User's Manual

GTC605

FUEL INJECTION ANALYZER

General Technologies Corp.

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1. SAFETY RULES

- This instrument is designed for indoor use at temperatures between 32° and 104° F (0°C and 40°C) and altitudes up to 6500 ft. (2,000 meters).
- To ensure that the instrument is used safely, follow all safety and operating instructions in this operation manual. If the instrument is not used as described in this user's manual, the safety features of this instrument may be impaired.
- Do not use the instrument if the instrument, the sensors, or the cable look damaged, or if you suspect that the instrument is not operating properly.
- When using the instrument, keep away from moving parts (fan, drive belts, etc) and hot objects (exhaust pipes, muffler , catalytic converter, etc), to avoid personal injuries and damage to the instrument, the sensors, flexible probe and extension cable..
- Do not connect the instrument to anything other than the sensor, cable, USB cable, or AC power adapter provided.
- At all times, to avoid electrical shock, use CAUTION when working with electrical circuits above 60 VDC or 25 VAC rms. Such voltages pose a shock hazard.
- Do not operate this instrument while it is connected to the AC power adaptor or any other device.
- To avoid electrical shock or damage to the instrument, do not exceed the specified input limits.

Exceeding the limits listed above when using this apparatus, or not observing the precautions listed above can expose you to physical injury and permanently damage your instrument and/or parts and components of the vehicle under test.

2. TECHNICAL SPECIFICATIONS

2.1 General specifications

Display:	3.5” TFT LCD, 320 x 240 pixels resolution.
Update rate:	Up to 30 times per second.
Fuel injector type:	Solenoid, piezoelectric and mechanical.
Engine cycle:	2-stroke or 4-stroke.
Power (internal):	3.2 volt/1500 mAh, rechargeable LiFePO4 battery.
Auto power off:	Automatically powers off after 3 min. of inactivity.
Battery life:	Approximately 4.5 hours of continuous operation.
USB connector (input):	Micro USB (5 Volt / 0.5 amperes DC).
Cable length:	83.5” (212 cm) long coaxial cable with connectors.
Three-channel sensor:	0.57” (D) x 2.74” (L) / (14.4 x 69.7 mm)
Dimensions:	6.3” x 3.9” x 1.3” / (160 x 99 x 34 mm) without cable and sensor.
Weight:	Approximately 14 oz. (406 g) without cable and sensor.
Included accessories:	Three-channel (voltage, power, and vibration) sensor, 83.5” (212 cm) long BNC cable, protective rubber holster, padded hard carrying case, micro USB cable, AC power adapter, and user’s manual.

2.2 Measurement specifications

- The specifications below are typical at 23° C, and will vary slightly from device to device, and with temperature. Do not connect the instrument to anything other than the sensor, cable, USB cable, or AC power adapter provided.

Measurement Mode	Measurement Range	Resolution	Accuracy
Tachometer	400 to 9999 RPM 2-stroke and 4-stroke	1 RPM	0.5% ± 1 LSD
Injector on time	0 to 30 ms	0.01 ms	± 0.05 ms + 1 LSD
Injector open time	0 to 30 ms	0.01 ms	± 0.05 ms + 1 LSD
Injector open delay	0 to 30 ms	0.01 ms	± 0.05 ms + 1 LSD
Injector close delay	0 to 30 ms	0.01 ms	± 0.05 ms + 1 LSD

3. GENERAL DESCRIPTION

3.1 Instrument description

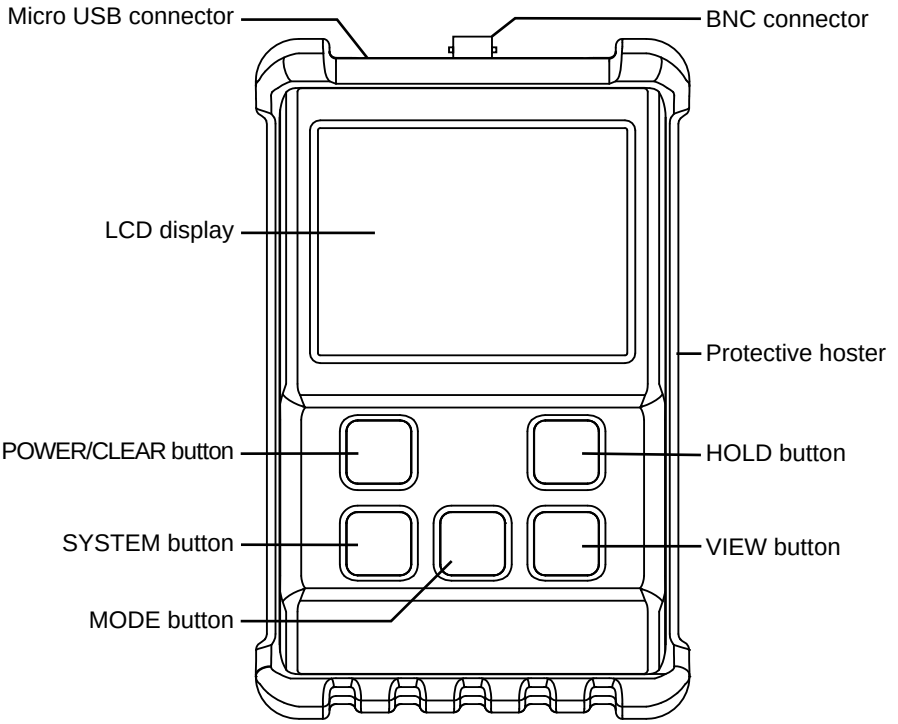


Fig. 1 - Instrument description

3.2 Display description

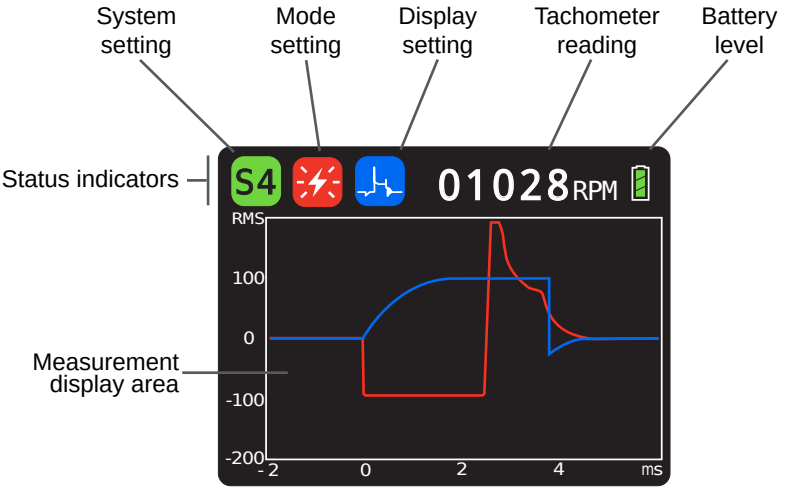


Fig. 2 - LCD Display

4. BUTTONS, ICONS AND MENUS OPERATION

4.1 ‘POWER/CLEAR’ button

- When the instrument is OFF, press and hold the ‘POWER/CLEAR’ button to turn the unit ON (in approximately 1 second).
- When the instrument is ON, press and hold the “POWER/CLEAR’ button to turn the unit OFF (in approximately 3 seconds).
- When the instrument is ON, press the ‘POWER/CLEAR’ button to clear all measurement data, and start a new measurement. This operation can be also be performed to re-scale the measurements and optimize viewing in the display.
- The ‘Auto-Power-Off’ feature will automatically turn the instrument off after 3 minutes of no button being pressed or 15 seconds after the last signal was detected. Turning the unit off manually when not in use will prolong battery life.

4.2 ‘SYSTEM’ button and menu

- The ‘SYSTEM’ button is used to select the injector type and engine cycle corresponding to the engine under measurement. Upon pressing this button, a pull down menu will open with the current setting highlighted. To change the setting press the ‘SYSTEM’ button repeatedly until the correct setting is highlighted, then wait until the pull down menu closes. The new setting will be indicated by the system icon at the top of the screen.

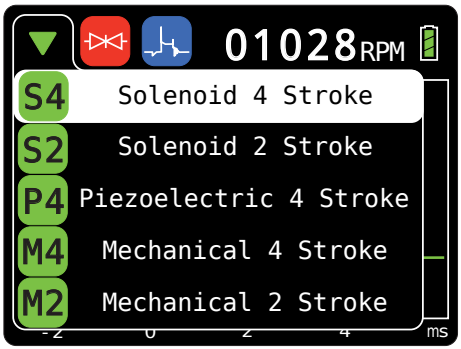


Fig. 3 - System selection menu

Solenoid-type injector in a 4-stroke engine

Solenoid-type injector in a 2-stroke engine

Piezoelectric-type injector in a 4-stroke engine

Mechanical-type injector in a 4-stroke engine

Mechanical-type injector in a 2-stroke engine

4.3 ‘MODE’ button and menu

- The ‘MODE’ button is used to select the type of measurement to be shown on the display. Upon pressing this button a pull down menu will open with the current setting highlighted. To change the setting press the ‘MODE’ button repeatedly until the desired setting is highlighted, then wait until the pull down menu closes. The new setting will be indicated by the mode icon at the top of the screen.

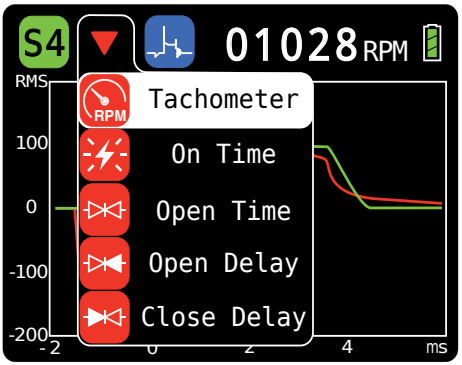


Fig. 4 - Measurement mode selection menu

Measuring/displaying engine RPM (tachometer).

Measuring/displaying fuel injector control voltage (for solenoid and piezoelectric systems).

Measuring/displaying fuel injector open time.

Measuring/displaying fuel injector open delay (for solenoid and piezoelectric systems).

Measuring/displaying fuel injector close delay (for solenoid and piezoelectric systems).

4.4 ‘VIEW’ button and menu

- The ’VIEW’ button is used to select how the chosen measurement will be shown on the display. Upon pressing this button a pull down menu will open with the current setting highlighted. To change the setting press the ‘VIEW’ button repeatedly until the desired setting is highlighted, then wait until the pull down menu closes. The new setting will be indicated by the view icon at the top of the screen.

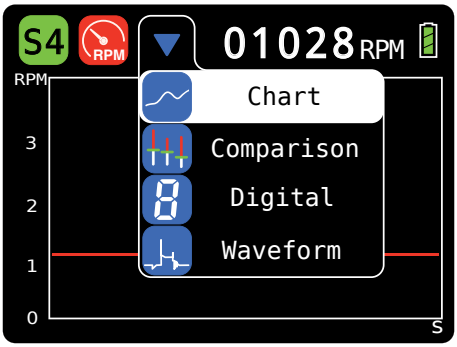


Fig. 5 - Display mode selection menu

Chart (i.e. trendline) view.

Comparison view.

Analog gauge and digital readouts.

Waveform (oscilloscope-style) view.

4.5 'HOLD" button

- When chart, digital, or waveform display mode is selected, pressing the 'HOLD' button will pause the measurement, hold the current readings and the word "HOLD" will be shown in the measurement area of the display to indicate this status. Press the 'HOLD' button again to resume normal operation.
- When in the comparison display mode, this button is used to initiate and stop a measurement. For further details see '6.2 Comparison view'.

4.6 Tachometer reading

Digital readout of the engine RPM.

4.7 Battery level indicator

The battery level indicator provides an approximate indication of the state of charge of the internal battery, as follows:

NOTE: The instrument will automatically turn off if the battery voltage falls below its minimum safe level.

5. MEASURING MODES

There are four different fuel injection parameters that can be selected for measurement, depending on the engine's fuel injection system:

- Engine RPM.
- Fuel injector control voltage (for solenoid and piezoelectric systems).
- Fuel injector open time.
- Fuel injector open delay (for solenoid and piezoelectric systems).
- Fuel injector close delay (for solenoid and piezoelectric systems).

5.1 Engine RPM

Measures engine RPM (revolutions per minute) in 2-stroke and 4-stroke engines, and may be used in combination with other measurements to evaluate fuel injection system performance at different engine speeds.

5.2 Fuel injector on time (for solenoid and piezoelectric systems)

This signal is generated by the engine's Powertrain Control Module/Electronic Control Module (PCM/ECM) to control the opening and closing of the fuel injector through the movement of the pintle or needle (i.e. injection of fuel in the intake manifold or cylinder). The control voltage is usually in the form of a pulse or several pulses and absence of this control voltage could indicate a problems with the PCM/ECM, connections or wiring. For solenoid type fuel injectors, the shape of the control pulse(s) may include spikes in the voltage (CEMF or kickback) generated by the inductance of the solenoid coil.

5.3 Fuel injector open time

This is the length of time the fuel injector is open. It is measured from the from when the pintle moves to its open position to when the pintle or needle moves back to its closed position. Unusually long or short open time may be caused by a defective or fouled fuel injector.

5.4 Fuel injector open delay (for solenoid and piezoelectric systems)

This is the length of time from when the control voltage is applied to when the pintle or needle moves to its open position. This delay is caused by the fuel injector electrical impedance (inductance/capacitance) and inertia of the moving parts. Unusually long or short open delays may indicate an electrical problem in the fuel injector circuits or mechanical condition.

5.5 Fuel injector close delay (for solenoid and piezoelectric systems)

This is the length of time from when the control voltage is removed to when the pintle or needle moves to its closed position. This delay is caused by the fuel injector electrical impedance (inductance/capacitance) and inertia of the moving parts. Unusually long or short close delays may indicate an electrical problem in the fuel injector circuits or mechanical condition.

6. DISPLAY VIEWS

There are four views that can be selected to display measurements:

- Chart
- Comparison
- Digital
- Waveform

6.1 Chart view

This view displays the selected measurement's value for each of the last 276 injections, with the left-most measurement being the oldest, and the right most the newest. The measurement scale and units are located on the vertical axis, at the far left of the display.

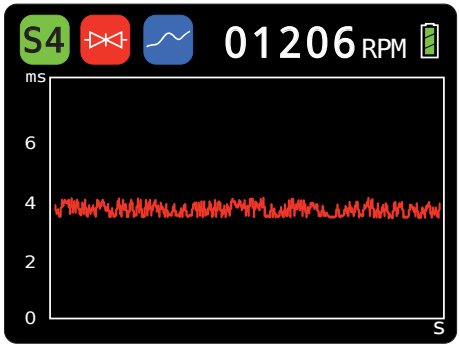


Fig 6 - Chart view display

- **'POWER/CLEAR' button:**
  Pressing the Power/Clear button clears all values from the chart, and re-scales the chart if necessary.
- **'MODE' button:**
  Pressing the 'MODE' button once will open the mode menu, and highlight the measurement mode currently selected; pressing the 'MODE' button again while the menu is open will select the next available measurement mode. All available measurements (RPM, on time, open time, open delay and close delay) for the type of fuel injector selected are simultaneously tracked and stored, and are available for viewing at any time (without delay)
- **'HOLD' button:**
  Pressing this button will pause the measurement, and hold the display in its the current condition. Pressing the 'HOLD' button again will resume normal measurement.

6.2 Comparison view

This mode is for comparing sets of values (minimum, average and maximum measurements) between several cylinders, under various testing conditions, or other situations.

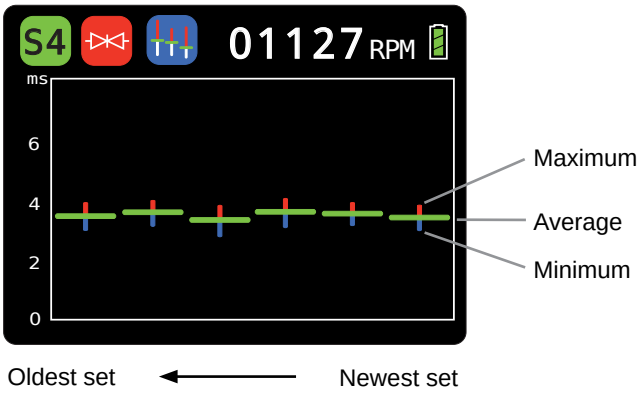


Fig. 7 - Comparison mode display

The measurement sets are displayed from left to right, with the left-most set of values being the oldest, and the right-most the newest . A new set of values is added every time the 'HOLD' button is pressed twice (stop/start) and up to 16 sets of values will be shown in the graph at once, if this maximum is exceeded, the oldest set will be deleted and a new set added. The measurement scale and units are located on the vertical axis, at the far left of the display.

- **'POWER/CLEAR' button:**
  Pressing the 'POWER/CLEAR' button clears all measurements, and re-scales the chart if necessary.
- **'MODE' button:**
  Pressing the 'MODE' button once will open the mode menu, and highlight the measurement mode currently selected; pressing the 'MODE' button again while the menu is open will select the next available measurement mode. All available measurements (RPM, on time, open time, open delay and close delay) for the type of fuel injector selected are simultaneously tracked and stored, and are available for viewing at any time.
- **'HOLD' button:**
  The 'HOLD' button when pressed once pauses measurement and holds the display in its current condition (while displaying a "HOLD" label in the center of the screen). Pressing the 'HOLD' button a second time will remove the pause (and label), and add a new set of values at the right of the screen, which will keep updating until the 'HOLD' button is pressed again. This is repeated every time the button is pressed twice (stop/start) and up to the last 16 set of values will be shown in the display at once, if this maximum is exceeded the oldest set will be deleted and a new set added.
- **Step by step procedure**

1- Turn the instrument on.

2- Using the "SYSTEM" button and pull down menu select the appropriate type of fuel injector and engine cycle .

3- Using the "MODE" button and pull down menu select the desired mode (measurement type).

4- Using the "VIEW" mode and pull down menu select "Comparison".

5- Press the "HOLD" button once. The display will show "HOLD".

6- While in hold mode, press the "POWER/CLEAR" button once.

7- Place and hold the sensor on the first fuel injector to be compared, and press the "HOLD" button once.

8- The instrument will start measuring and displaying maximum, minimum and average measurements. When sufficient data has been collected, press the "HOLD" button once again. This will finish the measurement set for the injector and the display will show "HOLD".

9- Place and hold the sensor on the next fuel injector to be compared and press the "HOLD" button to start a new set of measurement.

10- Repeat step 8- and 9- for each new injector to be compared.

6.3 Digital view

- **RPM mode selected:** Displays engine RPM in analog and digital formats, current firmware version number, and signals status indicators for control voltage, coil power and pintle motion.

Indicator	Description
	Signal detected
	Inconsistent signal detected
	No signal detected

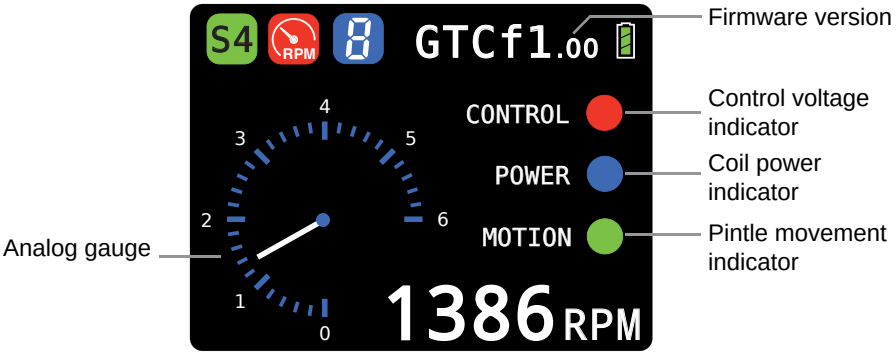


Fig. 8 - Digital display in RPM mode

- **on time, open time, open delay, or close delay mode selected:** Displays the selected measurement in analog and maximum and minimum in digital format, along engine RPM.

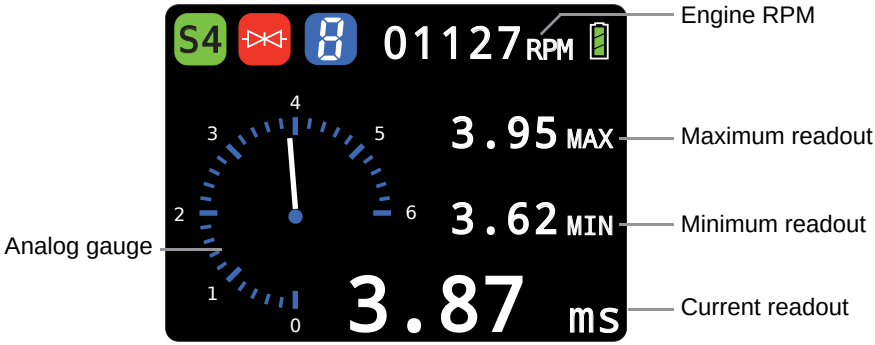


Fig. 9 - Digital display with on time, open time, open delay, or close delay mode

- **'POWER/CLEAR' button:**
  Pressing the 'POWER/CLEAR' button clears all digital readout values, indicators, and re-scales the analog gauge if necessary.
- **'MODE' button:**
  Pressing the 'MODE' button once will open the mode menu, and highlight the measurement mode currently selected; pressing the 'MODE' button again while the menu is open will select the next available measurement mode. All available measurements (RPM, on time, open time, open delay and close delay) for the type of fuel injector selected are simultaneously tracked and stored, and are available for viewing at any time (without delay).
- **'HOLD' button:**
  Pressing this button will pause measurement, and hold the display in the current condition. Pressing the 'HOLD' button again will resume normal measurement.

6.4 Waveform view

This view mode displays the signals amplitude over time (oscilloscope-style), which are color coded. The scale and units of the measurement are located on the vertical axis, at the far left of the display. The time scale and units are shown below the horizontal axis, at the bottom of the screen.

Control Voltage Current Pintle motion

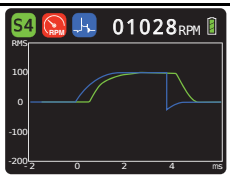
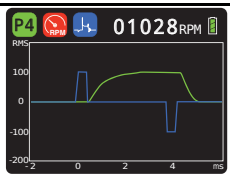
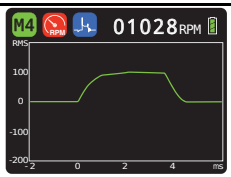
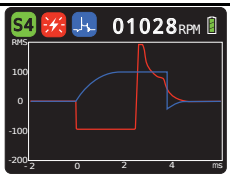
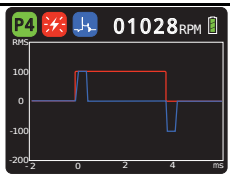
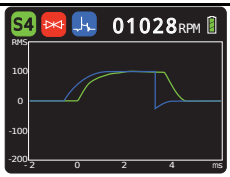
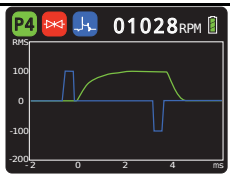
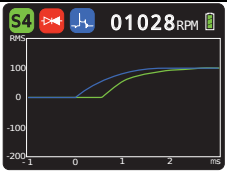
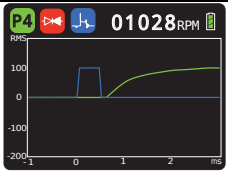
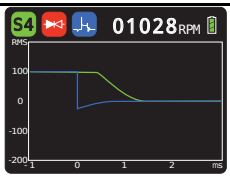
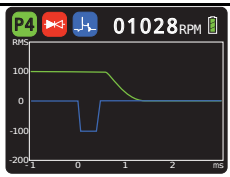
System / Mode	S4 S2	P4	M4 M2
RPM			
On time			N/A
Open time			
Open delay			N/A
Close delay			N/A

Fig. 10 - Waveform view

- **'POWER/CLEAR' button:**
  Pressing the 'POWER/CLEAR' button clears the graph, and re-scales it if necessary.
- **'MODE' button:**
  Pressing the 'MODE' button once will open the mode menu and highlight the measurement mode currently selected; pressing the 'MODE' button again while the menu is open will select the next available measurement mode. The waveform graph focuses on the area of the spark waveform which is most relevant to the mode selected.
- **'HOLD' button:**
  Pressing this button will pause the current measurement, and hold the display in the current condition. Pressing the 'HOLD' button again will resume normal measurement.

7. MEASUREMENT PROCEDURES

CAUTION

To avoid personal injuries and damage to the instrument carefully inspect the area around the fuel injectors for damage or leaks, and avoid using the instrument in case any damage or leaks are found. Wear insulating gloves when working around high voltage and hot parts, and keep away from moving parts (fan, drive belts, etc.) and hot objects (exhaust manifold and pipes, muffler, catalytic converter, etc.).

7.1 Sensor and cable setup

This instrument is supplied with a three-channel sensor and a cable.

- Three-channel sensor: it can detect the fuel injector control voltage, power (current) and motion of the pintle and is equipped with a jack barrel connector.
- Cable: 83.5" (212 cm) long coaxial cable equipped with a BNC connector at one end and a barrel connector plug and O-ring seal at the other.

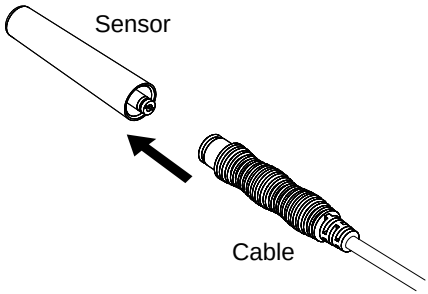


Fig.11 - Sensor connection to cable

1- Connect the cable to the instrument using their BNC connectors.

2- Insert the sensor by twisting it into the barrel connector of the cable, and then press both firmly together.

3- When turned on the instrument will automatically detect the sensor connected to the cable.

7.2 Ground wire

The GTC605 is also supplied with a ground wire and clip, that allows to ground the instrument to the engine in order to reduce AC mains hum and other electrical interference.

- To connect the ground wire to the instrument, insert the ground wire's fork connector onto the barrel of the instrument's BNC connector as shown in the figures below.

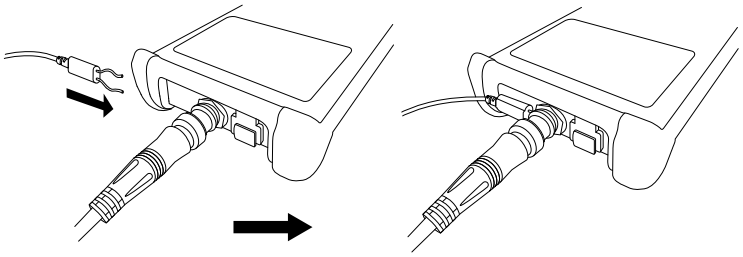


Fig 12 - Connecting the ground clip to the instrument

7.3 Measuring solenoid and piezoelectric fuel injectors

1- Ensure the instrument is turned off.

2- Ensure the sensor's barrel connector is plugged into the cable's receptacle, and that the cable is connected to the instrument.

3- Turn the instrument on and use the 'SYSTEM' button to select the type of fuel injector (solenoid or piezoelectric) and the engine cycle (2-stroke or 4-stroke) corresponding to the engine under measurement.

4- Select the desired mode and view.

5- Place and press the sensor onto the fuel injector, and observe whether the instrument is able to detect and display the desired measurement.

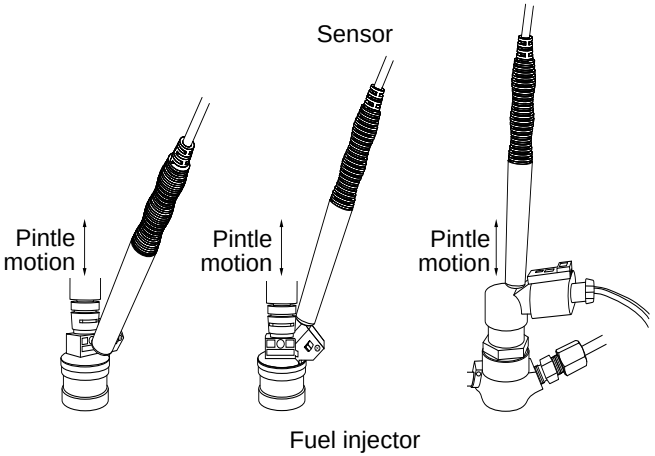


Fig. 13 - Using the sensor on solenoid and piezoelectric fuel injectors

6- If the instrument is unable to detect the signals of the fuel injector system signal, it may be necessary to reposition the sensor so that a consistent signal is detected and displayed.

7- External electrical noise (e.g. power mains hum) may interfere with the sensor causing distortion of the control voltage. To mitigate interference, use the ground wire and clip provided with the unit to connect the instrument to the electrical ground of the engine.

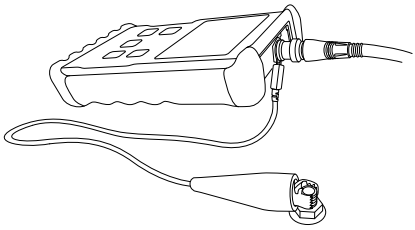


Fig. 14 - Grounding the instrument

NOTES

- To best detect the fuel injector's pintle or needle movement, place the sensor on a metal part of the injector body, aligning the sensor' body as much as possible with the fuel injector body (direction of movement of the pintle or needle). Apply a light pressure to the sensor, as applying excessive force may damage the sensor.

- The position of the sensor and the particular position and design of the fuel injector may affect the signal's detection and shape shown when the waveform display is selected. In order to compare waveforms between several cylinders' fuel injectors, the placement of the sensor relative to the fuel injector should be kept as consistent as possible for all measurements.
- In some engines, the ignition modules, spark plug wires, and fuel injectors are located very close together, and in rare occasions this may cause the instrument's sensor to detect ignition signals, leading to inconsistent measurements. This can usually be solved by changing the placement or orientation of the sensor on the fuel injector.

7.4 Measuring mechanical fuel injectors

1- Ensure the instrument is turned off.

2- Ensure the sensor's barrel connector is plugged into the cable's receptacle, and that the cable is connected to the instrument.

3- Turn the instrument on and use the 'SYSTEM' button to select "M4" or "M2" corresponding to the engine cycle (2-stroke or 4-stroke) under measurement.

4- Select the desired mode and view.

5- Place and press the sensor onto the fuel injector, and observe whether the instrument is able to detect and display the desired measurement.

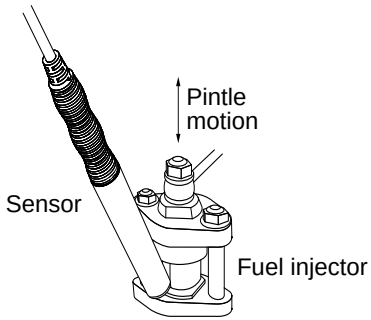


Fig. 15 - Using the sensor on a mechanical type fuel injector

6- If the instrument is unable to detect the signals of the fuel injector system signal, it may be necessary to reposition the sensor so that a consistent signal is detected and displayed.

NOTES

- To best detect the fuel injector's pintle or needle movement, place the sensor on the injector body, aligning the sensor' body as much as possible with the fuel injection body (direction of movement of the pintle or needle). Apply a light pressure to the sensor, as applying excessive force may damage the sensor.

- The position of the sensor and the particular position and design of the fuel injector may affect the signal's detection and shape shown when the waveform display is selected. In order to compare waveforms between several cylinders' fuel injectors, the placement of the sensor relative to the fuel injector should be kept as consistent as possible for all the measurements.

8. FUEL INJECTION MEASUREMENTS AND WAVEFORMS

8.1 Solenoid fuel injectors

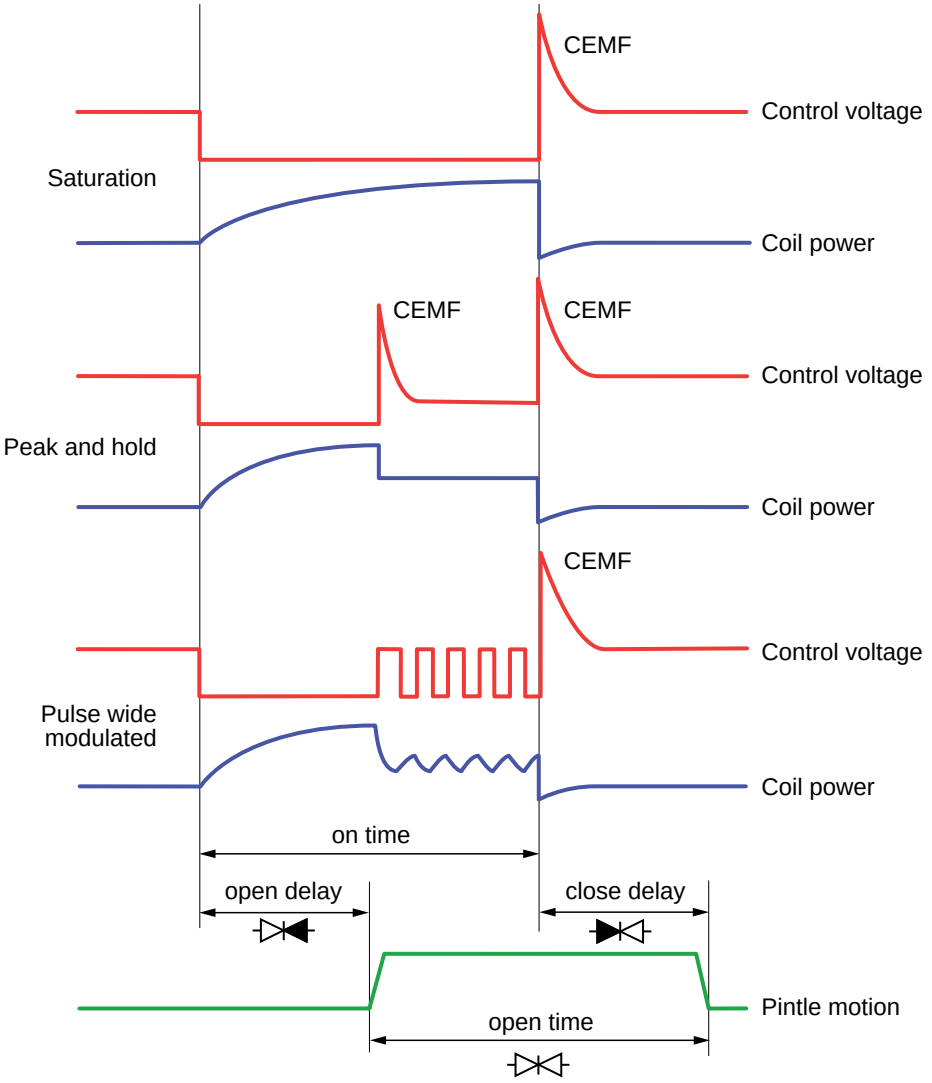


Fig. 17 - Typical solenoid fuel injector waveforms

- **Control voltage (from PCM/ECM):** This is the control voltage applied by the Powertrain Control Module (PCM) or Electronic Control Module (ECM) to the fuel injector. This control voltage can be a constant voltage pulse (saturation), a peak and hold pulse, or pulse width modulated.
- **CEMF:** Counter Electromotive Force (or kickback) is generated by the inductance (coil) of the solenoid when the current through it is interrupted, causing a sudden collapse of the magnetic field. A small counter current is also generated by the solenoid by the CEMF.

- **On time:** This is the length of time the PCM/ECM applies voltage (and current) to the fuel injector. The control voltage is usually in the form of a pulse where the current gradually increases (ramp) until it reaches saturation. When peak and hold or pulse width modulated control voltage is used, after saturation the current is reduced to a lower level, to reduce power consumption while holding the fuel injector open.
- **Open time:** This is the length of time from when the pintle moves to its open position to when the pintle or needle moves back to its closed position. When the pintle reaches its open or close position, the pintle will take some time to settle (settling time). Settling time is a function of the fuel injector design, but is also affected by mechanical conditions, fuel flow, etc.
- **Open Delay:** This is the length of time from when the control voltage is applied to when the pintle or needle moves to its open position. This delay is caused by the fuel injector electrical impedance (inductance/capacitance) and inertia of the moving parts. Unusually long or short open delays may indicate an electrical problem in the fuel injector circuits or mechanical condition of the injector.
- **Close delay:** This is the length of time from when the control voltage is removed to when the pintle or needle moves to its closed position. This delay is caused by the fuel injector electrical impedance (inductance/capacitance) and inertia of the moving parts. Unusually long or short close delays may indicate an electrical problem in the fuel injector circuits or mechanical condition of the injector.

8.2 Piezoelectric fuel injectors

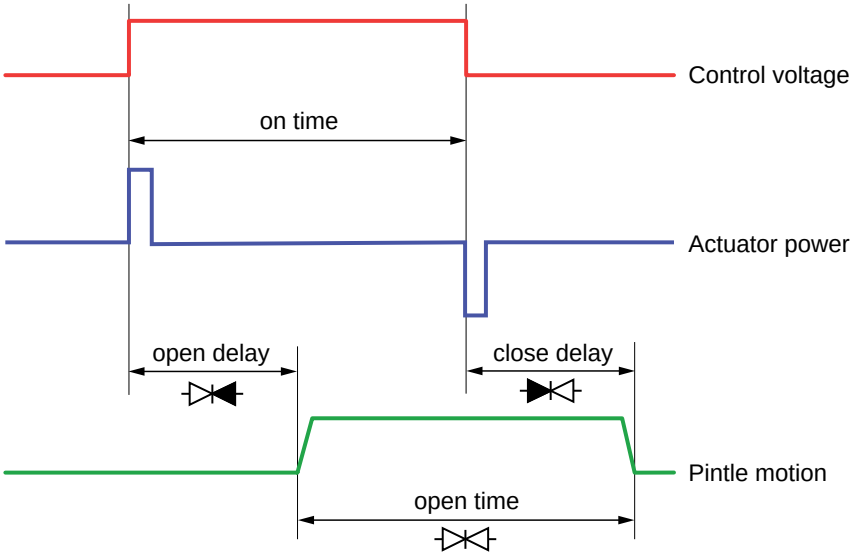


Fig. 18 - Typical piezoelectric waveforms

- **Control voltage (from PCM/ECM):** This is the control voltage applied by the Powertrain Control Module (PCM) or Electronic Control Module (ECM) to the fuel injector.
- **On-time:** This is the length of time the PCM/ECM applies a voltage pulse to the fuel injector.

- **Open time:** This is the length of time from when the pintle moves to its open position to when the pintle or needle moves back to its closed position. When the pintle reaches its open or close position, the pintle will take some time to settle (settling time). Settling time is a function of the fuel injector design, but is also affected by mechanical conditions, fuel flow, etc.
- **Open Delay:** This is the length of time from when the control voltage is applied to when the pintle or needle moves to its open position. This delay is caused by the fuel injector electrical impedance (inductance/capacitance) and inertia of the moving parts. Unusually long or short open delays may indicate an electrical problem in the fuel injector circuits or mechanical condition of the injector.
- **Close delay:** This is the length of time from when the control voltage is removed to when the pintle or needle moves to its closed position. This delay is caused by the fuel injector electrical impedance (inductance/capacitance) and inertia of the moving parts. Unusually long or short close delays may indicate an electrical problem in the fuel injector circuits or mechanical condition of the injector.

8.3 Mechanical fuel injectors

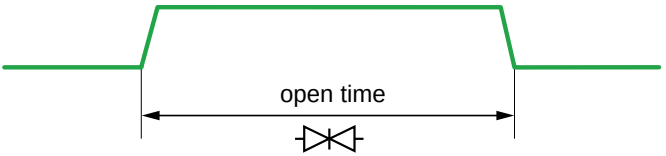


Fig. 19 - Typical mechanical injector waveform

- **Open time:** This is the length of time from when the pintle moves to its open position to when the pintle or needle moves back to its closed position. When the pintle reaches its open or close position, the pintle will take some time to settle (settling time). Settling time is a function of the fuel injector design, but is also affected by mechanical conditions, fuel flow, etc.

9. RECHARGING THE INSTRUMENT

1- If still operating, turn the instrument power off.

2- Locate and lift the rubber cap (attached to the protective holster and located beside the BNC connector) to reveal the micro USB receptacle.

3- Insert the USB charger cable's micro USB plug into the receptacle of the instrument matching the orientation of the connectors.

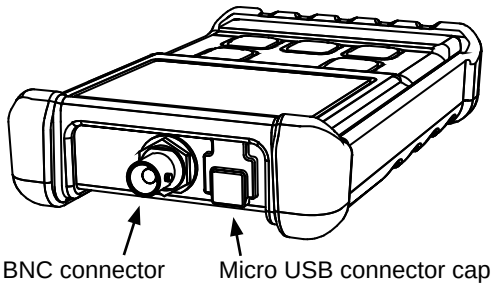


Fig. 16 - Instrument's connectors

4- Insert the USB type A connector of the cable into the USB port of the supplied USB power charger adapter, and plug the power adapter into an AC power outlet.

5- When the battery starts charging, the display will show the charging in progress icon and the screen will turn off after a few seconds.

Fig. 16 - Charging indicators

6- If the instrument is turned on (by pressing the 'POWER/CLEAR' button) at any time while connected to the power adapter, the instrument will display the charging status .

7- The USB type A connector can be also plugged into a USB port of a personal computer, powered USB hub, or any other USB compliant power source.

5- The recharge time will depend on the battery's state of charge, and it may take up to 6 hours to fully recharge a depleted battery.

NOTES

- If the instrument has not been used for a long time, or the state of charge of the battery has fallen to a critically low level, a period of pre-conditioning of the battery is automatically added to the normal charging cycle, which increases the charging time in order to restore the battery capacity, No user intervention is needed, and this process is automatically carried out by the instrument.
- While the battery is completely depleted, pressing the power on button will not turn the instrument on, and it must be recharged before it can be used again.

10. MAINTENANCE

Keep the instrument in its carrying case when not in use and do not subject it to dampness, severe heat or cold. Do not use the instrument in the rain; if it should accidentally get wet, dry it off with a clean paper towel before storing it away.

Protect the unit from contact with any solvents. Never clean with a solvent or petroleum based medium such as gasoline, as these chemicals may attack the plastic parts and cause permanent damage. Never use an abrasive cleaner. Cleaning should be limited to wiping with a clean damp paper towel and a small amount of soap if required. Dry the unit thoroughly after any cleaning.

The unit is a sealed instrument, and contains no user serviceable parts. Opening this instrument will void the warranty.

11. WARRANTY

This instrument carries a one (1) year warranty (from the date of purchase by the original owner) against defects of material or workmanship. For details see the Standard Warranty Information on our web page at www.gtc.ca, or request a printed copy.

Type this URL in your browser to visit our website:

www.gtc.ca

Or scan the QR code below with your smart phone.

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