FGI 100
FLAME - GARD™ IGNITION

Installation & Operation Manual

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CSA Caution

Please read this manual carefully and keep the product within stated current and voltage limits.

Introduction

What is a "FLAME-GARD ™IGNITION" System?

The term **"FLAME-GARD ™" refers** to that portion of a system that monitors a pilot flame, takes action to stop the flow of fuel gas if the pilot flame fails, and brings the fuel gas on in an orderly manner when the system is commanded to restart.

The term **"IGNITION**" refers to the portion of the system that provides a means to ignite the pilot flame.

The **"FLAME-GARD™ IGNITION"** system is not the only device in the fuel gas loop. Other instrumentation such as temperature controllers, level switches and high temperature shutdowns can also take control and shut off fuel gas to the burner system.

The FGI 100 System consists of:

- **A fibreglass enclosure containing two circuit boards (The FGI 100-T and FGI 100- M).**
- **An ignition coil with a circuit board (FGI 100-S) on a mounting base.**
- **A flame detection probe and ignition electrode with a pilot-mounting bracket.**
- **High voltage ignition wire and probe extension wire.**

The FGI 100 Flame Gard**™** Ignition system was designed for use in natural draft or atmospheric burners and should not be considered for use in forced air burner systems. Typical atmospheric burner systems are found in U-tubes (treaters, line heaters, glycol heaters, glycol reboilers, salt bath heaters etc.), direct-fired heaters, and non-blower type furnaces.

FGI 100 Features

Compact fibreglass enclosure with a switch pad front panel.

Enclosure CSA approved for Class 1, Division 2 locations.

Input Power can be +12 to +30 VDC, 9 or 18 VAC.

Thermocouple based system (type K thermocouple encased in 446 SS).

DC Voltage spark generator with spark electrode included.

Auto relight or manual operation, push button and/or jumper selected.

Flame fail contacts supplied for flame fail alarm.

Solenoid status LEDs on front panel.

Remote Start/Stop control standard features.

'RUN/SERVICE' mode switch for field testing and start up

Large, easily accessible field termination terminal blocks.

Pilot signal on front panel.

Two-trip point action with an Atmospheric purge cycle. Trip levels are adjustable with on board trim pots.

Supports continuous current solenoids or the Skinner Magnalatch (pulse open, pulse closed) solenoids.

Minus 40 C to plus 60 C operating range with no internal heater required.

Very low power consumption. Less than 1/5th of one Watt when using Skinner Magnalatch solenoids.

All circuits are transient protected and are fail-safe.

FGI 100 Specifications

Enclosure:	- Fibreglass 8" x 6" x 4" - CSA and UL approved for Class 1, Division 2 locations - Enclosure type 4, 4X, 12, 13
Circuit boards:	- All solid state, cpu based. - CSA approved for class 1, division 2 locations.
Ignition base and coil:	- CSA approved for non-hazardous area only.
Power requirements:	- 11 to 30 volts DC - 9 or 18 volts AC (50 or 60 Hz, 1 phase)
Supply current:	- 2.0 amps surge, 0.015 - 2 amps run
Power Consumption**:**	**- FGI 100 only @ 11-30 VDC = 0.17 to 0.45 Watts** **- Constant current solenoids add power for two Solenoids** **- Limited power output to solenoids, Max = 60 Watts/Solenoid**
Operating Conditions:	- -40 °C to +60 °C
Warnings:	THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS 1, DIVISION 2 GROUPS (C&D) OR NON-HAZARDOUS LOCATIONS ONLY. **WARNING: -EXPLOSION HAZARD-** SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2 **WARNING: -EXPLOSION HAZARD-** DO NOT REMOVE OR REPLACE THE POWER TERMINAL OR FUSE UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS. **WARNING: -EXPLOSION HAZARD-** DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

FGI 100 Installation

Site Selection

The FGI 100 "Flame Gard / Ignition" system enclosure is CSA approved for a Class 1, Division 2 (C&D) area classification. This means the system enclosure must be mounted outside any Class 1, Division 1 building or area. The system can be mounted on the unit skid or on a building wall as long as it does not infringe on a Class 1, Division 1 area.

The spark generator, however, must be mounted in a non-hazardous area, as there is a potential of a spark arcing across the output terminals of the coil or along the insulated high voltage leads. The ideal location for the spark generator is inside the burner housing.

The enclosure should be mounted in a location so that it faces away from the burner housing so that the operator is facing both the enclosure and the burner housing while operating the unit. Other considerations are panel access, traffic, wire runs and visibility. The enclosure should be mounted about 5 1/2 feet above ground level.

Mounting the Enclosure

The FGI 100 "Flame-Gard™ / Ignition" system enclosure is a fibreglass box 6" X 8" x 4" complete with mounting tabs. The enclosure weighs less than 5 pounds so heavy duty supports are not required, but the unit should be firmly mounted, as the push buttons on the front panel have to operate.

Mounting the Coil Base

The coil base must be mounted in a non-hazardous location and the inside of the burner housing is just that. The generator base has the DC generator circuit card mounted underneath and the coil on top. The mounting base has four holes for mounting the unit either on a plate or on a flat surface. The terminal access to input and output (high voltage) are all-accessible from the top of the unit.

NOTE: Prior to mounting the coil base, check the jumper positions for 12 or 24 VDC operation and set according to your supply voltage. If the supply voltage is 9VAC use the 12VDC jumper setting. On a supply voltage of 18VAC use the 24VDC setting.

FGI 100 Installation (continued)

Internal Connections

SUPPLY INPUT (DC POWER): When using DC power, connect 12 to 30 VDC to the '12V-30VDC' terminal located at the top of the main terminal block on the FGI 100T circuit board. Attach common to the common terminal directly below the 12-30 VDC terminal. Make sure the system is grounded by bringing a good earth ground to the terminal marked "ground".

SUPPLY INPUT (AC POWER): When using AC power (120 or 250 VAC), as the source power, it must be transformed down to either 9 or 18 VAC with an external AC/AC transformer. When using 9 VAC the system will rectify the AC voltage and filter it to 12 VDC. The Ignitor circuit jumper must be set to 12 VDC and the Main and Pilot solenoids must be rated for 12 VDC. When using 18 VAC, the system will rectify the input voltage to 24 VDC the Ignitor circuit jumper must be set to 24 VDC and the Main and Pilot solenoids must be rated for 24 VDC.

TO IGNITOR: Three conductors (#18 wire is sufficient) must be routed from the FGI 100 Enclosure to the Ignition Coil/Base terminal block. Attach one conductor to '12V/24V OUT' terminal (on the main terminal block - TB1 on Rev 5 and up) and route it to 'VIN' on the Ignitor/Coil Base terminal block. Attach a 12 or 24 VDC common wire to the 'COM' terminal directly below the '12v/24V out' terminal and route it to 'COM' on the coil base terminal block. Attach the third conductor to 'control' terminal and route it to 'control' on the coil base terminal block. These conductors must be labelled or colour coded to insure correct installation and re-attachment if necessary.

TC INPUT: Attach the positive side of the T/C extension wire to the '+' terminal on the main terminal block, and the negative side of the T/C extension to the '-' terminal. The T/C extension wire need not be thermocouple wire as the pilot signal is only a relative temperature signal and the cold junction created by the non-thermocouple extension wire has little effect on the detection of a pilot flame. If a thermocouple cable is run, then the cable should be light gauge, twisted pair and shielded. If a shield is run with the thermocouple wire, only attach the shield to the main terminal block on the terminal provided, and leave the other end of the shield open. Never ground both ends of a shield wire as this ground loop will attract miscellaneous noise and cause the T/C signal to be very erratic. **NOTE:** The colour code for Type K Thermocouple Wire is: Yellow = +ive, Red = -ive.

FGI 100 Installation (continued)

REMOTE UNIT CONTROL: The FGI 100 provides for a remote start and remote stop control function from an RTU or PLC. The signal that is required to activate the start and stop functions is a voltage pulse with a minimum of 100 milli second duration. There is no maximum duration but the voltage must be removed from the terminal before any subsequent pulses can be given. The voltage level must be between 12 VDC and 30VDC. The "remote start" and "remote stop" input power requirements are identical and the polarity of the input signal must be observed.

Remote Start will attempt to light the pilot burner to establish Pilot Proved if the FGI 100 is in 'MANUAL' mode, (ie: 'MANUAL' is selected by push button or by jumper, manual forced from an ESD, or 'MANUAL' from a failed auto relight). Repeated attempts to start a failed or a running burner is acceptable as the circuit will lock on the first call and ignore repeats until it resets the pulse input circuit. The input circuit resets when the either the restart has failed or the pilot burner has failed.

Remote Stop command will stop a running burner (pilot and main) and will be ignored if the burner is already in a Flame Failed mode.

NOTE: Remote Start and Remote Stop functions are intended for just that, remote units controlled from a central site (eg: field line heaters in a gas gathering system, controlled from a central gas plant). A much more effective method of stopping and starting an FGI 100 that is hard wired into a central control system, is to simply drop the power to the unit for stopping and applying power to start. The FGI 100 on a power failure will stop the burner (pilot and main) and all LEDs will go out. If all the LEDs are out on the FGI 100, this will serve as an indicator that the master system has locked the unit out and does not want the burners to run. When the master system restores the power, and the unit is not forced into 'MANUAL' mode, the FGI 100 will automatically relight the burner system.

ALARM OUT CONTACT: The alarm out contact is an optically isolated solid-state switch that is like a set of "dry contacts". The "contacts" are good for 0.100 amps at 60 volts AC or DC (with DC as the preferred voltage). Even though the terminal blocks are marked '+' and '-', the switch is not polarity dependent so either wire from the alarm circuit can be connected to either terminal. The "contact" will be open when the FGI 100 is in "flame failure" mode and closed when in "pilot proved". The one exception to this switch action is when the system is in automatic and is trying to relight the pilot burner. The "flame failure" alarm is not announced until the system is unsuccessful in lighting and proving the pilot after the third attempt.

FGI 100 Installation (continued)

MAIN AND PILOT SOLENOIDS (CONSTANT CURRENT): Both AC and DC constant current solenoids are not polarity sensitive so that either extension wire from the solenoid coil can be hooked into the solenoid terminal block in the FGI 100. One wire will attach to ‘OPEN’, the other to ‘COM’ on both the 'PILOT' and 'MAIN' solenoids.

The valve portion of the solenoid must be tubed into the pneumatic control in a normally closed configuration. For example, the ASCO Red Hat solenoid requires supply to port two (2), output to port one (1) and the vent to port three (3). The expression is:
"In - 2, Out -1, Vent - 3".

NOTE: The maximum power output to constant current solenoids is 60 watts (2 amps at 30 VDC). If your solenoid draws more power or is AC voltage, interposing relays will have to configure into your system.

MAIN AND PILOT SOLENOIDS (PULSE OPEN/CLOSE): Pulse solenoids are unique in that the solenoid is operated open and closed by short voltage pulses. The attractive feature of these solenoids is that there is no power consumed while the solenoid is in the open or closed position. Their weakness, however, is that these solenoids are not totally fail safe. The FGI 100 will insure that the solenoids close even if the power to the unit fails as there is sufficient power stored in capacitors C1 & C2 on the FGI 100-T board that the microprocessor uses when it detects the power dropping. While the FGI 100 will look after a "fail safe" in a power fail situation, the solenoid cannot be closed if either the 'close' or 'common' wires have become detached or broken. Titan Logix Corp. has used the Skinner/Honeywell Magnalatch solenoid in many of our systems with excellent results.

If a pulse type solenoid is being used, three wires must be routed to each solenoid from the FGI 100. Polarity and wire identification must be observed. The Magnalatch solenoid has colour coded wires and the hook up to the FGI 100 is as follows: The red wire from the solenoid must run to the 'OPEN' terminal on the main and pilot solenoids; the white wire must run to the 'COM' terminal; the black must run to the 'CLOSE (PULSE ONLY)' terminal.

The valve portion of the SKINNER MAGNALATCH solenoid must be tubed into the pneumatic portion of the control system in a normally closed configuration. That requires that the supply be hooked to port one (1) or 'P', the output to port-to-port two (2) and the vent to port three (3).

Selecting the Operation Jumpers

There are three critical jumpers that have to be set prior to applying power to the unit. The jumpers are found on the main board (FGI 100-M) in the upper left corner. The jumper labels and their function are as follows:

IN=SLEEP EN - If this jumper is in (ie: the jumper plug over top of both jumper posts) then the front panel LEDs will turn off (ie: go to sleep) ten minuets after the last panel push button was pressed. To wake the lights up, simply push any front panel push button once. When the panel LED'S are lighted, the panel push buttons are again active to respond to their designated function.

IN=PULSE O/P - If this jumper is in, the system will issue a voltage pulse to open and close both the MAIN and PILOT solenoids. If the jumper is out, the system will supply a continuous current to both the MAIN and PILOT solenoids to keep them open and will take the current off to close them. It should be noted here that applying a pulse to a continuous current solenoid will simply open, and then very quickly close the solenoid with no damage to the solenoid. However, if a constant current is applied to a pulse solenoid the coils within the solenoid could be damaged.

IN=MAN. ONLY - If this jumper is in, the system will be held in the 'MANUAL' mode of operation. Any attempts to switch the unit to 'AUTO' by pushing the 'AUTO/MAN' push button will be ignored. The Active Lights will not flash (even though the system is in 'MANUAL'), and there will be no attempts to relight the burner system after a failure. If the jumper is out, the 'AUTO/MAN' push button is enabled and either the 'AUTO' or 'MANUAL' mode of operation can be selected. If the 'AUTO' mode is selected, all the Active Lights will be solid. If the system is switched to 'MANUAL' all of the Active Lights will flash quickly. In 'AUTO' the system will attempt three relights after a flame failure before issuing and external alarm, in 'MANUAL' there are no attempts to relight.

DEFINITION: Active Lights

The Active Lights on the FGI 100 are defined as a set of three pairs of Lights, and each pair will only ever have one of the pair on at any one time. The Pilot Signal LEDs are NOT part of the Active Lights. The three pairs that make up the Active Lights are:

1) Flame Failure & Pilot Proved.
2) Pilot Solenoid ON & OFF.
3) Main Solenoid ON & OFF

FGI 100 Indicators

Front Panel Indicator LEDs

FLAME FAILURE: The Flame Failure LED is on when: the unit is first powered up and the pilot signal is below the low trip point; the pilot signal falls below the high trip point; the system has detected a situation that is forcing a pilot/main burner shut down;

The Flame Failure LED is also the "purge" indicator. Whenever the system has determined a purge situation it will pulse the Flame Failure LED off and on every second. When the unit is in 'MANUAL' mode the slow flash of "purge" will overlay the fast flash of the LED that is indicating 'MANUAL'.

The Flame Failure LED and the Pilot Proved LED are one pair of the Active Lights and only one of this pair will be on at any one time.

PILOT PROVED: The Pilot Proved LED comes on when the pilot flame temperature exceeds the Low Trip Point level (rising). The Pilot Proved LED will go out when ever the Flame Failure LED is on.

The Pilot Proved LED and the Flame Failure LED are one pair of the Active Lights and only one of this pair will be on at any one time.

PILOT SOLENOID ON/OFF: The Pilot Solenoid ON/OFF LEDs Indicate the status of the pilot solenoid. The OFF (red) LED will indicate the system has closed the pilot solenoid and the ON (green) LED will indicate the system has opened the pilot solenoid.

The Pilot Solenoid ON/OFF LEDs make up another pair of Active Lights and only one of this pair will be on at any one time.

MAIN SOLENOID ON/OFF: The Main Solenoid ON/OFF LEDs Indicate the status of the main solenoid. The OFF (red) LED will indicate the system has closed the main solenoid and the ON (green) LED will indicate the system has opened the main solenoid.

The Main Solenoid ON/OFF LEDs make up another pair of Active Lights and only one of this pair will be on at any one time.

FGI 100 Indicators (continued)

PILOT SIGNAL °C: This group of LEDs indicate the relative temperature the thermocouple probe is sensing from the pilot flame. Each LED indicates a 200? C increase in pilot flame temperature. Each LED will flash slowly when probe temperature is well below the temperature indicated for that LED. As the temperature rises toward the indicated temperature, the frequency of the flash will increase. When the indicated temperature is reached the LED will come on to solid. The next LED will repeat the sequence as the probe temperature rises.

If **ALL** the Pilot Signal LEDs are flashing, the sensor has gone bad or a connector to the sensor may have come loose.

Circuit Board Indicator LEDs

ABOVE LOW: This LED comes on when the Pilot Signal (ie: the temperature read by the thermocouple) exceeds the low trip point. This LED is found on the main board (FGI 100-M) in the upper left portion, near the 'LOW ADJUST' potentiometer.

ABOVE HIGH: This LED comes on when the Pilot Signal (ie: the temperature read by the thermocouple) exceeds the high trip point. This LED is found on the main board (FGI 100-M) in the upper left portion, near the 'HIGH ADJUST' potentiometer.

POWER FAIL DETECT: This LED will never be on solid. The LED will only flash to indicate that the FGI has registered a power failure and that it is taking action to do an orderly shutdown of the burner system.

FGI 100 Controls

Push Button Functions

BURNER ESD (Emergency Shut Down): At any time this button will close both solenoids, do a purge of the system, and set the unit in 'MANUAL' mode.

AUTO/MAN: This button will switch between 'AUTO' and 'MANUAL' modes. Switching between 'AUTO' and 'MANUAL' has no effect on a normally operating burner system.

SWITCH MAIN: In 'MANUAL' or 'SERVICE' mode, this button will open and close the main burner solenoid. The solenoid will open only if the pilot flame is proved (ie: the Pilot Signal is above the Low Trip Point), and close only if the solenoid is open. In 'AUTO' mode this button has no effect.

OPEN PILOT: In 'MANUAL' or ''SERVICE'' mode, this button will open the Pilot Solenoid to allow fuel gas to flow to the pilot burner. Releasing the button prior to a Pilot Proved condition will close the solenoid. In 'AUTO' mode this button has no effect.

PILOT IGNITION: In 'MANUAL' or 'SERVICE' mode, this button will ignite the sparker. In 'AUTO' mode this button has no effect.

FGI 100 Controls (continued)

Jumper and Jumper Settings

MAIN BOARD (FGI 100-M):

J1 With this jumper in the IN position, Earth ground and the circuit board ground are tied together. In the OUT position, Earth Ground and the circuit board ground are not tied together.

J2 Sleep Enable (located in the upper left corner on the main board): With this jumper in the IN position, Sleep Mode is enabled. In the OUT position, Sleep mode is disabled.

J3 Pulse Output (located in the upper left corner on the main board): With this jumper in the IN position, a pulse will be sent to open or close the solenoids. Use this option if you are using Magnalatch solenoids. In the OUT position, constant current will be supplied to the solenoids. Use this option if you are using continuous current solenoids

J4 'MANUAL' Only (located in the upper left corner): With this jumper in the IN position, the FGI 100 will not enter 'AUTO' mode. In the OUT position, 'AUTO' mode may be enabled normally.

SPARKER BOARD (FGI 100-S):

J1 and **J2** Input Voltage (located in the lower left corner on the sparker card): These jumpers set the input voltage for the sparker unit. Use the IN position if you are using 12V input voltage. Use the OUT position if you are using 24V input voltage. Both jumpers MUST be set to the same position.

FGI 100 Controls (continued)

Service/Run Switch

The 'SERVICE/RUN' mode switch is located near the centre of the FGI 100-T circuit board. It is used to switch the FGI 100 between 'SERVICE' mode and 'RUN' mode. ('RUN' mode is defined as 'MANUAL' mode or 'AUTO' Relight mode). The 'SERVICE' Mode allows the FGI 100 to be operated manually and will lock out any unwanted attempts to relight the burner while the system is being worked on. The 'AUTO/MAN' is non-operative while the switch is in 'SERVICE' mode and the Active Lights will flash as if the system is in 'MANUAL'.

NOTE: It is recommended to set the FGI 100 in 'SERVICE' mode prior to applying power for the first time after installation.

Low/High Trip Point Potentiometers

LOW ADJUST: The Low Adjust potentiometer (Pot) adjusts the Low Trip Point level. The Low Trip Point level is the point at which the pilot signal will determine the Pilot Proved level when rising, and the end of the Purge cycle when falling. Adjusting the Pot clockwise will raise the level. Adjusting the Pot counter clockwise will lower the level. The factory setting and the bench calibration point for the Low Trip Point is 200 degrees C.

HIGH ADJUST: The High Adjust Pot adjusts the High Trip Point level. The High Trip Point level is the point at which the pilot signal will turn the Main burner on when rising, and the Flame Fail point complete with the start of the Purge cycle when falling. Adjusting the Pot clockwise will raise the level. Adjusting the Pot counter clockwise will lower the level. The factory setting and the bench calibration point for the High Trip Point is 600 degrees C.

FGI 100 Operation

Modes of Operation

AUTO RELIGHT MODE: This mode is the usual operating mode of the FGI 100. In 'AUTO' mode the FGI 100 will light and monitor the pilot flame and start the main burner automatically. To enter 'AUTO' mode, put the 'SERVICE/RUN' mode switch in the 'RUN' position then press the Auto/Man switch on the front panel.

MANUAL MODE: This mode is normally used for troubleshooting the burner system. It allows a user to operate any function of the FGI 100 manually. To enter 'MANUAL' mode, (with the Service mode switch in 'RUN' and system in 'AUTO') press the 'AUTO/MAN' switch. The Active Lights will go into a fast flash mode indicating the unit is in 'MANUAL'.

SERVICE MODE: This mode is used to troubleshoot the FGI 100 and/or the pilot probe and ignition electrode, wiring etc. The FGI 100 should be in 'SERVICE' mode when power is first applied to the unit. To enter 'SERVICE' mode, place the 'SERVICE/RUN' mode switch in the 'SERVICE' position. The Active Lights are set to a fast flash indicating the unit is in 'MANUAL' and/or 'SERVICE' mode. If the unit will not switch out of 'MANUAL' when the 'AUTO/MAN' push button is pressed, the unit is in 'SERVICE' mode.

DEFINITION: Active Lights

The Active Lights on the FGI 100 are defined as a set of three pairs of Lights, and each pair will only ever have one of the pair on at any one time. The Pilot Signal LEDs are **NOT** part of the Active Lights. The three pairs that make up the Active Lights are:

1) Flame Failure & Pilot Proved.
2) Pilot Solenoid ON & OFF.
3) Main Solenoid ON & OFF.

FGI 100 Operation (continued)

Auto Relight Mode

The 'AUTO' mode is the normal mode of operation for the FGI 100. Before the FGI 100 can be put into 'AUTO', the 'SERVICE' switch must be in 'RUN' mode and the **J4** 'MANUAL' Only jumper has to be off. If the system is not being forced to 'MANUAL' then the 'AUTO' mode can be selected by simply pressing the 'AUTO/MAN' switch while the system is in 'MANUAL'. If the 'SERVICE' switch is in 'RUN' mode and the **J4** jumper is out, the FGI 100 will always come up in 'AUTO' when power is applied to the unit. The 'AUTO' mode of operation is identified by the Active Lights on solid (ie: not flashing).

In 'AUTO' mode the FGI 100 will attempt to start the pilot burner and main burner in an orderly manner after applying power or after the purge in a Flame Fail situation. The sequence for a successful start up is as follows:

1) **Clear the Flame Fail alarm.**
2) **Open the pilot solenoid and at the same time begin a 5 second ignition.**
3) **Monitor the Pilot Signal to see if pilot ignition was successful while holding the pilot solenoid open and update the Pilot Signal LEDs according to their flashing sequence (ie: slow flash, faster flash as Pilot Signal increases, on solid when the temperature indicated for that LED is reached).**
4) **When the Pilot Signal reaches the first or Low Trip Point, declare a Pilot Proved by turning the Flame Failure LED off and the Pilot Proved LED on.**
5) **Continue to monitor the Pilot Signal, and compare it to the second or High Trip Point.**
6) **When the Pilot Signal reaches the High Trip Point, open the main burner solenoid to start the main burner**.
7) **Continue to monitor the Pilot Signal to watch for a flame failure.**

In the event that the pilot burner did not light, or lighted but did not have enough flame to get the Pilot Signal to the Low Trip Point, (ie: sequence stop at point 3 above), the FGI 100 will shut the pilot solenoid and go into a 15 second purge cycle (indicated by the Flame Failure LED set to a slow flash). After the purge cycle is complete, the FGI 100 will attempt to light the pilot a second time and a third time if necessary. On the unsuccessful third attempt the system will go into a final purge sequence, re-issue the Flame Fail alarm, set itself into manual then wait for someone to address the problem.

FGI 100 Operation (continued)

There is a situation, however, for which the FGI 100 will not attempt subsequent restarts after the first or second attempt and it occurs at point 6 above. When the pilot lights on the first, second or third attempt and the Pilot Signal gets over the Low Trip Point three non operative situations can arise. The three situations and the system reaction are as follows:

1) **The Pilot Signal reaches the Low Trip Point but very slowly increases towards, but does not reach the High Trip Point within five (5) minutes.**

2) **The Pilot Signal reaches the Low Trip Point, rises to a point before reaching the High Trip Point, and then falls off in value of more than 50 degrees C.**

3) **The Pilot Signal reaches the Low Trip Point, rises to a point and then stops for any more than two (2) minutes before the High Trip Point is reached.**

The System reaction to the above three situations is to shut the pilot and main burner solenoids off, and issue a Flame Fail alarm. Unlike the third attempt failure, the system will not set itself into 'MANUAL' mode and this serves as an indicator as to the problem the system encountered.

FGI 100 Operation (continued)

Manual Mode

The 'MANUAL' mode of operation allows the user to operate any of the FGI 100 functions manually by using the Manual Operators on the front panel. If the FGI 100 has been forced to 'MANUAL' Only with Jumper **J4** in the IN position the Manual Operator must be used to light the burners and the Active Lights will be on solid at all times. If the FGI 100 is in 'AUTO/MANUAL' mode the unit may be switched to 'MANUAL' mode by pressing the 'AUTO/MAN' push-button when the unit is in 'AUTO' mode. When 'MANUAL' mode is selected, the Active Lights will be set into a fast flash to alert the operator that 'MANUAL' has been selected and the unit will not do an auto relight when unattended.

To light the burner system in 'MANUAL' mode, the operation of the 'MANUAL' operators will follow the same sequence 'AUTO' mode does with one exception, that being when the main burner is turned on. Take note of this sequence change in 'MANUAL' as the main burner could switch off in a transfer from 'MANUAL' to 'AUTO'.

The 'MANUAL' light up sequence for the FGI 100 is as follows:

1) Both pilot and main burner are off and the purge cycle is complete (ie: flame Failure LED is not in slow flash), the indicator LEDs will be in the following state:
   - Flame Failure red LED is on
   - Pilot Proved green LED is off
   - Pilot Solenoid is off (red LED on, green LED off)
   - Main Solenoid is off (red LED on, green LED off)
   - Flame Failure alarm is on (ie: contacts open)
2) Light the Pilot Burner:
   - Push and hold the Open Pilot push button.
   - At the same time or shortly after push the Pilot Ignition push button.
   - Release the Pilot Ignition push button after 2-3 seconds and continue to hold the Open Pilot push button. Push the Pilot Ignition push button again if you feel you need to.
   - After a short while the Pilot Signal should increase as indicated by the first Pilot Signal LED going from a slow flash to a faster flash to solid.
   - Continue to hold the Open Pilot push button until the FGI 100 switches the Flame Failure LED off and the Pilot Proved on.
   - Release the Open Pilot push button.
3) Light the Main Burner:
   - Press the Switch Main push button.

FGI 100 Operation (continued)

NOTE: When the Switch Main push button is pushed the Main Burner solenoid will open to allow instrument air to open the Main Burner shut down valve. In some cases and with some solenoid/valve combinations and piping, the main burner may come on too quickly and without sufficient air support, will choke for a short while until the stack exhaust is built up to get new fresh air in to support combustion. There are two things that can be done to alleviate this problem:

1) Prior to lighting the main burner, close the main burner isolation valve (block valve). After the pilot is established (Pilot Proven), press the Switch Main push button to open the solenoid (the control valve will open but the gas to the burner will be blocked in to the main burner). With fuel gas supply up to the block valve, slowly open the valve to light off the main burner from the pilot. Pause and confirm that the main burner is indeed lit off, then very slowly open the valve to full open. The burner should come to full fire very smoothly without any choking if the temperature controller is calling for full fire. This procedure should always be followed on initial start up and if the heater has been down for an extended period of time.

The above procedure is advisable when lighting the burner manually but does no one any good when the unit is auto relighting. Read on.

2) If the main burner is coming on too strong, too fast in 'AUTO' mode, a flow-limiting orifice can be installed in the tubing outlet of the Main Burner solenoid. The most acceptable flow limiting orifice we have found is the AMOT 2727C. This device will limit the outflow without limiting the reverse flow (vent outflow) and is adjustable to bring the main burner on slowly and safely.

Service mode

'SERVICE' mode is used for testing or troubleshooting the FGI 100. It is not intended to be used as a formal operating mode. The 'SERVICE' mode forces the FGI 100 into 'MANUAL' and any attempt to spark the ignitor or to bring the pilot and/or the main burner on is suppressed by any 'AUTO' action. The 'SERVICE' mode is intended for first time start up and working on the system with no surprise happenings. In 'SERVICE' mode the front panel operates in the 'MANUAL' mode only.

FGI 100 Calibration

Warning !!

Titan Logix (formerly Nagy Burner Control) is not responsible for miscalibration or damage caused to the FGI 100 system by persons attempting to calibrate the unit.

Bench Test and Initial Settings

REQUIRED EQUIPMENT:

To calibrate the FGI 100 the following equipment is needed:

- A millivolt generator (thermocouple simulator)
- A voltmetre accurate to 0.001 Volts
- A small precision flathead screwdriver
- A power supply (a source of 12 or 24 VDC)

SET UP:

1. Attach the millivolt generator leads (+ive and -ive) to TC INPUT, + and -.
2. Attach the power source to SUPPLY INPUT, +ive to 12-30VDC and -ive to common.
3. Monitor voltage readings at the designated test points

SETTING THE LOW TRIP POINT TO 200 C:

1. Place the FGI 100 in 'SERVICE' mode by putting the 'SERVICE' / 'RUN' mode switch to "SERVICE".
2. Measure the voltage on the test points 'TC OP VOLTS' and 'GND'. These test points are found on the right hand side of the master (FGI 100-M) board 2/3 up.
3. Using a thermocouple simulator, adjust the output until the volt meter reads 2.015V.
4. Turn the Low Adjust Potentiometer (located on the left side of the FGI 100M circuit board) clockwise until the Above Low LED goes off. The Above Low LED may already be off so there is no need to turn the Pot clockwise any further.
5. Slowly turn the Low Adjust Potentiometer counter clockwise until the “Above Low” LED just comes on.

FGI 100 Calibration (continued)

SETTING THE HIGH TRIP POINT TO 600 C:

1. Place the FGI 100 in 'SERVICE' mode by putting the 'SERVICE/RUN' mode switch to "SERVICE".
2. Measure the voltage on the test points 'TC OP VOLTS' and 'GND', (Master board, right side, 2/3 up).
3. Using a thermocouple simulator, adjust the output until the volt meter reads 6.161V.
4. Turn the High Adjust Potentiometer (located on the left side of the FGI 100M circuit board) clockwise until the Above High LED goes off. The Above High LED may already be off.
5. Slowly turn the High Adjust Potentiometer counter clockwise until the Above High LED just comes on.

FIELD/ON LINE CALIBRATION:

The best way to calibrate the FGI 100 is to calibrate the unit on line and with the pilot that it will be working with from now on. To do the OnLine calibration it is necessary to understand the two-trip point/purge operation of the FGI 100.

As the Pilot Signal rises from ambient to the sensor temperature of the pilot flame it will pass through a point, say 200 degrees C. on its way to a stable temperature. It is at this temperature that the FGI 100 will acknowledge the pilot flame to be lighted and state a Pilot Proved. As the Pilot Signal continues its climb to its high point, it will (hopefully) pass through the second trip point, which is defined as the High, or Off Trip Point. Passing trough the High Trip Point (rising) will arm the system for a future Flame Failure. W hen the Pilot Signal falls below the High Trip Point the fuel gas to the burners will be shut down and the system will take the appropriate action according to the mode of operation (‘AUTO’ or 'MANUAL'). The common action will be to shut in the pilot and main fuel gas to shut the fuel flow off to the burners. The span between the High Trip Point and the Low Trip Point when the Pilot Signal is falling is defined as the Purge Time. All functions to relight the burner system during the Purge time will be locked out with no reaction to any manual action and auto relight will not try until the purge is complete.

FGI 100 Calibration (continued)

Both the Low Trip Point and the High Trip Point are adjustable. Adjustments are made on the Low Adjust Pot and the High Adjust Pot. These Pots are found on the FGI 100-M board (upper left) and are distinguishable as grey boxes with a screwdriver adjuster in the upper right hand corner of the device. Always, and on both Pots, clockwise rotation of the adjustment screw will raise the Trip Point and counter clockwise will lower the Trip Point.

The most practical method of calibrating the FGI 100 on line is to have the burner system down and the FGI 100 in 'MANUAL' or 'SERVICE' mode. Assuming the burner system is down and we are in manual, the following steps will complete an 'On Line' calibration:

- Turn the High Adjust Pot clockwise 4-5 full turns.
- Set the FGI 100 to 'MANUAL' and light the pilot.
- Get the pilot proved and wait for 2-3 minuets for the Pilot Signal to stabilize.
- Start the main burner and note if main burner fire has any effect on the Pilot Signal. If the main burner causes the Pilot Signal to fall, calibrate the system with the main burner running. If the main burner has no effect, or causes the Pilot Signal to rise, then calibrate the system with pilot only running.
- After the choice is made (ie: pilot only or main and pilot) on when to calibrate the unit, pause and let the probe temperature stabilize.
- Insure that the "ABOVE HIGH" LED is not on. If the LED is on, turn the Pot clockwise 3-4 more turns. This should result in a Flame Failure and we will have to start the process over again. If it does not result in a Flame Failure, then continue turning the Pot clockwise until the unit goes into Flame Failure.
- If the "ABOVE HIGH" LED is not lit, the High Trip Point is above the current Pilot Signal. The action here is to lower the High Trip Point to the current Pilot Signal level, then add some dead band.
- Turn the 'HIGH ADJUST' Pot counter clockwise slowly until the "ABOVE HIGH" LED lights. Pause. Continue turning the Pot counter clockwise two (2) full turns to add the dead band.
- The unit should be calibrated and ready to go.

FGI 100 Troubleshooting

The entire front panel LEDs are off:

1) Check power connections.
2) Unit may be in sleep mode. Press a front panel push button once. If the LEDs come on, the unit was in sleep mode. Remove jumper J4 if 'Sleep' Mode is not wanted.
3) Check for master system lockouts. (Some systems will remove power to the FGI 100 for burner shut down). Reset master system if required.

If there is a 'Bad Sensor' error (All Pilot Signal LEDs flashing):

1) Check thermocouple connections. If all connections are okay, the thermocouple or the extension wire may be bad.

Pilot burner lights okay but Pilot Signal does not increase in value. There is no faulty probe indication.

1) Suspect the thermocouple probe or extension wire to be shorted outside the pilot flame. This will give an alternate thermocouple junction that will not change with pilot flame.

Pilot burner lights okay and the pilot signal rises to about 200 degrees C, then suddenly goes into 'Faulty Probe'.

1) Suspect the thermocouple wires to be connected in the reverse polarity.
2) If the polarity is correct, suspect a ground loop on the thermocouple wires (ie: shield grounded on both ends). Ground only one end of shield.

In 'MANUAL' the pilot lights ok, the Pilot Signal rises above the Low Trip Point (Pilot Proved) and the main burner is turned on with the Switch Main push button. When the FGI 100 is set into 'AUTO' the main burner shuts down.

1) The Pilot Signal has not reached the High Trip Point and in 'AUTO' the burner cannot run until the High Trip Point is reached. Either adjusts the pilot flame, probe position or re-calibrate the High Trip Point.

Burner Controls Thermocouple

Extend thermocouple probe 2” beyond nozzle and bend 10% toward center

3/8” gap between electrode tip and nozzle. Apiece of 3/8” instrument tubing should ‘snap’ through the gap

Do not overtighten Swagelok fitting. Should be just tight enough so probe cannot move.

NOTE: If there are no outside slots on the nozzle then bend or place the electrode tip at the end of the nozzle while still maintaining a 3/8” gap.

Ensure silicone boot is pushed on fully

Using a tie-strap on the cable, try to maintain a slight loop on the ignition cable.

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Figure 1.1

Burner Controls Terminal Card

FGI 100 - T Terminal Card

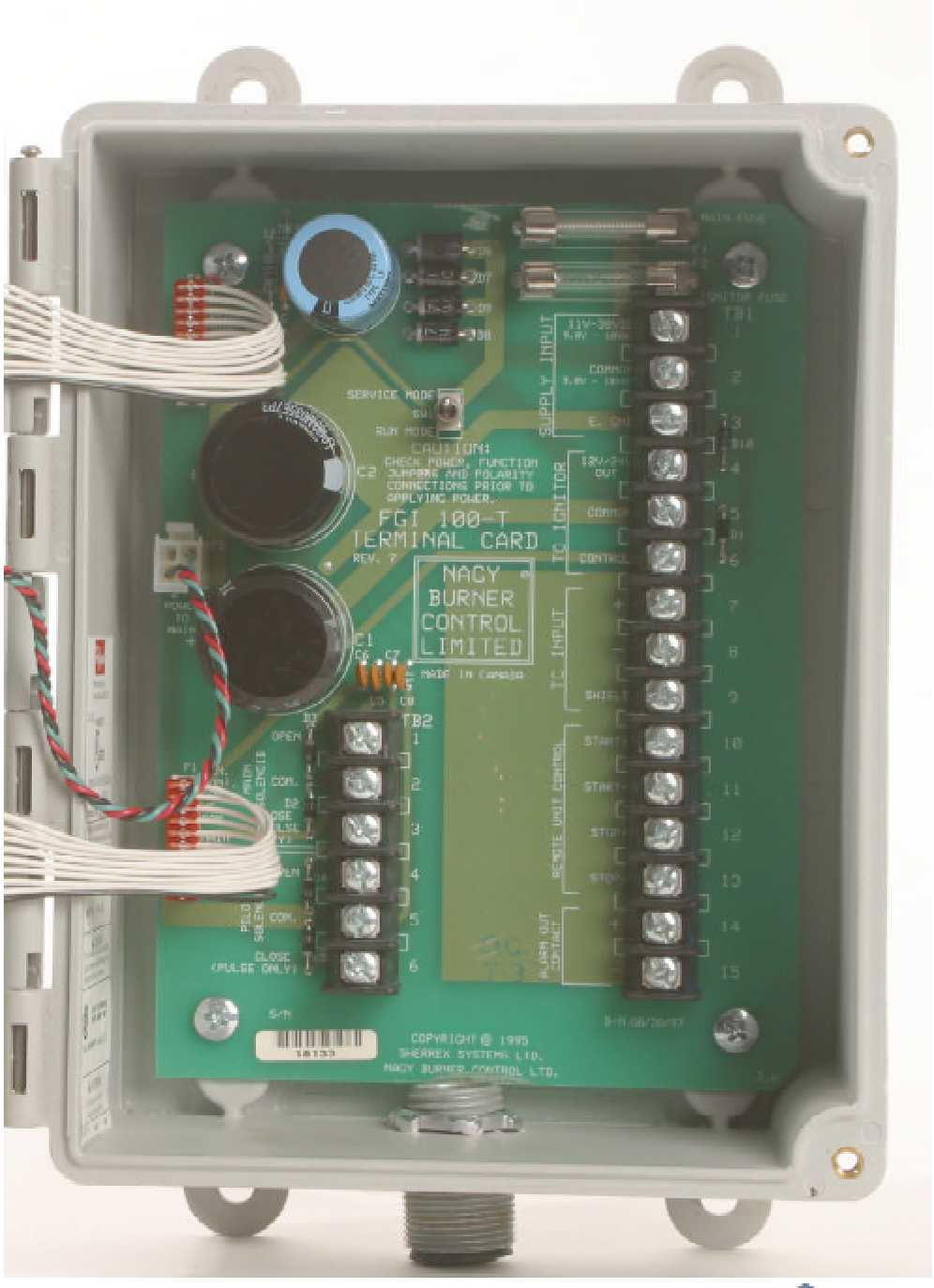

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Figure 1.2

Burner Controls Product Keypad

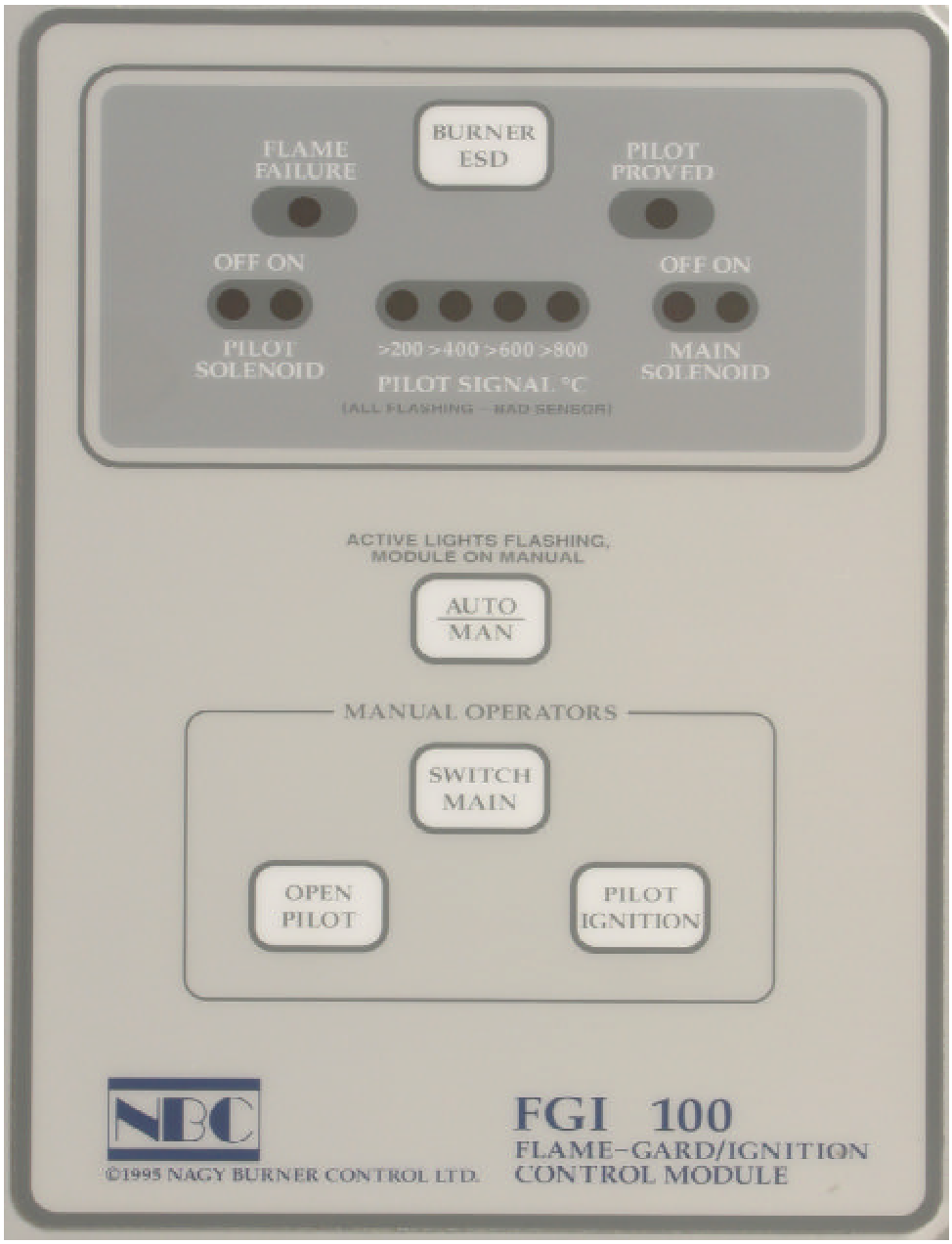

Figure 1.3

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Burner Controls System Hook Up

FGI 100
Ignition Control Module

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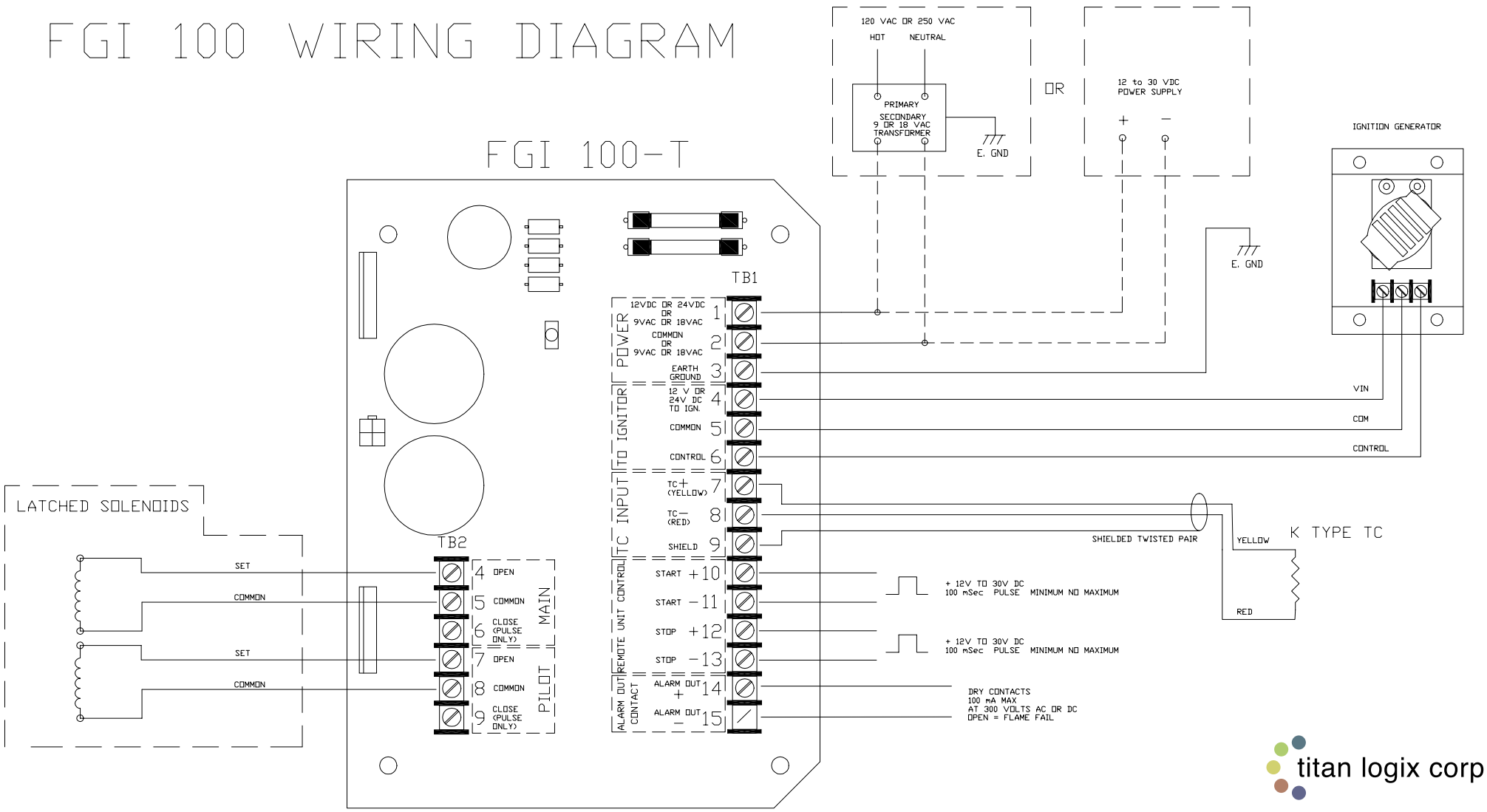
Figure 1.4

FGI 100 WIRING DIAGRAM



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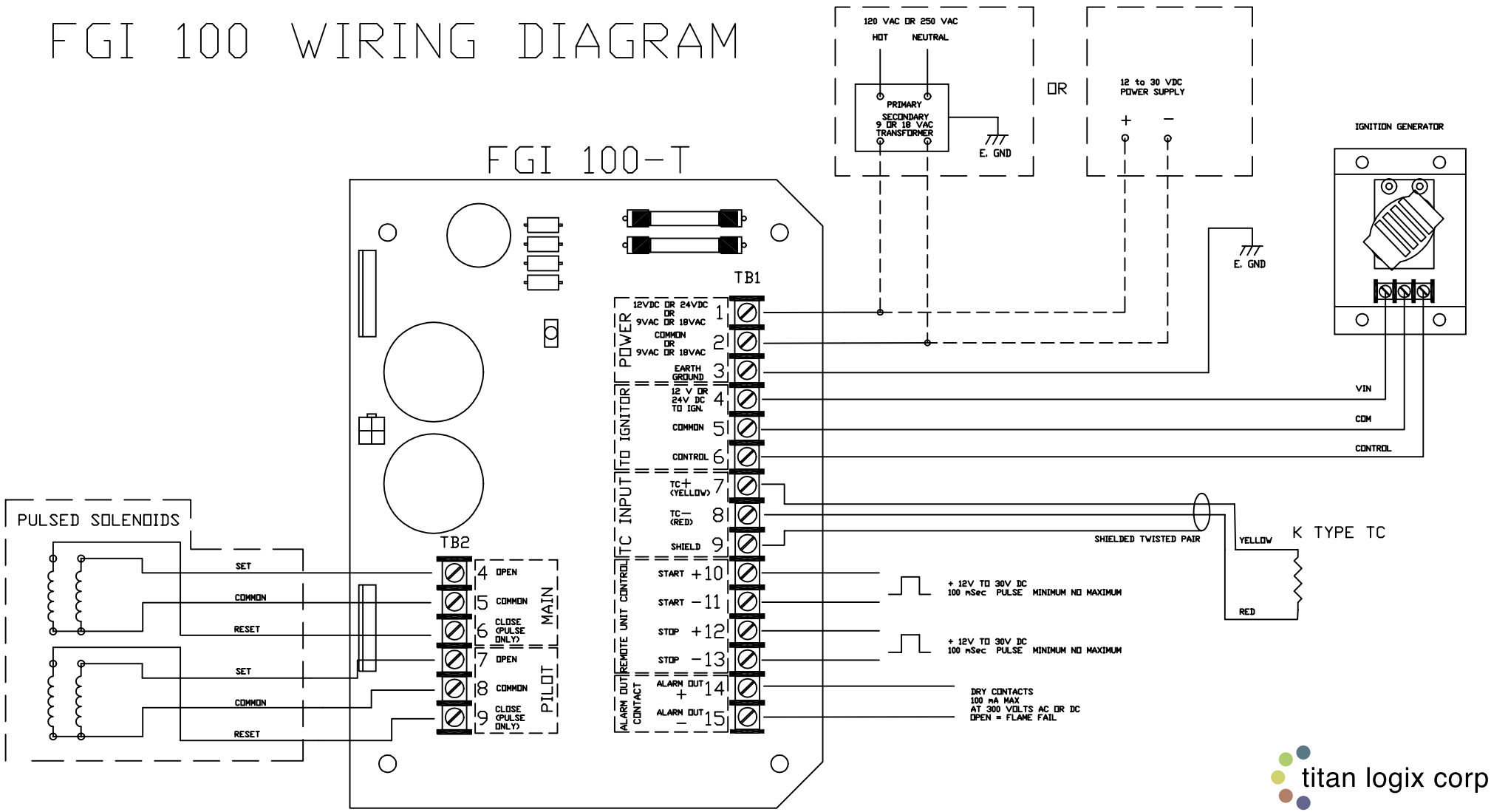
FORMERLY NAGY BURNER CONTROL

FGI 100 WIRING DIAGRAM



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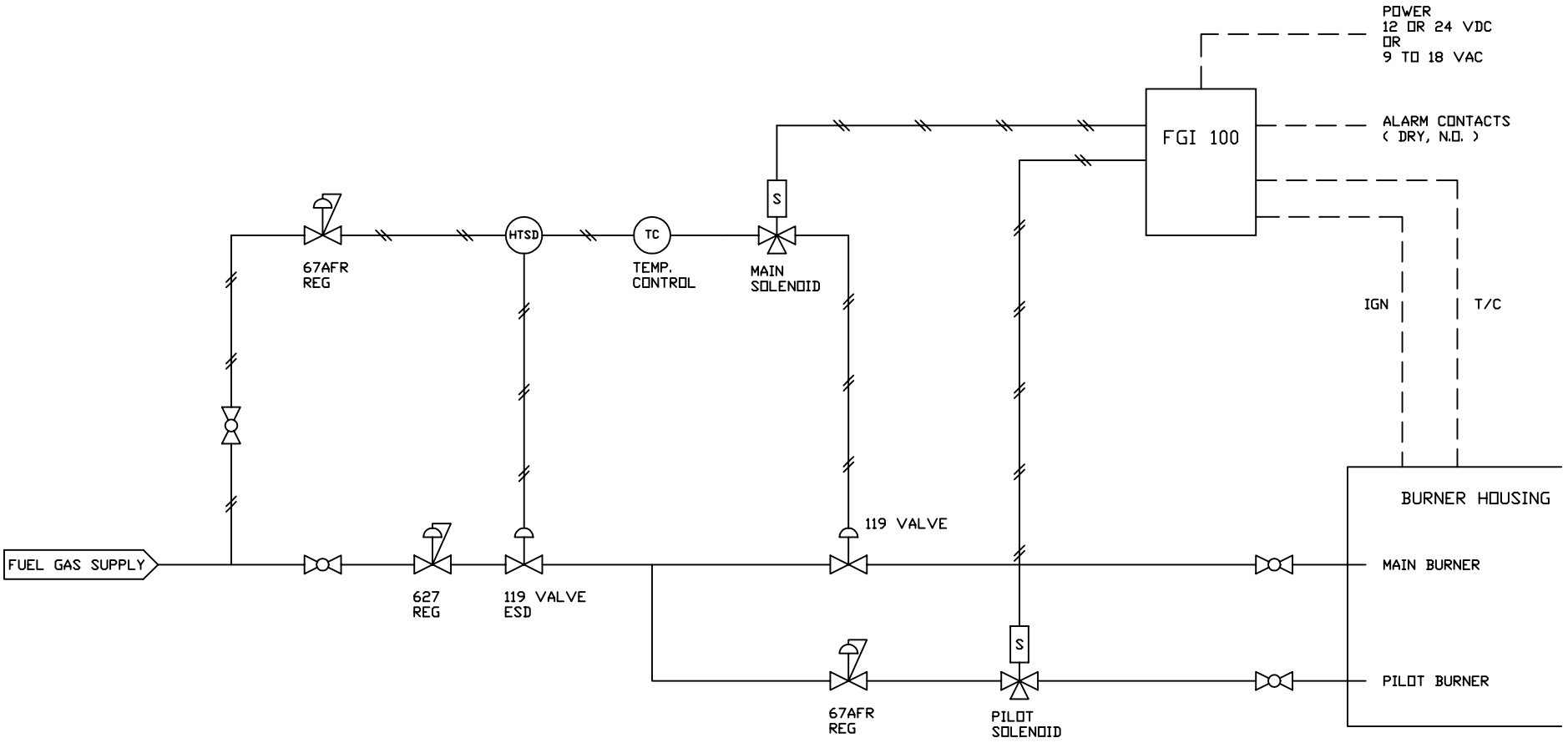
FORMERLY NAGY BURNER CONTROL



REV	DESCRIPTION	BY	DATE

DIMENSION UNITS: INCHES [mm]
TOLERANCES EXCEPT AS NOTED
.X ±0.05 125 RMS
.XX ±0.01 63 RMS
.XXX ±0.005 32 RMS
ANGLES ±1°
PROJECTION

WEIGHT
MATERIAL
FINISH

SCALE NA
DESIGN CHK
DRAWN XX CHK
DATE 13JUL99
FILE PNID3

titan logix corp.
FORMERLY NAGY BURNER CONTROL
TEL: 780-462-4085

DWG. TITLE
SINGLE BURNER FUEL GAS CONTROL

PART NO. PNID3
REVISION
SHT 1/1