FY6600 Series Function Waveform Generator

Host Computer Communication Protocol Specification

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Rev 3

Overview

The overall structure of control command using the command line, the baud rate of fixed value 115200 bps, the command issued by PC, the execution machine analysis, each command marks the

end to newline (16_d `0x0a`$_h$, the representation in escape code is \n). The execution machine will reply \n after command executed. The following is a detailed description of the different orders.

Detailed description of each command

General conventions:

⇗	symbol for send from PC to device
⇘	symbol for send from device to PC as return value
<designator>	part of the communication string that is numeric code or numeric value is written in angle brackets. The designator is given as an expression for printf programming statement.
{interval}	intervals are written in curly brackets
decimal separator	must always be point, make sure your LC variable is set accordingly.

Example for a communication is written like this

`communication string is written like this`

Waveform Parameter commands

WMW, WFW: Set the wave form

⇗`WMW<%2i>\n`	⇘`\n`	CH1
⇗`WFW<%2i>\n`	⇘`\n`	CH2

<%2i> codes the waveform, see chapter Wave form codes on page 4.

RMW, RFW: Read wave form

⇗`RMW<%2i>\n`	⇘`<retval>\n`	CH1
⇗`RFW<%2i>\n`	⇘`<retval>\n`	CH2

<$2i> codes the waveform, see chapter *Wave form codes* on page 4.

A retval of 0000000001 represents the code for the current waveform, which is the code for Squarewave.

Wave form codes

The wave form codes are represented by a integer number {0...94} (CH1) and {0...48} (CH2):

- 00 ⇒ sine
- 01 ⇒ Rectangular
- 02 ⇒ Triangle/Square
- 03 ⇒ Rise Sawtooth
- 04 ⇒ Fall Sawtooth
- 05 ⇒ Step Triangle
- 06 ⇒ Positive Step
- 07 ⇒ Inverse Step
- 08 ⇒ Positive Exponent
- 09 ⇒ Inverse Exponent
- 10 ⇒ Positive Falling Exponent
- 11 ⇒ Inverse Falling Exponent
- 12 ⇒ Positive Logarithm

13 ⇒ Inverse Logarithm
14 ⇒ Positive Falling Logarithm
15 ⇒ Inverse Falling Logarithm
16 ⇒ Positive Half Wave
17 ⇒ Negative Half Wave
18 ⇒ Positive Half Wave Rectification
19 ⇒ Negative Half Wave Rectification
20 ⇒ Lorenz Pulse
21 ⇒ Multitone
22 ⇒ Noise
23 ⇒ Electrocardiogram (ECG)
24 ⇒ Trapezoidal Pulse
25 ⇒ Sinc Pulse
26 ⇒ Narrow Pulse
27 ⇒ Gauss White Noise
28 ⇒ AM
29 ⇒ FM
30 ⇒ Linear FM
31 ⇒ Arbitrary1
32 ⇒ Arbitrary2
...
94 ⇒ Arbitrary64

Output Frequency

WMF, WFF: Set the output frequency CH1, CH2

⇗`WMF<%14i>\n`	⇘`\n`	CH1
⇗`WFF<%14i>\n`	⇘`\n`	CH2

<%14i> is a positive integer number with maximum 14 digits that represents the frequency value in µHz.

WMF1000000000\n sets CH1 frequency to 1000 Hz
WMF000123456\n sets CH1 frequency to 123.456 mHz
WMF000000001\n sets the CH1 frequency to 1 µHz.
WFF100000000\n sets the CH2 frequency to 100 Hz.
WFF000123456\n sets the CH2 frequency to 0.123456 Hz

RMF, RFF: Read the output frequency

⇗`RMF\n`	⇘`<%8.6f>\n`	CH1
⇗`RFF\n`	⇘`<%8.6f>\n`	CH2

<%8.6f> is a positive float number in Hz, with maximum 6 digits after decimal point.

A value of "00010000.000000" corresponds to a current frequency of 10 KHz. The unit of frequency value is Hz (fixed).

Output amplitude

WMA, WFA: set the Amplitude in V

⇗WMA<%2.4f>\n ⇘\n CH1
⇗WFA<%2.4f>\n ⇘\n CH2
<%2.4f> is a float number {0...20.0000} that represents the amplitude value in V.
WMA12.3521\n sets the CH1 amplitude to 12.3521 V.
WMA0.35\n sets the CH1 amplitude to 0.35 V.
WFA12.351\n sets the CH2 amplitude to 12.351 V.
WFA0.352\n sets the CH2 amplitude to 0.352 V.

RMA, RFA: Read amplitude in mV

⇗RMA\n ⇘<%5i>\n CH1
⇗RFA\n ⇘<%5i>\n CH2
<%5i> is a positive integer number {0...20000} that represents the voltage in mV.
A return value of "00000010000" means the current amplitude is 10.000 V

Output Offset

WMO, WFO: Set the offset voltage in V

⇗WMO<%2.3f>\n ⇘\n CH1
⇗WFO<%2.3f>\n ⇘\n CH2
<%2.3f> is a float number {-10.0...+10.0} that represents the offset voltage in V
WMO2.351\n sets the CH1 offset to 2.351 V
WMO-2.35\n sets the CH1 offset to -2.35 V

RMO, RFO: Read offset voltage of CH1, CH2

⇗RMO\n ⇘<%i>\n CH1
⇗RFO\n ⇘<%i>\n CH2
<%i> is a positive integer number {0...2^32} that is intrinsicly a signed integer and must be converted accordingly:
Value = (returnvalue – 2^32) / 1000 in Volt | returrnvalue > 10000
Value = (returnvalue / 1000 in Volt | returrnvalue < 10000
If the device returns "611", it means the current offset is 0.611 V.

Output Duty Cycle (Square wave only)

WMD, WFD: set the duty cycle in %

⇗WMD<%2.3f>\n ⇘\n CH1 (square wave only)
⇗WFD<%2.3f>\n ⇘\n CH2 (square wave only)

<%2.3f> is a positive float number {0...100.000} that represents the duty cycle in %

WMD50.1\n sets the CH1 duty cycle to 50.1 %.

RMD, RFD: read the duty cycle in 10×%

⇗`RMD\n`	⇘`<%i>\n`	CH1
⇗`RFD\n`	⇘`<%i>\n`	CH2

<%i> is a positive integer number {0...1000}

A return value of 0000000689 means the current CH1 duty cycle is 68.9 %.

Output Phase

WMP, WFP: Set the Phase for CH1, CH2 in Degrees

WMPxxx\n	WFPxxx\n	
⇗`WMP<%3.3f>\n`	⇘`\n`	CH1
⇗`WFP<%3.3f>\n`	⇘`\n`	CH1

<%3.3f> is a positive float number {0...359.999}

WMP123.4\n sets the CH1 phase to 123.4.

WMP4.5\n sets the CH1 phase to 4.5°.

WFP142.3\n sets the CH2 phase to 142.3°.

WFP4.5\n sets the CH2 phase to 4.5°.

RMP, RFP: Read the phase in 10×Degrees

⇗`RMP\n`	⇘`<%i>\n`	CH1
⇗`RFP\n`	⇘`<%i>\n`	CH2

<%i> is a positive integer number {0...3599} that represents 10× the phase value in degrees.

A return value of 2189 means the current phase is 218.9°.

Output On/Off

WMN, WFN: Enable/Disable output.

⇗`WMN\n`	⇘`\n`	CH1
⇗`WFN\n`	⇘`\n`	CH2

WMN0\n *disables CH1 output*

WMN1\n *enables CH1 output*

WFN0\n *disables the CH2 output*

WFN1\n *enables the CH2 output*

RMN, RFN: Read the output status

⇗`RMN\n`	⇘`<%i>\n`	CH1
⇗`RFN\n`	⇘`<%i>\n`	CH2

<%i> represents a positive integer number {0,255} that codes the status. See chapter *Status code*

on page 8.

Status code

0 ⇒ disabled.
255 ⇒ enabled.

Pulse Period

WMS: Set CH1 pulse period in ns

⇗`WMS<%i>\n` ⇘`\n` CH1
<%i> is a positive integer number {0...?} that represents the pulse period in ns.
WMN10000\n sets CH1 pulse period to 10000 nS.

RSS: Read CH1 pulse period in ns

⇗`RSS\n` ⇘`<%i>\n` CH1
<%i> is a positive integer number {0...?} that represents the pulse period in ns.
A retun value of 10000 means the CH1 pulse period is 10000 nS.

Trigger

WPM: Set the CH1 trigger source

⇗`WPM<%1i>\n` ⇘`\n` CH1
<%1i> is a positive integer number that codes the trigger source. See chapter *Trigger source codes* on page 8.
WPM1 means the main waveform is triggered by subsidiary (CH2) waveform.

RPM: Read CH1 trigger source

⇗`RPM\n` ⇘`<%i>\n` CH1
<%1i> is a positive integer number that codes the trigger source. See chapter *Trigger source codes* on page 8.
A return value of 0000000002 means the current trigger mode is by external signal.

WPN: Set the number of burst cycles for CH1.

⇗`WPN<%1i>\n` ⇘`\n` CH1 (burst mode)
<%i> is a positive integer number {1...1048575}.
WPN10 means the CH1 will output a burst series of 10 cycles when triggered.

Trigger source codes

The trigger mode is coded by a positive integer number {0...3}

0 ⇒ No trigger
1 ⇒ Triggered by subsidiary wave.
2 ⇒ Triggered by external signal and signals input from Ext. terminal.
3 ⇒ Triggered by manual. Triggered a single time by the command sent

Modulation

The codes for the modulation has changed since the original version of this manual. The following refers to the firmware version V3.2.1.

WPF: Set the modulation type

⇗`WPF<%1i>\n` ⇘`\n` CH1

<%1i> is a positive integer number {0...6} that codes the modulation type. Modulation typ number corresponds to the set of modulation types {PSK ASK PSK BURS AM FM PM}

WPF0 means PSK modulation.

~~WTF: Set FSK[1] modulation source of CH1~~

⇗`WTF<%1i>\n` ⇘`\n` CH1

<%1i> is a positive integer number {0...2} that codes the modulation source. Refer to chapter *Modulation source codes* on page 9

WTF0 means normal output without trigger.

WTF1 means modulation source is external signal input.

~~Modulation source codes~~

The modulation mode is coded by a positive integer number {0...2}

0 ⇒ No modulation, continuous output
1 ⇒ modulation by CH2.
2 ⇒ modulation by external signal and signals input from external terminal (FSK IN or ASK IN)

WFM: Set bias frequency for FM

⇗`WFM<%8.6f>\n` ⇘`\n` CH1

<%8.6f> is a positive float number {0...10000000.0} that represents the frequency in Hz.

WFK123.4 means the bias frequency for FM modulation is 123.4 Hz.

WPP: Set the phase for PM

⇗`WPP<%3.2f>\n` ⇘`\n` CH1

<%3.2f> is a positive float number {0...359.99} that represents the phase in °.

WPP123.4 means the phase for PM modulation is 123.4 °.

1 FSK = Frequency Shift Keying

WPR: Set modulation rate for AM

⇗`WPR<%3.1f>\n` ⇘`\n` CH1

<%3.1f> is a positive float number {0...200.0} that represents the modulation rate.

WPR100.0 means the modulation rate is 100.0 %.

WFK: Set hop frequency for FSK

⇗`WFK<%8.6f>\n` ⇘`\n` CH1

<%8.6f> is a positive float number {0...10000000.0} that represents the frequency in Hz.

WFK123.4 means the secondary hop frequency for FSK modulation is 123.4 Hz.

~~WTP: Set PSK modulation source for CH1.~~

⇗`WTP<%1i>\n` ⇘`\n` CH1

<%1i> is a positive integer number {0...2} that codes the modulation source. Refer to chapter *Modulation source codes* on page 9

WTP0 means normal output without trigger.

WTP1 means modulation mode of external signal input.

RPN: Read number of burst cycles on CH1 when triggered.

⇗`RPN\n` ⇘`<%i>\n` CH1

<%i> is a positive integer number that represents the number of burst cycles that are outputted on trigger event.

A return value of 0000000068 means the pulse No. is set to 68.

~~RTA: Read ASK modulation source~~

⇗`RTA\n` ⇘`<%1i>\n` CH1

<%1i> is a positive integer number that codes the trigger mode. See chapter *Trigger source codes* on page 8.

A return value of 0000000002 means the current modulation mode is manual.

~~RTF: Read FSK modulation source~~

⇗`RTF\n` ⇘`<%1i>\n` CH1

<%1i> is a positive integer number that codes the trigger mode. See chapter Trigger source codes on page 8.

RFK: Read FSK hop frequency.

⇗`RFK\n` ⇘`<%i>\n` CH1

<%i> is a positive integer number that represents the frequency in μHz

A return value of 0000002345 means the current secondary frequency is 234.5 Hz.

~~RTP: Read PSK modulation source~~

⇗RTP\n ⇘<%1i>\n CH1

<%1i> is a positive integer number that codes the trigger mode. See chapter *Trigger source codes* on page 8.

If the machine returns 0000000002 , it means the current modulation mode is manual.

Measurement commands

RCF: Read frequency of external measurement

⇗RCF\n ⇘<%i>\n INPUT or TRIG IN

<%i> is a positive integer number that represents the frequency multiplied by the gate time. Calculate the frequency by dividing this number by gate time.

If the machine returns 0000000668,

If the gate time is 1 s, the frequency result is 668 Hz.

If the gate time is 10 s, the frequency result is 66.8 Hz.

If the gate time is 100 s, the frequency result is 6.68 Hz.

Note: Please read the gate time first before do this command to confirm the magnitude.

RCC: Read external counting value.

⇗RCC\n ⇘<%i>\n INPUT (fron panel)

<%i> is a positive integer number that represents the counter.

A return value of 0000000668 ,means the value counted is 668.

WCZ: Reset the counter.

WCZx\n

⇗WCZ<%1i>\n ⇘\n OBJECT

<%1i> is a positive integer number that codes the object for reset.

WCZ0 means reset the counter.

WCP: Pause the measurement.

⇗WCP<%1i>\n ⇘\n OBJECT

<%1i> is a positive integer number that codes the object for pause.

WCP0 means pause the counter.

RCT: Read the external counting period.

⇗RCT\n ⇘<%i>\n INPUT

<%i> is a positive integer number that represents the count period in ns.

A return value of 0000060668 means the counting period is 60668 ns.

RC+: Read positive pulse width of external measurement.

⇗RC+\n ⇘<%i>\n INPUT

<%i> is a positive integer number that represents the positive pulse with in ns.

A return value of 0000060668 means the width of positive pulse is 60668 ns.

RC-: Read negative width of external measurement.

⇗RC-\n ⇘<%i>\n INPUT

<%i> is a positive integer number that represents the negative pulse with in ns.

If the machine returns 0000060668, it means the width of negative pulse is 60668 ns.

RCD: Read the duty cycle of external measurement.

⇗RCD\n ⇘<%i>\n INPUT

<%i> is a positive integer number that represents the duty cycle in %×10.

If the machine returns 0000000668, it means the duty cycle of external measurement is 66.8 %.

WCG: Set the gate time of measurement.

⇗WCG<%1i>\n ⇘\n OBJECT

<%1i> is a positive integer number {0...2} that represents the exponent value of the gate time to the base of 10. $gate\,time = 10^{x}$

WCG0 Means gate time is set to 1 s

WCG1 Means gate time is set to 10 s

WCG2 Means gate time is set to 100 s

RCG: Red the gate time of measurement.

⇗RCT\n ⇘<%i>\n INPUT

<%i> is a positive integer number {0...2} that represents the exponent value of the gate time to the base of 10. $gate\,time = 10^{x}$

A return value of 0000000000 means the gate time is 1 s.

WCC: Set the coupling mode of measurement.

⇗WCG<%1i>\n ⇘\n INPUT

<%1i> is a positive integer number {0...1} that codes the coupling mode.

WCC0 means set the coupling mode is set to DC coupling.

WCC1 means set the coupling mode is set to AC coupling.

Sweep commands

SOB: Set the sweep object.

⇗SOB<%1i>\n ⇘\n OBJECT

<%1i> is a positive integer number {0...3} that codes the sweep object.

SOB0 means the frequency is the object.

SOB1 means the amplitude is the object.

SOB2 means nothing is the object.

SOB3 means the duty cycle is the object.

SST: Set the start position of sweep.

⇗`SST<%f>\n` ⇘`\n` OBJECT

<%f> is a float number that range depends on the object.

object = {frequency amplitude offset "duty cycle"}

1, if object = frequency {0...60000000.000000}, unit is Hz, <%f> is actually <%8.6f>.

SST1000.0 means the start frequency is 1000.0 Hz

2, if object = amplitude {0.000...20.0000}, unit is V, <%f> is actually <%2.4f>

SST10.001 means the start amplitude is 10.001 V

3, if object = offset {-10.000...10.000}, unit is V, <%f> is actualy <%2.3f>.

SST-6.000 means the start offset is -6.000 V.

4, if object = duty cycle {0...100.0}, unit is %, <%f> is actually <%3.1f>.

SST68.9 means the start duty cycle is 68.9 %.

When the input value is higher than the max value, the machine will keep the max value.

SEN: Set the sweep end position.

⇗`SEN<%f>\n` ⇘`\n` OBJECT

<%f> is a float number that range depends on the object, similar to the start position SST command.

1, if object = frequency {0...60000000.000000}, unit is Hz, <%f> is actually <%8.6f>.

SEN1000.0 means the end frequency is 1000.0 Hz

2, if object = amplitude {0.000...20.0000}, unit is V, <%f> is actually <%2.4f>

SEN10.001 means the end amplitude is 10.001 V

3, if object = offset {-10.000...10.000}, unit is V, <%f> is actualy <%2.3f>.

SEN-6.000 means the end offset is -6.000 V.

4, if object = duty cycle {0...100.0}, unit is %, <%f> is actually <%3.1f>.

SEN68.9 means the end duty cycle is 68.9 %.

Note: When the value input is higher than max value, the machine will keep the max value.

STI: Set the sweep time

⇗`STI<%f>\n` ⇘`\n` OBJECT

<%f> is a float number that represents the sweep time.

STI68.9 means the sweep time is set to 68.9 s

SMO: Set the sweep mode

⇗`SMO<%1i>\n` ⇘`\n` OBJECT

<%1i> is a positive integer {0...1} that represents a code for the sweep mode.

SMO0 means the sweep mode is linear sweep.

SMO1 means the sweep mode is log sweep.

SBE: Set the sweep on/off.

⇗SBE<%1i>\n ⇘\n OBJECT

<%1i> is a positive integer {0...1} that represents a code for switching the sweep mode.

SBE0 Set the sweep turned off.

SBE1 Set the sweep turned on.

SXY: Set the control source of sweep.

⇗SXY<%1i>\n ⇘\n OBJECT

<%1i> is a positive integer {0...1} that represents a code for the source for the sweep.

SXY0 means the control source is time.

SXY1 means the control source is analog signal input from VCO IN terminal.

System Setting commands

USN, ULN: Save, Load a set of parameters the parameters

⇗USN<%2i>\n ⇘\n save Parameters

⇗ULN<%2i>\n ⇘\n load Parameters

<%2i> is a positive integer {0...20} that represents a code for the storage position.

USN06 means save current parameters to position 6.

USN01 means save current parameters to position 1.

ULN06 means load parameters from position 6.

Note: saves/loads a set of parameters for both channels (Frequency, amplitude, offset, duty cycle, waveform ...) from/to a specified storage position. If the position 1 has data saved, the machine will load these data when start-up.

USA: Add synchronization mode.

⇗USA<%1i>\n ⇘\n OBJECT

<%1i> is a positive integer {0...4} that represents a code for the object to synchronize. Refer to chapter *Synchonization object codes* on page 15

USA0 means set the waveform of CH2 synchronized with CH1.

USA1 means set the frequency of CH2 synchronized with CH1.

Note: Synchronization function is not available in sweep mode.

USD: Cancel synchronization mode

⇗USD<%1i>\n ⇘\n OBJECT

<%1i> is a positive integer {0...4} that represents a code for the object to cancel the synchronization.

USD0 means cancel the waveform sync of CH2 and CH1.

RSA: Read synchronization information.

⇗RSA<%1i>\n ⇘<%i>\n OBJECT

<%1i> is a positive integer {0...4} that represents a code for the object. Refer to chapter *Synchonization object codes* on page 15

<%i> is a positive integer value {0,255} that represents the returned status code for the object. Refer to chapter *Status code* on page 8

For example: object = amplitude, ⇗RSA2\n

A return value of 0 means the amplitude synchronization is disabled.

A return value of 255 means the amplitude synchronization is disabled.

Synchonization object codes

0	waveform
1	frequancy
2	amplitude
3	offset voltage
4	duty cycle

UBZ: Set the buzzer on/off

⇗UBZ<%1i>\n ⇘\n Buzzer

<%1i> is a positive integer {0,1} that represents a code for on and off

UBZ0 means turn off the buzzer.

UBZ1 means turn on the buzzer.

RBZ: Read the buzzer on/off status.

⇗RBZ\n ⇘\n Buzzer

<%i> is a positive integer value that represents a status code described in chapter *Status code* on page 8

A return value of 0 means the buzzer is disabled.

A return value of 255 means the buzzer is enabled.

UMS: To set the uplink mode.

⇗UMS<%1i>\n ⇘\n Uplink

<%1i> is a positive integer {0,1} that represents a code for the uplink mode.

UMS0 means setting the instrument as master machine.

UMS1 means setting the instrument as slave machine.

RMS: To read the uplink mode.

⇗RMS\n ⇘<%i>\n Uplink

<%i> is a positive integer value that represents a status code described in chapter *Status code* on page 8

A return value of 0 means the device is a master in uplink.

A return value of 255 means the device is a slave in uplink.

UUL: To turn on/off uplink function.

⇗`UML<%1i>\n` ⇘`\n` Uplink

<%1i> is a positive integer {0,1} that represents a code for the uplink mode.

UML0 means turning off the uplink function.

UML1 means turning on the uplink function.

RUL: To read the uplink on/off status.

⇗`RUL\n` ⇘`<%i>\n` Uplink

<%i> is a positive integer value that represents a status code described in chapter *Status code* on page 8

A return value of 0 means the uplink function is in off status.

A return value of 255 means the uplink function is in on status.

UID: To read the ID number of the instrument.

⇗`UID\n` ⇘`<%i>\n` Device

The instrument returns its uniique ID number.

UMO: To read the model of the instrument.

UMO\n

⇗`UMO\n` ⇘`<%s>\n` Device

The instrument returns its model as a string:

FY6600-60M

NOTE: Feeltech reserves the right to modify all protocol without notice Please download latest communication protocol from our website: http: //www.feeltech.net/