

Product Manual

9606

Pushbutton Station for Fuji Electric N Series Programmable Controller

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1.0 Introduction

The 9606 is a 16 switch, push-button/selector switch panel (PB/SS). Each of the sixteen membrane switches can be configured as a momentary Push-button or a two position selector switch, utilizing a push on/push off method. Sixteen tricolor Light Emitting Diodes (LED) are also provided. Each LED can be individually controlled to illuminate Green, Amber or Red.

The 9606 communicates directly with the Fuji Electric N series programmable controller through its RS-485 communication port, eliminating the need for I/O modules and discrete wiring.

2.0 Operating the 9606

The 9606 has two operating modes, **mode B** and **mode A**. **Mode B** controls the LEDs as an integral part of the switch function. That is, when a switch is pressed its associated LED will light to confirm the selection. **Mode A** allows the PLC to control the tricolor LEDs independent of the switches. Both modes may provide a watchdog timer reset which allows the processor to detect a loss of communications.

2.1 Switch Image File

A group of M type internal relays must be reserved within the PLC for use by the 9606. This group of bits is called the Switch Image File. The Switch Image File will provide a means for information to be exchanged between the 9606 and the PLC's application program. By using the bits in the Switch Image File, the 9606's switches can be monitored and its LEDs can be controlled from within the application program.

! The Switch Image File number is assigned using the 9606's Setup Mode (Section 3.0).

Switch Image File for Operating Mode B

In Mode B, the Switch Image File holds two 16-bit internal relay words, the Switch Image Register and the Configure Register, as shown below. The table, assumes the Switch Image File is number M05.

	9606's Switch Number															
	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Switch Image M05 bit#→	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Configure M06 bit#→																

Example: Switch 9 on the 9606 will control internal relay M058.

Switch Image File for Operating Mode A

In Mode A, the Switch Image File holds five 16-bit internal relay words (i.e. 3 LED control registers, in addition to the Switch Image, and the Configure registers) as shown below. In the table, assume the Switch Image File is number M1F.

	9606's Switch Number															
	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Green LEDs M1F bit#→																
Amber LEDs M20 bit#→																
Red LEDs M21 bit#→	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Switch Image M22 bit#→																
Configure M23 bit#→																

Examples: Switch 9 on the 9606 will control internal relay M228.
 Internal relay M210E will turn LED 15 red when energized.

2.2 Switch Image bits, Mode B

The switch image bits, within the Switch Image File, will be used to indicate the status of the 9606's switches. The function of the switch image bits depends on how the switch is configured, i.e. push-button or selector switch.

Push-button: When a switch is not being pressed, its image bit will be de-energized (0, off) by the 9606. Its corresponding LED will be off. When a switch is pressed, its image bit will be energized (1, on) by the 9606. Its corresponding LED will light red.

Push-button truth table

Switch	Image Bit	LED
Open	0	Off
Pressed	1	Red

Selector: The 9606 will control the status of a selector switch using a read-modify-write procedure. When the switch is pressed it will first read the status of the switch image bit, complement it, then write it back to the PLC. The corresponding LED will light Green if its image bit is currently off and Red if the bit is on.

Selector switch truth table

Switch	Image Bit	LED
Open	No Change	If bit = 0 = Green If bit = 1 = Red
Pressed	If 0 → 1	Red
	If 1 → 0	Green

2.3 Switch Image bits, Mode A

The switch image bits perform the same function in Mode A as they do for Mode B (described above). The difference for Mode A is that the 9606 will not control its LEDs based on the status of the switch image bits. The LED's must be controlled by the PLC's application program, using the Green, Amber, and Red LED bits.

2.4 Green/Amber/Red LED bits, Mode A only

In operating Mode A, the PLC's application program will control the 9606's LEDs, using the Green, Amber, and Red LED bits in the Switch Image File. To turn on a given LED a particular color simply set the proper color bit. For example, to turn on LED number one, green, set bit 0 in the Green LED register. Similarly, to make that LED amber or red, set bit 0 in the Amber or Red register.

If a given LED is assigned to be more than one color, a priority system is employed to resolve the conflict. In this priority system, red is highest priority, then amber, and finally green is the lowest. If two or more colors are in conflict, the highest priority color (of the bits in conflict) will be used.

For a given LED to be off, all three of its color bits must be 0.

2.5 Switch Configure bits

Each of the 9606's 16 switches can be individually configured as a push-button or selector switch. Each one of the Switch Configure bits will configure one of the 9606's switches. If a Configure bit is zero (0) the corresponding switch will operate as a momentary push-button. If a Configure bit is one (1) the corresponding switch will operate as a push on/push off selector switch.

0 = Momentary (push-button) switch. 1 = Selector switch (push on/push off).

2.6 Watchdog Timer

The 9606 offers the ability to create a communication watchdog timer in the PLC's application program. It will work like this: You must program a free running timer into the application program; set a preset value of about ten (10) seconds for most applications. Then give the 9606 the address of this timer (this can be assigned using the Setup Mode). The 9606 will write zero to the accumulator of this timer on a regular basis; therefore the timer will not be able to reach its preset value as long as the 9606 is communicating with the PLC. If the watchdog timer ever times-out, you will know that communication has been interrupted, and you can take whatever action is appropriate.

- ! The watchdog timer function is optional. It must be selected by setting a valid timer address to the Watchdog Timer Variable in the 9606's Setup Mode. A timer number of zero will disable this feature.
- ! The timer number can be assigned from T001 through D255.

In most applications the watchdog timer function will be very important. Keep in mind that the PLC's application program will be making decisions based on the status of the bits in the Switch Image File. If the 9606 cannot communicate with the PLC, the data in the Switch Image File may not be valid.

3.0 Setup Mode

The 9606's Setup Mode allows you to configure the unit for a particular application. The Setup Mode must be used to define:

- ! Switch Image File number.
- ! Watchdog Timer number.
- ! Operating Mode (A or B).

The Setup Mode will be activated when the 9606 is powered up with **DIP switch 4 ON**. This condition is only tested at power up, so turning the switch on after power up will NOT activate the Setup Mode.

The Setup Mode will allow you to enter specific operating parameters. The information that you enter will be saved in nonvolatile memory (EEPROM). This means that you only have to configure the 9606 once (the Setup data will be maintained even if power is removed), but you can change the configuration as often as you need to.

DIP switch 4 actually controls the write enable line to the EEPROM. So, when switch 4 is on, the EEPROM can be changed; when switch 4 is off, the EEPROM cannot be changed. Switch 4 should be kept off whenever the 9606 is not in the Setup Mode. This will assure that the 9606's configuration data is safe.

3.1 Using the Setup Mode

Upon entry into the Setup mode, the display will be all amber, then one-by-one the LEDs will turn green. This distinctive display pattern will act to confirm the Setup mode selection.

Once Setup Mode is selected, the 9606 will use its LEDs to indicate the current value of the assignable parameters, and its switches may be used to change values. The switches are assigned as follows:

- 1 = Switch Image File number.
- 2 = Watchdog Timer number.
- 3 = Operating Mode: Amber = Mode B (LEDs controlled by 9606).
 Green = Mode A (LEDs controlled by PLC).

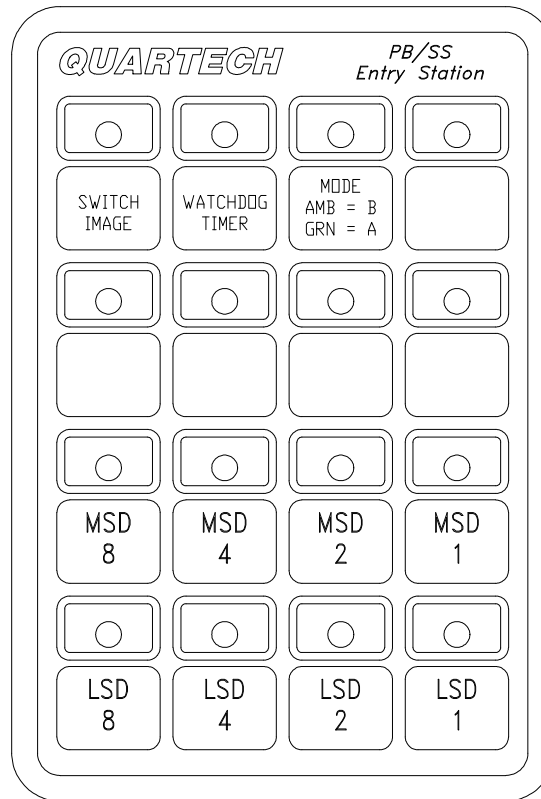
The last two rows of LEDs will be used to display the current value of the Switch Image File number or the Watchdog Timer number, depending on which one is selected. The value will be displayed as two hexadecimal digits.

Example:

Perhaps the best way to describe the process of changing the Setup parameters is with an example: To change the Switch Image File number, the operator would:

1. Turn on DIP switch 4. Then apply power to the 9606, to enter Setup Mode. Notice how the last two rows of LEDs are used to display the current value of the parameter. The value is coded as a two digit hex number.
2. When LED 1 is amber, the Switch Image File number will be displayed in hex. If you want to change the number, simply use the last two rows of keys to toggle the bits of the hex number. A green LED means the bit is zero (0); a red LED means the bit is one (1). You may press as many keys as needed to make up the desired number. Then press the [1] key again to enter this new value into memory. If you don't press the [1] key a second time, the changes will not be saved.
3. If your entry is accepted, the last two rows of LEDs will flash green for a few seconds. If there is a problem with your entry, the last three rows will flash red. The entry will be rejected if you attempt to save a number that is out of range.

Figure 1: Setup Mode Switch Assignments.



MSD = Most Significant Digit, LSD =
LED Green = 0, LED Red = 1

Least Significant Digit

Binary to Hexidecimal conversion table

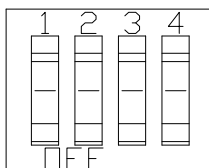
0000 = 0	0100 = 4	1000 = 8	1100 = C
0001 = 1	0101 = 5	1001 = 9	1101 = D
0010 = 2	0110 = 6	1010 = A	1110 = E
0011 = 3	0111 = 7	1011 = B	1111 = F

Appendix A: Error Codes

Error Signal	Description	Possible Cure
LEDs 1 - 16 Amber Flash	Communication Time-out. The PLC did not reply to a message from the 9606.	Check the 9606's power supply voltage, and the communication cable. A drawing of the cable is provided in Appendix C.
LEDs 1 - 16 Green Flash	EEPROM Checksum Error.	The Setup parameters must be re-programmed using the 9606's setup mode. Make sure DIP switch 4 is turned OFF while communicating with the PLC.
LEDs 1 - 4 Red, 5 - 12 Amber, 13 - 16 Red, Flash	EEPROM Write Error.	Make sure DIP switch 4 is turned ON while in Setup mode.
LED's 1 - 8 Red, 9 - 16 Green Flash	Basic Assurance Test failure.	Check power supply voltage. The 9606 must be powered by 5.0 volts DC.

Appendix B: DIP Switch

A four element DIP switch is accessible through a hole in the rear cover of the 9606. The function of each switch is detailed below.



Switch 1: This switch enables line termination for the RS-485 receiver circuit in the 9606. It can normally be set to the off position unless the 9606 is located a long distance from the PLC.

Switch 2: Not Assigned

Switch 3: Not Assigned

Switch 4: This switch enables Setup Mode. See Section 3 for details.

Appendix C: Installation

The 9606 is designed to be mounted in the door of an enclosure or on an operators console for ease of use. A template is provided to assist in the drilling and cutting of the mounting holes for the unit.

Care should be taken to protect the unit from metal chips and conductive particles. Failure to protect the unit may cause failure when power is applied and may void the warranty.

A minimum clearance of six inches should be kept between the unit and any other device that generates heat. In the event that the internal enclosure temperatures periodically exceeds 60 Deg. C (140 Deg. F), fans or a purge air system should be used to increase the air flow and eliminate "Hot Spots" that occur within the panel.

Electrical Requirements:

Power to the 9606 must be provided by an external power supply meeting the following requirements:

Output voltage: 5.0 VDC \pm 5% at 30 mV max. ripple.

Output current: 450 mA (minimum).

Quartech Model 8552 power supply is an excellent choice for most applications.

Wiring Considerations:

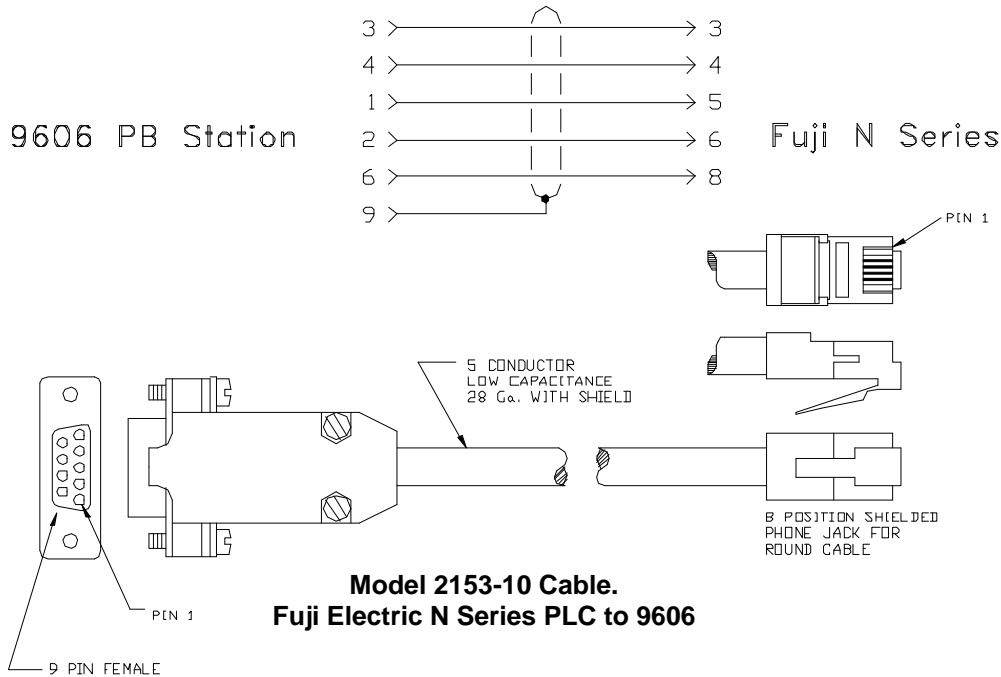
Care should be taken when routing the 5 VDC power supply cable and the communication cable. Follow these guidelines for a trouble free installation.

- ! The power supply should be mounted as close as possible to the 9606. If the 9606 is to be mounted a long distance from the PLC, the power supply should be mounted local to the 9606 to allow short supply cables.
- ! Use at least 16 AWG wire for the 5 VDC power supply cable. Use 14 AWG if the cable is to be longer than 10 feet. Do not make the power supply cable longer than 20 feet.
- ! Keep the cables away from AC power lines. Keep the cables at least one foot from 120 VAC lines, and at least two feet away from higher voltage lines. This especially applies to the communication cable.
- ! If the cables must cross AC power lines, cross them at right angles.
- ! If you route the cables through conduit, the conduit should contain only other communication cables or low voltage DC signals. Do not run the cables in conduit that contains AC power lines.
- ! Keep the cables away from sources of high energy fields such as arc welders, AC motors, motor starters, servo controllers, generators, induction heaters, and transformers.

Environment:

Operating Temperature: 0°c to 60°c
 Storage Temperature: -40°c to 85°c
 Humidity: 10% to 95% non-condensing
 Vibration: 0.5mm displacement (X,Y,Z axis), 10-55Hz
 Shock: 40G

Communication Cable:



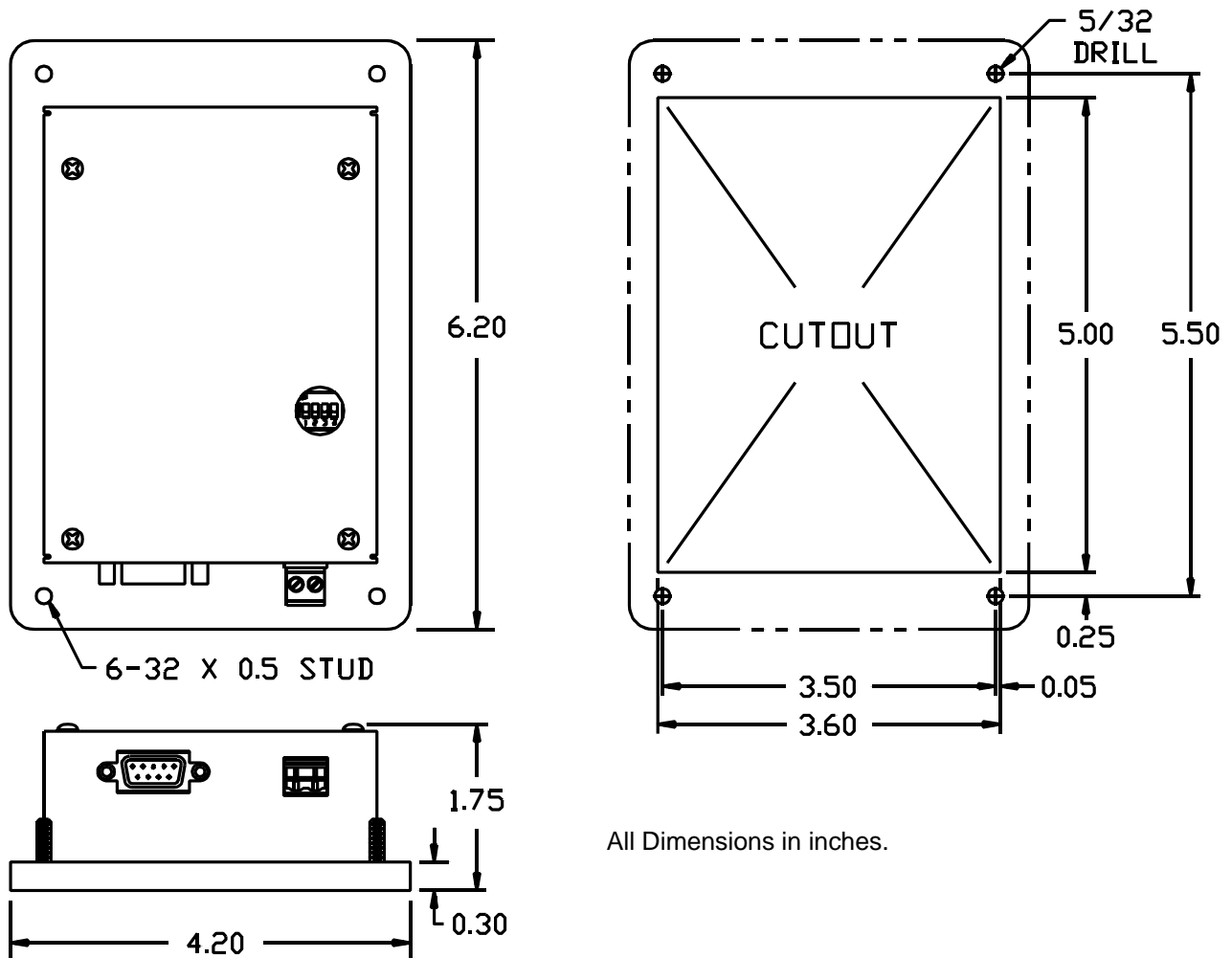
Legend Tags:

The 9606 allows the user to customize the legend area beneath each LED. A pocket between the layers of the polycarbonate is accessed by peeling the gasket back from the face plate. The pocket extends completely across the face plate to aid in removal of the tags.

A sheet of blank legend strips has been included. The area for customizing will allow three lines by nine characters of type (12 cpi). The strip area measures 4 x 0.7 inches (0.01 inch max. thickness).

The 9606 is gasketed for NEMA 12 panel applications. However, under high humidity conditions it may be desirable to seal the gasket to the polycarbonate face plate. This may be accomplished by using either a black RTV sealant or LOCTITE 403 gel adhesive. Use of the LOCTITE will make the seal permanent, where as the RTV can be peeled off if desired.

Mechanical Dimensions:



All Dimensions in inches.

