Controllers

Model 353 Process Automation Controller

Introduction

Features & Benefits

- Affords easy integration with and migration to existing systems
- Multiple loop capabilities for indication, control, logic, or sequencing accommodate comprehensive process control needs
- Scalable hardware provides lower entry costs, without limiting future needs
- Full configuration capability via front faceplate push-buttons allows quick field changes without requiring additional tools
- Ethernet networking option provides higher speed, peer-to-peer communications.
- RS485 MODBUS® network connection allows multi-drop wiring for operation, monitoring, troubleshooting, or configuration from a system workstation
- Local Instrument Link (LIL) networking option provides integration with existing systems
- Front panel PC connection accommodates local configuration, monitoring, or troubleshooting using the graphical configuration software
- Removable Real Time Clock/Configuration Board (RTC/CB) option minimizes maintenance and complexity via a simple board replacement technique that stores a complete copy of the control strategy configuration
- Factory Configured Options (FCOs) facilitate fast configuration for common applications
- Password protection provides individual security for various plant personnel
- LonWorks® digital fieldbus provides flexible I/O expansion and reduced wiring costs for continuous and discrete variables
- Hardware designed to support emerging fieldbus technologies for both field and network connections ensures smooth plant integration
- Graphical configuration program provides a choice of function block or ladder logic configuration
- Short case design allows mounting in 12" deep cabinets
- Coated circuit boards ensure reliable operation and environmental integrity

Description

The Model 353 Process Automation Controller is a stand-alone, microprocessor-based industrial controller designed for a broad range of process applications. It can serve as a simple single-loop controller or as a multi-loop controller with complete control and logic functions for a small unit batch or continuous process. The Model 353’s fieldbus and networking options enable it to function as an integral element in a plant system.

Loops are configured for control, sequence, or logic as needed within the Model 353. Each configured loop can have a virtual operator display that is viewed locally using the LOOP button on the faceplate and is mapped to network communication for a plant operator station. Alarm management is handled using the L (Loop) & S (Station) indicator lights along with the priority assignments and flashing options of each alarm.

User defined pushbuttons in each loop can be used for traditional functions, such as Console/Local, External/Internal Switching or individual user requirements, such as Start, Stop or Jog. Multiple variables are displayed on the operator faceplate and viewed using the D button. User defined units assigned to each variable are displayed via the UNITS button. Complete configuration of the Model 353 is available using buttons located behind the flipdown ID door.

A built-in library of preconfigured control strategies (FCOs) enable selection of common basic controller types for quick field set-up. A large selection of reusable function blocks enable simple changes to FCOs or the design of a custom control strategy to meet the needs of specific process control application. The Model 353 Configuration Utility accommodates design, simulation, downloading, uploading, and on-line monitoring capabilities for improved management of controller configurations. In addition, sequencer/logic loops can be configured and monitored on-line in ladder diagram format for those more familiar with this language.
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Specifications

Electrical & Environmental

Power Supply
Standard: 120/240 Vac (85 to 264 Vac); 47 to 63 Hz
Optional: 24 Vdc, +20%, -15%

Power Requirements
25 Watts, 40 VA (max.)

2-Wire Transmitter Power
Voltage: 25 Vdc ±3V
Current: 120 mA, short circuit protected

Hazardous Area Approvals Pending
FM/CSA: Class I, Division 2, Groups A, B, C & D
BASEEFA: Ex N IIC
CE
(Consult Siemens for current approvals)

Ambient Temperature Range
Operating: 32 to 122°F (0 to 50°C)
Storage: -40 to 185°F (-40 to 85°C)

Climate Conditions - IEC654-1
Class B3 - Standard Mounting
Class D1 - Installed per instructions in Class D1 enclosure

Electrostatic Discharge
IEC 801-2

RFI Protection
IEC 801-3

Electrical Transients
IEC 801-4

Net Weight
6 lbs.

Heat Dissipation
80 BTU/Hr.

Scan Time
Varies with configuration: 20 msec (minimum)

Inputs

Analog Inputs (non-isolated)
1-5 Vdc, 4-20 mA with included 250 resistor
MPU Controller Board: Qty 3
I/O Expander Board: Qty 1

Digital Inputs (isolated)
0-1 Vdc OFF, 15-30 Vdc ON
MPU Controller Board: Qty 3
I/O Expander Board: Qty 1

Outputs

Analog Outputs (non-isolated)
4-20 mA into 800 ohms (max.)
MPU Controller Board: Qty 2
I/O Expander Board: Qty 1

Digital Outputs (non-isolated)
Open Collector Transistor (emitter @ station common)
Load Voltage: 30Vdc (maximum)
Load Current: 100 mA (maximum)
Off State Leakage Current: <200 mA @ 30 Vdc
MPU Controller Board: Qty 2

Relay Outputs (SPDT)
Contact Rating: 5A @ 120 Vac, 2.5 A @ 230 Vac, Resistive Load
Minimum Current: 100 mA @ 10 mVdc 150 mA @ 50 mVac
I/O Expander Board: Qty 2

Optional Boards
Local I/O Expander
LonWorks Remote I/O Bus
Local Instrument Link Network
Real Time Clock/Removable Configuration Board
Ethernet Communications

Standard Configuration

Nine of the most common control strategies have been stored in a built-in library and can be selected with a single pushbutton entry. These control strategies, which can be customized to accommodate individual needs, are:

- Single-Loop Controller with Tracking Setpoint
- Single-Loop Controller with Fixed Setpoint
- Ratio Set Controller with Operator Setpoint Limits
- Single-Loop Controller with Operator Setpoint Limits
- Cascade Loop Controller
- Cascade Loop Controller with Operator Setpoint Limits
- Ethernet Set Controller with Tracking Setpoint
- External Setpoint with Fixed Setpoint
- Dual Loop controller
Controllers

Model 353 Process Automation Controller

Function Blocks

Control strategies within the Model 353 are configured using the following function blocks, which are stored in memory. The total number and type of I/O function blocks available in the Model 353 depend on the installed hardware, and when available, can be used as needed within a configured loop. Loop function blocks can be used in the quantities indicated within each loop. Each configured loop can contain one operator display block & one controller block*.

Station Hardware I/O

- AIN1-4 - Analog Input
- AINU1-2 - Analog Input Universal
- AOUT1-3 - Analog Output
- DIN1-4 - Digital Input
- DINU1-2 - Digital Input, Universal
- ROUT1-2 - Relay Output

Ethernet Peer-To-Peer I/O

- AIE01-32 - Analog Input Ethernet
- AOE01-32 - Analog Output Ethernet
- CIE01-32 - Cool Input Ethernet
- DIE01-32 - Digital Input Ethernet
- DOE01-32 - Digital Output Ethernet

LIL Peers To Peer Global Data I/O

- AIL01-99 - Analog Input_LIL
- AOL01-99 - Analog Output_LIL
- DIL01-99 - Discrete Input_LIL
- DOL01-99 - Discrete Output_LIL

Lonworks Remote I/O

- AIP01-25 - Analog Input lev_Percent
- AOP01-25 - Analog Output lev_Percent
- DID1-6 - Digital Input lev_Discrete, 16 Chan.
- DOD1-6 - Digital Output lev Discrete, 16 Chan.
- DIS1-6 - Digital Input_State
- DOS1-6 - Digital Output State

Loop Function Blocks

- A/M - Auto/Manual
- ACS01-99 - ARC Cosine
- ADD01-99 - Addition
- AGA3 - Orifice Metering of Natural Gas
- AGA7 - Measurement of Gas by Turbine Meters
- AGA8 - Compressibility Factors of Natural Gas
- ALARM - Alarm
- AND01-99 - AND Logic
- ASN01-99 - ARC Sine
- ATD01-05 - Analog Trend Display
- ATN01-09 - Arc Tangent
- BATOT - Batch Totalizer
- BATSW - Batch Switch
- BIAS - Bias
- CHR01-99 - Characterizer
- CMP01-99 - Comparator
- COS01-99 - Cosine
- DAM01-99 - Deviation Amplifier
- DIV01-99 - Division
- DNC01-99 - Divide by N Counter
- DTM01-99 - Dead Time Table
- DYT01-99 - Delay Timer
- E/I - External/Internal Transfer
- ESL - Event Sequence Logger
- EXP01-99 - Natural Exponentiation
- EXT01-99 - Exponentiation
- FGT01-99 - Falling Edge Trigger
- GB01-99 - Gain & Bias
- HLD01-99 - Hold
- ID* - ID Controller
- LLO1-99 - Lead/Lag
- LMT01-99 - Limit
- LN01-99 - Natural Logarithm
- LOG01-99 - Logarithm Base 10
- MTH01-99 - Math
- MUL01-99 - Multiplication
- NND01-99 - NAND Logic
- NOR01-99 - NOR Logic
- NOT01-99 - NOT Logic
- ODC* - Operator Display for Controllers
- ODS* - Operator Display for Sequencers
- ODA - Operator Display for Analog
- ODD - Operator Display for Discrete
- ODP - Operator Display for Pushbutton
- ONOFF* - ON OFF Controller
- OR01-99 - OR Logic
- ORSL - Override Selector
- OST01-99 - One Shot Timer
- PB1SW - PB1 Switch
- PB2SW - PB2 Switch
- PB3SW - PB3 Switch
- PCOM - Phase Communication
- PD* - PD Controller
- PID* - PID Controller
- PIDAG* - PIDAG Controller
- PRSEQ - Program Sequencer
- QHD01-99 - Quickset Hold
- RATIO - Ratio
- RCT01-99 - Repeat Cycle Timer
- RLM01-99 - Rate Limiter
- ROT01-99 - Retentive On Timer
- RSF01-99 - RS Flip-Flop
- RTG01-99 - Rising Edge Trigger
- SCL01-99 - Scale
- SEL01-99 - Signal Selector
- SETPT - Setpoint
- SIN01-99 - Sine
- SPLIM - Setpoint Limit
- SRF01-99 - SR Flip-Flop
- SRT01-99 - Square Root
- SUB01-99 - Subtraction
- TAN01-99 - Tangent
- TH01-99 - Track & Hold
- TOT01-99 - Totalizer
- TSW01-99 - Transfer Switch
- XOR01-99 - Exclusive OR Logic
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Accessories

- Graphical Configuration Software (P/N i|config™ Vx.xx¹, Consult Siemens for latest version) Windows® 95/NT™ software for configuration of the Model 353 and creation of the function block diagram. Configurations can be transferred using the built-in front panel connector, the Modbus network, or the LIL network connection or Ethernet.

- Transmitter Power Supply (P/N 15124-1) - Acopian Model B24G210M 24 Vdc 2.0 Amp Power Supply.

- Blank Filler Panel (P/N 15738-168) - Blank unit panel for uniform control room appearance when panel includes space for future controllers.

- Loop Identification Card - Custom printed loop identification for flipdown access door. Up to 5 lines with 24 characters per line can be specified.

- Permanent Instrument Tag - Stainless steel instrument tag permanently attached to the Moore 353 casing. Two lines with up to 15 characters per line can be specified.

¹ x.xx specifies the software's revision number. This will be defined by Siemens as the latest version.
### Controllers

#### Model 353 Process Automation Controller

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Automation Controller</td>
<td>353- ■■■■■■■■</td>
</tr>
</tbody>
</table>

### MPU Controller Board
- 120/240 Vac (85-264 Vac); 47-63 Hz
- 24 Vdc, +20%, -15%

### Mounting Case
- Standard Terminals with Ethernet Connection

### Operator’s Display Panel
- Fixed Analog & Digital Displays

### Expansion Board
- Not Required
- Local I/O Expander (T/C, RTD, Frequency, Relay, ..)

### Option Board A-1 (Remote I/O Communications)
- Not Required
- LonWorks Protocol

### Option Board A-2
- Not required

### Option Board B-1 (Network Communications)
- Ethernet
- Not Required
- Local Instrument Link (LIL)

### Option Board B-2
- Not Required
- Real Time clock/Configuration Board

### Modification Options
- Not Required
- Controller Modified as detailed in order bill of material

### Reserved for Future Use
- Reserved for Future Use

### Design Level
- Design Level A

### Electrical Approval
- Not required
- FM/CSCA Class I, Div. 2, Groups A, B, C, D & CE Compliant
- FM/CSCA Class I, Div. 2, Groups A, B, C, D

*Consult Siemens for current approvals.*

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Ordering data
Controllers
Model 353 Process Automation Controller LonWorks Remote I/O

Introduction

Features & Benefits
- High speed digital fieldbus with peer-to-peer communications between intelligent field devices allows quantity and type of I/O to scale to individual needs
- Star, bus, and loop network wiring options provide quick, cost effective installation
- Free topology network allows for easy system expansion
- The ability to distribute I/O over a fieldbus network.

Description
The Model 353 Process Automation Controller uses LonWorks technology to communicate to remote I/O over a single twisted pair network. By distributing I/O over LonWorks, users can benefit from a digital fieldbus. The Model 353 can be connected to over 100 I/O points. When connecting to discrete I/O, the Model 353 eliminates the need for a small PLC. With the Windows®-based configuration utility, the Model 353 can be configured using ladder logic and function blocks, satisfying the needs of combined continuous and discrete control applications. Connecting to analog I/O expands the number of loops that can be controlled from a single station.

Remote I/O
A variety of LonWorks remote I/O modules are available as shown in the table below.

Table 1 LonWorks Remote I/O Modules

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Module</th>
<th>Current Draw 15V</th>
<th>24V</th>
</tr>
</thead>
<tbody>
<tr>
<td>27005-3</td>
<td>Two 4-20 mA Inputs</td>
<td>50 mA</td>
<td>30 mA</td>
</tr>
<tr>
<td>27005-4</td>
<td>One T/C, RTD Input</td>
<td>41 mA</td>
<td>30 mA</td>
</tr>
<tr>
<td>27005-5</td>
<td>4 DC Inputs (-1 to 1V or -20 to +20mA)</td>
<td>25 mA</td>
<td>20 mA</td>
</tr>
<tr>
<td>27005-6</td>
<td>Same as 27005-5 w/Factory Cal.</td>
<td>25 mA</td>
<td>20 mA</td>
</tr>
<tr>
<td>27005-7</td>
<td>4 High Level DC Inputs</td>
<td>25 mA</td>
<td>20 mA</td>
</tr>
<tr>
<td>27005-8</td>
<td>Same as 27005-7 w/Factory Cal.</td>
<td>25 mA</td>
<td>20 mA</td>
</tr>
<tr>
<td>27005-9</td>
<td>Two 4-20 mA Outputs</td>
<td>100 mA</td>
<td>70 mA</td>
</tr>
<tr>
<td>27005-10</td>
<td>3 Isolated DC Discrete Inputs</td>
<td>29 mA</td>
<td>20 mA</td>
</tr>
<tr>
<td>27005-11</td>
<td>3 Isolated AC Discrete Inputs</td>
<td>26 mA</td>
<td>18 mA</td>
</tr>
<tr>
<td>27005-12</td>
<td>8 Discrete Inputs (0-42V)</td>
<td>36 mA</td>
<td>26 mA</td>
</tr>
<tr>
<td>27005-13</td>
<td>3 Mechanical Relay Outputs</td>
<td>77 mA</td>
<td>50 mA</td>
</tr>
<tr>
<td>27005-14</td>
<td>3 Solid State Relay Outputs</td>
<td>38 mA</td>
<td>26 mA</td>
</tr>
<tr>
<td>27005-15</td>
<td>8 Discrete Outputs (0-42V)</td>
<td>35 mA</td>
<td>26 mA</td>
</tr>
<tr>
<td>27005-16</td>
<td>4 in/4 out Discrete (0-42V)</td>
<td>32 mA</td>
<td>24 mA</td>
</tr>
<tr>
<td>16802-3</td>
<td>16 Discrete Inputs (0-42V)</td>
<td>70 mA</td>
<td>50 mA</td>
</tr>
<tr>
<td>16802-4</td>
<td>16 Discrete Outputs (0-42V)</td>
<td>85 mA</td>
<td>60 mA</td>
</tr>
</tbody>
</table>
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Model 353 Process Automation Controller LonWorks Remote I/O

Specifications

Power Supply
The power requirement for the modules is +10V to 36V. Table 1 shows the current draw when powered with 15V and 24V. Order power supply #27005-24 (115/230 VAC input/24 VDC, 2.1 A) for the necessary input requirement.

Cable Wiring
The Model 353 uses the new Free Topology Transceiver (FTT). The FTT allows the LonWorks network to be wired in a bus or free topology (star, loop, mixed). Free topology simplifies installation, reduces wiring costs, and makes it easy to expand the network. Refer to Table 3 for cable specifications. In the table, the maximum network length depends upon whether the network is wired in a bus or a free topology. Note that FTT can be wired in a bus configuration to achieve longer distances. When wired in a free topology format, there are specific limitations on the distance between nodes. The maximum total length of a free topology configuration is 1640 feet (500m).

Start-Up Kit
In order to connect LonWorks equipment together, each module (node) must be “installed” on a LonWorks network. Up to 64 nodes can be configured on a single network channel. Once the nodes are installed on the network, the individual I/O points (variables) must be “bound” in order for them to communicate. For example, a discrete input from a discrete input module must be bound to a discrete input block in the Model 353. The process of configuring, installing, and binding LonWorks products is accomplished via a LonWorks configuration tool. For convenience, Siemens resells SmartPack Configuration Software from Acromag.

An Echelon LonTalk Adapter is used to communicate between the computer and the LonWorks network. The SmartPack Configuration Software, LonTalk Adapter, and necessary cables are provided in a start-up kit. The contents of the LonWorks start-up kit (P/N16353-65) are listed in Table 4 and available separately.

Table 4 LonWorks Start-up Kit

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15939-70v1.00</td>
<td>Echelon SLTA/2 Device Driver</td>
</tr>
<tr>
<td>27005-1</td>
<td>Echelon LonTalk Adapter</td>
</tr>
<tr>
<td>27005-2</td>
<td>Acromag 50SW-CFS-MO3-1.44</td>
</tr>
<tr>
<td>16260-27</td>
<td>Cable, 15 ft., DB9M to DB9F</td>
</tr>
<tr>
<td>16353-66</td>
<td>Cable, SLTA/2 to LonWorks Network</td>
</tr>
</tbody>
</table>

Table 3 Cable Parameters

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>AWG</th>
<th>Max. Bus Length Max.</th>
<th>Free Topology Node to Node Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belden 85102, single twisted pair, stranded</td>
<td>16</td>
<td>8858 ft. (2700 m)</td>
<td>1640 ft. (500 m)</td>
</tr>
<tr>
<td>9/29, unshielded, plenum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belden 8471, single twisted pair, stranded</td>
<td>16</td>
<td>8858 ft. (2700 m)</td>
<td>1312 ft. (400 m)</td>
</tr>
<tr>
<td>9/29, unshielded, non-plenum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level IV, twisted pair, typically</td>
<td>22</td>
<td>4593 ft. (1400 m)</td>
<td>1312 ft. (400 m)</td>
</tr>
<tr>
<td>solid &amp; unshielded</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JY (St) Y 2x2x0.8, 4-wire helical twist,</td>
<td>20</td>
<td>2952 ft. (900 m)</td>
<td>1049 ft. (320 m)</td>
</tr>
<tr>
<td>solid, shielded</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Features & Benefits

- Windows® 95 or NT™ operating system provides powerful graphical interface
- Automatic line routing and interloop wiring reduces overall drawing time
- User selected tag names in a reference list allow easy interconnection between continuous and discrete loops
- Choice of function block and ladder logic format provides application versatility
- Easy cut, copy, and paste capabilities allow control strategies to be duplicated and shared between multiple controllers for reduced configuration time
- User defined line styles and colors permit visual separation of continuous and analog signals for easier understanding of control loops
- Line layering capability allows viewing of continuous and discrete signals independently or together
- Comprehensive drawing package facilitates creation of text comments and graphical illustrations for better understanding of the control strategy
- Application Library provides quick start-up and base line for more complex configurations
- History features provide comprehensive archiving capabilities

Description

The Model 353 Process Automation Controller is a stand-alone, The i|config™ Configuration Utility provides the tools to create a loop controller graphical interface and manage a loop controller configuration. Based on the 32-bit Windows technology, the software allows configuration of discrete control in function block or ladder logic. Moreover, comprehensive drawing capabilities allow the inclusion of comments and illustrations that further explain the control circuit to be included.

Loops for continuous control are configured in function block form, while discrete loops are configured in either ladder logic or function block. The software's reference list allows users to create tags that interconnect discrete signals between function block loops and contacts or coils in the ladder logic. Interconnecting signals from comparators or alarms on measured variables, such as pressure flow and temperature, eliminate the need for external pressure switches or thermal switches.

Depending on the user's preference, function block interconnection can be performed via Windows-based dialog boxes or point and click wiring with a cursor. A dynamic drag and drop feature allows user to easily move function blocks to create an intuitive signal flow design. Function block parameters are entered and modified via clear dialog boxes.

System Requirements

- Model 353 with software version 1.2 or higher
- Windows 95 or NT version 3.51 or higher
- 486 or higher processor
- 16 MB of memory
- 6 MB of free disk space

1) x.xx specifies the software's revision number. This will be defined by Siemens as the latest revision.