WaveMaker III

Gartech Enterprises Inc.

12/17/2012

Preface:

WaveMaker III standalone unit is produced for those desiring a flexible wave form generator.

This unit is capable of providing selectable waveform configurations (via SD card). Specific waveform setups are included, per customer request. Wave form frequency values are readily-selectable via encoder input control.

Hardware consists of 8 configurable waveform channels, along with an additional 10-digital waveform channels, which can generate square or pwm (pulse-width-modulated) waveforms.

A display screen is provided for operator convenience and control. Push-button switches, along with 2 encoder spin-dials with PB's, provide for flexible input and control interface.

Index

Table of Pictures

1. Getting Acquainted:

Picture 1 – WaveMaker – Front Panel

Picture 1 illustrates power switch at bottom middle, (2) encoder dial controls above (MENU & SPEED) with push-button capability. Left of The encoder dials is a 5-push-button display screen, located below the screen. To the right of the encoder dials, covering the right one-third of the front panel are output jacks for 8 (1-8) arbitrary channels plus an additional 10 (9 – 18) digital channels.   The digital channels are labeled 1 thru 10; however, the configuration files identify these as 9 thru 18.

Arbitrary channels which have arb cards installed emit a red LED indicator on the front panel.

Shown in Picture #1A, the rear panel has a 50-pin connector for accessing the 18 WaveMaker channels, along with a PC Control Plug(USB Type A-connector) for use in accessing a LUIS GEN2 capable PC. A 120VAC power plug is also included.

PC
CONTROL

DRC26-50S02 PINOUT

DIG 1+	=	2	ARB 1+ = 9
DIG 1-	=	3	ARB 1- = 8
DIG 2+	=	4	ARB 2+ = 7
DIG 2-	=	5	ARB 2- = 6
DIG 3+	=	11	ARB 3+ = 20
DIG 3-	=	10	ARB 3- = 21
DIG 4+	=	13	ARB 4+ = 18
DIG 4-	=	12	ARB 4- = 19
DIG 5+	=	15	ARB 5+ = 16
DIG 5-	=	14	ARB 5- = 17
DIG 6+	=	22	ARB 6+ = 29
DIG 6-	=	23	ARB 6- = 28
DIG 7+	=	24	ARB 7+ = 27
DIG 7-	=	25	ARB 7- = 26
DIG 8+	=	31	ARB 8+ = 40
DIG 8-	=	30	ARB 8- = 39
DIG 9+	=	33	
DIG 9-	=	32	SYNC IN+ = 37
DIG 10+	=	35	SYNC IN - = 36
DIG 10-	=	34	
			SYNC OUT+ = 47
J1939 +	=	44	SYNC OUT - = 48
J1939 -	=	45	

100-250 VAC

WAVEMAKER 3
G02450-00

Picture 1A – WaveMaker – Rear Panel

From the front panel, the bottom encoder dial is used in selecting a configuration file which generates the required waveforms for your specific application. It is also used to select the best-suited screen display format, for data manipulation. Once a format is entered a specific channel can then be selected by this control so that a desired frequency can be set.

The top encoder control is used then used primarily to set these frequency values. Depending on the configuration used, speed(RPM) or (Hz) values will be input. Provisions are also available to input a PWM value, which can be varied between 0-100%.   In selection screen #3 an input waveform offset for lead/lag can be utilized for the arbitrary channels.

The Five (5) Display Screen push-button controls are also provided to perform the various switch tasks needed. Use of these will be described in the sections below.

To better clarify statements, numbers have been scribed on the picture displays in this document to indicate the positions of pushbuttons 1 – 5.

2. Getting Started:

The following 4 pictures illustrate WaveMaker startup screens. When the unit is first powered , you will automatically see the Gartech banner (< 5sec) followed by a Wavemaker banner. See Pictures #2 & #3.

Picture 2 & 3 – Startup Banner

Next, a load screen will appear which will load the complete set of "*.CFF" files from the internal wavemaker SD_Card (root directory).   The description of these files will then be shown on the file selection screen as illustrated in Picture #5. File selection can be made by scrolling up or down using the bottom encoder dial. Pushing screen button #2 or using the PB on the bottom encoder will access the highlighted configuration file.

Pictures 4 & 5 – File Load and Selection

Picture 6 – Home Selection Screen (Main Menu)

After entering a file selection, the "home" selection screen will pop-up. This is considered the main display menu screen. All further screens can be scrolled and selected via the bottom encoder dial from this screen. Note: This screen can be returned to from further selected display screens by pressing screen button #3.

3. Large Dial Selection Screen:

Pictures 7 & 8 – Large Dial Selection Screens

From the screen display (Main menu), the bottom encoder dial can be used to select the most appropriate display readout. Placing the highlighting square over the upper left picture, see Picture #7, the large dial display can be selected. Using the large dial screen display (Picture #8), and the bottom encoder, a channel to be displayed can be selected. This screen gives you the selected channel digital value along with a dial display readout. It displays the channel file description along with the selected waveform file name. It also indicates whether a particular channel is listed as an independent, master, or slave.

A channel can be setup as independent with no interaction from other channels, or a slave channel which is controlled by a designated independent channel (master).   This screen indicates slave channels and also the master channel for a particular slave.

  Note that slave channels cannot be controlled by the speed encoder. These channels are only controlled by the master channel, which is frequency variable.

4. Quad Dial Selection Screen:

...

Pictures 9 & 10 – Quad Dial Selection Screens

Another screen display is the Quad screen display, see Picture #9.   With this display you can toggle thru (w/ bottom encoder) the quad screen display fields. Channels for a highlighted Quad can be changed by pressing the bottom encoder pushbutton and then using the bottom encoder to toggle thru the channels. Switching back with the encoder pushbutton, this screen gives you the opportunity to select any of the Quad channels and adjust the speed of the selected channel with the top (frequency) encoder. It displays the channel value, description, name and channel #.   It also indicates whether a particular file is listed as a slave or independent channel. It does not however indicate which channel is the master for a particular slave. Also, as with the large dial display, slave channels cannot be adjusted directly with the speed encoder (only thru the master channel).

5. All Channel Selection Screen:

…

Pictures 11 & 12 – All Channel Selection Screens

In the "all channel display", see Picture #11, all 18 channels are simultaneously displayed on one screen. The channel description, value and units complete the channel display. No master/slave indications are shown on this screen. If a master channel's speed is changed, all related slave channels will track this change, simultaneously.
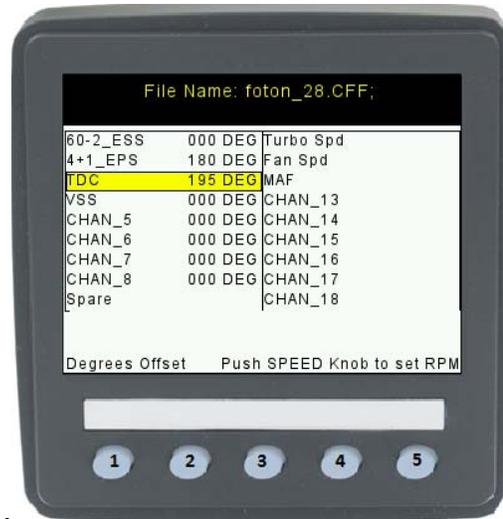
Picture 13 – Arbitrary Channel Offset Selection Screen

As shown in picture #13 pressing the speed encoder pushbutton will change the display such that a degrees offset can be entered for each arbitrary channel. To switch to this mode press the speed encoder pushbutton. This changes the screens to display a degrees offset value.

Then using the bottom encoder to highlight a particular channel, the degrees offset can then be advanced by using the speed encoder. Angle values up to a max of 720 degrees can be entered for each active arbitrary channel.

Again, by pushing the speed pushbutton switch the display will revert back to the "normal" display channel speeds mode. It also starts the waveform in the defined offset configuration.

6. Closed Loop Control Screen:

Closed Loop functionality allows the output waveform frequencies to be adjusted by an automatic feedback control system located within the wavemaker. Inputs of dynamic load values broadcast from the ECM allow the control system to make appropriate adjustments to its output waveforms to simulate a running engine.

By contrast, open loop disables the feedback control interface and allows for adjustments by only using the speed encoder.

Pictures 14 & 15 – Closed Loop Selection Screens

(Shown in Open Loop Mode)

By selecting the lower left display square, Picture #14, open/closed loop control is accessed. Display pushbutton #4 selects open loop control mode. A tracing speed line graph along with an associated display dial and digital output are updated via input from the engine's J1939 public datalink broadcast. This is received as a J1939, EEC1 message and uses SPN-190 to pick up the ECM's current speed broadcast.

When switching from closed loop to open loop control, the last recorded values broadcast from the ECM on SPN 190 will set the open loop running speed.

When commanding closed loop by pressing display push button #5, see Picture #16, the engine speed will be set to zero and then, with an appropriate waveform signal, ramped to start and run the engine.

Engine loads can be applied by using the speed encoder while setting the yellow dot indicator to the load display quadrant using the bottom encoder. The control loop gain can then be adjusted by moving the yellow dot to the gain quadrant and again adjust the value via the speed encoder.

Picture 16 – Closed Loop Selection Screens

(Shown in Closed Loop Mode)

The tracing speed line graph, displayed in the upper left quadrant, is set to a range of 0 to the specified max arbitrary channel speed range; ie: 3000, 4500, 6000 or 8000.   The graph update rate is controlled by the broadcast timing of SPN 190.

7. Channel Information Screen:

...

Pictures 17 & 18 – Channel information Screens

As shown in selection Picture #17, and then in display Picture #18, a menu selection is available to display the file descriptions for each channel of the selected configuration file. Also displayed are the file name and wavemaker firmware version along with the wavemaker serial number.

8. Universal Setup Selection Screens:

Screens have been provided to adjust universal values and limits for the wavemaker system. These include setting the engine source address, setting max limits for the waveform frequencies, setting the J1939 baud rate value, and turning the Bleep function On/Off. Also included is a "Reset All", a "Com Viewer", and an "About" Screen.

In order to make adjustments to the WaveMaker universal setup values, an "Other Info" screen is provided to access the VeeCAN display device setup screens.

If adjustments are needed for the WaveMaker/VeeCAN universal settings, access can be made to the following screens by:

1) Pushing button #1 until the Wavemaker banner screen is visible, see Picture #19.
2) Using the button for Other Info; ie: button #5, Picture #19, hold down for approx. 5 seconds until the CONFIG MENU is shown, Picture #20.

Using this menu, selections can be made by scrolling up and down with pushbuttons #1 and #2 and then enter further screens by using pushbutton #4. Pushbutton #5 is used to return to the previous menu screen.

 If selection menu "SETTING" Picture #21 is entered, it includes:

1) Engine Source Address (0 - 254).
2) Max allowable RPM/Hz for arbitrary channels. (3000, 4500, 6000, or 8000)
3) Max allowable RPM/Hz for digital channels. (12000 or 20000)
4) Engine Baud Rate selection. (250K baud or 500K baud)
5) Bleep On/Off.

Use pushbuttons #1 and #2 to scroll up and down in this menu. The highlighted selection can then be changed with the "+" and "-" pushbuttons #3 and #4. A return from this menu is then selected by using pushbutton #5.

Pictures 19 & 20 – Wavemaker Internal Setup Screens

Pictures 21 & 22 – Wavemaker Internal Setup Screens
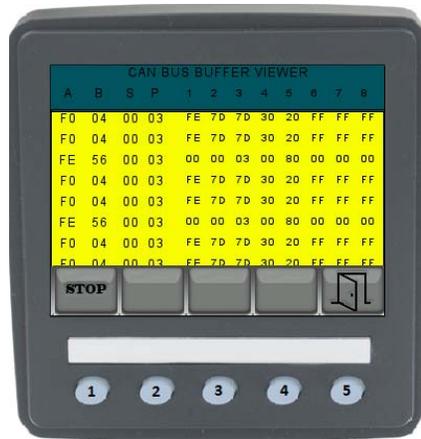
Pictures 23 – Wavemaker CAN BUS Running Display Screen

The RS232 selection in Picture #22 is not currently supported but as indicated below the J1939 network dynamic network can be viewed.

Picture #23 displays this network for viewing as follows: The PGN value's A & B are shown, also the source address, and message priority. Eight bytes of data follow such that they can then be displayed for each message packet.

The CAN BUS screen scrolls thru data broadcast on the incoming public J1939 bus. It can be set to use either 250K or 500K baud rates via the baud rate selection screen of Picture #21.   The scrolling display shows the header values along with transmitted data.

Also other selections included are a "Reset All" and an "About" selection (shows Software Version for the VeeCAN display device.)

9. Technical Info:

WaveForm Types	Wave form	Min Freq	Max Freq
Digital Variable Reluctance	Square -5V to +5V	0 RPM/Hz	20000 RPM/Hz
Digital Hall Effect	Square 0V to +5V	0 RPM/Hz	20000 RPM/Hz
Digital Pulse Width Modulated**	Variable Square 0 to +5	0 %	100 %
Arbitrary 4 – 32k Data Points	Variable design -6 to +6	0 RPM/Hz	8000 RPM/Hz

Notes: ** The configuration file sets the PWM frequency from 0–20000 Hz.