TRASE 2100 COMMAND PROTOCOL

2100 Series Software 3-Letter Code Command Protocol March 1998

0898-60503LC-1

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

SOILMOISTURE®

TABLE OF CONTENTS

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

SOILMOISTURE®

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

SOILMOISTURE®

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

SOILMOISTURE®

1. START UP INSTRUCTIONS

The Trase Command Codes were designed to remotely perform the same operations available on Trase I without user entry on a keypad. Review the *Trase version 2000 Operating Instructions* to acquaint yourself with the capabilities and function of your Trase equipment. Also review the *Start Up Instructions for Trase BE*, if your unit is a BE. Some operations are different, but the basic capabilities of Trase BE are identical to Trase version 2000 (System I).

Communications Connections - Trase

Trase I

The DTR signal is used only if you have a special serial cable or junction box (6503-100) supplied by Soilmoisture that plugs in to both the R-232 Serial Port connector and the Multiplexer connector. If you use this cable or junction box, Trase will power up automatically when the communications program initiates a connection. Otherwise you must press the Enter button on Trase to power it up before starting a connection in a communications program. Refer to the *Trase version 2000 Operating Instructions* Technical Interface Information section for details on RS-232 serial port connections.

Trase BE

The communication programs "ProComm", "HyperTerminal" and "Windows Terminal" provide the necessary signals to initiate Trase BE operation. If you use another program or write your own, DTR must be asserted to power up the Trase BE automatically. Refer to the *Start Up Instructions for Trase BE* for details on RS-232 serial port connections, switch settings and null modem use.

Trase Modem

A Modem may have been part of your Trase I or Trase BE package. If not, please contact Soilmoisture to obtain a supported modem, or information about customized firmware to support your existing modem.

Cellular Phone

You can connect the Trase modem to a cellular phone. The cellular phone will require a special adapter that provides a RJ11 connector for the modem. Contact the phone supplier for more information.

Communications Settings - Trase

Default Communications Settings for Trase I and Trase BE

These values should be used in setting up communications programs or configuring your own communications port. The default communications settings currently cannot be changed in the Trase BE:

Baud Rate: 9600
Stop Bit: 1
Parity: none
Flow Control: Xon/Xoff
Data Bits: 8

Direct Connection

The modem must be set to none after communication is established. Refer to the MOD command section and Example 1 for instruction on how to change the modem setting. Note: If a modem will be used after operating in the direct connection mode, be sure that the modem status is set back to Modem ON. Refer to the MOD Command section and example 1.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

SOILMOISTURE®

Modem Connection

Your computer must have a modem installed, either internal or external. In addition to the Trase default communications settings, you need some key pieces of information tos etup the computer modem support correctly:

1. The control strings required to correctly initialize and operate the modem.
2. The telephone number of the remote Trase modem.

PC Software Communications Programs for Sending/Receiving Data

There are ways to set basic fundamental operating conditions of your computer using "Mode" and "Comm" and other settings with batch commands to communicate with Trase directly, but these take a technical understanding of your particular PC and its equipment. It is far easier and much more convenient to use a standard "communications" package. The following examples are application programs for sending data to and from the PC to Trase using easily accessible share ware or system communications packages. The first is a good basic communications package that operates under DOS (non-Windows) offered by Datastorm Technologies Inc. in a shareware evaluation package. The second is called "Terminal" (ver. 3.1), and comes as standard utility in Windows 3.1. The third is called "HyperTerminal" and comes as standard utility in Windows 95. There are, of course, many more communications packages to suit your specific needs, but we cannot cover them all here.

A. ProComm 2.4.3 (for DOS)

ProComm 2.4.3 is a limited use shareware program by Datastorm Technologies Inc. that can be down-loaded from their bulletin board service (BBS) at (573) 875-0503. Contact your Systems Manager or ProComm's sysop for further instructions.

How to Set Up ProComm 2.4.3 on a PC

Direct and Modem Connections

1. Call up the ProComm program on your computer. The screen will have a status bar at the bottom of the screen.
2. Press the [ALT] key and the [P] key on the computer. The Line Setting window will come up on the screen.
3. Enter [11] to select 9600, n, 8, 1. Then enter [22] to select COM1. The current setting line should read: 9600, n, 8, 1, COM1. (Remember to select the actual COM# port that the serial cable or modem is attached to; in your case it may be another COM port number).

Continue with the Following Steps for Modem Connection Only

5. Under the Setup Menu, choose Modem Setup
6. Enter the control strings appropriate for your modem type.
7. Under the Help Screen, choose your remote Trase telephone number.
8. Choose [DIAL] to connect to the remote modem, or [HANGUP] to disconnect (always remember to send #P0; before hanging up for a clean disconnect).

Saving the Configuration

To save this configuration, enter [24]. This configuration is saved on the computer and will be used from now on as the computer default setting. This configuration portion of the ProComm program will not have to be used again. Now simply type in the commands and watch the responses scroll on your screen.

How to Exit ProComm

When your communications session is complete, exit the ProComm communications program as follows:

1. Press the [Alt] key and [X] key on the computer to call up the Exit window.
2. Press the [Y] key and then [Enter]. The system will respond by exiting the ProComm program.

B. Terminal (for Windows 3.1)

The Terminal program is normally found in the "Accessory Group" applications provided in the standard load of Microsoft Windows 3.1 operating system. Contact your Systems Manager if you are unable to locate the program.

Direct and Modem Connections

1. Open the Terminal icon.
2. Open "Settings" menu under the Terminal window.
3. Open the Communications window. Under the Connector heading, select the COM port to which the serial cable or modem is connected. In our example, we use COM1; yours may differ. Select Baud rate 9600, no parity, 1 stop bit, and 8 data bits. We also recommend you choose the Xon/Xoff flow control. Select [OK].

Continue with the Following Steps for Modem Connection Only

4. Open the Settings menu and choose Modem commands.
5. Select your modem type if supported, or enter your modem control strings. Select [OK].
6. Open the Settings menu and choose Phone Number.
7. Enter the telephone number of the remote Trase modem.
8. Set "Time out if not connected in..." to 60 seconds or more. Select [OK].
9. Open the Phone menu and choose DIAL to connect to the remote modem, or HANGUP to disconnect (always remember to send #P0; before hanging up).

Saving the Configuration

To save this configuration, open the File Menu under the Terminal window. This will open the "File Save As" window. Enter the file name "TRASE.TRM" and select [OK]. This will save the current RS-232 communications port setting to be used by Windows and can be called up from the File Menu under the Terminal window automatically configuring the computer. Now simply type in the commands and watch the responses scroll on the screen.

How to Exit Terminal

1. Hang up the phone (modem only) by choosing Hang UP under the Phone Menu.
2. Select File - Exit.

C. HyperTerminal (for Windows '95)

The HyperTerminal program is normally found in the "Accessory Group" applications provided in the standard load of Microsoft Windows '95 operating system. Contact your Systems Manager if you are unable to locate the program.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

SOILMOISTURE®

Direct and Modem Connections

1. In the Windows 95 screen, select Start, Programs, Accessories, then HyperTerminal.
2. The HyperTerminal window will open. Locate and doubleclick on the Hypertrm.exe icon and the Connection Description window will appear. Enter a name for the New Connection Information file (for example, you may enter "Trase" or "Trase BE"). Remember, this is NOT your data file name, it is your CONNECTION setup file name. Click [OK].
3. Next the Phone Number window will appear.

Continue with the Following Steps for Direct Connection Only

4. Skip down to "Connecting Using.." and select "Direct to COM#" (# denotes the COM port you selected) from the pull down arrow. Click [OK].
5. The COM Properties window will appear. Enter the following settings for the RS-232 communications port and then click [OK].
   Baud rate: 9600
   Data bits: 8
   Parity: none
   Stop bit: 1
   Flow Control: Xon/Xoff
6. A blank screen should appear with the name of your New Connection and HyperTerminal in the top left-hand corner of your PC screen and the box in the lower left-hand corner of the PC screen should read "Connected".

Continue with the Following Steps for Modem Connection Only

4. Enter:
   Country Code
   Area Code
   Phone number and modem type. Click [OK].
5. The connect window will appear. Click the Modify button
6. The Properties window will appear. Check that the phone number and modem type are correct and click the Configure button.
7. The Modem Properties window will appear. Under the General Tab, check that the correct port is selected for your computer, then select the Connection tab.
   Enter the following settings for the connection preferences:
   Data Bits: 8
   Parity: None
   Stop Bits: 1
   Under call preferences check "wait for dial tone before dialing" and "cancel the call if not connected within...". Enter at least 60 seconds in this last box. Click OK twice.
8. Push the Dialing Properties button and enter the appropriate information for your location. Click [OK].
9. Click the Dial button or choose Call-Connect from the HyperTerminal main menu.
10. A blank screen should appear with the name of your New Connection and HyperTerminal in the top left-hand corner of your PC screen and the box in the lower left-hand corner of the PC screen should read "Connected".

Saving the Configuration

To save this configuration, select File-Save. Now simply type in the commands and watch the responses scroll on the screen.

How to Exit HyperTerminal

When you are finished using HyperTerminal, and you are still in the HyperTerminal window, select "Call" from the Menu Bar and Disconnect. This will cancel the connection between the Trase unit and your PC. Then Select File-Exit.

Operational Differences

Trase I Keypad/Screen Operations during Command Protocol Operations

The Graph Screen is disabled.
The SEND DATA key does not function.
Data cannot be printed or tables loaded directly.
Moisture Tables cannot be loaded directly.
Flow control cannot be changed.
Automatic Shutoff time is disabled.

Data and Table Retrieval

The data files retrieved from Trase I and Trase BE through Command Codes can be opened as text files and printed from any word processing program. These files may also be imported into a spreadsheet for data analysis. Refer to the GTR and MTS command section and Examples 4 and 7 for instruction on how to retrieve data and tables.

Automatic Shutoff

While in the Command Protocol Mode, Trase I and Trase BE do not automatically shut off as described in the Trase version 2000 Operating Instructions. Command P0 must be issued to allow Trase I and Trase BE to hang up the Trase modem (if modem connection), prepare for later autologging, and shut down. Refer to the P0 command section and examples for instruction on how to shut off Trase. After a ten-minute period without receiving a command, Trase will begin the shut off procedure.

2. SCOPE

This specification describes the command protocol used to control Trase Remotely. Communication is via the RS232 connector.

3. PROTOCOL

This is a strict command/response protocol. Commands are sent from the computer to Trase and Trase sends responses to the computer.

Character Set

Communication between the computer and Trase uses only ASCII printable characters.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

Command Format

The command format is:
#*CCC*[*p1*[,*p2*]…];

Where:
is the start character (ASCII '#')
CCC is the three character command mnemonic code
p1 is parameter one
p2 is parameter two
; is the end character (ASCII ';')
Each command begins with a start character ('#') and ends with an end character (';'). With the exception of the connect and disconnect commands, the command mnemonic codes are three characters. Depending on the command, it may contain parameters. If a command has more than one parameter, they are separated by commas (',').

Commands may contain spaces. There can be one or more spaces between the command code and the first parameter and parameters may have one or more leading spaces.

A carriage return or line feed can appear after the end character. These are ignored by Trase.

If Trase receives a start character and part of a command and then another start character, it will clear its input buffer and begin receiving the new command. When typing commands by hand, this can be used to correct mistakes.

Response Format

The response format is:
$*eee*[,*p1*[,*p2*]…]~

Where:
$ is the response start character (ASCII '$')
eee is the error code
p1 is first response parameter
p2 is the second response parameter
~ is the response end character (ASCII '~')

Each response begins with a response start character ('$') and ends with a response end character ('~'). Each command also contains an error code. See "Error Codes" section for complete listing. The response parameters depend on the command. If the response contains more then one parameter they are separated by commas or carriage returns. Tabular information like TDR graph data and moisture tables contains a mixture of commas and carriage return/line feed pairs.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

4. CONNECT/DISCONNECT COMMAND

P - Connect/Disconnect

Command Format:
#Pn;

Response:
$B*nsfpv*~

The response is a string containing the Trase general status:

B	the ASCII character 'B'
n	screen number, '0' through '3'
s	screen shift, '0' = primary screen set, '1' = secondary screen set
f	cursor field, '0' through 'B'
p	protocol number. This is '1' for Trase and Trase BE.
v	protocol version, '0' through 'Z'

Examples:
#P1;
#P0;

Sample response:
$B00312~

Before you can send commands to Trase you should first connect. After sending the last command you should send a disconnect. When you send the connect command Trase disables its internal auto-shut-down timer. The two commands are:

#P1; Connect
#P0; Disconnect

The response to #P1; is a string containing the Trase general status. If you are communicating with a Trase BE only the last two characters are meaningful.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

SOILMOISTURE®

5. SETUP COMMANDS

Setup commands configure setup values in Trase. The response from Trase is the new setup value. These commands can also be used to retrieve setup values. Sending a setup command with no parameters will return the corresponding setup value without modifying it.

DAT - Set/Get Date

Command Formats:
#DAT*dd-mmm-yy*;
#DAT;

Response:
$*eee,dd-mmm-yy*~

Example:
#DAT 08-MAR-96;

Sample response:
$000,08-MAR-96~

The date is a two digit day of the month, a month abbreviation and a two digit year. Valid month abbreviations are: JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV and DEC.

TIM - Set/Get Time

Command Formats:
#TIM*hh:mm:ss*;
#TIM;

Response:
$*eee,hh:mm:ss*~

Example:
#TIM 09:45:00;

Sample response:
$000,20:59:45~

The time is a two digit hour, a two digit minute and a two digit second using a 24-hour clock.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

SOILMOISTURE®

CAP - Set/Get Capture Window Size

Command Formats:
#CAP*nn*;
#CAP;

Response:
$*eee,nn*~

Examples:
#CAP 10;

Sample response:
$000,10~

Set/Get the capture window size in nanoseconds. Valid capture window sizes are 10,20,40.
The response is the capture window size in nanoseconds.

MTB - Set/Get Moisture Table Selection

Command Formats:
#MTB*ttt*;
#MTB;

Response:
$*eee,ttt*~

Examples:
#MTB BUN;

Sample response:
$000,BUN~

This command selects the moisture table used by Trase to convert K_A to percent moisture. The table select code is a three character mnemonic:

CUN connector type waveguide, uncoated
CCT connector type waveguide, coated
BUN buriable type waveguide, uncoated
BCT buriable type waveguide, coated
FUN buriable type field waveguide, uncoated
FCT buriable type field waveguide, coated
SUN buriable type special waveguide, uncoated - user defined table
SCT buriable type special waveguide, coated - user defined table

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

SOILMOISTURE®

MTS - Load/Get Optional Moisture Table

Command Formats:
#MTS;
#MTS”*ttt*”,”*llllllll*”,*ss*
ka1,m1
ka2,m2,
…
kan,mn;

Response:
$*eee,”ttt”,”llllllll”,ss*
ka1,m1
ka2,m2
…
kan,mn~

Example:
#MTS ”SUN”,”SOIL”,17
2.0, 0.0
3.8, .050
6.0, .100
7.8, .150
10.0, .200
12.8, .250
17.4, .300
21.2, .350
23.5, .375
26.3, .400
27.9, .450
31.8, .493
37.7, .600
47.3, .700
59.2, .800
71.9, .900
80.0, .999;

Sample response:
$000,”BUN”,”Bur unco”,17
2.00,0.000
3.80,0.050
6.00,0.100
7.80,0.150
10.00,0.200
12.80,0.250
17.40,0.300
21.20,0.350
23.50,0.375
26.30,0.400

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

27.90,0.450
31.80,0.493
37.70,0.600
47.30,0.700
59.20,0.800
71.90,0.900
80.00,0.999
~

This command loads one of the user defined moisture tables in Trase. Trase can use one of the these tables to convert K_A to percent moisture, see **MTB - Set/Get Moisture Table** Selection. The Get command returns the currently selected moisture table values. The Set command contains the following fields:

ttt	Table indentifier: SUN or SCT
llllllll	Table label, up to 8 characters, 'A'-'Z', '0'-'9', '.'
ss	table size, maximum = 30
ka1	first K_A value
m1	first moisture value, 1.0 = 100%
ka2	second K_A value
m2	second moisture value

The maximum number of table entries is 30.

STO - Get Storage Size and Status

Command Formats:
#STO*n*;

Response:
$*eee,nn,rrrrrr,mmmmmm,nnnnn*~

Examples:
#STO 2;

Sample response:
$000,01,000001,122849,03957~

This command returns information about a storage area in Trase. In the command, n is the storage area you are requesting information about, 1, 2, 3 or 4. The response contains the following fields:

nn	the storage area number
rrrrrr	the number of readings currently stored in storage area nn
mmmmmm	the unused storage space remaining in storage area nn in readings
nnnnn	the unused storage space remaining in storage area nn in graphs

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

ERS - Erase Storage Area

Command Formats:
#ERS*n*;

Response:
$*eee,n*~

Examples:
#ERS 2;

Sample response:
$000,1~

Erase all the readings and graphs in a Trase storage area. The storage area n, is 1, 2, 3 or 4.

WGL - Set/Get Waveguide Length

Command Formats:
#WGL*nnn.n*;
#WGL;

Response:
$*eee,nnn.n*~

Example:
#WGL 20.0;

Sample response:
$000, 20.0~

Set/Get the waveguide length. The waveguide length is in centimeters. The response is the waveguide length in centimeters.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

WGT - Set/Get Waveguide Type

Command Formats:
#WGT*ttt*;
#WGT;

Response:
$*eee,ttt*~

Example:
#WGT BUR;

Sample response:
$000,BUR~

Set the waveguide to be used by Trase. The waveguide select code is a three-character mnemonic:
CON for Connector type waveguide
BUR for Buriable type waveguide
FLD for Field type waveguide

WOV - Set/Get Waveguide Offset Time Value

Command Formats:
#WOV *n.nn*;
#WOV;

Response:
$*eee, n.nn*~

Example:
#WOV 0.23;

Sample response:
$000,.45~

Set/Get the waveguide offset time in nanoseconds for the currently selected Waveguide type (see **WGT**) and Table type (see **MTB**). Only user defined special tables (SUN and SCT) are available for *setting* the waveguide offset time. This command replaces COT.

Buriable waveguide types: Entering a waveguide offset value of 0 for these tables will revert to the default waveguide offset value.

Connector and Field waveguide types: An error code is returned unless the Waveguide is zeroed (see **ZRO**) prior to issuing this command.

The command and response contains the following fields:

n the waveguide offset time in nanoseconds where n < 9.00

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

SOILMOISTURE®

ZRO - Zero Connector or Field Type Waveguide

Command Formats:
#ZRO;

Response:
$*eee*~

Examples:
#ZRO;

Sample response:
$000~

Set the Trase connector or field zero. This command is valid only if the connector type is CON, connector or FLD, field. See **WGT - Set/Get Waveguide Type**. Also see the Trase Operator manual for more details about this procedure.

VER - Get Firmware Part Number and Revision

Command Formats:
#VER;

Response:
$*eee,ppp…r*~

Examples:
#VER;

Sample response:
$000,6058C6-2000J ~

This command gets the firmware part number and revision. In the response, the letter at the end of the part number is the revision. In the above example the revision is J.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

SOILMOISTURE®

MOD - Set/Get Modem Status

Command Formats:
#MOD;
#MOD*n*;

Response:
$*eee,n*~

Examples:
#MOD;
#MOD0;

Sample responses:
$000,1~
$000,0~

This command sets or gets the modem status. The modem status (n) indicates:
0 - no modem connection
1 - modem connection

6. READING AND MEASUREMENT COMMANDS

MES - Measure Moisture

Command Formats:
#MES;

Response:
$*eee,mm.m,kk.k*~

Example:
#MES;

Sample response:
$000, 0.0, 1.10~

Command Trase to make a moisture measurement. The fields in the reponse are:

mm.m	percent moisture
kk.k	K_A value

Each time Trase makes a measurement it stores the reading and graph in a temporary buffer. This buffer is reading number 0. Use the **#GTR R,1,0;** to retrieve the full reading information or **#GTR G,1,0;** to retrieve the reading and TDR graph data. See **#STR** to store the reading/graph.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

TAG - Set/Get Reading Tag

Command Formats:
#TAG"*aaaaaaaa*";
#TAG;

Response:
$*eee,"aaaaaaaa"*~

Examples:
#TAG"BATCH43";

Sample response:
$000,"BATCH43"~

Set the tag text to be stored with readings. This text is stored as part of the reading information. See the Trase Operator manual for more details.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

SOILMOISTURE®

GTR - Get Stored Moisture Reading

Command Formats:
#GTR*t,s,rrrrr*;

Reading response:
$*eee,reading-header*~

Graph response:
$*eee,reading-header*
graph-header
v1
v2
…
vn~

Examples:
#GTR G,1,3;
#GTRR,2,1;

Sample responses:
$000,1,3,"",4.6,3.7,20.0,"BUR",0,0,"BUN",13.1,"30-OCT-97","22:08:11",10,"","20F"
10.000,0.639,0.000,"MUX/OFF",0.000
2472
2472
2472
…
2472
2472
~
$000,1,3,"",4.6,3.7,20.0,"BUR",0,0,"BUN",13.1,"30-OCT-97","22:08:11",10,"","20F"~

Get a stored reading or reading and graph from Trase. The command parameters are:

t type of response, 'R' = reading information only, 'G' = reading information plus the TDR graph data for the reading. The graph contains 1200 points

s storage area number: 1, 2 , 3 or 4

rrrrr reading number.

If Trase used a custom moisture table to make the measurement (SUN or SCT), the contents of this table are appended to the graph data in the response.

Select -1 as the reading number to obtain all readings/graphs in a storage area at one time.
Select 0 as the reading number to obtain the current reading/graph before it is stored.

For more information about the contents of the reading and graph header see the Trase Operator manual.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

SOILMOISTURE®

STR - Store Current Reading

Command Formats:
#STR*t,n*;
Response:
$*eee,t,n,rrrrr*~

Examples:
#STR G,2;

Sample response:
$000,G,1,3~

Store the most recent reading in a Trase storage area. The command parameters are:
t type: 'R' = store reading only, 'G' = store reading plus the TDR graph data
n storage area number: 1, 2, 3 or 4

The response contains the following fields:
t type: 'R' = stored reading only, 'G' = stored reading plus the TDR graph data
n storage area number: 1, 2, 3 or 4
rrrrr reading number

7. MULTIPLEXER COMMANDS

Multiplexer commands require that the Trase unit is equiped with the Model 6022 Multiplexer Control Board.

MCK - Check Multiplexer Hardware

Command Formats:
#MCK;

Response:
$*eee,n*~

Examples:
#MCK;

Sample response:
$000,16~

This command checks for the presence of the multiplexer hardware and connections. Each channel is scanned as an installation check. Response is the number of multiplexer channels available.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

MCN - Set/Get Multiplexer Channel

Command Formats:
#MCN*nnn*;
#MCN;

Response:
$*eee,nnn*~

Example:
#MCN 23;

Sample response:
$000,012~

This command sets the multiplexer channel Trase will use for future measurements.

MOV - Set/Get Multiplexer Auxiliary Offset Time Value

Command Formats:
#MOV *nn.nn*;
#MOV;

Response:
$*eee,nn.nn*~

Example:
#MOV 0.01;

Sample response:
$000,0.01~

Set/Get the Multiplexer auxiliary offset time in nanoseconds for the currently selected multiplexer channel (see **MCN**).

Trase uses this value to adjust the transit time per muliplexer channel. This enables standardizing of moisture measurements on channels with differing levels of dispersion and noise, variable buriable waveguides, cable types and lengths, etc.

The command and response contains the following fields:

n the MUX offset time in nanoseconds where -99.99 < n < 99.99

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

SOILMOISTURE®

MOT - Load/Get Multiplexer Auxiliary Offset Time Table

Command Formats:

#MOT 0;   (Clear - set all values to 0.00)

#MOT 1,   (Load new values)
n1, n2, n3, n4, n5, n6, n7, n8, n9, n10,
...
n251, n252, n253, n254, n255, n256
;

#MOT;   (Get):

Response:
$eee,
n1, n2, n3, n4, n5, n6, n7, n8, n9, n10,
...
n251, n252, n253, n254, n255, n256
;

This command loads a user defined multiplexer auxiliary offset table in Trase (see **MOV**).

The command and response contain the following fields:

n   the MUX offset time in nanoseconds where   -99.99 < n < 99.99

Example:

```
#MOT 1,
0.01,-0.02,0.00,0.00,0.02,0.04,0.00,-0.03,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
```


SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

```
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00
;
```

Sample response:

```
$000,
0.01,-0.02,0.00,0.00,0.02,0.04,0.00,-0.03,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.00,
0.00,0.00,0.00,0.00,0.00,0.00
~
```

8. AUTOLOG COMMANDS

SDA - Set/Get Autolog Start Date

Command Formats:
#SDA*dd-mmm-yy*;
#SDA;

Response:
$*eee,dd-mmm-yy*~

Example:
#SDA 08-MAR-96;

Sample Response:
$000,08-MAR-96, ~

Set the autolog start date. This is the date on which the next autolog cycle will start.

The date is a two digit day of the month, a month abbreviation and a two digit year. Valid month abbreviations are: JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV and DEC.

STA - Set/Get Autolog Start Time

Command Formats:
#STA*hh*:*mm*:*ss*;
#STA;

Response:
$*eee,hh*:*mm*:*ss*~

Example:
#STA 09:45:00;

Sample Response:
$000,09:45:00~

Set the autolog start time. This is the time at which the next autolog cycle will start. The time is a two digit hour, a two digit minute and a two digit second using the 24-hour clock.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

SOILMOISTURE®

INA - Set/Get Autolog Measurement Interval Time

Command Formats:
#INA *dd:hh:mm*;
#INA;

Response:
$*eee,dd:hh:mm~*

Examples:
#INA 00:05;
#INA 02:00:00;

Sample Response:
$000,02:00:00~

Set the autolog measurement interval time This is the time between autolog cycles. The time is a zero to two digit day, two digit hour and a two digit minute. The maximum autolog measurement interval time is 99:23:59. The minimum interval is dependent on the number of multipexed waveguides.

NCA - Set/Get Number of Autolog Cycles

Command Formats:
#NCA*n*;
#NCA;

Response:
$*eee,n~*

Example:
#NCA 150;

Sample Response:
$100,150~

Set the number of autolog cycles. The number of readings/graphs is limited by the storage remaining. The command and response parameters are:

0 < n < 99999

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

SRA - Set/Get Autolog Storage and Type

Command Formats:
#SRA*t,n*;
#SRA;

Response:
$*eee,t,n*~

Example:
#SRA G,2;

Sample response:
$000,G,1~

Store the autolog readings in a Trase storage area. The command parameters are:

t type: 'R' = store reading only, 'G' = store reading plus the TDR graph data
n storage area number: 1, 2, 3 or 4

The response contains the following fields:

t type: 'R' = stored reading only, 'G' = stored reading plus the TDR graph data
n storage area number: 1, 2, 3 or 4

SCM - Set/Get Multiplexer Start and End Channel Numbers

Command Formats:
#SCM*ss,nn*;
#SCM;

Response:
$*eee,ss,nn*~

Example:
#SCM 1,16;

Sample Response:
$000,1,16, ~

Set the starting and ending multiplexer channel numbers. Trase unit must be equiped with the Model 6022 Multiplexer Control Board. The command parameters are:

ss starting channel number where $1 < ss < 256$
nn ending channel number where $1 < nn < 256$

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

SOILMOISTURE®

TRP - Set/Get Trap Threshold

Command Formats:
#TRP*pp.p*;
#TRP;

Response:
$*eee,pp.p*~

Example:
#TRP 4.5;

Sample Response:
$000, 4.5~

Set the autolog reading trap value. See the Trase Operator manual for an explanation of this function.

SEQ - Enable/Disable Sequence Switch

Command Formats:
#SEQ*nn.n*;
#SEQ;

Response:
$*eee,nn.n*~

Example:
#SEQ 2.5;

Sample response:
$000, 1.5~

This command enables or disables the sequence switch that is activated at the end of an autolog cycle. The command parameter *nn* is the number of seconds the switch will remain activated. Setting this parameter to 0 disables the switch, in other words it will not activate.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

SOILMOISTURE®

9. TDR COMMANDS

TST - Set/Get TDR Start Time

Command Formats:
#TST*nn*;
#TST;

Response:
$*eee,nn*~

Example:
#TST 22;

Sample response:
$000,22~

Set/Get the TDR start time in nanoseconds. Valid TDR start times are 0 - 600. TDR start time plus the TDR range must be less than 610 nanoseconds. The response is the TDR start time in nanoseconds.

TRG - Set/Get TDR Range

Command Formats:
#TRG*nn*;
#TRG;

Response:
$*eee,nn*~

Example:
#TRG 80;

Sample response:
$000,80~

Set/Get the TDR range in nanoseconds. Valid TDR range times are 10,20,40,80,160,320. TDR start time plus the TDR range must be less than 610 nanoseconds. The response is the TDR range in nanoseconds.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

SOILMOISTURE®

TDR - Capture TDR Pulse

Command Formats:
#TDR;

Response:
$*eee*~

Example:
#TDR;

Sample response:
$000~

Command Trase to capture the TDR Pulse. Each time Trase makes a TDR capture it stores the graph in a temporary buffer. This buffer is graph number 0. Use **#GTR G,1,0;** to retrieve the TDR graph data or **#STR G,1** to store the graph.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

SOILMOISTURE®

10. ERROR CODES

Most responses include a three digit error code. The most significant digit contains general status information:

1xx Autolog is active
2xx Battery is low
3xx Autolog is active and battery is low

The remaining two digits contain error information about the most recent command:

x01 Command format error or illegal character
x02 Zero failed or the zero is not set
x03 Moisture and K_A values are out of range
x04 Moisture measurement software cannot locate the end of the wave guide
x05 Time measurement failed in the moisture measurement
x06 Invalid date or time value
x07 Out of storage memory
x08 Waveguide length too short for accurate measurement
x09 Waveguide length too long for accurate measurement
x10 Reading or graph not found
x11 Capture window out of range
x12 Unknown command code
x13 Unrecognized waveguide type
x14 Multiplexer is not installed or not connected
x15 Multiplexer error
x16 Multiplexer channel number out of range
x17 Command parameter error
x18 Invalid moisture table number
x19 Invalid storage area number
x20 Moisture table error
x21 Autolog start time/date too early
x22 Autolog reading interval too short
x23 Autolog insufficient storage for cycles requested
x24 Trap value out of range
x25 Sequence switch value out of range
x26 Measurement error - check TDR window size
x27 Measurement reading/graph not new, not saved
x28 Waveguide length not set
x29 Invalid baud rate
x30 Cannot modify waveguide offset for selected table
x31 Waveguide offset value out of range
x32 Muliplexer offset value out of range
x33 TDR capture time exceeds range
x34 Multiplexer controller card not installed

11. EXAMPLES

Example 1: Initializing Trase, Checking Default Values

SEND	ACTION
#P1;	Keep Trase power on.
#MOD 0;	Set modem to none for direct connect (default is Modem ON).
#DAT 07-FEB-97;	Set the date.
#TIM 08:45:00;	Set the Time.
#VER;	Check Trase firmware part number and revision.
#WGT;	Check waveguide type.
#MTB;	Check moisture table.
#CAP;	Check capture window.
#MOD 1;	Set modem back to ON if using modem connect next time.
#P0;	Turn Trase power off.

Example 2: Taking Measurements with a Connector Waveguide

Take two readings, tag and store.

SEND	ACTION
#P1;	Keep Trase power on.
#WGT CON;	Set waveguide type to connector.
#MTB CUN;	Set moisture table to connector uncoated (or CCT).
#WGL 30;	Set waveguide length in centimeters to 30, for 30 cm waveguide.
#CAP 10;	Set capture window to 10 nanoseconds.
#ZRO;	Set the zero time reference to the connector.
#MES;	Initiate a moisture measurement cycle.
#TAG “SO40”	Tag the reading as SO40, you may use up to 8 characters.
#STR R, 1;	Store the reading in storage area 1.
#MES;	Initiate a moisture measurement cycle.
#TAG “SO41”	Tag the reading as SO41, you may use up to 8 characters.
#STR R, 1;	Store the reading in storage area 1.
#P0;	Turn Trase power off.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

SOILMOISTURE®

Example 3: Taking Measurements with a Multiplexed Buriable Waveguide

Take two measurements with different sized buriable waveguides using the Multiplexer, tag and store graphs.

SEND	ACTION
#P1;	Keep Trase power on.
#WGT BUR;	Set waveguide type to buriable.
#MTB BUN;	Select moisture table buriable uncoated (or BCT,FUN,FCT,SUN,SCT).
#WGL 20;	Set waveguide length in centimeters to 20, for 20 cm waveguide.
#CAP 10;	Set capture window to 10 nanoseconds.
#MCN 12;	Select multiplexer channel 12.
#MES;	Initiate a moisture measurement cycle.
#TAG "AREA51"	Tag the reading as AREA51, you may use up to 8 characters.
#STR G,2;	Store the graph in storage area 2.
#MCN 13;	Select multiplexer channel 13.
#WGL 70;	Set waveguide length in centimeters to 60, for 60 cm waveguide.
#CAP 20;	Set capture window to 20 nanoseconds
#MES;	Initiate a moisture measurement cycle.
#TAG "AREA52"	Tag the reading as AREA52, you may use up to 8 characters.
#STR G,2;	Store the graph in storage area 2.
#P0;	Turn Trase power off.

Example 4: Retrieving Readings and Graphs; Erasing Storage

SEND	ACTION
#P1;	Keep Trase power on.
#STO 1;	Get storage size and status;
#GTR R,1,0;	Get current graph from storage area 1.
#GTR G,2,7;	Get data from storage area 2, graph Number 7.
#ERS 1;	Erase Storage Area Number 1.
#GTRR,3,-1;	Get all readings from storage area 3.
#ERS 3;	Erase Storage Area Number 3.
#P0;	Turn Trase power off.

Note: To obtain all readings/graphs from a storage area, begin with reading 1 and end with the reading number returned by STO or loop until error code 10 is returned. Alternatively, use -1 as the reading/ graph number field.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

Example 5: Autologging with the Multiplexer

Save readings and trap graphs.

SEND	ACTION
#P1;	Keep Trase power on.
#MCK;	Check the multiplexer hardware.
#SDA 01-MAR-97;	Set the autolog start date.
#STA 06:30:00;	Set the autolog start time.
#INA 00:04:30;	Set the measurement interval time , 4hrs, 30min.
#SCM 1,7;	Set multiplexer channels 1 to 7 for autolog cycle.
#SRA R,2;	Save readings, storage area 2.
#TRP 5.0;	Set trap value to save graphs if moisture varies by 5.0%
#NCA 50;	Set the number of autolog cycles.
#P0;	Turn Trase power off.

Notes: Error code returned should be 1xx to indicate autolog is active.
To abort an autolog between cycles, send #NCA 0.
Autolog will not begin until Trase power is turned off using #P0.

Example 6: Capturing TDR Pulse Data With No Moisture Calculations

SEND	ACTION
#P1;	Keep Trase power on.
#TST 21;	Set the start time in nanoseconds.
#TRG 10;	Set the range in nanoseconds.
#TDR;	Capture the TDR Pulse.
#GTRG,1,0;	Get the TDR Data.
#STRG,2;	Save the graph, storage area 2.
#P0;	Turn Trase power off.

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, California 93105 USA
Phone: (805) 964-3525 · Fax: (805) 683-2189
e-mail: sales@soilmoisture.com · Web: http: //www.soilmoisture.com

SOILMOISTURE®

Example 7: Measurements with Special Waveguides and Special Tables

Tables may be entered by hand or text file as in example 8, replacing the 000, and the tilda.

SEND	ACTION
#P1;	Keep Trase power on.
#MTB BUN;	Select moisture table buriable uncoated (or BCT,FUN,FCT,SUN,SCT).
#MTS;	Get copy of moisture table selected.
******	Determine new table values.
#MTS “SUN”,”SL”,17,	Label the table and record number of entries.
2.0, 0.0	Enter 17(eg.) pairs of numbers.
...	
80.0, .999;	:
;	Finish loading new user defined moisture table (SUN or SCT).
#WGT BUR;	Set waveguide type to buriable.
#MTB SUN;	Select moisture table special uncoated.
#WOV 0.25;	Set waveguide offset time to special waveguide offset in nanoseconds - valid on SUN & SCT tables (ZRO first if Connector or Field type).
#WGL 20;	Set waveguide length in centimeters to 20, for 20 cm waveguide.
#CAP 10;	Set capture window to 10 nanoseconds.
#MES;	Initiate a moisture measurement cycle.
#P0;	Turn Trase power off.

Note: Capture window size of 20 or 40 may be required with long or larger waveguides when error code 05 or 26 is returned after a measure.

Example 8: Standardizing Multiplexer Channel Moisture Measurements

SEND	ACTION
#P1;	Keep Trase power on.
*****	Prepare to capture the text in any communications program(e.g. Terminal, ProComm, and HyperTerminal).
#MOT;	Get copy of Multiplexer Auxiliary Offset Time Table.
*****	

Stop text capture. Open the file you have saved in any text editor like Notepad. Replace the first line “$000,” with “#MOT 1,“ Replace the last line tilda “ ~” with a semicolon “;” Determine time offsets needed for each channel.

Edit the table values for the appropriate Mux channel number and save the file. Use the communications program to send the text file to Trase. Trase will echo your table values which will scroll on your PC screen. Verify that the values are correct by examination on your screen, or by repeating the #MOT; command.

#MOT;	Get copy of Multiplexer Auxiliary Offset Time Table.
*****	Recheck data on all channels. Individual channels may be selected for modification.
#MCN 4;	Select Multiplexer channel 4.
#MOV 0.01;	Enter Multiplexer Auxiliary Offset Time value for single channel 4
#MES;	Initiate a moisture measurement cycle.
#P0;	Turn Trase power off.