Optoelectronics, Inc.
Digital ScoutÔ
Serial Interface Specification

Interface Version 1.1

February 19, 2002

INTRODUCTION

This document describes the serial interface of the Digital Scout™, a hand-held frequency counter capable of measuring the frequency of pulsed or continuous wave (CW) VHF and UHF transmitters and other signal sources. The Digital Scout™ is also capable of storing up to 1000 frequencies, as well as the number of occurrences, or "hits", of each frequency. This frequency data can then be downloaded to a personal computer for logging and analysis.

This document was written to assist the programmer in developing computer software applications for the Digital Scout™.

Optoelectronics, Inc. assumes no responsibility for the accuracy of the information contained in this document. Optoelectronics, Inc. is under no obligation to provide technical support on matters pertaining to this document, or to provide notification of changes or corrections to this document. To inquire about possible revisions, or to order copies of this document, contact the factory. A nominal fee may be charged to cover printing and shipping costs.

<div align="center">

OPTOELECTRONICS, INC.
5821 N.E. 14th Avenue
Fort Lauderdale, FL 33334
Phone: (954) 771-2050
FAX: (954) 771-2052
www.optoelectronics.com

</div>

ABOUT CI-5

The command structure of the Digital Scout™ serial interface conforms to the Icom CI-V interface standard. However, Optoelectronics has added enhancements in the form of additional commands and features. Optoelectronics has, therefore, modified the name of this new enhanced interface to CI-5.

Also, unlike the original Icom CI-V interface, and the CI-5 interface on most Optoelectronics products, the Digital Scout™ serial interface is full-duplex with RS-232C compatible voltage levels. The communications parameters for the serial interface are listed in Table 1 below.

Table 1. Communications Parameters.

DATA RATE	9600 bps
START BITS	1
DATA BITS	8
PARITY	NONE
STOP BITS	1

To connect the Digital Scout™ to a personal computer, a miniature (3.5 mm) stereo phone jack is provided on the top panel. The Digital Scout™ receives commands on the RING terminal and transmits responses on the TIP terminal of the stereo phone jack. Signal ground is provided on the SHIELD terminal of the phone jack. Since the Digital Scout™ serial interface is compatible with RS-232C voltage levels, no external interface converter box is required to connect the Digital Scout™ to a standard personal computer COM port. An interface cable for connecting the Digital Scout™ to a PC is available.

For ReactionTune™ applications, a subminiature (2.5 mm) phone jack is provided on the top panel. The TIP terminal provides the TTL equivalent of the RS-232 transmit data signal to drive ReactionTune™-capable receivers. Signal ground is provided on the SHIELD terminal of the phone jack.

COMMAND REFERENCE

The Digital Scout™ accepts commands over the CI-5 RS-232 interface when CI-5 COMMAND interface is selected from the front panel. In this section, all CI-5 command and response bytes are expressed in hexadecimal notation. The Digital Scout™ recognizes 14 different commands, which are summarized in Table 2 below.

Following the command summary table is a detailed description of each of the commands, including examples illustrating their use. In the command descriptions, "ra" refers to the RECEIVE ADDRESS, and "ta" refers to the TRANSMIT ADDRESS.

The RECEIVE ADDRESS is the address of the Digital Scout™, which is fixed at 9E. Each CI-5 device has its own unique address. The Digital Scout™ will not process any command in which the RECEIVE ADDRESS is not 9E. However, the Digital Scout™ will process commands with a RECEIVE ADDRESS of 00, but all command responses will be suppressed. A RECEIVE ADDRESS of 00 has special meaning. It provides a means for a device on a CI-5 bus to transmit a command to all other devices simultaneously. However, since several simultaneous responses would cause a collision, the responses are suppressed. Because the Digital Scout™ serial interface is an RS-232C interface, the Digital Scout™ will be the only device connected to the host computer.

The TRANSMIT ADDRESS is the address of the device which is transmitting the command to the Digital Scout™. In most cases, this device is a personal computer executing application software, usually referred to as the CONTROLLER. The standard address for the CONTROLLER is E0, but most any address can be used for the TRANSMIT ADDRESS. However, the TRANSMIT ADDRESS must be in the range 01 to EF. Also, the Digital Scout™ will not process any command in which the TRANSMIT ADDRESS matches its own address, 9E.

It is important to remember that the values specified are not ASCII characters, but are bytes expressed in hexadecimal notation. For example, "FE" represents a single byte with a value of 0xFE (hexadecimal), or 254 (decimal). It does not represent the ASCII character "F" followed by the ASCII character "E", a two-byte sequence.

Table 2. Digital ScoutÔ CI-5 Interface Command Summary.

COMMAND	SUB-COMMAND	DESCRIPTION
03	-	Read Frequency
04	-	Read Mode
06	-	Write Mode
15	01	Read Squelch Status
15	02	Read Signal Strength
7F	09	Read Identification
7F	12	Read Squelch Setting
7F	13	Write Squelch Setting
7F	20	Read Configuration
7F	21	Write Configuration
7F	22	Read Frequency Memory
7F	23	Read Hits Memory
7F	24	Clear Memory
7F	25	Write Frequency Memory

READ FREQUENCY

Command:

FE	FE	ra	ta	03	FD

Example:

FE	FE	9E	E0	03	FD

Response:

FE	FE	ta	ra	03	frequency	FD

Examples:

162.550000 MHz

FE	FE	E0	9E	03	00	00	55	62	01	FD

1045.725000 MHz

FE	FE	E0	9E	03	00	50	72	45	10	FD

Error

FE	FE	E0	9E	FA	FD

Description:
This command instructs the unit to send the current frequency measurement result. This command is only valid when FREQUENCY mode is selected.

The frequency data is in the form of 5 bytes, each consisting of 2 BCD digits. The order of the 10 BCD digits is as follows: 10 Hz digit, 1 Hz digit, 1 kHz digit, 100 Hz digit, 100 kHz digit, 10 kHz digit, 10 MHz digit, 1 MHz digit, 1 GHz digit, 100 MHz digit. See the examples shown above.

If the command length is incorrect, or if FREQUENCY mode is not selected, then the command is ignored, and the error response is returned.

READ MODE

Command:

FE	FE	ra	ta	04	FD

Example:

FE	FE	9E	E0	04	FD

Response:

FE	FE	ta	ra	04	ms	FD

| ms | is a BCD value representing the selected operating mode. BCD values are encoded as follows:

00:	FREQUENCY mode
01:	SIGNAL STRENGTH mode
02:	MEMORY mode
03:	CLEAR MEMORY mode
04:	AUTO STORE mode
05:	RESOLUTION mode
06:	MIN PULSE WIDTH mode
07:	FILTER mode
08:	FREQ DISPLAY mode
09:	INTERFACE mode
10:	RECEIVER mode
11:	PCR1000 VOLUME mode
12:	PCR1000 SQUELCH mode
13:	APO mode
14:	BEEPER mode
15:	VIBRATOR mode

Examples:
MEMORY mode

FE	FE	E0	9E	04	02	FD

RESOLUTION mode

FE	FE	E0	9E	04	05	FD

RECEIVER mode

FE	FE	E0	9E	04	10	FD

Error

FE	FE	E0	9E	FA	FD

Description:
This command instructs the unit to send the current operating mode.

The mode data is in the form of 1 byte, consisting of 2 BCD digits. See the examples shown above.

If the command length is incorrect, then the command is ignored, and the error response is returned.

WRITE MODE

Command:

FE	FE	ra	ta	06	ms	FD

ms is a BCD value representing the selected operating mode. BCD values are encoded as follows:

        00:      FREQUENCY mode
        01:      SIGNAL STRENGTH mode
        02:      MEMORY mode
        03:      CLEAR MEMORY mode
        04:      AUTO STORE mode
        05:      RESOLUTION mode
        06:      MIN PULSE WIDTH mode
        07:      FILTER mode
        08:      FREQ DISPLAY mode
        09:      INTERFACE mode
        10:      RECEIVER mode
        11:      PCR1000 VOLUME mode
        12:      PCR1000 SQUELCH mode
        13:      APO mode
        14:      BEEPER mode
        15:      VIBRATOR mode

Examples:

FREQUENCY mode

FE	FE	9E	E0	06	00	FD

SIGNAL STRENGTH mode

FE	FE	9E	E0	06	01	FD

APO mode

FE	FE	9E	E0	06	13	FD

Response:

FE	FE	ta	ra	FB or FA	FD

Examples:

OK

FE	FE	E0	9E	FB	FD

Error

FE	FE	E0	9E	FA	FD

Description:

This command selects the operating mode.

The mode select data is in the form of 1 byte, consisting of 2 BCD digits. See the examples shown above.

If the command length is incorrect, or if the mode select code is not valid, then the command is ignored, and the error response is returned.

READ SQUELCH STATUS

Command:

FE	FE	ra	ta	15	01	FD

Example:

FE	FE	9E	E0	15	01	FD

Response:

FE	FE	ta	ra	15	01	sd	FD

| sd | is a BCD value representing the current squelch status. BCD values are encoded as follows:

        00:      Squelch CLOSED
        01:      Squelch OPEN
        02:      Squelch PULSED

Examples:
Squelch closed

FE	FE	E0	9E	15	01	00	FD

Squelch open

FE	FE	E0	9E	15	01	01	FD

Error

FE	FE	E0	9E	FA	FD

Description:
This command instructs the unit to send the current squelch status. This command is only valid when FREQUENCY mode is selected.

The squelch status data is in the form of 1 byte, consisting of 2 BCD digits. See the examples shown above.

If the command length is incorrect, or if FREQUENCY mode is not selected, then the command is ignored, and the error response is returned.

READ SIGNAL STRENGTH

Command:

FE	FE	ra	ta	15	02	FD

Example:

FE	FE	9E	E0	15	02	FD

Response:

FE	FE	ta	ra	15	02	ss	FD

Examples:
-6.2 dBm

FE	FE	E0	9E	15	02	00	62	FD

-21.7 dBm

FE	FE	E0	9E	15	02	02	17	FD

-53.4 dBm

FE	FE	E0	9E	15	02	05	34	FD

Error

FE	FE	E0	9E	FA	FD

Description:
This command instructs the unit to send the current signal strength. This command is only valid when SIGNAL STRENGTH mode is selected.

The signal strength data is in the form of 2 bytes, each consisting of 2 BCD digits. The signal strength is reported in units of absolute dBm at 0.1 dB resolution, as measured at the antenna connector. The reported signal strength ranges from a maximum signal level of 0.0 dBm to a minimum signal level of –70.0 dBm. A minus sign is implied. See the examples shown above.

If the command length is incorrect, or if SIGNAL STRENGTH mode is not selected, then the command is ignored, and the error response is returned.

READ IDENTIFICATION

Command:

FE	FE	ra	ta	7F	09	FD

Example:

FE	FE	9E	E0	7F	09	FD

Response:

FE	FE	ta	ra	7F	09	id	sv	iv	FD

Example:

Digital Scout™, software version 2.6, interface version 1.1

FE	FE	E0	9E	7F	09	44	53	43	26	11	FD

Error

FE	FE	E0	9E	FA	FD

Description:

This command instructs the unit to send the identification information.

The identification data is in the form of 5 bytes, each consisting of 2 digits. The first 6 digits uniquely identify the device. The next 2 BCD digits indicate the current software version. The last 2 BCD digits indicate the current interface version.

If the command length is incorrect, then the command is ignored, and the error response is returned.

READ SQUELCH SETTING

Command:

FE	FE	ra	ta	7F	12	FD

Example:

FE	FE	9E	E0	7F	12	FD

Response:

FE	FE	ta	ra	7F	12	squelch	FD

Examples:

Squelch 0

FE	FE	E0	9E	7F	12	00	00	FD

Squelch 37

FE	FE	E0	9E	7F	12	00	37	FD

Squelch 100

FE	FE	E0	9E	7F	12	01	00	FD

Error

FE	FE	E0	9E	FA	FD

Description:
This command instructs the unit to send the current squelch setting. This command is only valid when FREQUENCY mode is selected.

The squelch setting data is in the form of 2 bytes, each consisting of 2 BCD digits. The squelch setting will be in the range 0 to 100. See the examples shown above.

If the command length is incorrect, then the command is ignored, and the error response is returned.

WRITE SQUELCH SETTING

Command:

FE	FE	ra	ta	7F	13	squelch	FD

Examples:

Squelch 0

FE	FE	9E	E0	7F	13	00	00	FD

Squelch 37

FE	FE	9E	E0	7F	13	00	37	FD

Squelch 100

FE	FE	9E	E0	7F	13	01	00	FD

Response:

FE	FE	ta	ra	FB or FA	FD

Examples:

OK

FE	FE	E0	9E	FB	FD

Error

FE	FE	E0	9E	FA	FD

Description:
This command selects the squelch setting. This command is only valid when FREQUENCY mode is selected.

The specified squelch setting data is in the form of 2 bytes, each consisting of 2 BCD digits. The specified squelch setting must be in the range 0 to 100. See the examples shown above.

If the command length is incorrect, or if the squelch setting data is not valid, then the command is ignored, and the error response is returned.

READ CONFIGURATION

Command:

FE	FE	ra	ta	7F	20	FD

Example:

FE	FE	9E	E0	7F	20	FD

Response:

FE	FE	ta	ra	7F	20	as	rs	pw	fm	fd	ap	bp	vb	FD

as	indicates the current AUTO STORE setting as follows:	00:	Disabled
		01:	Enabled

rs	indicates the current RESOLUTION setting as follows:	00:	1 kHz (FAST)
		01:	100 Hz (SLOW)

pw	indicates the current MIN PULSE WIDTH setting as follows:	00:	500 uS (SLOW)
		01:	1300 uS (MEDIUM)
		02:	8300 uS (FAST)

fm	indicates the current FILTER MODE setting as follows:	00:	Disabled
		01:	Enabled

fd	indicates the current FREQ DISPLAY setting as follows:	00:	Measured
		01:	Channel

ap	indicates the current AUTO POWER OFF setting as follows:	00:	Disabled
		01:	Enabled

bp	indicates the current BEEPER setting as follows:	00:	Disabled
		01:	Enabled

vb	indicates the current VIBRATOR setting as follows:	00:	Disabled
		01:	Enabled

Examples:
AUTO STORE = Disabled, RESOLUTION = 1 kHz (FAST), MIN PULSE WIDTH = 500 uS (SLOW), FILTER MODE = Enabled, FREQ DISPLAY = Channel, AUTO POWER OFF = Disabled, BEEPER = Disabled, VIBRATOR = Disabled

FE	FE	E0	9E	7F	20	00	00	00	01	01	00	00	00	FD

AUTO STORE = Enabled, RESOLUTION = 100 Hz (SLOW), MIN PULSE WIDTH = 1300 uS (MEDIUM), FILTER MODE = Disabled, FREQ DISPLAY = Measured, AUTO POWER OFF = Enabled, BEEPER = Enabled, VIBRATOR = Disabled

FE	FE	E0	9E	7F	20	01	01	01	00	00	01	01	00	FD

AUTO STORE = Enabled, RESOLUTION = 100 Hz (SLOW), MIN PULSE WIDTH = 8300 uS (FAST), FILTER MODE = Disabled, FREQ DISPLAY = Measured, AUTO POWER OFF = Enabled, BEEPER = Disabled, VIBRATOR = Enabled

FE	FE	E0	9E	7F	20	01	01	02	00	00	01	00	01	FD

Error

| FE | FE | E0 | 9E | FA | FD |

Description:
This command instructs the unit to send the current configuration data.

The configuration data is in the form of 8 bytes, each consisting of 2 BCD digits, and specifies the settings of the various configuration parameters. See the examples shown above.

If the command length is incorrect, then the command is ignored, and the error response is returned.

WRITE CONFIGURATION

Command:

FE	FE	ra	ta	7F	21	as	rs	pw	fm	fd	ap	bp	vb	FD

as	indicates the desired AUTO STORE setting as follows:	00:	Disabled
		01:	Enabled

rs	indicates the desired RESOLUTION setting as follows:	00:	1 kHz (FAST)
		01:	100 Hz (SLOW)

pw	indicates the desired MIN PULSE WIDTH setting as follows:	00:	500 uS (SLOW)
		01:	1300 uS (MEDIUM)
		02:	8300 uS (FAST)

fm	indicates the desired FILTER MODE setting as follows:	00:	Disabled
		01:	Enabled

fd	indicates the desired FREQ DISPLAY setting as follows:	00:	Measured
		01:	Channel

ap	indicates the desired AUTO POWER OFF setting as follows:	00:	Disabled
		01:	Enabled

bp	indicates the current BEEPER setting as follows:	00:	Disabled
		01:	Enabled

vb	indicates the current VIBRATOR setting as follows:	00:	Disabled
		01:	Enabled

Examples:
AUTO STORE = Disabled, RESOLUTION = 1 kHz (FAST), MIN PULSE WIDTH = 500 uS (SLOW), FILTER MODE = Enabled, FREQ DISPLAY = Channel, AUTO POWER OFF = Disabled, BEEPER = Disabled, VIBRATOR = Disabled

FE	FE	9E	E0	7F	21	00	00	00	01	01	00	00	00	FD

AUTO STORE = Enabled, RESOLUTION = 100 Hz (SLOW), MIN PULSE WIDTH = 1300 uS (MEDIUM), FILTER MODE = Disabled, FREQ DISPLAY = Measured, AUTO POWER OFF = Enabled, BEEPER = Enabled, VIBRATOR = Disabled

FE	FE	9E	E0	7F	21	01	01	01	00	00	01	01	00	FD

AUTO STORE = Enabled, RESOLUTION = 100 Hz (SLOW), MIN PULSE WIDTH = 8300 uS (FAST), FILTER MODE = Disabled, FREQ DISPLAY = Measured, AUTO POWER OFF = Enabled, BEEPER = Disabled, VIBRATOR = Enabled

FE	FE	9E	E0	7F	21	01	01	02	00	00	01	00	01	FD

Response:

FE	FE	ta	ra	FB or FA	FD

Example:
OK

FE	FE	E0	9E	FB	FD

Error

| FE | FE | E0 | 9E | FA | FD |

Description:

This command selects the configuration data.

The configuration data is in the form of 8 bytes, each consisting of 2 BCD digits, and specifies the settings of the various configuration parameters. See the examples shown above.

If the command length is incorrect, or if any of the configuration parameters is invalid, then the command is ignored, and the error response is returned.

READ FREQUENCY MEMORY

Command:

FE	FE	ra	ta	7F	22	memory	FD

Examples:
Memory location 000

FE	FE	9E	E0	7F	22	00	00	FD

Memory location 563

FE	FE	9E	E0	7F	22	05	63	FD

Memory location 999

FE	FE	9E	E0	7F	22	09	99	FD

Response:

FE	FE	ta	ra	7F	22	frequency	FD

Examples:
162.550000 MHz

FE	FE	E0	9E	7F	22	00	00	55	62	01	FD

1045.725000 MHz

FE	FE	E0	9E	7F	22	00	50	72	45	10	FD

Error

FE	FE	E0	9E	FA	FD

Description:
This command instructs the unit to send the frequency stored in the specified memory location.

The specified memory location data is in the form of 2 bytes, each consisting of 2 BCD digits. The specified memory location must be in the range 0 to 999. The frequency data is in the form of 5 bytes, each consisting of 2 BCD digits. The order of the 10 BCD digits is as follows: 10 Hz digit, 1 Hz digit, 1 kHz digit, 100 Hz digit, 100 kHz digit, 10 kHz digit, 10 MHz digit, 1 MHz digit, 1 GHz digit, 100 MHz digit. See the examples shown above.

If the command length is incorrect, or if the specified memory location is not in the range 0 to 999, then the command is ignored, and the error response is returned.

READ HITS MEMORY

Command:

FE	FE	ra	ta	7F	23	memory	FD

Examples:

Memory location 000

FE	FE	9E	E0	7F	23	00	00	FD

Memory location 563

FE	FE	9E	E0	7F	23	05	63	FD

Memory location 999

FE	FE	9E	E0	7F	23	09	99	FD

Response:

FE	FE	ta	ra	7F	23	hits	FD

Examples:

214 Hits

FE	FE	E0	9E	7F	23	00	02	14	FD

21,583 Hits

FE	FE	E0	9E	7F	23	02	15	83	FD

Error

FE	FE	E0	9E	FA	FD

Description:

This command instructs the unit to send the number of hits stored in the specified memory location.

The specified memory location data is in the form of 2 bytes, each consisting of 2 BCD digits. The specified memory location must be in the range 0 to 999. The hits data is in the form of 3 bytes, each consisting of 2 BCD digits. The number of hits will be in the range 0 to 65,535. See the examples shown above.

If the command length is incorrect, or if the specified memory location is not in the range 0 to 999, then the command is ignored, and the error response is returned.

CLEAR MEMORY

Command:

FE	FE	ra	ta	7F	24	FD

Example:

FE	FE	9E	E0	7F	24	FD

Response:

FE	FE	ta	ra	FB or FA	FD

Example:
OK

FE	FE	E0	9E	FB	FD

Error

FE	FE	E0	9E	FA	FD

Description:
This command clears all frequency and hits memory locations.

Once this command is executed, all memory locations are set to zero. This command has the same effect as clearing the memory from the front panel.

If the command length is incorrect, then the command is ignored, and the error response is returned.

WRITE FREQUENCY MEMORY

Command:

FE	FE	ra	ta	7F	25	frequency	FD

Examples:

162.550000 MHz

FE	FE	9E	E0	7F	25	00	00	55	62	01	FD

1045.725000 MHz

FE	FE	9E	E0	7F	25	00	50	72	45	10	FD

Response:

FE	FE	ta	ra	FB or FA	FD

Example:

OK

FE	FE	E0	9E	FB	FD

Error

FE	FE	E0	9E	FA	FD

Description:
This command writes a frequency to the next available memory location. The corresponding number of hits is set to zero, to indicate that the frequency was uploaded instead of captured.

The frequency data is in the form of 5 bytes, each consisting of 2 BCD digits. The order of the 10 BCD digits is as follows: 10 Hz digit, 1 Hz digit, 1 kHz digit, 100 Hz digit, 100 kHz digit, 10 kHz digit, 10 MHz digit, 1 MHz digit, 1 GHz digit, 100 MHz digit. See the examples shown above.

If the command length is incorrect, or if all memory locations are full, then the command is ignored, and the error response is returned.

OPTOELECTRONICS, INC.
5821 N.E. 14th Avenue
Fort Lauderdale, FL 33334
Phone: (954) 771-2050
FAX: (954) 771-2052
www.optoelectronics.com