should be installed indoors in a temperature-controlled area.

Ensure there is enough airflow to avoid high ambient temperatures.

6.3 Operating temperature

The Base Station is designed to operate in a –20º to +55ºC ambient temperature environment.

6.4 VHF antenna installation

When installing the VHF antenna, use an adapter cable (10 cm of RG223) if the thickness or bending radius of the antenna cable makes it difficult to attach the cable.

6.5 GNSS antenna installation

The Base Station is equipped with a TNC GNSS connector. Mind the +5V DC output to supply the GNSS antenna amplifier if the GNSS antenna is shared with other equipment.

6.6 Presentation system (VTS, etc.)

The presentation system shall be connected to the RS-232 port, RS-422 port or to one of the Ethernet ports ETH 1 or ETH 2.

6.7 Supervisor system

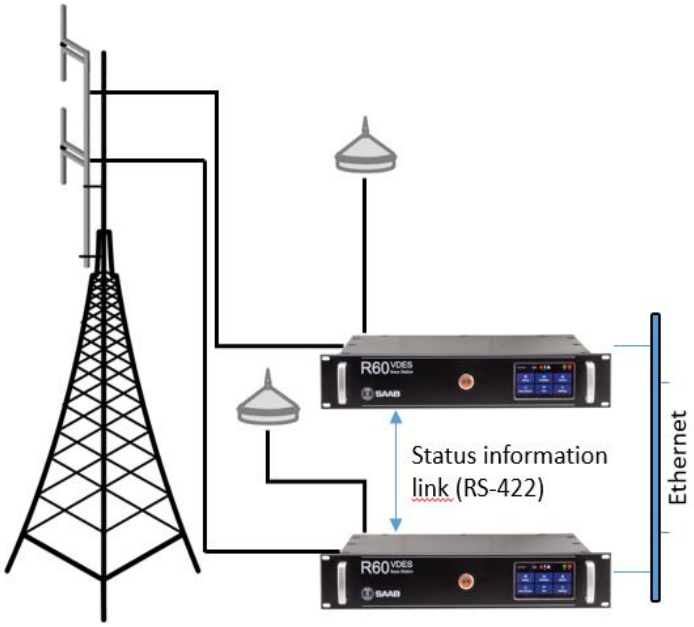
Supervision and servicing of the equipment is done through the supervisor web interface. This interface is accessed via a dedicated Ethernet port ETH 3.

6.8 Site Ground

Attach a grounding cable connected to the Site Ground to the Grounding Stud on the Rear Panel.

6.9 Hot Standby installation

When installing two Base Stations in a hot standby redundancy pair a Hot Standby cable (see Appendix A.6 – Hot Standby Cable) shall be connected between the Base Stations.



Hot Standby installation

The Hot Standby cable is used to share information between the Base Stations. Connect the Hot Standby cable to the BSC 1 port on the first Base Station to the BSC 1 port on the second Base Station.

6.10 Power-up

When the installation is finalized it is time to power-up.

If AC-power is used the main switch on the rear panel of the Base Station must be turned on.

To power on the R60 VDES Base station, push the centre power button. The unit will power on immediately.

When the R60 VDES Base Station has finished booting, the power button should indicate a steady green or red light depending on its status.

LED Colour	LED Behaviour	Description
Black	Steady	Base station is powered off and no AC or DC power is available
Black - Blue	Fade	AC or DC power source is available. Base station is powered off but supervisor is powered on.
Green - Blue	Fade	Base station powered on and is booting.
Green	Steady	Base station is operational with no active alarms.
Red	Steady	Base station is operational with at least one active alarm.
Green - Yellow	Fade	Base station is operational with no active alarms. Base station is configured for hot standby and is currently operating in standby mode.

LED Colour	LED Behaviour	Description
Red - Blue	Fade	Software load in progress. Base station is not operational.
Black - Red	Fade	Base station failure, base station is not operational

If both AC and 24 volts DC are connected to the Base Station a quick test can be performed by switching the main AC on and off. The power source indicator ** on the front display should change from AC to DC to indicate that no AC is present, but otherwise the Base Station should continue operating.

To power off the R60 base station, press and hold the button least 2 seconds.

To completely interrupt power supply to the unit, both the DC and the AC connectors shall be disconnected.

** 

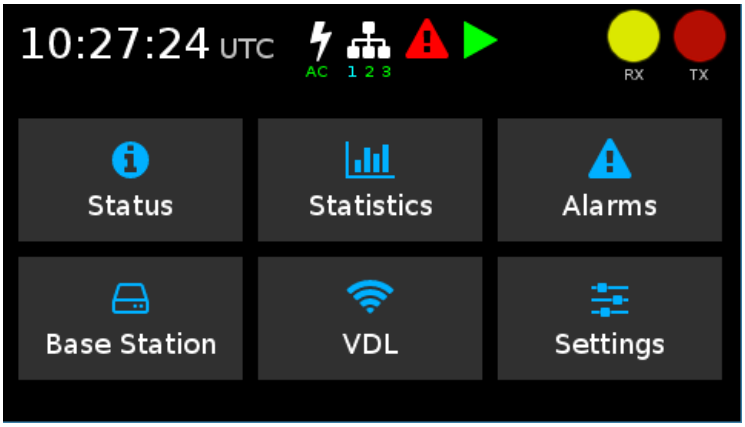
6.11 Configuring the R60 VDES Base Station

Once powered-up the Base Station uses default parameters. If the Base Station is part of a network or is located near other Base Station stations it needs to be configured, see the user manual (Ref. 1) for further information.

In case the R60 should connect via Ethernet, the IP parameters may need to be changed. This is done as described in section 11.

7 R60 VDES BASE STATION FRONT PANEL

The information provided by the front panel is briefly described in this section. More detailed information can be found in the user manual (Ref. 1).



R60 front display

7.1 Status bar

Item	Description
07:37:16 UTC	Current time in UTC
AC	Current power source *AC* *DC*
1 2 3	Ethernet link status. Number indicates physical Ethernet interface. Colour indicates current link speed Grey: No link Magenta: 10Mbit Green: 100Mbit Cyan: 1Gbit
	Alarm status. Icon is red when at least one alarm is active and grey when no alarm is active.
	Base station is configured for hot standby and is currently operating as master.
	Base station is configured for hot standby and is currently operating in standby mode.
RX	Soft LED. Blinks yellow when receiving.
TX	Soft LED. Blinks red when transmitting.

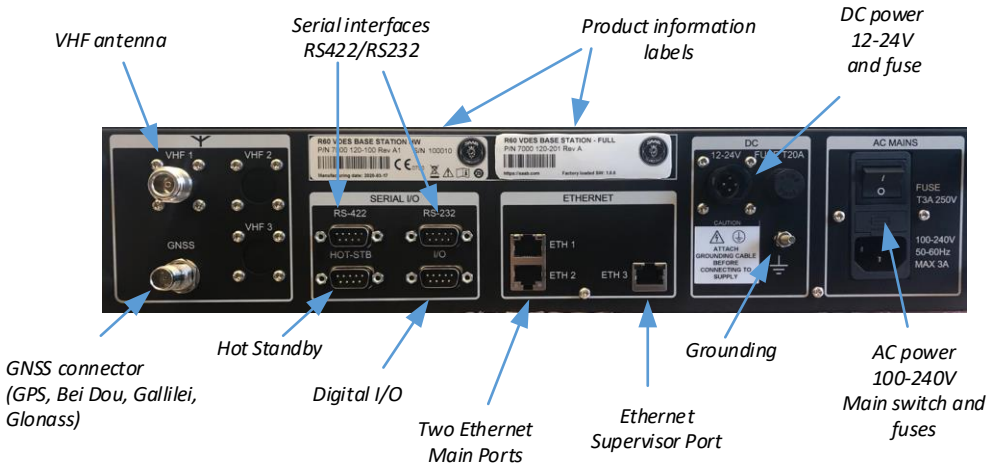
7.2 Status

Group	Parameter	Description
Base Station	**Temperature**	Current temperature inside the base station.
	AC	AC power available
	DC	DC power available
	DC Voltage	DC power voltage level
	Source	Current power source (AC or DC)
	State	Indicates base station state *Booting:* Base station is starting up *Operational:* Base station is operational
	Uptime	Base station supervisor uptime in *hh:mm:ss*
GNSS	**Source**	Current GNSS source
	Visible Satellites	The number of GNSS satellites that theoretically could be detected at the R60 location.
	Satellites in Use	The number of GNSS satellites that are received.
Self-Surveyed Position	**Latitude**	Latitude
	Longitude	Longitude
	Altitude	Altitude in meters
	Accuracy	Self-surveyed position accuracy in percent
Hot Standby	**Hot Standby Mode**	Current hot standby mode, available modes are *Not active* *Manual* *Autonomous*
	Hot Standby Status	Current hot standby status *Master* *Standby*
	Alarm Status	Hot standby alarm status
VDL	**Channel**	VHF data link (VDL) channel
	Units	Number of received units (including own station)
	Load	Link load in percent including transmitted and received messages during last minute.
	Mode	Current mode *Autonomous* *Assigned*
Ethernet	**ETH1**	Link status and speed of Ethernet interface 1
	ETH2	Link status and speed of Ethernet interface 2
	ETH3	Link status and speed of Ethernet interface 3 (Supervisor)
Local Storage	**Total Size**	Available total size of local storage media
	Used Size	Used size of local storage media
	Status	Status of local storage
SW/HW Version	**Software Version**	Base station software version
	Hardware Version	Base station hardware version
	Part Number	Base station part number
	Serial Number	Base station serial number

Group	Parameter	Description
	Supervisor Software Version	Supervisor software version

8 R60 VDES BASE STATION REAR PANEL

The rear panel accommodates all physical connectors. The connectors and their usage are briefly described in this section. For more detailed information refer to the following sections of this manual.



R60 VDES Base station back plane

Item	Description
VHF	VHF antenna connector. N-type female, 50 Ω
GNSS	GNSS antenna jack connector. TNC-type, 50 Ω
Product information labels	This label provides unit-specific information such as product, part and serial number.
DC power 12-24V	+12-24V DC power supply. Use a DC cable of at least 4x1.5 mm^2.
DC fuse	Replaceable fuse for the DC supply. Use: T20A min 50VDC, 5x20 mm
AC power 100-240V	Main supply standard (IEC 320) inlet. 100-240V, 50/60 Hz. Use the supplied AC cable or an IEC 320 compatible cable of at least 3x0.75 mm^2.
AC fuse	Replaceable fuses for AC main supply. Use: T3A 250V, 5x20 mm fuses.
Main switch	Primary main supply switch. Use this in order to fully turn off the Base Station. Remember to also remove the DC power cable.
Grounding stud	Connect the grounding stud to the site ground to fully utilize the lightning protection of the Base Station. The gounding stud is internally connected to the AC supply protective ground pin. **Note**, this termination shall be done by a skilled person.
RS-232 port	Presentation system interface. The electrical interface is RS-232. Default rate 38400 baud. D-Sub 9 pin male connector. Screws with #4-40 thread.

Item	Description
Digital IO port	1 Digital input (reserved for future use) 1 Digital output (active when an alarm is present) 1 PPS pulse input (Option) The R60 supports input of external time synchronization using one of the following options: 1. Input of 1 PPS pulse aligned with a ZDA on serial input. 2. Input time synchronization signal using IRIGB-003. D-Sub 9 pin male connector. Screws with #4-40 thread.
RS-422 port	Presentation system interface. The electrical interface is RS-422 to support long serial cabling. Default rate 38400 baud. D-Sub 9 pin male connector. Screws with #4-40 thread.
Hot-standby (HOT-STB)	Used to connect to another R60 when in a hot standby configuration. The electrical interface is RS-422. D-Sub 9 pin male connector. Screws with #4-40 thread.
Ethernet main ports ETH 1 and ETH 2	The Ethernet main ports are used to connect to external equipment such as PC's or IP network.
Ethernet Supervisor port ETH 3	The supervisor port is used for monitoring and control of the R60.

9 CONNECTING TO EXTERNAL EQUIPMENT

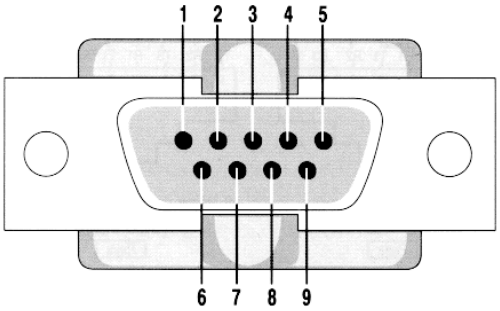
External equipment can be connected to the ports on the rear panel of the Base Station.

9.1 Serial ports electrical interface (RS-232 and RS-422)

Two types of electrical interfaces are used for serial communication:

- RS-232: For communication over short distances between equipment on the same site that uses the same power system. The serial communication cable can be as long as 15 m (50 ft), but short cables within the same cabinet is preferred to avoid malfunction.
- RS-422, V11: Enables serial communication over longer distances. The ports are isolated to 1 kV, so that equipment with different power systems can be connected to the Base Station. Cabling can be as long as 800 m (0.5 miles), but the performance is dependent on the cable type and its routing.

The R60 9-pin DSUB pinouts are as follows:



9-pin DSUB connector

Pin No.	Signal	RS-232
2	Receive Data	Rx Data
3	Transmit Data	Tx Data
5	Ground	GND

RS-232 ports pinout

Pin No.	Signal	RS-422
1	Isolated signal ground	C
2	R60 receive data (-)	RxA
3	R60 transmit data (-)	TxA
5	System ground (chassis)	GND*
7	R60 transmit data (+)	TxB
8	R60 receive data (+)	RxB

RS422 ports pinout

(*) Not necessary for communication. Enables connection to the chassis ground just like the GND-pin for the RS-232 interface.

Note: The RS-232 electrical interface standard does not provide isolated connection between devices. Use only fixed RS-232 connections between units on the same power supply.

9.2 Configuration via front display

The configuration parameters possible to set via the front display GUI are specified in the table below. Input is done by means of a virtual keyboard shown when a parameter value is pressed.

Group	Parameter	Description
Network ETH1	**IP Address**	IP address of Ethernet interface 1
	Netmask	Netmask of Ethernet interface 1
	Gateway	Gateway of Ethernet interface 1 and 2
Network ETH2	**IP Address**	IP address of Ethernet interface 2
	Netmask	Netmask of Ethernet interface 2
	Gateway	Gateway of Ethernet interface 1 and 2
Network ETH3 (Supervisor)	**IP Address**	IP address of Ethernet interface 3 (Supervisor)
	Netmask	Netmask of Ethernet interface 3 (Supervisor)
	Gateway	Gateway of Ethernet interface 3 (Supervisor)
Display	**Display timeout**	Sets time when display turns off since last touch input.
	Brightness	Sets the display brightness
	Language	Sets the display language

Front display configuration parameters

9.3 Presentation System Serial Port (RS-232)

This port is used to interface external presentation and communication systems (i.e. VTS), and is configurable to 4800, 9600, 19200, 38400, 57600 or 115200 baud serial communication (38400 baud default) [Input/Output]. The port can also be used for configuration of the Base Station.

Note! This port does not support comment/TAG blocks.

9.4 Presentation System Serial Port (RS-422)

This port has the same function as the presentation system RS-232 port, but has the RS422 electrical interface. It enables longer wiring of the serial cables and the use of multi port serial networks. The default bit-rate is 38400 baud.

9.5 Hot standby port (HOT-STB)

This port is only used in a hot standby configuration. Connect this port to the HOT-STB port of the other R60 or BSC 1 port of an R40. It uses the RS-422 electrical interface. Refer to Appendix A.6 – Hot Standby Cable.

9.6 Digital IO port (I/O)

The digital IO port includes three different functions

- Digital output
- Digital input

- 1PPS input (Optional)

The digital output can be used to activate an external alarm relay based on the alarm relay setting. The port is also equipped with a digital input for future use.

The optional 1PPS input port enables external synchronisation of the Base Station. For it to be used the Base Station must be configured to use an external synchronization source, otherwise it will use its internal GNSS receiver as source for synchronisation to UTC.

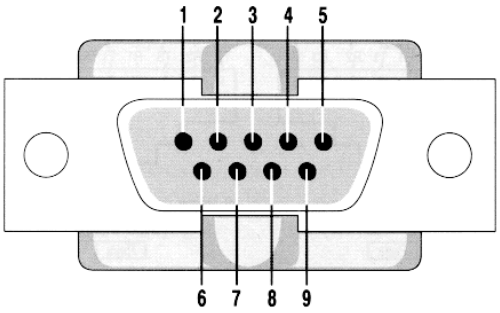
When a 1PPS signal is connected to the 1PPS input port the corresponding ZDA sentences must be input on a serial port.

An IRIGB-003 signal can be used as an alternative to a 1PPS signal. In this case no ZDA input is required; all the needed timing information is available within the IRIGB-003 signal. IRIGB-003 is an unmodulated time code signal with 100 pulses per second and one frame is one second long. For further details, see IRIG Standard 200-04.

The port pinout is:

Pin No.	Signal	Comment
1	Not Used	-
2	1PPS Input TTL: 3.3V/5V	External synchronisation also requires input of ZDA sentences on the serial port. The 1PPS pulse input alone is not sufficient.
3	Digital input (+) TTL: 3.3V/5V	-
4	Digital input (-) TTL: 3.3V/5V	-
5	Ground (1PPS)	-
6	Digital output TTL: 5V Maximum current: 32mA	High when inactive Low when activated
7	Ground (Digital Out)	-
8	Not Used	-
9	Not Used	-

Digital IO port pinout



9-pin DSUB connector

9.7 Ethernet main ports

The Ethernet ports (ETH 1, ETH 2) enables control, monitoring and VDES services like any other port, and supports the same configuration tools. The electrical interface conforms to the Ethernet standard. Both ports has the same functionality allowing redundant installations.

Note! The Ethernet main ports are the only ports that supports comment/TAG blocks.

9.8 DC Inlet

The Base Station can be operated on +12-24V DC supply alone or together with main supply. If main supply is available the R60 will not consume any DC power, but use the DC source as back-up power only. Thus, the Base Station will continue operating without disruption if the main supply should fail.

In order to avoid external battery damage, the Base Station will turn itself off if the DC supply voltage should drop significantly below 10.8V.

The DC Receptacle is a CPC Series 1, 4-pin connector, Keying A, (TE product no: 1-207825-5) with pin assignment described by the following figure and table.

DC Connector

Pin	Assignment
1	Plus 10.8 – 31.2 V DC
2	0 V
3	0 V
4	Plus 10.8 – 31.2 V DC

DC connector pin assignment

Mating cable connector AMP (Tyco Electronics) order numbers:

Part	Order number
Plug	182647-1
Cable clamp	182658-1
Sockets	163092-2

9.9 AC Inlet

The Base Station can be connected to Mains AC supply (110 or 230 VAC, 50/60Hz) via the “applicances” chord supplied with the Base Station. Depending on customer order the chord is supplied with a EU/UK/US connector.

The AC Power switch on the rear side if the base station has to be switched ON to use AC.

DC can be connected at the same time as AC, but is in that case used as a backup in case of failure or fluctuations on AC.

Note that when AC power is used the Mains supply socket shall be equipped with protective ground in order to provide grounding in the event of a fault in in AC supply.

9.10 VHF1

Attach the VHF antenna cable to the TNC connector marked as VHF1. This provides a Rx/Tx connection for RF.

9.11 GNSS

Attach the GNSS antenna cable to the connector identified as GNSS.

10 MAINTENANCE

10.1 Replacing fuse

The Base Station has three accessible fuses, located on the rear panel of the Base Station.

Warning! **Disconnect the main supply before you replace any fuse. Both the DC and the AC connectors shall be disconnected.**

AC FUSES: Main power 2 x T3A 250V, 5x20 mm.

Symptom: The AC power indicator does not light up when power is applied and the main switch is in the on position.

DC FUSE: 12-24V volts. Use T20A, min 50VDC, 5x20 mm.

Symptom: The DC power indicator does not light up when DC power is applied.

10.2 Service and repairs

All service of the Base Station shall be performed of a by Saab AB (Publ.) TransponderTech authorized service organization. Unauthorized service results in unnecessary risks of exposing personnel to hazardous voltages, electromagnetic radiation and materials that may affect the health. It will also result in discontinuance of the warranty of the Base Station.

Hazardous voltage

Warning!

Do not remove the cover!

The Base Station contains equipment with touchable parts, which operates with hazardous power levels. If the cover is removed these parts will be accessible.

11 CONFIGURING THE BASE STATION

11.1 Passwords

The default password is “Config” and it is case sensitive.

11.2 Default TCP/IP Parameters

It is necessary to configure the R60 TCP/IP communication parameters for the R60 to work properly in an IP network. The configuration of IP settings is most conveniently done via the front display GUI see section Instructions on how to set all parameters via the built-in web server can be found in the user manual (Ref. 1). The default IP parameters are:

Parameter	Value
IP address	192.168.73.73
Net mask	255.255.255.0
Gateway address	192.168.73.1
DHCP	Not Available
Client base station connection	TCP Port 8030

ETH 1: IP default parameters

Parameter	Value
IP address	172.16.0.73
Net mask	255.255.0.0
Gateway address	0.0.0.0
DHCP	Not Available
Client base station connection	TCP Port 8030

ETH 2: IP default parameters

Parameter	Value
IP address	192.168.73.74
Net mask	255.255.255.0
Gateway address	192.168.73.1
DHCP	Not Available

ETH 3: IP default parameters

Note: If the IP-parameters are unknown it is recommended to use the front display GUI of the R60.

11.3 Configuration of TCP/IP parameters via front display

The configuration parameters possible to set via the front display GUI are specified in the table below. Input is done by means of a virtual keyboard shown when a parameter value is pressed.

Group	Parameter	Description
Network ETH1	**IP Address**	IP address of Ethernet interface 1
	Netmask	Netmask of Ethernet interface 1
	Gateway	Gateway of Ethernet interface 1 and 2
Network ETH2	**IP Address**	IP address of Ethernet interface 2
	Netmask	Netmask of Ethernet interface 2
	Gateway	Gateway of Ethernet interface 1 and 2
Network ETH3 (Supervisor)	**IP Address**	IP address of Ethernet interface 3 (Supervisor)
	Netmask	Netmask of Ethernet interface 3 (Supervisor)
	Gateway	Gateway of Ethernet interface 3 (Supervisor)
Display	**Display timeout**	Sets time when display turns off since last touch input.
	Brightness	Sets the display brightness
	Language	Sets the display language

Front display configuration parameters

Follow the steps below to configure the IP settings of the R60 via the front display GUI.

1. Press “Settings” on the touch display.
2. Enter the correct Network settings and press Ok.
3. The parameters have now been set and the R60 Base Station is ready to use.

11.4 View and update licenses

In addition to the IP parameters there might be a need to update the license key for the R60 in order to access new functionality purchased.

Current license info can be shown in the front display GUI by pressing *Status*, and then *SW/HW version*.

It can also be accessed via the web interface by opening the R60 start web page and then selecting *HW/SW info.* The *HW/SW info* page also displays which functionality is available with the current license.

APPENDICES

APPENDIX A.1 - REFERENCE DOCUMENTS
APPENDIX A.2 - TECHNICAL DATA
APPENDIX A.3 - GNSS-CABLE SELECTION GUIDE
APPENDIX A.4 - VHF-CABLE SELECTION TABLE
APPENDIX A.5 – EXTERNAL PORT OVERVIEW
APPENDIX A.6 – HOT STANDBY CABLE

APPENDIX A.1 - REFERENCE DOCUMENTS

[Ref. 1] R60 VDES Base Station User Manual, 7000 120-009 /
R60 User Manual, 7000 120-019

APPENDIX A.2 - TECHNICAL DATA

PHYSICAL DATA	
Type	19” rack mount. Unit height: 2U
Dimensions Height: Width: Depth:	 89 millimetres (3.51”) 483 millimetres (19.02”) 357 millimetres (14.06”)
Weight:	4.5 kilograms (10 Lbs)

DC-POWER	
Power input requirements	10.8-31.2 V
Grounding	The negative DC feed is isolated from the chassis.
Current need (typical): During transmission - with 12.5W VHF output power setting - with 1W VHF output power setting Operating (except during transmission) Off, but supplied with DC only Normal operation	@ +24 V 109 W/4.52 A 61 W/2.55 A 19 W/0.78 A 1.6 W/65 mA 22 W/0.9 A
Recommended fuse	20 A (T20A 50VDC) 5x20mm

AC-POWER	
Power input requirements	100-240 volts @ 50/60 Hz
Power consumption (typical): During transmission: - with 12.5W VHF output power setting - with 2W VHF output power setting Operating (except during transmission) Off, but supplied with AC. Normal operation	 110 W 74 W 51 W 21 W 53 W
Recommended fuse	3 A (T3A 250V) 5x20mm

VHF TRANSCEIVER	
Frequency	**155 – 162.5 MHz**
Channel Bandwidth	25 kHz, future VDE options 50 kHz, 100 kHz
Channel Selection	Channel numbers as in ITU-R M. 1084-4
Output power	AIS: LOW (1W) and HIGH (12.5W) ASM: from 1W to 12.5W
Bit rate (Tx/Rx)	9.6 kbps (AIS), 19.2 kbps (ASM), 307.2 kbps (VDE option max bit rate)
Modulation	GMSK (AIS) FSK (DSC) π/4 QPSK (ASM and VDE option). 16-QAM (VDE option)

ELECTRICAL INTERFACES	
Data Ports	RS-232/422 V11. Bit-rate up to 115 200 bps
TCP/IP Port	3 x Ethernet (UDP, UDP Multicast, TCP) Up to 10 simultaneous TCP data clients
GNSS-Antenna	TNC-Female, with 5V @ 40mA power supply to GNSS antenna pre-amplifier
1PPS and IRIG-B 003	Via 9-pin D-sub (male), on Digital Input and Output Port
VHF-Antenna	N-Female, separate RX and TX antenna ports (option)
Digital Input and Output Port	Via 9-pin D-sub (male)
AC-power DC-power Serial data	IEC 320 connector AMP CPC Type III+ 9-pin D-sub (male)

ENVIRONMENTAL DATA	
Temperature/humidity:	-20°C to +55°C (Operational) -55°C to +85°C (Storage) Humidity 0-95%

INTERNATIONAL STANDARDS	
General	IEC 62320-1 IEC 62320-2
Electromagnetic Compatibility	EN 301 489-1 EN 55032:215 EN 61000
Radio performance	IEC 62310-1
Electrical safety	EN 62368-1
Environment	EN 60945

APPENDIX A.3 - GNSS-CABLE SELECTION GUIDE

The table below gives recommendation on cables that can be used for the GNSS-antenna connections. Due to the high frequency it's important that the attenuation in the cable is low for the specific frequency (1.5 GHz).

Type	Attenuation @ 1.5 GHz (dB/m)	∅ (mm)	Weight (kg/100m)
RG 58	0.9	5	3.7
RG 400	0.6	4.95	6.3
RG 223	0.6	5.40	5.5
RG 214	0.35	10.8	18.5
RG 225	0.3	10.9	23.3

GNSS cable selection guide

For optimum performance of the internal GNSS equipment a resulting gain of approximately +10dB should be available when the cable attenuation has been subtracted from the GNSS-antenna preamplifier gain. The net gain shall not exceed +26dB.

Example:

Cable type	Preamplifier Gain (dB)	Recommended min cable length (m)	Recommended max. cable length (m)
RG 58	12	0	2
RG 58	26	0	18
RG 58	30	4.5	22
RG 223	12	0	3.5
RG 223	26	0	26.5
RG 223	30	6.5	33.5
RG 214	12	0	6
RG 214	26	0	46
RG 214	30	11.5	57

Example of GNSS cable and cable attenuation

Min. length = (Preamp. Gain – 26 dB)/Cable attenuation per meter

Max length = (Preamp. Gain – 10 dB)/Cable attenuation per meter

APPENDIX A.4 - VHF-CABLE SELECTION TABLE

The table below gives recommendation on cables that can be used for the VHF-antenna connections. The cable attenuation shall be kept as low as possible; a 3 dB loss is the same as a reduction of the input and output signal power to a half.

Type	Attenuation @ 150 MHz (dB/100m)	∅ (mm)	Weight (kg/100m)
RG 214	7	10,8	18,5
RG 217	5	13,8	30,1
RG 225	8	10.9	23,3

VHF cable selection table

Ex: A cable length of 40 meters RG 214 attenuates 2,8dB.

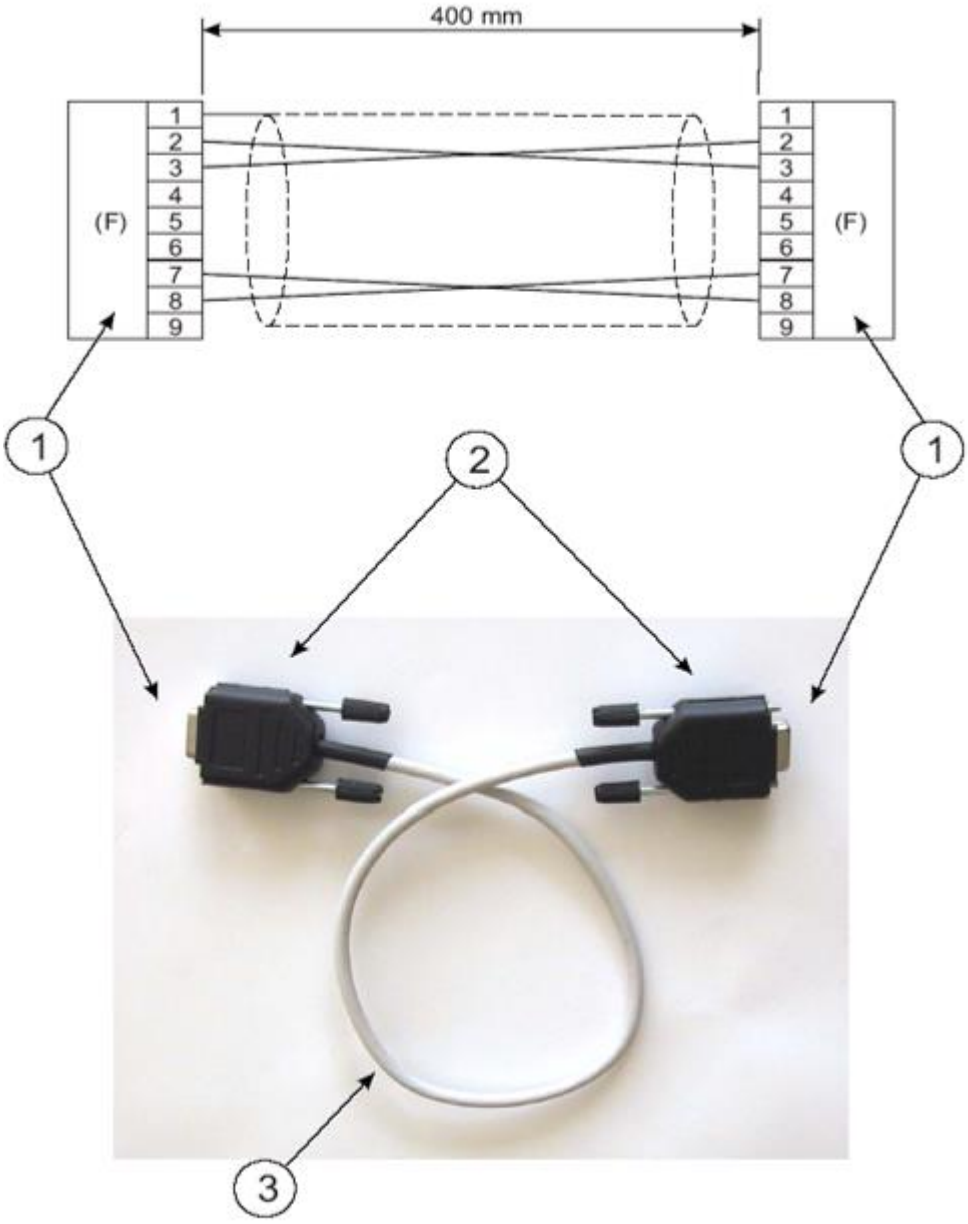
APPENDIX A.5 – EXTERNAL PORT OVERVIEW

Name	ELECTRICAL INTERFACES		DATA FORMATS		APPLICATION	
	IN	OUT	IN	OUT	IN	OUT
RS-232 Presentation System Port	RS-232	RS-232	NMEA(*) NMEA RTCM	NMEA(*) NMEA	Standardized IEC 62320-1 applications Differential correction	Standardized IEC 62320-1 applications
RS-422 Presentation System Port	RS-422, V11	RS-422, V11	NMEA(*) NMEA RTCM	NMEA(*) NMEA	Standardized IEC 62320-1 applications Differential correction	Standardized IEC 62320-1 applications
HOT-STB Hot standby status port	RS-422, V11	RS-422, V11	NMEA (*)	NMEA (*)	Hot standby status information	Hot standby status information
ETH 1 Presentation System Port	Ethernet	Ethernet	NMEA(*) NMEA IP	NMEA(*) NMEA IP	Configuration, Software upgrade, Standardized IEC 62320-1 applications	Configuration data, Standardized IEC 62320-1 applications
ETH 2 Presentation System Port	Ethernet	Ethernet	NMEA(*) NMEA IP	NMEA(*) NMEA IP	Configuration, Software upgrade, Standardized IEC 62320-1 applications	Configuration data, Standardized IEC 62320-1 applications
ETH 3 Supervisor Port	Ethernet	Ethernet	NMEA(*) NMEA IP	NMEA(*) NMEA IP	Configuration, Software upgrade, Standardized IEC 62320-1 applications	Configuration data, Standardized IEC 62320-1 applications

(*) Saab AB (publ.) TransponderTech proprietary

APPENDIX A.6 – HOT STANDBY CABLE

Part number: 7000 100-775



Pos	Item	Qty	Supplier	Supplier no.
1	D-Sub 9 Pin Connector	2	ELFA	44-055-02
2	D-Sub 9 Pin Housing	2	ELFA	6260-0101-01
3	Signal Cable Shielded	L=400	ELFA	55-466-27