

Operations Manual



INSTAScan[®] SCANNER ***MODEL S556-EP***

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Version 100479-2 Rev.A September
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Chapter 1

Introduction

The S556-EP InstaScan scanners and Dura-label Radio Frequency (RF) Identification Tags developed by SCS are state-of-the-art data gathering and inspection systems that combine sophisticated Interactive Identification technology in a compact form factor. This unique synergy allows our system to integrate seamlessly into — and significantly increase productivity for — a wide range of applications and environments.

This system consists of the following components:

A scanner that is capable of writing information to and reading information from Dura-labels using a read/write head (antenna). The scanner conforms to FCC Part 90 specifications and can operate with one to six externally connected antennas.

Dura-label RF tags that contain information programmed by the scanner. These tags are designed to store information under extremely harsh environments without requiring a battery, and the read/write Dura-labels can store a permanent record of multiple events and transactions.

Communications between the scanner and tags are conducted using a revolutionary two-way technology that provides superior advantages over conventional communication methods. The specific data being communicated, and the amount of interaction you have with the scanner and tag, may be determined by your application.



Advantages

Data-gathering systems such as bar code readers use one-way communication: a sensor reads information from a device, without any interaction between the two devices.

Moreover, bar code systems are subject to line-of-sight limitations. As a result, airborne contaminants such as dust, dirt, oil, and mist, as well as label damage and objects residing outside the line of sight, result in inefficient and erroneous results.

The SCS Interactive Identification System overcomes these restrictions by using state-of-the-art technology. This technology allows the scanner and tag to conduct ongoing two-way communications that are not restricted by line-of-sight constraints.

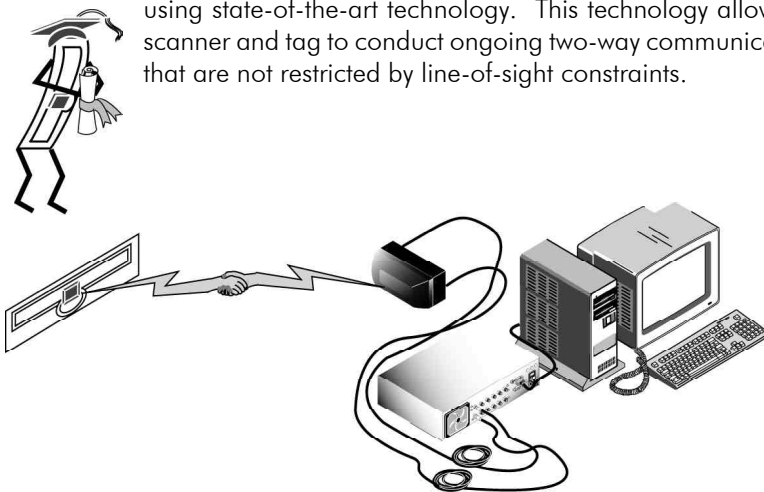


Figure 1. Interactive Identification Technology

This unique capability allows:

- *Collective or selective data to be read from a single tag.*
- *Collective or selective data to be read from multiple tags without requiring sorting or unpacking.*
- *Classes of tags to be filtered according to user-defined criteria.*

This technology employs a superior interrogation feature that enables applications to uniquely identify all tags in the scan field, without misidentification or identifying the same tags multiple times.

It also uses a robust protocol that maintains a uniform per-tag scan time, regardless of the number of tags in the scan field. The protocol provides a flexible software application interface that can be customized to the specific needs of particular industries and markets.

These unparalleled capabilities make our system an ideal solution for logistics and warehousing, automatic sortation, pallet tracking, and anti-diversion/anti-counterfeiting applications.



S556-EP InstaScan Scanner

The S556-EP scanner is designed for applications or configurations that require the scanner to be a considerable distance from tags, or where numerous tags are required to be read simultaneously. Conveyor belt applications are ideally suited to the scanner.

The scanner provides six pairs of coaxial connectors for supporting up to six external antennas. Each antenna plugs into its own set of connectors on the front panel of the scanner.

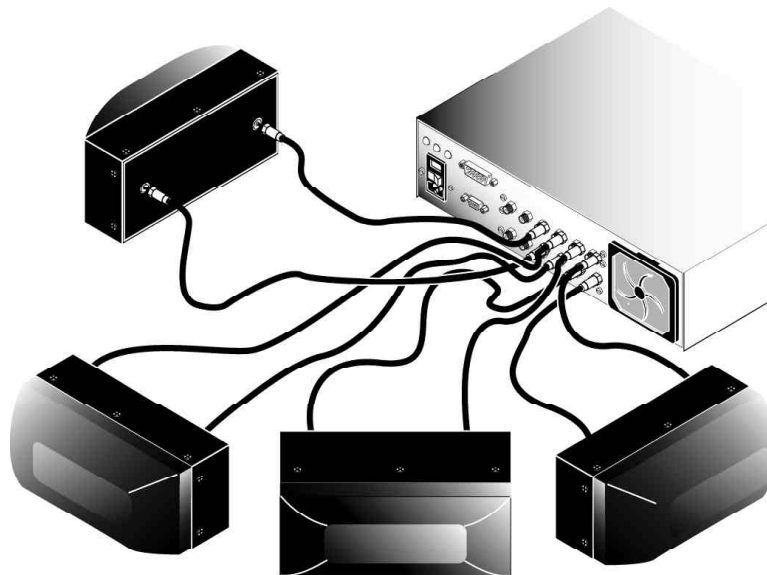


Figure 2.
S556-EP InstaScan Scanner

What Else You Need

To complete your system, you need an IBM or compatible personal computer with the following minimum system requirements:

- 486 processor or better
- Compatible screen and keyboard
- 9-pin RS-232 port
- Windows 95 or 98
- 16 MB of RAM (32+ MB recommended)
- FCC Part 90 Site License (U.S. Customers)

The applications you use to interface with this system may have additional hardware and software requirements. For more information, consult the manual that came with your applications.



Summary of Chapters

Besides Chapter 1, this Operations Manual contains the following additional chapters:

- *Chapter 2, Installation* – describes how to install the scanner and tag(s)
- *Chapter 3, RF Communication* - provides information on radio frequency (RF) communications
- *Chapter 4, Troubleshooting* – describes how to identify, resolve, and avoid problems when using the scanner and tag. This chapter also contains Customer Service information and merchandise return instructions
- *Chapter 5, Specifications* – lists scanner specifications
- *Chapter 6, DB-25 Connector Function* – describes the 25-pin connector of the S556-EP scanner

Chapter 2

Installation

This chapter provides instructions for installing the S556-EP scanner and tag(s).

LEDs and Connectors

The scanner provides the connectors and LEDs described in the following sections and shown in Figure 3.

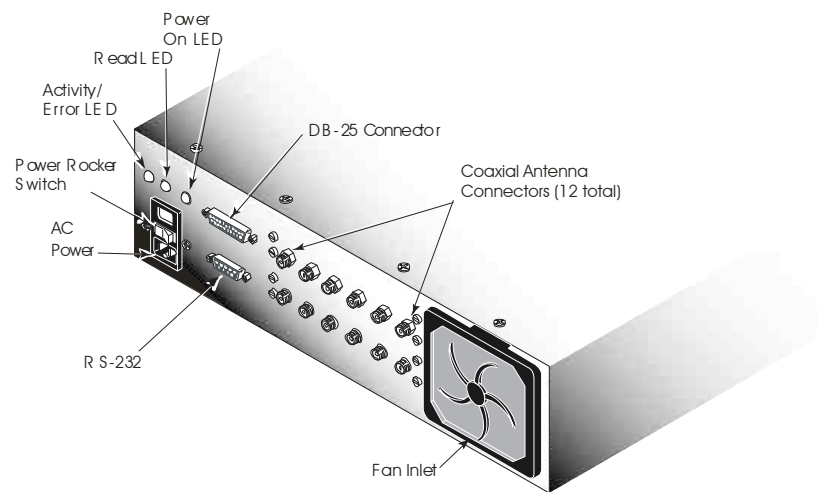


Figure 3. S556-EP InstaScan Scanner



Scanner Front

The front panel of the S556-EP scanner has three LEDs that indicate power, activity, and transmitter ON/OFF (see Figure 3). Table 1 describes the meanings of the LEDs.

The front panel also has an On/Off switch located below the three LEDs (see Figure 3).

- In the ON position, the red Power ON LED should go ON, indicating that the scanner is receiving power.
- If the OFF position, the scanner is not receiving power, even if the connected to the power outlet.

The front panel also contains three connectors. The lower connector is a standard DC power receptacle. The power cord provided with the scanner should be plugged into this connector and into the wall outlet. For more information, refer to "Connecting to an AC Outlet" on page 14.

The small multi-pin connector is the 9-pin RS-232 port. The RS-232 serial port connector allows the scanner to communicate with a personal computer through the PC's serial port. For more information on making this connection, refer to page 13.

The large multi-pin connector is the 25 pin test connector. For more information on this connector, refer to Chapter 6.

Scanner Rear

The S556-EP scanner rear panel houses a fan for cooling. Be sure to allow for space between the fan and nearby objects to prevent overheating.

Table 1. S556-EP Scanner LED Meanings

LED	Color	Status
Power ON	Red	ON = scanner is turned on and receiving power from external power supply
Activity/Error	Yellow	Flicker = scanner detects tag information. Constant Flickering with no tag in the scanning field = (a) Noisy environment or possible interference, resulting in diminished tag reading. (b) Loose cable or bad connector
Transmit On	Green	On = Scanner is transmitting RF signals.



Scanner Installation Steps

The scanner installation consists of the following steps:

1. Position the scanner – locate near desired antenna locations.
2. Connect external antennas – see page 11.
3. Place the antenna for optimum read/write operation – see page 12.
4. Connect the scanner to a computer serial port or RS-232 – see page 13.
5. Connecting to an AC outlet – see page 14.
6. Configure the scanner - see page 15.
7. Align the antenna – see page 18.

Connecting External Antennas

The front panel provides six pairs of coaxial antenna Receive/Transmit connectors. Each pair of connectors accommodates a single external antenna. Figure 4 shows the external antenna connections to the scanner.

 *The S556-EP can be used with fewer than six antennas. Install antennas sequentially, starting with the left-most connector pairs.*

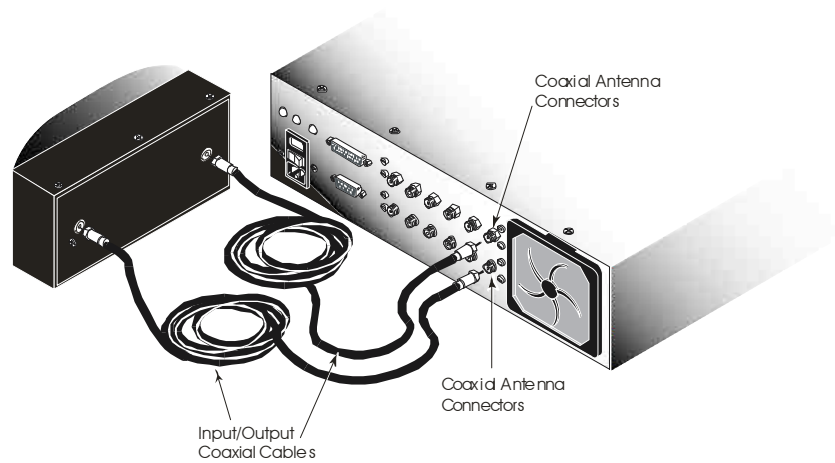


Figure 4. Antenna Connections



Placing the Antenna

Antenna placement is critical to ensuring that information is transmitted to and from tags accurately. Observe the following guidelines when placing the antenna:

Locate the antenna away from metal objects, microwave ovens, and other devices that may induce radio frequency interference. In addition, make sure there are no metallic surfaces between, or in relative proximity to, the scanner and tag. For additional placement considerations, refer to "RF Communications" on page 23.

When reading, the antenna should be placed no more than 60 inches from the objects bearing tags. When writing, the antenna should be no more than 22 inches from objects bearing tags.

 *Tags must reside within the scan field for at least 3 milliseconds for information to be retrieved from them.*

Connecting to a PC Serial Port or RS-232

The scanner has a 9-pin female RS-232 connector that connects to a serial port or RS-232 connector on an IBM or compatible personal computer. The serial port can operate up to 57,600 bps.

To make this connection, you need:

An appropriately configured serial cable.

One of the following adapters, if your computer's serial port does not have a 9-pin connector:

- A 15-pin to 9-pin adapter, if your computer has a 15-pin serial port connector.
- A 25-pin to 9-pin adapter, if your computer has a 25-pin serial port connector.

These adapters are available from most computer and electronics stores.

Use the following procedure to connect the scanner to your computer's serial port.

1. Attach the male connector on the serial cable to the 9-pin serial connector on the scanner's front panel (see Figure 3).
2. Connect the other end of the cable to your computer's serial port. Use an adapter, if appropriate, to make this connection.



Connecting to an AC Outlet

The following procedure describes how to connect the scanner to an AC Outlet.

1. Verify that the On/Off switch on the scanner front panel is in the OFF position (see Figure 3).
2. Connect the power cord to the AC receptacle in the scanner front panel (see Figure 3).
3. Connect the other end of the power cord to the wall outlet.
4. Set the On/Off switch to the ON position. The Power ON LED lights.

Configuring the Scanner

The following procedure will verify that the RS-232 link between the scanner and the computer is working correctly.

1. Insert the supplied Series 5 Development and Demo Tools, Disk 1, into an available floppy disk drive.
2. Open the "My Computer" icon on the desktop.
3. Open the floppy disk drive (typically A:).
4. Run the application "Setup.exe"
5. Installshield will launch and guide you through the installation of the Series 5 Tools onto your computer.
6. Turn on the scanner and ensure that the antennas are connected to the scanner. If you are using two or more antennas, connect each antenna from left to right.
7. Select the "Series 5 Test Tool" icon in the Series 5 tools folder from the start menu.
8. If the scanner is attached to COM1 or COM2, it will be recognized by the application automatically. In the application dialog, you will see the text "found scanner (rev XX.XX) on COMX".
9. If the scanner is attached to COM3 or COM4, the application will not recognize the scanner automatically. In the application dialog, you will see the text "Can't find Scanner, use Manual Connect." Select the appropriate COM PORT by pressing the down arrow in the "Scanner <-> Host" frame. Hit the connect button. You should see the text message "Connect: found scanner (revision XX.XX) on COMX".

 *If you receive the error message "Can't find scanner on COMX" refer to page 27 for troubleshooting procedures.*



10. Look for the text "Scanner type = XXXX" in the application dialog. If "XXXX" is not "S556-EP", select "S556-EP" from the Scanner menu of the Series 5 Test Tool application.
11. Look for the text "Mode = ..." in the application dialog. If the mode is not "Basic Function Test", select "Basic Function Test" from the Mode menu of the Series 5 Test Tool application.
12. There are three tests you must run in order to confirm that the scanner is working correctly. These are "Read Test", "List Test", and "Write Test".
13. Select "Antenna 1" button at the top of the Series 5 Scanner Test window. Position the tag in the antenna field, ensuring that the object which the tag is attached is not between the antenna and tag.
14. Position a tag within 60 inches of the antenna.
15. Click the "Read Test" button. You should see the text "- Check Read: PASS -" appear in the Test Results box. If the test fails, follow the instructions given by the application.
16. Remove all tags from around the antenna and click the "List Test" button. Wait two seconds. If the test is successful, you should see the following text appear in the Test Results box.

"- Check List -"

"List Start: OK"

"List Stop: OK"

"List Report: OK"

"Found 0 tags:"

"Place 1 tag in the field and run test again."

-
17. Each List Test is composed of three commands given to the scanner. If the test is successful, all these tests should say "OK" after the test name. The application will ask you to repeat the List Test with 1) A single tag, and 2) two tags in front of the antenna. The test is complete when the application successfully detects two tags.
 18. The Write Test requires a write - capable tag. Position the object with the tag within 22 inches of the antenna.
 19. Click on the Write Test button and observe the results in the Test Results box. If the test passes, you will see:

"- Check Write -"

"Write: OK"
 20. If the test fails, follow the instructions given by the application. If you repeatedly get the "Move tag closer to antenna" instruction, ensure the tag is directly over the antenna and there are no objects between the antenna and tag.
 21. For each antenna that is connected to the scanner, repeat steps 13-20 for that antenna.
 22. This completes the test of the scanner.



Aligning the Antenna

After verifying that the scanner is operating properly, use the following procedure to align the antenna(s). Aligning the antenna(s) ensures optimal performance.

1. Connect the scanner to COM1 or COM2 and turn the power on.
2. Run the application "Series 5 Test Tool" in the "Series 5 Tools" folder in the start menu.
3. From the mode menu, choose "Antenna Alignment".
4. Select the antenna you wish to align with the available antenna buttons. Press the "Go" button.
5. Move the object with the tag into the "scanning area", the point where you intend to scan.
6. Adjust the antennas until the application indicates it detects a tag. You can find the complete scanning field by moving the tag around. When the application detects a tag, the window will flash with the message "Label Found". Press the "GO" button again to stop the alignment test.
7. If you have other antennas connected, you can select the different antennas by using the antenna buttons on the top of the window.

This completes the scanner installation procedure.

Installing Dura-labels

Dura-label RF tags have a diminutive form factor that allows them to be installed in areas that cannot accommodate conventional RF tags. In addition, Dura-labels can communicate with the scanner without having to be in the line-of-sight. This unique combination provides tremendous flexibility when determining a location for placing tags.

In textile applications, for example, tags can be inserted into the front tail of a shirt or the waistline of pants using a heat seal patch and a heat press. Because this system does not require line-of-sight scanning, the tag does not have to be visible to the scanner.

When considering locations for installing tags, make sure they are within 60 inches of the scanner antenna for at least 3 milliseconds so data (16-bit word) can be read from the tag. Avoid locations where metal or water is present because radio-frequency communication does not penetrate metal and is absorbed by water.



Reading Information from your Dura-labels

Once you have installed your tags, and have set-up your scanner system, you are ready to begin.

1. Run the "Series 5 Demo" application in the "Series 5 Tools" folder in the start menu.
2. The connect dialog box will appear, set COM Port to the port where the scanner is connected, Baud Rate to the highest value supported by your computer and cable length. Set "# of Antenna" to the appropriate value then click the "Connect" button.
3. After a few seconds, the main SCS Demo dialog will come up. The scanner is in List-ID mode. As a tag is moved into the field in front of the antenna, you will see the ID of that label displayed under Label ID.
4. Try having additional tags moved in front of an antenna. You can also reset the display with the Clear button.
5. Double click on the ID of a tag to bring up detailed information about that tag. This will bring up a tag dialog where you can see the data in each of the memory locations of the label. Additional usage of this dialog is described in the following section.

Writing Information to Your Dura-label

Read/write tags can be written to using the scanner. Each bit of memory is write once, read many (WORM). Meaning after you have written to a specific bit, it is permanent and cannot be overwritten or erased. To add more data to the tag you must write to a different bit. Another feature included with each user-writable word of memory is a Write-Protect bit. This bit allows you to protect an entire word (16 bits) after any or all of the bits have been written.

1. Start the Series 5 Demo application as described in the previous section.
2. Position an object with a tag in the field and double click on its ID to bring up the tag dialog.
3. In the Write Protect frame, hit "Query All". Any writeable memory location will become editable (white), while write protected memory locations will stay gray.
4. Move the mouse cursor over a memory location and click within that location to edit it. Enter a new value and then hit "refresh" or move the cursor to a different memory location and click. The application will attempt to write the value you specified to the tag.
5. The status of the tag will be displayed in the status box at the lower part of the screen. If the write was unsuccessful, the value in the memory location will change back to reflect the value actually stored there.
6. To write protect a memory location, move the cursor to a memory location and click the "Set" button in the Write Protect section. The memory location will change from a white background to a gray background to show that it is now write protected.



7. To write to a block of memory locations, use the commands in the block section of the window. Enter the starting memory location in the "From" window. Enter number of memory locations in the "Length" window. The ending memory location will be automatically calculated in the "To:" window. Click the box to the left of the "Write" text and enter the data in the window below the "Write" command.
8. To write protect the entire block, click the box to the left of the "Write Protect" text.
9. To complete the block write command, select the "Perform" button.
10. To return to the List ID mode, click the "OK" button.

Loading Your Application

After you install your system according to the instructions in this chapter, you can load your application and begin reading information from the Dura-labels. Your application will determine the amount of interaction you have with the InstaScan Scanner and Dura-labels.

 *If you will be developing applications designed to interface to your system, refer to the Software Development Disk for programming information.*

Chapter 3

RF Communications

In general, devices that communicate using radio frequency, such as your system, can be sensitive to signal interference and signal attenuation. This chapter provides tips for optimizing radio-frequency (RF) communications with your InstaScan and Dura-label.

Topics in this chapter include:

- Signal interference — see page 24
- Signal attenuation/reflections — see page 25
- Optimizing performance — see page 26



Signal Interference

Signal interference is RF signals that interfere with the information being exchanged between the tag and scanner. Signal interference can severely diminish the scanner's ability to read information from the tags. The Activity LED on the scanner flickers constantly if it detects signal interference.

The source of the interfering signals may be:

- An RF system, such as an RF local-area network (LAN) or another Interactive Identification system, located close to your system.
- Security gates, garage doors, or similar devices that emit RF signals.
- Appliances such as microwave ovens.

The effects of these noise sources are localized and can be eliminated by relocating the scanner and its antenna.

Your system's communication capabilities are significantly reduced when the noise level perceived by the system exceeds the strength of signals received.

Signal Attenuation/Reflections

Signal attenuation is the loss of signal strength that occurs naturally over distances, but which can also be caused by RF barriers in the signal path.

Examples of such barriers include:

- Enclosed locations that have concrete walls, floors, and ceilings.
- Metal surfaces surrounding the antenna or tag.
- Water or other fluids surrounding the antenna or tag.

Almost every object (furniture, partitions, and people) in the path of a signal causes some degree of attenuation. The effects can be minimized by careful antenna placement.

The reflection from metal or metallic surfaces behind the tag can also affect signal attenuation. In some cases, this may increase the read distance slightly, while inducing intermittent “dead” spots within the read field that permit little or no communication between the scanner and tag.



Optimizing Performance

While it is not possible to predict how the system will perform in any given environment, observing the following guidelines will help optimize performance in your environments and applications:

Carefully plan the placement of the scanner antenna.

The antennas can be extended approximately ten feet from the scanner depending on cable length purchased for the application.

The scanner antenna should never be disassembled, altered, or modified except by an authorized technician. Any unauthorized antennas modifications can void your warranty.

Consider the environment's RF characteristics, including construction materials, office plan (closed or open), and the presence of windows and ducting. The RF field pattern, and the reading distance, may be influenced by nearby metal objects, such as appliances, equipment, metal wall framing, and wire coat hangers.

Ensure that objects containing tags are no more than 60 inches from the antenna and remain in the scan field for at least 3 milliseconds.

To avoid mutual interference when installing more than one tag in the same object, allow a sufficient distance between the tag. The maximum interference occurs when tags within the same object are within two inches of each other and nearly equidistant from the scanner antenna.

Never apply chemicals to the tags. Certain chemicals, such as alcohol, may have little or no effect at room temperature, but may become corrosive at higher temperatures.

Chapter 4

Troubleshooting

This chapter provides troubleshooting information you can use in the unlikely event you have a problem with your system. Customer Service information and merchandise return instructions are included in this chapter.

Solving Problems

The following table identifies scanner and tag problems and provides suggestions for resolving the problem.

Table 2. Problem Solving

Problem	Probable Cause	Solution
The Power ON LED does not light when you turn on the scanner	The AC outlet may not be working.	Plug another electrical appliance, such as a lamp, into the outlet and turn it on. If the appliance does not work, plug the scanner into a different outlet.
	The AC outlet may be controlled by a wall switch.	Set the wall switch to provide AC power to the outlet, or use an outlet to be controlled by a switch.



Problem	Probable Cause	Solution
The Activity/Error LED does not light hen you configure the scanner.	You may have a faulty tag.	Try another tag.
	The scanner may be faulty.	Use the Series 5 Test utilities to verify scanner operation (see "Configuring the Scanner" on page 15)
	The antenna cable may be faulty.	Contact SCS Customer Service (see page 30).
You receive an error message when configuring the scanner.	The scanner may not be turned on.	Verify that the Power ON LED is lit.
	The scanner's serial port connection to your computer may not be secure.	Verify the scanner-to-serial port connection. If you are using a serial port adapter, make sure the adapter connections are secure.
	The Series 5 Test programs are accesing a different a different Com Port than the one connected.	Switch the serial cable to Com Port 1 or set the Com Port being used.

Problem	Probable Cause	Solution
Information could not be read from the tag.	The tag may be outside of the scanning area.	Make sure the tag is no more than 60 inches from the scanner.
	The tag may have passed too quickly past the scanner.	Make sure the tag is in the scanning area for at least 3 milliseconds.
	No RF Power	The supplied SCS Diagnostic tag may be used to verify that the scanner is transmitting RF power. When held within a few inches of the transmit antenna, the LED on the Diagnostic tag will glow Red, indicating the presence of the RF field.
Same as above, but the Activity/Error LED flickers constantly.	RF Interference is disrupting scanner-to-tag communications.	See "Chapter 3-RF Communications" for suggestions on improving communications.



Contacting Customer Service

If you encounter a problem using your system that you cannot resolve, contact Customer Service:

Before contacting CUSTOMER SERVICE, please have the following information available:

1. InstaScan Scanner Information:

- InstaScan Model Number
- Serial Number, located on the bottom of scanner
- Any modifications made to the scanner or tags
- Location where system is installed

2. Computer Information:

- Computer Brand and Model number
- Processor speed and available RAM
- COM Port used

**SCS Support (858) 485-9196
8:00 a.m. – 5:00 p.m. PST
Email – techsupport@SCS-Corp.com**

Returning Your System

If SCS Customer Service determines you need to return your system for service, the Service Representative will give you a Return Merchandise Authorization (RMA). Write this number on the outside of the box containing the returned system, and on a slip of paper inside the box, so your return can be processed quickly.

Return only your scanner, antenna, cable, and adapter. Do not return accessories, such as the Diagnostic Label or the diskette containing the Scanner configuration program.

Follow these steps to return your scanner and accessories for service:

1. Carefully pack your scanner and accessories in the original static-protected bubble wrap and container. If you no longer have the original container, use a protected box.
2. Use filler material to cover the items in the box.
3. Add a note with the RMA number inside the package.
4. Write the RMA number and the word FRAGILE on the outside of the package in large, legible writing.
5. Address the package to:

SCS Corporation
10905 Technology Place
San Diego, CA 92127

ATTN: RMA # _____ (indicate your RMA number here)



Chapter 5

Specifications

SCS Patents

SCS Corporation is currently holding the following patents. Other patents outstanding.

- #4,424,579
- #4,442,507
- #4,933,735
- #5,148,256
- #5,296,722
- #5,407,851
- #5,496,763
- #4,796,074
- #5,095,362
- #5,583,819
- #5,686,341
- #5,856,788
- #5,963,144

S556-EP Specifications

LEDs: One Red Power ON LED, one Yellow Activity/Error LED and one Green Transmit ON LED

Communication Method: RS-232

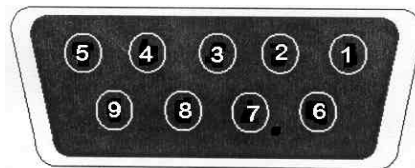
Serial transmission rate: Up to 57,600 bps

Connector: One DB-9F for RS-232 communications

One DB-25 for diagnostic use

Pin assignments: (DB9F)

- Pin 1 – Not used
- Pin 2 - Transmit Data (Input)
- Pin 3 - Receive Data (Output)
- Pin 4 - Internally connected to Pin 6
- Pin 5 - Protective Ground
- Pin 6 - Internally connected to Pin 4
- Pin 7 - Internally connected to Pin 8
- Pin 8 - Internally connected to Pin 7
- Pin 9 - Protective Ground



Power jack: Internal Power Module, External Power cable

RF Output Power: 5 Watts

Power Consumption: 120 watts



Ambient operating temprature:	0° to 43° C (32° to 110° F)
Approved Standards:	FCC Part 90
Maximum serial cable length:	10 meters (30 Feet)
Dimensions:	36.8 cm x 40.6 cm x 14 cm (14.5 in x 16 in x 5.5 in)
Weight:	5.5 Kg (12 lbs.)

Chapter 6

DB-25 Connector Function

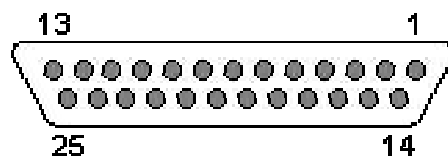


Table 3. Pin assignments: (DB-25)

Pin #	Name	Function
1	GND	Ground
2	BUFCOMP	Digital test signal: output of receiver comparator
3	GND	Ground
4	PER_IN2	Peripheral input bit 2
5	PER_IN0	Peripheral input bit 0
6	PER_OUT6	Peripheral output bit 6
7	PER_OUT4	Peripheral output bit 4
8	TX_ASEL5	Transmit antenna select bit 5
9	TX_ASEL3	Transmit antenna select bit 3
10	TX_ASEL1	Transmit antenna select bit 1
11	RX_ASEL5	Receive antenna select bit 5
12	RX_ASEL3	Receive antenna select bit 3
13	RX_ASEL1	Receive antenna select bit 1
14	VCC	+5 volts
15	BUFCOMPIN	Analog test signal: input to receiver comparator



Pin #	Name	Function
16	PER_IN3	Peripheral input bit 3
17	PER_IN1	Peripheral input bit 1
18	BLANK	Digital test signal: blanking signal
19	PER_OUT5	Peripheral output bit 5
20	PER_OUT3	Peripheral output bit 3
21	TX_ASEL4	Transmit antenna select bit 4
22	TX_ASEL2	Transmit antenna select bit 2
23	GND	Ground
24	RX_ASEL4	Receive antenna select bit 4
25	RX_ASEL2	Receive antenna select bit 2

Receive Antenna Select Lines

Pins 13, 25, 12, 24, and 11 are the high order bits of the hardware pins that select the receive antenna. Bit 0 is kept internal to the interrogator. These lines are used to drive external multiplexers for multi-antenna systems. They are controlled by:

1. Setting up the antenna select table in flash memory (if necessary) using Load Antenna Table command.
2. Issue the Set Antenna Quantity command.
3. Default mode automatically cycles through all antennas. The interrogator will freeze at a certain antenna selection by issuing the Select Receive Antenna command.

Transmit Antenna Select Lines

Pins 10, 22, 9, 21, and 8 are the high order bits of the hardware pins that select the transmit antenna. Bit 0 is kept internal to the interrogator. These lines are used to drive external multiplexers for multi-antenna systems. They are controlled by:

1. Setting up the antenna select table in flash memory (if necessary) using Load Antenna Table command.
2. Issue the Set Antenna Quantity command.
3. Default mode automatically cycles through all antennas. The interrogator will freeze at a certain antenna selection by issuing the Select Transmit Antenna command.

Peripheral Inputs

Pins 5, 17, 4, and 16 are TTL level inputs that can be read with the Read Peripheral Inputs command.

Table 4. Input Characteristics

Description	Min.	Max.	Units
Input high level voltage	2.0	VCC*	Volts
Input low level voltage	0	0.8	Volts
Input signal transition time		250	nS
Input leakage current	-10	+10	μA
Input capacitance		10	pF

* Note: VCC is nominally 5.0 volts.



Peripheral Outputs

There are 8 peripheral outputs internal to the interrogator. 4 of these are available at the DB-25 connector: pins 20, 7, 19, and 6 can be controlled by setting or resetting bits, 3, 4, 5 and/or 6 of the command data byte of the Write Peripheral Outputs command. The outputs are compatible with CMOS levels.

Table 5. Output Characteristics

Description	Min.	Max.	Units
High level output voltage @ $I_{\text{OutputHigh}} = 1.0 \text{ mA}$, $V_{\text{CC}}^* \text{ Min.}$	$V_{\text{CC}}^* - 0.5$		Volts
Low level output voltage @ $I_{\text{OutputHigh}} = 12.0 \text{ mA}$, $V_{\text{CC}}^* \text{ Min.}$		.4	Volts
Source current		-1.0	mA
Sink current		12.0	mA
Output leakage current	-10	+10	μA

*Note: $V_{\text{CC}} \text{ Min.}$ is 4.75 volts, V_{CC} is nominally 5.0 volts.

Buffered Comparator Input (BUFCOMPIN)

This is the analog output of the RF receiver. The pin must remain unconnected, or deterioration of read capability will occur.

Buffered Comparator (BUFCOMP)

This is the digitized output of the RF receiver.

Receiver blanking signal (BLANK)

When low, the microcontroller is ignoring the output from the RF receiver.

VCC

This is the 5.0 V regulated power for the interrogator. It should only be used as a reference. Current drawn in excess of 50 mA may cause the system to shut down.



Limited Warranty

SCS warrants its Dura-label to be free from defects in workmanship and materials, under normal use and service, for a period of ninety (90) days from receipt of products.

SCS warrants its Scanner to be free from defects in workmanship and materials, under normal use and service, for a period of ninety (90) days from date of receipt.

If a product does not operate as warranted during its applicable warranty period, SCS shall, at its option, repair the defective product or deliver to Customer an equivalent product to replace the defective item. All products that are replaced shall become the property of SCS. Replacement products may be new or reconditioned. The warranty for replacement or reconditioned product is the same as the equivalent newly purchased product.

SCS reserves the right to refuse to warranty repair any product that has been subjected to any abnormal electrical, mechanical, or environmental abuse.

FCC Part 90 Compliance

The FCC has established rules that permit the Scanner and Label system to be used within acceptable bounds of radio frequency emissions. Your Scanner and Label system complies with Part 90 of the FCC Rules.

Operation of the Scanner and Label system is subject to the following conditions: This device may not cause harmful interference; This device may accept any interference received, including interference that may cause undesired operation.

This device complies with the limits for a Class B digital device, pursuant to Part 90. The Class B limits help ensure that this device provides reasonable protection against harmful interference in residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions in this manual, may cause harmful interference to radio communications.

Radio Frequency (RF) exposure limits for operators of this device

Operators of this device must have knowledge of their RF exposure conditions in order for the device to comply with FCC-adopted RF exposure limits for persons in the "controlled exposure environment". The average RF exposure for operators is 5.0 mW/cm², which requires them to maintain an estimated separation distance of 22 cm or 8.5" from the transmitter, while in operation. They should not remain closer than the suggested distance for any continuous 6 minute interval. Holding "Tags" in front of the transmitter for brief moments, at closer than 8.5" is allowed provided the average exposure in any 6 minute interval is less than 5.0 mW/cm². For example, if an operator spends 50% of the time with his/her hands or body closer than 8.5" to the transmitter while spending the other 50% of the time at more than 15" away, the allowed RF exposure limits will be satisfied. Operators should use their own judgment to limit their exposure to the allowed RF exposure limits with control of exposure conditions, separation distance from the transmitter, and duration of exposure. While this device is in operation, nearby persons who have no knowledge of being in the RF fields of this device should be at least 20" away from the transmitter in order for this device to be compliant with the FCC-adopted RF exposure limits.

Disclaimer

Operation of any radio transmitting equipment, including the Scanner, may interfere with the functionality of inadequately protected medical devices. Consult a physician or the manufacturer of the medical device if you have any questions. Other electronic equipment may also be subject to interference.

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