OPERATOR AND INSTALLATION MANUAL

TR-810

VHF AM GROUND TO AIR COMMUNICATION RADIO

JOTRON

www.jotron.com

Approvals

The equipment is designed to meet the essential requirements of European Directives 1999/5/EC, 89/336EEC as amended by Directive 93/68/EEC and 72/23/EEC

Standards

The following standards are applied:

EMC:	EN 301 489-22 v. 1.3.1
	FCC part 15 and part 87
Health and Safety:	IEC 60945 ed.4 and EN60950-1
Radio specifications:	EN 300 676-1 v.1.4.1

For an updated list of approvals and statements of conformity, these are available on:

www.jotron.com

List of abbreviations and definitions

BITE
Built In Test Equipment

bps
Bits Per Second.

DSP
Digital Signal Processor

ETSI
European Telecommunication Standardisation Institute

ICAO
International Civil Aviation Organization

IEC
International Electro-technical Commission.

OCP
Operators Control Panel (In this manual: Front module)

PA
Power Amplifier

PSU
Power Supply Unit. Separate unit to power the equipment.

PTT
Push To Talk

RF
Radio Frequency

S/N
SIGNAL- TO-NOISE RATIO

VSWR
Voltage Standing Wave Ratio

Amendment Record

NO	INIT	DATE	PAGE(S)	VERSION	REASON FOR CHANGE
1	ES	09.05.08	Total: 33	84417_OM_TR-810_A	New manual
2	ES	08.07.08	1-1, 2-1	84417_OM_TR-810_B	Change in Tables
3	ES	14.10.08	ALL Total:32	84417_O&I_TR-810_C	Operation and Installation manual
4	ES	04.03.10	1-1, 1-2,4-6, 5-7, 7-1	84417_O&I_TR-810_D	Added Man-Pack Change in table 5.7-1
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The information in this book has been carefully checked and is believed to be accurate. However, no responsibility is assumed for inaccuracies.
Jotron AS reserves the right to make changes without further notice to any products or modules described herein to improve reliability, function or design. Jotron AS does not assume any liability arising out of the application or use of the described product.

SAFETY INSTRUCTIONS

CAUTION!

This equipment contains CMOS integrated circuits. Observe handling precautions to avoid static discharges which may damage these devices.

WARNING!

Some RF semiconductor devices used in this equipment may contain Beryllium Oxide. If inhaled, dust from this oxide can be toxic. No danger will arise from normal handling but no attempt should be made to tamper with these devices. On no account must these transistors be destroyed or discarded with industrial or domestic waste, but should be returned to the manufacturers for subsequent disposal.

PRECAUTIONS

Connectors and cables

Do not force plugs in place, as this may damage the pins in the plugs.
Do not pull the cables when removing connectors from the TR-810, take instead a firm grip around the connector, press in the locking pin and pull.

Display and front panel

Avoid touching the display with sharp objects, as scratches can reduce the visibility.

Storage and safe handling

Storage temperature is between -40°C to + 70 °C.
Cleaning of the equipment can be done with a cloth soaked in a mixture of ordinary dish-detergent and water.

SAFETY PRECAUTIONS

1. **Do not place liquid-filled containers on top of the equipment.**
2. **Immediately turn off the power if water or other liquid leaks into the equipment. Continued use of the equipment can cause fire or electrical shock. Contact Jotron AS for service.**
3. **Immediately turn off the power if the equipment is emitting smoke or fire.**
4. **Do not operate the equipment with wet hands.**

WARNING STATEMENT

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

MODIFICATION WARNING STATEMENT

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

DIGITAL DEVICE STATEMENT

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

--Reorient or relocate the receiving antenna.

--Increase the separation between the equipment and transceiver.

--Connect the equipment into an outlet on a circuit different from that to which the transceiver is connected.

--Consult the dealer or an experienced radio/TV technician for help.

TABLE OF CONTENTS

1 Introduction

1.1 Models covered by this manual

The following models / variants are covered by this operator manual

Model	P/N	Accessories	Output	Frequency range	Modes
TR-810 Transceiver Vehicle version	83200	See Table 1.1-2	10 Watt	118-137 MHz	AM
TR-810 Transceiver Desktop version	83200	See Table 1.1-2	10 Watt	118-137 MHz	AM
TR-810 Transceiver Manpack version	83200	See Table 1.1-2	5 Watt	118-137 MHz	AM

Table 1.1-1, Radio models

Accessory X = *Standard supply* O = *Optional supply*	**Part number**	**TR-810** Vehicle version	**TR-810** Desktop version	**TR-810** Manpack version
5m extension cable for split mount	84317	X	X	
Hand microphone	84092	X	X	X
Console bracket	84084	X	X	
Lock screws	84086	X	X	
Front module bracket (for split mount)	84391	X	X	
Operation and Installation manual	84417	X	X	X
Antenna with cable (Vehicle kit)	97976	X		
Antenna adapter FME - BNC	84605	X		
DC cable with fuses for vehicle mount	84329	X		
Power AC/DC with connector	84330		X	
DC/DC converter with separation	84545		X	
Antenna adapter BNC - N	80577		X	
Front cover plate with flange (for split mount)	84082		O	
Console cover plate (for split mount)	84416		O	
Base antenna	91794		O	
Coax cable RG-213 – 30m	97898		O	
N-connector for RG-213	98244		O	
Antenna ½``flammable retardant cable	82907		O	
N-connector for ½``flammable retardant cable	82908		O	
Antenna lightning protector	80322		O	
Technical manual	84096	O	O	O
Antenna w/mount and cable for Man-Pack	tba			X
Shoulder bag	tba			X
Battery pack	tba			X
Battery charger	tba			X

Table 1.1-2, Accessory list

1.2 Layout of the transceiver

The TR-810 VHF AM transceiver is designed for use in ground to air communication in the 118-137MHz air band, with selectable channel spacing, 8.33KHz* or 25KHz. The transceiver operates in accordance to ICAO recommendations and conforms to the requirements of European Telecom Standard Institute, ETSI, EN 300 676 standard. The transceiver will be delivered with 10 Watt, 40 Watt PEP, output power.

*) 8.33KHz are only applicable outside USA and Canada

Figure 1.2-1, Transceiver, TR-810 with microphone

1.3 Applications

The TR-810 AM transceiver can be used for ground to air voice and can be operated in the following modes:

- Locally, mounted into a vehicle, with a microphone connected to the front module connector or to the transceiver unit micII connector. An external loudspeaker can be connected to the transceiver unit I/O connector.

- Locally, mounted as a desktop, with microphone and/or headphone connected to the front module connector or the microphone connected to the transceiver unit rear connector. An external loudspeaker can be connected to the transceiver unit I/O connector.

- Locally, flush mounted on a horizontal or vertical plate, with microphone and /or headphone connected to the front module connector or the microphone connected to the transceiver unit micII connector. An external loudspeaker can be connected to the transceiver unit I/O connector.

- Locally, enclosed in a shoulder/carrier bag, with a battery pack, antenna and microphone (or headset) connected. On standby, an external battery charger can be connected for charging the battery pack.

2 Technical SPECIFICATIONS

2.1 General specification, TR-810

TR-810		
Radio performance	EN 300 676 v.1.3.1	
Temperature range	-20°C to +55°C (operating) -40°C to +70°C (storage)	
Humidity	90% @+40°C (non condensing)	
Shock & Vibration	Transport: EN 300 019-2-2	
Shock & Vibration	Ground Vehicle installations: EN 300 019-2-5	
Shock & Vibration	Portable and non-stationary use: EN 300 019-2-7	
Safety	According to EN/IEC 60950	
EMC	EN 301 489-1 v.1.5.1, EN 301 489-22 v.1.3.1 , IEC 60945	
MTBF	>10 years / unit	
MTTR	<30 minutes at lowest replaceable unit	
Transceiver	**AM 25 kHz**	**AM 8.33 kHz** (applicable outside USA and Canada)
Frequency response	300-3400 Hz	350-2500 Hz
Effective bandwidth <6dB @	+/- 8.5kHz	+/- 4 kHz
Supply voltage, DC	12 - 28VDC negative ground +/- 10%	
Power consumption	At 10W, 80%modulation: < 60W	
Frequency range	118-137 MHz	
Frequency stability	± 1.0ppm	
Data ports	RS232 for service only	
BITE monitoring	VSWR, Voltages, Currents, Levels, Lock detect, Temperature, Output power, External alarm	
Weight Transceiver unit	1.95Kg	
Dimension Transceiver unit	184mm (W) * 241mm(D) * 72,8mm (H)	
TX Output power	10W ± 1dB, adjustable. (40W PEP). Output is reduced automatically depending of BITE measure.	
TX Modulation	AM up to 90%. Modulation level adjustable from front panel.	
TX Distorsion	< 5% @ 90% modulation	
TX LF compression VOGAD	30dB with less than 10% change in modulation	
TX Hum and noise level	> 40dB below @ 90% modulation	
TX Keying time	< 20.0ms	
TX Conducted spurious emission	< -70dBm	
TX Permissible input level	5V EMF	
TX THD	< 5%, 90% mod	
TX Mic input	Dynamic/Electret. Sensitivity 1.9mV	
TX Intermodulation attenuation	> 40dB with a frequency offset of ± 150kHz	
RX Adjacent channel rejection	>80dB	>65dB
RX THD	< 100µV, 1kHz	
RX Sensitivity @1µV / 30% pd	10dB SINAD (CCITT)	
RX Image and IF frequency response	>100 dB	
RX Intermodulation immunity	>80 dBc	
RX Squelch operation	Adjustable -1µV pd. to 25µV pd., Hysteresis:< 3dB, Opening/Closing: < 50ms	
RX Audio AGC	30% - 90%, <3dB variation	
RX Audio output	Built in speaker: >4W	
RX Headphone	8 - 32Ω >100mW	
RX External speaker	>4W @ 4Ω, adjustable volume from front panel	
RX Signal / Noise	>45dB on any output @100µV, 30%, 1kHz	
RX Monitor output	600Ω (unbalanced) -7dBm @ 90% modulation	
RX Harmonic distortion	<3% @90% AM (line output)	
RX Cross modulation	>90dB @ 1MHz offset	
RX Blocking	>95dB @1MHz offset	
RX Dynamic range	>110dB	
RX Spurious response rejection	>90dB	

3 Functional description

3.1 Front module controls

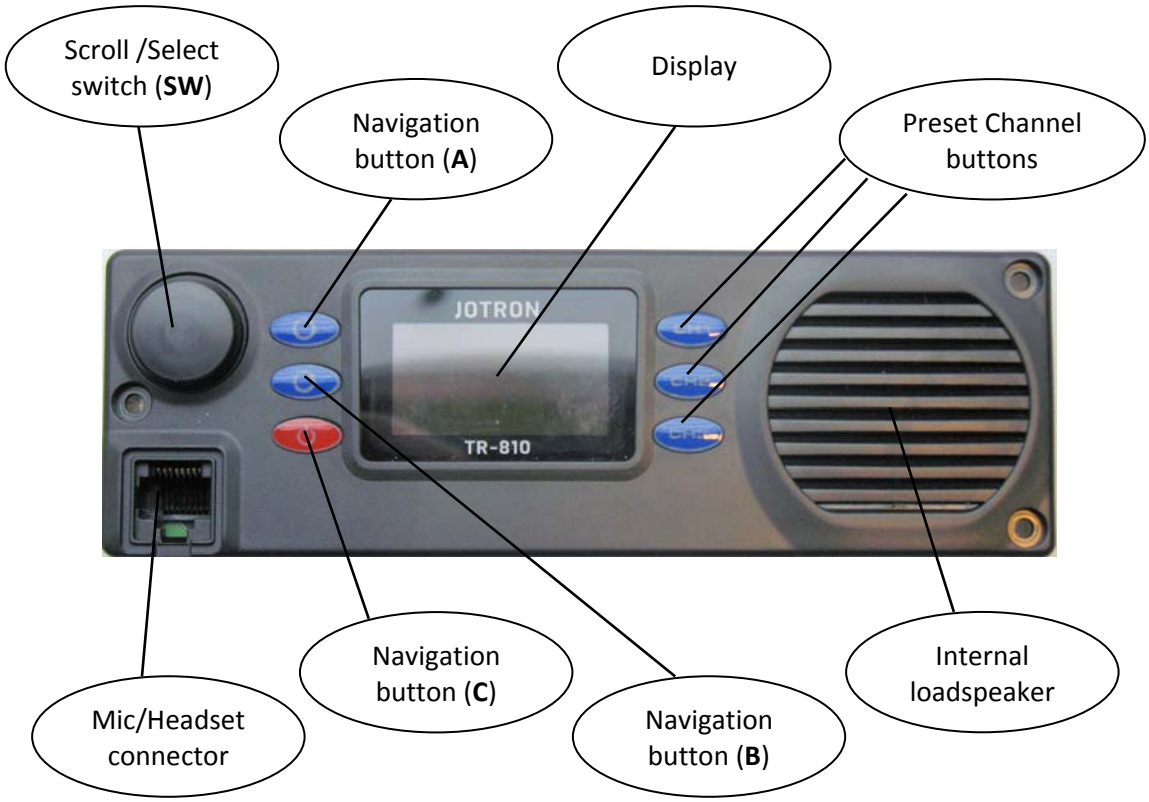


Figure 3.1-1, Front module controls

3.1.1 Display

The display shows the most important operational parameters, selected channel and frequency.
In addition, the display will show various menus, submenus and operational parameters to be accessed by the Scroll/Select switch and Navigation buttons A, B and C.
The bottom line of the display will show icons to indicate different status:

TX Indicates that the key button on the microphone is pressed, and the radio is transmitting.

LP Indicates that the radio transmitter has decreased the output level to Low Power. See chapter 5.7 for details.

SQ Indicates that the Squelch is open and/or a signal is received.

⚠ Indicates an Alarm condition. An alarm text will be shown at the right side of this symbol.

3.1.2 Scroll/Select switch and Navigation buttons A, B and C

The Scroll/Select switch together with the navigation buttons, A, B and C, are used to navigate through the menus. The Scroll/Select switch has three actions: It can be turned clockwise, anti-clockwise, or momentarily pressed.
In general the use of the navigation buttons are:

A has two functions:	Select Channel or One step back
B has two functions:	Squelch on/off or Enter/Confirm a selected submenu
C has two functions:	Enter Main menu or Power on/off
SW Scroll/Select right:	Increase a value (up)
SW Scroll/Select left:	Decrease a value (down)
SW Scroll/Select press:	Enter/Confirm

The user interface will indicate which navigation button to use.

3.1.3 ON/OFF button

Navigation button **C.**
To switch the transceiver ON, press and hold button for 1 second.
To switch the transceiver OFF, press button once to enter the Main menu. Then press and hold the button for 5 seconds.

3.1.4 Front Mic/Headset connector

The front Mic/Headset connector is used for multiple purposes. First it is used to connect a microphone and/or a headset to the front module of the transceiver for local operation. The headset output contains the sidetone generated from the output of the transmitter together with the received audio when the transmitter is not keyed.
In addition the Mic/Headset connector has a RS232 serial line that can be used to control radio parameters from an external unit, or to upload new firmware into the radio unit for future upgrades. A service dongle can be inserted to access the service menu.

Microphone Connector Front		
Name	**PIN**	**Purpose**
MIC. INPUT	1	
MIC. GND	2	
Headset	3	
RS232	4	RS232 TD
RS232	5	RS232 RD
KEY	6	Grounding this pin will key the transmitter
+12VDC	7	+12 VDC to external equipment (10mA)
GND	8	Common ground

Table 3.1.4-1, Front Mic/Headset connector, pin out

3.1.5 Preset channel buttons

These buttons are used to bring already stored channels.

3.2 Transceiver, rear connections

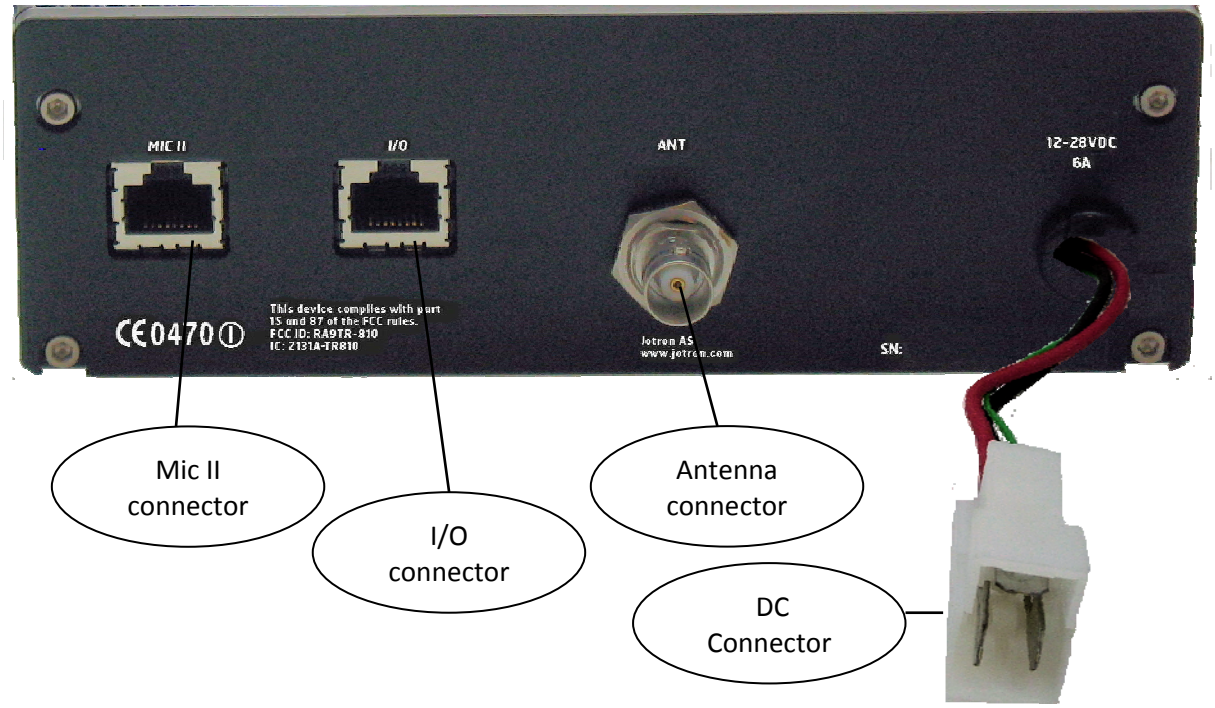


Figure 3.2-1, TR-810 transceiver unit, rear view

3.2.1 Antenna connector (50 ohm N)

Interface to the antenna cable for the transceiver Connector (50 ohm BNC).
This connector is connected to the antenna relay internally in the transceiver unit.

3.2.2 DC Connector

The DC wires are connected to the external DC supply (+12V to + 28V ±10%), or directly to the cars battery via a separate external fuse.
Red wire is the positive connection and Black wire is the negative.

A thin Green wire is together with the DC input wires. This wire can be connected to + voltage through the ignition key, to automatically turn the TR-810 off when the ignition is turned off.
To ignore this possibility, this wire has to be connected to a constant + voltage.

DC Connector		
Name	**PIN**	**Purpose**
Red wire	1	Connected to + DC voltage
Black wire	2	Connected to minus
Green wire	3	Ignition + DC voltage sense

Table 3.2.2-1, DC connector, pin out

3.2.3 I/O connector (RJ45)

The transceiver unit I/O connector is used for multiple purposes described in the table.

I/O Connector		
Name	**PIN**	**Purpose**
EX-SPEAKER	1	To external speaker.
EX-SPEAKER	2	To external speaker.
MONITOR	3	To tape recorder etc. 600Ω unbalanced
LOW POWER	4	Grounding this pin will force the transmitter to low power (Gas alarm)
NC	5	Not in use
MUTE	6	Used to mute external equipment. Triggered by squelch
+12VDC	7	+12 VDC to external equipment (10mA)
GND	8	Common ground

Table 3.2.3-1, I/O connector, pin out

3.2.4 MIC II connector (RJ45)

The microphone can be connected to this connector if it is convenient to have the microphone connected at the rear side of the transceiver unit. See chapter 4.7 and 5.5 for selecting an external microphone.

Rear mic. Connector		
Name	**PIN**	**Purpose**
MIC. INPUT	1	
MIC. GND	2	
Headset	3	
NC	4	Not in use
NC	5	Not in use
KEY	6	Grounding this pin will key the transmitter
+12VDC	7	+12 VDC to external equipment (10mA)
GND	8	Common ground

Table 3.2.4-1, MIC II connector, pin out

4 Installation

4.1 Compass safe distance

The Compass safe distance for the TR-810 is minimum 110cm.

4.2 Introduction.

The procedures for installing the transceiver are described in Table 4.2-1 below.
It is recommended that these procedures are completed in the order shown.

Procedure		Reference
1	Initial inspection	4.3
2	Install equipment	4.4
4	Connect remote connectors as required	4.7
5	Connect antenna	4.5
6	Connect DC supply	4.6

Table 4.2-1, Installation procedures

4.3 Initial inspection

Items included for a TR-810 transceiver	
1	TR-810 transceiver
2	CD with Operators Manual
3	Accessories ordered according to model and installation. See Table 1.1-2, Accessory list

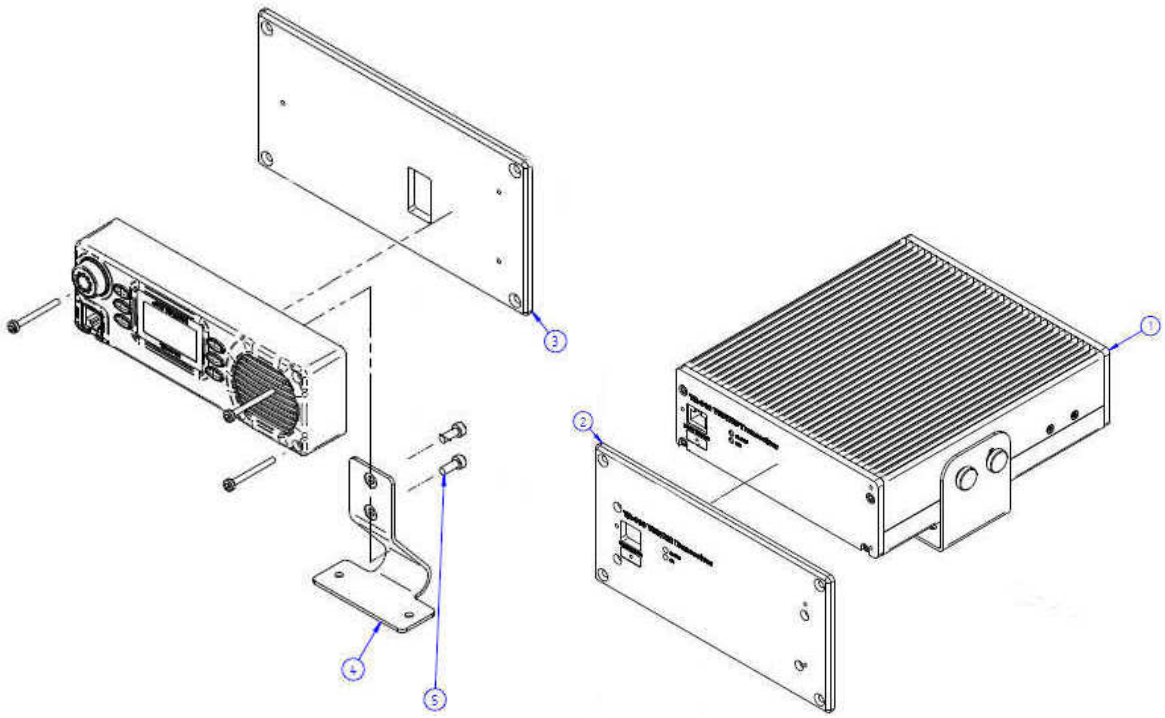
Table 4.3-1, Inspection procedures

On receipt of the radio unit, remove all transit packaging and check that there is no damage to the equipment. If damage is evident, contact Jotron AS immediately and retain the original transit packaging.

4.4 Installation of TR-810

4.4.1 Split installation parts

Figure 4.4.1-1 shows some extra parts used for split installation. The TR-810 can be mounted as a Mobile radio, Desk top or Flush mounted into a horizontal or vertical area. The front module can be mounted separately away from the transceiver unit using an extension cable and a mounting plate or a bracket.



Item number	Document number	Title	Quantity
1	82767	TRANSCEIVER UNIT W/ DESKTOP BRACKET	1
2	84082	FRONT COVER PLATE W/FLANGE	1
3	84416	CONSOLE MOUNTING PLATE FRONT MODULE	1
4	84414	BRACKET FRONT MODULE	1
5	82276	DIN912-CYL HEAD UMBRAKO M4X10	2

Figure 4.4.1-1, Examples of various parts used for split installation

4.4.2 Measures of TR-810

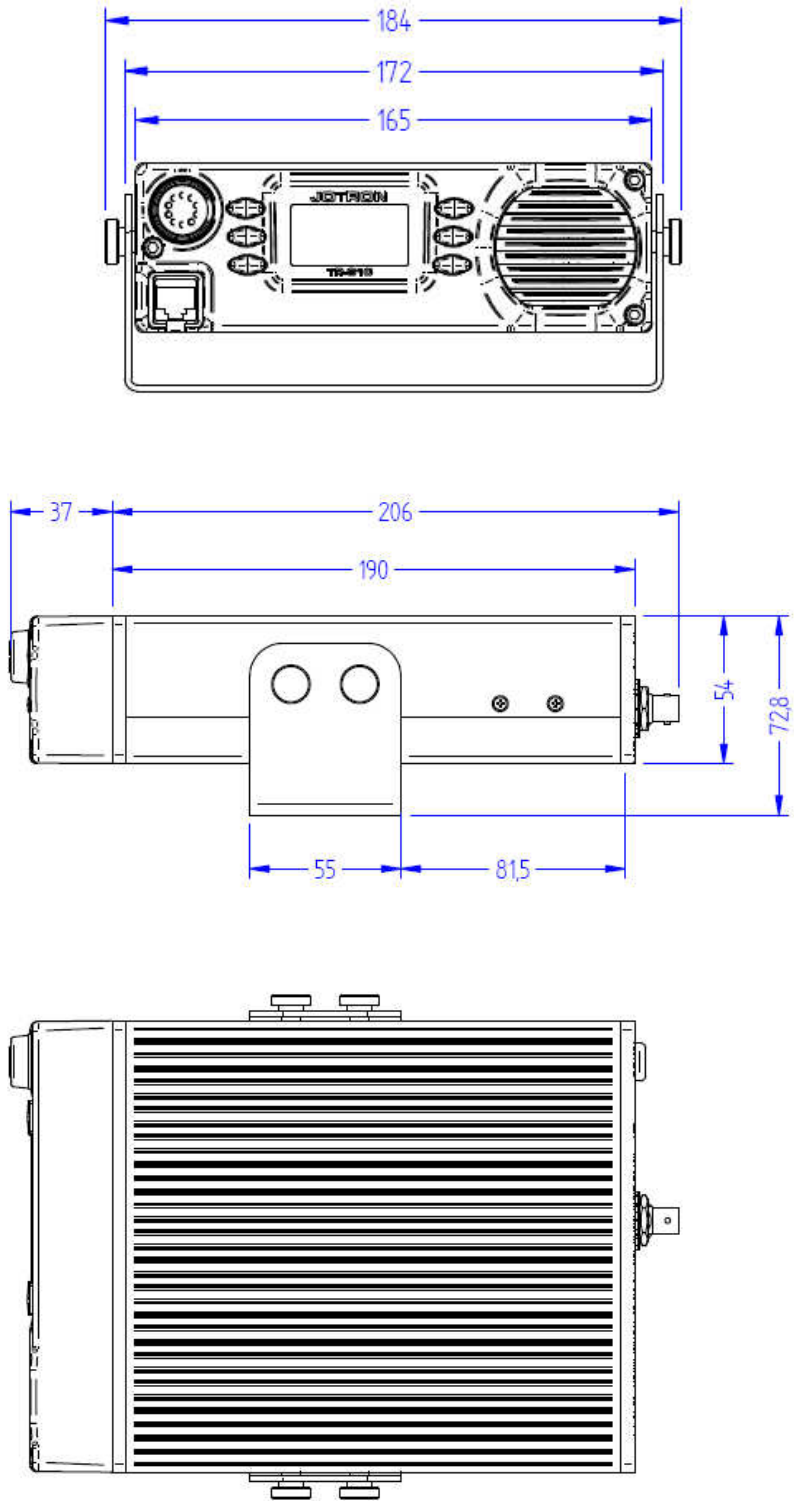


Figure 4.4.2-1, Measures of TR-810

4.4.3 Desktop Mounting

Figure 4.4.3-1, Standard desktop mounting

Figure 4.4.3-2, Split desktop mounting

4.4.4 Flush mounting

Figure 4.4.4-1, Standard flush mounting

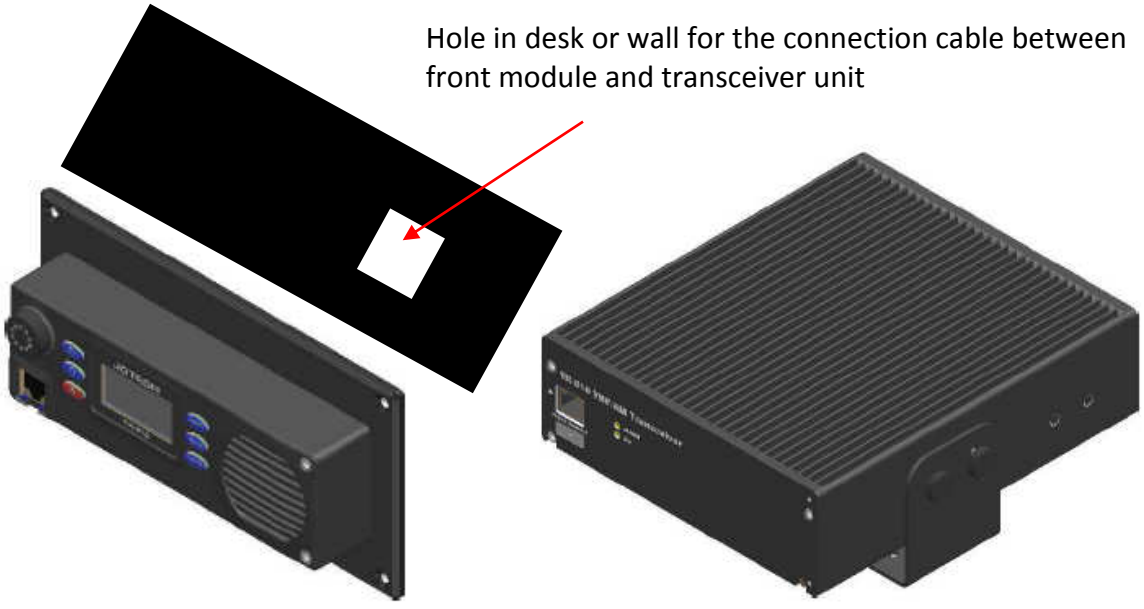


Figure 4.4.4-2, Split flush mounting

4.4.5 Manpack / Last resource radio

Figure 4.4.5-1, Manpack

4.5 Antenna connectors

The antenna should be of good quality with regards to gain and VSWR to obtain maximum performance. Make sure that the VSWR on the antenna is low, and that the cable from the transmitter to the antenna is of good quality to avoid mismatch and unnecessary losses.
A cable loss of 1 dB is the same as reducing the power output of a 10W transmitter to less than 8.5W. Similarly, a cable loss of 2 dB is the same as reducing the output power to less than 7W.

In areas were thunderstorms and lightning is a problem, surge arrestors should be mounted between the antenna connector and the antenna cable. The arrestors should be of good quality and be capable of handling the output power of the transmitter.

The antenna input of the transceiver is the BNC-type antenna connector on the back of the transceiver unit.

4.6 DC connection

Refer to chapter 2.1 for voltage limits.

4.7 Remote signals

Several remote signals are available on the rear interfaces of the transceiver unit.
These signals can be grouped into: Audio signals, Key signals and I/O signals.

Note, for all interface signals, RJ45 connectors are used. As far as practically possible, the pairs used on a standard ethernet connection are used when a signal is input/output as a pair to the radio (e.g. audio lines).

For interconnections between the front module and transceiver unit, standard Cat5E, ethernet cable should be used. This is a good quality, screened cable, with 1 to 1 connections between the two connectors.

Refer to chapter 3.1.4, 3.2.3 and 3.2.4 for an overview of the different connectors.

The following audio remote signals are available on the rear connectors:

Monitor out: Monitor signal, usually connected to a recording unit.

Microphone input: MIC II connector for connection of microphone at the rear of the transceiver unit.
See Table 4.7-1 for menu settings.

Loudspeaker output: For connection of an external loudspeaker. See Table 4.7-1 for menu settings.

Menu path: Radio Ctrl ►	Parameter	Range	Default	Details
Audio	**Mic Rear**	On/ Off	Off	Set to "On" when the microphone is connected to the Mic II connector at the rear side of the transceiver unit
Audio	**Ex. speaker**	Track On/Off	Off	Set to "On" when an external loudspeaker is connected to the I/O connector at the rear side of the transceiver unit, and shall follow the volume adjustment of the internal speaker .
Audio	**Ex. speaker**	Mute on TX On/Off	Off	Set to "On" when an external loudspeaker is going to be silenced when TX is keyed.
RX settings	**Ex. Speaker**	Volume balance between internal and external loadspeaker	Equal	When an external loudspeaker is connected to the I/O connector at the rear side of the transceiver unit, adjust volume balance between the internal and external loudspeaker..

Table 4.7-1, Settings associated with microphone and loudspeaker connections

See chapter 5.2 and 5.3 to enter menus.

5 Operating Instructions

5.1 Introduction

To set up the TR-810 transceiver unit, various parameters can be selected from the front panel. This section details how this is done and the range of all parameters.
Since the transceiver unit contains no manual tuning points or switches, all parameters can in principal be set from the front panel, however except in some rare occasions, most parameters should be left at their default (factory preset) values.
There are 2 user levels that can be selected to limit the user access to certain parameters. A service level for technical people can be entered by inserting a dongle into the front connector.

These user levels are:

- **Restricted** Limits front panel operation to select preset channels and adjust audio output levels, turn the squelch on/off and change the display appearance. Use this level when the radio is used in cases where the user should be restricted to use preset channels only (0 – 63).

- **Operation** Same as restricted, but in addition the local user has full access to change and store channel names, the squelch operating level and frequencies.

- **Technician** This level gives the local user access to the most used installation specific parameters (line levels, output power, etc.) and should be used only for installation or maintenance of the transceiver.

In the following section, these symbols and abbreviations are used to explain navigation in menus / setting of values:

- Scroll/Select switch = **SW**
- Navigation button A (top left button) = **A**
- Navigation button B (middle left button) = **B**
- Navigation button C (on/off button) = **C**
- Clockwise = **CW**
- Counter Clockwise = **CCW**

5.1.1 Note on frequency setting

The frequency is set according to the procedure described in ICAO annex 10. This is a way of setting the frequency in a mixed 8.33* and 25 kHz environment. The frequency set does not always reflect the actual transmit or receive frequency but is the frequency used to orally communicate the frequency between controllers and pilots.
The frequency and bandwidth used are in accordance with the table below:

Display	Actual frequency [MHz]	Bandwidth [kHz]
118.000	118.000	25
118.005	118.0000	8.33*
118.010	118.0083	8.33*
118.015	118.0167	8.33*
118.025	118.025	25
118.030	118.0250	8.33*
118.035	118.0333	8.33*
118.040	118.04167	8.33*
118.050	118.050	25
118.055	118.0500	8.33*
118.060	118.0583	8.33*
118.065	118.0667	8.33*
118.075	118.075	25
118.080	118.0750	8.33*
118.085	118.0833	8.33*
118.090	118.09167	8.33*
118.100	118.100	25
…….	…….	…….
136.975	136.975	25
136.980	136.9750	8.33*
136.985	136.9833	8.33*
136.990	136.99167	8.33*

*) 8.33KHz are only applicable outside USA and Canada

Table 5.1.1-1, Frequency setting 8.33 and 25 kHz channels

5.2 User menu – transceiver (Restricted access level)

Main display window in restricted mode.

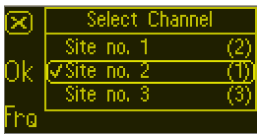
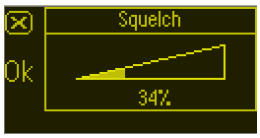
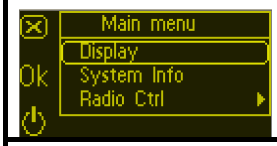
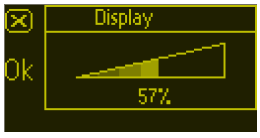
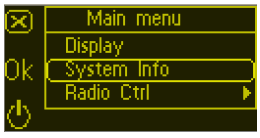
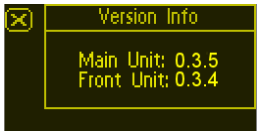
Display	Description
	When the transceiver is switched on, it will show the name of the last selected channel and the frequency. This is the start-up menu. Any fault indications will be shown at the bottom line of the display.
	Rotating SW will set the volume in the front speaker and, if connected and activated, also the remote speaker. Press B to Save the speaker volume level. Press A to go one step back.
	Press A to navigate to the channel recall screen. Select any channel (up to 63) that is previously stored in the transceiver, by rotating SW. Press B to Recall the selected channel. If no channel is stored, the display will show: DEFAULT 136.000MHz
	Press B to navigate to the squelch adjustment screen. This setting adjusts the squelch operating level. Rotate SW **CW** or **CCW** to adjust the squelch operating level. Press B to Save the selected squelch operating level.
	Press C to access the Main menu options available for the current user level. Select sub-menu by rotating SW.
	Press B to navigate to the Display contrast adjustment screen. Rotate SW **CW** or **CCW** to adjust the Display contrast level. Press B to save the selected squelch operating level.
	Select sub-menu for System software information by rotating SW.
	Press B to navigate to the System software information screen. Press A to return to Main menu.
	The Transceiver Ctrl submenu is for non-restricted users and technicians only. Press B to navigate to the Transceiver Ctrl information screen. For details refer to chapter 5.3.

Table 5.2-1, User menu selections transceiver - restricted access level

5.3 User menu – transceiver (Non-restricted access level)

Main display window for user levels: Operator and Technician

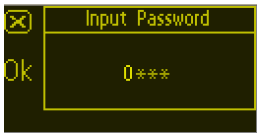
Display	Description
	Select number by rotating SW CW or CCW. Press SW to step to the next digit. When all four digits are set correctly, press B to save. The input password is described in the technical manual.
	Select sub-menu for Transceiver Ctrl information by rotating SW. Press B to enter selected sub-menu. For details of sub-menus refer to chapter 5.5.
	Select sub-menu for Transceiver Ctrl information by rotating SW. Press B to enter selected sub-menu. For details of sub-menus refer to chapter 5.5.

Table 5.3-1, User menu selections transceiver- Operator and Technician levels

5.4 User menu – transceiver (Technician)

Main display window for user levels: Technician

Display	Description
	Inserting a dongle into the front connector will access the Service menu. Select Service menu by rotating SW. Press B to enter selected sub-menu.
	Select sub-menu for Service information by rotating SW. Press B to enter selected sub-menu. For details of sub-menus refer to chapter 5.6.
	Select sub-menu for Service information by rotating SW. Press B to enter selected sub-menu. For details of sub-menus refer to chapter 5.6.

Table 5.4-1, User menu selections transceiver- Technician levels

5.5 Setting, information and configuration menus – transceiver

Under the menu selection from the transceiver Ctrl menu, various submenus are available for the non-restricted users and Technician. The submenus and details for them are shown in the tables below.

Menu	Submenu	Description
RX settings ►	Ext. Speaker AAGC Noise Blank Squelch	Access to configuration parameters for: - External speaker (Balance between internal and external speaker if both are selected. See Audio menu). - AAGC on/off setting - Noise blanking level adjustment - Squelch operation level adjustment
TX settings ►	TX Power Time Out Modulation	Access to configuration parameters for: - TX output power setting - Timeout setting - Modulation level setting
Channel setup ►	Sel.Visibility Sel.Rx only Freq and name No of channels 25KHz step	Access to configuration parameters for : - Setting the channels visible for the restricted user - Configure a channel as a receiver only channel - Setting the frequency and names of the channels - Setting the number of channels for the transceiver (≤ 63) - Selecting 25KHz step also as a 8.33KHz transceiver
Audio ►	Headphone Sidetone levl Mic Rear Ex. Speaker	Access to configuration parameters for : - Headphone - Side-tone level - Mic Rear on/off - Tracking and muting of External speaker.
Bite ►		Displays information about a number of selected critical parameters inside the transceiver. For details regarding information, refer to chapter 5.7.
Password ►		Access to change password

Table 5.5-1, Submenus available on the transceiver

5.6 Service information menus – transceiver

Under the menu selection from the Service menu, various submenus are available for the technician. The submenus and details for them are shown in the tables below.

Menu	Submenu	Description
Service	AGC	Access to configuration parameters for: - AGC on/off setting
Service	TCXO	Access to configuration parameters for: Fine tuning of oscillator frequency
Service	Noise Squelch	Access to configuration parameters for: - Noise squelch level adjustment
Service	Limiter	Access to configuration parameters for: - Limitation of modulation level
Service	Power Adj	Access to configuration parameters for: - Fine tuning of power output level
Service	Menu timeout	Access to configuration parameters for: Will be fixed as a default value later

Table 5.6-1, Submenus available on the Service menu

5.7 Bite information menus – transceiver

Under the menu selection from the Bite menu, various submenus are available for the technician. The submenus and details for them are shown in the tables below.

Menu path: Bite Parameter:	Range	Default	Details
Temp PA	-20 °C to +95 °C	32°C	**Alarm Temp Pa** Internal temperature of the RF Module is out of range (above 85˚C). Check X-82770 Transceiver Board, PA stage.Possible faults: IC140 or some of its surrounding components.
Fwd power	0,2W to 10W	10W	**Alarm Pwr** Transmitted output power is below 0.2W. Check X-82770 Transceiver Board, PA stage, output amplifier or some of its surrounding components.
SWR	0W to 10W	0W	**Alarm SWR** Reflected power exceeds threshold. Possible faults: Defective antenna, antenna cable, cavity filter out of tune etc.
Input volt	10VDC to 28VDC	13,8V	
RSSI	1.1 V at 1 uV	0,9V	
12V	10VDC to 14VDC	12V	**Alarm 12V** The +12V is out of range. Check X-82770 Transceiver Board, and measure test point TP_+12V. Possible faults in: Power supply.

Menu path: Bite Parameter:	Range	Default	Details
5 volt	4,3VDC to 5,6VDC	5V	**Alarm 5V** The +5V is out of range. Check X-82770 Transceiver Board, and measure test point TP_+5V. Possible faults: Step down converter IC143 or some of its surrounding components.
5 volt REF	4,3VDC to 5,6VDC	5V	**Alarm 5V REF** The +5V_REF is out of range. Check X-82770 Transceiver Board, and measure test point TP+5V_REF. Possible faults: Regulator IC126 or some of its surrounding components.
3 volt	2,7VDC to 3,3VDC	3V	**Alarm 3V** The +3V is out of range. Check X-82770 Transceiver Board, and measure test point TP_+3V. Possible faults: Regulator IC141 or some of its surrounding components.
Current	< 5A	4,0A	**Alarm Cur** The current consumption in the transceiver is too high (above 5A). Check X-82770 Transceiver Board. Possible faults: +12V shorted to GND, defective output stage etc.
IF current	20mA to 60mA	40mA	**Alarm IF** The current consumption in the 1 IF circuit is out of range. Check X-99205 Main Board, 1 IF mixer. Possible faults: Q143 or some of its surrounding components.
LNA current	35mA to 55mA	43,5mA	**Alarm LNA** The current consumption in LNA is out of range. Check X-82770 Transceiver Board, Front ended. Possible faults: Transistor Q148 and its surrounding components.
Modulation	0% to 100%	90%	
Synth TX			**Alarm Synth TX** Transmitter synthesizer is out of lock. Check X-82770 Transceiver Board, TX Synth & VCO. Possible faults: Defective synthesizer circuit IC127, oscillator Q126 or any surrounding components. Check critical soldering points.
Synth RX			**Alarm Synth RX** Receiver synthesizer is out of lock. Check X-82770 Transceiver Board, RX Dual synth & VCO. Possible faults: Defective synthesizer circuit IC137, oscillators Q131/Q142 or any surrounding components. Check critical soldering points.

Table 5.7-1, Submenus available on the Bite menu

6 Error conditions and corrective actions

When the internal BITE (Built In Test Equipment) in the transceiver unit detects a failure, the alarm indicator on the front module display will be lit.
Details about the fault that caused the alarm are accessible for the technician. See chapter 5.7.

The technician can access the BITE measurements to get more detailed information about the cause of the alarm. If the TR-810 stop functioning for internal reasons, the whole transceiver unit has to be replaced.

7 List of tables and figures

Jotron AS
P.O. Box 54, NO-3280 Tjodalyng, Norway
Tel: +47 33 13 97 00 | Fax: +47 33 12 67 80

www.jotron.com