

Manual No. 000-131-001

DV-505 OPERATORS REFERENCE MANUAL

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communications security

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Second Edition

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SECTION I GENERAL

The Model DV-505 is a dynamically changing five-band Voice Scrambler which provides a high level of voice privacy over telephone, single sideband, or VHF/UHF radio circuits. The DV-505 includes accurate digital timing circuitry to establish and maintain synchronization over long distance, world-wide circuits where transmission times as well as signal variations may be significant.

The clear voice input is split into five frequency bands, then rearranged (or scrambled) into five output bands. When the unit is operated as "fixed band scrambler," this rearrangement is held constant for a transmission or time period. When the unit becomes a "rolling code band scrambler," the rearrangement structure is changed each 0.25 seconds, thus rendering analytical attack impractical. Each new rearrangement is selected by a digital key generator using cryptographic techniques. Over 2,000,000 user keys (codes) are selectable on the front panel. An internal programmable plug increases the number of keys to 32,000,000,000,000.

Sections II and III describe the keys (codes) and how to set them. Section IV describes each control switch or indicator on the front panel. Sections V and VI contain instructions for operating the unit over telephone or radio communications networks respectively.

SECTION II LEVELS OF SECURITY

Three levels of security are available, selected by the "A-B-C" Mode switch located behind the locked front panel. These options provide flexibility to the user in

establishing procedures for different classes of information, for example inter and intra organizational communications.

In the A Mode, the unit operates as a fixed band scrambler with 512 permutations/inversion combinations. In this mode, the last three thumbwheel switches (of the set of seven located behind the locked "Universal" key panel) on the right hand side determine the permutation and inversion of the five bands.

In the B and C Modes, the unit operates as a rolling code band scrambler. In the B Mode, the Universal key, entered on the set of seven switches located behind the Universal key panel, is the sole determiner of the unit's key. Any other voice security system with an identical Universal key can decipher its traffic.

The Custom private feature provides the user with an additional level of security. When the eighth switch behind the front panel is set to "C," the DV-505 Voice Security System is customized by programmable plug located on the CFD-ROM printed circuit board located inside the chassis. A complete custom key must consist of (1) the correct setting of the seven Universal key switches followed by the letter "C" on the eighth switch, and (2) the correct configuration of the programmable plug located inside the chassis. In this mode, two Voice Security Systems must have a complete and identical custom key before cryptographic communication can be achieved.

There are 2,000,000 Universal keys and 16,000,000 Custom keys arranged in a matrix to provide a total of 32,000,000,000,000 keys, giving the user a very high degree of security.

SECTION III SETTING THE KEYS

A. FIXED BAND KEY

The Universal Key panel of the DV-505 can be removed by inserting the proper key and rotating it one-fourth turn clockwise. Of the set of seven switches, the last three switches on the right-hand side determine the permutation, plus the three position mode switch ("A," "B," or "C") must be in the A position. This mode is suggested for emergency situations only.

B. THE UNIVERSAL KEY

The Universal Key panel is removed as above. The Universal switches are the full set of seven octal switches plus the mode switch.

C. THE CUSTOM KEY

To change the Custom Key, the Voice Security Unit chassis must be removed from its case. Refer to the DV-505 Installation Manual for detailed instructions for changing the Custom Key.

SECTION IV DESCRIPTION OF CONTROLS

A. **POWER SWITCH** controls the power to the unit in both DC and AC modes of operation.

B. **POWER INDICATOR** lights to show when power is on.

C. **UNIVERSAL KEY** consists of a set of seven thumb-wheel switches located under the locked front panel. The Mode switch, A, B, or C, is the last thumbwheel switch on the right. The microswitch interrupts power to the digital portions of the unit when the Universal Key panel is removed.

D. **POWER SELECTION SWITCH**, located under the front panel at the bottom of the panel key lock hole, adapts the unit for either 115 volts or 230 volts AC operation.

E. **FUSES** are in the main power line. The AC fuse is in the AC line, and the DC fuse is in the DC line.

F. **POWER CONNECTOR** is used for attaching the external power.

G. **INTERFACE CONNECTOR** provides the connection to the communications system in use. An interface cord is supplied with the unit. To provide the proper output and input levels, jumpers and attenuators are included in the plug that connects to the DV-505. The method used to program the interface plug is covered in the DV-505 Installation Manual.

H. **SPKR SWITCH** turns the speaker built into the DV-505 on or off.

I. **PVT-CLEAR SWITCH** places the DV-505 in the clear or private mode of operation, as indicated.

J. **PVT INDICATOR** comes on when the PVT-CLEAR switch is in the PVT position and all interlock switches are closed. If this indicator does not come on, the unit will not function in the PRIVATE mode.

K. **WAIT INDICATOR** comes on during synchronization and input-audio overdrive situations. Speech will not be transmitted when this indicator is on.

L. **EXT SPKR** permits the attachment of an external speaker by means of a three-circuit phone plug.

M. **REC VOLUME** adjusts the volume for both the DV-505 speaker and handset.

N. **R** is a control used to set the receive audio level in special cases, and should only be adjusted by qualified personnel during installation.

O. **T** is a control used to set the transmit level in special cases, and it should only be adjusted by qualified personnel during installation.

P. **PUSH-TO-TALK (PTT)** is the switch on the handset which must be pressed to transmit.

Q. **HOOKSWITCH**, located in the handset cradle, opens the talk line and disconnects the unit when used on the telephone system. Therefore, the DV-505 handset acts just like an extension telephone.

SECTION V OPERATING INSTRUCTIONS FOR 4-PRONG JACK CONNECTION TO STANDARD TELEPHONE SYSTEM

If the DV-505 Voice Security System is not installed, refer to the DV-505 Installation Manual for instructions.

Once the unit is installed and the key and mode switch selections made, the following gives step-by-step procedure to use the unit.

- A. Make sure the handset is in its cradle.
- B. Turn the power switch on. The adjacent power indicator should light.
- C. Place CLEAR/PVT switch in the CLEAR position.
- D. Establish telephone contact with other party using the regular telephone in normal manner.
- E. Take the handset on the DV-505 out of its cradle.
- F. Replace telephone handset in its cradle. (This is very important to the security of the conversation.)
- G. DV-505 handset may now be used as a telephone handset, except that the handset grip button must be squeezed to talk and released to listen.
- H. Place CLEAR/PVT switch in the PVT (private) position. The PVT indicator should come on. If the PVT indicator does not come on, do not attempt to use the scrambler for private operation. Refer to Section VII.
- I. Sensitive information may now be discussed.
- J. The WAIT indicator will come on at the beginning of each transmission in each direction during the private conversation. Do not talk while this light is on.
- K. You should hear a short "beep" in the handset earpiece every few seconds while transmitting in the PVT mode. This beep is your confirmation that the scrambler is properly "rolling," that is, changing codes several times per second. If the rolling circuitry were to fail, you would hear a continuous alarm tone in the handset earpiece.
- L. At the end of the conversation, simply replace the DV-505 handset in its cradle on the DV-505.
- M. The DV-505 may be left connected to the telephone outlet jack without affecting the normal operation of the telephone system, provided the DV-505 handset is returned to its cradle.

SECTION VI OPERATING INSTRUCTIONS FOR CONNECTION TO A RADIO SYSTEM

If the DV-505 Voice Security System is not installed, refer to the DV-505 Installation Manual for instructions.

Once the unit is installed and the Key and Mode switch selections made, the following gives step-by-step procedures to use the unit.

- A. Turn the scrambler power switch on. The adjacent power indicator should light.
- B. Place CLEAR/PVT switch in the CLEAR position.
- C. Using the scrambler handset just as you normally would use the radio mike, establish radio contact in the CLEAR. Push-to-talk button is on the handset. Exchange radio station call signs if required by law.
- D. Place CLEAR/PVT switch in the PVT position. The PVT indicator should come on. If the PVT indicator does not come on, do not attempt to use the scrambler for private operation.
- E. Sensitive information may now be discussed.
- F. The WAIT indicator will come on at the beginning of each transmission in each direction during the private conversation. Do not talk while this light is on.
- G. You should hear a short "beep" in the handset earpiece every few seconds while transmitting in the PVT mode. This beep is your confirmation that the scrambler is properly "rolling;" that is, changing codes several times per second. If the rolling circuitry were to fail, you would hear a continuous alarm tone in the handset earpiece.
- H. At the end of the private conversation and at intervals, as required by law, return to the CLEAR mode for station identification in both directions.

I. If desired, the scrambler may be left on between conversations. The scrambler speaker is especially convenient for monitoring during this period. It is suggested that the scrambler be left in the CLEAR mode in order to receive any station which may be calling in the CLEAR, and to facilitate intelligible station identifications as required by law.

SECTION VII NOTES ON OPERATION/ MINOR PROBLEMS

A. When the channels are poor or extremely noisy, synchronization may not be received correctly and the complete transmission will be lost. In the case of poor channels, it is recommended that transmissions be limited to one or two minutes each, to reduce the amount of information which will need to be repeated. Experience with a particular channel will determine the necessary precautions.

Station A, who has been receiving and is ready to transmit, should make certain that Station B has stopped transmitting and is in the receive mode before proceeding. Otherwise, the phase signals from Station A may be missed by Station B, resulting in garbled reception.

Voice commands such as "over," "come back," "go ahead," etc., should be used at the end of each trans-

mission. Make certain that all of the synchronization signal is being received. If the wait indicator does not come on while the sync signals are being received, refer to the Installation Manual.

B. Loss of synchronization in the middle of a message will occur if:

1. A momentary loss of power occurs, including switching the power off and on rapidly.

2. An operator receiving a message accidentally presses the PTT button on the handset before the transmitting operator has finished his transmission.

3. The CLEAR-PVT switch is switched from PRIVATE to CLEAR and back to PRIVATE.

4. The Universal key panel is open.

C. The DV-505 will operate in the PRIVATE mode only when the CLEAR-PVT switch is in the PVT position and the PVT indicator is illuminated.

1. When the Universal key panel is open, the PVT indicator will be off.

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