Flexible System Controller (FSC)

Overview

The FSC-120 is a general purpose programmable logic controller that is programmed with function block logic. A single FSC can be used to control a single device or process, or multiple FSC's can be networked together for coordinated distributed control of larger systems.

A single FSC controller, or node, contains:

- 24 Digital Inputs
- 10 Relay Outputs
- 8 Analog Inputs
- 3 Analog Outputs

Up to ten FSC nodes can be linked together using the hardened, redundant, isolated, masterless Preferred NodeNet communication network. Both networks communicate continuously. If one network goes down (broken wire, shorted terminal, etc.) the other network communicates with no loss of function. Additionally, if any node fails, all other nodes continue to function.

Network communication between nodes eliminates the need to run numerous lines and low voltage wires between devices or control panels.

Each FSC node can be connected with a color touchscreen HMI for setup and operator interface.

Node Net Operation

The FSC has redundant NodeNet Communication Ports (A & B) that continuously communicate between all FSC controllers wired in parallel (up to 10 FSC's maximum). All of the information from all of the FSC's will travel through both cables to all of the nodes. Both cables are always active and are electrically isolated at each node.

Address Selection

The FSC has a 10 position address dial which can manually address each FSC. To select an address, turn the dial until the arrow is pointing to the address to be used. The first FSC in line shall always be set at address zero (factory default), and addresses must be in consecutive order without skipping numbers.

Easy Programmability

The FSC features a USB programming port for writing configurations to the controller with the FSC Edit software. The Preferred-Draw can also be programmed using the available SD card slot (no laptop required).

Modbus RS-485 Communication

The FSC communicates to the OIT the messages and statuses of the FSC via RS-485. Additionally, the FSC controller can communicate via Modbus to building automation systems or energy management systems.

Features

- Node Net Operation
- Easily Programmed
- Address Selection
- Modbus RS-485 Communication

Advantages

- Reduced Field Wiring
- Reduced Per Project Programming
- Color Touchscreen HMI
- Building Automation System Interface

FSC - Flexible System Controller terminal blocks

Specs found here

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Application Example

Reduced Field Wiring

In this application example, FSC controllers are used to control a duplex pump set, fill station, filtration system, and six day tanks. Instead of pulling up to 6-10 conductors from each day tank back to a centralized controller, these 6-10 wires are landed locally at the day-tank-mounted FSC controller. Each FSC controller is linked via dual redundant cables.

Reduced Per Project Programming

In this example, the FSC programs for the day tank controllers, filtration controllers, and pump set controllers are standard programs from a library of Preferred FSC programs. The Preferred D4A tank gauges are provided pre-programmed. Job-specific information for the individual controllers and tank gauges is entered during field commissioning. Standard programs are thoroughly debugged and used over and over again on numerous projects.

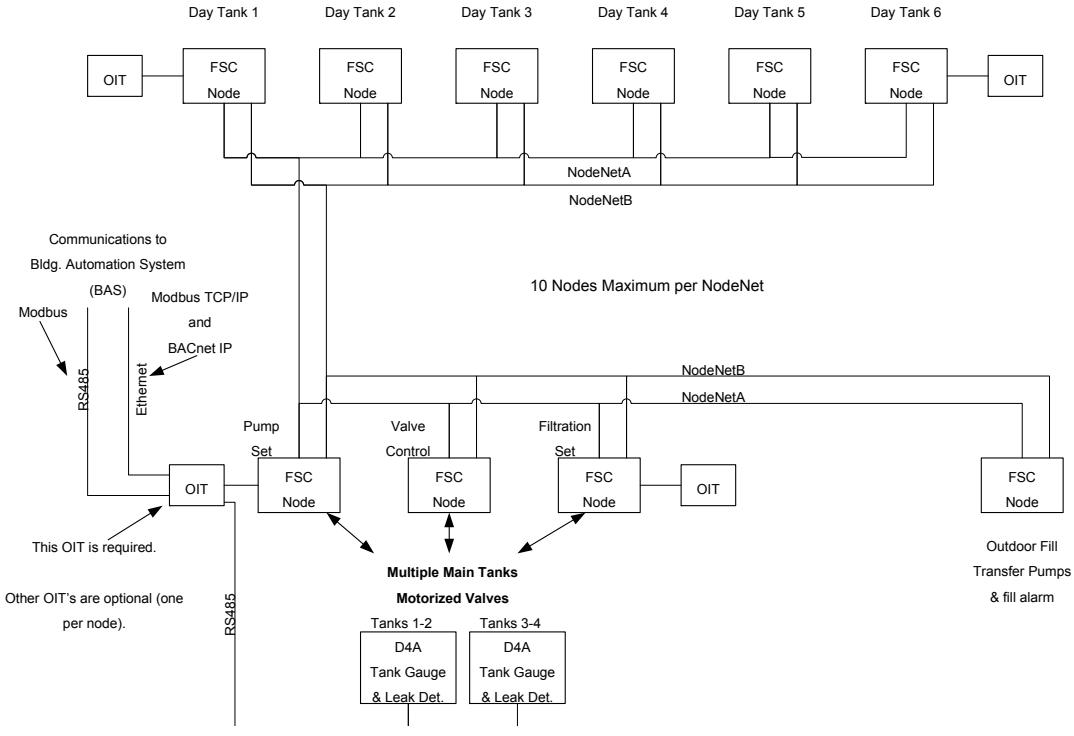
Color Touchscreen HMI

Each of the FSC controllers can be provided with a 4" color touchscreen Operator Interface Terminal (OIT). The touchscreens can be used to configure the controllers and provide operating and trouble-shooting information for service technicians and operators. Examples of touch screen graphics pages are shown on the following page.

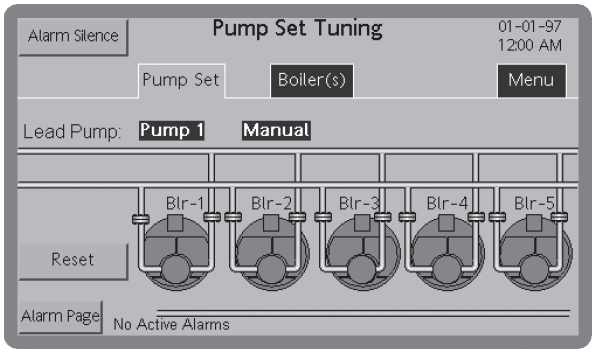
Building Automation System Interface

Each of the FSC controllers has Modbus address registers assigned to each of the useful control parameters. This data is shared among all controllers via the redundant NodeNet network. A 4" OIT attached to one of the FSC controllers acts as a gateway and provides Modbus RS-485, Ethernet, or BacNet IP communication of all Modbus register addresses in all the connected FSC controllers to an external building automation system or Preferred SCADA system.

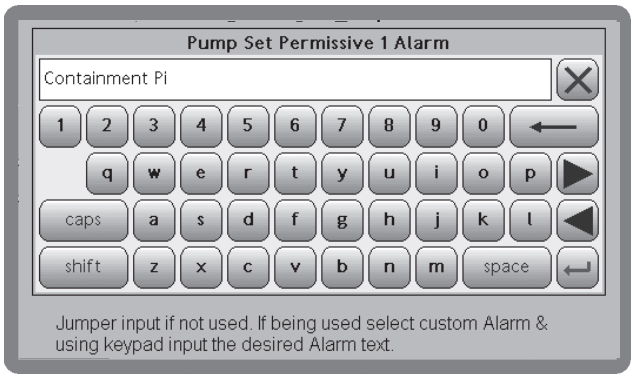
FSC = **F**uel **S**ystem **C**ontroller



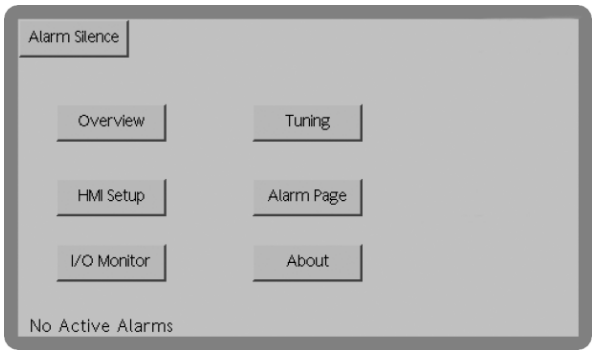
Ten FSC controllers in an emergency generator application with six day tanks, two bulk storage tanks, duplex pump set, filtration system, and interface to a building automation system.



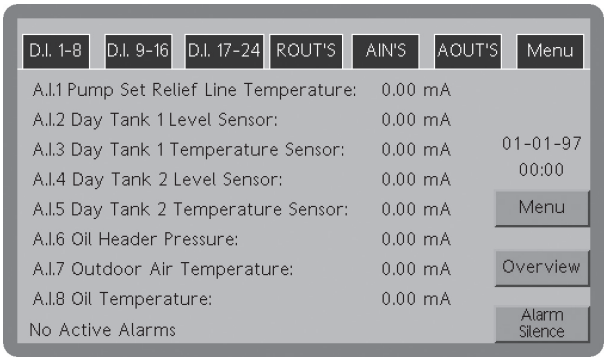
Typical overview screen on the optional 4" Color Touchscreen provides status of controlled equipment and active alarms.



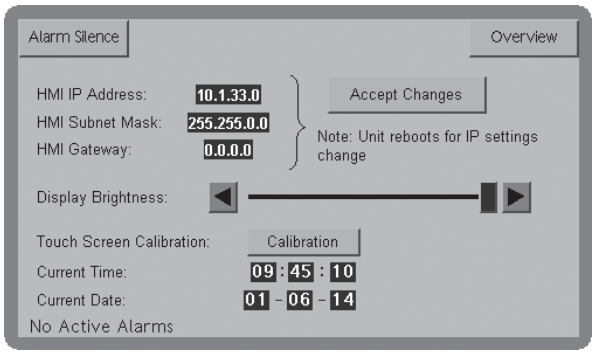
Text editor screen allows users and technicians to input custom messages for each application or jobsite.There are no error codes or diagnostic codes--just plain English.



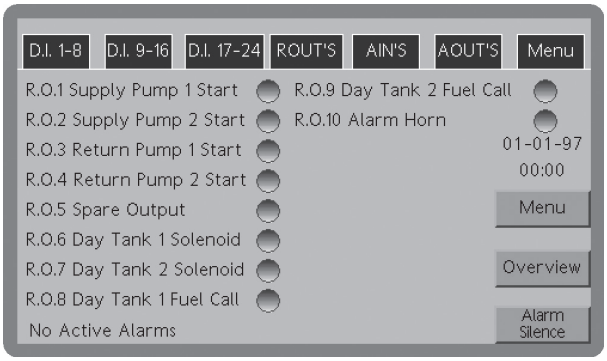
Typical main menu screen used to navigate between overview, setup, alarm, and other screens.



Typical analog input screen used for setting up engineering units, troubleshooting wiring, and monitoring current readings. I/O can be viewed from any other Node with an OIT-4K2 touchscreen.



OIT setup screen allows the user to input the screen's IP address, set the time and date, and change screen contrast.



Typical relay output screen helps troubleshoot controlled devices.

Flexible System Controller (FSC)

Terminal Descriptions

Ordering Info:

- FSC-120
- SD Card

Line Voltage Terminals

Terminal	Name	Description
L, N, G		120VAC power supply for FSC-120 internal use.
1 - 24	DIN ch. x	120 VAC Discrete Inputs, Channels 1-24, Terminals 1-24, optically isolated. 120VAC Hot for DIN inputs supplied and fused externally. All DIN channels internally connected to FSC-120 “N” terminal for current return.
25	C	Relay Output channels 1-5 Common terminal, 10A max
26	NO	Relay Output ch. 1 SPST NO, 2A / 250 VAC
27	NO	Relay Output ch. 2 SPST NO, 2A / 250 VAC
28	NO	Relay Output ch. 3 SPST NO, 2A / 250 VAC
29	NO	Relay Output ch. 4 SPST NO, 2A / 250 VAC
30	NO	Relay Output ch. 5 SPST NO, 2A / 250 VAC
31	NC	Relay Output ch. 6 SPDT, 10A, 1/2 HP 120/250 VAC
32	C	
33	NO	
34	NC	Relay Output ch. 7 SPDT, 10A, 1/2HP 120/250 VAC
35	C	
36	NO	
37	NC	Relay Output ch. 8 SPDT, 10A, 1/2 HP 120/250 VAC
38	C	
39	NO	
40	NC	Relay Output ch. 9 SPDT, 10A, 1/2HP 120/250 VAC
41	C	
42	NO	
43	NC	Relay Output ch. 10 SPDT, 10A, 1/2HP 120/250 VAC
44	C	
45	NO	

Low Voltage DC Wiring (Terminals 101-134)

Term.	Name	Description
101	24 VDC +	Power for external Touchscreen or other loads. 180 mA max
102	24 VDC - / DC Common	
103	RS485 +	Com0, RS485, Reserved for Touch Screen Interface
104	RS485 -	
105	DC Common	
106	Shield Tie Point (Isol.)	
107	RS485 + / RS232 Tx	Com1, RS485/RS232, Reserved for Future Use.
108	RS485 - / RS232 Rx	
109	DC Common	
110	Shield Tie Point (Isol.)	
111	RS485 + (Isol.)	NodeNetA, RS485, Node-to-Node Communications Only
112	RS485 - (Isol.)	
113	NetA Isolated. Common	
114	Shield Tie Point (Isol.)	
115	RS485 + (Isol.)	NodeNetB, RS485, Node-to-Node Communications Only
116	RS485 - (Isol.)	
117	NetA Isolated. Common	
118	Shield Tie Point (Isol.)	
119	4-20 mA Output +	Analog Output ch. 1
120	DC Common / Shield	
121	4-20 mA Output +	Analog Output ch. 2
122	DC Common / Shield	
123	4-20 mA Output +	Analog Output ch. 3
124	DC Common / Shield	
125	2 wire 4-20 mA Input	Analog Input ch. 1, 22 VDC/30 mA max for 2 wire xmtr, or other load
126	Switched 22VDC +	
127	2 wire 4-20 mA Input	Analog Input ch. 2, 22 VDC/30 mA max for 2 wire xmtr, or other load
128	Switched 22 VDC +	
129	DC Common / Shield	Connect AIN 2 wire 4-20 mA xmtr shield here
130		
131	2 wire 4-20 mA Input	Analog Input ch. 3, 22 VDC/30 mA max for 2 wire xmtr, or other load
132	Switched 22 VDC +	
133	2 wire 4-20 mA Input	Analog Input ch. 4, 22 VDC/30 mA max for 2 wire xmtr, or other load
134	Switched 22VDC +	

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Terminal Descriptions

Low Voltage DC Wiring (Terminals 135-148)

Term.	Name	Descrition
135 136	DC Common / Shield	Connect AIN 2 wire 4-20 mA xmtr shield here
137 138	2 wire 4-20 mA Input Switched 22VDC +	Analog Input ch. 5, 22 VDC/30 mA max for 2 wire xmtr, or other load
139 140	2 wire 4-20 mA Input Switched 22VDC +	Analog Input ch. 6, 22 VDC/30 mA max for 2 wire xmtr, or other load
141 142	DC Common / Shield	Connect AIN 2 wire 4-20 mA xmtr shield here
143 144	2 wire 4-20 mA Input Switched 22VDC+	Analog Input ch. 7, 22 VDC/ 30 mA max for 2 wire xmtr, or other load
145 146	2 wire 4-20 mA Input Switched 22 VDC +	Analog Input ch. 8, 22 VDC/ 30mA max for 2 wire xmtr, or other load
147 148	DC Common / Shield	Connect AIN 2 wire 4-20 mA xmtr shield here

Mechanical	
Size:	*10.61" H x 3.50" W x 5.18" D* *(4) .017" Dia. Mounting Holes in 10.11" x 2.40" pattern*
Weight:	*5.5 lbs*

Environmental	
Operating:	*32 to 131 F (0 – 55 C)*
Storage:	*-20 to 150 F (-28 to 65 C)*
Humidity:	*5 – 95% (non-condensing)*
Enclosure:	*NEMA 1*

Communications	
Com0:	*Reserved for Touch Screen Interface* *RS485, Modbus RTU, Device = 1 for all Nodes, 38.4k baud, 8/1/N* *DC common connected to FSC DC common, but isolated from frame ground.* *OIT-4k2 power output: 24VDC/ 180 mA steady state / 250 mA start-up*
Com1:	*Shared Port for USB interface and RS485/ RS232 interface.*
NodeNetA:	*Node-to-Node Communications only.* *Redundant Auto Fail Over: A->B or B->A* *Isolated RS485, Custom Protocol, 38.4k baud NetA data & common is isolated from: NetB, FSC DC common, and FSC frame ground.*
NodeNetB:	*Node-to-Node Communications only.* *Redundant Auto Fail Over: A->B or B->A* *Isolated RS485, Custom Protocol, 38.4k baud NetB data & common is isolated from: NetA, FSC DC common, and FSC frame ground.*
Firmware:	*Upgradeable via SD Memory Card (must be <1GB size)*

Electrical	
Power:	*120 VAC +15/-20%, 40 VA, 50/60 Hz*
Discrete Inputs:	*24 channels* *120 VAC, 12 mA typical* *>70 VAC = ON, <2mA = OFF*
Relay Outputs:	*10 channels* *Ch. 1-5: SPST NO, 2 A/250 VAC each channel One 'common' for all 5 channels*
Ch. 6-10:	*SPDT, 10A, ½ HP 120/250 VAC*
Analog Inputs:	*8 channels* *4-20 mA input, 100 ohm input resistor.* *0.2% accuracy, 13 bit resolution 22 VDC / 30 mA supply for each channel (the control logic enables/disables each 22 VDC supply)*
Analog Outputs:	*3 channels* *4-20 mA, 800 ohm max loop resistance* *0.2% accuracy, 13 bit resolution*

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Suggested Specifications

1. General

Supply a distributed control system composed of up to ten individual microprocessor-based controllers communicating via a redundant masterless digital network. Individual controllers shall be programmed using function block language. Devices mounted in close proximity to each controller shall be hard-wired to the controller's analog inputs, analog outputs, digital inputs, or relay outputs. Multiple controllers shall communicate digitally using a pair of redundant three-wire communication networks. If either communication network loses communication, the other network will resume communication and provide uninterrupted control to the entire network. If any controller, or node, in the network shuts down or stops communicating, the other controllers will continue to operate. The control system logic and calibration data shall be stored in a non-volatile memory that does not require battery backup.

2. Controller Hardware

Each microprocessor controller shall include the following inputs and outputs:

(24) 120 VAC digital inputs
(5) 2 A relay outputs
(5) 1/2 HP (10 A) relay outputs
(8) loop-powered 4-20 mA analog inputs
(3) 4-20 mA analog outputs

Each controller shall include two RS-485 NodeNet communication ports for communicating to the other controllers in the distributed control system. In addition, each controller shall include two RS-485 communication ports for connection to a color touchscreen or other external device.

3. Operating Displays

Each microprocessor controller may be equipped with a 4" color touchscreen Operating Interface Terminal (OIT). The touchscreen communicates to the controller via RS-485 Modbus protocol. The touchscreens shall be pre-programmed at the factory with graphic pages for operation, setup, trouble-shooting, and alarm indication. Each touchscreen shall be capable of displaying information from any of the controllers in the distributed control system. The touchscreens can communicate to an external controller, building automation system, or energy management system via RS-485 Modbus, Ethernet TCP/IP, or BacNet IP protocol.

4. Reliability

The controllers shall communicate using two NodeNet Communication Ports (A & B) that continuously communicate between all controllers wired in series (up to 10 controllers maximum). All of the information from all of the controllers will travel through all of the units. Upon start up, NodeNet A will be the lead communication port, with NodeNet B being the back up. In the event of a loss of communication, NodeNet B will become the lead communication port. If one controller in the network fails, a common alarm will be activated and the other controllers will continue to function.

5. Quality Assurance

The control enclosure shall be manufactured and labeled in accordance with UL508A (CSA C22.2 #14 for use in Canada). Simply supplying UL recognized individual components is not sufficient. The assembled control enclosure, as a whole, must be inspected for proper wiring methods, fusing, etc., and must be labeled as conforming to UL508A. Inspection and labeling shall be supervised by UL or other OSHA approved Nationally Recognized Test Lab (NRTL). Lack of an NRTL certified UL508A wiring methods inspection and labeling will be grounds for control enclosure rejection.