



GSI ONLINE for Leica TPS

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Advanced User Guide

Leica
Geosystems

Introduction

Controlling electronic Total Stations with remote interface devices opens a big, new section in the world of surveying applications. Exchanging data and configurations between instruments and computers or transferring data directly to a data logger highly enhances the flexibility and functionality of Leica's sensors. The latest TPS Total Stations, as well as previous series support a large set of interfacing commands, to allow direct user access via RS232 serial interface.

The Leica Geo Serial Interface (GSI) is a general purpose, serial data interface for bi-directional communication between TPS Total Stations and computers. GSI uses a simple command structure to read/write values from/to the sensor. Global and instrument specific word indexes (WI) are used to specify various data types. Depending on the type of Total Station used, GSI provides a specific set of commands considering the instrument series functionality.

In addition to the former online reference guide „WILD INSTRUMENTS ONLINE“, this User Guide focuses the latest Leica Series of Total Stations - TPS100/300/700/1000/1100. We have designed this guide as a simple command listing and therefore basic aspects of serial data communications will not be covered. For detailed information and advice on GSI communication, we strongly recommend to consult the „WILD INSTRUMENTS ONLINE“.

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GSI Data Format

Data transmitted through GSI interface is composed in a sequence of blocks, ending with a terminator (CR or CR/LF). Every block (see the GSI8 example below) starts with a two character WI code, specifying the data type within this block. So far, a GSI8 block consists of totally 15 characters, including 7 information characters (e.g. WI, sign) and 8 (GSI8) data characters. Since data had become larger than 8 characters, we have introduced an enhanced 16 character data format, called GSI16. This new format size considers large scaled values, such as UTM coordinates, large alphanumeric codes, attributes or pointnumbers. Following, a GSI8 example showing a sequence of three blocks, containing pointnumber (11), easting coordinate (81) and northing coordinate (82). Example 2, shows a GSI16 block sequence with pointnumber (11), horizontal (21) and vertical (22) angle.

Example GSI8:

```

110001+0000A110 81..00+00005387 82..00-00000992
110002+0000A111 81..00+00007586 82..00-00003031
110003+0000A112 81..00+00007536 82..00-00003080
110004+0000A113 81..00+00003839 82..00-00003080
110005+0000A114 81..00+00001241 82..00-00001344
      |←8ch.→|

```

GSI8 Datablock Structure:

Pos.1-2:	Word Index (WI)	e.g. " <u>11</u> "; WI code
Pos.3-6:	Information related to data	e.g. " <u>0002</u> "; number of lines
Pos.4:	Sign	e.g. <u>±</u> or -
Pos.8-15:	GSI8 data (8 digits)	e.g. " <u>0000A113</u> "; Pointnumber
Pos.16:	Blank (=separating character)	

Example GSI16:

```

110001+000000000PNC0055 21.002+0000000013384650 22.002+0000000005371500
110002+000000000PNC0056 21.002+0000000012802530 22.002+0000000005255000
110003+000000000PNC0057 21.002+0000000011222360 22.002+0000000005433800
110004+000000000PNC0058 21.002+0000000010573550 22.002+0000000005817600
110005+000000000PNC0059 21.002+0000000009983610 22.002+0000000005171400
      |← 16 char. →|

```

GSI16 Datablock Structure:

Pos.1-2:	Word Index (WI)	e.g. "11"; WI code
Pos.3-6:	Information related to data	e.g. "0002"; number of lines
Pos.4:	Sign	e.g. ± or -
Pos.8-23:	GSI16 data (16 digits)	e.g. "000000000PNC0058"; Pointnumber
Pos.16/24:	Blank (=separating character)	

GSI Block Information

<i>Position</i>	<i>Explanation</i>	<i>Applicable for</i>
3	No significance	All words
4	AUTOMATIC INDEX INFORMATION 0: Automatic index OFF 1: Automatic index OPERATING 3: Automatic index OPERATING	All words containing angle information
5	INPUT MODE 0: Original measured values transferred from the instrument 1: Manual input from keyboard 2: Measured value, Hz-Correction ON 3: Measured value, Hz-Correction OFF 4: Result of special function	Measured data
6	UNITS 0: Meter (last digit: 1mm) 1: Feet (last digit: 1/1000ft) 2: 400 gon 3: 360° decimal 4: 360° sexagesimal 5: 6400 mil 6: Meter (last digit: 1/10mm) 7: Feet (last digit: 1/10'000ft) 8: Meter (last digit: 1/100mm)	Measured data
7	SIGN +: Positive value -: Negative value	Measured data
8-15 (8-23)	DATA Data includes a sequence of 8(16) numerical or alphanumerical characters. Note that certain data blocks are allowed to carry more than 1 value (e.g. PPM/MM). Those data are automatically transferred with a sign before each single value.	Measured data
16 (24)	SEPARATING CHARACTER _: Blank	All words

[Tab.1]; [Source: WILD INSTRUMENTS ONLINE; 1988]

Online Command Structure

GSI online commands represent a simple syntax structure consisting of four basic commands. To access a wide range of settings or values, commands can be enhanced with a limited sequence of word indexes (WI) and parameters. Following, a short summary explaining the meaning of the basic commands continued with some examples.

- SET Set instrument parameters
- CONF Read internal parameter settings
- PUT Write/change values within the Total station
- GET/I/... Get instant values from the Total Station (last valid value)
- GET/M/... Release measurement and get measured values from the Total Station

Examples:

SET commands

SYNTAX: SET/<set spec>/<parameter><CR/LF>

EXAMPLE: SET/30/0

RESPONSE: ?

Instrument BEEP:	SET/30/0	OFF (disable)
	SET/30/1	ON (enable)

CONF commands

SYNTAX: CONF/<conf spec><CR/LF>

EXAMPLE: CONF/30

RESPONSE: 0030/000

Above CONF/30 reads the BEEP setting	0030/0000	Beep disabled
	0030/0001	Beep enabled

PUT commands

SYNTAX: PUT/<put spec> <Value>_<CR/LF>

EXAMPLE: PUT/11....+00000012

RESPONSE: ?

CONFIRMATION: <CR/LF>

Writes Pointnumber	PUT/11....+00000012	→ PtNo "1234"
--------------------	---------------------	---------------

☞ Make sure you put a space (), behind <Value>!

GET commands

SYNTAX: GET/n/WI<get spec><CR/LF>

EXAMPLE: GET/M/WI21

RESPONSE: 21.102+12149400

Read Hz-Angle value	GET/I/WI21	→ 21.104+12149400
Read Hz-,and V-Angles	GET/I/WI <u>21</u> /WI <u>22</u> ;	→ <u>21</u> .104+12149400
		→ <u>22</u> .104+08832420

TPS100 Series

The TPS100 Series were introduced in 1996/97. These Total Stations were the first series supporting an enhanced set of GSI interfacing commands. The additional functionality conducted to increasing operational benefit, compared to its predecessor TC500 which is described in the WILD INSTRUMENTS ONLINE, Appendix E.

Supported Instruments:

- TC403L, TC600, TC800 (Firmware Version 2.13 and higher)
- TC605/L, TC805/L TC905/L (collectively the "TCx05" series)

The following command listing is split into separate sections for each basic command (SET, CONF, PUT, GET). Some of the listed features may require specially equipped instruments (e.g. instruments with Laser Plummet or EGL). For detailed description of single functions, we recommend to consult the corresponding User Manual.

Low Level commands

SYNTAX: <command>CR/LF

RESPONSE: ?

<Command>:	a	Powers on the instrument
	b	Powers off the instrument
	c	Clears a distance measurement

Restrictions:

- ¹⁾ Applies to TCx05 instruments only
- ²⁾ Applies to TCx00/403 instruments only
- ³⁾ Applies to instruments equipped with EGL (Electronic Guide Light) only
- ⁴⁾ Applies to instruments equipped with Laser Plummet only

SET Syntax: SET/<SET SPEC>/<Parameter><CR/LF>

<SET SPEC>	FUNCTION	<PARAMETER>	SETTING
30	BEEP	0	OFF
		1	ON
32	Display contrast	0	Low contrast
		1	Medium contrast
		2	Medium to high contrast
		3	High contrast
34	BEEP @ 90°	0	OFF
		1	ON
40	Angle UNIT	0	GON
		1	Degree decimal
		2	Degree sexagesimal
41	Distance UNIT	0	Meter
		1	Feet
44	V angle READING	0	Zenith
		1	Horizontal
		2	Slope in percent
49 ¹⁾	Time/Date format	0	Form 1 (am/pm)
		1	Form 2 (24 hours)
50	Angle rounding	0	Low
		1	Medium
		2	High (→ refer to manual)
70	Baudrate	0	300 Baud
		1	600 Baud
		2	1200 Baud
		3	2400 Baud
		4	4800 Baud
		5	9600 Baud
71	Parity	0	None
		1	Odd
		2	Even
73	Terminator	0	CR
		1	CR/LF
76	Data recording device	0	Internal Memory
		1	RS232
80 ³⁾	EGL activity	0	OFF
		1	ON
81 ³⁾	EGL intensity	0	Poor
		1	Medium
		2	Strong
95	AutoOFF	0	OFF
		1	ON
102 ⁴⁾	Laser plummet	0	OFF
		1	ON

[...cont.]

<SET SPEC>	FUNCTION	<PARAMETER>	SETTING
103 ⁴⁾	Laser plummet availability	0 1	No Yes
135	RS232 recording mask	0 1	Mask1 (11, 21, 22,) Mask2 (11,....., 81, 82, 83)
136	Data transfer output format	0 1 2 3	Mask1 Mask2 Activates user format #1 Activates user format #2 (→ refer to manual)
137	RS232 format length	0 1	GS18 GS16
138 ¹⁾	Quick code recording	0 1	Before measurement After measurement
149	Display MASK	0 1 2 3 ¹⁾	WI 11, 21, 22, 31 WI 21, 22, 32, 33 WI 11, 81, 82, 83 WI 11, 41, 32, 87
160	Setting measured distance to invalid	0	Set distance (WI31,32,33) and coordinates (WI81,82,83) to invalid
171	Direction of horizontal circle reading (Hz-Angle)	0 1	Clockwise Counterclockwise
177	Compensator	0 1	OFF ON
178 ¹⁾	Hz compensator	0 1	OFF ON (→ refer to manual)
179 ¹⁾	Hz collimation	0 1	OFF ON (→ refer to manual)

[Tab.2]

Example:

Intended action: Change Display contrast to "HIGH" contrast

Command: SET/32/3<CR/LF>

Response: ?

CONF Syntax: CONF/<CONF SPEC><CR/LF>

<CONF SPEC>	FUNCTION	RESPONSE	CONFIGURATION
30	BEEP	0030/0000 0030/0001	OFF ON
32	Display contrast	0032/0000 0032/0001 0032/0002 0032/0003	Low contrast Medium contrast Medium to high contrast High contrast
34	BEEP @ 90°	0034/0000 0034/0001	OFF ON
40	Angle UNIT	0040/0000 0040/0001 0040/0002	GON Degree decimal Degree sexagesimal
41	Distance UNIT	0041/0000 0041/0001	Meter Feet
44	V angle READING	0044/0000 0044/0001 0044/0002	Zenith Horizontal Slope in percent
49 ¹⁾	Time/Date format	0049/0000 0049/0001	Form1 Form2 (→ refer to manual)
50	Angle rounding	0050/0000 0050/0001 0050/0002	low medium high
70	Baudrate	0070/0000 0070/0001 0070/0002 0070/0003 0070/0004 0070/0005	300 Baud 600 Baud 1200 Baud 2400 Baud 4800 Baud 9600 Baud
71	Parity	0071/0000 0071/0001 0071/0002	NONE ODD EVEN
73	Terminator	0073/0000 0073/0001	CR CR/LF
76	Data recording device	0076/0000 0076/0001	Internal Memory RS232
80 ³⁾	EGL activity	0080/0000 0080/0001	OFF ON
81 ³⁾	EGL intensity	0081/0000 0081/0001 0081/0002	poor medium strong
90	Battery level	0090/000n	N[1=empty..9=full]
91	Instr. Temperature	0091/00nn	nn<100: Temp in °C nn>200: nn-255= temperature in -°C

[...cont.]

<CONF SPEC>	FUNCTION	RESPONSE	CONFIGURATION
95	AutoOFF	0095/0000 0095/0001	OFF ON
102 ⁴⁾	Laser plummet	0102/0000 0102/0001	OFF ON
103 ⁴⁾	Laser plummet availability	0103/0000 0103/0001	Not available Available
135	RS232 recording mask	0135/0000 0135/0001	Mask1 (11, 21, 22,) Mask2 (11,....., 81, 82, 83)
136	Data transfer output format	0136/0000 0136/0001 0136/0002 0136/0003	Mask1 Mask2 Activates user format #1 Activates user format #2 (➔ refer to manual)
FORM/n	Check format name; n:[1..4]	“Format_1” “Format_n”	e.g. CONF/FORM/1 -> „GSI 2“
137	RS232 format length	0137/0000 0137/0001	GSI8 GSI16
138 ¹⁾	Quick code recording	0138/0000 0138/0001	Before measurement After measurement
149	Display MASK	0149/0000 0149/0001 0149/0002 0149/0003 ¹⁾	WI 11, 21, 22, 31 WI 21, 22, 32, 33 WI 11, 81, 82, 83 WI 11, 41, 32, 87
160	Validity of measured distance	0160/0000 0160/0001	Invalid DIST Valid DIST
161	EDM measuring mode	0161/0000 0161/0001	IR Fine mode IR Rapid mode
171	Direction of horizontal circle reading (Hz-Angle)	0171/0000 0171/0001	Clockwise Counterclockwise
177	Compensator	0177/0000 0177/0001	OFF ON
178	Hz compensator	0178/0000 0178/0001	OFF ON
179	Hz collimation	0179/0000 0179/0001	OFF ON)
180	Instrument Series	0180/0004 0180/0006 0180/0008 0180/0009	TC403 TC600/605 TC800/805 TC905
181	Instrument Type	0181/0000 0181/0001	T (Theodolite) TC (Total Station)
182	Firmware version	0182/0217	e.g. Version 2.17

[Tab.3]

PUT Syntax: SET/<PUT SPEC>/<Parameter>_<CR/LF>

<PUT SPEC>	FUNCTION	Access/Example
11	Set Pointnumber	PUT/11....+00001234_<CR/LF> → puts PtID "1234"
21	Hz Angle	PUT/21...n+1000000_<CR/LF> n[2..4]; angle units must be specified → for n=2; puts Hz="100.0000 gon"
58	Prism const	PUT/58....+00000200_<CR/LF> → puts reflector constant to "20mm"
59	PPM	PUT/59....+02200000_<CR/LF> → puts PPM correction to "220"
84	Station Easting	PUT/84...n+00100000_<CRLF> n[0..1]; distance unit must be specified → for n=0; puts Easting="100.000 m"
85	Station Northing	PUT/85...n+00100000_<CRLF> n[0..1]; distance unit must be specified → for n=0; puts Northing="100.000 m"
86	Station Elevation	PUT/86...n+00045000_<CRLF> n[0..1]; distance unit must be specified → for n=0; puts Elevation="45.000 m"
87	Reflector height	PUT/87...n+00001700_<CRLF> n[0..1]; distance unit must be specified → for n=0; puts hr="1.700 m"
88	Instrument height	PUT/88...n+00001500_<CRLF> n[0..1]; distance unit must be specified → for n=0; puts hi="1.500 m"

[Tab.4]

GET Syntax: GET/n/WI<GET SPEC>/<Parameter><CR/LF>

<GET SPEC>	FUNCTION	Access/Example
11	Pointnumber	GET/M/WI11<CR/LF>; e.g. 11....+00000H66 → PtNo="H66"
21	Hz Angle	GET/M/WI21<CR/LF>; e.g. 21.102+17920860 → Hz „179.086“ gon
22	Vertical Angle	GET/M/WI22<CR/LF>; e.g. 22.102+07567500 → V: „75.675“ gon
31	Slope distance	GET/M/WI31<CR/LF>; e.g. 31..00+00003387 → Sdist: „3.387“ m
32	Horizontal distance	GET/M/WI32<CR/LF>; e.g. 32..00+00003198 → Hdist: „3.198“ m
33	Height difference	GET/M/WI33<CR/LF>; e.g. 33..00+00001119 → Hdiff: „1.119“ m
51	PPM and Prism constant	GET/I/WI51; e.g. 51....+0220+002 → PPM „220“ and Prism const „2“ mm
58	Prism constant	GET/I/WI58; e.g. 58..16+00000020 → Prism „2“ mm
59	PPM	GET/I/WI59; e.g. 59..16+02200000 → PPM „220“
81	Target Easting (E)	GET/M/WI81; e.g. 81..00+01999507 → E: “1999.507”m
82	Target Northing (N)	GET/M/WI82; e.g. 82..00-00213159 → N: “-2139.159”m
83	Target Elevation (H)	GET/M/WI83; e.g. 83..00+00032881 → H: “32.881”m
84	Station Easting (E0)	GET/I/WI84; e.g. 84..11+00393700 → E: “393.700”m
85	Station Northing (N0)	GET/I/WI85; e.g. 85..11+06561220 → N: “6561.220”m
86	Station Height (H0)	GET/I/WI86; e.g. 86..11+00065618 → H: “65.618”m
87	Reflector height (hr)	GET/I/WI87; e.g. 87..11+00001700 → hr: “1.700” m
88	Instrument height (hi)	GET/I/WI88; e.g. 88..11+00001550 → hi: “1.550” m
GETDATE ¹⁾	read date	GETDATE; (dd:mm:yy) → 07/02/00
GETTIME ¹⁾	read time	GETTIME; (hh:mm:ss) → 04:06:58p

[Tab.5]

Remote Stake Out

The TCx05 series support a remote set-out method for surveyors using handheld or external recording devices. Stake out data can be transferred from via RS232 interface to the instrument's onboard Remote Stake Out application. The following procedure describes a possible way for successful field stake out. [Note: “_” represents a space character]

- Remote Set Station

Start Remote S/O	SETOUT<CR/LF>	Calls onboard S/O
Set Station Pointnumber	PUT/16...+000S7000_<CRLF>	e.g. “S7000”
Set Station Easting	PUT/84...0+00100000_<CRLF>	e.g. “100.000”[m]
Set Station Northing	PUT/85...0+00100000_<CRLF>	e.g. “100.000”[m]
Set Station Height	PUT/86...0+00050000_<CRLF>	e.g. “50.000”[m]
Set Instrument Height	PUT/88...0+00001500_<CRLF>	e.g. “1.500” [m]

- Remote Set Orientation

Set Hz-Orientation	PUT/21...2+00000000_<CRLF>	e.g. “0.000” gon (respectively Hz=0)
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- Remote Target Point setting out

Set Target Pointnumber	PUT/11...+000S7000_<CRLF>	e.g. “S7000”
Set stakeout bearing	PUT/24...2+00102000_<CRLF>	e.g. “102.000”[m]
Set stakeout distance	PUT/34...0+00103000_<CRLF>	e.g. “103.000”[m]
Set stakeout height	PUT/83...0+00053000_<CRLF>	e.g. “53.000”[m]
Set Reflector height	PUT/87...+00001500_<CRLF>	e.g. “1.500” [m]
Release DIST or ALL key to measure a distance		
Terminating remote S/O	X<CR/LF>	Quits remote S/O

For further information, please refer to the corresponding instrument manual. Refer also to „Basic Knowledge“ BK99/44.

Warnings/Errors

<i>Message ID</i>	<i>Meaning</i>	<i>Possible reasons</i>
@W100	Instrument busy	Any other device is still interfacing the instrument; check interfacing priorities
@W127	Invalid command	The string sent to the TC could not be decoded properly or does not exist; check the syntax, or ... Input buffer overflow (max. 100 characters)
@W139	EDM error	The EDM could not proceed the requested measurement; no or weak signal; Check EDM mode and target
@W158	One of the instruments sensor corrections could not be assigned.	Instrument is not stable or levelled; Tilt is out of range (e.g. when tilt sensor is out of range)
@E101	Value out of range	Check parameter range
@E103	Invalid Value	No valid value; Check parameter range
@E112	Battery low	Low Battery; check voltage
@E114	Invalid command	No valid command; check the syntax
@E117	Initialisation error	Contact service
@E119	Temperature out of range	Refer to manual for temperature range
@E121	Parity error	Wrong parity set; check Com-Port settings
@E122	RS232 time-out	The instrument was waiting for a response for the last 2 seconds
@E124	RS232 overflow	RS232 overflow; check Com-Port settings
@E151	Compensator error	Inclination Error; check instrument setup or switch of the compensator
@E155	EDM intensity	Weak signal; target is most likely outside the field of view
@E156	EDM system error	Contact service
@E158	One of the instruments sensor corrections could not be assigned.	Instrument is not stable, not levelled or suffering of vibration; Tilt is out of range (e.g. when tilt sensor is out of range); Level instrument or switch off compensator
@E190	General hardware error	Contact service
@E197	Initialization error	Contact service

[Tab.6]

TPS300/700 Series

The TPS300 and TPS700 series were introduced in 1998/99. Featuring the latest generation technology, these instruments have further increased their interfacing capabilities. Considering the new firmware and application platform, lots of new commands have been added or existing commands being changed compared to its predecessors, the TPS100 Total Stations. However, basic functions use the same commands and therefore most of the existing TPS100 interfacing applications will still support the new TPS300/700 series.

Supported Instruments:

- TC302, TC303, TC305, TC307
- TCR302, TCR303, TCR305, TCR307
- TC702, TC703, TC705
- TCR702, TCR703, TCR705

The following command listing is split into separate sections for each basic command (SET, CONF, PUT, GET). Some of the listed features may require specially equipped instruments (e.g. Reflectorless EDM → RL). For detailed description of single functions, we recommend to consult the corresponding User Manual.

Low Level commands

SYNTAX: <command>CR/LF

SYNTAX: BEEP/<value>

<Command>:	a	Powers on the instrument
	b	Powers off the instrument
	c	Clears a distance measurement
<Value>:	BEEP/0	Short beep
	BEEP/1	Long beep
	BEEP/2	Alarm beep (short beep, 3 times)

Restrictions:

¹⁾ TCR models ONLY

²⁾ Instruments equipped with EGL3 only

SET Syntax: SET/<SET SPEC>/<Parameter><CR/LF>

<SET SPEC>	FUNCTION	<PARAMETER>	SETTING
30	BEEP	0 1 2	OFF Medium Loud
31	Display illumination	0 1 2 3	Off Low Medium High
32	Display contrast	[0..100] 0 50 100	→ [range] Low contrast Medium contrast High contrast
34	BEEP @ 90°	0 1	OFF ON
35 ²⁾	EGL activity	0 1 2 3	OFF Low Medium High
36 ¹⁾	Laser Pointer	0 1	OFF ON
40	Angle UNIT	0 1 2 3 4	GON Degree decimal Degree sexagesimal Mils radian
41	Distance UNIT	0 1 2 3 4	Meter US Feet, decimal Intl. Feet, decimal US Feet/Inch Intl. Feet/Inch
42	Temperature UNIT	0 1	Degree Celcius Degree Fahrenheit
43	Pressure UNIT	0 1 2 3 4 5 6	hPa MmHg Mbar PSI InchHg Atm Torr
50	Angle; displayed decimals	0 1 2 3 4	,0000 ,n000 ,nn00 ,nnn0 ,nnnn

[...cont.]

<SET SPEC>	FUNCTION	<PARAMETER>	SETTING
51	Distance; displayed decimals	0	,000
		1	,n00
		2	,nn0
		3	,nnn
		4	,nnn(n)
55	Angle rounding	[0..10]	e.g. n=3: 0.3, 0.6, 0.9, ...
55	Distance rounding	[0..10]	e.g. n=3: 0.3, 0.6, 0.9, ...
70	Baudrate	0	300 Baud
		1	600 Baud
		2	1200 Baud
		3	2400 Baud
		4	4800 Baud
		5	9600 Baud
	6	19200 Baud	
71	Parity	0	None
		1	Odd
		2	Even
73	Terminator	0	CR
		1	CR/LF
75	Protocol	0	Off
		1	On
76	Data recording device	0	Internal Memory
		1	RS232
78	Timeout delay	[0..50]	Increase of 10ms/unit
95	AutoOFF	0	Off
		1	On
		2	Sleep mode
102	Laser plummet	0	Off
		1	On
104	Laser plummet pulse rate	[0..100]	[range]
		0	permanent
		100	High pulse rate
105	Laser plummet intensity	[0..100]	[range]
		0	Low
		100	bright
106	Display heat	0	Off
		1	On
120	Orientation face definition	0	Face I
		1	Face II
135	Recording mask	[0..8]	[range] (→ refer to manual)
136	Output format number	[0..127]	[range] (→ refer to manual)
137	RS232 format length	0	GS18
		1	GS116

[...cont.]

<SET SPEC>	FUNCTION	<PARAMETER>	SETTING
138	Quick code recording	0 1	Before measurement After measurement
160	Setting measured distance to invalid	0	Setting WI31,32,33 and coordinates WI81,82,83 to invalid; (CONT variables only; contact a TPS product manager)
161	EDM modes (SET/161/n)	0 1 2 3 4 5 6 ¹⁾ 7 ¹⁾ 8 9 ¹⁾ 10	IR Standard IR Fast n.a. n.a. n.a. IR Tracking RL Long (with prisms) RL Short n.a. RL Tracking IR Tape
171	Direction of horizontal circle reading (Hz-Angle)	0 1	Clockwise Counterclockwise
173	Compensator	0 1	OFF ON
178	Standing axis correction	0 1	OFF (1-Axis) ON (2-Axis) (→ refer to manual)
179	Hz collimation	0 1	OFF ON (→ refer to manual)

[Tab.7]

CONF Syntax: CONF/<CONF SPEC><CR/LF>

<CONF SPEC>	FUNCTION	RESPONSE	CONFIGURATION
30	BEEP	0030/0000 0030/0001 0030/0002	Off Normal Loud
31	Display illumination	0031/0000 0031/0001 0031/0002 0031/0003	Off Low Medium High
32	Display contrast	0032/0nnn	n:[0..100] 0: lowest contrast 50: Medium contrast 100: Highest contrast
34	BEEP @ 90°	0034/0000 0034/0001	Off On
35 ²⁾	EGL activity	0035/0000 0035/0001 0035/0002 0035/0003	Off Low Medium High
36 ¹⁾	Laser Pointer	0036/0000 0036/0001	Off On
40	Angle UNIT	0040/0000 0040/0001 0040/0002 0040/0003 0040/0004	Gon Degree decimal Degree sexagesimal Mil Radiant
41	Distance UNIT	0041/0000 0041/0001 0041/0002 0041/0003 0041/0004	Meter US Feet, decimal Intl. Feet, decimal US Feet/Inch Intl. Feet/Inch
42	Temperature UNIT	0042/0000 0042/0001	Degree Celcius Degree Fahrenheit
43	Pressure UNIT	0043/0000 0043/0001 0043/0002 0043/0003 0043/0004 0043/0005 0043/0006	hPa mmHg mBar PSI InchHg Atm Torr
50	Angle; displayed decimals	0050/0000 0050/0001 0050/0002 0050/0003 0050/0004	,0000 ,n000 ,nn00 ,nnn0 ,nnnn

[...cont.]

<CONF SPEC>	FUNCTION	RESPONSE	CONFIGURATION
51	Distance; displayed decimals	0051/0000 0051/0001 0051/0002 0051/0003 0051/0004	,000 ,n00 ,nn0 ,nnn ,nnn(n)
55	Angle rounding	0055/00nn	N:[1..10]
56	Distance rounding	0056/00nn	N:[1..10]
70	Baudrate	0070/0000 0070/0001 0070/0002 0070/0003 0070/0004 0070/0005 0070/0006	300 Baud 600 Baud 1200 Baud 2400 Baud 4800 Baud 9600 Baud 19200 Baud
71	Parity	0071/0000 0071/0001 0071/0002	NONE ODD EVEN
73	Terminator	0073/0000 0073/0001	CR CR/LF
75	Protocol	0075/0000 0075/0001	Off On
76	Data recording device	0076/0000 0076/0001	Internal Memory RS232
78	Timeout delay	[0..50]	Increase of 10ms/unit
90	Battery level	0090/00nn	n:[0..10] 0: Empty 10: Full
91	Temperature	0091/0nnn	[0..±100] °C
95	Auto-OFF	0095/0000 0095/0001	Off On
102	Laser plummet	0102/0000 0102/0001	Off On
103	Laser plummet availability	0103/0000 0103/0001	Not available Available
104	Laser plummet pulse rate	0104/0nnn	N: [0..100] 0: Permanent 100: High pulse rate
105	Laser plummet intensity	0105/0nnn	N: [0..100] 0: Low 100: bright
106	Display heat	0106/0000 0106/0001	Off On
120	Orientation face definition	0120/0000 0120/0001	Face I Face II

[...cont.]

<CONF SPEC>	FUNCTION	RESPONSE	CONFIGURATION
122	Orientation face status (face of last measurement)	0122/0000 0122/0001	Face I Face II (→ refer to manual)
135	RS232 recording mask	0135/000n	N: [0..8]
136	Output format number	0136/0nnn	n: [0..127]
137	RS232 recording length	0137/0000 0137/0001	GS18 GS16
138	Quick code recording	0138/0000 0138/0001	Before measurement After measurement
138	Display MASK	0138/000n	N: [0..8]
160	Validity of measured distance	0160/0000 0160/0001	Distance invalid Distance valid
161	EDM modes (SET/161/n)	0161/0000 0161/0001 0161/0005 0161/0006 ¹⁾ 0161/0007 ¹⁾ 0161/0009 ¹⁾ 0161/0010	IR Standard IR Fast IR Tracking RL Long (with prisms) RL Short RL Tracking IR Tape
170	Detect current face	0170/0000 0170/0001	Face I Face II (→ refer to manual)
171	Direction of horizontal circle reading (Hz-Angle)	0171/0000 0171/0001	Clockwise Counterclockwise
173	Compensator	0173/0000 0173/0001	OFF ON
178	Standing axis correction	0178/0000 0178/0001	OFF (1-Axis) ON (2-Axis) (→ refer to manual)
179	Hz collimation	0179/0000 0179/0001	OFF ON (→ refer to manual)

[Tab.8]

PUT Syntax: SET/<PUT SPEC>/<Parameter>_<CR/LF>

<PUT SPEC>	FUNCTION	Access/Example
11	Set Pointnumber	PUT/11....+00001234_<CR/LF> → puts PtID "1234"
16	Station Pointnumber	PUT/16....+0000A100_<CR/LF> → puts StNr "A100"
21	Hz Angle	PUT/21...n+10000000_<CR/LF> n[2..4]; angle units must be specified → for n=2; puts Hz="100.0000 gon"
41	Code-Block ID	PUT/41....+0000TREE_<CR/LF> → puts code value "TREE"
42	Information 1	PUT/42....+000012.4_<CR/LF> → puts info value "12.4"
43	Information 2	PUT/43....+0000CAT2_<CR/LF> → puts info value "CAT2"
44	Information 3	PUT/44....+000000NN_<CR/LF> → puts info value "NN"
45	Information 4	PUT/45....+000000NN_<CR/LF> → puts info value "NN"
46	Information 5	PUT/46....+000000NN_<CR/LF> → puts info value "NN"
47	Information 6	PUT/47....+000000NN_<CR/LF> → puts info value "NN"
48	Information 7	PUT/48....+000000NN_<CR/LF> → puts info value "NN"
49	Information 8	PUT/49....+000000NN_<CR/LF> → puts info value "NN"
58	Prism const	PUT/58....+00000200_<CR/LF> → puts reflector constant to "20mm"
59	PPM	PUT/59....+02200000_<CR/LF> → puts PPM correction to "220"
84	Station Easting	PUT/84...n+00100000_<CRLF> n[0..1]; distance unit must be specified → for n=0; puts Easting="100.000 m"
85	Station Northing	PUT/85...n+00100000_<CRLF> n[0..1]; distance unit must be specified → for n=0; puts Northing="100.000 m"
86	Station Elevation	PUT/86...n+00045000_<CRLF> n[0..1]; distance unit must be specified → for n=0; puts Elevation="45.000 m"
87	Reflector height	PUT/87...n+00001700_<CRLF> n[0..1]; distance unit must be specified → for n=0; puts hr="1.700 m"

[...cont.]

<PUT SPEC>	FUNCTION	Access/Example
88	Instrument height	PUT/88...n+00001500_<CRLF> n[0..1]; distance unit must be specified → for n=0; puts hi="1.500 m"
560	Time: [hh.mm.ss]	PUT/560..6+00113059_<CRLF> → "11:30:59"
561	Date: [mm.dd]	PUT /561..6+00020800_<CRLF> → February 8 th 2000
562	Year: [yyyy]	PUT/562...+00002000_<CRLF> → year "2000"
912	Station Pointnumber	PUT/912...+0000ST15_<CRLF> → puts Station PtID "ST15"

[Tab.9]

GET Syntax: GET/n/WI<GET SPEC>/<Parameter><CR/LF>

<GET SPEC>	FUNCTION	Access/Example
11	Pointnumber	GET/M/WI11<CR/LF>; e.g. 11....+00000H66 → PtNo="H66"
12	Serial number	GET/I/WI12<CR/LF>; e.g. 12....+00640054 → S.No. "640054"
13	Instrument type	GET/I/WI13<CR/LF>; 13....+00TCR305 → Instr. "TCR305"
16	Station Pointnumber	GET/I/WI16; e.g. 16....+00000100 → St.No. "100"
17	Date [DD.MM.YYYY]	GET/I/WI17; e.g. 17....+08022000 → "Feb. 8 th 2000"
19	Time [MM.DD.hh.mm]	GET/I/WI19; e.g. 19....+02081029 → "Feb. 8 th ; 10:29"
21	Horizontal Angle	GET/M/WI21<CR/LF>; e.g. 21.102+17920860 → Hz „179.086“ gon
22	Vertical Angle	GET/M/WI22<CR/LF>; e.g. 22.102+07567500 → V: „75.675“ gon
31	Slope distance	GET/M/WI31<CR/LF>; e.g. 31..00+00003387 → Sdist: „3.387“ m
32	Horizontal distance	GET/M/WI32<CR/LF>; e.g. 32..00+00003198 → Hdist: „3.198“ m
33	Height difference	GET/M/WI33<CR/LF>; e.g. 33..00+00001119 → Hdiff: „1.119“ m
41	Code-Block ID	GET/I/WI41<CR/LF>; e.g. 41....+00000013 → Code: „13“ m
42	Information 1	GET/I/WI42<CR/LF>; e.g. 42....+000TREES → Info1: „TREES“
43	Information 2	GET/I/WI43<CR/LF>; e.g. 43....+000004.5 → Info2: „4.5“
44	Information 3	GET/I/WI44<CR/LF>; e.g. 44....+00CAT.02 → Info3: „CAT.02“
45	Information 4	GET/I/WI45<CR/LF>; e.g. 45....+000000NN → Info4: „NN“
46	Information 5	GET/I/WI46<CR/LF>; e.g. 46....+000000NN → Info5: „NN“
47	Information 6	GET/I/WI47<CR/LF>; e.g. 47....+000000NN → Info6: „NN“
48	Information 7	GET/I/WI48<CR/LF>; e.g. 48....+000000NN → Info7: „NN“
49	Information 8	GET/I/WI49<CR/LF>; e.g. 49....+000000NN → Info8: „NN“
58	Prism constant	GET/I/WI58; e.g. 58..16+00000020 → Prism „2“ mm
59	PPM	GET/I/WI59; e.g. 59..16+02200000 → PPM „220“

[...cont.]

<GET SPEC>	FUNCTION	Access/Example
81	Target Easting (E)	GET/M/WI81; e.g. 81..00+01999507 → E: "1999.507"m
82	Target Northing (N)	GET/M/WI82; e.g. 82..00+00213159 → N: "2139.159"m
83	Target Elevation (H)	GET/M/WI83; e.g. 83..00-00032881 → H: "32.881"m
84	Station Easting (E0)	GET/I/WI84; e.g. 84..11+00393700 → E: "393.700"m
85	Station Northing (N0)	GET/I/WI85; e.g. 85..11+06561220 → N: "6561.220"m
86	Station Height (H0)	GET/I/WI86; e.g. 86..11+00065618 → H: "65.618"m
87	Reflector height (hr)	GET/I/WI87; e.g. 87..11+00001700 → hr: "1.700" m
88	Instrument height (hi)	GET/I/WI88; e.g. 88..11+00001550 → hi: "1.550" m
531	Atmos. correction: pressure	GET/I/WI531; e.g. 531.16+10130000 → "1013"
538	Coefficient of refraction	GET/I/WI538; e.g. 538.16+00001300 → "1.300"
560	Time: [hh.mm.ss]	GET/I/WI560; e.g. 560..6+00105018 → "10:50:18"
561	Date: [mm.dd]	GET/I/WI561; e.g. 561..6+00020800 → "2.8.2000"
562	Year: [yyyy]	GET/I/WI562; e.g. 562...+00002000 → year "2000"
590	SW-Version: Application	GET/I/WI590; e.g. 590..6+00021000 → "V2.10"
591	SW-Version: Operating system	GET/I/WI591; e.g. 591..6+00020000 → "V2.00"
592	SW-Version: OS interface	GET/I/WI592; e.g. 592..6+00010000 → "V1.00"
593	SW-Version: GEOCOM	GET/I/WI593; e.g. 593..6+00022000 → "V2.20"
594	SW-Version: Gsi communication	GET/I/WI594; e.g. 594..6+00010000 → "V1.00"
595	SW-Version: Edm Device	GET/I/WI595; e.g. 595..6+00011100 → "V1.11"
913	Job	GET/I/WI913; e.g. 913...+BLDG.A12 → "BLDG.A12"
914	Operator	GET/I/WI914; e.g. 914...+0MM-3519 → "MM-3519"

[Tab.10]

Warnings/Errors

<i>Message ID</i>	<i>Meaning</i>	<i>Possible reasons</i>
@W100	Instrument busy	Any other device is still interfacing the instrument; check interfacing priorities
@W127	Invalid command	The string sent to the TC could not be decoded properly or does not exist; check the syntax, or ... Input buffer overflow (max. 100 characters)
@E139	EDM error	The EDM could not proceed the requested measurement; no or weak signal; Check EDM mode and target
@E158	One of the instruments sensor corrections could not be assigned.	Instrument is not stable, not levelled or suffering of vibration; Tilt is out of range (e.g. when tilt sensor is out of range); Level instrument or switch off compensator

[Tab.11]

TPS1000/1100 Series

The TPS1000 and its successor TPS1100 series represent the very high end level of Leica's Total Station products. Functionality has increased and instruments do more and more support customized remote control options. Thus controlling instruments with GSI commands has come to a technical limit. However, to provide access to all implemented functions, a new interfacing tool has been developed, called GEOBASIC. As GEOBASIC will not be covered within this reference guide, we kindly ask you to consult the corresponding GEOBASIC USER MANUAL, for further information on GEOBASIC. You will find the manual on every CD-ROM's delivered with TPS Total Stations. Following, the complete set of GSI ONLINE commands providing access to TPS1000/1100 GSI functions.

Supported Instruments (TPS1000 Series)

- TC1100/L, TC1500/L, TC1700/L, TC1800/L
- TCM1100/L, TCM1800/L
- TCA1100/L, TCA1800/L

Supported Instruments (TPS1100 Series)

- TC1101, TC1102, TC1103, TC1105
- TCR1101, TCR1102, TCR1103, TCR1105
- TCM1101, TCM1102, TCM1103, TCM1105
- TCRM1101, TCRM1102, TCRM1103, TCRM1105
- TCA1101, TCA1102, TCA1103, TCA1105
- TCRA1101, TCRA1102, TCRA1103, TCRA1105

For standard recording, the instrument needs to be activated in any "Measure&Record" mode. To avoid unnecessary miscommunication, we therefore recommend to enable the autostart function for remote control applications.

Low Level commands

SYNTAX: <command>CR/LF

SYNTAX: BEEP/<value>

<Commands>:	a	Powers on the instrument
	b	Powers off the instrument
	c	Clears a distance measurement
Example:	BEEP/0	Short beep
	BEEP/1	Long beep
	BEEP/2	Alarm beep (TPS1000 series only!)

SET

Syntax: SET/<SET SPEC>/<Parameter><CR/LF>

<SET SPEC>	FUNCTION	<PARAMETER>	SETTING
30	BEEP	0	OFF
		1	Medium
		2	Loud
31	Display (DSP) and Crosshairs (X-hairs)-illumination	0	Off
		1	DSP on, X-hairs low
		2	DSP on, X-hairs medium
		3	DSP on, X-hairs bright
32	Display contrast	0	Low
		1	Low-Medium
		2	Medium-High
		3	High
35	EGL	0	Off
		1	On
40	Angle UNIT	0	Gon
		1	Degree decimal
		2	Degree, sexagesimal
		3	Mils
41	Distance UNIT	0	Meter
		1	US Feet, decimal
		2	Intl. Feet, decimal
		3	US Feet/Inch
		4	Intl. Feet/Inch
42	Temperature UNIT	0	°C
		1	°F
43	Pressure UNIT	0	hPa
		1	mmHg
		2	mbar
		3	PSI
		4	inchHg
50	Angle; displayed decimals	2	123.12
		3	123.123
		4	123.1234 or ... max. accuracy
51	Distance; displayed decimals	0	123.
		1	123.1
		2	123.12
		3	123.123
		4	123.1234
		5	123.12345
71	Parity	0	None
		1	Odd
		2	Even
73	Terminator	0	CR
		1	CR/LF

[...cont.]

<SET SPEC>	FUNCTION	<PARAMETER>	SETTING
75	Protocol	0 1	Without GSI
76	Data recording device	0 1	Memory card RS232 interface
95	AutoOFF	0 1	Off On
137	RS232 format length	0 1	GSI8 GSI16
160	Setting measured distance to invalid	0	Setting WI31,32,33 and coordinates WI81,82,83 to invalid
161	EDM modes (SET/161/n)	0 1 2 3 4 5 6 7 9 10 11 12	IR Standard IR Fast IR Average IR Precise ¹⁾ /Standard ²⁾ IR Tracking IR Rapid tracking RL Stand. long range ²⁾ RL Standard ²⁾ RL Tracking ²⁾ IR Tape ¹⁾ RL Average long range ²⁾ RL Average ²⁾
173	Compensator	0 1	Off On

[Tab.12]

¹⁾ TPS1000 only

²⁾ TPS1100 only

CONF Syntax: CONF/<CONF SPEC><CR/LF>

<CONF SPEC>	FUNCTION	RESPONSE	CONFIGURATION
30	BEEP	0030/0000 0030/0001 0030/0001	OFF Medium Loud
31	Display (DSP) and Crosshairs (X-hairs)-illumination	0031/0000 0031/0001 0031/0002 0031/0003	Off DSP on, X-hairs low DSP on, X-hairs medium DSP on, X-hairs bright
32	Display contrast	0032/0000 0032/0001 0032/0002 0032/0003	Low Low-Medium Medium-High High
35	EGL	0035/0000 0035/0001	Off On
40	Angle UNIT	0040/0000 0040/0001 0040/0002 0040/0003	Gon Degree decimal Degree, minute, second Mil
41	Distance UNIT	0041/0000 0041/0001 0041/0002 0041/0003 0041/0004	Meter US Feet, decimal Intl. Feet, decimal US Feet/Inch Intl. Feet/Inch
42	Temperature UNIT	0042/0000 0042/0001	°C °F
43	Pressure UNIT	0043/0000 0043/0001 0043/0002 0043/0003 0043/0004	hPa mmHg mBar PSI InchHg
50	Angle; displayed decimals	0050/0002 0050/0003 0050/0004	123.12 123.123 123.1234 or ... max. accuracy
51	Distance; displayed decimals	0051/0000 0051/0001 0051/0002 0051/0003 0051/0004	123. 123.1 123.12 123.123 123.1234 or ... max. accuracy
70	Baudrate	0070/0003 0070/0004 0070/0005 0070/0006	2400 Baud 4800 Baud 9600 Baud 19200 Baud

[...cont.]

<CONF SPEC>	FUNCTION	RESPONSE	CONFIGURATION
71	Parity	0071/0000 0071/0001 0071/0002	None Odd Even
73	Terminator	0073/0000 0073/0001	CR CR/LF
75	Protocol	0075/0000 0075/0001	Without GSI
76	Data recording device	0076/0000 0076/0001	Memory card Serial interface
90	Battery level	0090/000n	N:[1..9]; n=1: low
95	AutoOFF	0095/0000 0095/0001 0095/0002	Off On Sleep
135	Recording mask	0135/0000	Mask 1
137	RS232 format length	0137/0000 0137/0001	GSI8 GSI16
149	Display MASK	0149/0001	Mask 1
160	Validity of measured distance	0160/0000 0160/0001	Distance/Coords invalid Distance/Coords valid
161	EDM modes (SET/161/n)	0161/0000 0161/0001 0161/0002 0161/0003 0161/0004 0161/0005 0161/0006 0161/0007 0161/0009 0161/0010 0161/0011 0161/0012	IR Standard IR Fast IR Average IR Precise ¹ /Standard ² IR Tracking IR Rapid tracking RL Stand. long range ² RL Standard ² RL Tracking ² IR Tape ¹ RL Average long range ² RL Average ²
170	Detect current face	0170/0000 0170/0001	Face I Face II (→ refer to manual)
171	Direction of horizontal circle reading (Hz-Angle)	0171/0000 0171/0001	Clockwise Counterclockwise
173	Compensator	0173/0000 0173/0001	OFF ON
182	Software version	0182/00nn	Version n.n
184	Active application running	0184/0000 0184/0001	No Yes

[Tab.13]

PUT Syntax: SET/<PUT SPEC>/<Parameter>_<CR/LF>

<PUT SPEC>	FUNCTION	Access/Example
11	Set Pointnumber	PUT/11....+00001234_<CR/LF> → puts PtID "1234"
21	Hz Angle	PUT/21...n+10000000_<CR/LF> n[2..4]; angle units must be specified → for n=2; puts Hz="100.0000 gon"
58	Prism const	PUT/58....+00000200_<CR/LF> → puts reflector constant to "20mm"
59	PPM	PUT/59....+02200000_<CR/LF> → puts PPM correction to "220"
71	Remark 1 (or Attribute 1)	PUT/71....+000012.4_<CR/LF> → puts info value "12.4"
72	Remark 2 (or Attribute 2)	PUT/72....+0000CAT2_<CR/LF> → puts info value "CAT2"
73	Remark 3 (or Attribute 3)	PUT/73....+000000NN_<CR/LF> → puts info value "NN"
74	Remark 4 (or Attribute 4)	PUT/74....+000000NN_<CR/LF> → puts info value "NN"
75	Remark 5 (or Attribute 5)	PUT/78....+000000NN_<CR/LF> → puts info value "NN"
76	Remark 6 (or Attribute 6)	PUT/76....+000000NN_<CR/LF> → puts info value "NN"
77	Remark 7 (or Attribute 7)	PUT/77....+000000NN_<CR/LF> → puts info value "NN"
78	Remark 8 (or Attribute 8)	PUT/78....+000000NN_<CR/LF> → puts info value "NN"
79	Remark 9 (or Attribute 9)	PUT/79....+000000NN_<CR/LF> → puts info value "NN"
84 ^{a)}	Station Easting	PUT/84...n+00100000_<CRLF> → for n=0; puts Easting="100.000 m"
85 ^{a)}	Station Northing	PUT/85...n+00100000_<CRLF> → for n=0; puts Northing="100.000 m"
86 ^{a)}	Station Elevation	PUT/86...n+00045000_<CRLF> → for n=0; puts Elevation="45.000 m"
87 ^{a)}	Reflector height	PUT/87...n+00001700_<CRLF> → for n=0; puts hr="1.700 m"
88 ^{a)}	Instrument height	PUT/88...n+00001500_<CRLF> → for n=0; puts hi="1.500 m"

[Tab.14]

^{a)} For W184-88; distance unit must be specified with n[0..1]; please refer to page 5.

GET Syntax: GET/n/WI<GET SPEC>/<Parameter><CR/LF>

<GET SPEC>	FUNCTION	Access/Example
11	Pointnumber	GET/M/WI11<CR/LF>; e.g. 11....+00000H66 → PtNo="H66"
12	Serial number	GET/I/WI12<CR/LF>; e.g. 12....+00640054 → S.No. "640054"
13	Instrument type	GET/I/WI13<CR/LF>; 13....+00TCR305 → Instr. "TCR305"
19	Time [MM.DD.hh.mm]	GET/I/WI19; e.g. 19....+02081029 → "Feb. 8 th ; 10:29"
21	Horizontal Angle	GET/M/WI21<CR/LF>; e.g. 21.102+17920860 → Hz „179.086“ gon
22	Vertical Angle	GET/M/WI22<CR/LF>; e.g. 22.102+07567500 → V: „75.675“ gon
31	Slope distance	GET/M/WI31<CR/LF>; e.g. 31..00+00003387 → Sdist: „3.387“ m
32	Horizontal distance	GET/M/WI32<CR/LF>; e.g. 32..00+00003198 → Hdist: „3.198“ m
33	Height difference	GET/M/WI33<CR/LF>; e.g. 33..00+00001119 → Hdiff: „1.119“ m
41	Code-Block ID	GET/I/WI41<CR/LF>; e.g. 41....+00000013 → Code: „13“ m
42	Information 1	GET/I/WI42<CR/LF>; e.g. 42....+000TREES → Info1: „TREES“
43	Information 2	GET/I/WI43<CR/LF>; e.g. 43....+000004.5 → Info2: „4.5“
44	Information 3	GET/I/WI44<CR/LF>; e.g. 44....+00CAT.02 → Info3: „CAT.02“
45	Information 4	GET/I/WI45<CR/LF>; e.g. 45....+000000NN → Info4: „NN“
46	Information 5	GET/I/WI46<CR/LF>; e.g. 46....+000000NN → Info5: „NN“
47	Information 6	GET/I/WI47<CR/LF>; e.g. 47....+000000NN → Info6: „NN“
48	Information 7	GET/I/WI48<CR/LF>; e.g. 48....+000000NN → Info7: „NN“
49	Information 8	GET/I/WI49<CR/LF>; e.g. 49....+000000NN → Info8: „NN“
51	PPM/mm	GET/I/WI51<CR/LF>; e.g. 51..1.+0000+034 → "0"ppm; "34"mm
58	Prism constant	GET/I/WI58; e.g. 58..16+00000020 → Prism „2“ mm
59	PPM	GET/I/WI59; e.g. 59..16+02200000 → PPM „220“

[...cont.]

<GET SPEC>	FUNCTION	Access/Example
71	Remark1 (or Attribute 1)	GET/I/WI71<CR/LF>; e.g. 71....+0000REM1 ➔ "REM1"
72	Remark2 (or Attribute 2)	GET/I/WI72<CR/LF>; e.g. 72....+0000REM2 ➔ "REM2"
73	Remark3 (or Attribute 3)	GET/I/WI73<CR/LF>; e.g. 73....+0000REM3 ➔ "REM3"
74	Remark4 (or Attribute 4)	GET/I/WI74<CR/LF>; e.g. 74....+0000REM4 ➔ "REM4"
75	Remark5 (or Attribute 5)	GET/I/WI75<CR/LF>; e.g. 75....+0000REM5 ➔ "REM5"
76	Remark6 (or Attribute 6)	GET/I/WI76<CR/LF>; e.g. 76....+0000REM6 ➔ "REM6"
77	Remark7 (or Attribute 7)	GET/I/WI77<CR/LF>; e.g. 77....+0000REM7 ➔ "REM7"
78	Remark8 (or Attribute 8)	GET/I/WI78<CR/LF>; e.g. 78....+0000REM8 ➔ "REM8"
79	Remark9 (or Attribute 9)	GET/I/WI79<CR/LF>; e.g. 79....+0000REM9 ➔ "REM9"
81	Target Easting (E)	GET/M/WI81; e.g. 81..00+01999507 ➔ E: "1999.507"m
82	Target Northing (N)	GET/M/WI82; e.g. 82..00+00213159 ➔ N: "2139.159"m
83	Target Elevation (H)	GET/M/WI83; e.g. 83..00-00032881 ➔ H: "32.881"m
84	Station Easting (E0)	GET/I/WI84; e.g. 84..11+00393700 ➔ E: "393.700"m
85	Station Northing (N0)	GET/I/WI85; e.g. 85..11+06561220 ➔ N: "6561.220"m
86	Station Height (H0)	GET/I/WI86; e.g. 86..11+00065618 ➔ H: "65.618"m
87	Reflector height (hr)	GET/I/WI87; e.g. 87..11+00001700 ➔ hr: "1.700" m
88	Instrument height (hi)	GET/I/WI88; e.g. 88..11+00001550 ➔ hi: "1.550" m

[Tab.15]

Telescope positioning (TM, TCM and TCA models only)

Command	Function
PASSWORD	Allows the use of the following commands. It must be sent at least once after the instrument is switched on
CFACE	Turns the telescope to the opposite face
POSIT/<spec>Hz/V	Turns the telescope to the given direction horizontally and vertically. Hz and V are given in the unit set in the instruments
List of <spec>	
A	Absout positioning to the giben values
R	Relative positioning from the current position
P	Turn the telescope to the direction of the last distance measurement
S	Search for a reflector in the giben range from the Current positon (only valid for TCA)

Example:

POSIT/A/123.4567/99.8754	Turns the telescope to the circle reading 123.4567 gon Hz and 99.8754 gon Vertical.
POSIT/R/20/0	Turns the telescope 20 units clockwise.
POSIT/P/1/-1	Tuns to the last position where a distance has been measured with 1 gon offset horizontal and vertical.
POSIT/S/2/2	Searches for a reflector in the range of 2 gons Horizontal and vertical.

Warnings/Errors

Errors, initiated by an interface command are not always transferred to the interface. Instead of the error message the warning @W127 will be sent and the TPS will be ready to receive the next command.

<i>Message ID</i>	<i>Meaning</i>	<i>Possible reasons</i>
@W100	Instrument busy	Any other device is still interfacing the instrument; check interfacing priorities
@W127	Invalid command	The string sent to the TC could not be decoded properly or does not exist; check the syntax, or... Input buffer overflow (max. 100 characters)
@E112	Battery low	Low Battery; check voltage
@E117	Initialization error	Contact service
@E119	Temperature out of range	Refer to manual for temperature range
@E139	EDM error	The EDM could not proceed the requested measurement; no or weak signal; Check EDM mode and target
@E144	V or Hz collimation error	Check calibration data
@E150	Angle error	Call service
@E158	One of the instruments sensor corrections could not be assigned.	Instrument is not stable, not levelled or suffering of vibration; Tilt is out of range (e.g. when tilt sensor is out of range); Level instrument or switch off compensator
@E182	Telescope position out of range	Positioning timeout; Instrument could not position; Try again
@E190	General motorisation Error	If frequently occurs call service
@E191	Data error	Check record mask
@E194	General error	If frequently occurs call service
@E197	ATR error	ATR not enabled; check ATR function

[Tab.16]

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