SPIDER

MANPACK TRANSCEIVER

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OPERATORS MANUAL

HGT5 - 2515e

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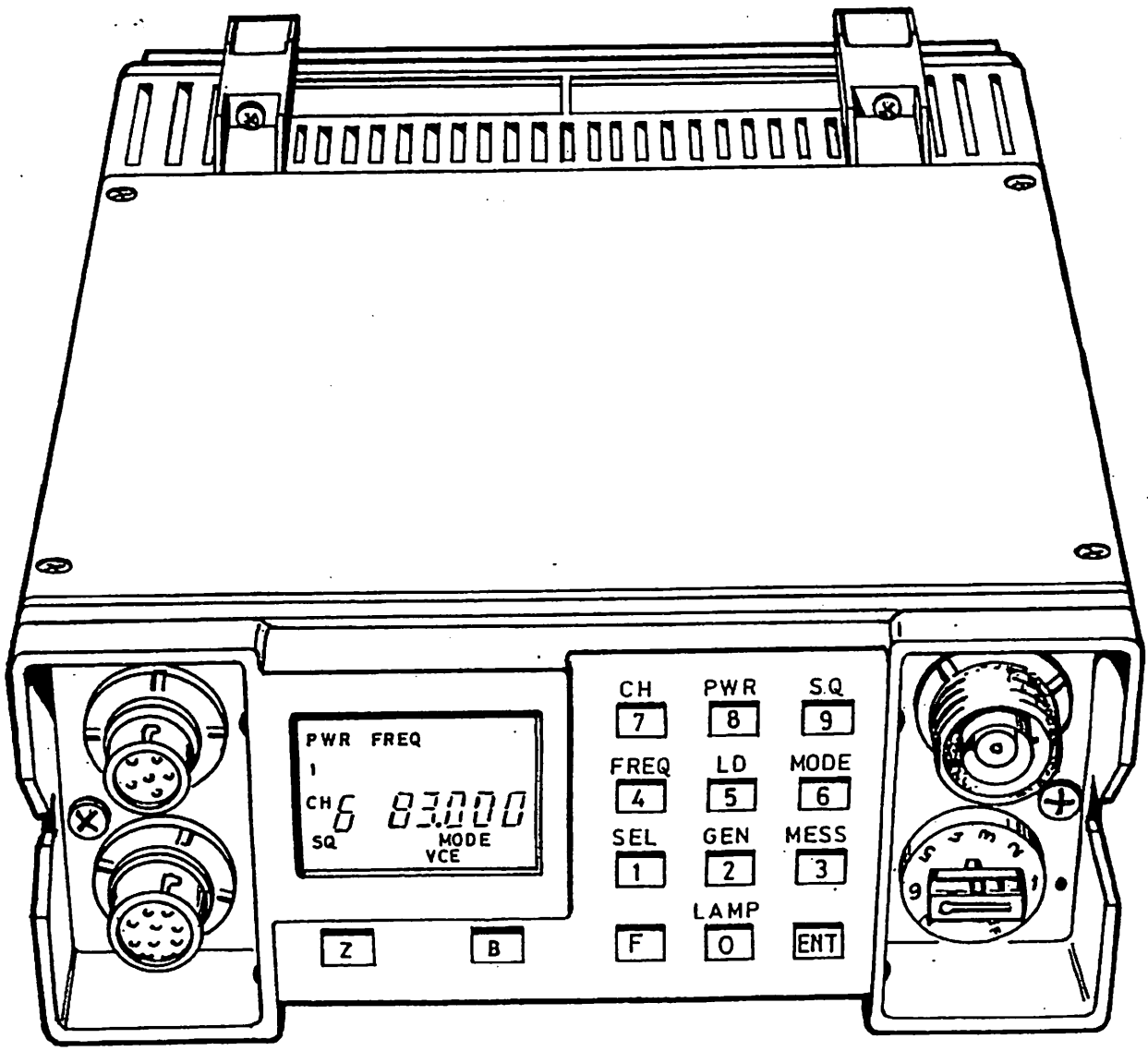
PROVISIONAL

HOLLANDSE SIGNAALAPPARATEN B.V. HENGELO (O) - THE NETHERLANDS



SPIDER MANPACK TRANSCEIVER

CONTENTS

LIST OF DIAGRAMS

CHAPTER 1 - GENERAL

1.1 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 (incl. Alk. batteries)	: 3.4 kg.

1.3.2 Transmitter

RF output power level 1...4, as indicated on display: level 1...3 via "PWR"-key, level 4 with "B" (= Burn-through) key.	: level 1 = 0.02 W 2 = 0.2 W 3 = 2 W 4 = 5 W
FM frequency deviation (incl. 150 Hz squelch tone modulation)	: nom. 6.5 kHz.

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 ┐
B = External supply input (+10 ... 15 Volt for optional use) ┘ Internally connected if external supply is present with the correct polarity.

C = Battery recharge current input (max. 100 mA).

D = Data signal ground ┐
E = Data signal output ├ Data interface (V24/28, 2400 Bd) for control of peripheral equipment.
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 DESCRIPTION

2.1 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 FUNCTIONS

3.1 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

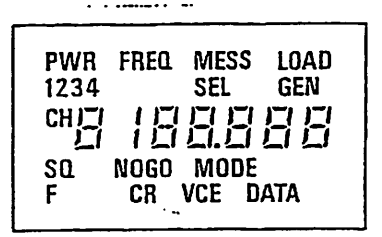
A custom designed LCD screen is used on the front panel to indicate the selected functions, parameter settings and values being entered.
The display functions consist of two main elements:

- 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

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 occurrance 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 INSTRUCTIONS

4.1 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...8]	0 = free channel, 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:
[FREQ]	4 or 5 digits have to be entered from left to right, e.g. when
[30.000 ... 107.975]	98.2 MHz is required key-in "9-8-2-0", the last digit will be
[ENT]	completed by the set!

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 3 = 2 Watt.
[1...3]	

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]

[0 ... 3]

- Key-in the required brightness level:
  0 = switched-off,
  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 CHANNELS

5.1 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 this channel, ciphers should be entered from left to right (see par. 4.6).
[FREQ]	
[30.000 ... 107.975]	
[ENT]	

. Power level

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

. Squelch facility

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

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 MAINTENANCE

6.1 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).

STEP	ACTION	RESULT
1	Switch-on the set and turn the rotary switch to "1". Wait till the continuous tone has stopped.	Last (or default) selected channel number and operational settings will be displayed.

STEP	ACTION	RESULT
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.

STEP	ACTION	RESULT
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

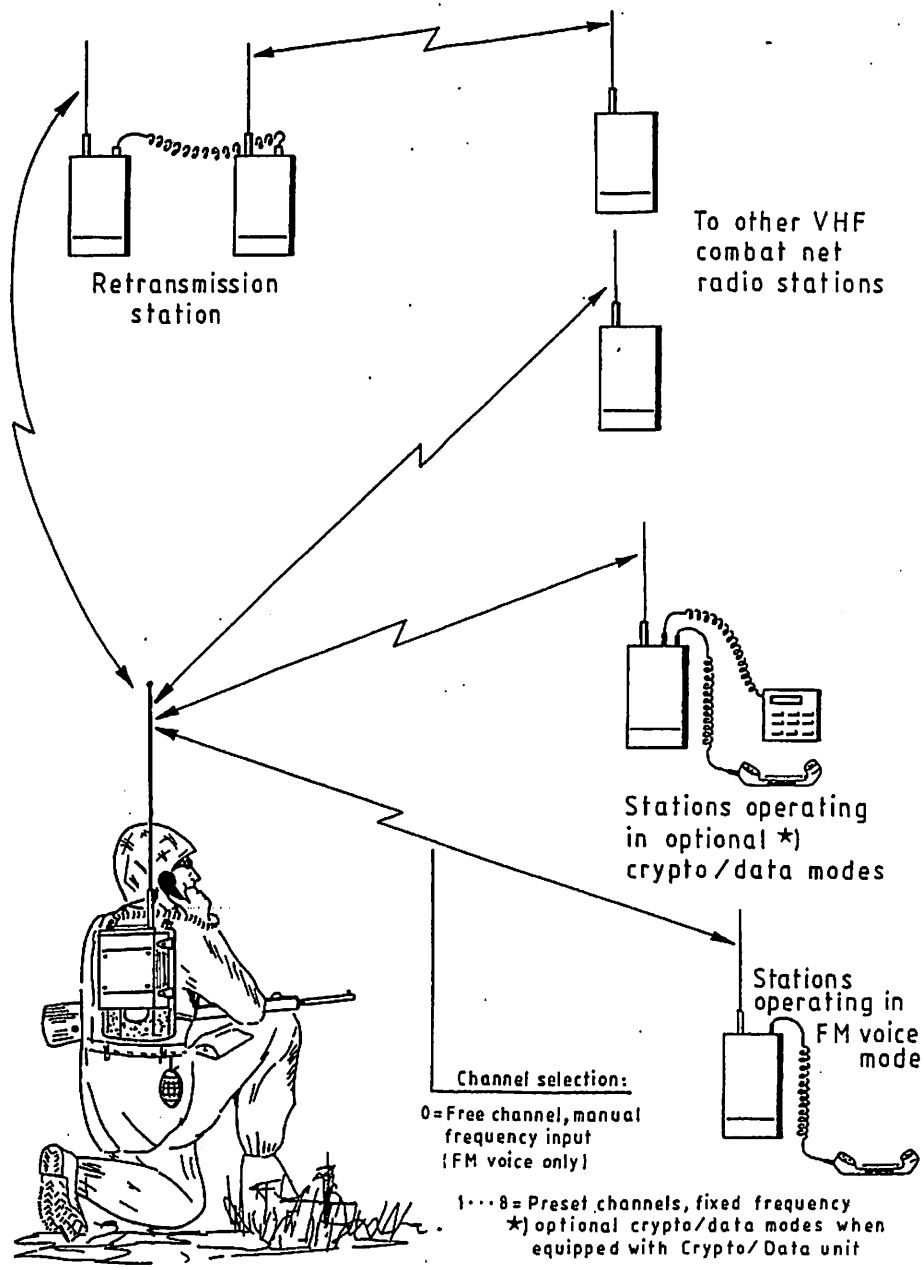
When in the radio set any malfunctions or defects are found which cannot be solved by the operator's maintenance, procedures should be started for further maintenance. In this case the operator is responsible to call for a higher maintenance level and for correct transport of the set if necessary.

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

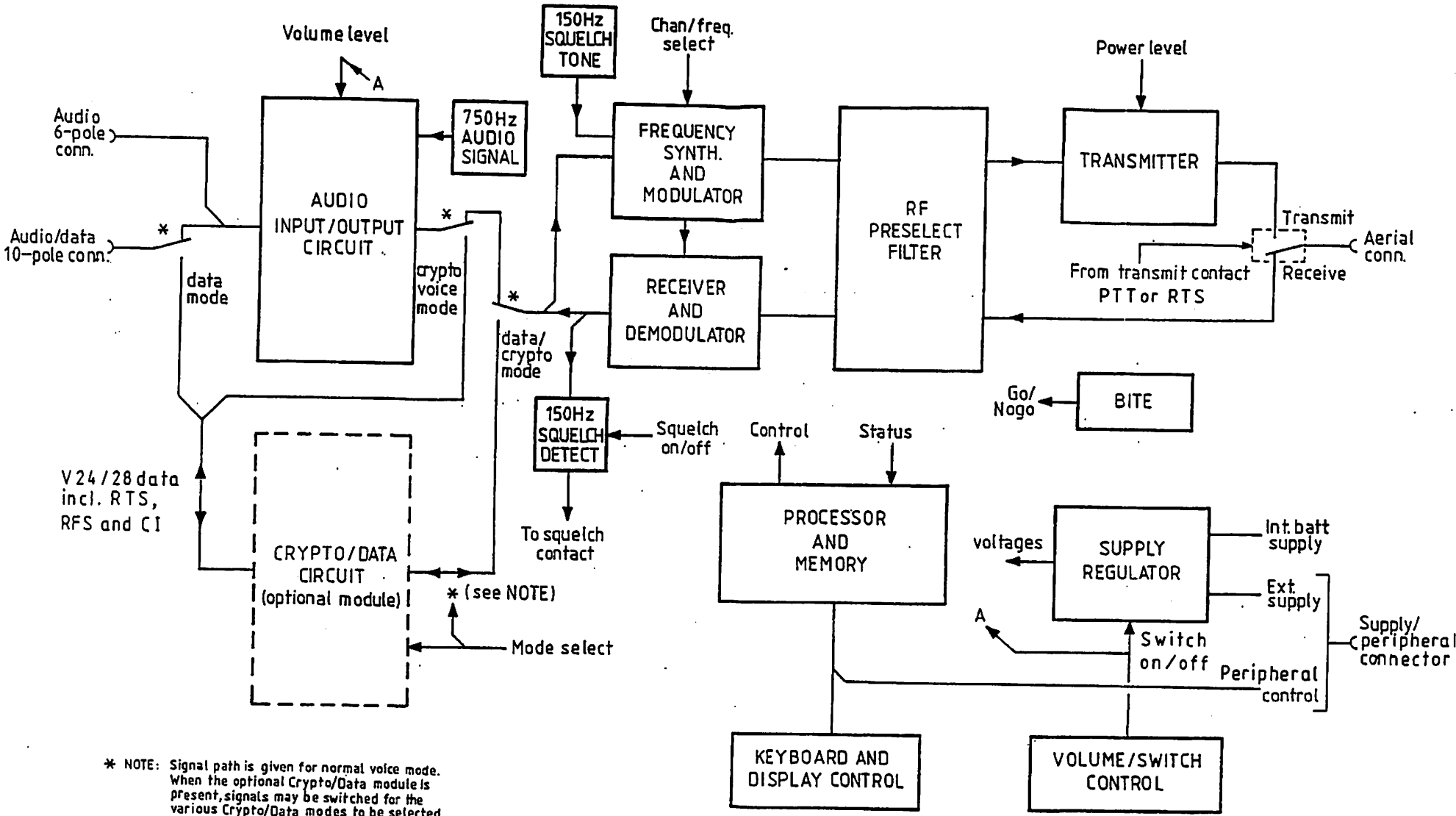
When a spare set is available the defective set may be replaced by a good-working one.
In this case the fresh radio set has to be installed and made operational by the operator as required for the operating network involved.

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).

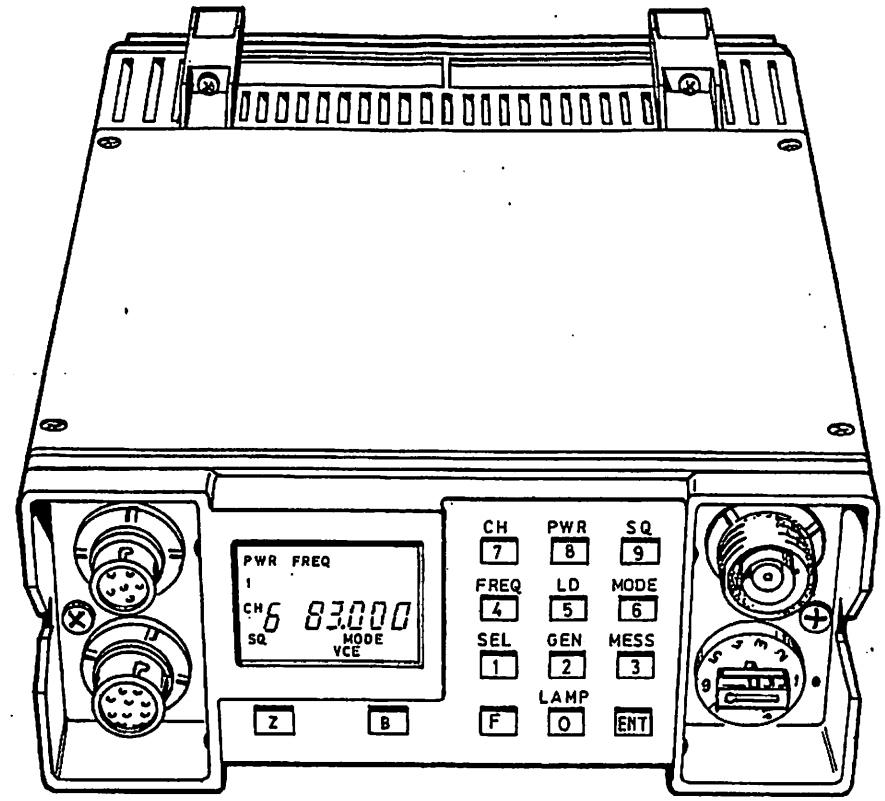


TYPICAL APPLICATION 881121 (1)



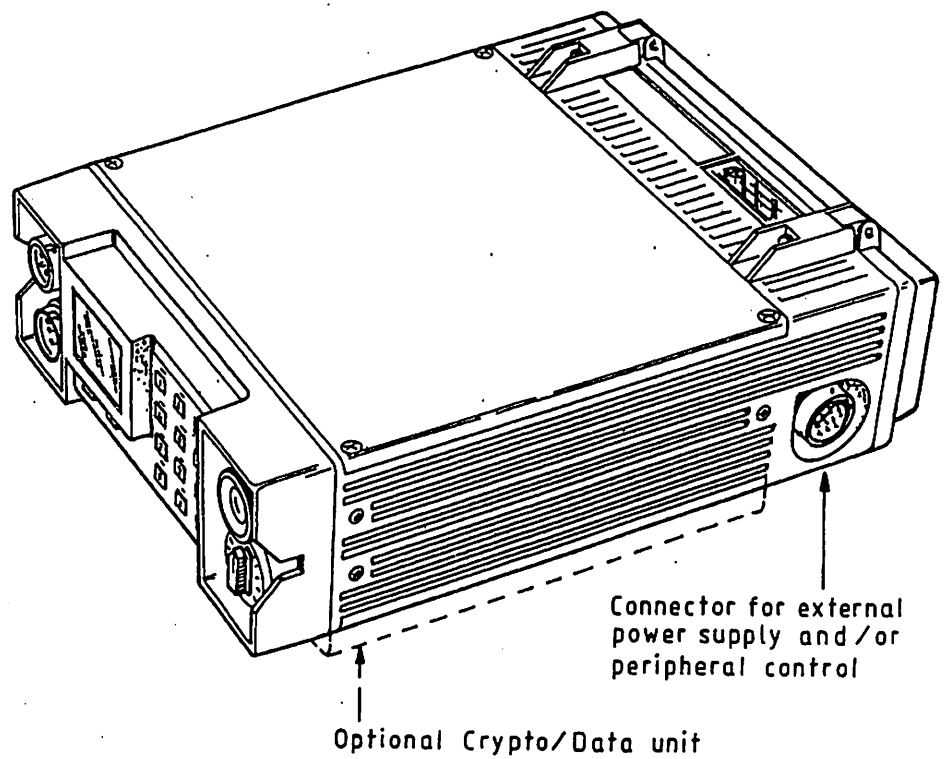
* NOTE: Signal path is given for normal voice mode. When the optional Crypto/Data module is present, signals may be switched for the various Crypto/Data modes to be selected. Switching is provided by the mode selection via the processor control.

BLOCK DIAGRAM SPIDER 881031

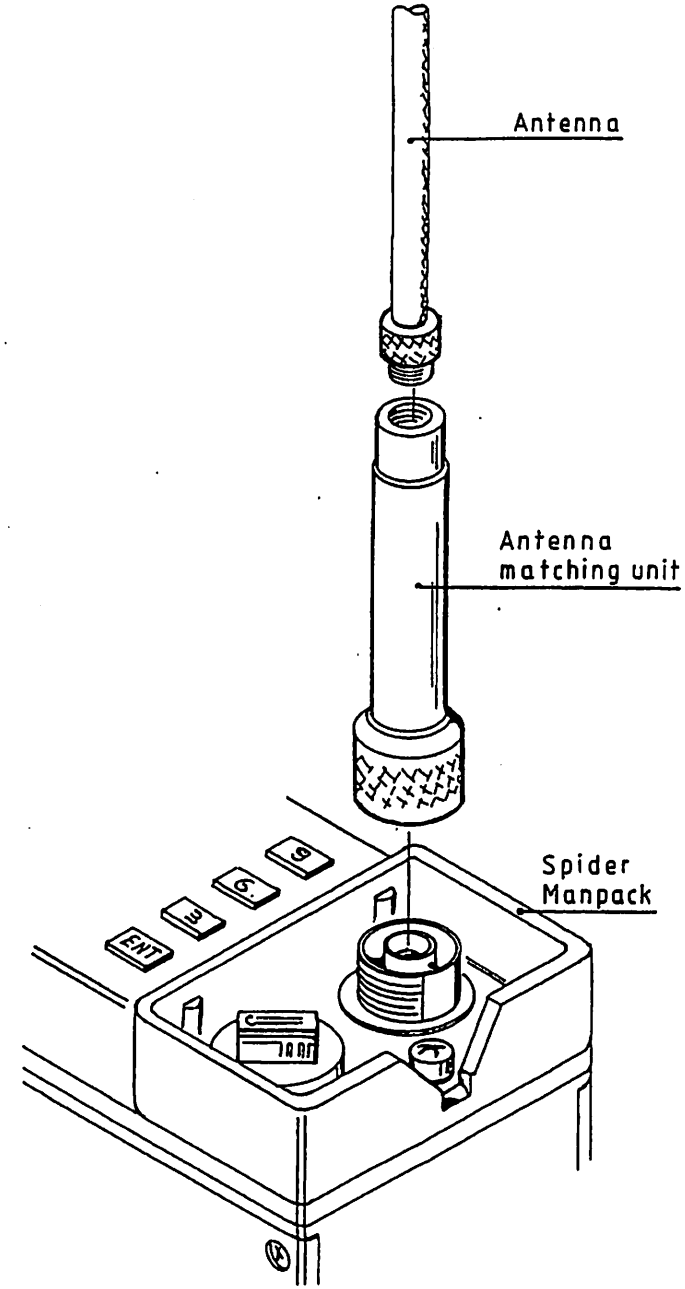


FRONT VIEW

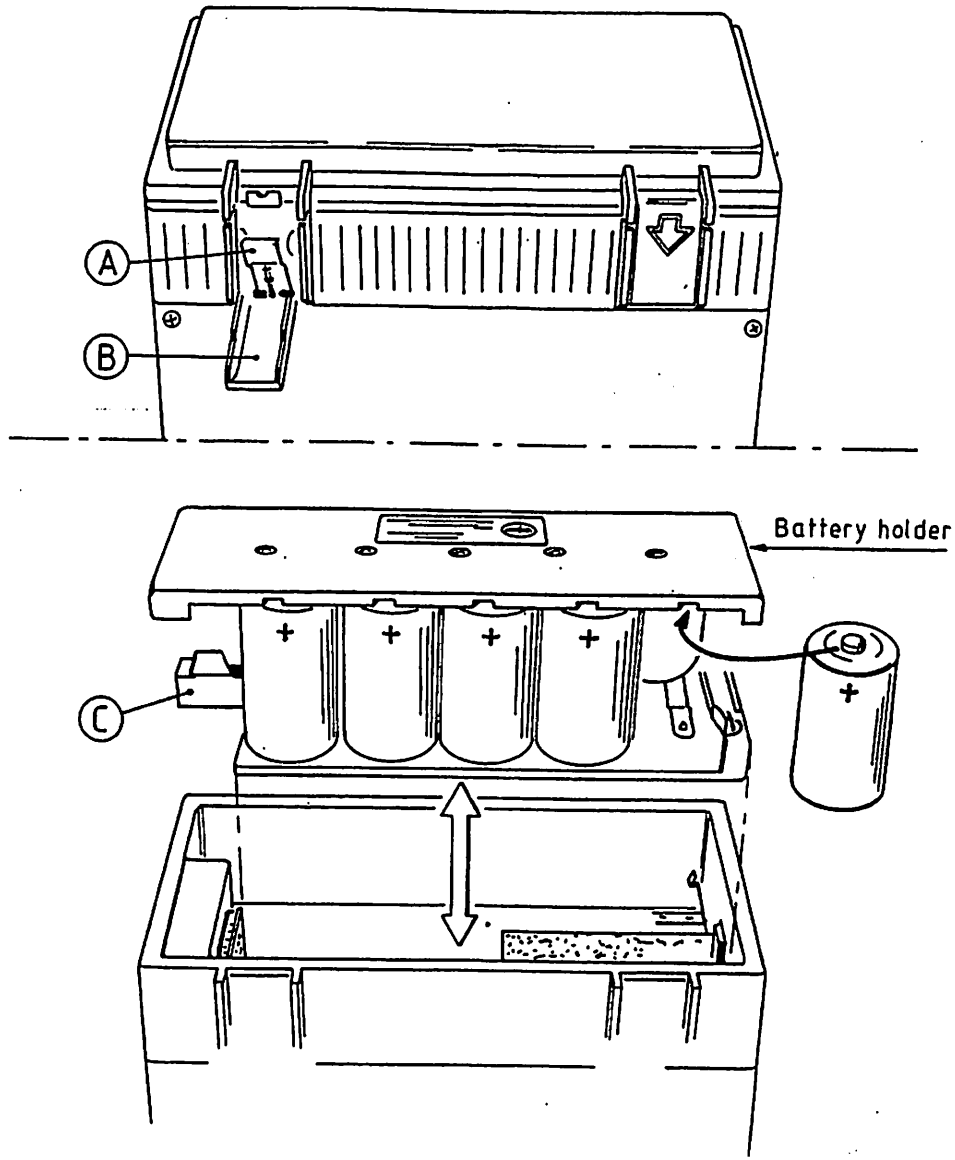
881031

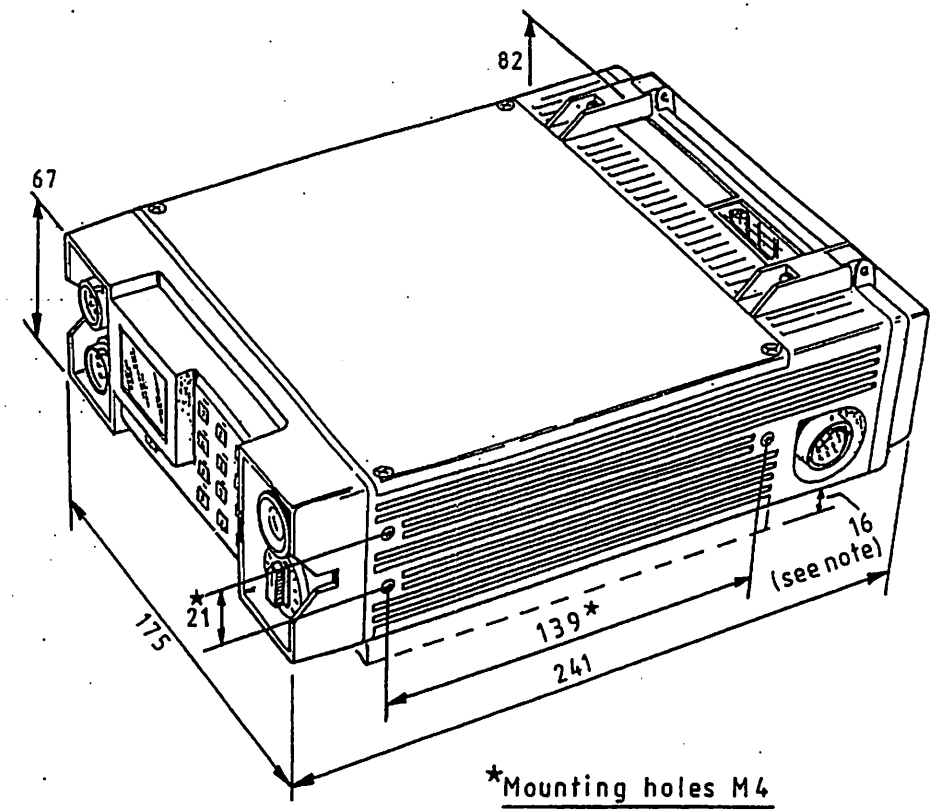


SIDE VIEW 881031



ANTENNA INSTALLATION

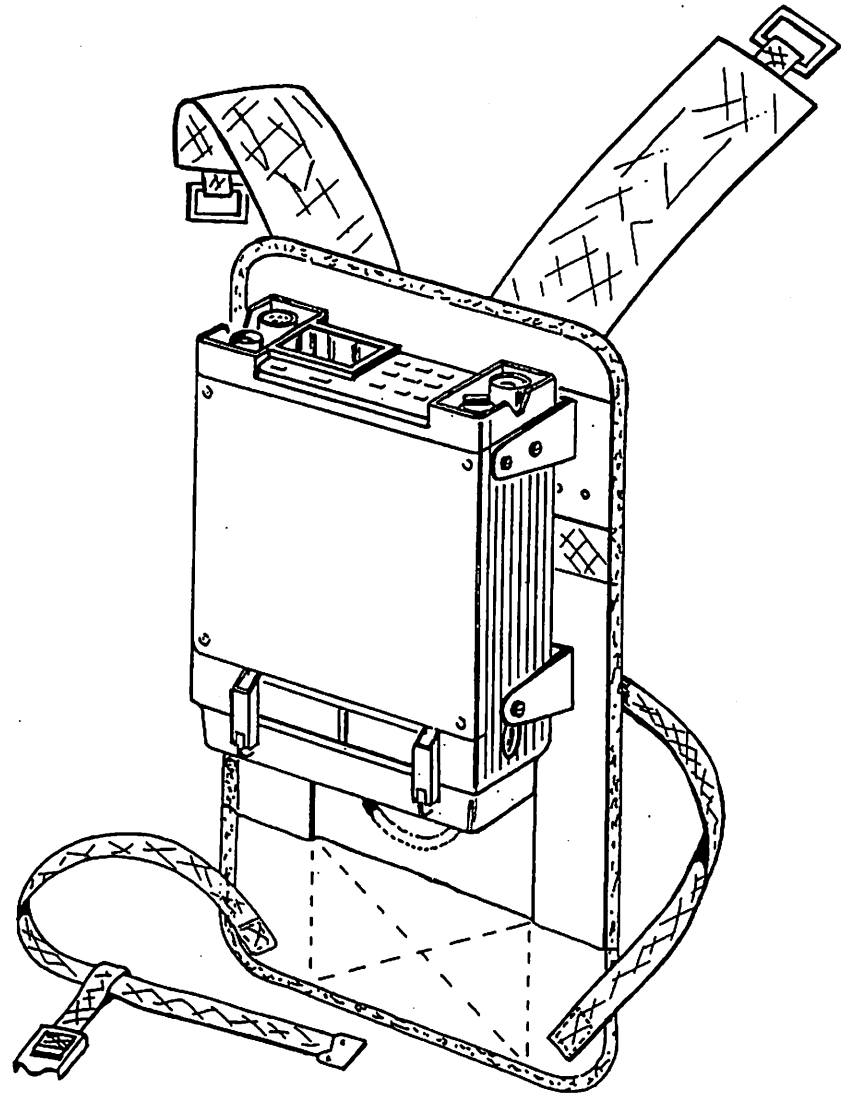

A
B
Battery holder
C



*Mounting holes M4

(Dimensions in mm)

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



CARRYING HARNESS FOR SPIDER 881115