SPIDER
MANPACK TRANSCEIVER

TYPE 9556 304 14800

OPERATORS MANUAL
HGT5-2531E

OCTOBER 1990

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CHAPTER 1

GENERAL

1.1 Introduction

This manual contains instructions for the operator of the SPIDER manpack radio transceiver.
The SPIDER manpack described in this manual is a portable VHF transmitter-receiver used to provide two-way voice communication in tactical military radio networks. When using a second transceiver retransmission is possible.
The battery compartment of the transceiver contains alternatively dry cells, or a rechargeable battery block.
An optional Crypto/Data unit may be integrated with the set, providing facilities for high-speed data transfer, encryption of voice or low-speed data, pre-coded messages and selective calling. This manual, however, refers only to the SPIDER manpack without Crypto/Data unit.

1.2 Technical data

Frequency range	: 30.000 ... 107.975 MHz.
Number of channels	: 3120 in steps of 25 kHz.
Number of preset channels	: 9 user programmable channels.
Modulation system	: FM (frequency modulation).
Power supply	: 10 alkaline batteries type R14 (to be replaced) or battery block of NiCad cells (rechargeable).
Battery life (NiCad)	: approx. 10 hours.
Transmitter power	: four user selectable levels: . low power 10 mW . medium power 100 mW . high power 1 W . burn-through power 5 W
Ambient temperature range	
Operating	: -30 ... +65°C
Storage	: -40 ... +70°C
Dimensions	: 240 x 175 x 66 mm
Weight	: approx. 2.6 kg (transceiver without accessories) approx. 5 kg (complete set)

1.3 Component parts
(See diagram 1)

The SPIDER manpack transceiver is composed of the following parts.

1. Transceiver
2. Carrying harness
3. Antenna matching unit
4. Antenna
5. Handset and/or headset
6a. Rechargeable battery block or
6b. Battery holder with 10 dry cells type R14
7. Instruction card.

CHAPTER 2

OPERATOR CONTROL FUNCTIONS

2.1 General

This chapter describes the functions for control of the SPIDER Manpack transceiver, including the keyboard and display functions.
Instructions for basic operation of the transceiver are given in chapter 4.
Procedures for programming of the preset channels are given in chapter 3.
Specific procedures for the optional crypto/data functions are not described in this manual.

2.2 Volume control/on-off switch

The rotary switch mounted on the front panel provides the following control functions (see diagram 2):

- Transceiver on/off: OFF is switched-off, any other position is switched-on.
- Audio volume : W is whisper mode, positions 1...6 control the output level (6 = max. level).
- Z (= Zeroise) : Zeroise position (protected against accidental use by a return spring mechanism), to enable the specific Z key on the keyboard.

2.3 Keyboard functions
(See diagram 2)

The keyboard provides a matrix of 3 x 4 keys for the input of functions, parameters and values.
The separate keys B and Z are provided for specific functions.

. Matrix keys

The numeric keys (0 ... 9) have a second function implemented, indicated by a mnemonic text above each key.
For key 1 ... 6 access of the second function is provided by the F key.
For the remaining double function keys the second function will be taken for input unless a numeric input is required for additional parameters or values.

The matrix keys are given in the following table, with their functions briefly explained.

KEY (numeric/function)	NUMERIC VALUE	SECOND FUNCTION
0/LAMP	Zero	Set brightness level for the display illumination.
1/SEL	One	Not used.
2/GEN	Two	Not used.
3/MESS	Three	Not used.
4/FREQ	Four	Select a frequency value for the present channel.
5/LD	Five	Not used.
6/MODE	Six	Not used.
7/CH	Seven	Select a given channel number.
8/PWR	Eight	Set the RF power level for the selected channel.
9/SQ	Nine	Turn squelch facility on/off for the receiver function.
F	-	Keyed-in before a function input: enables the given function. Keyed-in during a function input: cancels the input procedure being started.
ENT	-	Enter the input data (being given after the F key) into the unit: preset data is stored for the selected channel.

NOTE: The functions SEL, GEN, MESS, LD and the selection of MODE require that the Crypto/Data unit is integrated with the transceiver.

. Separate keys

Two keys are placed apart on the front panel because of their specific function:

B - Burn-through key, tc activate an extra high RF power level (indicated by "4") for transmission during adverse conditions. To be pressed before each transmission.

Z - Zeroise key, only enabled when the rotary switch is set to Z simultaneously; when activated this key erases all preset channel data stored in the set.

2.4 Display functions

An LCD screen is used on the front panel to indicate the selected functions, parameter settings and values being entered.

FIELD	MEANING
PWR 1 2 3 4	Power level for transmission is set to 1...4 (4 = Burn-through level) as indicated by the associated fields.
FREQ	Frequency field, to indicate that a frequency value is given in the alpha-numeric display.
CH	Channel field, placed just before the leftmost character of the display to indicate the selected channel.
SQ	Squelch facility is turned-on for the receiver function.
F	F is keyed-in preceding a double function key, to enable the (second) function for control or as preset data.
NOGO	A malfunction has been detected in the radio set (e.g. frequency synthesizer out-of-sync).
MODE VCE	Mode field. Indicates normal voice mode with FM transfer.

2.5 Connectors

The following connectors are available.

a. Coaxial antenna connector

Used to connect the whip antenna for portable use, via the antenna matching unit. When used as a vehicular transceiver, the 50 Ohms vehicular antenna is connected here.

b. 6-pins audio connector

Used to connect a handset or headset with a 5- or 6-pins plug. A handset with a channel selector switch and a volume control switch can be connected.
If such a handset is used, the preset channels 1...8 can only be selected via the handset switch, not with the keys on the frontpanel. If the handset switch is set to position 0, the keys on the frontpanel can be used to select a channel.

c. 10-pins audio connector

Used to connect a handset or headset with a 10-pins plug. Can also be used to connect a retransmission cable, a cable to a vehicular intercom network or other peripheral equipment.

d. Supply/peripheral connector (right-hand side)

Used to connect an external power supply for vehicular use, a booster for increased transmitter power, or other peripheral equipment.

CHAPTER 3

PREPARING FOR USE

3.1 General

This chapter provides the instructions for installation and for programming the preset channels.

3.2 Installation
(See diagram 3)

1. Open the battery compartment to check if a battery is present. If not install the battery. For details see para. 5.2.
2. Mount the antenna matching unit on the coaxial antenna connector.
3. Mount the antenna on top of the antenna matching unit.
4. Connect a handset and/or a headset to the 6-pins and/or the 10-pins audio connector of the set.
5. Program the preset channels, if this has not been done earlier. See para. 3.3.
6. Install the transceiver on the carrying harness and fasten it with the strap.

3.3 Channel presetting

For each channel to be programmed the following preset data must be used:

- Frequency value.
- Power level for transmission.
- Squelch facility on/off.

Act as follows:

1. Switch on the set by turning the volume control switch to any position except OFF or Z.
2. An audio tone is heard until the transceiver is ready for use (approx. 4 seconds). The display shows the channel and frequency last used.

NOTE: If the audio tone continues and/or NOGO appears on the display, or if the set is completely "dead", replace the battery. If this doesn't help, the transceiver is defect.

3. Select the channel to be preset by pressing the key CH, followed by one of the keys 0...8. If a handset with channel selector switch is used first turn this switch to channel 0.
4. Enter the desired frequency by pressing the keys F, FREQ and the necessary numerical keys. Four or five digits have to be entered from left to right, e.g. when 98.200 MHz is required, key in 9-8-2-0. The last digit will be completed by the set.
5. Confirm by pressing key ENT. An audio tone will be heard during approx. 1 second and the display shows the selected frequency.

The frequency must be in the range 30.000...107.975 MHz. A non-valid input will be ignored.

ATTENTION: when entering a frequency or other data, the time between two key strokes must be less than 10 seconds.
If not the input disappears again and you will have to start anew.

6. Enter the desired power level by pressing the keys F, PWR and one of the keys 1...3.
   1 = low power
   2 = medium power
   3 = high power
   Confirm by pressing key ENT. Select low power for a range of less than 1 km, medium power for a range of up to 2 km, high power for longer distances.
   Note: the ranges given are valid for flat, open country. In densely wooded areas or towns, or if the transmission path is obstructed by e.g. a hill, the range may be much less.
7. If squelch is desired press keys F, SQ and ENT. The display shows "SQ".
8. If no squelch is desired press keys F, SQ, SQ and ENT. The display doesn't show "SQ".
9. If more channels are to be preset, repeat item 3...8 for the relevant channel number(s).

NOTE: The preset data are retained indefinitely if the set is switched off and/or the battery is removed. Only a zeroise operation (see para. 4.8) will erase the preset data. It is not necessary to erase the preset data when one or more channels are to be preset to a new frequency.

CHAPTER 4

OPERATION

4.1 General

This chapter contains instructions for the daily operation of the SPIDER manpack.
Special instructions for retransmission and operation under unusual conditions are also included.

4.2 Switching on and off

To switch on turn the rotary switch from OFF to position W or 1...6.
Position W is the whisper mode, to be used e.g. during patrols in enemy territory. During reception the audio level is low (the same as in position 1 of the switch), when transmitting the operator can whisper in the microphone, without a volume decrease at the receiving station.

Positions 1...6 give an increasing audio volume during reception. After switching on an audio tone is heard till the set is ready for use (approx. 4 seconds). The display shows the channel and frequency used last time.
If the audio tone doesn't stop and/or NOGO appears on the display, or if the set is completely "dead", replace the battery. If this doesn't help, the set is defect. Report to the maintenance technician.

For switching-off, turn the rotary switch to OFF.

4.3 Channel selection

To select a preset channel, press key CH, followed by one of the keys 0...8. The display shows the selected channel number, the preset frequency for this channel, squelch (SQ) or no squelch and the preset transmitter power level (PWR 1, 2 or 3). An audio tone is heard until the set is ready for use.

If a handset with channel selector switch is connected, this switch overrides the keyboard control for channels 1...8. So the channels 1...8 are normally selected by means of the handset switch. If however the handset switch is turned to channel 0, keyboard control is possible again. The display shows the same data as above.
NOTE: it is possible for the operator to change the squelch mode or the transmitter power level during operation, without affecting the preset data for the channel being used.
It is also possible to change the frequency for one or more channels, using the procedure of para. 3.3. In this case the frequency is now the new preset frequency, and the old frequency for this channel is lost.

4.4 Squelch facility

The receiver is equipped with squelch to suppress noise when there is no signal present. The squelch function can be turned on or off during operation without affecting the preset data (squelch or no squelch) for the selected channel. This is done by pressing the SQ key. Using this key will alternately enable/disable the squelch function. The display shows SQ when the squelch function is enabled. When the signal to be received is very weak, it may be better to switch off the squelch function.

4.5 Display illumination

To switch on the display illumination press key LAMP, followed by one of the keys 1...3. Key 1 gives minimum brightness, key 3 maximum brightness. To switch off the display illumination press key LAMP, followed by key 0.
NOTE: the display illumination is switched off automatically if during 10 seconds no keys are pressed.

4.6 Reception - transmission

When switched on the transceiver is in the receive mode, on the frequency shown by the display. For transmission (on the same frequency) press the push-to-talk button of the handset or an equivalent contact. The power level for the transmitter, as preset for the channel, is shown by the display:

PWR 1 = low power
PWR 2 = medium power
PWR 3 = high power

It is possible to change the transmitter power level during operation, without changing the preset power level for the channel. To do this, press key PWR, followed by key 1, 2 or 3 for resp. low, medium or high power.
For adverse conditions, an extra high power level may be selected by pressing the B (= Burn-through) key before transmitting. This burn-through power is indicated by the display as PWR 4. It is valid for one transmission only, the set will return to the preset power level for the next transmission, unless the B key is pressed again.
The length of the transmission must be limited to one minute or less.
NOTE: never use more transmitter power than necessary. High transmitter power will exhaust the battery more quickly, will increase the possibility of interference with other radio nets and will increase the possibility of being overheard by the enemy.

4.7 Retransmission

Retransmission can be used when direct communication between two radio stations is impossible because the distance is too great or the transmission path is obstructed by a hill.
In this case a retransmission station may be set up about halfway between the two stations, if possible in a favourable location such as on top of a hill.

The retransmission station consists of two transceivers, interconnected via the retransmission cable between the two 10-pins audio connectors.
See fig. 4.1.

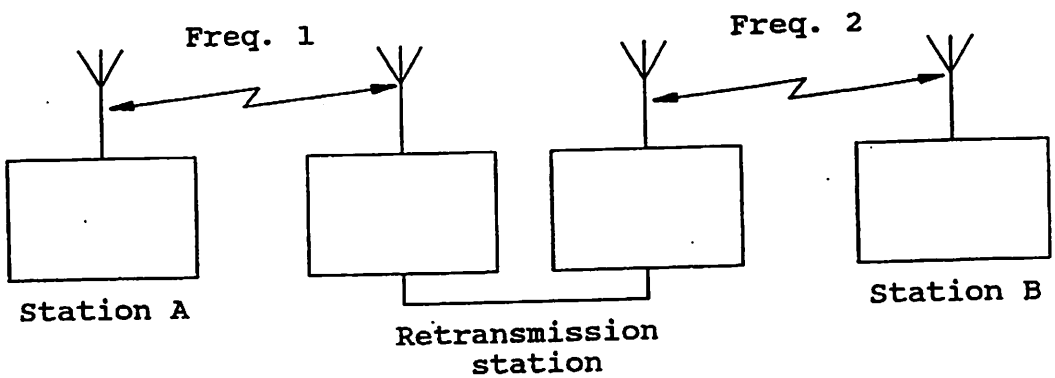


Fig. 4-1

Every message transmitted by station A on frequency 1 is received by the retransmission station and retransmitted on frequency 2 to station B. In reverse, every message transmitted by station B on frequency 2 is retransmitted to station A on frequency 1.
In the retransmission station one transceiver is always transmitting when the second transceiver receives a message. For this reason the frequencies 1 and 2 of the two radio links must be selected with some care. The advised frequency separation is more than 5 MHz for frequencies below 50 MHz, more than 10% for frequencies above 50 MHz. Even then interference may occur with some frequency combinations. Always check each combination of frequencies in actual practise before the retransmission link has to become operational.
A retransmission station is set up as follows:

1. Connect the retransmission cable to the 10-pins audio connector of one transceiver, but do not yet connect the second transceiver.
2. Set the two transceivers as far apart as the retransmission cable permits.
3. Connect the handsets of both transceivers to the 6-pins audio connector.
4. Switch on both sets and select for each set the channel or frequency prescribed for the link (two different frequencies!). Check that for both sets the squelch function is enabled.

5. Using one of the sets in the retransmission station, set up radio communication with one of the distant operators. Check that communication is possible and tell the operator to wait.
6. Using the second set, try communication with the second distant operator.
   If communication is possible connect the retransmission cable to the second set and tell both operators that retransmission can begin.
7. Check during the first moments whether the retransmission proceeds smoothly by listening-in with the handset.

If interference occurs it may help to select a lower transmitter power. In general, low transmitter power causes less interference in the retransmission station, but for long distances high power may be necessary. Alternatively, a different combination of frequencies can be tried.

4.8 Erasing preset channels

It is possible to erase the frequencies and other data of all preset channels from the memory of the transceiver. This may be done when capture by the enemy is imminent. Act as follows:

1. Turn the rotary switch to the Z position and keep it there (spring-loaded position).
2. Press the Z (= Zeroise) key. All channel data are now erased. An audio tone will be heard during 10 seconds.
3. After erasing the preset channels the set should be switched off. Next time the set is switched on the display shows a frequency of 30.000 MHz. All channels can be preset anew.

NOTE: erasing the preset channels is not possible if there is no battery present or if the battery is empty.

4.9 Operation under unusual conditions

When using the SPIDER manpack under unusual conditions such as
- very low temperatures
- very high temperatures, or
- in an environment with dust or sand,

difficulties may occur.
This paragraph contains instructions by which these difficulties can be minimized.

a. Cold weather operation

Operation of the transceiver at extremely low air temperatures requires the following precautionary measures.
. The transceiver should be treated with care.
. Keep the transceiver warm and dry if possible.

. When using a headset condensation can be formed in the earpieces. If this freezes correct operation will stop. It is advisable to have a spare set at hand.
. When using a handset condensation can be formed in the microphone and freeze afterwards. It is advisable to have a spare handset at hand.
. When the transceiver is transferred from low air temperature to a comparatively high temperature, condensation will be formed until the temperatures of the transceiver and the surrounding air are the same.
When this point is reached dry the transceiver. Never open the transceiver before this point has been reached.

b. Hot weather operation

Operation of the transceiver at extremely high air temperature requires the following precautionary measures.
. When practicable some method of shading the equipment shall be used.
. When temperature and humidity are both high do not open the transceiver if this can be avoided. If a transceiver has to be opened mark this set. As soon as a suitable opportunity occurs this set should be opened again and allowed to dry.

c. Operation in an environment with dust or sand

Operation of this transceiver in an environment with dust or sand requires the following precautionary measures:
. Unused connectors should be covered if possible.
. Clean the connectors before connecting.
. Do not open the transceiver unless this is absolutely unavoidable.

CHAPTER 5

OPERATORS MAINTENANCE

5.1 General

The operators maintenance is mainly preventive maintenance, aimed at keeping the set in good condition and so preventing defects.
Replacing the battery is also part of the operators maintenance.

5.2 Replacing the battery
(See diagram 4)

1. The hinged cover of the battery compartment is closed by means of two clamps at one side. Each clamp consists of an inner part (A) and an outer part (B) as shown in diagram 4.
2. To loosen the clamps, clip-down (B) (arrow indication) and clip-off (A). Keep the cover tightly pressed down if necessary.
3. When the cover is open, the rechargeable battery block (C) or the battery holder with the 10 dry cells (D) can be removed.
4. Replace the battery block by a freshly charged one or replace the 10 dry cells by new ones.
5. Place the battery block or battery holder in the battery compartment.
6. Close the cover by first hooking the inner part (A) of the clamps over the lug and then pressing down the outer part (B).
7. If a rechargeable battery block is used, hand in the discharged battery for recharging.

5.3 Preventive maintenance

Preventive maintenance of the SPIDER manpack consists of two parts:
1. Cleaning the set, as described in para. 5.4.
2. A routine test procedure, as described in para. 5.5.

When starting the preventive maintenance, always check first that all parts of the set (see para. 1.3) are present and free from damage.

5.4 Cleaning the transceiver

The cleaning procedure comprises the following items:

1. Remove dust and loose dirt with a clean soft cloth or with a soft brush. For dirt that is difficult to remove damp the cloth with water.

2. To remove any moisture use a dry clean cloth.

3. To remove grease, oil or such-like from the equipment use a cloth moistened with cleaning spirits.
   WARNING: Cleaning spirits are highly inflammable!

4. Remove dust and dirt from plugs and receptacles, taking care not to damage the pins.

5.5 Routine test procedure

A routine test must be performed in the following events:

- after the transceiver is installed and is ready for operation.
- periodically for preventive maintenance.
- when the operation of the transceiver or the connected equipment is not satisfactory.

To check the audio and transceiver functions, a handset (or similar accessory) should be connected to the set and a second radio station (on the same channel) must be available for call procedures.
No special tools are required for the routine test.

The routine test procedure is arranged in the following table, for the operating instructions see chapter 4.
Actions to be carried-out by the operator are given in steps with the correct results in the second column. In case a malfunction should be detected, the corrective actions to be taken are mentioned in the next paragraph (Trouble-shooting).

STEP	ACTION	RESULT
1	Switch-on the set and turn the rotary switch to 1. Wait till the continuous tone has stopped.	Last (or default) selected channel number and operational settings will be displayed.
2	Select successively the preset channels to be used and check their operational settings and radio frequency.	The operational frequency and presettings are shown on the display for the selected channel.
3	Select the channel (or frequency) on which another radio station is available.	The radio frequency for this channel is displayed with the operational settings.

STEP	ACTION	RESULT
4	Set-up a call to the other radio station, if necessary increase the power level. Check meanwhile the connected audio accessory (adjust the volume level if required).	After a response from the other station the connection is established.
5	Check if radio traffic on this channel is possible. Check the squelch function.	The SQ field is displayed when the squelch function is enabled.
6	Check the correct operation of the set in both directions and finish the call.	Radio traffic is possible.
7	If required, repeat the call procedure for a specific station to check the radio link involved.	See step 3...6 mentioned before.
8	Select a free channel and enter some (valid) frequency values to check the keyboard input.	The given digits will be displayed (from left to right) when keyed-in.
9	Check the display illumination by using the LAMP function: 0 = switched-off 1...3= switched-on (3 = max. brightness).	The brightness level of the display illumination is adjustable.
10	When the transceiver has passed the routine test, no further action is needed.	

5.6 Trouble-shooting

The following trouble-shooting procedures are given for the operator in case a malfunction should occur at start-up or during operation of the radio set.

Procedures are given for the following events.

a. Transceiver doesnot work at all

(i.e. no continuous tone and display contents after switching-on):

- Check the batteries. See par. 5.2 for replacing the batteries.

- Check the internal supply by means of the display illumination (use LAMP-function).
- Try switching the set off and then on again.

No result: higher level maintenance necessary.

b. No audio signal

- Replace the handset or headset by a spare one.

No result: higher level maintenance necessary.

c. No radio traffic possible

- Check if the connectors are free from dirt, dust or moisture. Clean if necessary.
- Check the antenna.
- Check the correct functioning of the PTT button.
- Check the radio frequency to be used for the relevant channel.
- The station being called is not operational on the required channel or frequency used. If possible, try to obtain a connection via another channel or to another station.

No result: higher level maintenance necessary.

CHAPTER 6

LIMITED STORAGE AND DESTRUCTION

6.1 General

This chapter contains instructions in case the equipment has to be placed in storage for a period of e.g. several months.
Furthermore instructions are given for destruction of the equipment to prevent enemy use.

6.2 Limited storage

Before storage, all equipment should be checked and cleaned. See chapter 5. If a defect is found that cannot be repaired at once report this to the field or depot maintenance.
The unit in question should be clearly marked with a label indicating the defect.
It is not permitted to use grease or corrosive preventive compounds to protect the equipment.
Storage should preferable be in buildings or sheds.
Storage in the open should be avoided.
Remove the batteries from the sets. The storage temperature may be as high as +70°C or as low as -40°C, the humidity up to 100%, so as a rule no special precautions are necessary.
Inspect the stored sets monthly for any unusual conditions such as accumulation of water, corrosion, mould growth or pilferage. Perform necessary repairs.
After removal from storage check the correct operation of the transceivers.

6.3 Destruction

Destruction of the radio set and related materiel, when subject to capture or abandonment in the combat zone, will be undertaken only when, in the judgement of the unit commander concerned, such action is necessary.
The set must be so badly damaged that it cannot be restored to an usable condition in the combat zone either by repair or cannibalization. Adequate destruction requires that all parts essential to the operation of the set be destroyed of damaged beyond repair.
However, when lack of time and personnel prevents destruction of all essential parts, priority is given to those parts most difficult to replace. The same essential parts must be destroyed on all like materiel so that the enemy cannot construct one complete set from several damaged ones.
Selection of particular methods of destruction requires imagination in the use of facilities at hand under the existing conditions.
The time available will be the major determining factor for the methods used in most instances when destruction of equipment is undertaken.

The tactical situation also will determine in what manner the destruction orders will be executed. If destruction is directed, due consideration should be given to observing appropriate safety precautions. The most generally applicable means of destroying the set are:

a. Mechanical. Smash the interior of the transceiver. Cut the cables in a number of pieces. Destructions by mechanical means requires axes, hammers, mallets, sledges, crowbars or similar implements.

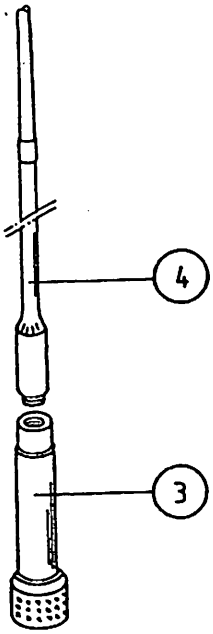
b. Burn. Burn the cables and technical manuals. Destruction by burning requires gasoline, oil, incendiary grenades, or other flammables.

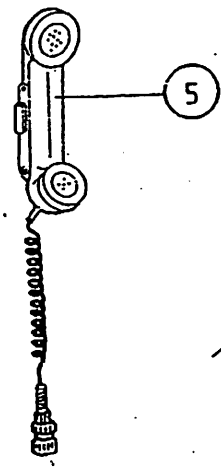
c. Explode. Use explosives, if available, to complete demolition or to cause maximum damage, before burning when the time does not permit complete demolition by other means. Powder charges, fragmentation grenades, or incendiary grenades may be used.

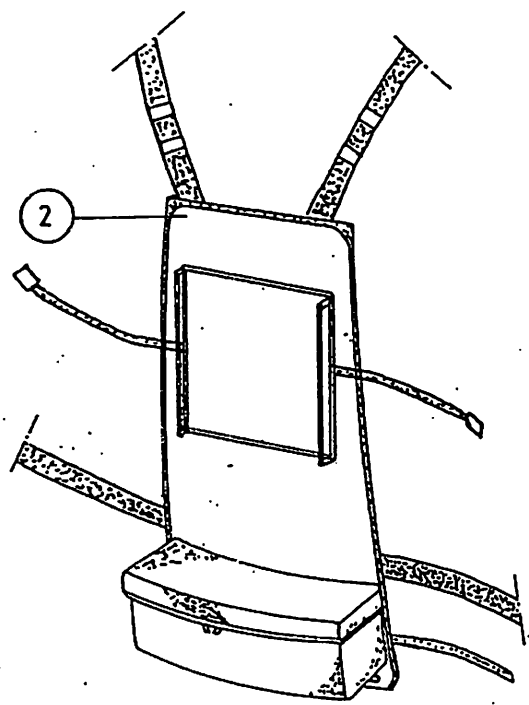
d. Gunfire. Destruction by gunfire includes rifles using rifle grenades. Under some circumstances handgrenades may be used.

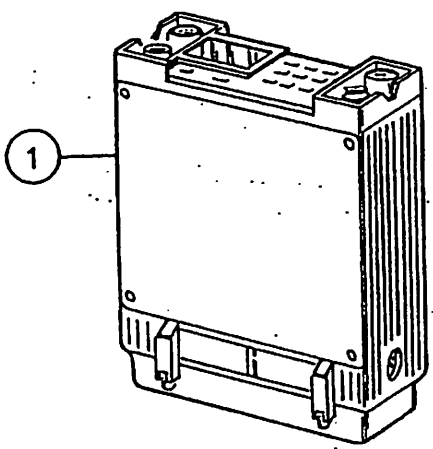
e. Dispose. Bury or scatter the destroyed parts, or throw them into nearby waterways.

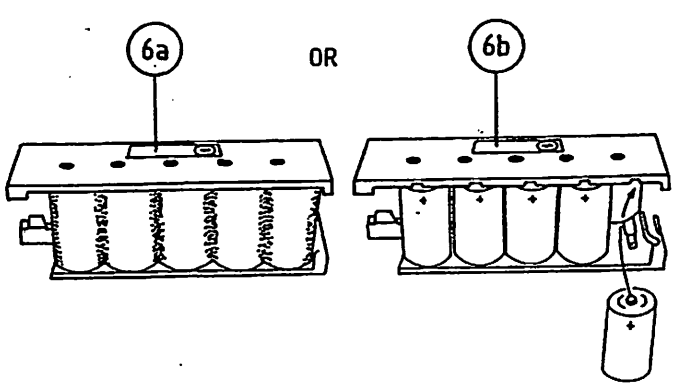
f. If there is no time for destruction, erase at least the preset channel data by turning the rotary switch to Z and simultaneously pressing the Z key.

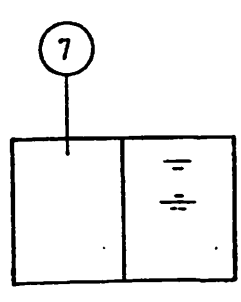




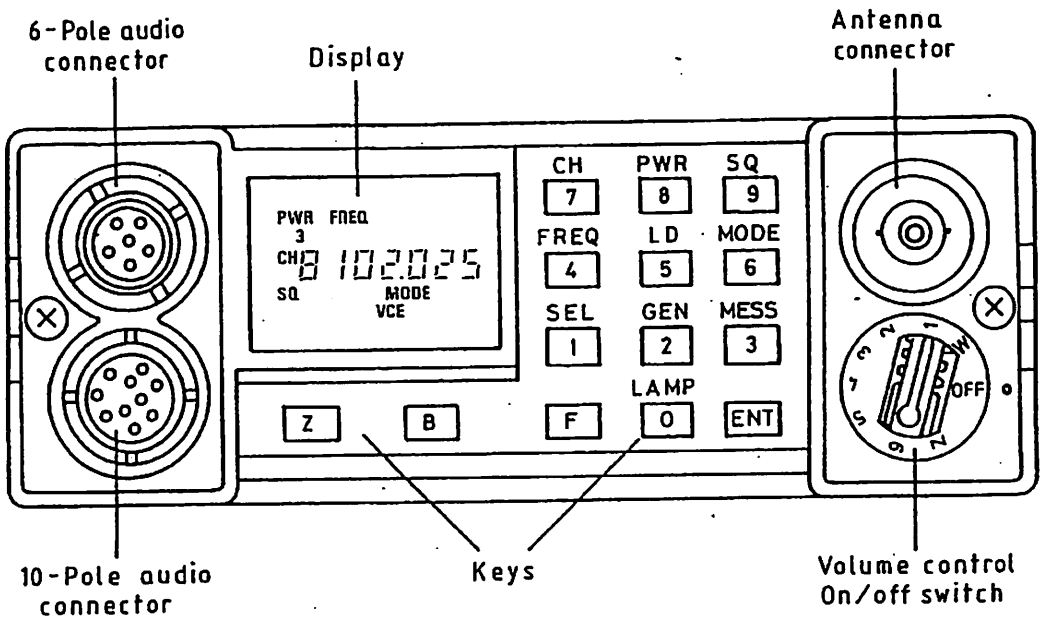




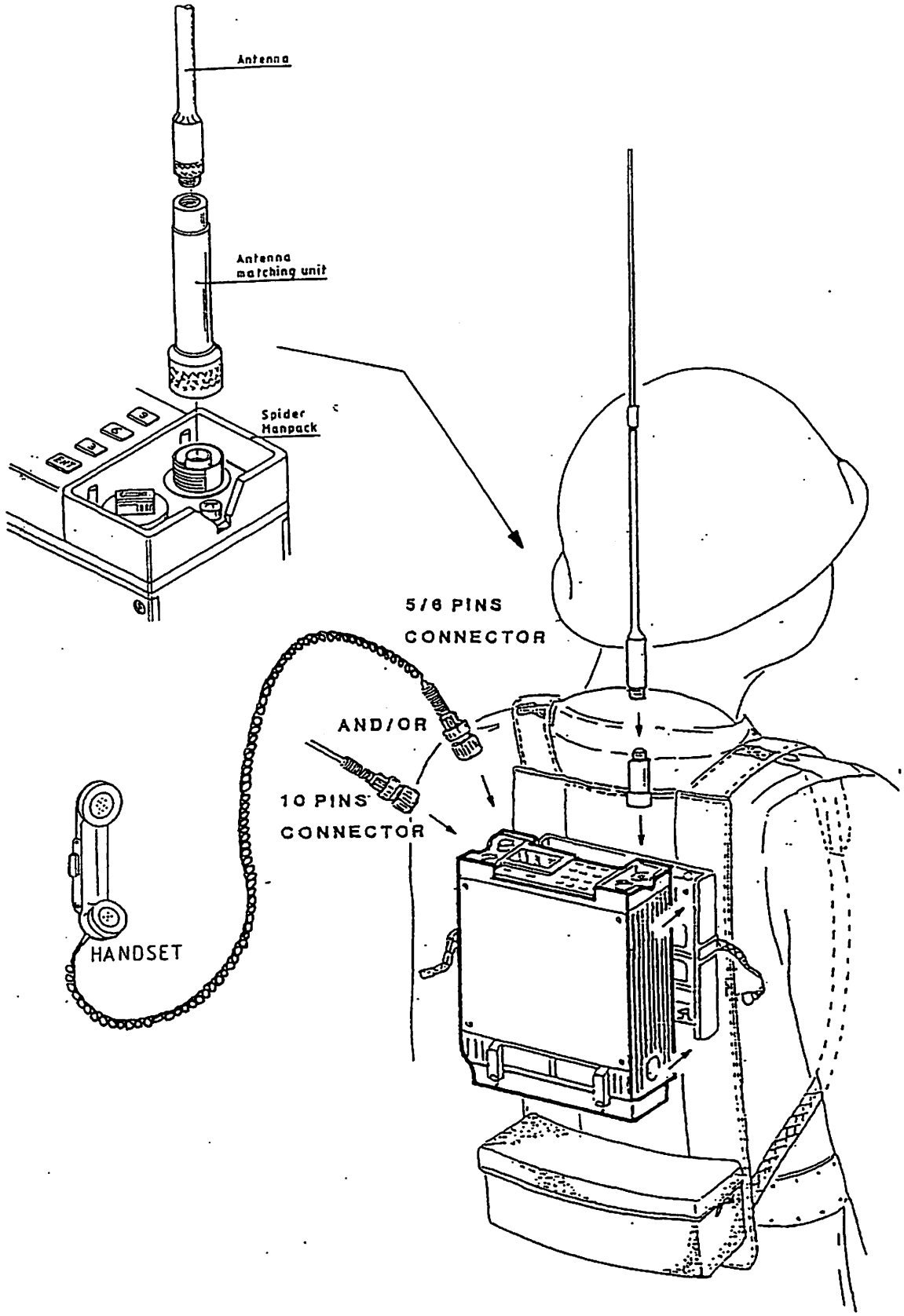


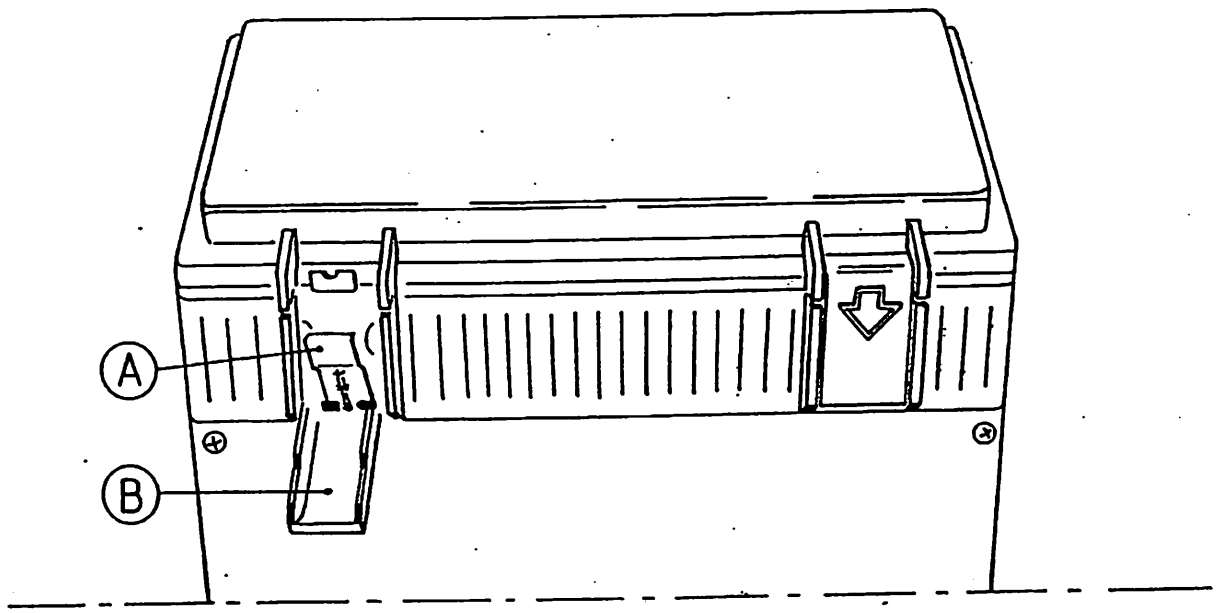


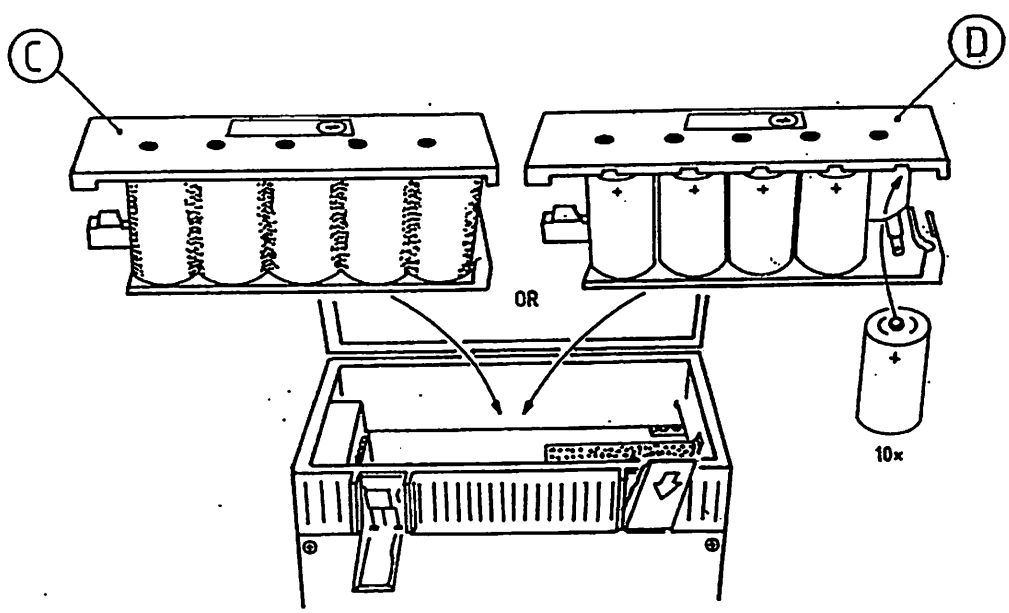
COMPONENT PARTS 891101



FRONT VIEW 891101


Antenna
Antenna matching unit
Spider Manpack
5/6 PINS CONNECTOR
AND/OR
10 PINS CONNECTOR
HANDSET


A
B


C
D
OR
10x