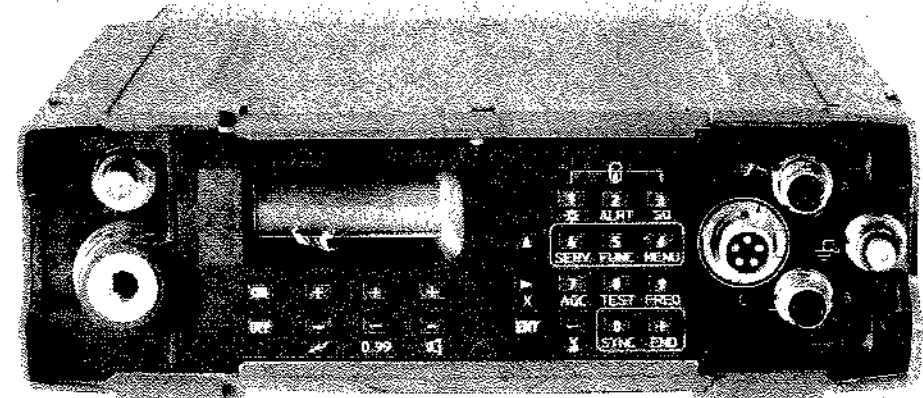


# HF TRANSCEIVER TRC 3400

 **THOMSON-CSF**  
COMMUNICATIONS

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## OPERATING INSTRUCTIONS

**WARNING**

Since the TRC3400 transceiver stores secret data (frequency plans, etc.), the personnel using it shall be informed of the particular rules and procedures relating to the protection of such data.

The specific instructions concerning these rules and procedures are left to the concerned authorities' initiative.

**DANGER**

THE ANTENNA TERMINALS OF THE 125 W OR 400 W STATION MAY DEVELOP DANGEROUS VOLTAGES. ALWAYS MAKE SURE THAT THE STATIONS ARE SWITCHED OFF BEFORE PERFORMING ANY OPERATION.

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# 1 - GENERAL

## 1.1 - GENERAL CHARACTERISTICS

The TRC3400 transceiver is designed for half-duplex radiocommunication in the HF band.

Optimized for tactical communications, it permits short- or medium-range communications with different types of antennas : short or long whip antenna, wire antenna, manpack or vehicular wideband antenna, vehicular NVIS antenna.

In vehicle applications, the TRC3400 transceiver can be integrated into a 125 W station (TRC3430) or 400 W station (TRC3440).

The 125 W station (TRC3430) consists of a TRC3400 transceiver, a 125 W amplifier (ALA172) and, if applicable, an associated antenna tuning unit (AEA172).

The 400 W station (TRC3440) consists of a TRC3400 transceiver, a 400 W amplifier (ALA176) and, if applicable, an associated antenna tuning unit (AEA176).

The two TRC3430 and TRC3440 stations can be equipped with HF/VHF and HF/HF proximity filters.

The transceiver is intended for use by a radio operator.

It features 100 programmable channels in fixed-frequency modes (FF, FD).

One of the following transmission modes is associated with each channel.

- FF : STANAG 4203 compatible simplex fixed-frequency mode
- FD : Half-duplex fixed-frequency mode

The transceiver can be directly operated with other types of HF transceivers in clear communication (J3E+, J3E-, H3E+) and Morse telegraphy (J2A+, J2A-) modes.

### 1.2 - IDENTIFICATION

Each transceiver is provided with an identification label stating :

- 1) TH-CSF part number
- 2) Contract number
- 3) Logo
- 4) Serial number

Moreover, the equipment software version is temporarily displayed during the test which is initiated upon switch-on.

### 1.3 - POWER SUPPLY

- Power supply through an external 14.5 V nominal source (24 V for the stations).
- Current consumption  $\leq 5A$  in transmission mode ( $< 25A/50A$  for 125 W/400 W stations, respectively).
- Autonomy  $\approx 12$  hr (with ALI116) (for manpack version).

### 1.4 - MECHANICAL CHARACTERISTICS

Characteristics	TRC3400	AEA172	ALA172	AEA176	ALA176
Width	260 mm.	176 mm.	290 mm.	400 mm.	340 mm.
Height	84 mm.	201 mm.	170 mm.	260 mm.	200 mm.
Depth	202 mm.	350 mm.	340 mm.	400 mm.	400 mm.
Weight	3.5 kg.	7 kg.	7.3 kg.	30 kg.	26 kg.

### 1.5 - TECHNICAL CHARACTERISTICS

Frequency band ..... 1.5 to 29.9999 MHz in 100 Hz steps  
 Clarifier ..... 10 Hz steps

Number of stored channels ... 100 programmable channels in Fixed-Frequency modes FF or FD.  
 Transmission modes ..... STANAG 4203 Simplex Fixed-Frequency (FF) mode,  
 Half-Duplex fixed-frequency (FD) mode.  
 Modulation types ..... J3E+, J3E-, H3E+, J2A+, J2A-.  
 Services ..... Voice communication, data link through an external modem, Morse telegraphy.  
 Audio interface (Receptacles "A" and "B") Phone output : 10 mW into 100  $\Omega$  to 300  $\Omega$  impedance.  
 High-level microphone input : 100 mV RMS nominal into 150  $\Omega$ .  
 Audio interface (Receptacle "C") Low-level microphone input : 1 mV RMS into 150  $\Omega$ .

#### TRANSMISSION POWER :

TRC3400 ..... 20 W PEP.  
 5W or 1W with reduced power.  
 TRC3430 ..... 125 W PEP and average power.  
 20 W or 5 W with reduced power.  
 TRC3440 ..... 400 W PEP and average power.  
 100 W or 20 W with reduced power.

RECEPTION CHARACTERISTICS :

SSB sensitivity (J3E) ..... SINAD > 10 dB for a -111 dBm signal  
Intermediate frequencies .... Attenuation > 70 dB

1.6 - OPERATING LIMITS

Nominal operating temperature range ..... -30°C to +55°C  
Operating and storage temperature limits ..... -40°C to +70°C  
(Operation is possible but certain operating characteristics may be lost)  
Maximum operating altitude ..... 4000 m  
Tightness ..... 2 hours in 1 m of water

1.7 - SAFETY RULES

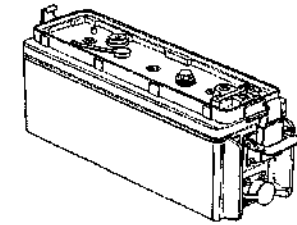
The secret data possibly stored in the TRC3400 transceiver can be manually erased through an EMERGENCY ERASE pushbutton.

1.8 - ACCESSORIES AND ASSOCIATED EQUIPMENT

1.8.1 - Basic complete unit

The basic complete unit comprises the following accessories associated with the TRC3400 transceiver :

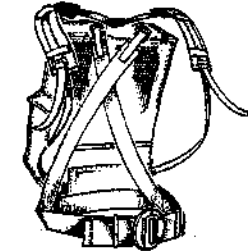
- ALI116 battery pack (12 replaceable Ni-Cd cells)



- COT113-14A handset (differential microphone)



- POR152 carrying harness



- ANT112-B whip antenna (folding fiberglass antenna)



1.8.2 - Optional accessories

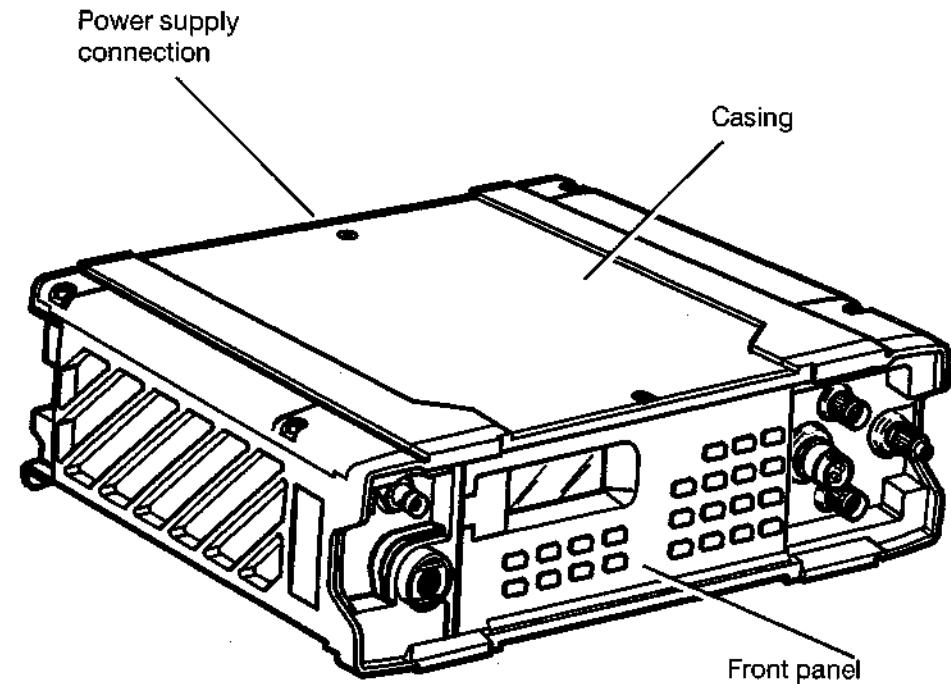
(See Appendix 6.3 in data preparation manual (MAP))

**1.8.3 - Documents**

TRC3400	Operating manual (MAE)
TRC3400 / TRC3430 / TRC3440	Data preparation manual (MAP)
TRC3400	3rd line (Intermediate) level maintenance and technical manual
ALA172	3rd line (Intermediate) level maintenance and technical manual
AEA172	3rd line (Intermediate) level maintenance and technical manual
ALA176	3rd line (Intermediate) level maintenance and technical manual
AEA176	3rd line (Intermediate) level maintenance and technical manual

**1.8.4 - Associated equipment (optional)**

- External modem for high-rate data transmission.
- Additional TRC3400 transceiver (for relay mode).
- On-board intercom.
- Calculator with SYCOMORE remote control protocol (TRC1732 for instance).
- Tactical terminal (with FSK analog output for fixed frequency link).
- TRC9724 fill gun (FG).
- Frequency and Key Loading Unit (FKLU) LG200.
- Remoting unit.

**1.9 - GENERAL DESCRIPTION****Figure 1.1 : General description**



**1.9.1 - Connecting components**

See Figure A at the end of this manual.

**1.9.2 - Operating controls**

See Figure B at the end of this manual.

**Operating keys :**



ON/OFF

Transceiver on/off



3 power levels and 1 radio silencing function

0..99

Selection of programmed channel



7 levels and 1 silencing function

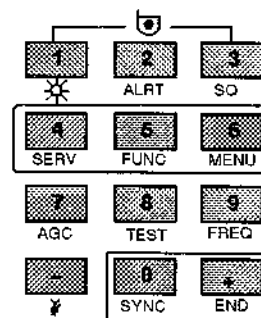
**Management keys :**

Return to first message (escape from menus),

Scrolling of messages or erasing of last acquired character,

Validation, erasing of message

**Function keys / Digital keyboard :**



- Front panel lighting
- ALRT** (Unused)
- SQ** Squelch activation/de-activation
- SERV** Change of service
- FUNC** Access to other functions
- MENU** Transceiver programming
- AGC** Gain control
- TEST** Initiation of controlled test
- FREQ** Change of frequency (channel 0)
- Antenna tuning and changeover
- SYNC** (Unused)
- END** (Unused)

**Emergency erase :**

Erases all Initial Elements and Initial Data.

**Keyboard locking :**

Keyboard inhibited by simultaneously pressing 1 and 3

Locking 1 and 3 pressed simultaneously  
 Unlocking Idem

No effect on ENT, Emergency Erase and keys.

**NOTE :** In case of action on a locked keyboard, the **LOCKED** message is displayed.

Display screen :

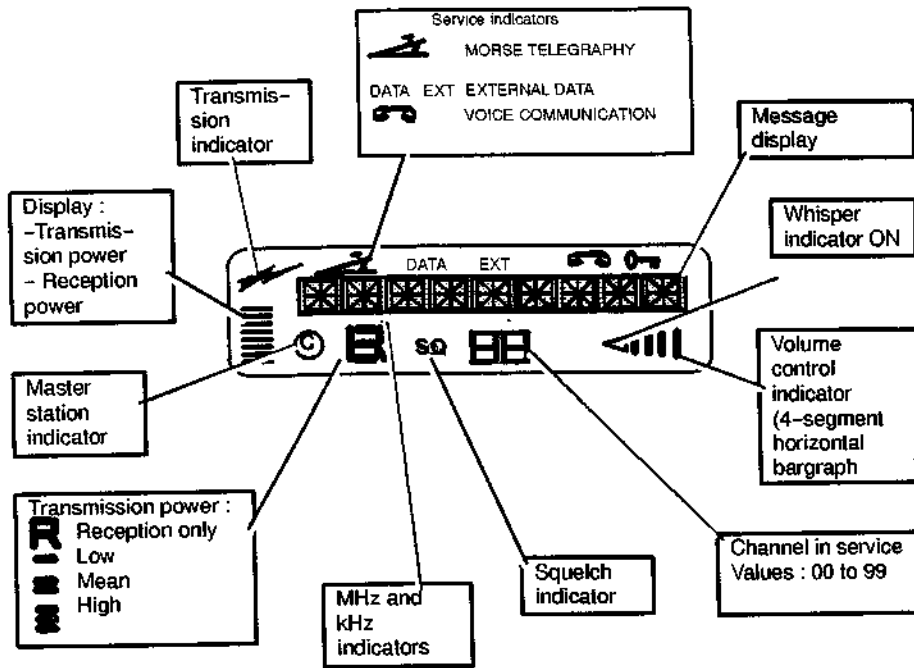


Figure 1.2 : Display screen view

The service indicator shows :

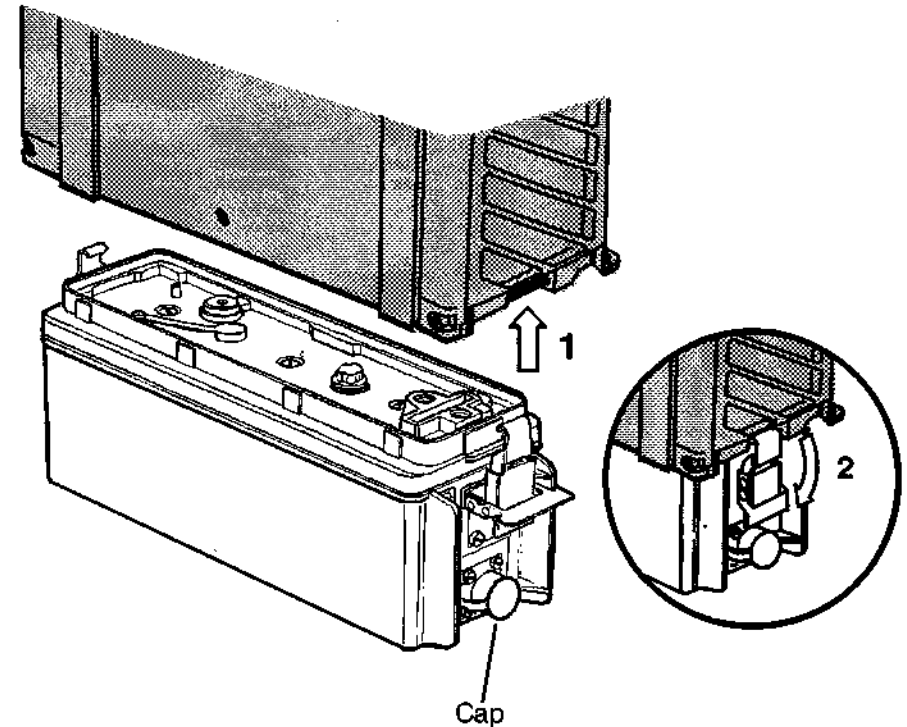
- The services available with the transceiver in passive reception mode with no traffic in progress.
- The service selected on the transmitting transceiver.
- The service received in active reception mode.

## 2 - SETTING UP

### 2.1 - PRELIMINARY STEPS

#### 2.1.1 - Installation of ALI 116 battery pack

**NOTE :** Make sure that the battery pack cap is correctly connected (electrical connection of power supply circuit).



#### 2.1.2 - Other power sources

The TRC3400 transceiver can be directly fitted with the following power supply units :

- ALI116 Ni-Cd battery,
- ALI128 lithium-battery unit,
- ALI115-B connecting unit associated with a 12 V DC source.

The ALI116 battery pack used a buffer battery can be connected to the following :

- GES101-6 solar panel,
- KIT103 hand-driven generator,
- ALT160 charger for two batteries, with 12 V/24 V or 127 V/220 V mains capability,
- ALT131-3 charger for ten batteries, with 12 V/24 V or 127 V/220 V mains capability,
- ALT137-1 auxiliary power supply for 24 V source,
- ALT137-2 auxiliary power supply for 12 V/24 V source.

## 2.2 - INSTALLATION OF COMPLETE UNIT

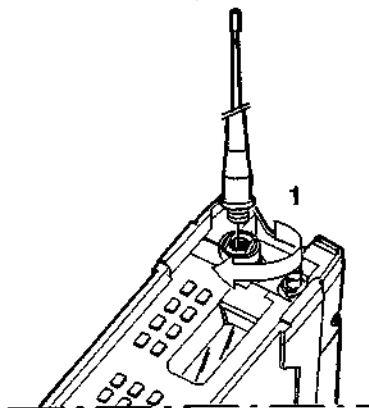
### 2.2.1 - Use on man's back

The transceiver can be used on man's back but with an effective power limited to about 5 W and a shorter range (ground wave propagation).

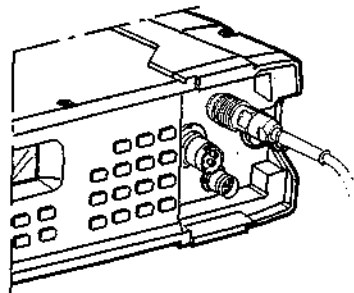
Use the POR152 carrying harness and the 1.20-meter ANT136 metal whip antenna.



Connect the antenna to receptacle (1).



Connect the audio accessory  
(receptacle "A", "B" : high level,  
receptacle "C" : low level)



### 2.2.2 -- Use with 2.40-meter whip antenna

Operation with the transceiver laid down on the ground is recommended within the 2.5 to 30 MHz HF band.

- Use the folding ANT112-B whip antenna made of fiberglass.



**NOTE :** In the 2.5 MHz to 10 MHz range, the AEA 104 antenna counterpoise should be used (not recommended above 10 MHz).

### 2.2.3 – Use with the AEA104 antenna counterpoise

The use of the antenna counterpoise is recommended in the HF band from 2.5 to 10 MHz.

- Spread the AEA104 counterpoise around the transceiver laid on the ground.
- Connect the ground terminal to the end of the AEA104 counterpoise.
- Connect the whip antenna (ANT 112-B) to the transceiver

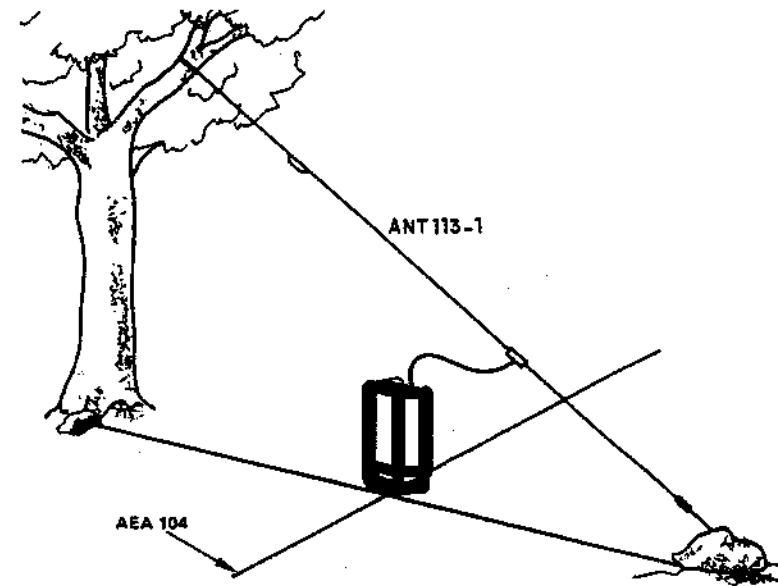


### 2.2.4 – Use with the ANT113-1 wire antenna

The use of the wire antenna is recommended to obtain a high sensitivity level within the whole transceiver band (1.5 MHz to 30 MHz). The aerial should be oriented (perpendicularly to the radio propagation direction) and installed in a slanting position with respect to the ground.

**NOTE :** The ANT113-1 is tuned by the transceiver, thus making it possible to change frequencies during transmission.

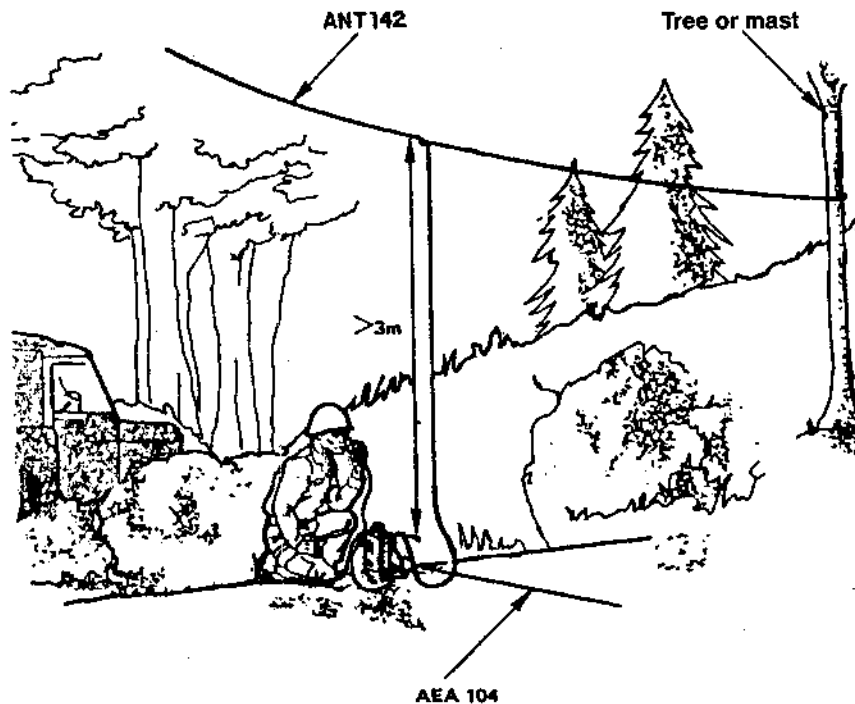
- Use the AEA104 antenna counterpoise within the 1.5 MHz to 10 MHz band (not recommended above 10 MHz).



### 2.2.5 - Use with the ANT142-1 field antenna

The use of the ANT142-1 field antenna is recommended to obtain a high sensitivity level within the 3 MHz to 30 MHz band. The antenna mid-point shall be from 3 m to 9 m above the ground.

- Orient the antenna perpendicularly to the radio propagation direction.
- Use the AEA104 antenna counterpoise within the 3 to 10 MHz band (not recommended above 10 MHz).



### 2.2.6 - Installing the transceiver as a mobile station

The TRC3400 transceiver can be installed as a 20 W, 125 W (TRC3430) or 400 W (TRC3440) mobile station.

- Refer to the data preparation manual (MAP) covering these stations.

### 2.3 - INITIAL DATA

#### Foreword :

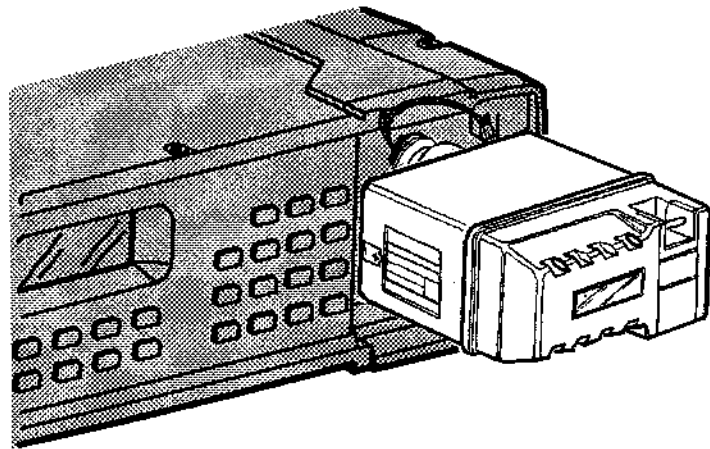
- If the transceiver contains operational initial data, directly refer to chapter 3.

#### 2.3.1 - Fill Gun loading

When loading the transceivers of a net through a Fill Gun (FG), it is first necessary to have this FG loaded by the Frequency and Key Loading Unit (FKLU) (LG200-A). The transceiver is switched on (see § 3.1.1)

##### 2.3.1.1 - FG connection

- Remove the protective blanking parts on the FG and transceiver.
- Place the FG in position before receptacle "A" (see figure hereafter).
- Engage and push in the FG.



2.3.1.2 – Messages displayed after FG connection

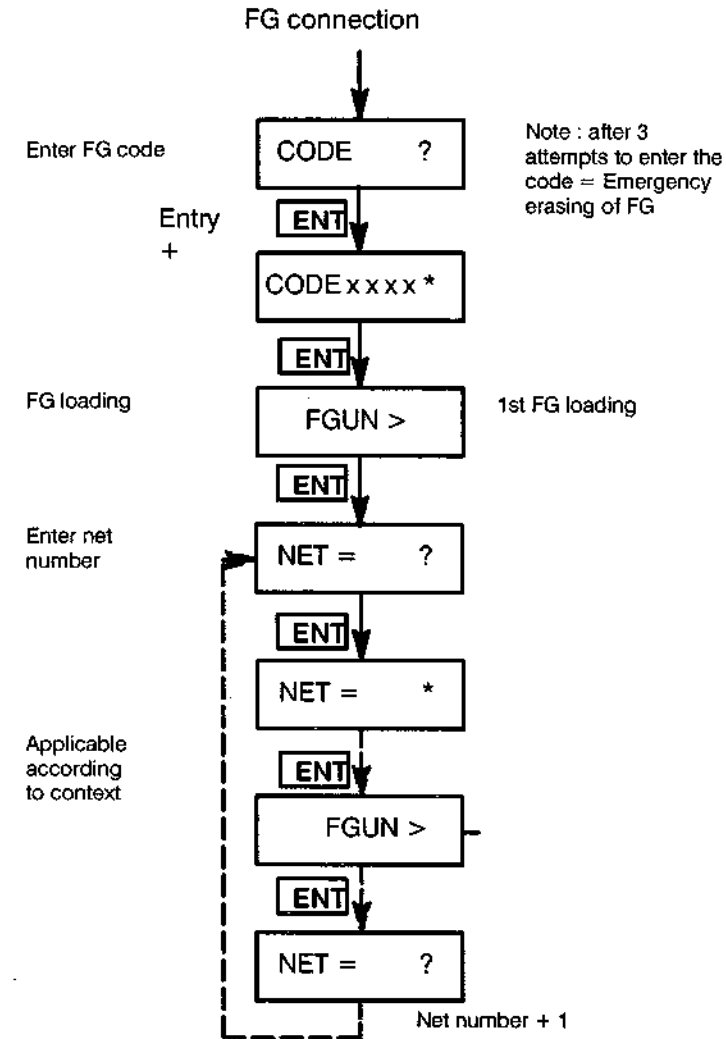
Comply with the instructions displayed on the screen after connecting the FG (Fill Gun) to the transceiver :

**NOTE 1 :** The T/R **FULL** message upon loading by the FG indicates that there are no more channels available in the transceiver. Loading is not complete.

**NOTE 2 :** If the integrity of data from FG is not assured, the transceiver displays the following : **FGUN ERR.**

**NOTE 3 :** The error messages which may be displayed on the fill gun are as follows :

- The stored data is erased.
- BAT123 Storage battery worn out to more than 90 % ; to be replaced soon.
- BAT IPS Storage battery failure.
- OS Fill gun failure.



-- Disconnect the fill gun when the **FGUN END** message is displayed.

### 2.3.2 – Programming by duplicating data between transceivers

When a given transceiver is programmed with initial data, the other net transceivers can be programmed by automatically duplicating the relevant data. This method makes it necessary to group the transceivers together for data preparation :

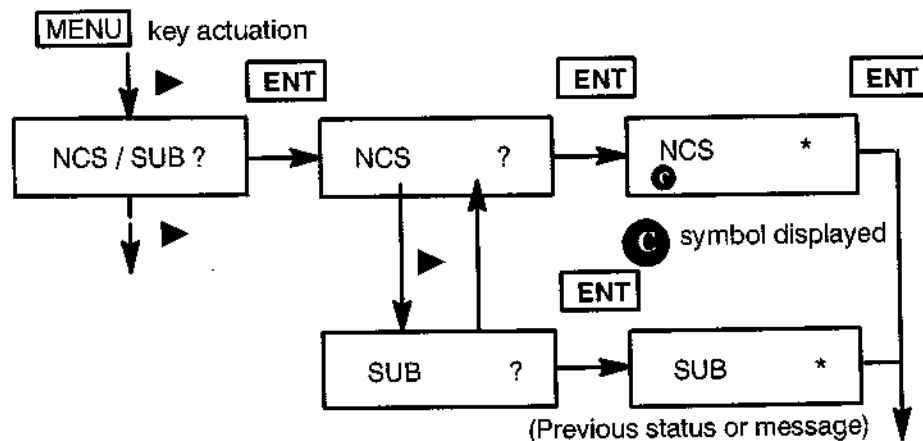
- Connect two transceivers (receptacle "B") to each other using a CBF258 cord and switch on both transceivers.
- On the programmed transceiver, press the **FUNC** key several times until the **COPY ?** message is displayed and then validate by pressing the **ENT** key.

**NOTE :** If initial data duplication is unsuccessful, the **COPY FAIL** message is displayed.

- During duplication, check that the **COPY >** and **COPY <** messages are displayed respectively on the transmitting and receiving sets. The **COPY OK** message being displayed, disconnect the two transceivers.

### 2.4 – NCS/SUBORDINATE SELECTION

This function is performed with the **MENU** key and is used to program the NCS or SUBORDINATE transceiver, for each channel FD. It is not used in the FF mode. There can only be one NCS transceiver for each net.



## 3 – OPERATION

For nominal operation, the TRC3400 transceiver must be loaded with initial data (see § 2.3).

### 3.1 – SWITCHING ON/OFF

#### 3.1.1 – Switching on

- Press the **ON** key. The transceiver uses the data which was available in the previous status.
- Check for display of the software version **V = Xxx.xx**, then self-test report **GO 3400** (or **GO 3430** or **GO 3440**) according to the configuration. Otherwise, see appendix 6.2 in case of error message.


#### 3.1.2 – Switching off

- Press the **OFF** key.
- The transceiver is immediately switched off.

### 3.2 – DISPLAY SCREEN LIGHTING


#### Sustained lighting :

Sustained lighting lasts about 5 minutes for a manpack transceiver ; it lasts permanently for the stations.

- Rapidly press the  key twice to illuminate the display screen.
- Press the above key again to extinguish the display screen.



### Short lighting (15 sec.) :

- Press the  key once to illuminate the display screen.

### 3.3 - DISPLAYED MESSAGES

The list of displayed messages is given in Appendix 6.2

### 3.4 - EMERGENCY ERASE

Lift the protective flap and press the pushbutton.

- This action is effective even when the transceiver is switched off.
- All stored data are immediately erased.

**NOTE 1 :** When pressed, the **EMERGENCY ERASE** pushbutton erases the transceiver data, and the FG data when the FG is connected.

**NOTE 2 :** The fill gun also includes an **EMERGENCY ERASE** pushbutton which can be activated in the same way.

### 3.5 - OPERATING SERVICES

Service changes can be controlled by the local operator, by remote control action or by a service change command received by radio.

The TRC3400 transceiver offers the following three operating services :

VOICE	Clear voice communication
EXT DATA	External data transmission
MORSE	Morse telegraphy

The display screen shows : **SERV >** when a service change is received through a radio channel. When the set is receiving in clear voice service or ciphered voice service, switching between these two services is automatic.

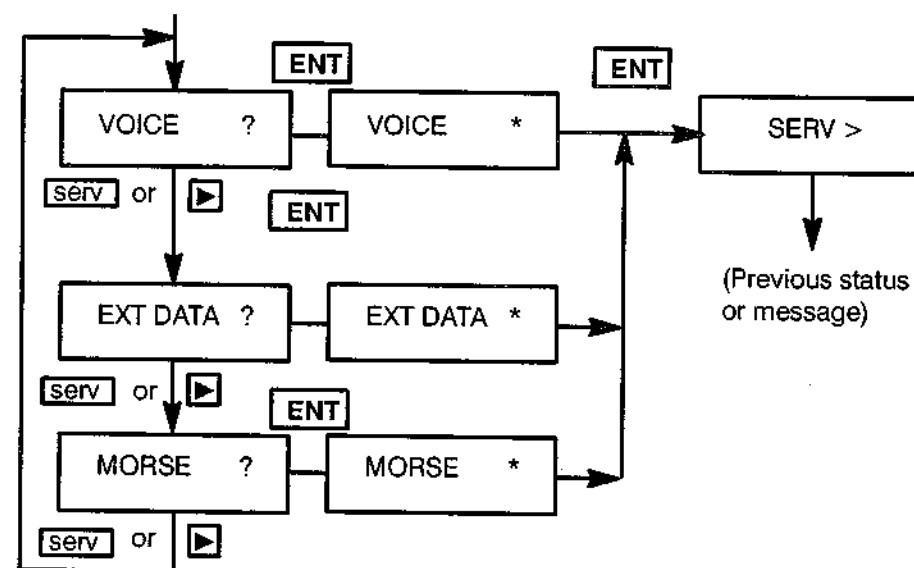
The voice communication services are used with an audio handset.

The morse telegraphy service is used with a morse key.

The external data ("high rate") transmission service is used with an external modem.

These accessories are connected to the transceiver audio receptacles (see figure A).

#### SERV key actuation



? replaced by \* if service already active

- Check for display of the selected service indicator (see the various icons in § 1.9.2).

If any incompatibility or error is found, refer to the list of error messages in Appendix 6.2

### 3.6 - POWER SELECTION

The TRC3400 transceiver allows three power levels to be selected in transmission mode, or the transmission mode to be inhibited.



Each actuation of the + or - key causes the power level to be increased or reduced. The selected power level is indicated to the operator by the following icons :



Reception only.



Minimum power level.



Mean power level.



Maximum power level

**NOTE 1 :** Power may be automatically adapted after any antenna change, incident or adaptivity. In these cases, the **ADAPT PWR** message is displayed.

**NOTE 2 :** In case of a transmission request on a transceiver set to reception only, the **RX ONLY** message is displayed.

### 3.7 - VOLUME CHANGE

The transceiver can be operated in "whisper" mode (low-level voice communication).

The reception volume can be selected among seven levels.



Each actuation of the + or - key causes the AF volume to be increased or reduced. The selected power level is indicated to the operator by the following icons :



Volume suppressed + whisper mode



Whisper mode + 1st and 2nd volume levels



3rd and 4th volume levels



5th and 6th volume levels



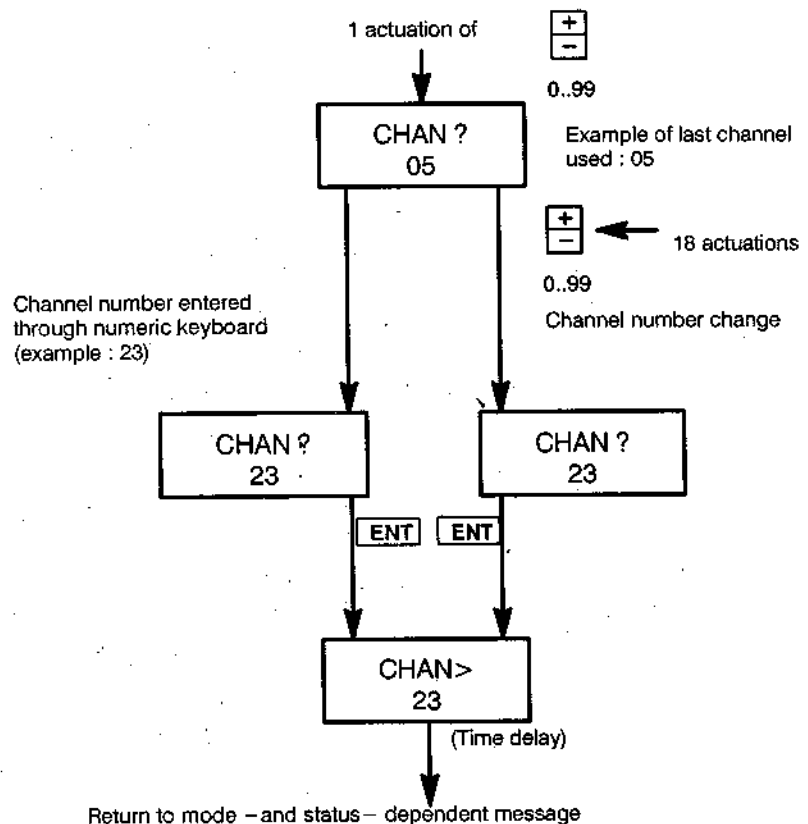
7th volume level



### 3.8 - CHANNEL CHANGE

The 0-99 key is used to change channels in operation. The channel number may also be entered through the numeric keyboard.

**NOTE :** Any channel change will automatically cause the transceiver to go into the mode programmed in the initial elements.



The error messages which may appear further to a channel change are as follows :

- Message :  
**FREQ ?** Minimum number of frequencies not programmed.
- CHAN ERR** Channel unusable due to problem with station.

### 3.9 - TRANSMISSION MODES

#### 3.9.1 - General

Two transmission modes are available :

- Analog clear fixed frequency mode (FF),
- Half-duplex fixed frequency mode (FD),

Mode changes are controlled from the front panel, by simply selecting another channel (each channel is programmed with one transmission mode).

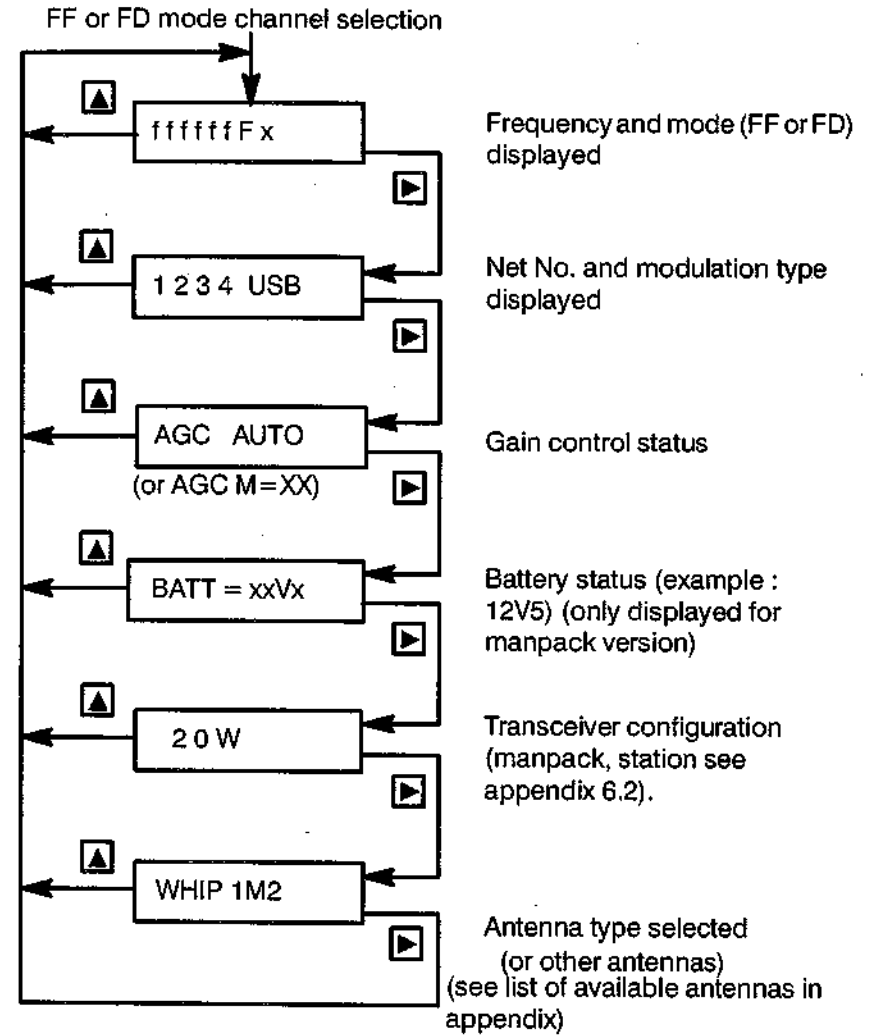
- **Simplex fixed frequency (FF)** : a single frequency is used for transmission and reception.
- **Half-duplex fixed frequency (FD)** : a frequency is used for transmission and another one is used for reception. In a net, only the NCS transceiver frequencies are automatically reversed with respect to the other (subordinate) transceivers.

The following methods of HF modulation are available :

- Carrier SSB or AM modulation by an analog signal,
- Morse telegraphy using a 1 kHz sub-carrier within the upper or lower SSB.

**3.9.2 – Operating procedure**

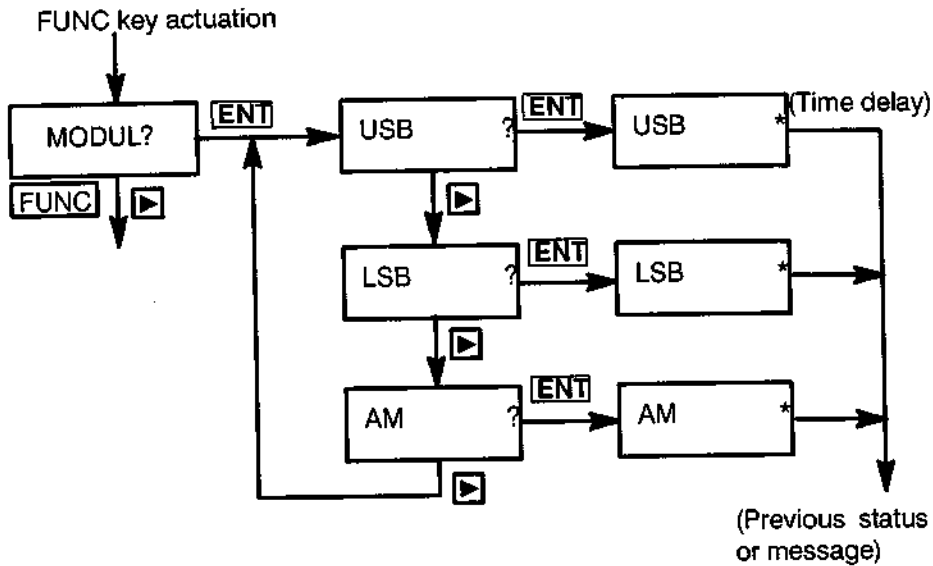
- Switch on the transceiver, select a channel programmed in FF or FD mode, or channel 0. (See § 3.8) Automatic tuning occurs upon channel opening or upon any power level change.
- Check that antenna selection is correct and that the power level does not concern radio reception (RX) only. The transceiver is ready for operation.
- To transmit, use the push-to-talk button of the audio handset (release the button for reception).
- Use the function keys to consult current data (optional) :



**3.9.3 – Modulation change**

The following methods of modulation are available : USB (Upper Sideband), LSB (Lower Sideband) and AM (Amplitude Modulation).

If any incompatibility or error is found, refer to the list of error messages in Appendix 6.2.



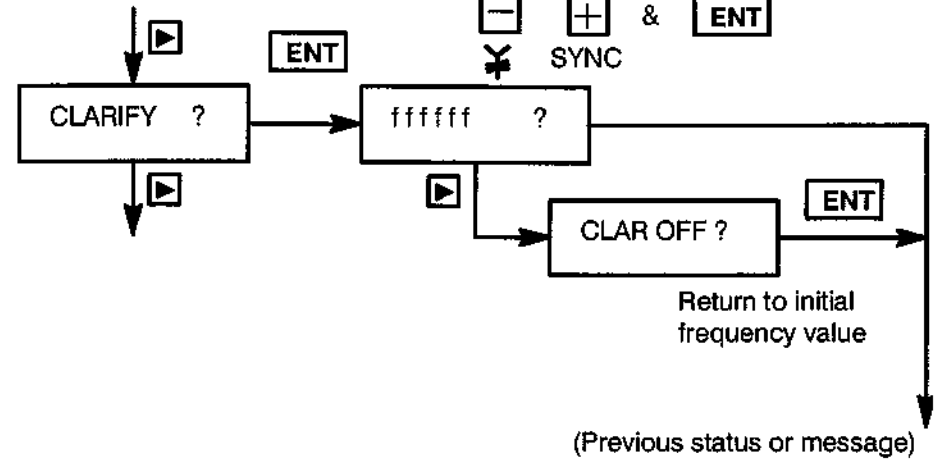
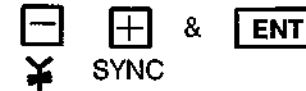
**3.9.4 - Clarifier**

The clarifier permits fine frequency tuning in 10 Hz increments within a +/- 300 Hz range.

After selection, the basic message of a clarified fixed frequency channel becomes : ff.fff.f FF\* (for FF mode) or ff.fff.f DF\* (for FD mode).

FUNC key actuation then clarifier selection

Frequency change by actuation of



**NOTE :** Tuning by means of the clarifier is lost after a channel or service change.

**3.9.5 - Frequency change**

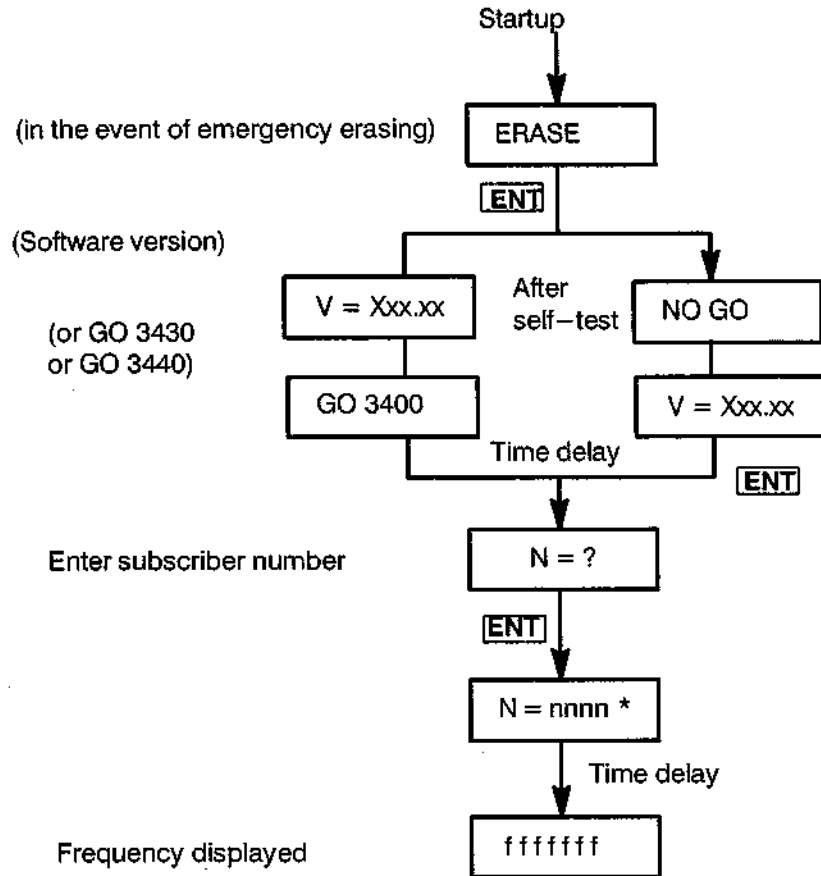
- To change the frequency on channel 0, press the **FREQ** key, modify the proposed frequency and validate (**ENT** key).

**NOTE :** Frequency change is accessible whatever may be the current channel ; it causes automatic switchover to channel 0.

### 3.10 – SWITCH-ON AFTER ERASING

The transceiver will not operate in any mode unless it is first loaded with initial data (see § 2.3).

Since transceiver initial data are erased during emergency erasing, default values are provided to permit minimum operation (see § 3.11).



- After an emergency erasing, traffic is only possible with the default data (see § 3.11).
- In station configuration, restart a learning phase (see § 3.12).

### 3.11 – DEFAULT VALUES FOR INITIAL DATA

When a transceiver is switched off and then switched back on, it restores the parameters previously programmed. In the absence of parameters, it contains the following default values :

INITIAL DATA	DEFAULT VALUES
Power	Reception only
Current channel No.	0
Volume	3
Gain control	Automatic
Access restriction	None
Transceiver antenna type (for manpack transceiver or 20 W station)	2.4-meter whip antenna
Station antenna type (for 125 W or 400 W station)	5-meter whip antenna
Squelch	Inactive
<b>For channel 0 :</b>	
Operating mode	FF
Frequency	10MHz
Modulation	USB
Service	Voice communication

**NOTE :** The other channels are erased and therefore cannot be used.

### 3.12 – LEARNING

Learning is an initial tuning calculation in 125 W or 400 W station configuration with external antenna tuning unit.

The calculation result is recorded upon each shutdown of the transceiver but may be lost after an emergency erase.

Learning should be performed at the end of installation or after an emergency erase.

#### Operating Mode

- Go to the **O** channel (successively press the **0.99**, **0** and **ENT** keys.
  - The **CHANNEL >** message is displayed, the channel indicator displays **0**.
- Successively press twice the **TEST** key.
  - The **LEARNING >** message is displayed.
- Press the **ENT** key to validate.
  - After "learning", the **LEARN OK** message is displayed temporarily.

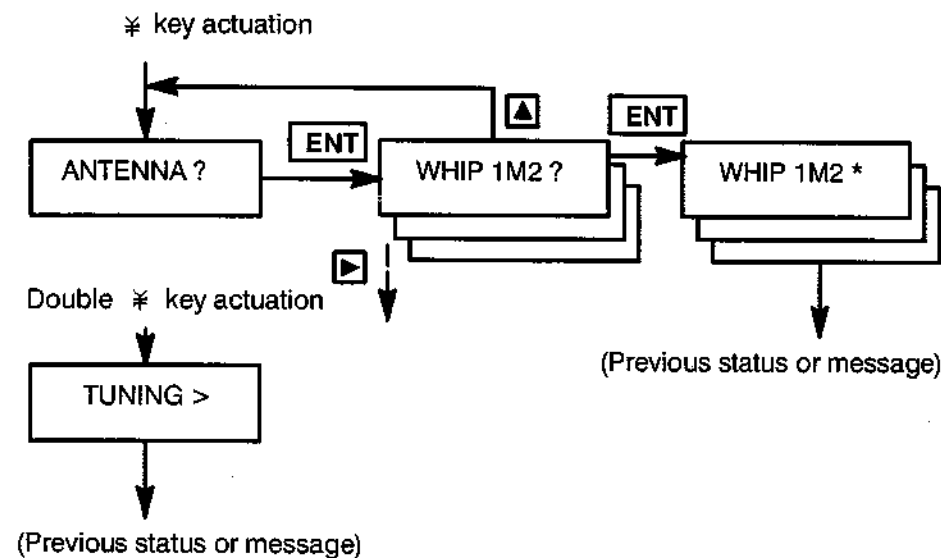
**NOTE :** If the **LEARN ERR** message is displayed, check configurations and connections.

### 3.13 – ANTENNA SELECTION AND TUNING

Antenna selection is mandatory after any antenna change. The **✕** key is used to enter the type of antenna which is connected to the transceiver and to initiate the tuning phase corresponding to this type (tuning depends on the antenna type).

Antenna tuning is initiated by actuating the **✕** key twice. Automatic tuning is achieved in all cases (during antenna change, frequency change or channel change or upon the first switch-on).

To install a 125 W or 400 W station antenna on an antenna tuning unit or an amplifier, refer to the data preparation manual (MAP).



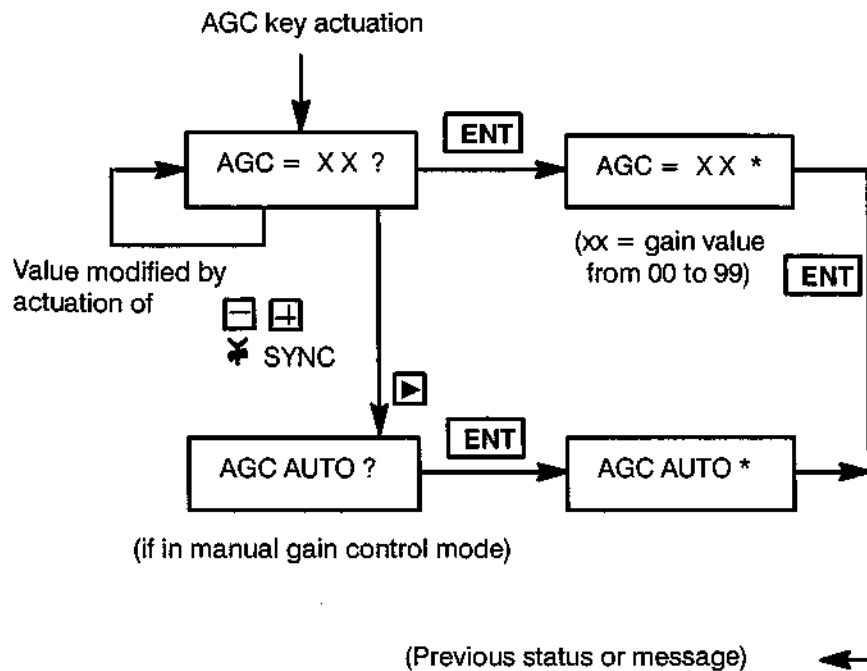
The list of possible antennas depends on the configuration (manpack, 125 W or 400 W station, or station with NVIS antenna). It is indicated in appendix 6.2.

**NOTE :** In case of tuning failure, the **MISMATCH** message is displayed.

### 3.14 - GAIN CONTROL

The **AGC** key is used to select manual or automatic gain control, provided the current transceiver service (voice communication or Morse telegraphy) makes it possible. In this case, the operator performs the adjustment by ear.

The gain control function resumes the automatic mode after any channel change or when the transceiver is receiving low-rate data or the external TD service is selected.



The **AGC WARN** message is displayed if the manual gain value is 10 dB above the automatic gain measured value.

### 3.15 - SQUELCH

The squelch function is used to mute the audio volume when there are no voice signals.

The SQUELCH function is activated or deactivated by actuating the **SQ** key.

This key is inoperative in Morse telegraphy, in data transmission mode through an external or internal modem and in scanning mode.

Pressing the **SQ** key causes the **SQ** icon to appear or disappear on the display screen.

### 3.16 - TONES

There are three types of tones :

**Error or start/end-of-procedure tone :**

one short BEEP



**Incident or alert message or selective call tone which must be validated by the operator :**

one long BEEP (5 sec.)





**Ringing tone :**

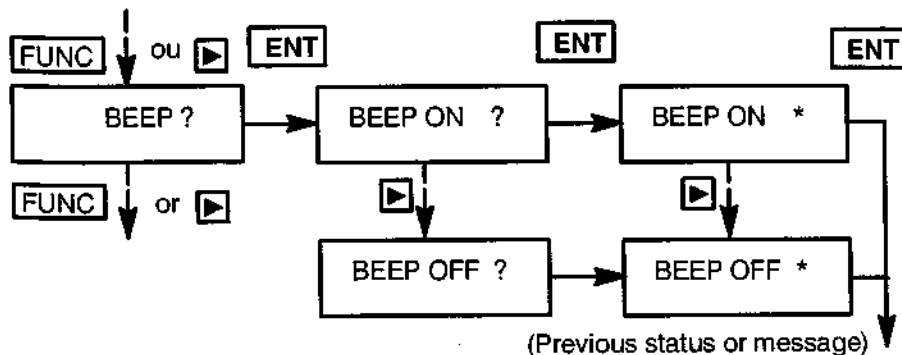
This tone prevents the operator from speaking during the link establishment time.

Series of short BEEPS



Depending on the operational constraints, it is possible to activate or deactivate the tones through the **FUNC** key :

FUNC key actuation  
then BEEP selection



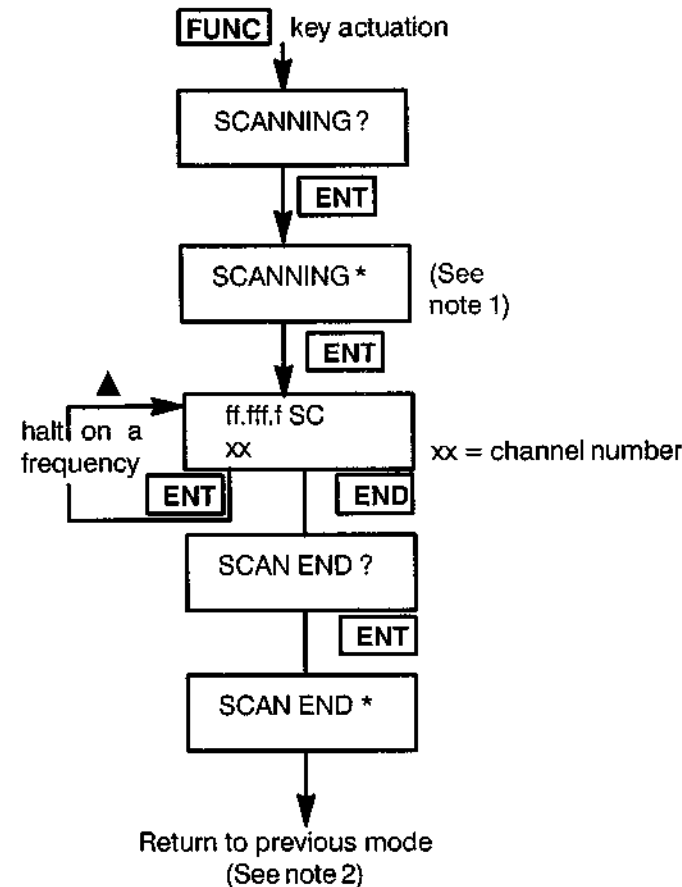
**3.17 - SCANNING FUNCTION**

This is a transmission search function performed through frequency scanning.

The scanning function is used to listen to each transmission for three seconds.

The operator cannot transmit as long as he remains in scanning mode.

During scanning, it is possible to remain on a frequency by pressing **ENT** :



**NOTE 1 :** All FF or FD programmed channels are opened in succession. The display screen shows the channel number upon each changeover.

**NOTE 2 :** After leaving the scanning function the transceiver returns to the channel from which the scanning function was initiated.

### 3.18 - RELAY FUNCTION

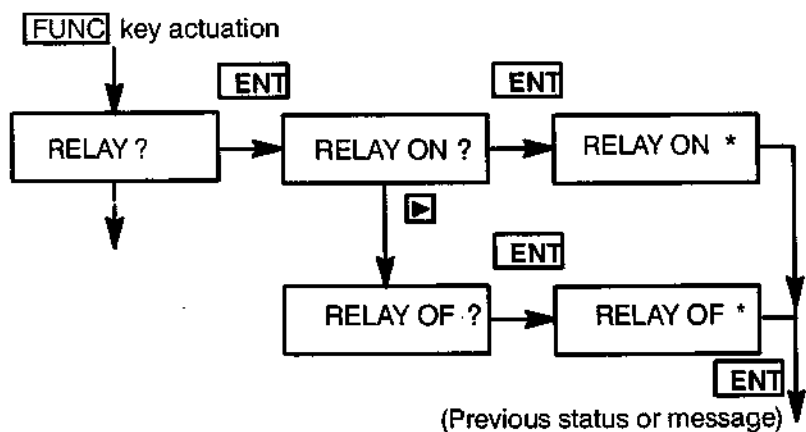
The relay function can only be performed in voice communication mode between two transceivers in the HF 3000 family (or with a transceiver belonging to the VHF TRC9000 family, except handheld transceivers).

Each transceiver should previously be configured as a function of the associated net and then be placed in the RELAY mode.

The local half-duplex signals and the half-duplex signals received during selective call are not relayed.



A relay can be established between a HF TRC3400 transceiver and a VHF transceiver (TRC9200). When the transceiver is integrated into a station, the relay cable is connected between the associated amplifier and the transceiver (receptacle "B").



**NOTE 1 :** A REL PTT error message is displayed in case of a PTT request on a transceiver, as the PTT control is already active on the relay transceiver and has therefore priority.

**NOTE 2 :** Once the nets are established and both transceivers configured in relay mode, the voice PTT controls are automatically relayed from a sub-net to the other. In case an external data transmission or morse telegraphy service change is received, the concerned transceiver exits from the relay mode.

## 4 – MAINTENANCE

The operator is in charge of routine site maintenance. Preventive maintenance operations should be performed at the intermediate maintenance level.

### 4.1 – ROUTINE MAINTENANCE

Maintain the outside of the transceiver and operating accessories in clean condition :

- Using a brush and a mild detergent, remove any traces of mud, sand, dust or moisture, especially on the connector receptacles, operating components, power supply contacts, rear face seal and the various connectors.
- Make sure there are no traces of corrosion.
- Check condition of connecting cables.
- Check condition of carrying bag and make sure that no tear begins to appear.
- Make sure that protective caps are installed on unused receptacles.
- Initiate a test at regular intervals, in particular before each mission.

### 4.2 – PREVENTIVE MAINTENANCE OPERATIONS

Send the transceiver or ALH16 battery pack to the next higher maintenance level for the following preventive maintenance operations :

- Master oscillator resetting : yearly.
- Replacement of backup battery : yearly.
- Replacement of transceiver seals : every five years.

Check condition of the battery at regular intervals (message displayed upon switch-on) and recharge it if necessary.

### 4.2.1 – Battery charging

**Foreword :** The transceiver enters the standby mode upon battery removal.

**Operating procedure :**

- Remove the battery pack.
- Remove the battery pack cap.
- Use one of the following charging accessories connected to the battery pack receptacle :
  - Charger for two battery packs : ALT 160.
  - Charger for ten battery packs : ALT 131-3.
  - Solar panel GES 101-6.
  - Hand-driven generator KIT103.
- Charge the battery at a temperature ranging from 15°C to 25°C (charging time : 14 hours for a completely discharged battery with ALT 131-3).

### 4.3 – TEST INITIATION

- Press the **TEST** key to initiate a test and validate on display of the **TEST?** message.

**Display screen :**

- All icons and segments are visible.
- A test result message is displayed.

Test OK : **GO 3400** (or **GO 3430** or **GO 3440** according to configuration).

Test OK, transceiver in reception mode only : **RX ONLY** (minimum power level selected with key).

Major failures : **NO-GO....** (send to next higher level).

Minor failures : ....**ERR** (acknowledge by pressing **ENT**).

The list of failure messages is given in Appendix B.

### 4.4 – MALFUNCTIONS

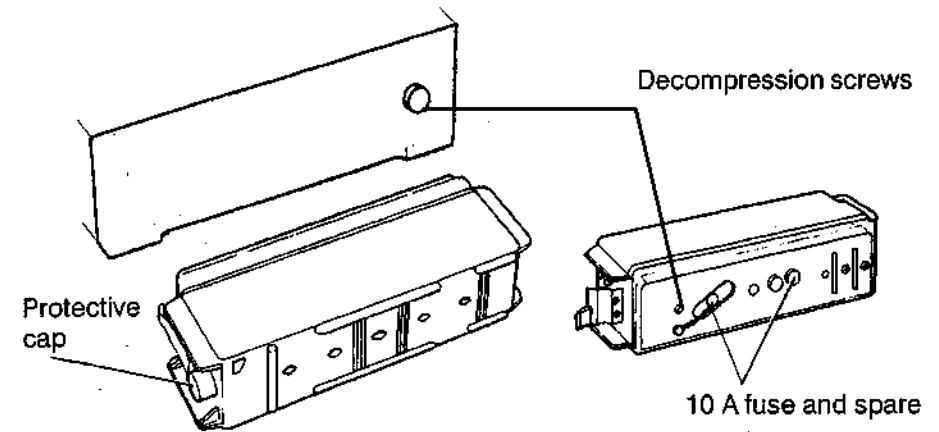
Findings	Probable causes	Remedial action
Messages :		
<b>AMP FAULT</b>	Transceiver defective (amplifier supply PCB)	– Send to next higher level
<b>AMP LINK</b>	Transmission problem between transceiver and amplifier (ALA)	– Check connections – Send to next higher level
<b>ATU FAULT</b>	Transceiver defective (Antenna tuning unit module)	– Send to next higher level
<b>ATU LINK</b>	Transmission problem between transceiver and antenna tuning unit	– Check connections – Send to next higher level
<b>FREQ WARN</b>	Radio frequency quality problem when setting up the link	– Change channel
<b>LOW CELL</b>	Transceiver defective (Backup battery)	– Send to next higher level
<b>LOW BATT</b>	Low battery voltage	– Recharge the battery pack (see § 4.2.1)
<b>NO FILTER</b>	Fault on external amplifier proximity filters	– Send to next higher level
<b>NO GO</b>	Transceiver defective	– Send to next higher level
<b>NO GO AMP</b>	ALA defective	– Send to next higher level

Findings	Probable causes	Remedial action
NO GO ANT	Fault on NVIS coupler	- Send to next higher level
NO GO ATU	Antenna tuning unit defective	- Send to next higher level
NVIS LINK	Transmission problem between transceiver and NVIS coupler	- Check connections - Send to next higher level
OUT BAND	Antenna incompatible with channel frequencies	- Change channel or antenna
OVERLOAD	Overload on antenna terminal	- Check antenna selection - Send to next higher level
REMOTE ERR	Transceiver remote control defective	- Check connections - Send to next higher level if fault continues
SYNT ERR	Transceiver defective (Synthesizer PCB)	- Send to next higher level if fault continues
T/R FAULT	Transceiver faulty (in station)	- Send to next higher level
UNABLE	Keystroke or function not valid in transceiver radio status	- Change mode or frequency

## 5 – TRANSPORT AND STORAGE

### 5.1 – USE AFTER AIR TRANSPORT

- Remove the battery pack.
- Slightly loosen decompression screws on the transceiver and battery pack and then retighten them moderately.



### 5.2 – STORAGE

- If the transceiver is fitted with the battery pack, remove the protective cap to prevent the battery from discharging.
- Check the battery charge status at regular intervals (message **BATT = xxVx** displayed after switch-on land successive keystrokes on ►), and recharge the battery if necessary.
- Store in clean and dry premises between minimum and maximum temperatures of  $-40^{\circ}\text{C}$  and  $+70^{\circ}\text{C}$ .

## 6 - APPENDICES

### 6.1 - TERMS USED

#### 6.1.1 - Glossary of abbreviations

AEA :	Antenna electrical accessory.
AF :	Audio frequency (data, voice communications).
AGC :	Automatic gain control.
ALA :	Amplifier power supply.
AM :	Amplitude Modulation.
ATU :	Antenna tuning unit.
COT :	Telephone handset.
FD :	Half-duplex fixed frequency mode (dual frequency).
FF :	Simplex fixed frequency mode (single frequency).
FG :	Fill Gun.
FKLU :	Frequency and Key Loading Unit.
HF :	High Frequency (1.5 to 30 MHz).
ID :	Initial data.
IE :	Initial elements.
J2A+(-) :	Morse telegraphy transmission in the upper (lower) sideband.
J3E+(-) :	Voice transmission in the upper (lower) single sideband.
LSB :	Lower SideBand.
NCS :	Net Control Station.
NVIS :	Near Vertical Incidence Skywave.
PC :	Personal Computer (computer featuring a microprocessor in the INTEL*86 family or compatible computer).

<b>PEP :</b>	Peak Envelope Power.
<b>RS :</b>	Radio silence.
<b>RX :</b>	Radio reception.
<b>SINAD :</b>	Signal + noise + distortion-to-noise + distortion ratio, indicated in dB.
<b>SSB :</b>	Single sideband amplitude modulation.
<b>STANAG :</b>	STANdardization AGreement (High-rate HF modulation transmission standard, approved by NATO).
<b>SYCOMORE :</b>	Organized-mechanism communication system for equipment, used to define the remote control system for equipment in the 3000 family.
<b>TD :</b>	Data transmission.
<b>T/R :</b>	Transceiver.
<b>USB :</b>	Upper SideBand.

### 6.1.2 - Terminology

<b>Channel :</b>	Radiocommunication channel characterized by a number of stored data.
<b>Current channel :</b>	Channel used for transceiver traffic.
<b>Gain control :</b>	The gain of the reception channel can be controlled either automatically or manually.
<b>Half-duplex operation :</b>	Communication in transmission or reception mode selected by pressing a push-to-talk button or pedal.
<b>Initial data :</b>	Number of parameters required to initialize the transceiver. This assembly includes the initial element assembly.
<b>Initial data fill gun :</b>	Peripheral external to the transceiver and which contains the initial elements.

<b>Initial elements :</b>	Number of parameters required to initialize the transceiver channels.
<b>Manpack transceiver :</b>	Self-contained portable transceiver.
<b>Mode :</b>	An operating mode (FF, FD) is assigned to each channel. Channel 0 only accepts the FF mode. Channels 01 to 99 accept the FF and FD modes.
<b>Modulation :</b>	The following modulation methods are available : <ul style="list-style-type: none"> <li>- USB : upper sideband,</li> <li>- LSB : lower sideband,</li> <li>- AM : amplitude modulation.</li> </ul>
<b>NCS/Subordinate :</b>	One of the operators should declare himself the NCS on all FD channels. <ul style="list-style-type: none"> <li>- The transmission and reception frequencies are reversed on the NCS transceiver.</li> </ul>
<b>Net :</b>	A net includes a group of transceivers which share common channels.
<b>Net number :</b>	Number 0001 to 9999.
<b>Power :</b>	Transmission power of transceiver or power assembly if the latter is connected to the transceiver.
<b>Scanning :</b>	Automatic transmission search through frequency scanning.
<b>Service :</b>	Selecting a given service allows the transceiver to be configured according to the desired use. The service (VOICE COMMUNICATION, EXTERNAL DATA, MORSE TELEGRAPHY) is selected by the operator.
<b>Squelch :</b>	It is used to mute the audio reception according to the received signal.
<b>Station :</b>	Assembly comprising a manpack transceiver, an amplifier, an antenna tuning unit and an antenna.
<b>Volume :</b>	Sound volume level in reception.

## 6.2 - LIST OF MESSAGES

There are different types of messages :

- Normal messages,
- Temporary messages,
- Menu messages,
- Alert and operating error messages.

The alert and error messages deactivate the keyboard (except the lighting circuit and the **ENT** key). Press the **ENT** key to reactivate the keyboard.

**NOTE :** When several events occur simultaneously, the message displayed is the one which has the highest priority.

### 6.2.1 - Normal messages

Message contents	Meaning of message	Chapter
20W	Manpack transceiver or vehicular 20 W station	3.9.2,
20W STAT	Connection of 20 W station with remote antenna tuning unit	3.9.2,
125W AMP	Connection of 125 W station with amplifier and without antenna tuning unit	3.9.2,
125W NVIS	Connection of 125 W NVIS station	3.9.2,
125W STAT	Connection of 125 W station with amplifier and antenna tuning unit	3.9.2,
400W AMP	Connection of 400 W station with amplifier and without antenna tuning unit	3.9.2,
400W NVIS	Connection of 400 W NVIS station	3.9.2,
400W STAT	Connection of 400 W station with amplifier and antenna tuning unit	3.9.2,

Message contents	Meaning of message	Chapter
ADAPT PWR	Power automatically modified by the application after any power adaptivity, incident, antenna change, etc.	3.6
AGC AUTO	Automatic gain control	3.14
AGC M= -xx	Manual gain control with "xx" manual gain	
AGC WARN	Very great difference between the gain values obtained in manual and automatic control mode	3.14
AM	Switchover to AM modulation	3.9.3
BATT=xxVx	Battery voltage in volts	3.9.2
BEEP ?	Entry into tone activation menu	3.16
CLARIFY ?	Entry into clarifier menu	3.9.4
CLAR OFF	Exit from clarifier mode	3.9.4
CHAN>	Channel opening	3.8
COPY OK	Positive result after transfer of initial elements from the transceiver to another transceiver	2.3.2
ff.fff.fDF (1)	Frequency in 100 Hz increments in FD mode	3.9.4
ff.fff.fff	Frequency in 100 Hz increments in FF mode	3.9.4
ff.fff.f SC	Frequency in 100 Hz increments in scanning mode	3.17
FGUN END	Unloading through the FG correctly completed	2.3.1.2
GO 3400	Positive results after self-tests performed upon switch-on or tests controlled on manpack transceiver	3.1.1, 3.10
GO 3430	Positive results after self-tests performed upon switch-on or tests controlled on 125 W station	3.1.1, 3.10



Message contents	Meaning of message	Chapter
GO 3440	Positive results after self-tests performed upon switch-on or tests controlled on 400 W station.	3.1.1, 3.10
LEARNING	Learning initiated	3.12
LEARN OK	Learning successful	3.12
LSB ?	Switchover to LSB mode	3.9.3
MODUL ?	Modulation change	3.9.3
MORSE ?	Switchover to telegraphy service	3.5
NET = ___ ?	Net number entry	2.3.1.2
nnnn USB nnnn LSB nnnn AM	Net number = 'nnnn' and modulation (USB, LSB, AM in FF mode)	3.9.2
RELAY ?	Entry into relay menu	3.18
RELAY OF ?	End of relay mode	3.18
RELAY ON ?	Selection of relay mode	3.18
REMOTE	The transceiver is remotely controlled by a SYCOMORE equipment	
SCAN END	Exit from scanning mode	3.17
SCANNING ?	Entry into scanning mode	3.17
SERV>	Execution of a service change requested by the operator	3.5
>SERV	Execution of a service change received by radio	3.5
TUNING>	Antenna tuning	3.13
USB ?	Switchover to USB mode	3.9.3
VOICE ?	Switchover to clear voice service	3.5

Message contents	Meaning of message	Chapter
V=Xxx.xx	Software version	3.1.1, 3.10
WHIP 1M2	1.2-meter whip antenna (for manpack)	3.13
WHIP 2M4	2.4-meter whip antenna (manpack, station)	
WHIP 3M	3-meter whip antenna (manpack, station)	
VEH 2M4	2.4-meter vehicular antenna (manpack, station)	
VEH 3M	3-meter vehicular antenna (manpack, station)	
VEH 4M	4-meter vehicular antenna (manpack, station)	
VEH 5M	5-meter vehicular antenna (station, NVIS)	
VEH 6M	6-meter vehicular antenna (station)	
VEH 7M5	7.5-meter vehicular antenna (station)	
VEH 8M5	8.5-meter vehicular antenna (station)	
VEH 10M	10-meter vehicular antenna (station)	
DIPOLE	Dipole (manpack, station)	
WIRE ANT	Wire antenna (manpack, station)	
WIDEBAND	Wideband antenna (manpack, station)	
NVIS	Near Vertical Incidence half-loop antenna (NVIS station)	

(1) If the transceiver is operating in the reception (or transmission) mode, the reception (or transmission) frequency is displayed.

### 6.2.2 - Failure and operating error messages

The operating error messages can be erased through validation by the operator (ENT key) when they are displayed, or after a time delay of 2 seconds.

Message contents	Meaning of message	Chapter
AMP FAULT	Amplifier malfunction	4.4
AMP LINK	Transmission problem between transceiver and associated amplifier	4.4
ATU FAULT	Excessive current consumed by the antenna tuning unit	4.4
ATU LINK	Transmission problem between amplifier and ATU	4.4
CHAN ERR	Problem detected upon channel opening (problem of defining channel frequencies in station configuration). The channel is unusable.	3.8
CODE ERR	Password incorrectly entered	2.3.1.2
COPY FAIL	Failure in copy of transceiver initial elements to another transceiver (or transceivers wrongly connected)	2.3.2
ERASE	The emergency erasing function has been used on the transceiver	3.10
FGUN ERR	Problematic integrity of data from the FG	2.3.1.2
FREQ ?	Initial elements of current channel incorrect or minimum number of frequencies not entered	3.8
LEARN ERR	Learning unsuccessful	3.12
LOCKED	Key actuation impossible due to keyboard inhibition	1.9.2
LOW BATT	Low battery voltage	4.4
LOW CELL	Low backup battery voltage	4.4

Message contents	Meaning of message	Chapter
MISMATCH	Antenna mismatching or slaved tuning unsuccessful	3.13
NET ERR	Net number entry error during loading by FG	2.3.1.2
NO FILTER	Fault on amplifier proximity filters (the transceiver can work but without the filters)	4.4
NO GO	Transceiver self-test unsuccessful upon switch-on (manpack transceiver or station) or complete failure detected during controlled tests	3.10, 4.4
NO GO AMP	ALA defect detected during self-test. Transceiver configured as manpack	4.4
NO GO ANT	Fault on NVIS coupler. Transceiver configured as manpack	4.4
NO GO ATU	ATU defect transmitted by ALA. Transceiver configured as manpack	4.4
NO GO TX NO GO RX	Major transmission or reception defect detected during controlled tests	4.4
NVIS LINK	Transmission problem between ATU and NVIS coupler	4.4
OUT BAND	Antenna incompatible with channel frequencies	4.4
OVERLOAD	Overvoltage at antenna terminal	4.4
REL PTT	The relay station has already activated its PTT control	3.18
REMOT ERR	SYCOMORE connection or link problem	4.4
RX ONLY	The transceiver is in radio silence mode and cannot register any operator's command, or test OK in reception only	3.8
STATION?	Unknown station type	4.4
SYNT ERR	Synthesizer malfunction	4.3

Message contents	Meaning of message	Chapter
T/R FAULT	HF problem at amplifier input	4.4
T/R FULL	No available channels in transceiver during loading by FG	2.3.1.2
TX ERR RX ERR USE ERR	Minor transmission, reception or operating defect detected during controlled tests	4.3
UNABLE	Key actuation impossible or function requested incompatible with transceiver status	4.4
WHIP ERR	Message displayed during test initiated on NVIS station when whip antenna is damaged or incorrectly connected	4.3

### 6.2.3 - Messages displayed during data preparation

Message contents	Meaning of message	Chapter
ANTENNA ?	Entry into antenna selection menu	3.13
COPY <	Reception of initial elements from another transceiver	2.3.2
COPY >	Transfer of initial elements from the transceiver to another transceiver	2.3.2
FGUN >	Loading of initial data through the FG	2.3.1.2
NCS ?	Confirmation for placing transceiver in NCS status	2.4
NCS/SUB ?	Entry into NCS/subordinate menu	2.4
PWD = ?	Entry into password entry menu	2.3.1.2
SUB ?	Confirmation for placing transceiver in subordinate status	2.4

### 6.3 - SUMMARY OF FUNCTIONS ACCESSIBLE WITH THE "FUNC" KEY

- **MODUL**                    Modulation function
  - **USB**                    Upper sideband
  - **LSB**                    Lower side band
  - **AM**                    Amplitude modulation
- **SCANNING**                Scanning function (between two transceivers)
- **RELAY**                    Relay function (frequency scanning)
  - **RELAY ON**              Selection of relay mode
  - **RELAY OF**              End of relay mode
- **CLARIFY**                Clarifier function (in fixed frequency)
- **BEEP**                    Tone (in audio accessory)
  - **BEEP ON**              Beep function activation
  - **BEEP OFF**             Beep function de-activation
- **COPY**                    Copy of initial data between transceivers

## TRANSCEIVER VIEWS

## CONNECTING COMPONENTS

- 1 - Receptacle "A" (14 ways) for audio interface, remote power supply, remote control, FG and modem.
- 2 - Receptacle "C" (5 ways) for audio interface (Accessories built to US standards).
- 3 - Ground terminal
- 4 - Receptacle "B" (14 ways) for audio interface, relay function, station and terminal.
- 5 - Whip antenna receptacle
- 6 - 50-ohm coaxial receptacle

## OPERATING CONTROLS

- 1 - Liquid-crystal display screen
- 2 - Three management keys
- 3 - Function keys
- 4 - Operating keys
- 5 - Guarded EMERGENCY ERASE pushbutton.

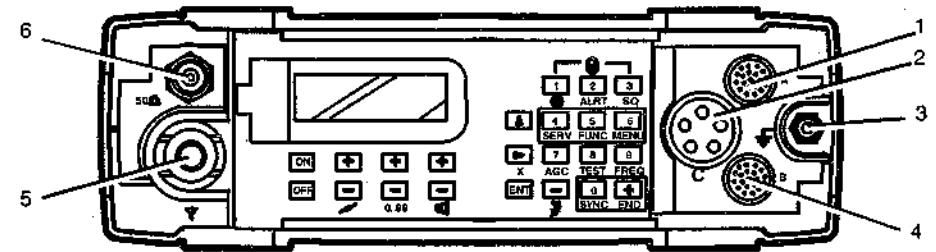


Figure A : Connecting components

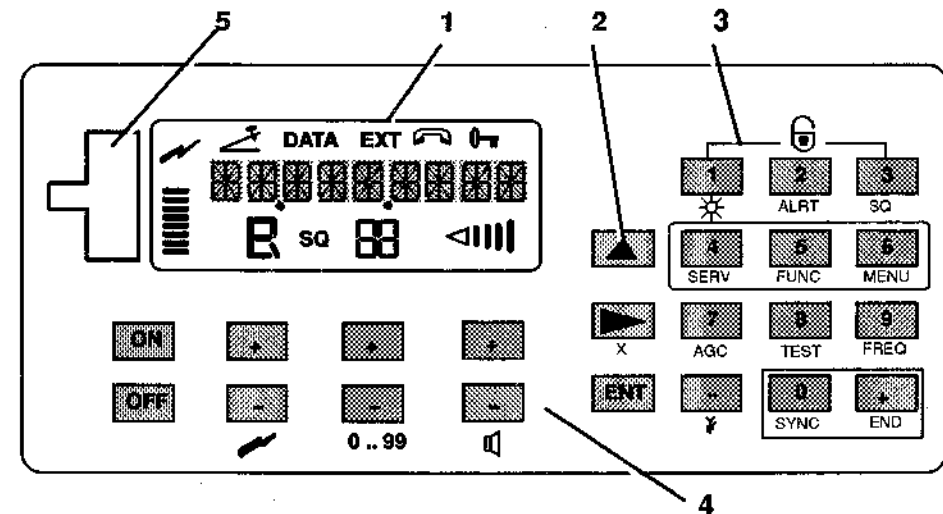


Figure B : Operating controls