FMCW Radar Sensors

Controlling the FMCW unit using the CO1000A/00

The following section describes the commands that are available for controlling the evaluation kit. Communication can either be performed using a terminal program for manual control or by sending and receiving characters over the serial port using a program for automated measurements. When automated measurements are performed it is important to make sure that the input and output buffers are properly emptied when reading and sending characters.

Startup

When the unit is started a message is displayed, i.e., transmitted on the serial line:

```
SiversIMA AB

FMCW Eval board initialized

Software version: B RS3400K/02 2008-06-29
```

This means that the unit is ready to control the module and to perform measurements. The following text will briefly describe the commands that are available. Please note that this message is sent on the serial line regardless if there is a terminal window open or not. If an automated system is configured, this has to discard the message from the input buffer before reading any data from the unit.

Having local echo turned on in your terminal emulator may be helpful for entering commands.

Having session logging enabled may be useful for retrieving measurement data.

FMCW Radar Sensors

Commands available on the control board

All commands are built up in a hierarchical structure where there are seven main categories:

- FREQUENCY (control frequency setting parameters)
- HELP (provides a simple list of available commands)
- INIT (initializes the unit)
- MEASURE (controls measurement parameters)
- SWEEP (controls sweep parameters)
- TRACE (handles data generated by the unit)
- TRIGGER (controls trigger parameters)

Some main categories have sub-categories. These are reached by entering the main category and a colon ":" followed by the sub-category.

All categories where data can be entered can also return data, typically the previously entered data. Some categories can only return data, typically measurement data. Data is returned by entering the full category name (main:sub) followed by a question mark "?". Please note that there should be a space between the category name and the question mark.

All data, where applicable, is entered and returned in SI units, e.g., frequency is entered in Hz and time is entered in seconds.

Commands are not case sensitive.

FMCW Radar Sensors

Main categories

FREQUENCY

Controls frequency setting parameters. Note: several parameters are related and the setting of one parameter may change the setting of others. As an example, changing SPAN will affect both START and STOP.

Under categories.

CENTER
Sets the center frequency of the sweep.

Usage:
```
FREQUENCY:CENTER 24.7e9
FREQUENCY:CENTER ?
```

Default: 24.75e9 (24.75GHz)

SPAN
Sets the frequency span of the sweep.

Usage:
```
FREQUENCY:SPAN 500e6
FREQUENCY:SPAN ?
```

Default: 1.5e9 (1.5GHz)

START
Sets the start frequency of the sweep.

Usage:
```
FREQUENCY:START 24.4e9
FREQUENCY:START ?
```

Default: 24.0e9 (24.0GHz)

Sivers IMA AB
Box 1274
SE-164 29 Kista
Sweden

Tel: +46-8-703 68 00
Fax: +46-8-751 92 71
e-mail: sales@siversima.se
www.siversima.com

FMCW Radar Sensors

STOP
Sets the stop frequency of the sweep.

Usage:
```
FREQUENCY:STOP 25.4e9
FREQUENCY:STOP ?
```

Default: 25.5e9 (25.5GHz)

STEP
Sets the frequency step, i.e., frequency separation between two contiguous frequency points of the sweep.

Usage:
```
FREQUENCY:STEP 0.5e6
FREQUENCY:STEP ?
```

Default: 1e6 (1MHz)
Max: -
Min: 8e3 (8kHz)

POINTS
Sets the number of frequency points to use during a sweep.

Usage:
```
FREQUENCY:POINTS 301
FREQUENCY:POINTS ?
```

Default: 1501
Max: 1501

HELP

Provides a simple list of available commands.

Under categories
None.

INIT

FMCW Radar Sensors

Initializes the RS3400 unit. Does not restore variables to default.

Under categories
None

MEASURE

Controls measurement parameters.
Under categories

CHANNEL
Sets the channel to be used when measuring during a frequency sweep. This feature is currently not active.

SWEEP

Controls sweep parameters. Note: several parameters are related and the setting of one parameter may change the setting of others. As an example, changing TYPE will affect the number of data points acquired when a measurement is performed and TIME will affect IDLE.
Under categories

TYPE
Sets the type of sweep to be performed. Available types are SAWTOOTH and TRIANGULAR. The type SAWTOOTH is a sweep of linearly increasing frequency. When the highest frequency is reached, the sweep restarts at the lowest frequency. The type TRIANGULAR is a sweep of first linearly increasing frequency and then linearly decreasing frequency. The sweep then restarts with an increasing frequency.

When a measurement is made during a TRIANGULAR sweep, data is recorded both on the positive and the negative frequency slope. Thus the number of data points is twice that of SAWTOOTH and also twice of what is entered at FREQ:POINTS.

Usage:
```
SWEEP:TYPE TRIANGULAR
SWEEP:TYPE ?
```

Default: SAWTOOTH

NUMBERS

FMCW Radar Sensors

Defines the number of frequency sweeps to be performed when triggered. The measurement of the IF signal is averaged over the number of sweeps. If 0 is entered, the sweep continues indefinitely, but can be aborted by sending a capital Q. Please note that the currently started sweep will be finished and communication with the unit is not possible before that.

Usage:
```
SWEEP:NUMBERS 5
SWEEP:NUMBERS ?
```

Default: 0 (infinite number of sweeps, finish with "Q")

MEASURE
Defines whether a measurement of the IF signal should be performed during the sweep or not.

Usage:
```
SWEEP:MEASURE ON
SWEEP:MEASURE ?
```

Default: OFF

TIME
Sets the total time for a complete sweep. This time should be chosen long enough to allow a sufficient time at each frequency point, see SWEEP:IDLE.
Usage:
```
SWEEP:TIME 1.0
SWEEP:TIME ?
```

Default 0.075 (75ms)

IDLE
Defines the time spent at each frequency point. In principle, the RF frequency is set at the beginning of this time and a measurement of the IF signal is performed at the end of this time.

Usage:
```
SWEEP:IDLE 10e-3
SWEEP:IDLE ?
```

Default: 50e-6 (50 µs)
Min: 50e-6
Max: 1

Sivers IMA AB
Box 1274
SE-164 29 Kista
Sweden

Tel: +46-8-703 68 00
Fax: +46-8-751 92 71
e-mail: sales@siversima.se
www.siversima.com

FMCW Radar Sensors

Please note that a high setting of IDLE time will give a very long frequency sweep when the number of frequency points is big.

TRACE

Controls data generated by the unit.

Under categories

DATA
Returns measurement data. Data is an array of floating point numbers. The array length is controlled by SWEEP:NUMBERS (see SWEEP).

Usage:
```
TRACE:DATA ?
```

Please note that TRACE:DATA ? will return data for a complete measurement. The number of lines that are returned is controlled by FREQUENCY:POINTS and SWEEP:TYPE. If SWEEP:TYPE is set to TRIANGULAR, twice the number of data points is returned.

This may overflow the input buffer of the serial connection of the computer if it is not set up correctly.

The output will be ended with a separate line containing OK indicating that transmission is completed.

TRIGGER

Controls trigger parameters.

Under categories.

SOURCE
Defines the source that will trigger the start of a frequency sweep. Available settings are IMMEDIATE, meaning that no trigger signal is necessary, and EXT0. The EXT0 is connected to the Trigger input pin of the control board. A transition from low (0V) to high (3.3V) will trigger a measurement.

Usage:
```
TRIGGER:SOURCE  IMMEDIATE
TRIGGER:SOURCE  ?
```

Sivers IMA AB
Box 1274
SE-164 29 Kista
Sweden

Tel: +46-8-703 68 00
Fax: +46-8-751 92 71
e-mail: sales@siversima.se
www.siversima.com

FMCW Radar Sensors

Default: IMMEDIATE.

ARM

Puts the unit in a state ready to start the defined frequency sweep. Certain parameters are calculated and the module is set to the start frequency. If TRIGGER:SOURCE is set to IMMEDIATE, the frequency sweep is started as soon as the unit has completed the necessary preparations.

Usage:
```
TRIGGER:ARM
```

OUTPUT

Defines whether or not a trig signal should be output when a frequency sweep starts. Trigger output is available as a 0/3.3V signal on the Trigger out on the control board.

DELAY

Sets the length of output trigger pulse. The actual frequency sweep does not start until the trigger pulse has completed and consequently this can be used as a delay between input trigger and actual start of the frequency sweep. If a trigger output is enabled, it will be issued for each single sweep.

Usage:
```
TRIGGER:DELAY 10e-3
TRIGGER:DELAY ?
```

Default: 10e-3 (10ms)
Min: 50e-6
Max: 1

Sivers IMA AB   Tel: +46-8-703 68 00
Box 1274   Fax: +46-8-751 92 71
SE-164 29 Kista   e-mail: sales@siversima.se
Sweden   www.siversima.com