

SPIDER
MANPACK TRANSCEIVER

TYPE 9556 304 14800

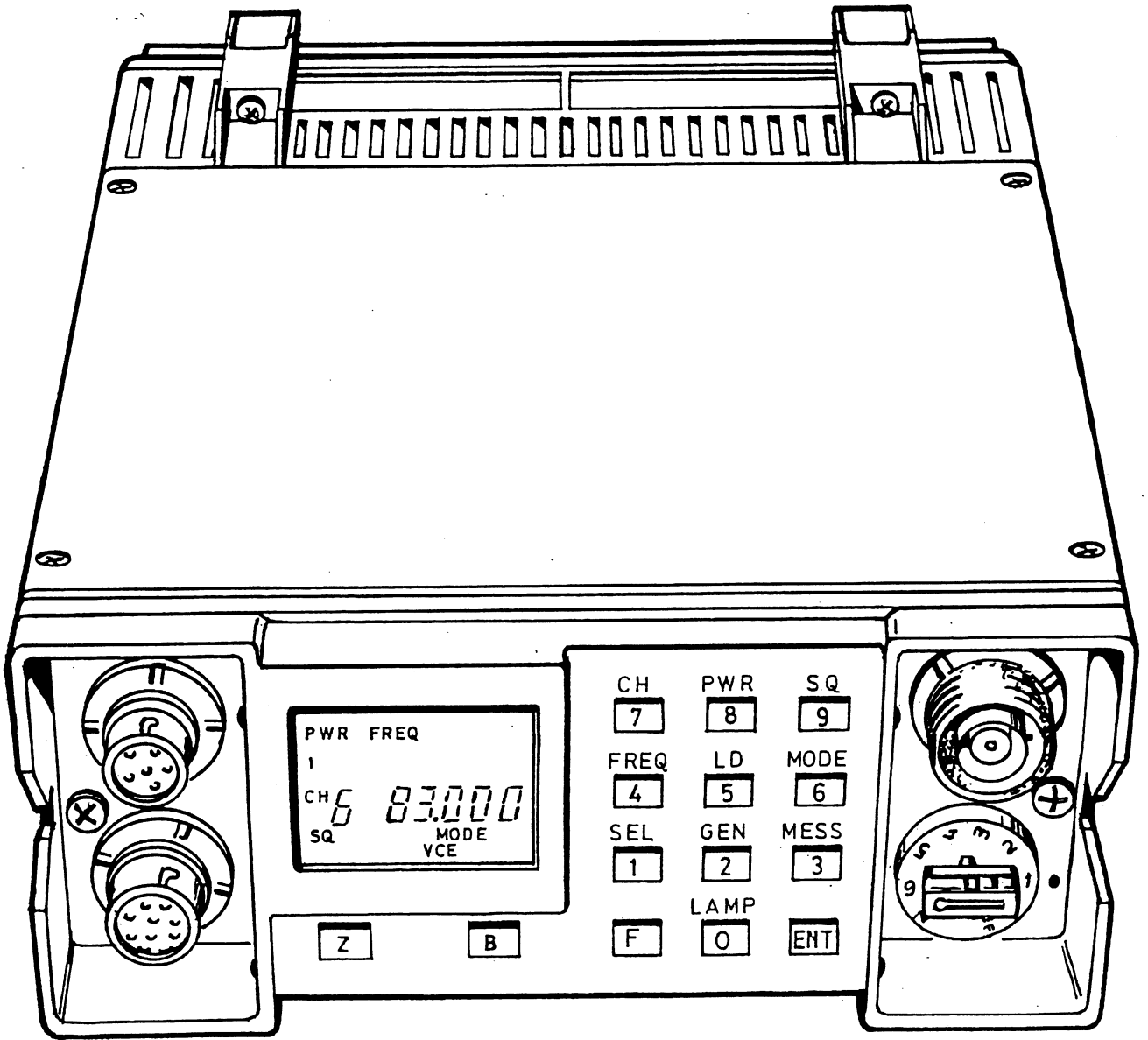
OPERATORS MANUAL

HGT5 - 2515e

DECEMBER 1988

PROVISIONAL





SPIDER MANPACK TRANSCEIVER



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CHAPTER 1 - GENERAL1.1 Introduction

The SPIDER Manpack is a transceiver supporting a number of pre-programmed channels in a tactical network. A typical application is given in diagram 1. The SPIDER Manpack is designed as a portable radio set which can be used in various operational modes for a given number of channels available to the operator.

A keyboard and display support the selection of preset channels and the programming of these channels. Because not all operators will be required to access all the facilities supplied by the transceiver, a layered user interface has been created.

This will enable easy access to the normal functions, while the more special or restricted functions (e.g. channel programming) are supported by specific access procedures.

Optional the Crypto/Data unit may be integrated with the radio set, providing the facilities for data transfer, encryption of voice or low-speed data, pre-coded messages and selective calling.

1.2 Functional summary

The basic mode for operation of the SPIDER Manpack transceiver is FM voice. Special modes are data and crypto voice or data, which are only available when the Crypto/Data unit is used.

The radio channel frequency may be selected or preset in steps of 25 kHz between 30 and 108 MHz. Up to eight channels can be preset and selected for use in a network.

Presetting is done by programming the frequency, RF power level, operational mode and functions to be used on these channels.

Modifications may be made during normal operation if required, e.g. to adapt the power level for transmission.

Another channel is available in FM voice mode only, to be used for transmit/receive operation on a frequency which can be freely selected via the keyboard.

The control functions for the SPIDER Manpack are provided on the front panel of the radio set (see diagram 3).

The selection of channels and functions and the entry of parameters and values can be done by means of a keyboard and display.

Most of the functions are combined as double or second function with the numerical keys on the keyboard. The display presents the power level, frequency, operational mode and functions being used for the present channel.

Furthermore an indication is given when the batteries are low or in case of a system malfunction.

Switching the radio set on/off and setting the audio volume level can be done with the rotary switch.

Besides the aerial connection, two connectors on the frontpanel provide the interface to various audio accessories or a retransmission cable in connection with another radio set.

A data interface for message transfer is provided when the Crypto/Data unit is part of the set.

The data interface provides also the facility to use a fill gun device for auxiliary parameter entry, including the loading and generation of crypto keys.

An extra connector is provided at one side of the battery compartment at the rear for external power supply or charging the internal batteries (see diagram 4).

This connector provides also the control interface for peripheral equipment to be connected.

1.3 Technical specifications

1.3.1 General

Radio frequency range	: 30 ... 108 MHz.
Total number of channels	: 3120 in steps of 25 kHz.
Number of preset channels	: 8 user programmable channels.
Carrier modulation	
Analog	: FM (Frequency Modulation).
Digital	: FSK (Frequency Shift Keying).
Audio frequency range (FM voice mode)	: 300 ... 3400 Hz.
Autonomous operating period (excluding the Crypto/Data unit)	: 10 hrs with Nicad batteries (transmit/receive ratio = 1/9).
Ambient temperature range	
Operating	: -30 ... +65°C.
Storage	: -40 ... +70°C.

Dimensions
 standard : 240 x 175 x 66 mm.
 with Crypto/Data unit : 240 x 175 x 82 mm.

Standard weight : 3.4 kg.
 (incl. Alk. batteries)

1.3.2 Transmitter

RF output power
 level 1...4, : level 1 = 0.02 W
 as indicated on : 2 = 0.2 W
 display: level 1...3 : 3 = 2 W
 via "PWR"-key, level 4 : 4 = 5 W
 with "B" (= Burn-through)
 key.

FM frequency deviation : nom. 6.5 kHz.
 (incl. 150 Hz squelch tone
 modulation)

1.3.3 Receiver

Aerial input sensitivity : 0.35 microvolts.

Adjacent channel
 selectivity : 60 dB.

Squelch facility : tone squelch on/off for
 use.

AF signal/noise ratio : 30 dB.

1.3.4 Interfaces

The SPIDER Manpack provides the interface connecting points as listed below for the following interface connectors:

- a. Aerial BNC connector.
- b. Audio 6-pole connector.
- c. Audio 10-pole connector.
- d. Supply/Remote connector.

The connector points may apply to various functions for signal transfer, control, selection and supply. These functions are given in brief for the corresponding points.

- a. Aerial BNC connector
-

50 Ohms coax = Aerial in/output for the radio
 frequency range 30 - 108 MHz.

b. Audio 6-pole connector

- A = Common ground.
 B = Telephone output: max. $2V_{rms}$ in 500 Ohms.
 C = Transmit contact (PTT input).
 D = Microphone input: - whisper 0.5 - 50 mV_{rms} .
 - normal 2 - 200 mV_{rms} .
 - retransmission 500 mV_{rms} .
 E = Squelch contact (open collector output).
 F = Channel preset selection: an external
 connected resistor (e.g. in the hand-set) may
 define the preset channel to be selected:
- 470 kOhms (2%) = channel 1
 - 180 kOhms = channel 2
 - 100 kOhms = channel 3
 - 68 kOhms = channel 4
 - 47 kOhms = channel 5
 - 33 kOhms = channel 6
 - 22 kOhms = channel 7
 - 15 kOhms = channel 8
 - no resistor (open) = channel selection via
 keyboard.

c. Audio 10-pole connector *)

- A = Common ground.
 B = Telephone output (see b.).
 C = Transmit contact.
 D = Microphone input (see b.).
 E = Squelch contact.
 F = "NOGO" information (active low).
 G = not used.
 H = Peripheral address: an external (built-in)
 resistor may define the address as
 implemented for the peripheral equipment to
 be connected:
- 470 kOhms (2%) = Retransmission cable.
 - 180 kOhms = Message Exchange
 Device.
 - 68 kOhms = Boardnet.
 - 33 kOhms = Fill gun device.
 - no resistor (open) = Hand- or head-set.
- J = +12 Volt supply to be used for peripheral
 equipment.
 K = "Data mode" information (active low).
- *) The V24/28 data-interface is provided when the
 Crypto/Data unit is available and the data
 mode is selected.

d. Supply/Peripheral connector

A = External supply ground	}	Internally connected if external supply is present with the correct polarity.
B = External supply input (+10 ... 15 Volt for optional use)		
C = Battery recharge current input (max. 100 mA).		
D = Data signal ground	}	Data interface (V24/28, 2400 Bd) for control of peripheral equipment.
E = Data signal output		
F = Data signal input		
G = +5 Volt supply for peripheral use.		
H = Peripheral address, to be defined by an external resistor included in the peripheral connection.		
J = Common ground.		

1.3.5 Power supply

Internal *)	: 10 batteries type R14, Nicad (rechargeable) or Alkaline (to be replaced).
External	: 10 ... 15V DC, max. 2A to be supplied via the rear connector.

*) Re-charge facility by connecting a battery charger via the rear connector, the battery charge current should be max. 100 mA.



CHAPTER 2 - TECHNICAL DESCRIPTION2.1 General

This chapter contains a concise technical description of the SPIDER Manpack transceiver. The basic functions of the radio set are given in a block diagram, including the interfaces. The mechanical construction is illustrated in several views, indicating the controls and connectors.

2.2 Description of the block diagram (see diagram 2)

On the block diagram the basic functions are given for the transfer of voice/data signals and the control of the transceiver. The signal path shown on the diagram illustrates the normal operational mode: receiving in FM voice mode. An optional module added to the set may provide the crypto/data functions. The description is given for the following functions:

- a. Audio Input/Output circuit
- b. Frequency Synthesizer and Modulator
- c. Receiver and Demodulator
- d. Transmitter
- e. Processor control
- f. Supply regulator
- g. Crypto/Data circuit (optional).

a. Audio Input/Output circuit

The Audio Input/Output circuit provides the interface for the audio connectors (6-pole and 10-pole).

The interface for the 10-pole connector will be switched to the Crypto/Data circuit when the optional data mode is selected.

Amplifiers and buffers will bring the audio in/output signals to the required level as set by the volume control.

The Audio Input circuit will limit the AF signal for modulation.

A 750 Hz audio signal is provided for alarm indications or warnings to the audio interface.

The audio in/output signals are transferred to/from the Modulator/Demodulator circuits, directly (FM voice mode) or via the Crypto/Data circuit (optional crypto voice mode).

b. Frequency Synthesizer and Modulator

The radio frequency on which the transceiver is operating is defined by the preset channel selection or the entry of a frequency value via the keyboard. The required frequency signals are excited in the Frequency Synthesizer, using PLL techniques and a reference oscillator. The Frequency Synthesizer is programmed for the selected carrier frequency by means of the processor control (Ch./Freq. Select).

The Modulator provides frequency modulation with the signal from the Audio Input circuit (FM voice mode) or the Crypto/Data circuit (optional crypto/data mode). In FM voice mode a 150 Hz squelch tone is added to the modulating signal. The modulated carrier signal is passed-on to the Transmitter via the RF Preselect filter.

c. Receiver and Demodulator

The aerial input signal comes in via the RF Preselect filter which is used for either transmit or receive.

A frequency signal being programmed from the Frequency Synthesizer will select the required channel for the Receiver.

For demodulation a FM discriminator is used to obtain the signal from the received channel, with or without detection for tone squelch.

When the squelch facility is enabled (Squelch ON) the detected 150 Hz tone will activate the squelch contact for the audio connection.

Depending on the operational mode, the received signal is passed-on to the Audio Output circuit (FM voice mode) or to the Crypto/Data circuit (optional crypto/data mode).

d. Transmitter

The Transmitter will provide the aerial output signal when the transmit-contact (PTT) from the audio or the request-to-send (RTS) from the data interface is activated.

The power level can be set in three steps. For adverse conditions an extra high level may be set via a specific key (Burn-through).

Transmission will be inhibited by the processor control on the moment a new channel/frequency is selected, during specific data load/generate procedures or when a system failure occurs.

e. Processor control

The processor control in the transceiver system is performed by the Processor & Memory. Functions for control are provided by the keyboard and display.

Besides control, the status of various functions is obtained to monitor the system functioning. A built-in test facility (BITE) provides the "go/nogo" information for the processor. Furthermore information may be obtained from the interfaces about the type of equipment being connected or the preset facility built-in. Information about mode selection and system status is provided for the audio/data interface.

The memory contains the required processor software and provides the storage of preset data for the various channels. The preset data will be stored in a non-volatile memory to be kept for use.

f. Supply regulator

When switched-on the Supply regulator provides the voltages for supply of the transceiver circuits, to be taken from the internal battery supply or an external connected supply. Supply is also provided to the interface connections for peripheral equipment.

When Nicad batteries are employed re-charging is possible via the Supply/Peripheral connector. This connector includes also the interface for peripheral control.

g. Crypto/Data circuit (optional)

The Crypto/Data circuit may be added as an optional module to the SPIDER Manpack transceiver. The crypto/data functions can be selected from the keyboard via the processor control (Mode Select).

The Crypto/Data unit provides the following modes for the preset channels:

- data (high-speed data with transparent transfer).
- crypto voice (voice-encoded data with encrypted transfer).

- crypto data (low-speed data with encrypted transfer).

The Crypto/Data unit includes the memory to store additional parameters for data traffic facilities and crypto keys needed for encryption (crypto voice/data).

Data for these parameters/keys may be entered from the keyboard or loaded from a fill gun device. A zeroise function provides the facility to erase any parameters or crypto keys stored in memory.

For the data mode a V24/28 interface is provided via the Audio/Data connector, supporting the signals RTS, RFS and CI.

For the crypto voice mode the incoming and outgoing voice signal is provided via the Audio Input/Output circuit.

To adapt the analogue voice signal for encryption it is converted into digital data and vice versa by means of delta-modulation and -demodulation. For crypto data the same encryption applies as for crypto voice.

Furthermore the Crypto/Data unit includes a modem for signals to/from the Modulator/Demodulator circuits.

The modem converts the digital crypto/data signal into a frequency shift-keying (FSK) signal and vice versa.

This FSK signal now can be used for modulation of the carrier signal to be transferred.

2.3 Mechanical construction (see diagram 7)

The SPIDER Manpack transceiver is built-up of the following parts:

- front panel with controls and interface connectors;
- case for accomodation of the printed circuit boards;
- battery compartment with cover and the supply/peripheral connector at the rear.

By removing the lower side cover the optional Crypto/Data unit can be mounted as part of the set. The connections for this unit are provided inside the transceiver and can be made via flat/coax cables.

The transceiver is primarily constructed for use as a portable radio set. For this purpose a specific carrying harness is provided (see diagram 8).

CHAPTER 3 - OPERATOR CONTROL FUNCTIONS3.1 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 radio transceiver are given in chapter 4. Procedures for programming of the preset channels are given in chapter 5. Specific procedures for the optional crypto/data functions are given in Appendix A, in case the Crypto/Data unit is added to the set.

3.2 Volume/Switch control

The rotary switch mounted on the front panel provides the following control functions (see diagram 3):

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

3.3 Keyboard functions (see diagram 3)

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	Turn selective call facility on/off for data traffic.
2/GEN	Two	Generate parameter/crypto data in transfer with a fill gun device.
3/MESS	Three	Turn message transfer facility on/off for data traffic.
4/FREQ	Four	Select a frequency value for the present channel.
5/LD	Five	Load parameter/crypto data from a fill gun device when connected or from keyboard input.
6/MODE	Six	Set operating mode for the selected preset channel.
7/CH	Seven	Select a given channel number.
8/PWR	Eight	Set the RF power level for transmission.
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.

KEY (numeric/function)	NUMERIC VALUE	SECOND FUNCTION
ENT	-	Enter the function input data (being given after the "F" key) into the unit: the function is taken for control and any 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 radio set.

. Separate keys

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

- B - Burn-through key, to activate an extra high RF power level (indicated by "4") for transmission during adverse conditions.
- Z - Zeroise key, only enabled when the rotary switch is set to "Z" simultaneously; when activated this key provides the erasure of crypto key values and preset data stored in the set.

3.4 Display functions

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

The display functions consist of two main elements:

- an alpha-numeric element for general display of values, e.g. channel number and frequency;
- a collection of individual fields, each of which will be used for specific display of a selected mode, function or parameter as listed below.

. Alpha-numeric display

The alpha-numeric display consists of seven characters.

The first character left presents the selected channel number.

The remaining characters may present the frequency (max. 6 digits) or specific values for crypto/data functions concerned.

. Display fields

PWR	FREQ	MESS	LOAD
1234		SEL	GEN
CH	0	100000	
SQ		NOGO	MODE
F		CR	VCE DATA

The individual fields may be displayed to indicate the corresponding mode, function or parameter being selected. A field is displayed either for the time that a function procedure or selection is in progress, or for the time that a function or parameter has been selected.

Furthermore some fields may flash to indicate a specific state, e.g. a received call or an alarm situation.

The following fields are available, with their meaning when energized for display.

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.
MESS	Message transfer facility is turned-on for transmission or parameter entry for this facility is in progress. When flashing a message has been received.
SEL	Selective call facility is turned-on for transmission or parameter entry for this facility is in progress. When flashing a selective call is being received.
LOAD	A load procedure has been initiated or is in progress for parameter/crypto data.
GEN	A generate procedure has been initiated or is in progress for parameter/crypto data. When flashing no fill gun device is connected.

FIELD	MEANING
CH	Channel field, placed just before the leftmost character for display to indicate the channel being selected.
SQ	Squelch facility is turned-on for the receiver function. When flashing a signal with squelch tone is received.
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: - flashing indicates a non-fatal fault (e.g. batteries low). - continuous-on indicates a fatal fault (e.g. frequency synthesizer PLL out-of-sync).
MODE	Mode field, parameters to be keyed-in for the mode selection are 1...4. Associated fields will indicate the selected traffic type (see next fields plus NOTE).
VCE	"MODE 1" is selected, traffic type is voice mode: normal voice with FM transfer.
CR VCE	"MODE 2" is selected, traffic type is crypto voice mode: encoded voice with encrypted transfer.
CR DATA	"MODE 3" is selected, traffic type is crypto data mode: low-speed data with encrypted transfer.
DATA	"MODE 4" is selected, traffic type is data mode: high-speed data with plaintext transfer.

NOTE: The crypto/data modes (MODE 2 ... 4) must be supported by the Crypto/Data unit being integrated with the set.
If a non-supported mode is selected the input will be ignored.
If a crypto/data mode is selected when this unit is in alarm, the corresponding mode field will flash. The mode will not be taken until an acceptable mode is selected.

3.5 Audible indications

For audible indications a 750 Hz signal generator is present in the unit.

These indications are given to inform the operator about special events or give a warning in special situations.

Tones for indication may vary in duration or intervals and are given only to the audio plugs on which no data terminal or fill gun device is connected.

The following types of tones may be given to indicate the corresponding event or situation.

. Continuous tone

- After switching-on during initialization of the internal circuits at start-up. The tone is given until the radio set is ready for operation.
- On selection of a parameter (e.g. another channel or frequency) which causes the radio to be non-operational for a short time. The tone is given until the radio is ready to operate using the selected parameters.
- On occurrence of a fatal error. The tone is given where possible and accompanied by display of the "NOGO" field.

. Repeating tone of 250 msec (with 750 msec pause)

- On reception of a message. The repeating tone is given until the message is accepted and accompanied by display of a flashing "MESS" field and the received message number.

. Once a tone of 250 msec

- On reception of a selective call being addressed to this radio station. The tone is accompanied by display of a flashing "SEL" field, any included message number and the sender address.

. Twice a tone of 250 msec (with 250 msec pause)

- On starting a transmission when a selective call is going-on between two other radio stations on the same channel.
The tones are given before transmission starts.

CHAPTER 4 - OPERATING INSTRUCTIONS4.1 General

This chapter provides the instructions for basic operation of the SPIDER Manpack transceiver in normal voice mode.

For radio traffic one free channel is available and up to eight preset channels, in so far as these channels have been programmed for implementation in an operational network.

The instructions given for preset channel selection presume that the channels to be used have already been implemented.

Basic operation of the radio transceiver requires the connection of an audio accessory equipped with a switch/contact (PTT) to enable transmission.

Possible connections for peripheral equipment are given in the next paragraph.

4.2 Peripheral connections

The following peripheral equipment may be connected to the radio set.

The possible connections are listed below for the corresponding interface connectors.

For the connecting points to be used see par. 1.3.

. Aerial BNC connector

- Standard plug-on antenna, mounted via the antenna matching unit with a 50 Ohms wide-band matching network built-in (see diagram 5).
- Other 50 Ohms aerial connections providing transmission/reception in the radio frequency range 30 ... 108 MHz.

. Audio 6-pole connector

- Simple audio accessories like hand- or head-set.
- Audio accessories with audio volume control and/or channel preset selection built-in, fixed to one channel or to be switched for more (see NOTE).
- Radio remote control system, providing control of the radio traffic via a field wire connection.

NOTE: On connection of an audio accessory with built-in preset selection, this will take precedence over that in the set (i.e. the channel selection via the keyboard will be disabled).

. Audio 10-pole connector

- Simple audio accessories like hand- or headset.
- Inboard network, e.g. harness or intercom.
- Retransmission cable.
- Data equipment with audio FSK modem.

NOTE: Apart from simple accessories like hand/headset, the equipment for the Audio 10-pole connector provides a peripheral address for the set. This address will inform the set about the type of equipment being connected.

. Supply/Peripheral connector (see NOTE)

- External power supply (incl. re-charge facility).
- Peripheral equipment to be controlled.

NOTE: These are optional connections.

4.3 Start-up

The radio set can be switched-on by using the following procedure (actions are placed in the first column, supplementary remarks in the second):

Set rotary switch to position W, 1...6 as required (W = whisper mode, see par. 3.2).	- A continuous tone will be heard until the unit is ready for operation.
--	--

After start-up the display will show the last (or default) selected channel number with the corresponding frequency value, functions and parameters.

For the display indications see par. 3.4.

For audible indications see par. 3.5.

When start-up is not correct see par. 6.5 for trouble-shooting.

4.4 Keyboard procedures

The required function procedures for control of the transceiver are in general provided by a sequence of keys to be selected from the keyboard (see par. 3.3). Key selection sequences for the various functions are given in the following paragraphs.

Key inputs to be given for functions and additional parameters or values are placed between square brackets.

Where applicable, the possible range is given for selection of parameters and values to be entered.

The keyboard actions to be taken for the following procedures are given in the first column, with the key inputs placed in sequence one below the other. Supplementary remarks are given in the second column.

NOTE: If a key selection sequence is not completed after 10 seconds since the last key activation, the function procedure involved will be quit and the foregoing input discarded.

4.5 Channel selection

Use the following key selection sequence:

[CH]	- Key-in the required channel number:
	0 = free channel,
[0...8]	1...8 = preset channels.

The selected channel number is indicated by the leftmost character on the alpha-numeric display. A continuous tone is heard until the new channel is ready for use.

When the free channel is selected (number 0 in FM voice mode only), the functions and parameters for operation are taken and displayed as last selected or entered for this channel.

When a preset channel is selected (number 1...8), the functions and parameters for operation and display are taken from the preset data stored in memory for this channel.

Mind that the keyboard channel selection is disabled when a device with preset selection is connected to the set.

4.6 Frequency selection

Use the following key selection sequence (normally to be used only for the free channel, see NOTE):

[F]	- Key-in the required frequency value:
	4 or 5 digits have to be entered from left to right, e.g. when 98.2 MHz is required key-in "9-8-2-0", the last digit will be completed by the set!
[FREQ]	
[30.000 ... 107.975]	
[ENT]	

The frequency value being selected is indicated on the alpha-numeric display, a previous value will be removed.

A non-valid key input will be ignored.

During the frequency selection and entry procedure a continuous tone is heard until the new frequency is ready for use.

After entry the selected value will be stored as the operating frequency for the present channel.

When an incorrect value is keyed-in, the input can be cancelled (before entry) by keying-in "F" again.

To enter the correct value the key selection sequence should be started again.

NOTE: In case of a preset channel the entered value will be taken as the new frequency for the preset data involved!

4.7 Select power level

The power level for transmission can be selected during normal operation (i.e. without affecting any preset data for the present channel).

Use the following key selection sequence:

[PWR]	- Key-in the required power level:
	1 = 0.02 Watt
	2 = 0.2 Watt
[1...3]	3 = 2 Watt.

The selected power level is indicated in the corresponding display field.

NOTE: For adverse conditions an extra high power level (5 Watt) may be selected by using the "B" (= Burn-through) key. This level will be indicated on display as level "4".

4.8 Squelch facility

The squelch facility for reception can be turned-on or -off during normal operation (i.e. without affecting any preset data for the present channel). Use the following key selection:

[SQ]	- Using this key will in turn enable/disable the squelch detect function. Turn-on will activate the corresponding display field.
------	--

4.9 Display illumination

The brightness level for illumination of the display screen can be selected for the time that a keyboard procedure is used (see NOTE).

Use the following key selection sequence:

[LAMP] - Key-in the required
brightness level:
0 = switched-off,
[0 ... 3] 1 ... 3 = switched-on
(3 = max. brightness).

NOTE: The display illumination is automatically switched-off when after 10 seconds since the last key activation no more key input is given.

4.10 Reception

The transceiver is normally enabled for reception when operating on the selected channel (i.e. frequency) in the network involved.

The received signal will be indicated by a flashing "SQ" field when a squelch tone is detected, provided the squelch facility is turned-on.

4.11 Transmission

When a call has to be given, the transmission must be enabled by the PTT (push-to-talk) button or its equivalent contact.

This button or contact should be provided by the audio accessory connected to the set.

The power level for transmission is as selected or preset for the channel involved.

When the normal power level is not sufficient (e.g. during adverse conditions), an extra high level may be set using the "B" (= Burn-through) key.

4.12 Retransmission procedure

Retransmission may be needed when a call has to be transferred from one channel or carrier frequency to another and vice versa.

For retransmission two radio sets are required, to be interconnected via the retransmission cable.

The following items have to be considered for the retransmission procedure:

- Select for each radio set the required channel or frequency value, corresponding to the retransmission link to be made. The frequency values for retransmission should be more than 10% different from each-other, according to the network rules.
- Turn-on the squelch facility for both sets to enable the receive/transmit operation in both directions.
- Set the RF power level for each set as required for the actual conditions in the field.



CHAPTER 5 - PROGRAMMING OF THE PRESET CHANNELS5.1 General

This chapter provides the instructions for programming of the preset channels by means of the keyboard and display functions. The correct information needed for programming should be provided by the liaison-officer responsible for operation of the radio network.

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

- Frequency value.
- Power level for transmission.
- Squelch facility on/off.
- Operating mode.
- Crypto key (required for encryption).

NOTE: The operating mode and crypto key are only used when the optional Crypto/Data unit is part of the set. For the specific Crypto/Data functions, the use of a fill gun device and the procedures involved see Appendix A.

5.2 Programming procedure

The procedure for programming of a preset channel is as follows:

- a. Select the preset channel number (1 ... 8) to be programmed.
- b. Enter the required preset data as given below.
- c. After correct entry the preset data is stored in memory for the preset channel involved.

During channel selection and data entry a continuous tone may be heard until the transceiver is ready for the new channel or preset data to be used. For general keyboard procedures see par. 4.4 in the previous chapter.

5.3 Entry of preset data

The data for programming of the preset channel being selected can be entered by using the following key selection sequences for the functions involved.

. Frequency value

[F] - Key-in the required
frequency value for
[FREQ] this channel, ciphers
should be entered from
[30.000 ... 107.975] left to right (see
[ENT] par. 4.6).

. Power level

[F] - Key-in the required
power level for this
channel:
[PWR] 1 = 0.02 Watt
2 = 0.2 Watt
[1...3] 3 = 2 Watt
[ENT]

. Squelch facility

[F] - Turn squelch facility
on/off for this
[SQ] channel ("SQ" will be
displayed when
[ENT] turned-on).

5.4 Storage and use of preset data

The preset data being entered for a preset channel will be stored in non-volatile memory. The given pre-settings will be displayed and taken for operational use as soon as the channel involved has been selected (either at start-up or by the operator).

Settings for the power level and the squelch facility may be altered during normal operation without affecting the given preset data (see par. 4.7 and 4.8).

CHAPTER 6 - OPERATOR'S MAINTENANCE6.1 General

The maintenance of the SPIDER Manpack to be carried-out by the operator is mainly preventive maintenance.

The operator is responsible for keeping the equipment in good condition if possible and for checking the correct functioning of the transceiver.

Checking can be done while operating the set, by reading the system status from display at regular intervals and by performing a routine test periodically.

For corrective maintenance the operator may be allowed to replace any malfunctioning accessories or connecting cables involved.

In case of a malfunctioning or defective radio set, the operator should call for higher level maintenance or ask for replacement by a spare set.

6.2 Preventive maintenance procedure

It is recommended that the following items are carried-out by the operator periodically (e.g. daily or at the start of an operating period).

1. Check that all parts of the set and the connected equipment are present.
2. Check the cables and connections for the equipment involved.
Connectors and plugs should be free of damage.
3. Check the power supply for the set, when switched-on a flashing "NOGO" field may indicate that the batteries are low. Replace or recharge the batteries if necessary (see par. 6.7 for replacement).
4. When operational, check the correct functioning of the set by reading the display functions for the channel being selected.
A continuous "NOGO" field indicates that the frequency synthesizer loop is out-of-sync.
5. Check that the set and its equipment are clean, dry and free of damage (see par. 6.3).
The set should be water-tight, inspect the seal of the battery cover for damage if necessary (see par. 6.7).
6. If necessary, check the set with the connected equipment further by performing the routine test procedure (see par. 6.4).

6.3 Cleaning the radio equipment

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.

6.4 Routine test procedure

A routine test may be performed in the following events:

- once the radio set is being installed and put into operation.
- periodically for preventive maintenance.
- when functioning of the set or the connected equipment should give cause for testing.

To check the audio and transceiver functions, a handset (or similar accessory) should be connected to the set and another 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 results for correct functioning. In case a malfunction should be detected, the corrective actions to be taken are mentioned in the next paragraph (Trouble-shooting).

<u>STEP</u>	<u>ACTION</u>	<u>RESULT</u>
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.

<u>STEP</u>	<u>ACTION</u>	<u>RESULT</u>
2	Select successively the preset channels to be used and check their operational settings and radio frequency.	The operational frequency and pre-settings are given on 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.
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 clear at the required power level. Check the squelch facility if possible.	The "SQ" field must be displayed to turn-on the squelch facility and will flash when a squelch tone is received.
6	Check the correct operation of the set in both directions and finish the call.	
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 the free channel (= number 0) 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 should be set according to the given parameters.

<u>STEP</u>	<u>ACTION</u>	<u>RESULT</u>
10	When the radio set has passed the routine test, no further action is needed.	If further maintenance procedures are required, see par. 6.6.

6.5 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. Radio set doesnot start-up

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

- Check the internal batteries or the external power supply when provided for the set. See par. 6.7 to open the battery compartment and reach for the battery-pack.
- If a connection is made to the Supply/Peripheral connector, check that no short-circuit is made for the +5V supply output (connector point G). A short-circuit at this point will switch-off the internal supply circuit.
- Check the internal supply by means of the display illumination (use LAMP-function). Try switching the set off and then on again if necessary.

b. No audio signal

-
- Check the corresponding audio connections (see par. 1.3).
 - Check the correct functioning of the audio accessory connected to the set.

c. No connection obtained

-
- Check the antenna installation for the set.
 - Check the correct functioning of the PTT button to be used.
 - Check the radio frequency to be used for the corresponding channel.
 - The station being called is not operational on the required channel or frequency used. If required, try to obtain a connection via another channel or to another station.

d. External preset/address selection doesnot function

- Check the required connection from the peripheral equipment to the corresponding connector (see par. 4.2).
- Have the correct resistor value checked (higher level maintenance), which should be included in the peripheral connection to provide the required selection (see par. 1.3).

e. Retransmission doesnot start

- Check the retransmission cable in connection with other radio equipment.
- Check that the squelch detect function is enabled at both sides and that the tone squelch from the receiving side provides the transmit contact for the transmitting side.
- Check the selected frequencies to be used at both sides.

6.6 Further maintenance procedures

When in the radio set any malfunctions or defects are found which cannot be solved by the operator's maintenance, procedures should be started for further maintenance. In this case the operator is responsible to call for a higher maintenance level and for correct transport of the set if necessary.

Accessories and connecting cables may be replaced by spare (or equivalent) parts if required.

When a spare set is available the defective set may be replaced by a good-working one. In this case the fresh radio set has to be installed and made operational by the operator as required for the operating network involved.

6.7 Replacement of the batteries (see diagram 6)

The cover of the battery compartment is fixed by means of two clamps at one side.

Each clamp consists of an inner (A) and an outer (B) part, as illustrated on the diagram.

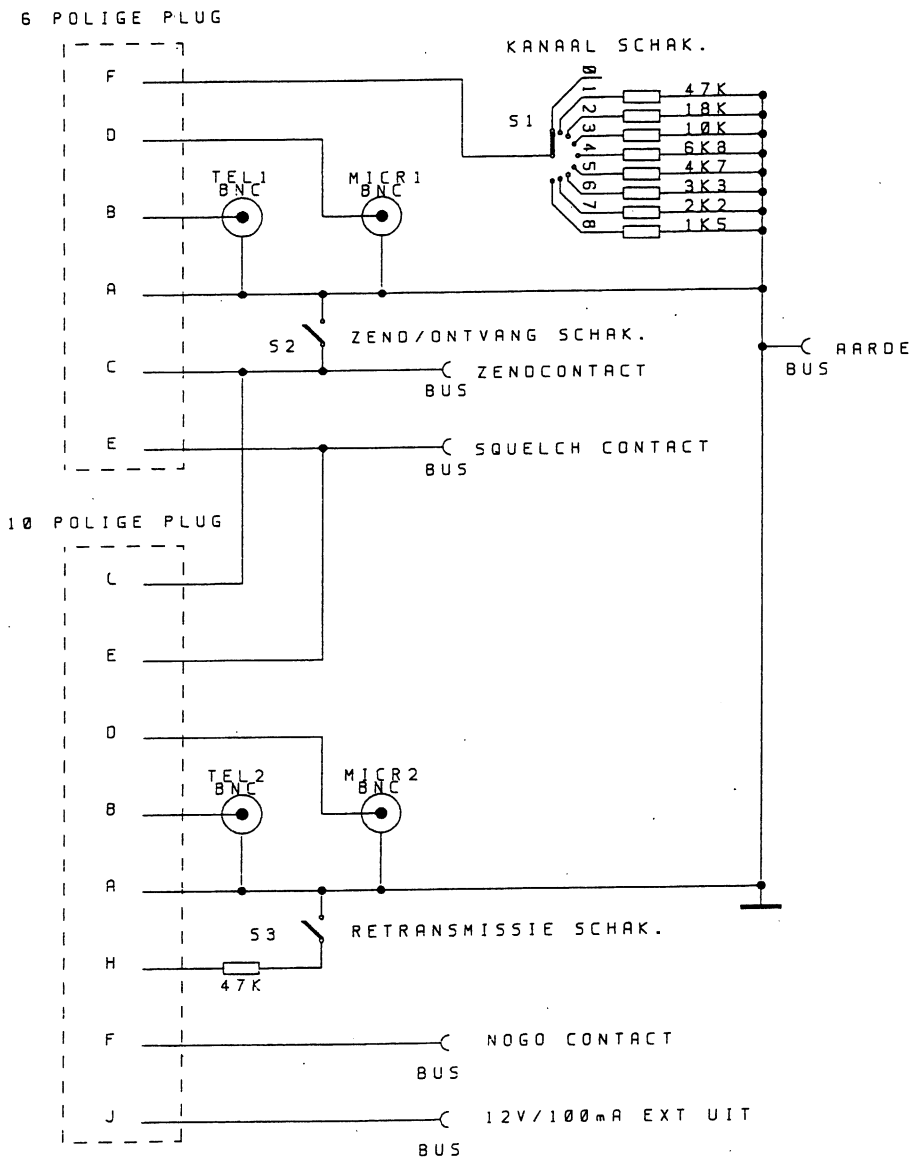
To loosen the clamps, clip-down "B" (arrow indication) and clip-off "A" (keep the cover tightly pressed if necessary).

When the cover is opened, the battery-pack can be taken out by removing the battery holder (C).

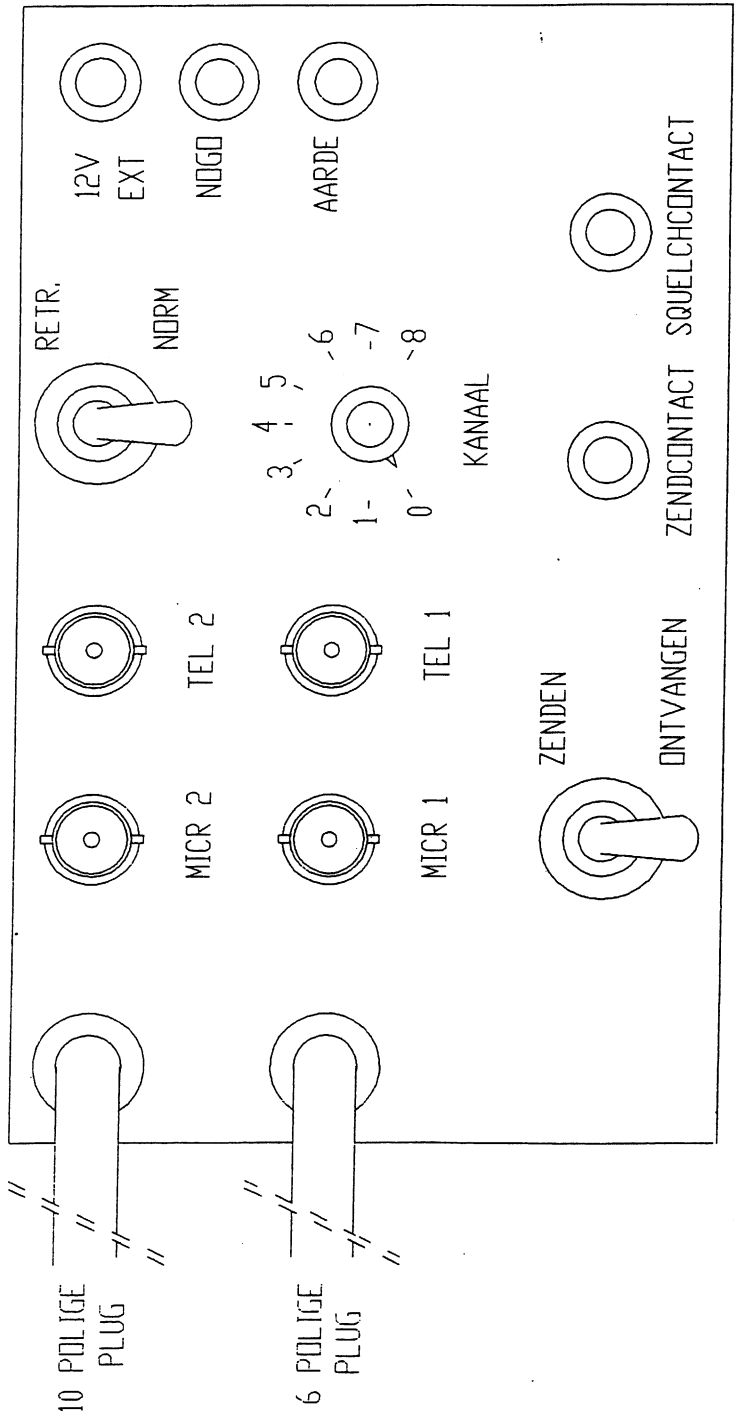
Replace the battery-pack or the batteries as illustrated and place "C" again in the set.

To close the cover, follow the given procedure in the reverse way (mind the seal of the cover).





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CHAPTER 1GENERAL1.1 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: <ul style="list-style-type: none"> . low power 20 mW . medium power 200 mW . high power 2W . burn-through power 5W
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 2OPERATOR CONTROL FUNCTIONS2.1 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, to 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 3PREPARING FOR USE3.1 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 4OPERATION4.1 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.

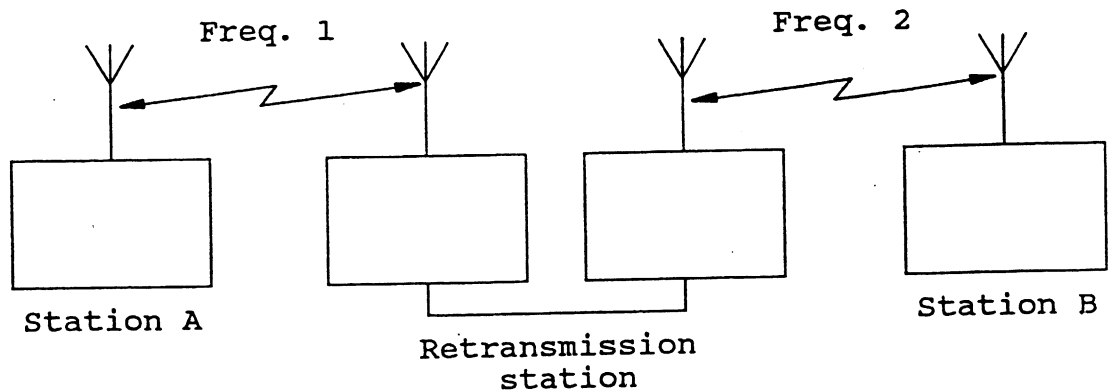


Fig. 4-1

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 (= Zeroize) 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 5OPERATORS MAINTENANCE5.1 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).

<u>STEP</u>	<u>ACTION</u>	<u>RESULT</u>
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 pre-settings 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.

<u>STEP</u>	<u>ACTION</u>	<u>RESULT</u>
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 6LIMITED STORAGE AND DESTRUCTION6.1 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 preferably 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 or damaged beyond repair.

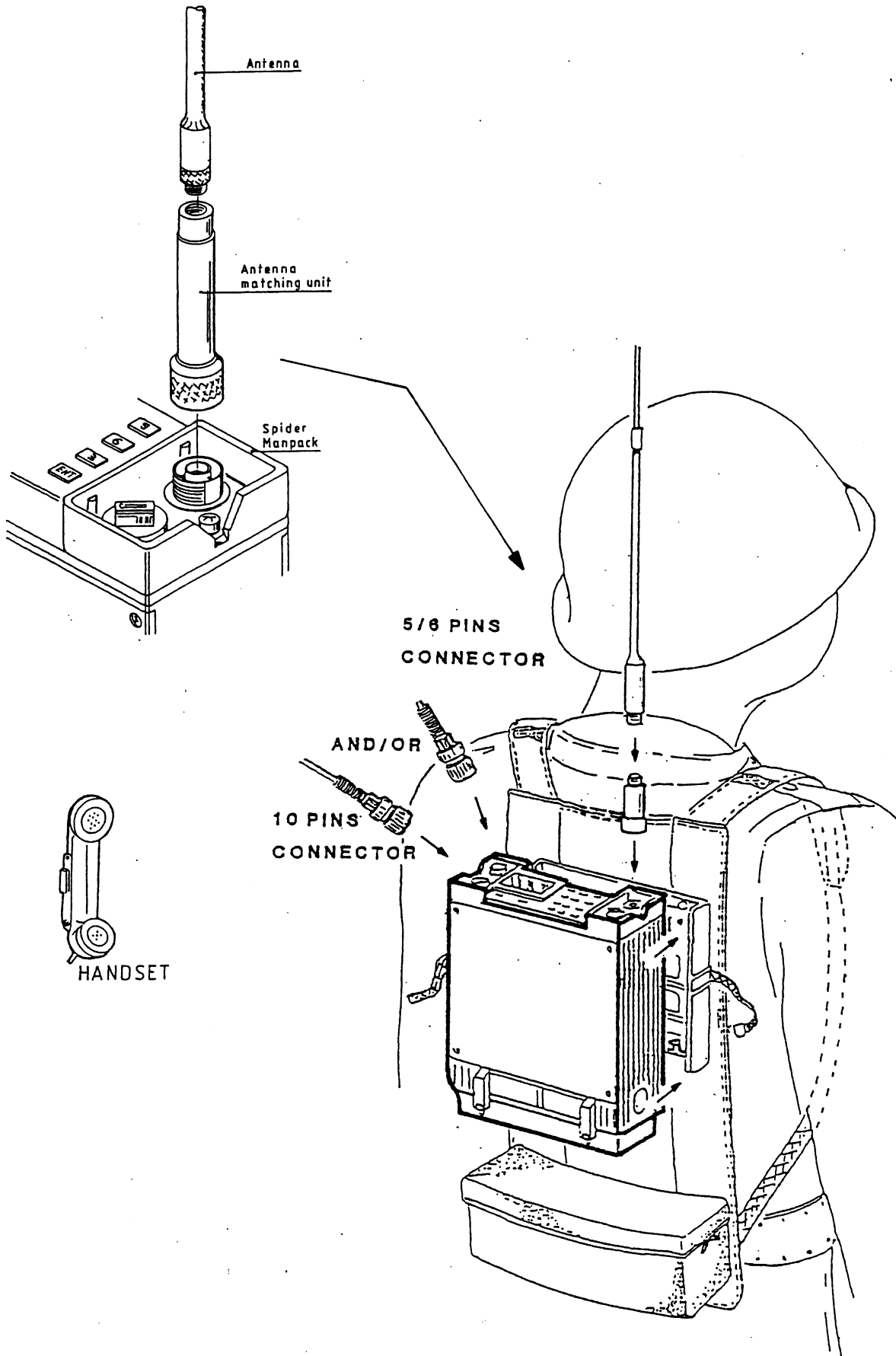
However, when lack of time and personnel prevents destruction of all essential parts, priority is given to those parts most difficult to replace. The same essential parts must be destroyed on all like materiel so that the enemy cannot construct one complete set from several damaged ones.

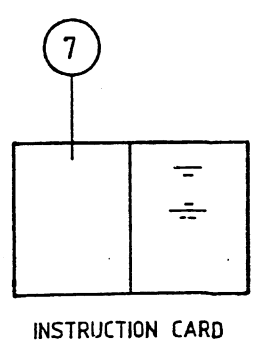
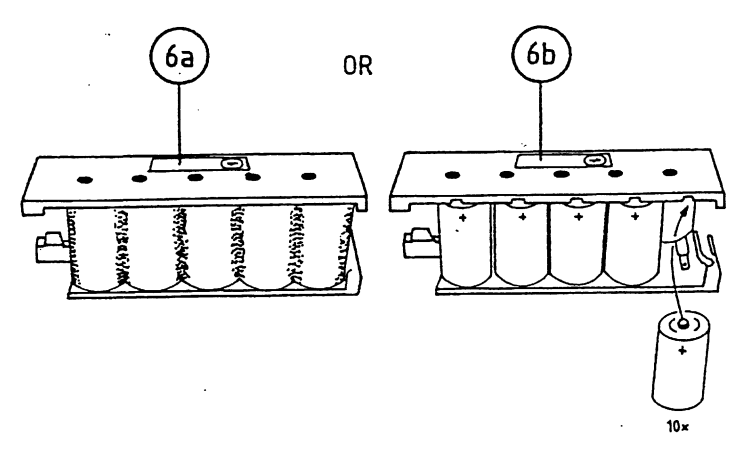
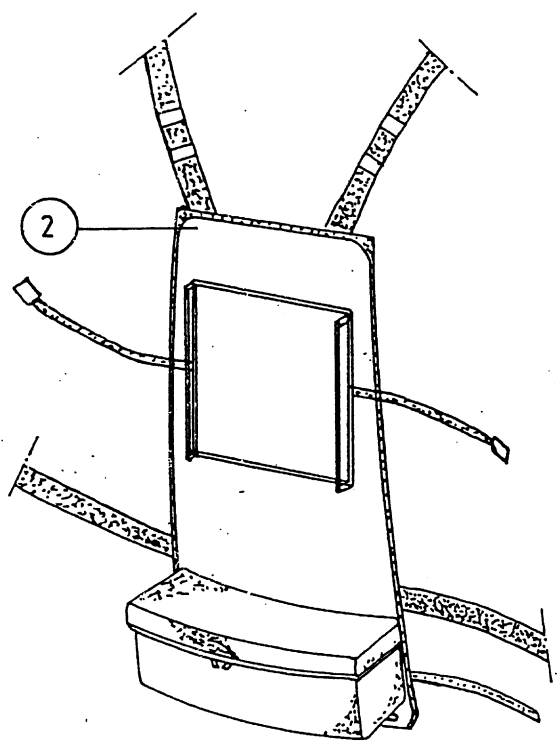
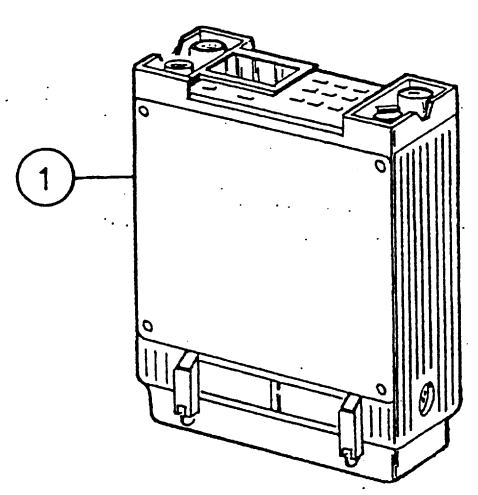
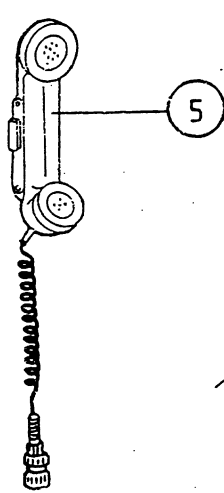
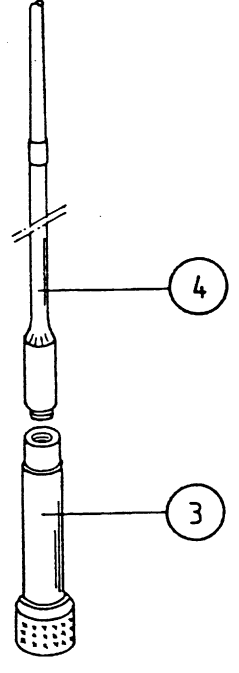
Selection of particular methods of destruction requires imagination in the use of facilities at hand under the existing conditions.

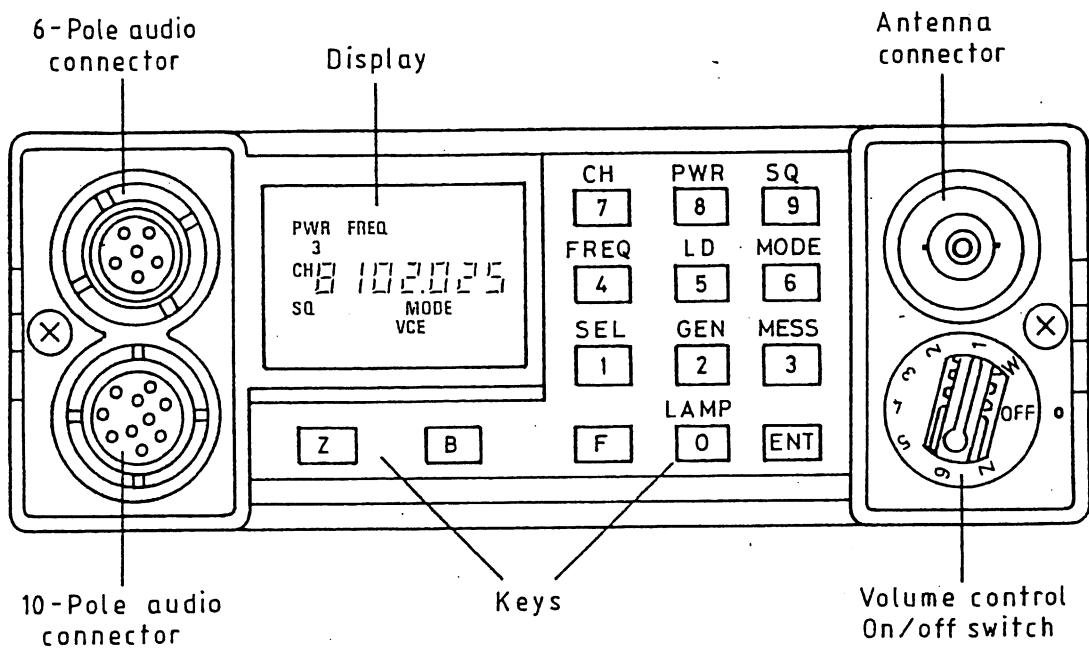
The time available will be the major determining factor for the methods used in most instances when destruction of equipment is undertaken.

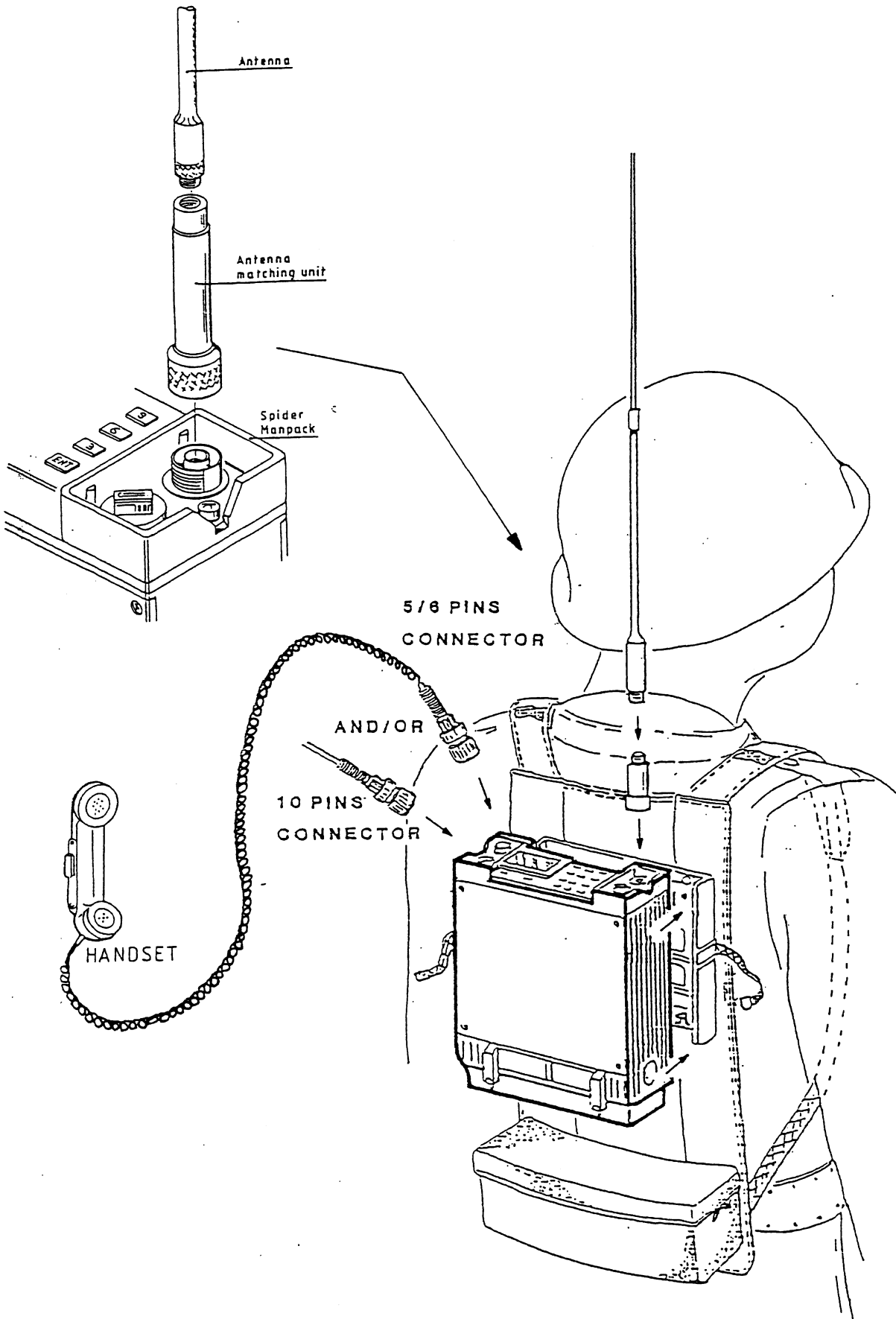
The tactical situation also will determine in what manner the destruction orders will be executed. If destruction is directed, due consideration should be given to observing appropriate safety precautions. The most generally applicable means of destroying the set are:

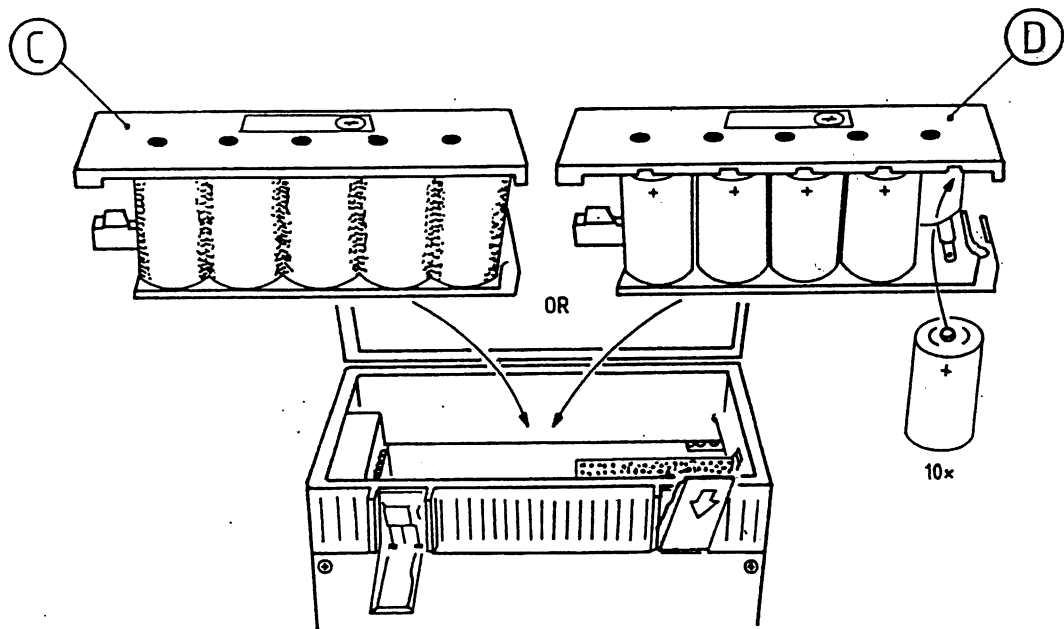
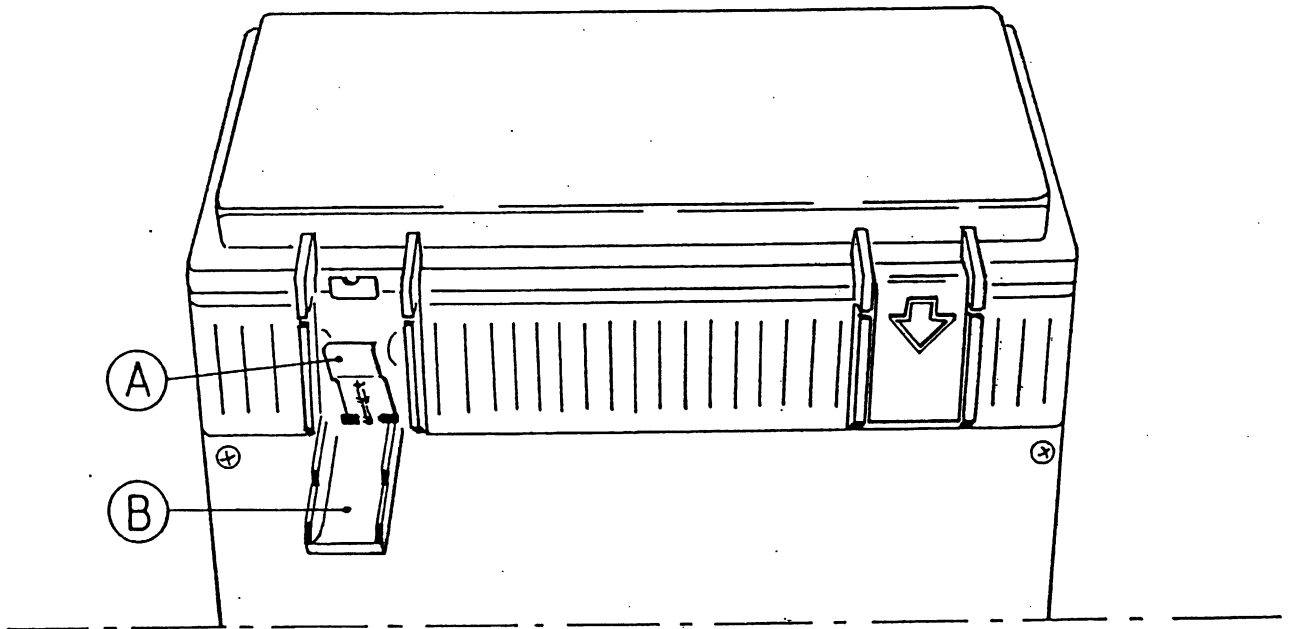
- a. Mechanical. Smash the interior of the transceiver. Cut the cables in a number of pieces. Destructions by mechanical means requires axes, hammers, mallets, sledges, crowbars or similar implements.
- b. Burn. Burn the cables and technical manuals. Destruction by burning requires gasoline, oil, incendiary 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.

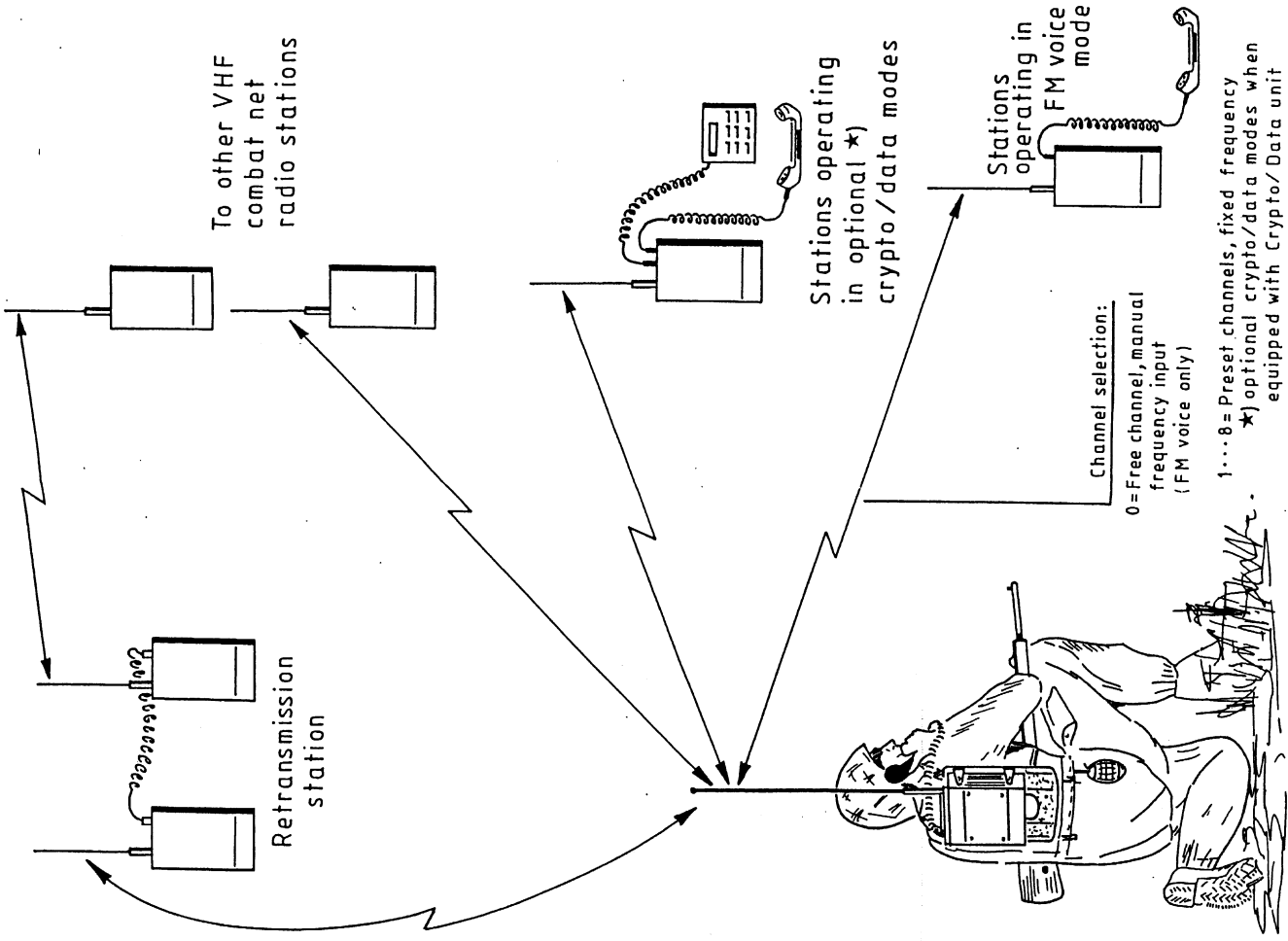


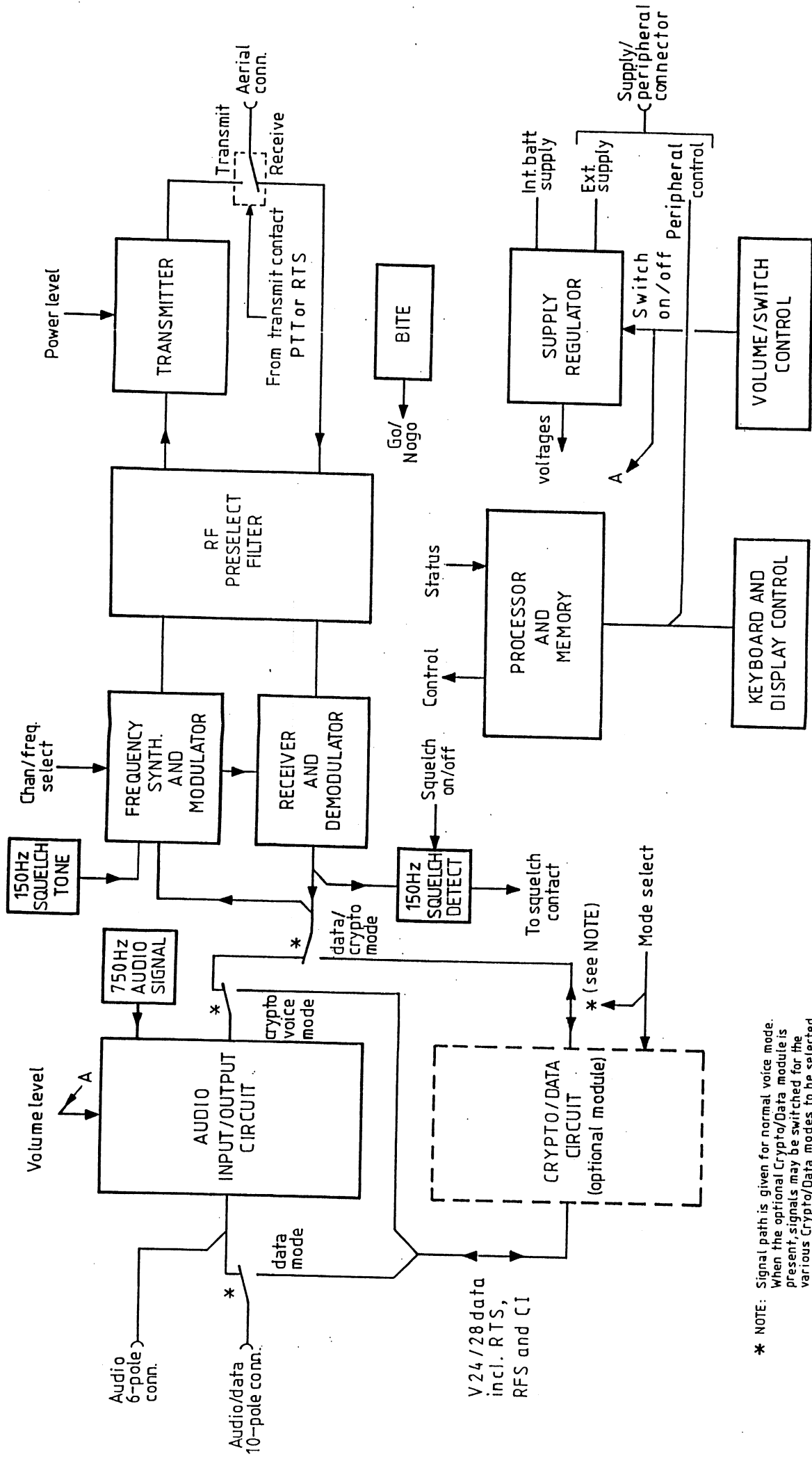




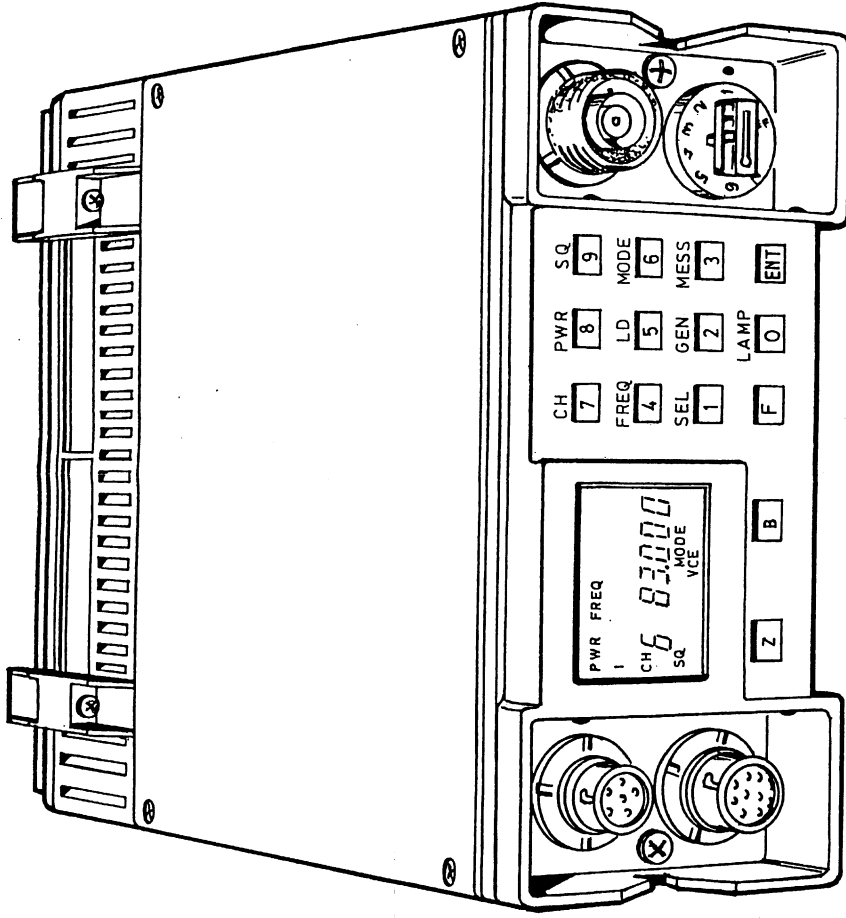


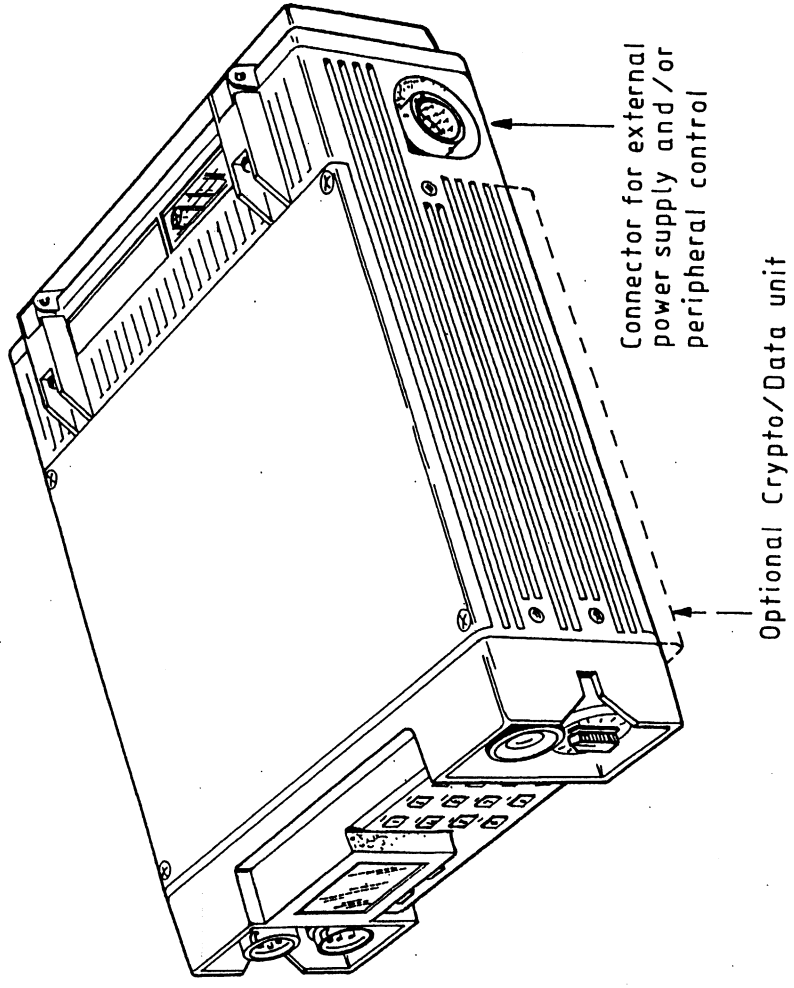


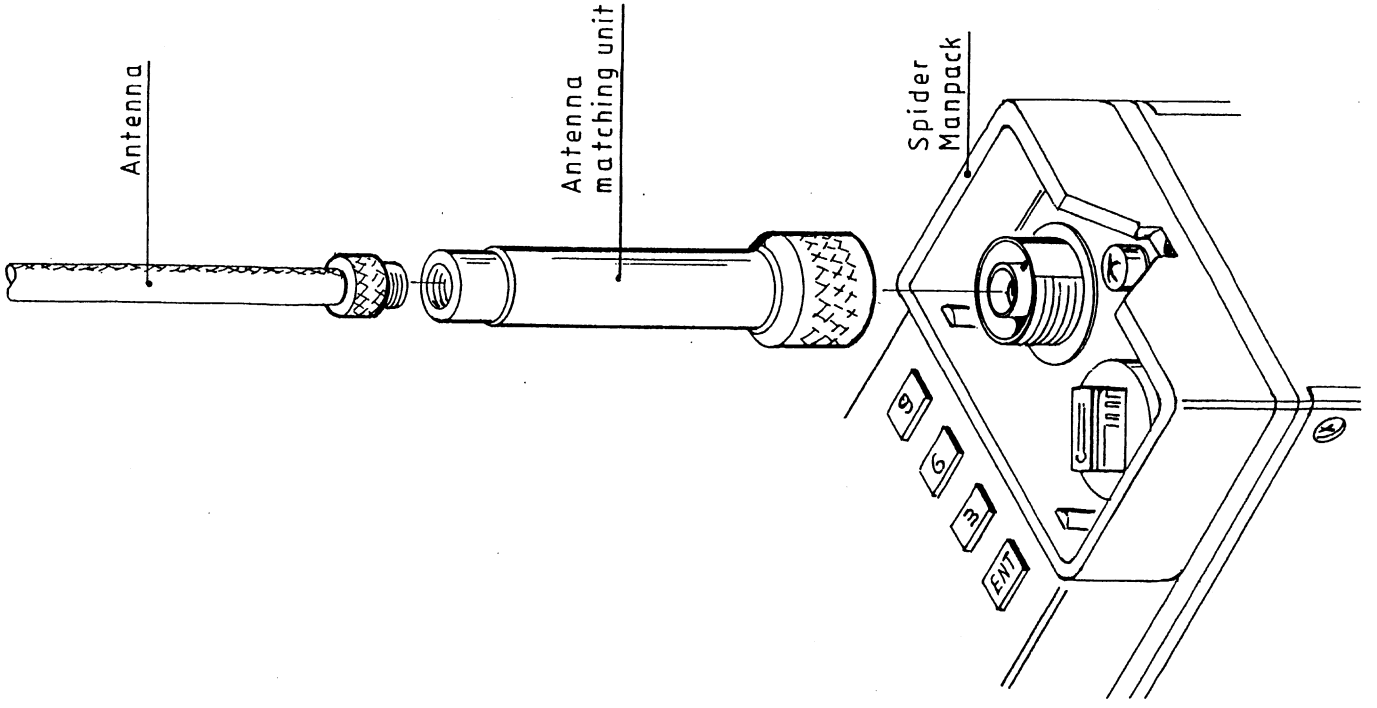


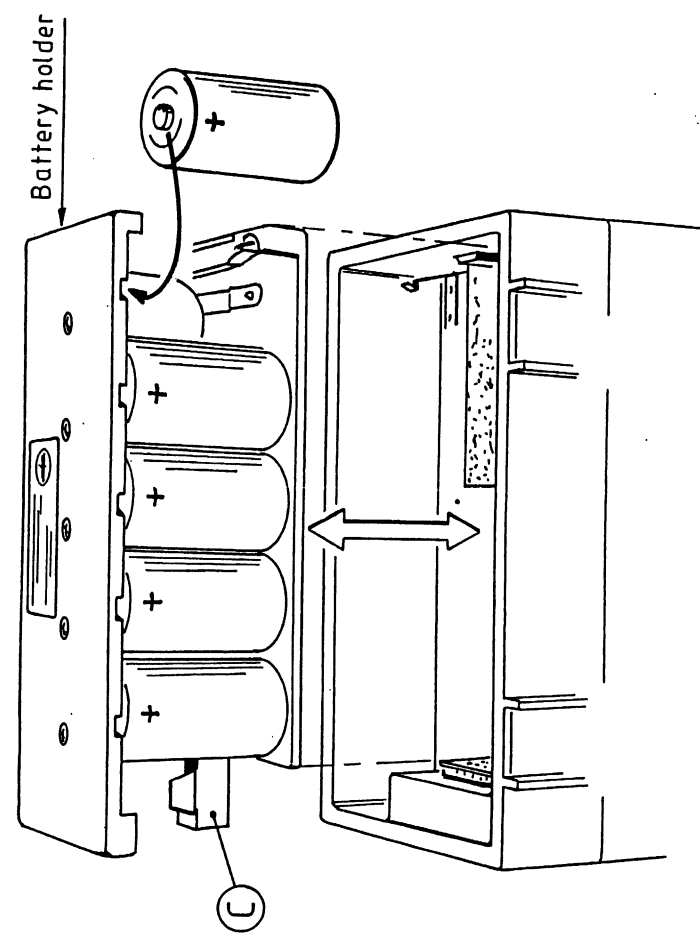
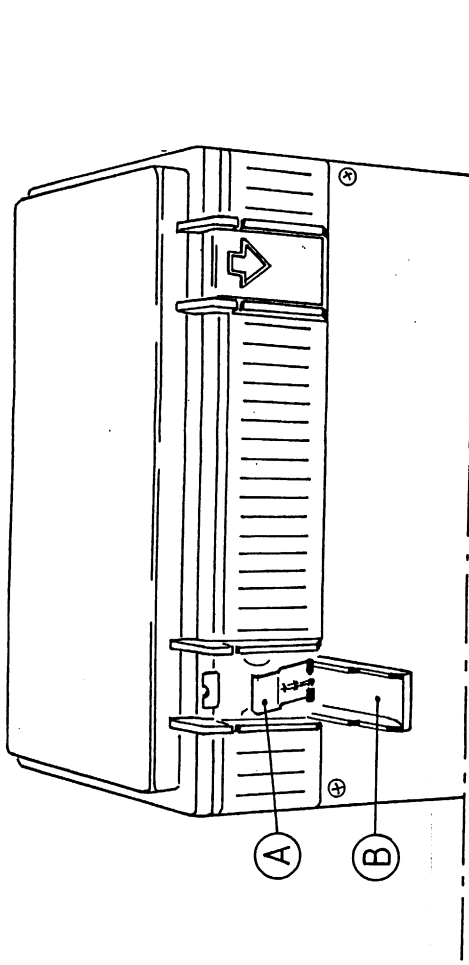


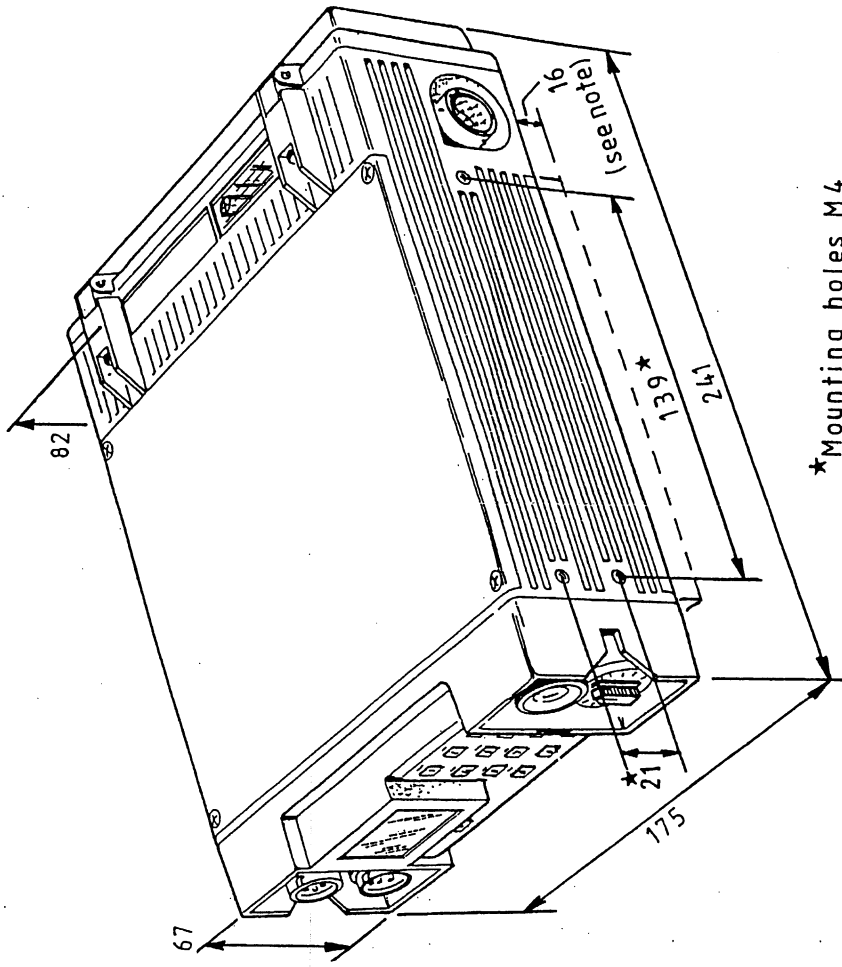
* NOTE: Signal path is given for normal voice mode. When the optional Crypto/Data module is present, signals may be switched for the various Crypto/Data modes to be selected. Switching is provided by the mode selection via the processor control.







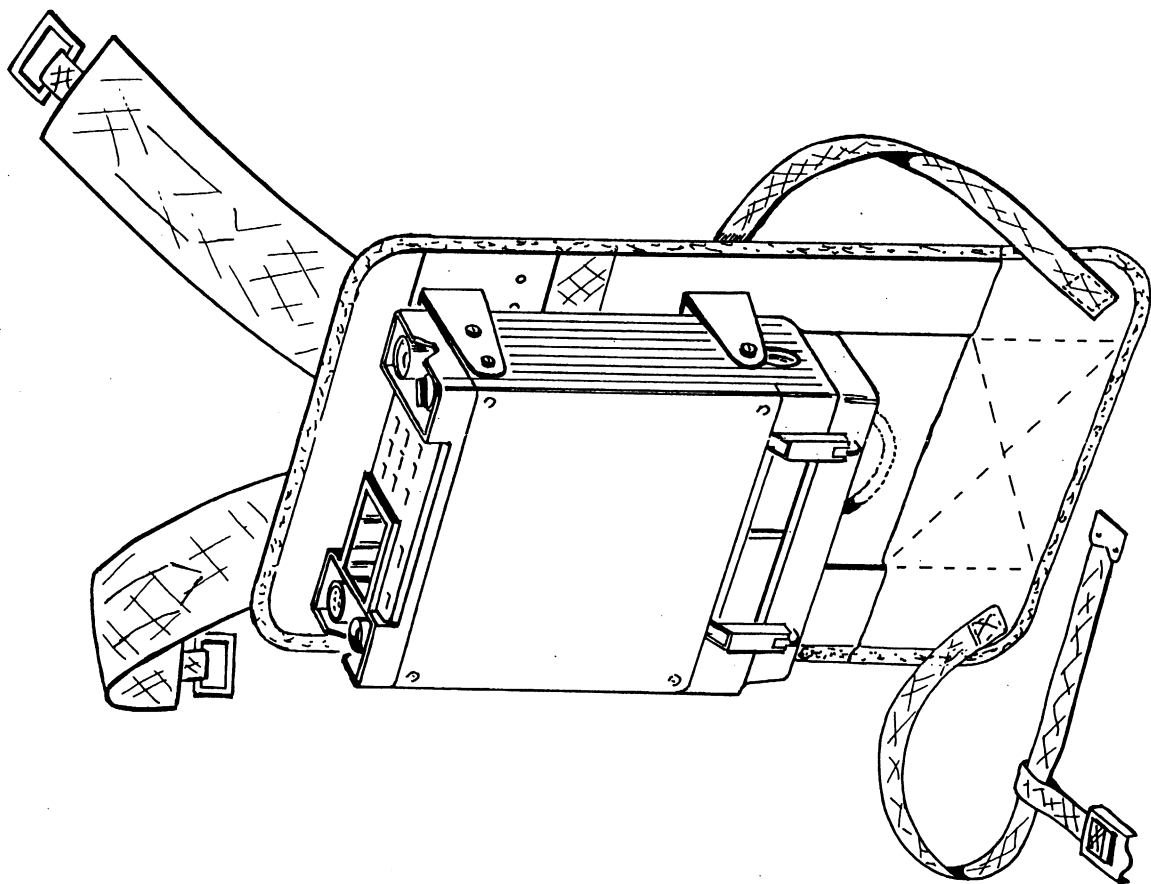




* Mounting holes M4

(Dimensions in mm)

Note: When equipped with the Crypto/Data unit
the lower side cover is extended



VEHICULAR RADIO SET
Based on the SPIDER Manpack

OPERATORS MANUAL
HGT5 - 2541e

OCTOBER 1990



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Revision record			
Revision no.	Revised by	Date	Initials
1			
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Associated Manual:
 SPIDER MANPACK TRANSCEIVER
 Operators manual

CHAPTER 1GENERAL1.1 Introduction.

This manual contains instructions for the operator of the low power vehicular set, based on the SPIDER manpack radio transceiver. Only the aspects typical for the vehicular installation are described in this manual, for operation of the radio transceiver consult the operators manual of the SPIDER manpack transceiver or the instruction card issued with the manpack transceiver.

For operation as a vehicular radio set the SPIDER manpack is removed from its carrying harness and fastened in a vehicular mounting. The whip antenna and antenna matching unit are replaced by a broadband vehicular antenna, connected via a coaxial cable. Power is obtained from the vehicular battery via a small power supply unit.

1.2 Technical data.

For the technical data of the radio transceiver consult the manual of the SPIDER manpack.

Power supply	: vehicular battery 24V DC nominal, limits 22 ... 33V DC
Current consumption	: 200 mA or less when receiving. Approx. 2A when transmitting at maximum power
Output voltage power supply unit	: 14V DC nominal. Limits 13,5 ... 14,5 DC
Max. output current	: 2A
Antenna frequency range	: 30 ... 108 MHz
Antenna impedance	: 50 ohms nominal. Standing wave ratio 4 : 1 max.
Ambient temperature range	
Operating	: -30 ... +65°C
Storage	: -40 ... +70°C
Dimensions	
Mounting	: 233 x 190 x 66 mm
Power supply unit	: 190 x 112 x 90 mm

1.3 Component parts
(see diagram 1)

The following parts are used to convert the SPIDER manpack into a vehicular radio set.

1. Vehicular mounting.
2. Power supply unit.
3. Broadband antenna.
4. Power cable (24V).
5. Supply cable (PSU - SPIDER)
6. Antenna cable.

CHAPTER 2OPERATOR CONTROL FUNCTIONS2.1 General

This chapter describes the functions for control and connections of the power supply unit and the vehicular antenna. Instructions for operation are given in chapter 3.

2.2 Power supply unit
(see diagram 2)

Control or connector	Symbol	Explanation
On - off switch	○ ●	Power supply switched off.
	⊙	Power supply switched on
3-pole connector		Connection for vehicular battery
10-pole connector		Connection to transceiver

2.3 Antenna

Control or connector	Symbol	Explanation
Coaxial connector		Connection to transceiver
Earthing bolt		Connection to nearest metal part of vehicle

CHAPTER 3OPERATION3.1 General

This chapter only describes the operation typical for the vehicular set. The operation of the radio transceiver itself is covered by the operators manual of the SPIDER manpack transceiver. Condensed operating instructions are available on the instruction card issued with the set.

3.2 Mounting and removing the set
(see diagram 3)

When mounting the manpack transceiver in the vehicle, act as follows:

1. Remove the antenna and the antenna matching unit from the set.
2. Loosen the strap and take the transceiver from the carrying harness.
3. Place the transceiver in the vehicular mounting and fasten it with the strap. Note that if the vehicular mounting is installed in a vertical position, the transceiver must be mounted reversed, to keep the display and the keyboard legible.
4. Connect the following cables:
 - * Coaxial antenna cable to the antenna connector of the transceiver.
 - * Power supply cable to the 10-pole connector at the side of the transceiver.
 - * Handset and/or headset to the audio connector(s) on the front of the transceiver.
5. Mount the antenna rods of the vehicular antenna on top of the antenna base, if this has not been done before.
6. The set is now ready for switching on.

For removing the set act as follows:

1. Switch off the transceiver and the power supply unit.
2. Disconnect the power supply cable and the antenna cable.
3. Loosen the strap and take the transceiver from the vehicular mounting.
4. Open the battery compartment to check if a battery is present. If not install the battery. For details see the operators manual of the SPIDER manpack.
5. Mount the antenna matching unit on the coaxial antenna connector.

6. Mount the antenna on top of the antenna matching unit.
7. Connect a handset and/or a headset to the audio connector(s) of the set, if this has not been done before.
8. Install the transceiver on the carrying harness and fasten it with the strap.

3.3 Switching -on and -off

For switching -on act as follows:

1. Set the switch on the power supply unit to
2. Turn the volume control switch on the transceiver to one of the positions W or 1...6.

For switching -off act as follows:

1. Turn the volume control switch on the transceiver to OFF.
2. Set the switch on the power supply unit to •

Notes:

1. With the power supply unit switched off and the transceiver switched on, the set will operate on the manpack batteries, provided that these have not been removed.
2. Charging of the manpack battery block by means of the power supply unit is not possible. For charging the battery block must be removed from the battery compartment and a separate battery charger must be used.

CHAPTER 4OPERATORS MAINTENANCE4.1 General

The operators maintenance is mainly preventive maintenance, aimed at keeping the set in good condition and so preventing defects. Preventive maintenance consists of two parts:

1. Cleaning the set, as described in para. 4.2.
2. A routine test procedure, as described in para. 4.3.

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

4.2 Cleaning the set

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. Remove the transceiver from its mounting for cleaning.
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.

4.3 Routine test procedure

A routine test must be performed in the following events:

- After the transceiver is installed and is ready for use.
- Periodically for preventive maintenance.
- When the operation of the transceiver or the connected equipment is not satisfactory.

For the routine test use the procedure described for the manpack, para. 5.5 of the operators manual of the SPIDER manpack transceiver. To make sure that the vehicular power supply unit is included in the test, remove the batteries from the battery compartment of the transceiver before starting the test.

4.4 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.

- a. Transceiver doesn't work at all
(i.e. no continuous tone and display contents after switching on):
- Disconnect the power supply unit and install the battery pack. Repeat the test, using the manpack configuration.
 - If the set is now ok, there is a defect in the power supply unit or the associated cables. If the set still doesn't work, the transceiver itself is probably defective.
 - Check the battery by means of the display illumination (use LAMP-function).
 - Try switching the set off and then on again.

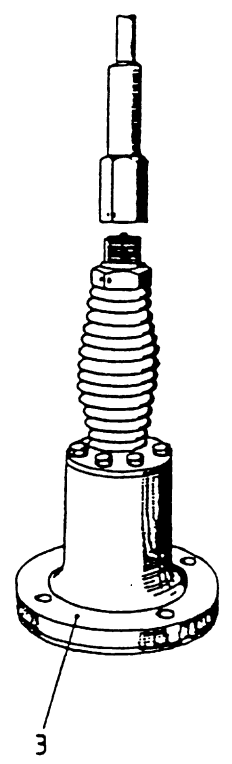
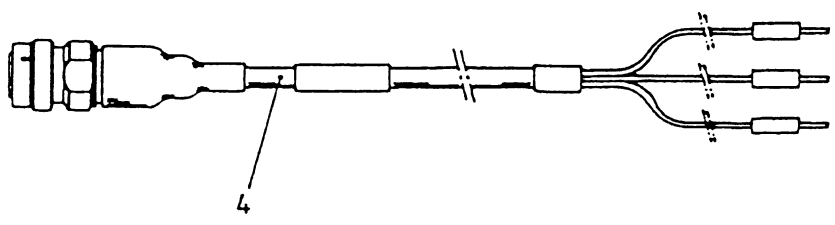
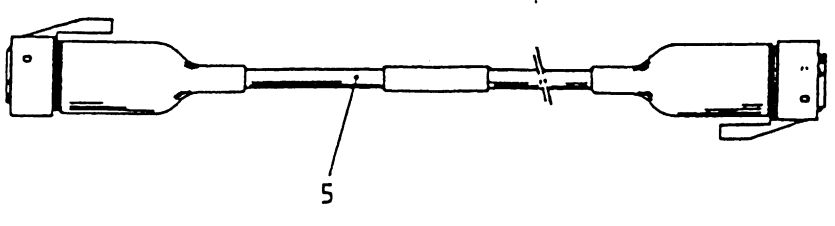
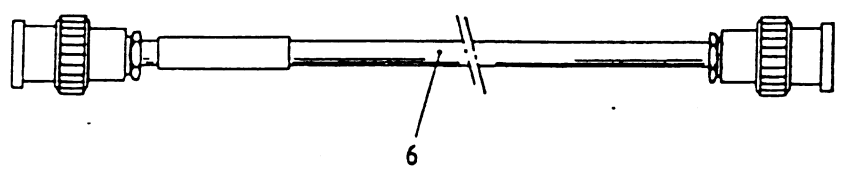
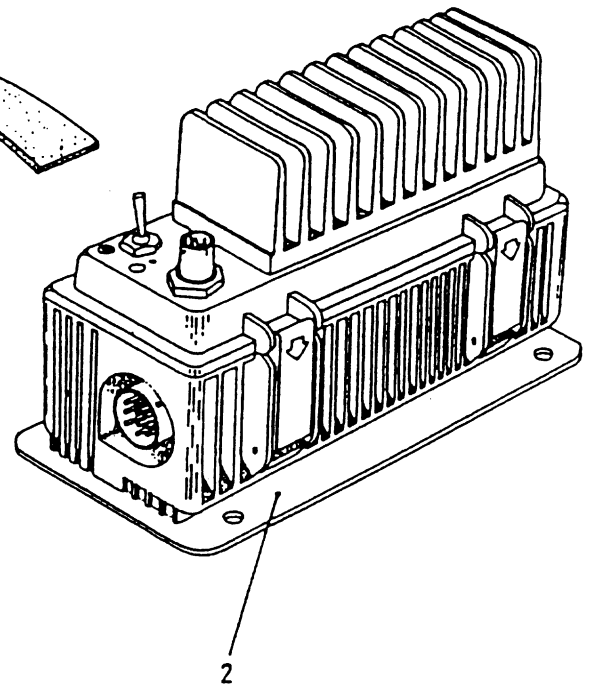
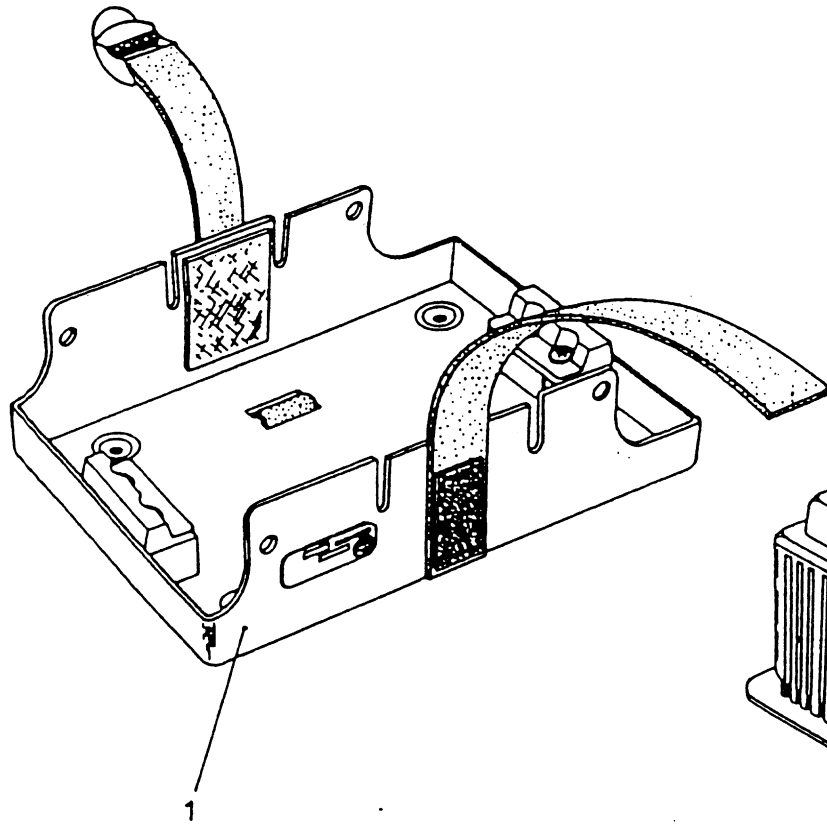
No result: higher level maintenance necessary.

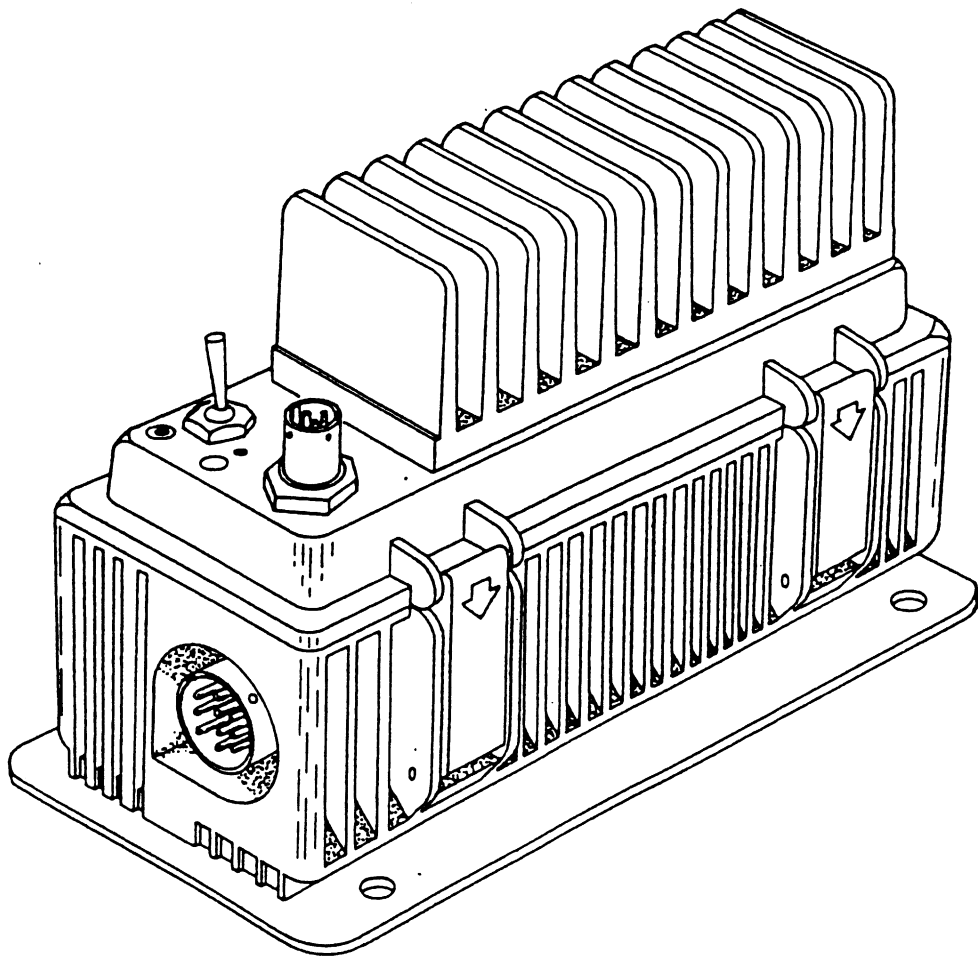
- b. No audio signal, but display contents visible
- Replace the handset or headset by a spare one.

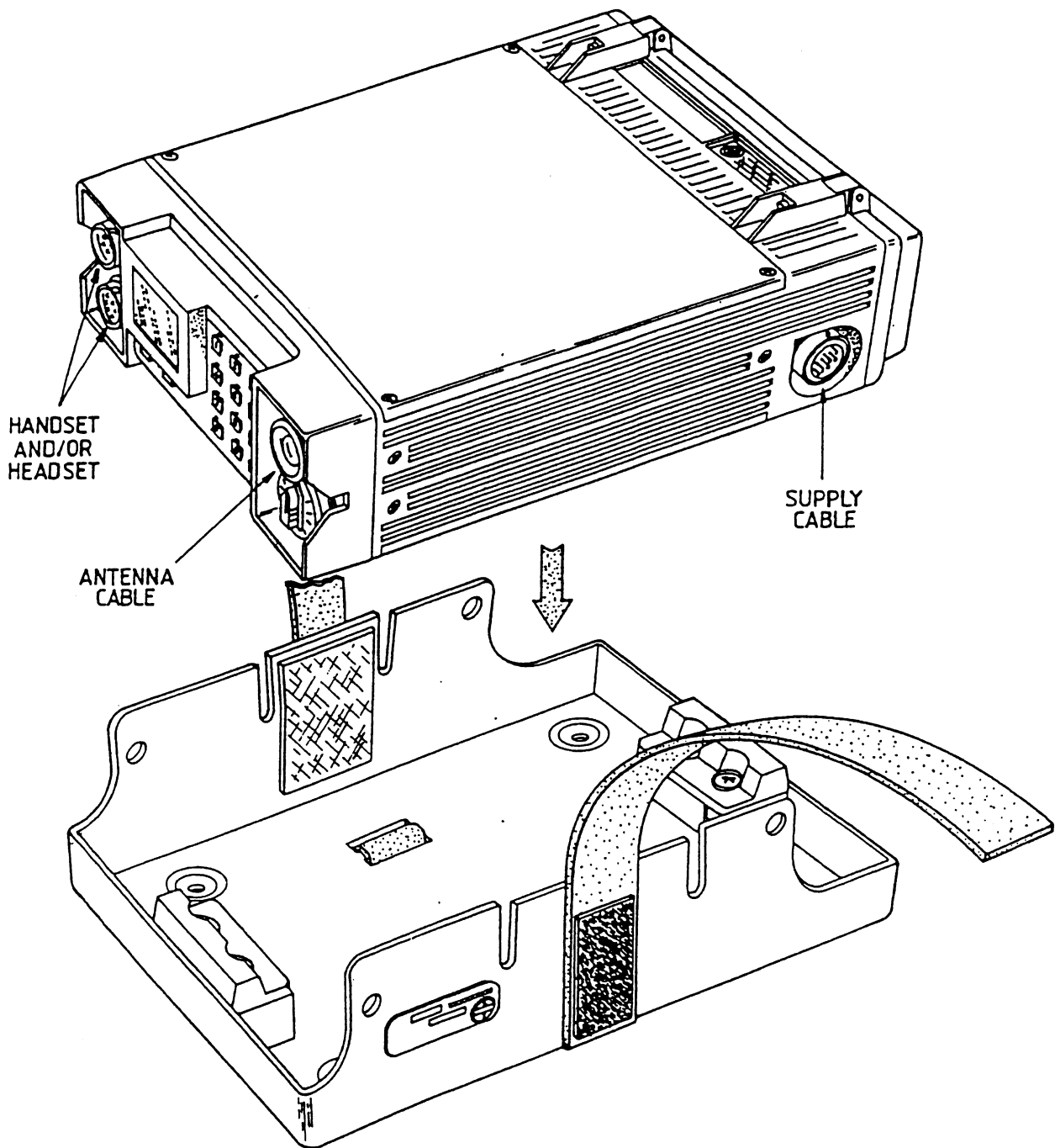
No result: higher level maintenance necessary.

- 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.

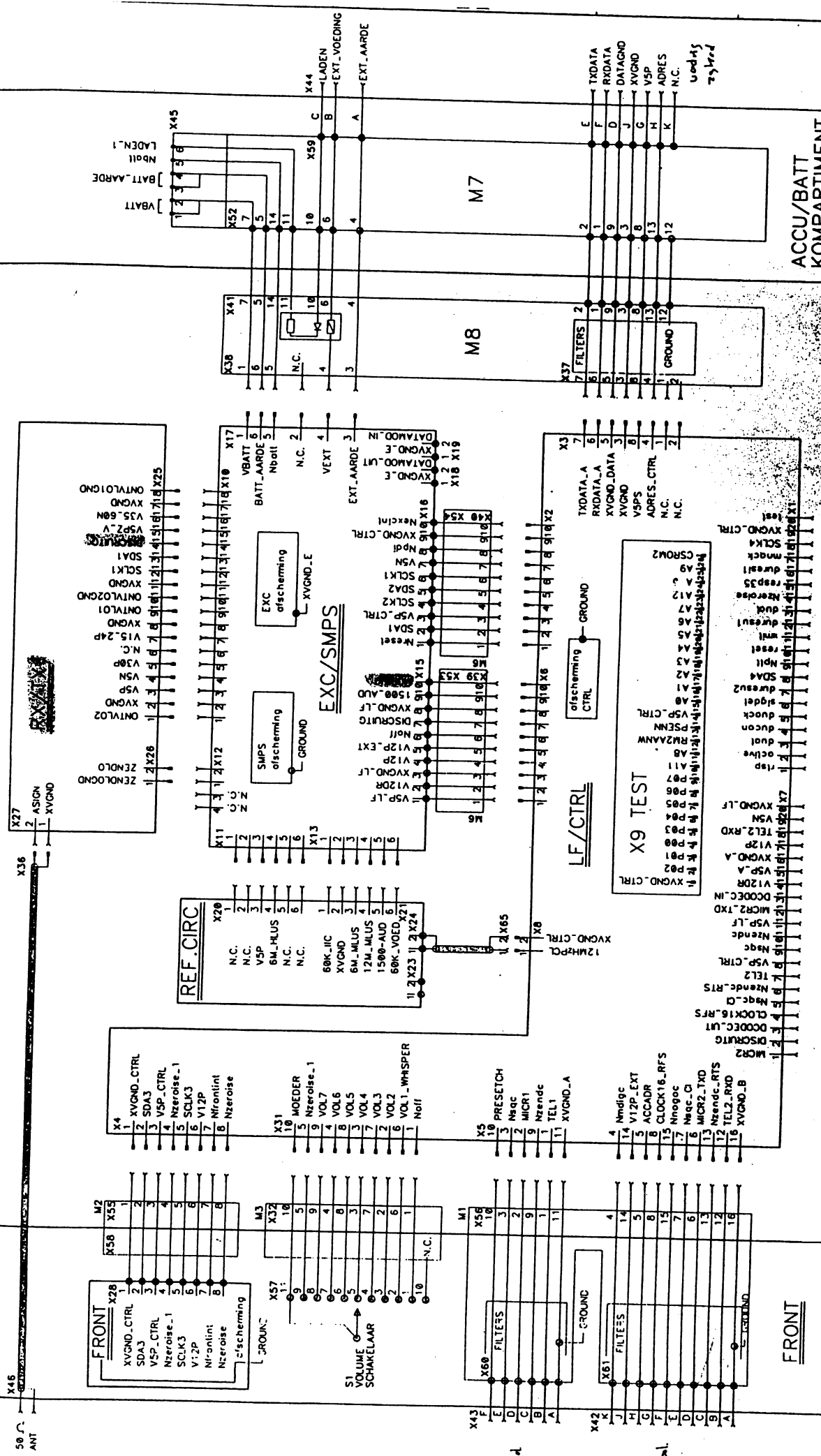






ACCU/BATT BLOK

ACCU/BATT KOMPARTIMENT



CLASS
SPIDER

NAME
SPIDER

DOCUMENT SUBJECT
9556 304 48XX EP 01 01

INSTRUCTION CARD

HGT5-2528e

SPIDER
MANPACK TRANSCEIVER

type 9556 304 14800

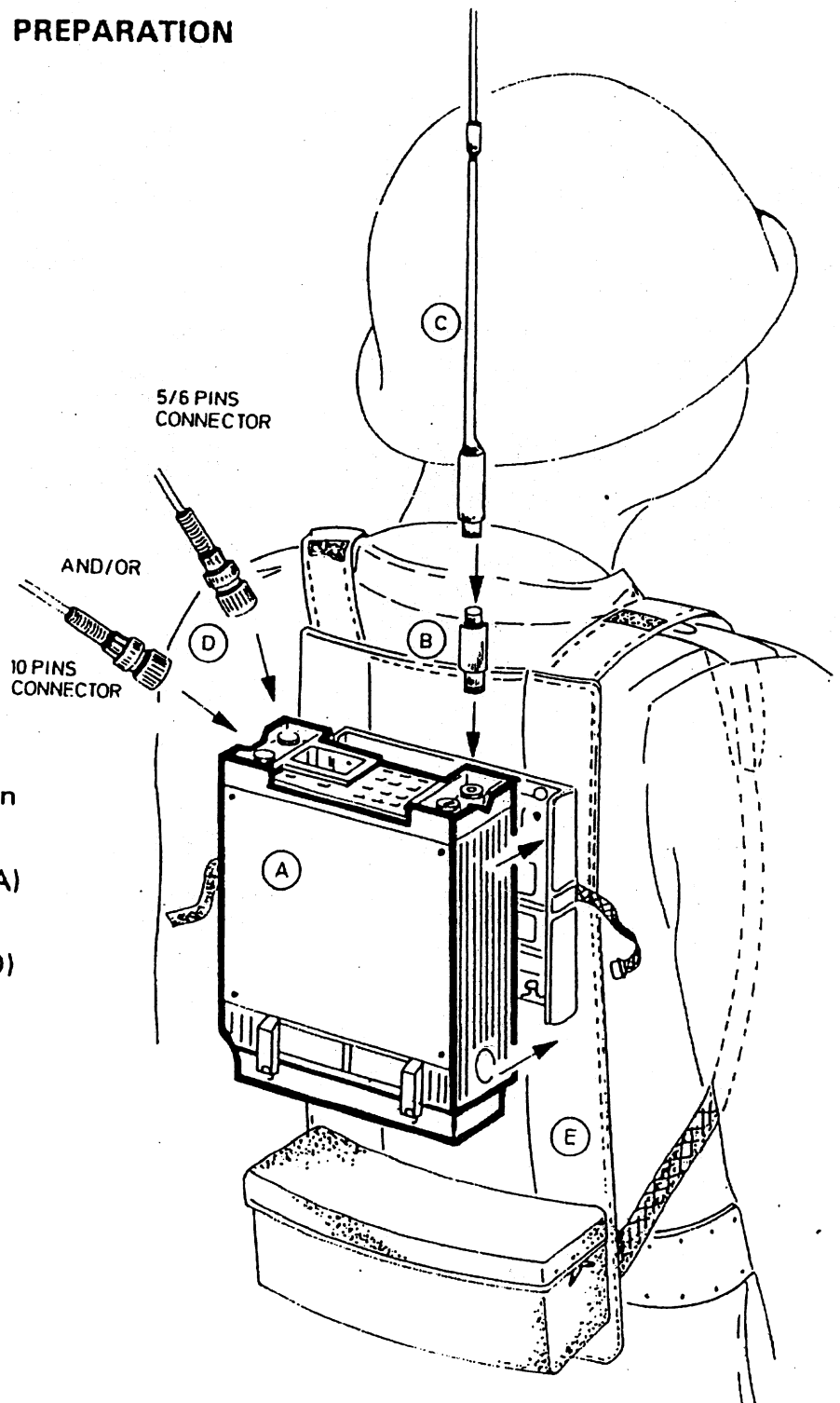
PREPARATION

COMPOSITION

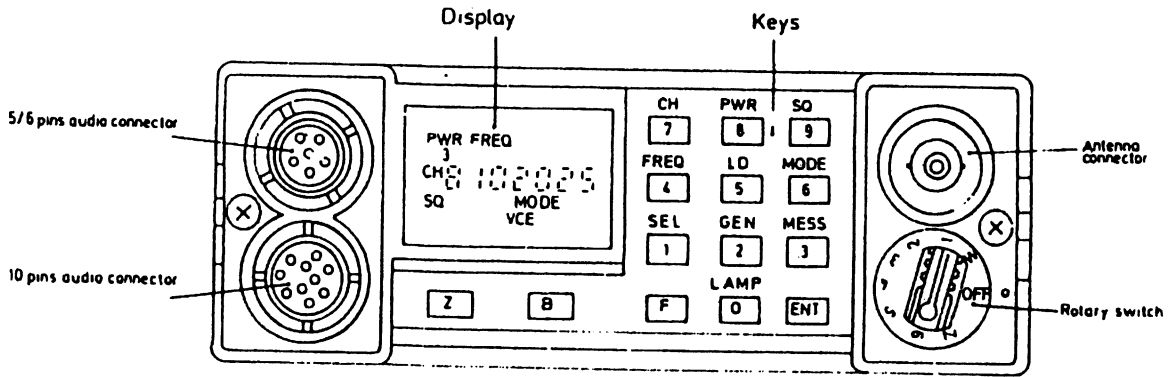
- A Transceiver
- B Antenna Matching Unit (AMU)
- C Antenna
- D Handset and/or headset
- E Carrying harness
- battery (see page 4)
- instruction card

ACTIONS

- 1 Check battery compartment, when empty install battery (see page 4)
- 2 Mount AMU (B) on transceiver (A)
- 3 Mount antenna (C) on AMU (B)
- 4 Connect hand- and/or headset (D) to transceiver (A)
- 5 Channel presetting (see page 2)
- 6 Install transceiver (A) on carrying harness (E)
- 7 Operation (see page 3/4)



SWITCHING



- 1 Turn rotary switch to any position, except OFF and Z.
- 2 An audio tone is heard until the transceiver is ready (approx. 4 seconds).

REMARK: In case the audio tone continues and/or 'NOGO' appears on the display, the transceiver is defect.

CHANNEL PRESETTING

When the transceiver is presetted go to OPERATION page 3 otherwise execute the following procedures.

Presetting of Channel Parameters (channel parameters will be retained after the set is switched off).

ATTENTION: Each key action must be executed within 10 seconds.

Step	Action	Result
1	Press key 'CH' and select channel no. (0-8)	- display shows 'CH 0'...'8' - audio tone during one second
REM.	When a handset with preselector and volume control is used turn the preselector rotary switch in the position '0'.	
2 3 4	Press keys 'F', 'FREQ' Key in desired frequency (30.000-107.975) Press key 'ENT'	- display shows 'FREQ' - display shows desired frequency - audio tone during one second
5 6 7	Press keys 'F', 'PWR' Key in desired power level '1' - low power '2' - medium power '3' - high power Press key 'ENT'	- display shows 'PWR 1'...'3'
8	If squelch is desired press keys 'F', 'SQ', 'ENT'	- display shows 'SQ'
REM.	To cancel the squelch mode repeat step 8	- display does not show 'SQ'

If desired repeat step 1 to 8 for each preset channel (0-8)

OPERATION

General

Step	Action	Result
1	Press keys 'CH', '0'...'8'	- display shows 'CH 0'...'8' - audio tone during one second

Reception

1	Set the rotary switch to the desired volume level 1 to 6	- the audio level in the telephone changes
REM.	In the position 'W' the operator can whisper into the microphone, without a volume decrease at the receiving station	
2	The squelch state can be changed by pressing key 'SQ'	- display shows 'SQ' or not

Transmission

1	The power level can be changed by pressing keys 'PWR', '1' - low power '2' - medium power '3' - high power	- display shows 'PWR 1'...'3'
REM.	If desired, an extra high power level can be selected by pressing key 'B'	- display shows 'PWR 4'
2	Press and hold the push-to-talk switch	- transceiver is transmitting
REM.	If key 'B' is pressed the power level returns to the original power setting after transmission	- display shows 'PWR 1'...'3'

ATTENTION: Use the lowest possible power level to prolong the battery lifetime.

Display Illumination

1	Press keys 'LAMP', '1'...'3' (1 min. and 3 max. brightness)	- display will illuminate
REM.	Display illumination will be switched off automatically if no key is pressed within 10 seconds	
2	Press keys 'LAMP', '0'	- display illumination off

Erasing Channel Presetting

Step	Action	Result
1	Turn and hold rotary switch to position 'Z' and press key 'Z'	- all channel parameters will be erased - audio tone during 12 seconds

Alarm Signals

If a continuous audio tone is heard and/or 'NOGO' appears on the display the set is defect.

Handset with Volume Control and Channel Selection

If a handset with volume control and channel selection is used the volume and the channel selection (1-8) can be controlled from the handset.

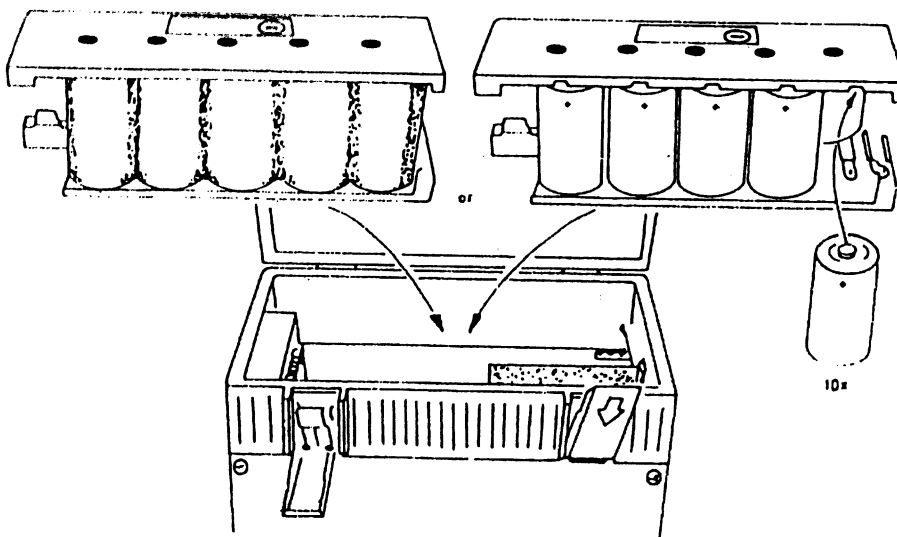
SWITCHING OFF

Turn the rotary switch in the position 'OFF'.

OPERATOR MAINTENANCE

Change Battery

- 1 Open the hinged cover at the bottom of the transceiver by loosening the two clamps.
- 2 Change batteries in battery holder or replace battery block.
- 3 Close cover by first hooking the inner part over the lug and then the outer part of each clamp.



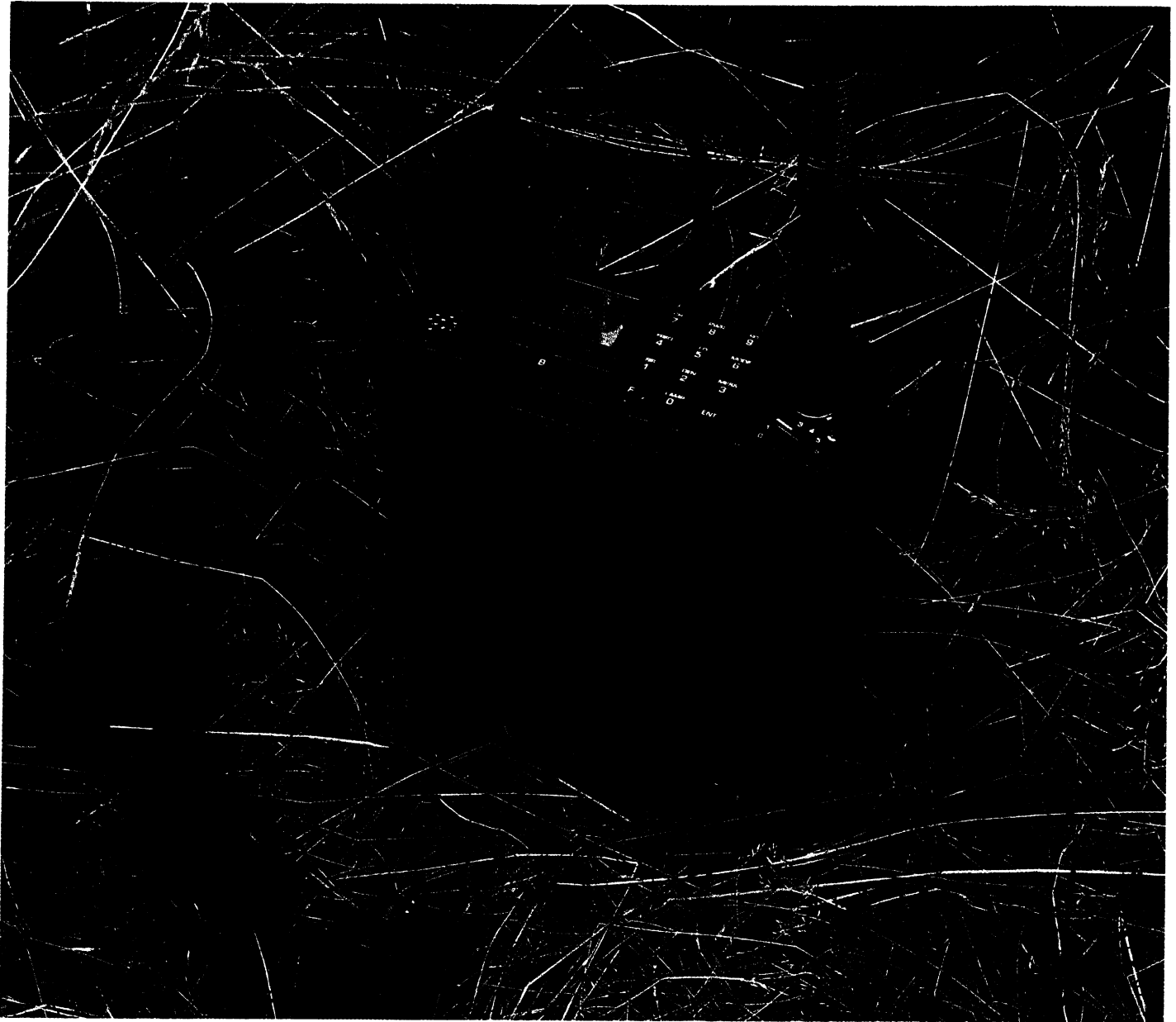
Preventive Maintenance

- 1 Keep the transceiver free from dirt and dust.
- 2 Before connecting the handset and antenna, always check that the connectors are free from dirt, dust or moisture, clean if necessary.



SPIDER

Signaal portable infantry digitally encrypted radio



OPERATIONAL FEATURES

SPIDER is a state-of-the-art VHF-FM manpack radio featuring some unique qualities. It offers both voice and data communication with selective calling and integrated crypto facilities. The set is user friendly and operation is made easy by a large liquid crystal display (LCD), a simplified key-board with a maximum of two functions per key, and one rotary switch. The display supports 13 functions. Hands-free operation is possible with a special chest-pad containing a telemicrophone and control switches. Both voice and data communication can be secured by full encryption in an optional encryption unit, to be integrated with the set. The encryption codes can be entered via

the set's key-board or using a separate quick-action fill-gun. Enemy detection of the transmissions can be avoided by using the minimum possible transmitting power. Transmitting power is selectable in 3 levels. This also extends the autonomy of the set. Under difficult conditions of range or interference extra burn-through power (5W) is available. The encryption unit also supports selective calling, the transmission of data and of up to 99 pre-coded numerical messages. These messages are transmitted from the key-board and shown on the display. SPIDER is compatible with all current VHF-FM radios including those with tone-modulation for squelch purposes. The set is

primarily a lightweight manpack but can be used in vehicles with a vehicle mounting, power supply adapter and power booster.

MAIN CHARACTERISTICS

- Wide frequency range (30 - 108 MHz)
- Lightweight
- Microprocessor control
- Simple control key-board and rotary switch
- BITE
- The option combines:
 - Highly secure integrated crypto option
 - Selective call facilities
 - 99-numerical messages transmission/reception

FUNCTIONAL ASPECTS

The basic configuration comprises an analogue FM transmitter and receiver. The set can be powered by a rechargeable NiCd battery, a high-capacity lithium battery, or dry batteries. Frequency setting is microprocessor-controlled and digitally selected with the key-board. The selected frequency or the numerical messages and 11 other functions will be shown on the display, e.g. type of traffic, selected power output. The antenna is a standard PRC-25 type. Two connectors are available for the connection of the handset, headset, remote-control chest pad, message exchange device (MED) or crypto fill-gun.

Accessories

Standard : Telemicrophone handset, Antenna PRC-25, Carrying harness
 Optional : Crypto unit (to be integrated with set, increasing its overall depth by 14 mm)
 Crypto fill-gun,
 Vehicle mounting,
 Chest-pad for hands-free operation
 Long-range antenna, Short-"jungle"-antenna,
 Handset with preset channel selector and volume control

TECHNICAL DATA

General

Frequency range : 30 - 108 MHz
 Channel spacing : 25 kHz
 Frequency accuracy : ± 5 ppm
 Modulation 300-3400 Hz : analogue: FM
 16 kb/s : digital : FSK
 Power supply : 12 VDC nominal
 Fault location : BITE
 Number of channels : 3120
 Preset channels : 8 + 1
 MTTR : less than 15 min.
 MTBF : 5600 hrs

Transmitter

RF output power : selectable: 2 W, 200 mW, 20 mW
 5 W burn-through
 Frequency deviation : 6.5 kHz
 Squelch-tone modulation : 150 Hz
 deviation : 1.6 kHz
 Protection : Transmitter can be short-circuited or not terminated

Receiver

Sensitivity : -116 dBm
 Image suppression : 60 dB
 Adjacent channel suppression : 60 dB
 IF suppression : 100 dB
 Blocking level at 10% from carrier : -5 dBm
 Audio output power : 2 Veff in 500 ohm

Crypto/data unit (option)

Encrypted voice : delta codings 16 kb/s
 Encrypted low-speed data : 1200 b/s
 High-speed data : 16 kb/s

ENVIRONMENTAL CONDITIONS

Temperature range : operational -20° to +65°C
 storage -40° to +85°C
 Mechanical : compliant with all relevant clauses of the British DEF-STAN 07-55 specification
 (vibration, bump, shock, drop, toppling, watertightness, tropical life)

DIMENSIONS AND WEIGHTS

	Width (mm)	Height (mm)	Depth (mm)	Weight (kg)
Basic configuration	236	175	66	4*
With crypto/data unit	236	175	80	4.4*

*) including batteries and standard accessories

POWER REQUIREMENTS

Supply voltage : 12 VDC
 Batteries : NiCd rechargeable
 Lithium high capacity
 10 dry batteries R14
 Supply from vehicle : 24 VDC
 12 VDC (stabilised)
 Battery autonomy : 10 hrs. at 10% transmit time (2 W) and 90% receive time.
 Expendable through transmitter output power reduction.

ASSOCIATED EQUIPMENT

- HF-VHF combat net radio equipment (UNICOM)
- Message exchange device (MED)
- Radio remote control system (GRA-3686)
- Two wire audio system (SOTAS)

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