
# LATEST FIRMWARE REVISIONS

**ESP504:**
OPS-504-U2 V2.00
OPS-504-U6 V2.00

**ESP520:**
OPS-520-U1 V2.00
OPS-520-U2 V2.00
OPS-520-U6 V2.00

**ESP1000:**
OPS-1000-U2R V2.01
OPS-1000-U2T V2.00
OPS-1000-U3I V2.06
OPS-1000-U6R V2.00
OPS-1000-U6T V2.00

**ESP1100:**
OPS-1000-U2R V2.01
OPS-1100-U2T V2.01
OPS-1000-U3I V2.06
OPS-1000-U6R V2.00
OPS-1000-U6T V2.00

**ESP604:**
OPS-0604-U2 V1.02
OPS-0604-U102 V1.02

# TESTING THE ESP504/520
# 220-222 MHz MOBILE RADIO
# USING THE IFR 1200 SUPER S
# SERVICE MONITOR

The ESP504 and 520 mobile units are advanced narrowband transceivers designed to be used in a 5 kHz channel spacing environment. These radios employ a novel modulation technique to keep the occupied bandwidth low (4 kHz) and still perform comparably to wider-bandwidth FM radios. The following guide was created to make servicing of the ESP504 and ESP520 mobile radios more convenient. For detailed information on this modulation technique and on the use, installation and servicing of these radios, refer to the ESP504/520 Instruction Manual, MAN-0504-01.

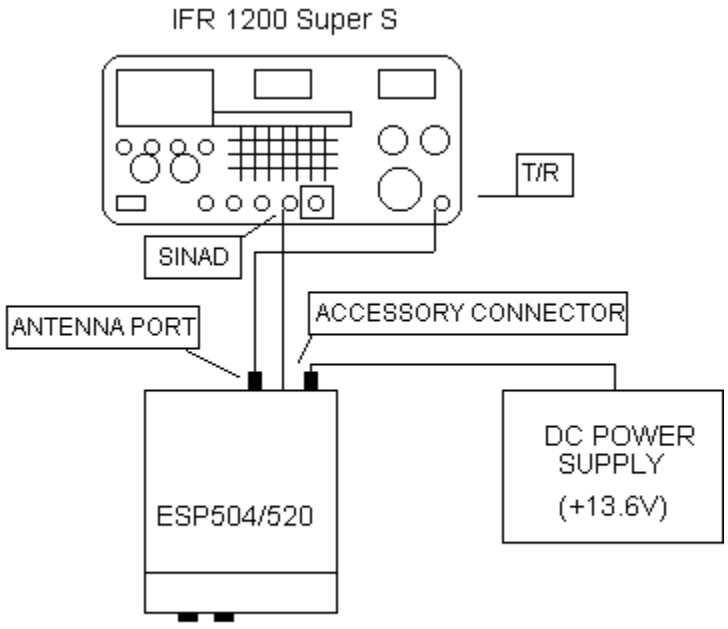


Figure 1 Receiver Test Setup

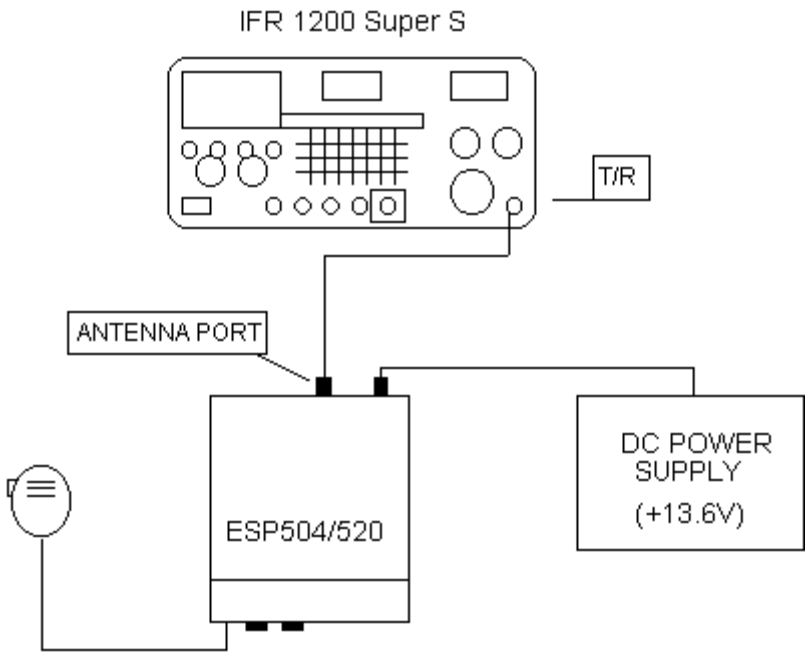


Figure 2 Transmitter Test Setup

1. **PRELIMINARY SETUP - Entering Test Modes Condition**
    a. Set up the radio to apply power from a power supply.
    b. Turn radio OFF.
    c. Install plug in mic jack which shorts TXd to RXd (pins 1 and 8) OR remove top cover and install jumper JU5 on Personality Board (ASY-0505-02).
    d. Turn radio ON. The radio is in Test Mode 1.
    e. On ESP504 verify that Mode 1 LED is on and there is no busy or fault tone from the radio.
    f. On ESP520 verify that display reads "*MODE 01" and there is no busy or fault tone from the radio.

    Refer to Section 12 of the ESP504/520 Instruction Manual for detailed information on Field Test Modes.

2. **RECEIVER TESTS**

    The receiver tests to be performed are 12 dB SINAD sensitivity, audio distortion, squelch sensitivity, and AFC lock range.

| **Definition: Standard Receiver Test Modulation (SRTM)** |
| --- |
| The required settings to create SRTM are as follows: |

| | |
|---|---|
| -Modulation Type: | AM |
| -RF Frequency: | 220.0015 MHz<br>(or the radio assigned frequency minus 1000 Hz) |
| - Modulation Frequency: | 2900 Hz |
| - Modulation Level: | 63% |

2.1 12 dB SINAD Sensitivity

a. Configure the test setup per Figure 1, **except do not hookup the audio output of the radio (accessory connector cable or ACC) to the EXT MOD/SINAD port yet.**
b. Unsquelch the receiver by pressing the HRN key in.
c. Setup the IFR1200 to generate SRTM as follows:
    1. set MODE switch to GEN,
    2. set MODULATION switch to AM NORMAL,
    3. set METER switch to kHz/%x10 = 20,
    4. use keypad to set TONE = 2900 Hz,
    5. use keypad to set RF frequency = 220.0015 MHz,
    6. set TONE GENERATOR VAR switch to INTL,
    7. press keypad 2ND FUNCT, METER (display reads "0.0 kHz AM XXXX"),
    8. adjust TONE GENERATOR VAR pot for 63% read on display. The service monitor is now generating SRTM.
d. Set IFR1200 METER switch to SINAD. Note IFR1200 display now reads SINAD.
e. Hookup the ACC to the EXT MOD/SINAD port.
f. Set GEN LEVEL to .35uV/-116 dBm. IFR display should read >12 dB SINAD.

2.2 Audio Distortion

g. Follow steps a, b and c of the section 2.1 12 dB SINAD Sensitivity Test.
h. Remove the ACC from the EXT MOD/SINAD port and connect it to the SCOPE/DVM port.
i. Set the IFR1200 scope: VERTICAL = 1V/div - HORIZONTAL = 1 mS/div
j. Set input coupling switch to GND and adjust VERT POS for trace to appear at bottom of display.
k. Set input coupling to AC. The display should show recovered audio.
l. Set GEN LEVEL to -47 dBm (1000 uV).

m. Adjust radio volume control for peak ac voltage displayed on scope = 5.6V. This will be loud if test is performed using the radio internal speaker as the load.
n. Disconnect the ACC from the SCOPE/DVN port and connect it to the EXT MOD/SINAD port.
o. Set METER switch to DIST.
p. Press keypad 2ND FUNCT, METER to read distortion measurement from display. Should be $\leq$ 5%.

2.3 Squelch Sensitivity

q. Set the radio to carrier squelch by pressing the HRN key so it is in the outward position and press the SCN key in. NOTE: the squelch will open intermittently. There is no adjustment for this.
r. Set the IFR1200 as follows:
    1. install a 20 dB attenuator between the radio and the T/R port,
    2. set the GEN LEVEL to minimum (approx -130 dBm),
    3. set the TONE GENERATOR VAR switch to OFF (turns off modulation),
    4. set the RF frequency to 220.0044 MHz.
s. Increase the GEN LEVEL until the squelch just opens. Level output should be <-109 dBm (squelch sensitivity -129 dBm).

Be sure to remove the 20 dB attenuator before performing any other tests.

2.4 AFC Lock Range

t. Set the IFR1200 as follows:
    1. set the TONE GENERATOR VAR switch to INTL,
    2. set the GEN LEVEL to -116 dBm,
    3. set the RF frequency to 220.0018MHz
    4. set METER to kHz/%x10 = 20,
    5. select 2ND FUNCT, METER,
    6. adjust TONE GENERATOR VAR pot for 63% AM read on the display.
u. Set the volume control on the radio so audio can be heard. 1000 Hz audio should be present. If so, the AFC is properly locking at the high extreme.
v. Disconnect the rf cable from the T/R port (remove rf signal)
w. Change the RF frequency to 220.0012 and reconnect the rf cable to the T/R port. 1000 Hz audio should be present. If so, the AFC is properly locking at the low extreme.

3. **TRANSMITTER TESTS**

The transmitter tests to be performed are transmitter power output and frequency accuracy.

## 3.1 Transmitter Power Output and Frequency Accuracy

a. Set up the equipment as shown in Figure 2.
b. Press the radio AUX key to put radio in simplex (MODE 1 LED flashing).
c. Set the IFR1200 as follows:
    1. set RF frequency to 220.0025 MHz,
    2. set METER switch to WATTS/AVG/150,
    3. set FREQ ERROR switch to 300,
    4. press keypad 2ND FUNCT, METER.
d. Set the mobile to transmit a 1kHz test tone by pressing the PGM key in. The mobile will now transmit a calibrated 1 kHz test tone, along with data carrier and pilot tone, when the mic PTT is depressed*.
e. Press the PTT switch on the mic.
f. Set the mobile to transmit a 2 kHz full power test tone* (with data carrier and pilot suppressed) by pressing and releasing the AUX key while the radio is in transmit.
g. Read the power output from the radio on the IFR1200 display. Should be 18 to 22 watts.
h. Read the frequency error from the FREQ ERROR meter. Error should be < 100 Hz.

* The spectrum sweeps of these signals may be observed by setting the scope display to HORIZONTAL = 1 kHz/div.

SEA Inc

ESP 520 Remote Control Capability

The ESP520 mobile radio features the ability to control and monitor certain radio functions via a remote device, through a simple three-wire connection. The remote capability of the ESP520 is realized through a series of RAM-resident registers dedicated to this function. The register and bit assignments for each function, as well as the ESP520 communication protocol, are described in this document.

## I. GENERAL COMMUNICATION PROTOCOL

Communication with the ESP520 radio is by means of standard asynchronous (NRZ) format: one start bit, eight data bits, one stop bit. The ESP520 uses TTL (0 to 5 volt) logic signal levels; therefore, a level-shifter is required for signals beyond that range. SEA manufactures and sells a unit designed to interface between the ESP500 series radios and devices which utilize standard RS-232 levels, the ESP500 Program Interface Unit. Please contact SEA for information regarding this product.

## II. ESP520 COMMAND PROTOCOL

Commands for remote operation are issued to the ESP520 as a string of standard ASCII characters, terminated by the Carriage Return character (ASCII $0D - hereafter referred to as CR). A Line Feed (ASCII $0A) may be included in the string, but is ignored by the ESP520. The total length of a single command line may not exceed 48 characters. Note: only those characters significant to the command are allowed in the string; no 'white space' characters may be inserted.

The first two characters received become the command specifier. The remaining characters are handled according to the particular command. The first command character also determines whether all the characters will be echoed; if the first character is lower case, characters will be echoed until the terminator (CR) is encountered. The terminator is not echoed. It is recommended that lower case characters be used in order to monitor communication latency throughout the system; after each character in a string is issued, the sender should wait for the digit to be echoed before sending the next. After the CR is sent to terminate the string, and upon completion of the command, the ESP520 will issue a prompt string, consisting of a CR, a LF, and a '!' (ASCII $21). Subsequent command strings should not be issued until the ESP520 has thus indicated it is ready to accept a new string.

There are four commands which can be used to examine and program both volatile (RAM) and non-volatile (EEPROM) memory in the radio. These commands may be understood by imagining them as members of the following matrix;

| | RAM | EEPROM |
|---|---|---|
| Program | pr | pe |
| Dump | dr | de |

The first two characters following the command specifier constitute the byte count, in hexadecimal, for the desired operation. The characters following the byte count comprise the starting address (also in hexadecimal) for the operation: for the RAM dictate, two characters are required to specify the eight-bit Page Zero address (upper byte assumed to be $00); for EEPROM operations, a full 16-bit (four character) address is necessary. For programming commands, the value(s) to be programmed follow the address, two ASCII hexadecimal characters for each memory byte. These commands are illustrated below.

Command: dr04bb(CR)

Interpretation: dump RAM, four bytes, starting at address $(00)BB.

Command: pr02d00427(CR)

Interpretation: program RAM, two bytes, starting at address $(00)D0, with data $04, $27

Command: de0b1245(CR)

Interpretation: dump EEPROM, eleven bytes, starting at address $1245

Command: pe10040038383838383838383841524b455220201a(CR)

Interpretation: program EEPROM, sixteen bytes, starting at address $0400, with data $38 $38 $38 $38 $38 $38 $38 $38 $41 $52 $4B $45 $52 $20 $20 $1A

For each byte of data requested by the 'dump' memory command (either RAM or EEPROM), the ESP520 will return an ASCII SPACE character ($20) followed by the two-character hexadecimal data value. The CR, LF, '!' prompt string will accompany the final data value. For example, in response to the 'dr04bb' command above, the radio might return

' 12 0E 9F 53(CR, LF, '!')'.

In the discussion regarding Remote Control that follows, the above commands are used to manipulate individual bits, or groups of bits, to achieve the desired function. For example, the command

pr01c001(CR)

would result in the HORN function being activated.

## III. ESP520 REMOTE CONTROL REGISTERS

The ESP520 Remote Control registers, and the specific function bits, are described in this section. In each description, the register is named, the bit positions named and described, and the absolute address of the register given. Except where otherwise noted, the functions observe positive logic: if a bit is SET (= logic 1), its named function will be active.

| | | |
|---|---|---|
| REM_BUTTONS | \| N/U\| SCN\| N/U\|TEST\| IGN\| AUX\| PGM\| HRN\| | $c0 |

The functions of four of the front panel switches are duplicated by the bits SCN, AUX, PGM, and HRN of the register REM_BUTTONS. These bits are ORed with the corresponding switch; that is, if either the front panel switch is depressed OR the bit position is set, the function will be executed.

> NOTE: Three of these switches (SCN, HRN, and PGM) are locked into one of two positions with alternating operation. AUX, however, is a momentary action switch. If AUX is to be used in remote control transactions, it must be operated as the switch would normally be, by clearing the bit position shortly after setting it.

The bit IGN is ORed with the signal IGNIT SENSE, which is available at rear connector P1, pin 1. TEST is used to place the radio in the Test mode, when followed by the 'soft' reset sequence, as described in a subsequent paragraph.

| | | |
|---|---|---|
| REM_SPECIAL | \|SRST\| N/U\|DMPH\|STST\|TXBD\|RXBD\| MON\| PTT\| | $c1 |

SRST signals a 'soft reset', whereby the radio performs a full software restart. If the TEST bit in REM_BUTTONS is set prior to setting this bit, the radio will enter the Test mode when it concludes its power-up sequence.

DMPH and STST bits are used for internal radio testing, and should not be manipulated for remote control applications.

If TXBD (TX BAND) is set when a valid Channel number (between 1 and 200) is written to REM_CHANNEL prior to transmit, upon detection of PTT the radio will transmit on a channel 1 MHz higher than the REM_CHANNEL value.

If RXBD (RX BAND) is set when a valid Channel number (between 1 and 200) is written to REM_CHANNEL, the radio will receive on a channel 1 MHz higher than the REM_CHANNEL value.

MON is a 'soft' bit which emulates the hardware 'monitor' (or 'hang-up box') signal. PTT is a 'soft' bit which emulates the hardware PTT signal; setting this bit will cause the radio to go into Transmit.

| | | |
|---|---|---|
| REM_CHANNEL | \|CHAN\|CHAN\|CHAN\|CHAN\|CHAN\|CHAN\|CHAN\|CHAN\| | $c2 |

The register REM_CHANNEL specifies which channel (1 - 200), along with the TXBD and TXBD bits above, will be loaded into the synthesizer. The synthesizer will continue to be loaded with the contents of REM_CHANNEL as long as it is occupied.

| | | |
|---|---|---|
| REM_MODE | \|MSIN\| N/U\| N/U\|MODE\|MODE\|MODE\|MODE\|MODE\| | $c3 |

The register REM_MODE mimics the action of the mode switch if an active mode (1 - 20, binary) occupies the MODE bits. This register will be cleared immediately upon being interpreted if MSIN, which inhibits the external MODE switch and SCAN, is not set.

| | | |
|---|---|---|
| REM_520BUTNS | \| XX \| XX \| XX \| H \| A/N\| MON\| LST\| VS \| | $d8 |

The bits of register REM_520BUTNS mimic the action of the five front panel key switches of the same name. These bits are ORed with the HOME, ALPHA/NUMERIC, MONITOR, LIST, and VOLUME SET functions.

> NOTE: These switches, like the AUX switch above, are momentary action switches. The remote control bits which emulate these functions should be operated as the switch would normally be, by clearing the bit position shortly after setting it.

| | | |
|---|---|---|
| REM_RX_ID | \|RXID\|RXID\|RXID\|RXID\|RXID\|RXID\|RXID\|RXID\| | $da |
| REM_TX_ID | \|TXID\|TXID\|TXID\|TXID\|TXID\|TXID\|TXID\|TXID\| | $db |

These registers specify the IDs that the radio will use for Receive and Transmit functions, respectively. When these registers are occupied, the IDs programmed into the normal radio EEPROM memory will be overridden.

## IV. AUTOMATIC STATUS REPORTING

The ESP520 has the capability to automatically report the status of certain functions via the ASR system. This process is coordinated by the RAM registers

| | | |
|---|---|---|
| ASR_BUFFER | \| XX \|SUSP\|ASTP\|ASTP\|ATSK\|ATSK\|ATSK\|ATSK\| | $df |
| ASR_TRIGGER | \|ASEN\| XX \| XX \| XX \| XX \| XX \| XX \|ASTR\| | $e0 |

where SUSP = Suspend bit
ASTP = ASR Type
ATSK = ASR Task (0 = no task in motion).
ASEN = ASR Enable
ASTR = ASR Trigger

The ASR system is enabled when the ASEN bit, which is copied to RAM from the non-volatile EEPROM bit at power-up, is set. The bit may subsequently be set or cleared remotely. ASR_BUFFER is for system use only and should not be disturbed.

The reporting of status is initiated by a change in one of the reported bits, whose update routine sets the ASR Trigger flag if the ASEN bit is set. A status report may also be initiated by (remotely) setting the ASTR bit regardless of the state of ASEN.

During serial input the SUSPend bit is set, inhibiting any ASR action which might interfere with the input stream. This bit is cleared when the input handling is terminated.

The 'main_loop' routine 'check_asr' polls the ASTR flag for action. Once a status report begins, the byte count is contained in the four ATSK bits. A new status report will not commence until this count returns to 0.

The number of bytes and the contents of the status report varies depending on the operational state of the radio at the moment, as given by the ASTP bits. Listed below are the string contents of the various outputs:

| | RECEIVE | TRANSMIT | LIST PROGRAMMING |
|---|---|---|---|
| ASTP bits: | 01 | 10 | 11 |
| 1st char | $D9 | $D9 | $D9 |
| 2nd char | $AA | $B8 | $C6 |
| 3rd char | MAIN_STAT | MAIN_STAT | MAIN_STAT |
| 4th char | LED_DATA | LED_DATA | LED_DATA |
| 5th char | REM_SWITCH | REM_SWITCH | REM_SWITCH |
| 6th char | TA_MODE | TA_MODE | TA_MODE |
| 7th char | RX_FLAGS | TX_FLAGS | RX_FLAGS |
| 8th char | KEY_520 | TX_ID | KEY_520 |
| 9th char | MAIN_LATCH | MAIN_LATCH | XSUM |
| → 10th char | VALID_ID | IN_USE | |
| 11th char | RX_CHANNEL | XSUM | |
| 12th char | SCAN_REVERT | | |
| 13th char | XSUM | | |
| Elapsed Time: | 16 | 14 | 12 mSec |

ASR Status Buffers

The following paragraphs describe the status buffers and bit assignments for the Automatic Status Reporting system. An asterisk above the bit in a register indicates that a change in this bit will initiate an Automatic Status Report (ASR Trigger). Additionally, during receive, receipt of a valid trunking word also initiates an ASR Trigger.

Bits labeled 'XX' are unused; however, these positions may be used by the ASR system as parity bits (to prevent the byte from being either '00' or 'FF', which may be unrecognized by some PC hardware), and should be ignored by the programming/monitoring software. Registers whose absolute RAM address is displayed (e.g., REM_SWITCH @ $dc) represent actual ESP520 working registers; these memory locations may be queried using the 'dr' command described earlier, but should not be disturbed ('pr' command).

---

1st char: D9

This character signals the start of the ASR 'packet'.

---

2nd char: Context/byte count - AA, B8, C6

This character contains two pieces of information: the upper nybl codes the context - A = Receive, B = Transmit, C = List; the lower nybl contains the count of the data bytes that follow, exclusive of the XSUM.

3rd char: MAIN_STAT

| ASR Trigger --> | | | | * | | * | | * | * |
|---|---|---|---|---|---|---|---|---|---|
| | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| MAIN_STAT | TXST | PTTC | SQST | TXIN | HKST | XX | TEST | NRDY |
| | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |

| | | |
|---|---|---|
| where | TXST = TX status | 0 if TX_TASK = 0 |
| | PTTC = PTT status | 0 if PTT_COUNT = 0 |
| | SQST = Squelch status | 0 if squelch closed |
| | TXIN = TX Inhibit | 0 if TX_INHIBIT_TIMER = 0 |
| | HKST = Hook status | 0 if ON HOOK |
| | XX = Reserved | 0/1 |
| | TEST = TEST status | 0 if not TEST mode |
| | NRDY = Not ready | 0 if ready |

If TX_TASK is occupied, a TX operation is in progress. PTT_COUNT, on the other hand, is a register which monitors the PTT switch activity, and may or may not by active while TX_TASK is.

The following are conditions under which NRDY is set:

Power-on Reset
Volume Set Tone
Program Mode
Synthesizer un-lock
RF Power fault
DSP error

---

4th char: LED_DATA

| ASR Trigger --> | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| LED_DATA | MD4 | TX | XX | MD3 | CALL | MD1 | RNGE | MD2 |

LEDs MD1 and MD2 backlight the SCN legend on the ESP520 faceplate; MD3 and MD4 backlight the PGM display.

5th char: REM_SWITCH

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ASR Trigger --> | | * | | * | * | * | * | * |
| REM_SWITCH | \|TEST\| | XX | \|SCAN\| | HORN\| | PRGM\| | AUX\| | IGNT\| XX \| | $dc |

All but two of these bits (TEST and IGNT) represent actual hardware switch levels, as transmitted from the Slave processor. TEST is the level at JU5, IGNT is the level at J2, pin 2, of the Personality PCB

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6th char: TA_MODE

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ASR Trigger --> | * | * | | * | * | * | * | * |
| TA_MODE | \| T/A\| | LCKO\| | XX \| | MODE\| | MODE\| | MODE\| | MODE\| | MODE\| | $d2 |

T/A = Talk Around status 1 if current mode is in talk-around
LCKO = Lockout status 0 if current mode in Scan List
MODE = current mode number (between 1 and 20)

---

7th char: RX_FLAGS or TX_FLAGS

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ASR Trigger --> | | | * | | | | | | |
| RX_FLAGS | \|RICS\| | XPDS\| | RNGS\| | XX \| | SCDL\| | XX \| | SCL1\| | SCL0\| | |

where RICS = RIC status 0 if RIC not engaged
XPDS = Transpond status 0 if Transpond not engaged
RNGS = Ringback status 0 if FSRB not engaged
XX = Reserved 1 always
SCDL = Scan Delay status 0 if SCAN_DELAY_TIMER = 0
SCL1 = Current Scan List bit 1
SCL0 = Current Scan List bit 0

ASR Trigger --> *

| TX_FLAGS | RICS | XPDS | RNGS | XX | TXT3 | TXT2 | TXT1 | TXT0 |
|---|---|---|---|---|---|---|---|---|

where RICS = RIC status — 0 if RIC not engaged
XPDS = Transpond status — 0 if Transpond not engaged
RNGS = Ringback status — 0 if FSRB not engaged
XX = Reserved — 0/1
TXT3 = TX_TASK bit 3 } represents the current Transmit Task -
TXT2 = TX_TASK bit 2 } a number between 1 and 13, or 0
TXT1 = TX_TASK bit 1 } if no task in progress
TXT0 = TX_TASK bit 0 }

| TASK NUMBER | DESCRIPTION | ASR TRIGGER |
|---|---|---|
| 0 | no TX in process | no |
| 1 | Set for TX start (test TX validity) | yes |
| 2 | Check handshake tries and PTT | yes |
| 3 | Send DTL handshake | yes |
| 4 | Switch to receive, set up for Barker | yes |
| 5 | Wait for Barker and/or DTL word | no |
| 6 | Transmit with voice | yes |
| 7 | Shut down TX functions | yes |
| 8 | Wait for DTL word, check Time Out Timer, PTT | yes |
| 9 | TX when FREE = 0 (Busy) | yes |
| 10 | TX when FREE = 0, wait for Barker | no |
| 11 | Transpond TX | yes |
| 12 | TX_TIMER timed out | yes |
| 13 | Transmitter start-up | no |

---

8th char: KEY_520 or TX_ID

ASR Trigger --> * * * * *

| KEY_520 | XX | XX | XX | H | A/N | MON | LST | VS | $dd |
|---|---|---|---|---|---|---|---|---|---|

This register represents the signal levels from the five front panel key switches of the same name.

| | |
|---|---|
| TX_ID | \|TXID\|TXID\|TXID\|TXID\|TXID\|TXID\|TXID\|TXID\| |

TXID is the current transmit ID, or 0 if transmit is not presently occurring.

---

9th char: MAIN_LATCH or XSUM (see below)

ASR Trigger -->

| | |
|---|---|
| MAIN_LATCH | \| TX \| XX \| RX \|HORN\| AUX\|PASQ\| XX \| XX \| |

These bits represent ESP520 Main Board control signal levels for the following circuits:

| | |
|---|---|
| TX = Transmit circuit power | 1 = on |
| RX = Receive circuit power | 1 = on |
| HORN = Horn output signal level | 1 = on |
| AUX = Auxiliary output signal level | 1 = on |
| PASQ = (Audio) Power Amp | 0 = on |

---

10th char: VALID_ID or IN_USE

ASR Trigger -->

| | | |
|---|---|---|
| VALID_ID | \| ID7\| ID6\| ID5\| ID4\| ID3\| ID2\| ID1\| ID0\| | $d4 |

00

IDx represents a Valid 8-bit ID that is being received by the ESP520 radio, or ~~254 ($FE) if no~~ ID is currently being received.

ASR Trigger -->

| | |
|---|---|
| IN_USE | \| XX \| XX \| XX \| IU4\| IU3\| IU2\| IU1\| IU0\| |

This register contains the current value of the IN_USE field of the Transmitted DTL data, a number between 1 and 20.

11th char: RX_CHANNEL or XSUM (see below)

ASR Trigger -->

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| RX_CHANNEL | XX | XX | XX | RPT4 | RPT3 | RPT2 | RPT1 | RPT0 |

This register contains the current value of the Receive Repeater, a number between 1 and 20.

---

12th char: SCAN_REVERT

ASR Trigger -->

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SCAN_REVERT | XX | XX | XX | SRT4 | SRT3 | SRT2 | SRT1 | SRT0 |

This register contains the current value of the Scan Revert mode, a number between 1 and 20.

---

13th char: XSUM.

This byte is the 8-bit exclusive-ORed checksum of all the data bytes, beginning with the 3rd character and exclusive of the XSUM character. Bit 7 of this digit will be set if the sum equals zero; otherwise, it is cleared.

□