5.3 Remote Interface Commands

You can instruct the multimeter to take measurements by using the SCPI

commands after the appropriate setup for their selected remote

interface.

The following conventions are used in SCPI command syntax. Triangle

brackets (<>) indicates that you must specify a value for the enclosed

parameter. The square brackets ([]) indicates that the parameter is

optional and can be omitted. The braces ({}) enclose the parameter

choices for a given command string. A vertical bar (|) separates several

choices for a parameter.

The MEASure? Command

Although it does not offer much flexibility, using the MEASure? Command

is the simplest way to program the multimeter for measurements. You

select the measurement function, range and resolution, the multimeter

automatically sets the other parameters for you, make the measurement

and send the result to the output buffer.

MEASure:

VOLTage:DC? {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

VOLTage:DC:RATio? {<range>|MIN|MAX|DEF },{<resolution>|MIN|MAX|DEF}

VOLTage:AC? {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

CURRent:DC? {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

CURRent:AC? {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

RESistance? {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

FRESistance? {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

FREQuency? {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

PERiod? {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

CAPacitance? {<range>|MIN|MAX|DEF}

CONTinuity?

DIODe?

TCOuple?

TEMPerature?

The CONFigure Command

The CONFigure command offers a little more flexibility than the MEASure?

Command. The multimeter sets the parameters for the requested function,

range and resolution, but does not make the measurements. You have an

option to change the configuration. To initiate the measurement, use INITiate

or READ? Command.

CONFigure:

VOLTage:DC {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

VOLTage:DC:RATio {<range>|MIN|MAX|DEF },{<resolution>|MIN|MAX|DEF}

VOLTage:AC {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

CURRent:DC {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

CURRent:AC {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

RESistance {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

FRESistance {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

FREQuency {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

PERiod {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

CAPacitance {<range>|MIN|MAX|DEF}

CONTinuity

DIODe

TCOuple

TEMPerature

CONFigure?

The READ? Command

The READ? Command changes the state of the trigger system from the

“idle” state to the “wait-for-trigger” state. When the specified trigger

condition requirements are met after the multimeter receives the READ?

command, the measurement will be initiated. The results are sent to the

output buffer right away. You must enter the reading data into your bus

controller or the multimeter will stop making measurements when the

output buffer fills. Readings are not stored in the multimeter’s internal

memory when using the READ? Command.

Using the READ? Command has a similar effect as using the INITiate

command followed immediately by the FETCh? command, except

readings are not buffered internally.

The INITiate and FETCh? Commands

These two commands provide the lowest level of control of measurement

triggering and reading retrieval, but offer the most flexibility. After you

have configured the multimeter, use INITiate command to change the

state of the triggering system from the “idle” state to the

“wait-for-trigger” state. The multimeter will start the measurements

when the specified trigger condition requirements are met after it

receives the INITiate command. The results are sent to the internal

memory and stored until you are ready to read them.

The FETCh? command sends the data in the multimeter’s internal

memory to the output buffer where you can read them into your bus

controller.

The SENSe Commands

※

Note: Default parameters are shown in bold italic.

[SENSe:]

FUNCtion “VOLTage:DC”

FUNCtion “VOLTage:DC:RATio”

FUNCtion “VOLTage:AC”

FUNCtion “CURRent:DC”

FUNCtion “CURRent:AC”

FUNCtion “RESistance” (2-wire F)

FUNCtion “FRESistance” (4-wire F)

FUNCtion “FREQuency”

FUNCtion “PERiod”

FUNCtion “CAPacitance”

FUNCtion “CONTinuity”

FUNCtion “DIODe”

FUNCtion “TCOuple”

FUNCtion “TEMPerature”

FUNCtion?

[SENSe:]

VOLTage:DC:RANGe {<range>|MINimum|MAXimum}

VOLTage:DC:RANGe? [MINimum|MAXimum]

VOLTage:AC:RANGe {<range>|MINimum|MAXimum}

VOLTage:AC:RANGe? [MINimum|MAXimum]

CURRent:DC:RANGe {<range>|MINimum|MAXimum}

CURRent:DC:RANGe? [MINimum|MAXimum]

CURRent:AC:RANGe {<range>|MINimum|MAXimum}

CURRent:AC:RANGe? [MINimum|MAXimum]

RESistance:RANGe {<range>|MINimum|MAXimum}

RESistance:RANGe? [MINimum|MAXimum]

FRESistance:RANGe {<range>|MINimum|MAXimum}

FRESistance:RANGe? [MINimum|MAXimum]

FREQuency:VOLTage:RANGe {<range>|MINimum|MAXimum}

FREQuency:VOLTage:RANGe? [MINimum|MAXimum]

PERiod:VOLTage:RANGe {<range>|MINimum|MAXimum}

PERiod:VOLTage:RANGe? [MINimum|MAXimum]

CAPacitance:RANGe {<range>|MINimum|MAXimum}

CAPacitance: RANGe? [MINimum|MAXimum]

[SENSe:]

VOLTage:DC:RANGe:AUTO {OFF|ON}

VOLTage:DC:RANGe:AUTO?

VOLTage:AC:RANGe:AUTO {OFF|ON}

VOLTage:AC:RANGe:AUTO?

CURRent:DC:RANGe:AUTO {OFF|ON}

CURRent:DC:RANGeAUTO?

CURRent:AC:RANGe:AUTO {OFF|ON}

CURRent:AC:RANGe:AUTO?

RESistance:RANGe:AUTO {OFF|ON}

RESistance:RANGe:AUTO?

FRESistance:RANGe:AUTO {OFF|ON}

FRESistance:RANGe:AUTO?

FREQuency:VOLTage:RANGe:AUTO {OFF|ON}

FREQuency:VOLTage:RANGe:AUTO?

PERiod:VOLTage:RANGe:AUTO {OFF|ON}

PERiod:VOLTage:RANGe:AUTO?

CAPacitance:RANGe:AUTO {OFF|ON}

CAPacitance:RANGe:AUTO?

[SENSe:]

VOLTage:DC:RESolution {<resolution>|MINimum|MAXimum}

VOLTage:DC:RESolution? [MINimum|MAXimum]

VOLTage:AC:RESolution {<resolution>|MINimum|MAXimum}

VOLTage:AC:RESolution? [MINimum|MAXimum]

CURRent:DC:RESolution {<resolution>|MINimum|MAXimum}

CURRent:DC:RESolution? [MINimum|MAXimum]

CURRent:AC:RESolution {<resolution>|MINimum|MAXimum}

CURRent:AC:RESolutioin? [MINimum|MAXimum]

RESistance:RESolution {<resolution>|MINimum|MAXimum}

RESistance:RESolution? [MINimum|MAXimum]

FRESistance:RESolution {<resolution>|MINimum|MAXimum}

FRESistance:RESolution? [MINimum|MAXimum]

[SENSe:]

UNIT {Cel|Far|K}

UNIT?

TCOuple:TYPE {E|J|K|N|R|S|T}

TCOuple:TYPE?

TCOuple:RJUNction:SIMulated {<value>|MINimum|MAXimum}

TCOuple:RJUNction:SIMulated?

[SENSe:]

TEMPerature:RTD:TYPE {PT100|D100|F100|PT385|PT3916|USER|SPRTD|NTCT}

TEMPerature:RTD:TYPE?

TEMPerature:RTD:RZERo {<value>|MINimum|MAXimum}

TEMPerature:RTD:RZERo? [MINimum|MAXimum]

TEMPerature:RTD:ALPHa {<value>|MINimum|MAXimum}

TEMPerature:RTD:ALPHa? [MINimum|MAXimum]

TEMPerature:RTD:BETA {<value>|MINimum|MAXimum}

TEMPerature:RTD:BETA? [MINimum|MAXimum]

TEMPerature:RTD:DELTa {<value>|MINimum|MAXimum}

TEMPerature:RTD:DELTa? [MINimum|MAXimum]

TEMPerature:SPRTD:RZERo {<value>|MINimum|MAXimum}

TEMPerature:SPRTD:RZERo? [MINimum|MAXimum]

TEMPerature:SPRTD:A4 {<value>|MINimum|MAXimum}

TEMPerature:SPRTD:A4? [MINimum|MAXimum]

TEMPerature:SPRTD:B4 {<value>|MINimum|MAXimum}

TEMPerature:SPRTD:B4? [MINimum|MAXimum]

TEMPerature:SPRTD:AX {<value>|MINimum|MAXimum}

TEMPerature:SPRTD:AX? [MINimum|MAXimum]

TEMPerature:SPRTD:BX {<value>|MINimum|MAXimum}

TEMPerature:SPRTD:BX? [MINimum|MAXimum]

TEMPerature:SPRTD:CX {<value>|MINimum|MAXimum}

TEMPerature:SPRTD:CX? [MINimum|MAXimum]

TEMPerature:SPRTD:DX {<value>|MINimum|MAXimum}

TEMPerature:SPRTD:DX? [MINimum|MAXimum]

[SENSe:]

VOLTage:DC:NPLCycles

{0.001|0.006|0.02|0.06|0.2|0.6|1|2|10|100|MINimum|MAXimum}

VOLTage:DC:NPLCycles? [MINimum|MAXimum]

CURRent:DC:NPLCycles

{0.001|0.006|0.02|0.06|0.2|0.6|1|2|10|100|MINimum|MAXimum}

CURRent:DC:NPLCycles? [MINimum|MAXimum]

RESistance:NPLCycles

{0.001|0.006|0.02|0.06|0.2|0.6|1|2|10|100|MINimum|MAXimum}

RESistance:NPLCycles? [MINimum|MAXimum]

FRESistance:NPLCycles

{0.001|0.006|0.02|0.06|0.2|0.6|1|2|10|100|MINimum|MAXimum}

FRESistance:NPLCycles? [MINimum|MAXimum]

[SENSe:]

FREQuency:APERture {0.01|0.1|1|MINimum|MAXimum}

FREQuency:APERture? [MINimum|MAXimum]

PERiod:APERture {0.01|0.1|1|MINimum|MAXimum}

PERiod:APERture? [MINimum|MAXimum]

[SENSe:]

DETector:BANDwidth {3|20|200|MINimum|MAXimum}

DETector:BANDwidth? [MINimum|MAXimum]

[SENSe:]

AVERage:TCONtrol {MOVing|REPeat}

AVERage:TCONtrol?

AVERage:COUNt {<value>|MINimum|MAXimum}

AVERage:COUNt? [MINimum|MAXimum]

AVERage:STATe {OFF|ON}

AVERage:STATe?

[SENSe:]

ZERO:AUTO {OFF|ONCE|ON}

ZERO:AUTO?

MATH OPERATION Commands

There are eight math operations. Only one of them can be enabled at a

time. They either store data for later use or perform mathematical

operations on the readings. Note that these eight math operations are

available to all measurement functions except continuity and diode

testing.

The math operations use one or more internal registers. You can preset

the values in some of the registers, while others hold the results of the

math operations.

CALCulate:

FUNCtion {PERCent|AVERage|NULL|LIMit|MXB|DB|DBM}

FUNCtion?

STATe {OFF|ON}

STATe?

CALCulate:

PERCent:TARGet {<value>|MINimum|MAXimum}

PERCent:TARGet? [MINimum|MAXimum]

CALCulate:

AVERage:MINimum?

AVERage:MAXimum?

AVERage:AVERage?

AVERage:COUNt?

CALCulate:

NULL:OFFSet {<value>|MINimum|MAXimum}

NULL:OFFSet? [MINimum|MAXimum]

CALCulate:

LIMit:LOWer {<value>|MINimum|MAXimum}

LIMit:LOWer? [MINimum|MAXimum]

LIMit:UPPer {<value>|MINimum|MAXimum}

LIMit:UPPer? [MINimum|MAXimum]

CALCulate:

MXB:MMFactor {<value>|MINimum|MAXimum}

MXB:MMFactor? [MINimum|MAXimum]

MXB:MBFactor {<value>|MINimum|MAXimum}

MXB:MBFactor? [MINimum|MAXimum]

CALCulate:

DB:REFerence {<value>|MINimum|MAXimum}

DB:REFerence? [MINimum|MAXimum]

CALCulate:

DBM:REFerence {<value>|MINimum|MAXimum}

DBM:REFerence? [MINimum|MAXimum]

DATA:FEED RDG\_STORE,{“CALCulate”|””}

DATA:FEED?

TRIGGERING

M3510A provides a variety of trigger operations. You User can select a

trigger mode, a trigger source and different trigger settings for a specific

measurement. Refer to Figure 4-8 for triggering system flow chart.

Triggering from a remote interface is a multi-step sequence. You must

first configure the mulitmeter by choosing the desired function, range

and resolution. Specify the trigger source from which the multimeter will

accept the trigger. The multimeter takes immediate internal trigger, a

software trigger from a remote interface and external trigger from the

rear panel. Then be sure that the multimeter is ready for a trigger (in the

“wait-for-trigger” state).

M3510A accepts a trigger only when it is in the “wait-for-trigger” state.

When you have finished configuring the multimeter and have selected a

trigger source, you need to place the multimeter in the “wait-for-trigger”

state so it will take the trigger and make the measurement. The INITiate,

READ? and MEASure? commands all place the multimeter to the

“wait-for-trigger” state.

Triggering Commands

INITiate

READ?

TRIGger:

SOURce {BUS|IMMediate|EXTernal}

SOURce?

TRIGger:

DELay {<seconds>|MINimum|MAXimum}

DELay? [MINimum|MAXimum]

TRIGger:

DELay:AUTO {OFF|ON}

DELay:AUTO?

SAMPle:

COUNt {<value>| MINimum|MAXimum }

COUNt? [MINmum|MAXimum ]

TRIGger:

COUNt {<value>| MINimum|MAXimum|INFinite }

COUNt? [MINmum|MAXimum]

SYSTEM-RELATED Commands

Each system related operation performs a task that is not measurement

related but plays an important role in making your measurements.

FETCh?

READ?

DISPlay {OFF|ON}

DISPlay?

DISPlay:

TEXT <quoted string>

TEXT?

TEXT:CLEar

SYSTem:

BEEPer

BEEPer:STATe {OFF|ON}

BEEPer:STATe?

SYSTem:ERRor?

SYSTem:VERSion?

DATA:POINts?

SYSTEM:IDNSTR “MANUFACTURER,PRODUCT”

\*RST

\*IDN?

L0

L1

STATUS REPORTING Commands

SYSTem:ERRor?

STATus:

QUEStionable:ENABle <enable value>

QUEStionable:ENABle?

QUEStionable:EVENt?

STATus:PRESet

\*CLS

\*ESE <enable value>

\*ESE?

\*ESR?

\*OPC

\*OPC?

\*PSC {0|1}

\*PSC?

\*SRE <enable value>

\*SRE?

\*STB?

Other Interface Commands

SYSTem:LOCal

SYSTem:REMote

IEEE-488.2 COMMON Commands

\*CLS

\*ESE <enable value>

\*ESE?

\*ESR?

\*IDN?

\*OPC

\*OPC?

\*PSC {0|1}

\*PSC?

\*RST

\*SRE <enable value>

\*SRE?

\*STB?

\*TRG