



## Most Commonly Used Commands on the Smart-Trak® Series

### IMPORTANT CUSTOMER NOTICE

This document is for firmware version 2.044. Sierra Instruments, Inc. reserves the right to change the command set without notification to the user. However, Sierra will also make every effort to maintain backwards compatibility with previously published command sets for Smart-Trak®. There is no implied warranty or guarantee regarding the use of this command set. Sierra Instruments, Inc. is not liable for any damage or personal injury, whatsoever, resulting from the use of this command set.

### PROTOCOL

The Smart-Trak communication is based on a standard RS232 port. All bytes are ASCII except the two CRC bytes used for a redundancy check. Each command starts with four bytes of command type, followed by a variable length value section. The two CRC bytes follow the value string and a carriage return ends the string. Each command string will vary in length but, can not exceed 26 bytes.

Command String = {4 command bytes + variable length value + 2 CRC bytes + carriage return} < 26 bytes.

The RS232 port does not depend on hardware handshaking and uses only three wires on the port: transmit, receive and ground. The port on the host needs to be configured to (9600,n,8,1) : 9600 baud, no parity, eight bit characters, one stop bit.

### DESCRIPTION

Commands for the Meter. There are old commands Smart-Trak (version 1.xx) and new commands Smart-Trak 2 (version 2.xx). The 2.xx commands will support some of the 1.xx commands. If a 1.xx command is not shown below, it is not supported in the 2.xx commands. CMNDS is a class included in the class of Meter. This page shows all types, fields, and values as derived from Meter. Version 2.xx commands that start with a '?' are read commands and commands that start with a '!' are write commands. This is list of the most commonly used commands, which are relative safe.

We can supply a list of more advanced commands, however you will need to agree to some special terms. Misuse of the Advanced commands can cause irreversible damage to the unit which would void your warranty.

## FLOW

### DESCRIPTION

FLOW makes the streaming mode data = flow only. If meter is in streaming mode, this data will stream until a FLOWwSETPOINT, FLOWwSETPOINTwDAC or TOTALwDIFFwDAC is sent to the meter. If not in streaming mode then one flow will be return with each FLOW command sent. ReadMeter, WriteMeter both will set flow as the streaming data.

### ASCII STRING COMMANDS

'?Flow + CRC + cr' Version 2.xx read command  
'!Flow + value + CRC + cr' Version 2.xx write command  
'?Flow + CRC + cr' Version 1.xx read command

Returns ASCII string 'Flow + value + CRC + cr'

Values are a string of digits and an optional decimal place: '10.00'

## SETPOINT

### DESCRIPTION

SETPOINT sets the control setpoint. The set point is store in the flash memory. This command is not recommended for version 2.xx,. Use SETPOINT\_FLASH.

### ASCII STRING COMMANDS

'?Sinv + CRC + cr' Version 2.xx read command  
'!Sinv + value + CRC + cr' Version 2.xx write command  
'?Sinv + CRC + cr' Version 1.xx read command  
'Sinv + value + CRC + cr' Version 1.xx write command

Returns ASCII string 'Sinv + valueSetpoint + CRC + cr'

Values are a string of digits and an optional decimal place: '10.00'  
CRC=redundancy check bytes; cr=carrage return byte.

## SETPOINT\_FLASH

### DESCRIPTION

SETPOINT\_FLASH returns the current flash memory value setpoint with read command. The write command sets the flash memory value and makes it the active setpoint. This would be the setpoint after a power down.

## ASCII String commands

'?Setf + CRC + cr' Version 2.xx read command  
'!Setf + value + CRC + cr' Version 2.xx write command

Returns ASCII string 'Setf + valueSetpoint + CRC + cr'

Values are a string of digits and an optional decimal place: '10.00'  
CRC=redundancy check bytes; cr=carrage return byte.

## SETPOINT\_RAM

### DESCRIPTION

SETPOINT\_RAM returns the current ram memory value setpoint with read command.  
The write command sets the ram memory value and makes it the active setpoint.

### ASCII STRING COMMANDS

'?Setr + CRC + cr' Version 2.xx read command  
'!Setr + value + CRC + cr' Version 2.xx write command

Read returns ASCII string 'Setr + valueSetpoint + CRC + cr'

Write returns ASCII string 'Sinv + valueSetpoint + CRC + cr'

Values are a string of digits and an optional decimal place: '10.00'  
CRC=redundancy check bytes; cr=carrage return byte.

## UNIT\_INDEX

### DESCRIPTION

UNIT\_INDEX selects the units the meter displays. The index value is between 1 and 30 and is assigned as shown. scc/s = 1, scc/m = 2, scc/H = 3, Ncc/s = 4, Ncc/m = 5, Ncc/H = 6, SCF/s = 7, SCF/m = 8, SCF/H = 9, NM3/s = 10, NM3/m = 11, NM3/H = 12, SM3/s = 13, SM3/m = 14, SM3/H = 15, sl/s = 16, sl/m = 17, sl/H = 18, NL/s = 19, NL/m = 20, NL/H = 21, g/s = 22, g/m = 23, g/H = 24, kg/s = 25, kg/m = 26, kg/H = 27, lb/s = 28, lb/m = 29, lb/H = 30

## ASCII STRING COMMANDS

'?Unti + CRC + cr' Version 2.xx read command  
'!Unti + unitIndex + CRC + cr' Version 2.xx write command  
'?Unti + CRC + cr' Version 1.xx read command  
'!Unti + unitIndex + CRC + cr' Version 1.xx write command

Returns ASCII string 'Unti + unitIndex + CRC + cr'

unitIndex is an integer string value of 1 to 30  
CRC=redundancy check bytes; cr=carrage return byte.

## VALVE\_INDEX

### DESCRIPTION

VALVE\_INDEX selects the state of the valve. Automatic = 1, Closed = 2, Purge = 3.  
This is a write to flash memory command. For version 2.xx, this command is not recommended. See VALVE\_FLASH\_INDEX and VALVE\_RAM\_INDEX.

## ASCII STRING COMMANDS

'?Vlvi + CRC + cr' Version 2.xx read command  
'!Vlvi + valveIndex + CRC + cr' Version 2.xx write command  
'?Vlvi + CRC + cr' Version 1.xx read command  
'!Vlvi + valveIndex + CRC + cr' Version 1.xx write command

Returns ASCII string 'Vlvi + valveIndex + CRC + cr'

valveIndex is an integer string value of 1 to 3  
CRC=redundancy check bytes; cr=carrage return byte.

## GAS\_INDEX

### DESCRIPTION

GAS\_INDEX selects the current gas.

## ASCII STRING COMMANDS

'?Gasi + CRC + cr' Version 2.xx read command  
'!Gasi + gasIndex + CRC + cr' Version 2.xx write command  
'?Gasi + CRC + cr' Version 1.xx read command  
'!Gasi + gasIndex + CRC + cr' Version 1.xx write command

Returns ASCII string 'Gasi + gasIndex + CRC + cr'

gasIndex value is **1** through **10**

CRC=redundancy check bytes; cr=carrage return byte.

## STREAM

### DESCRIPTION

Communications can be in one of three mode set by this STREAM command. In off mode, the meter will respond when queried with a read command. In echo mode, the meter will respond with either a read or a write command. In stream mode, the meter will continuously send data back. If a read or write command needs to update more than one value, all values will be sent back on write command.

### ASCII STRING COMMANDS

'?Strm + CRC + cr' Version 2.xx read command

!'Strm + streamString + CRC + cr' Version 2.xx write command

Returns ASCII string 'Strm + streamString + CRC + cr'

streamString = "On", "Off", "Echo"

CRC=redundancy check bytes; cr=carrage return byte.

## VERSION\_NUMBER

### DESCRIPTION

VERSION\_NUMBER returns the firmware version. This is useful when Ver. 1.xxx and 2.xxx are in the same system to determine which command to send.

### ASCII STRING COMMANDS

'?Vern + CRC + cr' Version 2.xx read command

Returns ASCII string 'Vern + alphaNumericString + CRC + cr'

alphaNumericString is alpha numeric string

CRC=redundancy check bytes; cr=carrage return byte.

## SERIAL\_NUMBER

### DESCRIPTION

SERIAL\_NUMBER returns the serial number

### ASCII STRING COMMANDS

'?Srm + CRC + cr' Version 2.xx read command

Returns ASCII string 'Srm + SERIAL\_NUMBER + CRC + cr'

alphaNumericString is alpha numeric string  
CRC=redundancy check bytes; cr=carrage return byte.

## SYNC

### DESCRIPTION

Sync returns the following events, VersionNumberEvent, SerialNumberEvent, DataEvent, ManufactureNumberEvent, TypeEvent, PassWordEvent, SetpointEvent, FullScaleEvent, GasNameEvent(10 times for all gas names), GasIndexEvent, GasSpanEvent(current gas only), SetpointIndexEvent, OuputIndexEvent, UnitIndexEvent, ValveFlashEvent, StreamEvent, SyncEvent

### ASCII STRING COMMANDS

'?Sync + CRC + cr' Version 2.xx read command

Returns ASCII string 'Sync + "" + CRC + cr'

SyncEvent returned last to indicate all events have been sent  
CRC=redundancy check bytes; cr=carrage return byte.

## ZERO

### DESCRIPTION

ZERO sets the flow offset value to a zero flow reading. Warning: All flow must be shut off, the unit needs to be at pressure with the gas being used.

### ASCII STRING COMMANDS

!'Zero + "" + CRC + cr' Version 2.xx write command

Returns ASCII string 'Zero + "" + CRC + cr'

CRC=redundancy check bytes; cr=carrage return byte.

## RESET\_ZERO

### DESCRIPTION

Reset zero flow offset value to zero

### ASCII STRING COMMANDS

'!Rezr + "" + CRC + cr' Version 2.xx write command

Returns ASCII string 'Rezr + "" + CRC + cr'

CRC=redundancy check bytes; cr=carrage return byte

## CRC CALCULATIONS

Below is the routine used to calculate the CRC bytes in C#. Comments are between the /\* \*/.

```

private static uint CalcCRC(byte[] cmnd)
/* cmnd is a byte array containing the command ASCII string ... cmnd[]="Sinv2.000" */
/* An unsigned 32 bit integer is return to the calling program */
/* only the lower 16 bits contain the crc */
{
    int i,j; /* interating indexes for the for loops */
    uint crc; /* crc variable that will be returned */

    crc=0xffff; /* initialize crc to hex value 0xffff */

    for (i=0; i<cmnd.Length; i++)
/* this for loop starts with ASCCCII 'S' and loops through to the last ASCII '0' */
    {
        crc=crc^((uint)(cmnd[i]*0x0100));
/* the ASCII value is times by 0x0100 first then XORED to the current crc value */
        for(j=0; j<8; j++)
/* the crc is hashed 8 times with this for loop */
/* if the 15th bit is set (tested by ANDING with hex 0x8000 and testing for 0x8000 result)
then crc is shifted left one bit (same as times 2) XORED with hex 0x1021 and ANDED
to hex 0xffff to limit the crc to lower 16 bits. If the 15th bit is not set then the crc is shifted
left one bit and ANDED with hex 0xffff to limit the crc to lower 16 bits. */
        {
            if((crc&0x8000)==0x8000)

```

```

    crc=((crc<<1)^0x1021)&0xffff;
                                     else
                                     crc=(crc<<1)&0xffff;
/* end of j loop */           }
/* end of i loop */         }
/* There are some crc values that are not allowed, 0x00 and 0x0d */
/* These are byte values so the high byte and the low byte of the crc must be checked and
incremented if the bytes are either 0x00 Or 0x0d. */
    if((crc&0xff00)==0x0d00) crc +=0x0100;
    if((crc&0x00ff)==0x000d) crc +=0x0001;
    if((crc&0xff00)==0x0000) crc +=0x0100;
    if((crc&0x00ff)==0x0000) crc +=0x0001;
    return crc;
}
/* If the string Sinv2.00 is sent through this routine the crc = 0x8f55 */
/* The complete command "Sinv2.000" will look like this in hex
0x53 0x69 0x62 0x76 0x32 0x2e 0x30 0x30 0x30 0x8f 0x55 0x0d */

```

**Below is the c# routine with no comments.**

```

private static uint CalcCRC(byte[] cmnd)
{
    int i,j;
    uint crc;

    crc=0xffff;
    for (i=0; i<cmnd.Length; i++)
    {
        crc=crc^((uint)(cmnd[i]*0x0100));
        for(j=0; j<8; j++)
        {
            if((crc&0x8000)==0x8000)
                crc=((crc<<1)^0x1021)&0xffff;
            else
                crc=(crc<<1)&0xffff;
        }
    }
    if((crc&0xff00)==0x0d00) crc +=0x0100;
    if((crc&0x00ff)==0x000d) crc +=0x0001;
    if((crc&0xff00)==0x0000) crc +=0x0100;
    if((crc&0x00ff)==0x0000) crc +=0x0001;
    return crc;
}

```

## CRC ROUTINE IN MS VISUAL BASIC:

```

Public Sub SendPacket(packet As String)
Dim crcBytes() As Byte
Dim crcLen, vpacket
Dim crcWord As Long
Dim i, j

    packet = Replace(packet, ",", ".") ' if commas are used as decimal place holder
    crcLen = Len(packet) - 1 ' zero based counter
    ReDim crcBytes(0 To crcLen)
    For i = 0 To crcLen ' convert string to bytes
        crcBytes(i) = Asc(Mid(packet, i + 1, 1)) ' get character
    Next
' calc crc
    crcWord = (&H1FFFE) / 2 ' not -1
    For j = 0 To crcLen
        crcWord = crcWord Xor CLng(crcBytes(j)) * &H100
        For i = 1 To 8
            If (crcWord And &H8000) Then
                crcWord = (crcWord * 2) Xor &H1021 ' prime number
            Else
                crcWord = crcWord * 2
            End If
            crcWord = (((crcWord * 2) And &H1FFFE)) / 2
        Next i
    Next j
    If (crcWord And &HFF00) = &HD00 Then ' carriage char not allowed
        crcWord = crcWord + &H100 ' make this byte &h0exx
    End If
    If (crcWord And &HFF00) = &H0 Then ' zero char is death
        crcWord = crcWord + &H100 ' make this byte &h01xx
    End If
    If (crcWord And &HFF) = &HD Then ' carriage char not allowed
        crcWord = crcWord + 1 ' make this byte &hxx0e
    End If
    If (crcWord And &HFF) = &H0 Then ' zero char is death
        crcWord = crcWord + 1 ' make this byte &hxx01
    End If

    ReDim Preserve crcBytes(0 To crcLen + 3) ' make room for crc and carriage return
    crcBytes(crcLen + 1) = Int(crcWord / &H100) ' high byte
    crcBytes(crcLen + 2) = (crcWord And &HFF) ' low byte
    crcBytes(crcLen + 3) = 13 ' carriage return
    vpacket = crcBytes
    commQueue.Add vpacket
End Sub

```