

# Stalker Sports Speed Sensor User Manual

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## 1 Overview

The Stalker Speed Sensor (S3) is available in four types: Traffic, Stationary, Speedometer and Sports. This document covers the Sports model only. Refer to document 011-0080-00 Stalker Speed Sensor User Manual for user information on the Traffic, Stationary and Speedometer models.

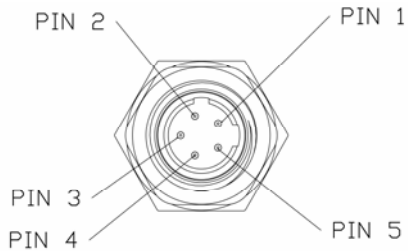
The S3 Sports operates in stationary mode and reports strong target speeds and faster (peak) target speeds. It communicates over an RS-232 serial communications port with separate single-ended transmit and receive signals and supports full-duplex communication. A variety of Speed Data Protocol Formats are supported to convey speed information from the S3.

This manual applies to:

- S3 User Interface: Version 0.8 and later
- S3 Sports model operating code: Version 10 and later

## 2 Connecting the S3 to a PC

The S3 is a self-contained radar unit with a single connector used to provide power to the unit and to monitor speed information. Its pinout is shown below. Pin 1 is between the polarizing slots, and pins 2 through 5 are numbered in a counter-clockwise direction.



- Pin 1 – RX – Receive Data – toward the S3 unit
- Pin 2 – PWR – 12VDC (nominal)
- Pin 3 – AUX – Auxiliary Input/Output
- Pin 4 – TX – Transmit Data – from the S3 unit
- Pin 5 – GND - Ground

The easiest way to start using an S3 is to connect it to a PC with the S3 Power/Programming Box (ACI P/N 200-0702-00). As shown in the pictures below, there are connections for a cable to the S3 unit (To RADAR), a cable to the PC (To Computer) and a power connector (9-12VDC).



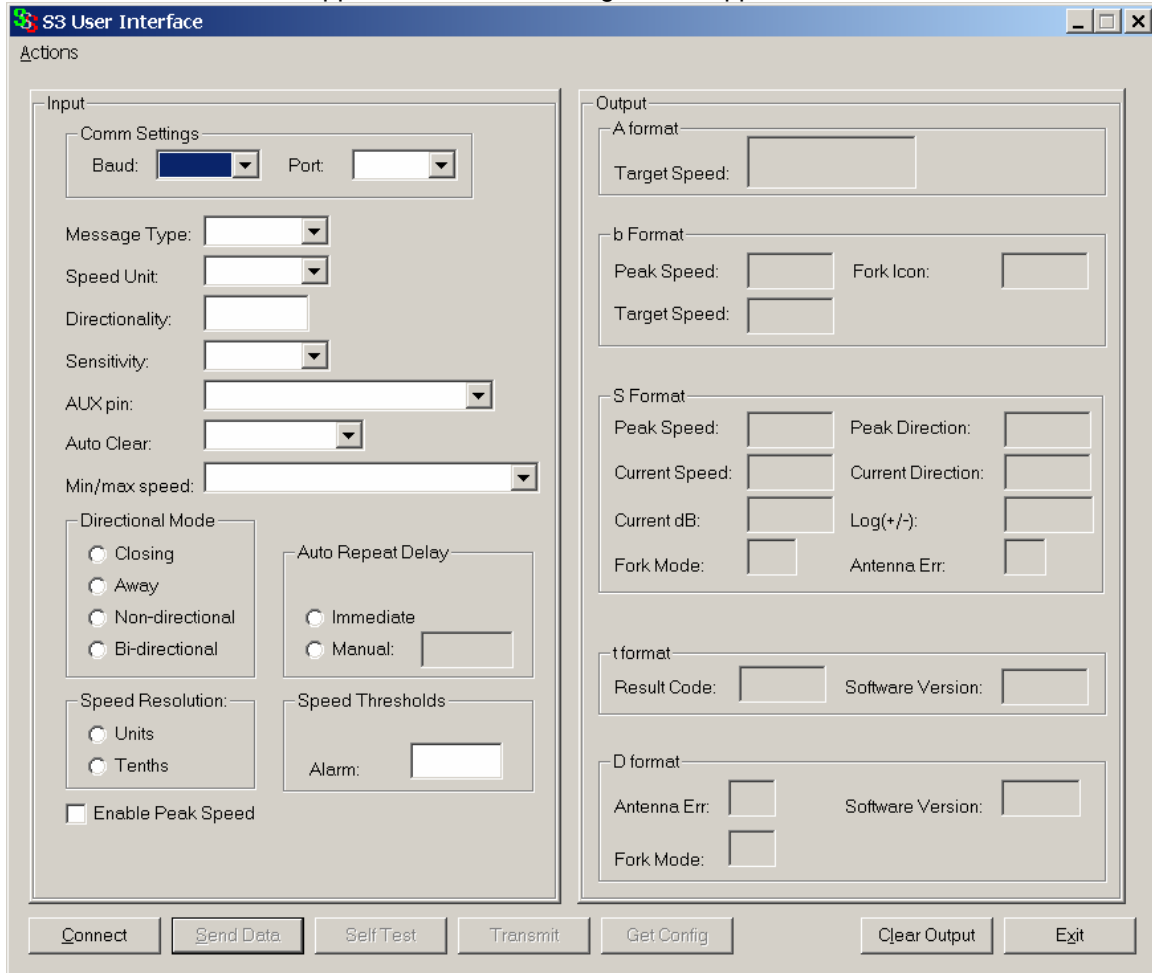
Connect the S3 to the box with the 155-2223-00 cable provided with the box.  
Connect to power by plugging the cigarette plug into a 12VDC nom. power supply.  
And connect to a PC serial port using a standard 9 pin D Serial Cable (not provided).  
Since some newer PCs are no longer configured with 9 pin D serial ports, a USB to serial adapter may be required. These products vary and may or may not work well. In some cases they provide undesirable buffering.

### 3 Communicating with the S3

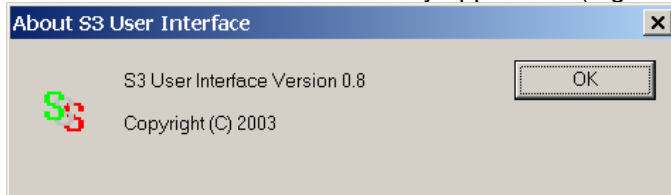
The RS-232 serial link is configured for 10 bit asynchronous serial communications with 1 start bit, 8 data bits, 1 stop bit and no parity (8N1). The baud rate is selectable from 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200. The default baud rate is 9600.

The basic PC tool for communicating with and configuring the S3 Sports is an executable application file: "S3 User Interface.exe". The CD provided with the S3 Power/Programming Box (ACI P/N 200-0707-00) will install the file on the user's PC in the "C:\Program Files\Stalker\Configuration Utilities" folder.

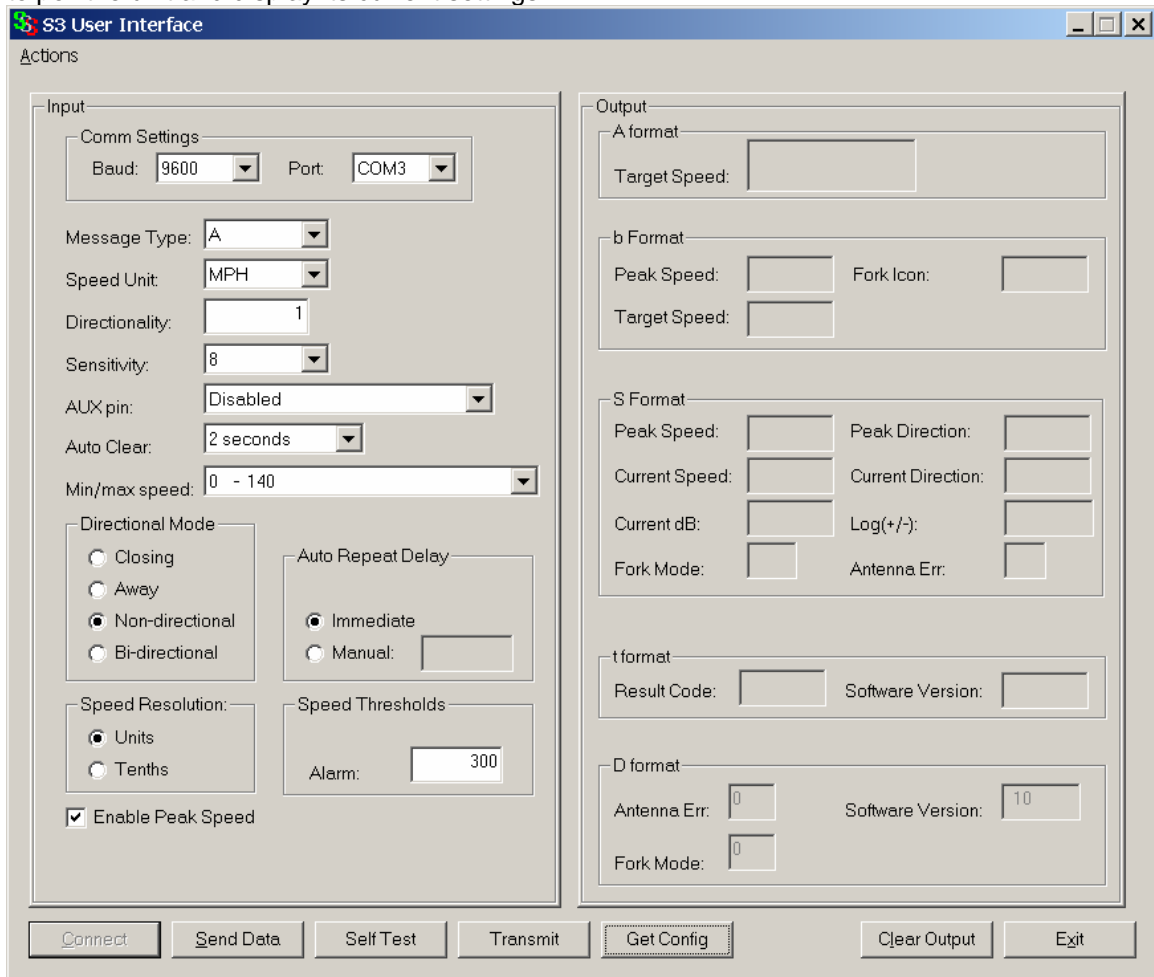
After turning on the Speed Sensor with the switch on the interface box, double-click the S3 User Interface icon to start the application. The following screen appears:



Right-click on the title bar, and select About S3 User Interface... to display the screen below. It identifies the version of the PC utility application (e.g. 0.8).



To initiate communications with the S3, select the 9600 baud rate and appropriate communication port from the pull-down boxes in the Comm Settings area of the screen in the top-left corner. Then click on the Connect button in the lower-left corner. And finally click the Get Config button to poll the unit and display its current settings:



If the unit is not communicating, confirm the communication port and baud rate settings from the pull-down menu. The version of operating code loaded into the S3 Sports will be displayed in the Software Version window near the lower-right corner of the screen (e.g. 10). The software version is also displayed in the “t format” area after clicking the Self Test button at the bottom of the screen. After a self test, a result code is also displayed in this area – “0” means all tests passed.

## 4 Configuring the S3

This section assumes that the S3 already has operational code loaded into it. To change the version of code in the S3, refer to 011-0054-00 LoadCode User's Manual.

The settings in the unit can be changed by selecting another value from a parameter's pull-down menu as shown below and clicking the Send Data button at the bottom of the screen. The changes may be confirmed by clicking the Get Config button again.

The screenshot shows the 'S3 User Interface' window with the following configuration options:

- Input Section:**
  - Comm Settings: Baud: 9600, Port: COM3
  - Message Type: A
  - Speed Unit: b (selected)
  - Directionality: S
  - Sensitivity: 0
  - AUX pin: Disabled
  - Auto Clear: 2 seconds
  - Min/max speed: 0 - 140
  - Directional Mode:  Closing,  Away,  Non-directional,  Bi-directional
  - Auto Repeat Delay:  Immediate,  Manual: [ ]
  - Speed Resolution:  Units,  Tenths
  - Speed Thresholds: Alarm: 300
  - Enable Peak Speed
- Output Section:**
  - A format: Target Speed: [ ]
  - b Format: Peak Speed: [ ], Fork Icon: [ ], Target Speed: [ ]
  - S Format: Peak Speed: [ ], Peak Direction: [ ], Current Speed: [ ], Current Direction: [ ], Current dB: [ ], Log(+/-): [ ], Fork Mode: [ ], Antenna Err: [ ]
  - t format: Result Code: [ ], Software Version: [ ]
  - D format: Antenna Err: [0], Software Version: [10], Fork Mode: [0]

Buttons at the bottom: Connect, Send Data, Self Test, Transmit, Get Config, Clear Output, Exit.

When the Send Data button is clicked, the PC application sends a command to change only a single parameter. If multiple settings need to be changed, the Send Data button must be clicked after each change.

Since the S3 reports speed data while the radar transmitter is on, it is best to turn the transmitter off while changing settings so that the serial communications aren't overloaded. The status of the radar transmitter may be determined by monitoring the Transmit/Hold button at the bottom of the screen. While the transmitter is off, the legend on this button is "Transmit" (clicking it now will put the unit into transmit mode). While the transmitter is on, the legend is Hold.

The S3 Sports can also be configured by sending command packets to it over the serial link. Refer to Appendix A for the command structures and descriptions of parameter values.

## 5 Operating the S3

The PC application described in the previous section can be used to monitor speeds that the S3 detects. Other equipment or applications can also monitor the speed data from the unit by decoding the messages it transmits over the serial link. Speed data is only sent from the S3 unit while the radar transmitter is on (unit not in Hold).

The S3 Sports supports several streaming message types. Refer to Appendix B for a detailed description of the speed data protocols. Speeds are displayed on the right side of the screen depending on the message type selected:

Format A and AP speeds display in the A format area. Format A shows strongest target speed, and Format AP shows peak speed.

Format b and Format S speeds display in their respective areas.

Format F is a development protocol not supported in this application.

The screenshot shows the 'S3 User Interface' window with the following configuration details:

- Input Section:**
  - Comm Settings: Baud: 9600, Port: COM3
  - Message Type: AP
  - Speed Unit: MPH
  - Directionality: 1
  - Sensitivity: 8
  - AUX pin: Disabled
  - Auto Clear: 2 seconds
  - Min/max speed: 0 - 140
  - Directional Mode:  Non-directional,  Closing,  Away,  Bi-directional
  - Auto Repeat Delay:  Immediate,  Manual
  - Speed Resolution:  Units,  Tenths
  - Speed Thresholds: Alarm: 300
  - Enable Peak Speed
- Output Section:**
  - A format: Target Speed: 25
  - b Format: Peak Speed: [ ], Fork Icon: [ ], Target Speed: [ ]
  - S Format: Peak Speed: [ ], Peak Direction: [ ], Current Speed: [ ], Current Direction: [ ], Current dB: [ ], Log(+/-): [ ], Fork Mode: [0], Antenna Err: [0]
  - t format: Result Code: [ ], Software Version: [ ]
  - D format: Antenna Err: [0], Software Version: 10, Fork Mode: [0]

At the bottom of the window are buttons for: Connect, Send Data, Self Test, Hold, Get Config, Clear Output, and Exit.

## Appendix A Command Packet Protocols

### Received Data Packet Format

The format for all received packets is shown below:

Byte #	Description
1	Command ID
2	Message Data
...	Message Data
N-1	Message Data
N	Carriage Return (0x0D)

The number of message data bytes is implicit in the command type so there is no data byte count in the packet. Packets do not necessarily have data associated with them so the minimum packet size is two bytes consisting of the Command ID and a carriage return. Message Data bytes, unless otherwise specified, are ASCII characters: '1' = ASCII 1 = 0x31.

### Message Type – Command 81H

Byte #	Description
1	0x81
2	Message Type = 0x20 – No Output 0x21 – A Format 0x22 – b Format 0x30 – S Format 0x40 – AP Format
3	Carriage Return (0x0D)

### Auto Repeat Message Delay – Command 82H

Byte #	Description
1	0x82
2	Delay ten thousands digit (ASCII)
3	Delay thousands digit (ASCII)
4	Delay hundreds digit (ASCII)
5	Delay tens digit (ASCII)
6	Carriage Return (0x0D)

The delay parameter specifies the total time in milliseconds between the start of successive messages. A Delay of '0000' causes the next message to immediately follow the carriage return of the previous message. In specifying a message repeat rate, there are three constraints that place a lower limit on the repeat rate:

1. RS-232 baud rate
2. The rate at which the DSP algorithms produce new speed data
3. The radar transmitter must be enabled.



### Transmit/Hold – Command 93H

This command instructs the S3 to enable or disable the radar transmitter. The user only receives speed data packets when the transmitter is enabled. When the S3 is powered on, the transmitter is automatically enabled by default.

Byte #	Description
1	0x93
2	'0' = Hold '1' = Transmit
3	Carriage Return (0x0D)

### Radar Directional Mode – Command 94H

Byte #	Description
1	0x94
2	'1' = Closing – only report speed of targets moving towards the S3 '2' = Away – only report speed of targets moving away from S3 '3' = Bi-directional – report speed of targets moving in either direction
3	Carriage Return (0x0D)

### Sensitivity – Command 96H

Byte #	Description
1	0x96
2	'1', '2', '3', '4', '5', '6', '7', '8'
3	Carriage Return (0x0D)

The S3 has two overall sensitivity settings: LOW and HIGH. And within each overall setting, four additional sensitivity levels are available. Therefore settings 1-4 correspond to LOW sensitivity while settings 5-8 correspond to HIGH sensitivity.

### Test – Command 99H

Byte #	Description
1	0x99
2	Carriage Return (0x0D)

This command instructs the S3 to stop transmitting, turn off the auto repeat message delay, and to perform an internal self test. After the self test is complete the S3 sends a response in the format below and enters tuning fork test mode for 1 minute.

#### Test Response Packet – t format

Byte #	Description
1	0x84
2	Test result code (0 = pass)
3-6	Software version in 4 ASCII bytes
7	Carriage Return (0x0D)

### AUX Pin – Command A2H

This command allows the user to enable or disable output on the AUX pin of the external connector. This pin can either be used to output Doppler audio or speed threshold alarms. Note (1) the AUX pin is read as an input on power-up to check whether factory defaults should be restored, and (2) the factory default is that the AUX pin is disabled for output. When used as a speed alarm, the AUX pin can source a maximum of 10mA at 3.3V.

Byte #	Description
1	0xA2
2	'0' = Disable AUX output '1' = Speed Alarm '2' = Doppler Audio without Squelch '3' = Doppler Audio with Squelch
3	Carriage Return (0x0D)

### Alarm Speed Threshold – Command A3H

The S3 allows the user to set an alarm speed threshold specified in whole numbers in the range of 1-309 MPH. This can only be set immediately after the gun is turned on.

Byte #	Description
1	0xA3
2	Alarm speed hundreds digit (ASCII)
3	Alarm speed tens digit (ASCII)
4	Alarm speed units digit (ASCII)
5	Carriage Return (0x0D)

### Serial Port Baud Rate – Command A4H

The serial port baud rate may be set in the range of 300-115200. The parameter change will take effect after the next time the S3 is powered on.

Byte #	Description
1	0xA4
2	Baud rate code: '0' = 300 '1' = 600 '2' = 1200 '3' = 2400 '4' = 4800 '5' = 9600 '6' = 19200 '7' = 38400 '8' = 57600 '9' = 115200
3	Carriage Return (0x0D)

### Peak Speed Mode – Command A5H

This command allows the user to enable or disable calculation of the peak speed.

Byte #	Description
1	0xA5
2	'0' = disable '1' = enable
3	Carriage Return (0x0D)

### Speed Resolution – Command A7H

Byte #	Description
1	0xA7
2	'0' = units '1' = tenths
3	Carriage Return (0x0D)

### Speed Units – Command A8H

Byte #	Description
1	0xA8
2	'0' = MPH '1' = KPH '2' = KNOTS '3' = FPS '4' = MPS
3	Carriage Return (0x0D)

### Directionality – Command A9H

This command allows the user to specify the directionality parameter that the radar uses to qualify directional true targets from non-directional spurious signals. This parameter can take any integer value in the range of 0 to 7 inclusive where the parameter is understood to represent the corresponding power of two. The target must be greater than or equal to 2 to the parameter value of the corresponding FFT bin of the other spectrum. This yields a settable range of 0-42dB.

Byte #	Description
1	0xA9
2	'0', '1', '2', '3', '4', '5', '6', '7'
3	Carriage Return (0x0D)

### Auto Clear Delay – Command AAH

Byte #	Description
1	0xAA
2	'0' = 0 seconds '1' = 1 second '2' = 2 seconds '3' = 3 seconds '4' = 4 seconds '5' = 2.33 hours
3	Carriage Return (0x0D)

### Minimum/Maximum Speed – Command ABH

This command allows the user to specify the minimum and maximum target speed. Any speed outside the range is ignored. Also Baseball and Tennis modes are implicitly set as well.

Byte #	Description			
1	0xAB			
2,3,4	Parameter	Mode	Min Speed (MPH)	Max Speed (MPH)
	'000'	Normal	0	140
	'001'	Normal	5	140
	'002'	Normal	15	140
	'003'	Normal	25	140
	'004'	Normal	50	140
	'005'	Normal	0	- (none)
	'006'	Normal	5	-
	'007'	Normal	15	-
	'008'	Normal	25	-
	'009'	Normal	50	-
	'010'	Baseball	10	110
	'011'	Baseball	20	110
	'012'	Baseball	30	110
	'013'	Baseball	40	110
	'014'	Baseball	50	110
	'015'	Tennis	50	148
5	Carriage Return (0x0D)			

Speeds in KPH are MPH readings x 1.609.

## Appendix B Speed Data Protocols

When a speed data protocol is selected, the S3 will send speed updates in the selected output format.

The following streaming protocol message formats are supported:

- A – ASCII target speed only
- AP – ASCII peak target speed only
- B – ASCII All speeds + some status
- S – ASCII All speeds + some status

### A Format (Strongest Target Speed Only)

Byte #	Description	
1	Target speed hundreds digit (ASCII)	
2	Target speed tens digit (ASCII)	
3	Target speed ones digit (ASCII)	
4	Carriage Return (0x0D)	

### AP Format (Peak Target Speed Only)

Byte #	Description	
1	Peak speed hundreds digit (ASCII)	
2	Peak speed tens digit (ASCII)	
3	Peak speed ones digit (ASCII)	
4	Carriage Return (0x0D)	

## b Format (all speeds)

Byte #	Description	Required Value or Range
1	Message Type	0x81
2	Status 1	<i>(see detail below)</i>
3	Status 2	<i>(see detail below)</i>
4	Patrol speed hundreds digit (ASCII)	
5	Patrol speed tens digit (ASCII)	
6	Patrol speed ones digit (ASCII)	
7	Locked speed hundreds digit (ASCII)	
8	Locked speed tens digit (ASCII)	
9	Locked speed ones digit (ASCII)	
10	Peak speed hundreds digit (ASCII)	
11	Peak speed tens digit (ASCII)	
12	Peak speed ones digit (ASCII)	
13	Target speed hundreds digit (ASCII)	
14	Target speed tens digit (ASCII)	
15	Target speed ones digit (ASCII)	
16	Carriage Return (0x0D)	0x0D

### Status 1 byte

- Bit 7-6: always 01 (to force displayable ASCII characters)
- Bit 5: lock status (0=no speed locked, 1=speed locked)
- Bit 4: zone (0=opposite, 1=same/both)
- Bit 3: fork mode (0=off/normal, 1=fork mode enabled)
- Bit 2: secondary antenna (1= secondary antenna selected)
- Bit 1: main antenna (1=main antenna selected)
- Bit 0: transmitter status (0=off, 1=on)

### Status 2 byte

- Bit 7-6: always 01 (to force displayable ASCII characters)
- Bit 5-3: not used - always 000
- Bit 2: fast status (0=faster disabled, 1=faster enabled)
- Bit 1: Low voltage (LoV) status (0=normal, 1=low voltage condition)
- Bit 0: radio frequency interference (RFI) Status (0=none, 1=RFI)

## S Format

Byte #	Description	Required Value or Range
1	Message type	0x83
2	Peak target direction	'A' = "away", 'C' = "closing"
3	Peak target speed	Hundreds (100) '0' - '9' (ASCII)
4	(same)	Tens (10) '0' - '9' (ASCII)
5	(same)	Ones (1) '0' - '9' (ASCII)
6	(same)	Tenths (0.1) '0' - '9' (ASCII)
7	Strongest target direction	'A' = "away", 'C' = "closing"
8	Strongest target speed	Hundreds (100) '0' - '9' (ASCII)
9	(same)	Tens (10) '0' - '9' (ASCII)
10	(same)	Ones (1) '0' - '9' (ASCII)
11	(same)	Tenths (0.1) '0' - '9' (ASCII)
12	Log of current speed	Hundreds (100) '0' - '9' (ASCII)
13	(same)	Tens (10) '0' - '9' (ASCII)
14	(same)	Ones (1) '0' - '9' (ASCII)
15	Log of current speed (Pos. Freq/Neg. Freq)	Hundreds (100) '0' - '9' (ASCII)
16	(same)	Tens (10) '0' - '9' (ASCII)
17	(same)	Ones (1) '0' - '9' (ASCII)
18	Status	(see detail below)
19	Carriage return	0x0D

### Status byte

Bit 7: not used (= 0)  
 Bit 6: not used (= 1)  
 Bit 5: not used  
 Bit 4: Fork Mode (1=enabled, 0=disabled)  
 Bit 3: not used  
 Bits 2,1,0: Antenna Errors

## Appendix C Accessories

ACI P/N	Accessory	Description
200-0702-00	S3 Programming Box Kit	Along with the programming box itself, items with ** after their name are included in this kit. Provides cigarette plug for power, connections for S3 and serial cables, on/off switch, reset button and auxiliary I/O access
155-2223-00	S3 Power and I/O Cable, 12' **	Standard 12' cable used to connect the S3 to the Programming Box or to a 155-2227-00 cable for a user-defined interface
155-2227-00	S3 Power I/O User Cable **	Can be used to interface S3 with 155-2223-00 cable to user-developed power and I/O connections
200-0707-00	S3 Applications CD **	CD containing user applications and associated files
155-2226-00	S3 Power and I/O Cable, 75'	Connects to S3 providing round connector on the distant end
155-2252-00	S3 Extension Power I/O Splitter Cable	Mates with round connector on 155-2226-00 cable to extend it by approximately 8', and provides a cigarette plug for power and a direct connection to a computer serial port
200-0708-00	S3 Cable Connector Kit	Includes a panel mount connector, socket contacts and a wiring diagram so user can wire 155-2226-00 cable into their system – used in lieu of 155-2252-00.
155-2225-75	S3 to Speed Sign Cable	Connects the S3 to an ACI Speed Sign