

**INNOVATIVE**

**AUTOMATION**

**CONTROL**



 **Control  
Technology**

**2000 Series  
Automation Catalog**

## Company Profile

CTC has been supplying innovative control hardware and software to many of the world's leading technology companies since 1975. Over the years, CTC has continued to expand its product line by offering easy to use automation products that offer more functionality and higher performance in smaller and more cost-effective packages.

In this catalog we feature our award winning 2000 series automation controllers. Thousands of these controllers are at work all over the world providing our customers with reliable 24/7 control in a wide variety of automation applications. To learn more about these applications and the full line of CTC automation products, visit our website at [ctc-control.com](http://ctc-control.com).



Since its inception, CTC has been dedicated to total customer satisfaction. CTC's expertise in providing its customers a competitive advantage in their industry, and its commitment to support, have resulted in lasting partnerships with its customers.

Today, with headquarters in Hopkinton, Massachusetts, CTC is a leading provider of innovative automation solutions that control and monitor machines and equipment. CTC's products and technologies integrate digital and analog I/O, motion control and user interfaces into compact, highly reliable controllers that feature built-in device to enterprise connectivity.



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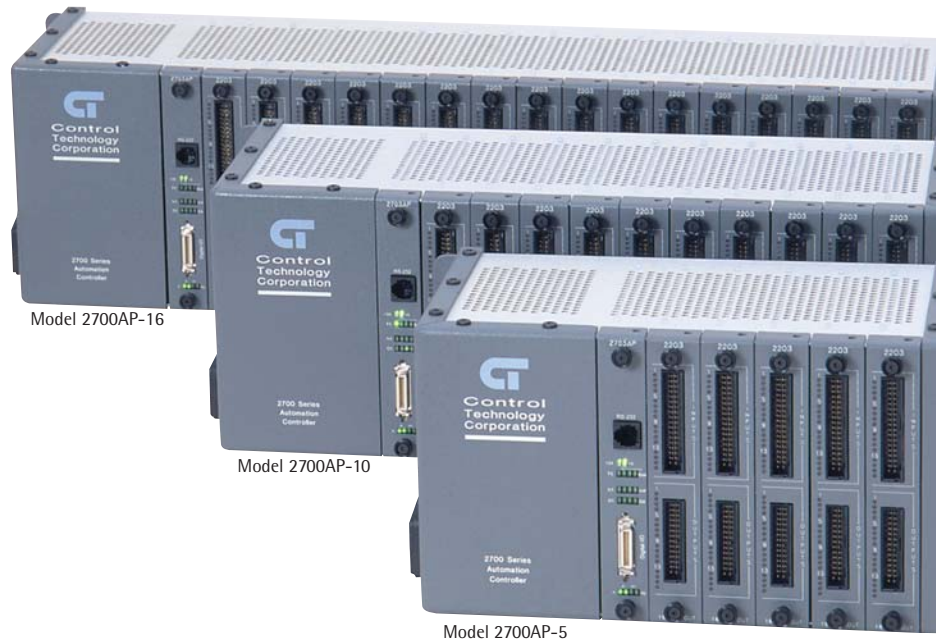
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# 2700 Series Automation Controllers

*Integrated, high-performance control*

- ▶ High-density rack mount system
- ▶ Integrates machine sequencing, motion control, networking and analog data acquisition
- ▶ Up to 16 axes of motion
- ▶ Up to 512 I/O
- ▶ Serial, Ethernet, DeviceNet communications



## Totally Integrated Control

The 2700 Series Automation Controllers are high-performance control systems that accept a wide range of plug-in modules to accommodate specific applications. These controllers integrate machine sequencing, motion control, networking and analog data acquisition into a single control strategy. Discrete devices can be programmed independently during preliminary stages of the project and then combined with other devices at later stages, which simplifies troubleshooting and accelerates development. Supplied in an easily panel-mountable format, the 2700 Series accepts modules for every aspect of motion, digital and analog control, with additional modules for advanced serial, Ethernet and DeviceNet™ communications. Supported protocols include TCP/IP and UDP. The 2700 uses powerful, flexible communications avenues to integrate with other devices such as robots, which may have their own control programs.

## Maximum Performance for Your Automation Dollar

The 2700 uses advanced technology, including a highly integrated plug-in CPU, to attain performance that exceeds the response metrics of much more costly systems. This performance level, combined with the controller's 128K user memory capacity and extended I/O and step capacities, makes the 2700 Series appropriate for any application that demands ultra fast response times or real-time, multitasking machine control. A multi-processor architecture distributes the workload, thereby increasing system performance. Multitasking for up to 84 independent tasks and advanced motion control commands enable you to design sophisticated solutions for the most complex applications.

# 2700 Series Automation Controllers

*Integrated, high-performance control*

2700AP-5 Automation Controller (5-slot)

2700AP-10 Automation Controller (10-slot)

2700AP-16 Automation Controller (16-slot)

## 2700AP Series Automation Controllers Specifications

### System Resources

- 64K program memory
- 64K data table memory
- 500 volatile registers
- 4500 non-volatile registers
- 16000+ element data table
- Real-time clock
- 24.576 MHz CPU processor

### Typical Performance Specifications

- Sense input, jump to new step, change output in 0.2 msec
- Change servo profile in 1.0 msec
- Analog I/O update per channel 2.083 msec

### Software Resources

- 4096 program steps
- Multitasking operating system
- 84 simultaneous tasks
- 8 linkable software counters - 750 Hz

## Other Specifications

### Capacities<sup>1</sup>

Models 2700AP-5/10/16 <sup>2</sup>	CPU Module On-board I/O		
Module Slots:	5/10/16	Digital Inputs <sup>4</sup>	4
Inputs: <sup>3</sup>	160/320/512	Digital Outputs <sup>4</sup>	4
Outputs: <sup>3</sup>	120/320/512	Encoder Inputs <sup>4</sup>	1
Analog Inputs:	80/128/256	Registration Inputs <sup>4</sup>	2
Servo Axes:	10/16/16	RS-232 Ports <sup>5</sup>	2
RS-232 Channels:	12/13/13		

1. Not mutually inclusive.

2. Includes 2703AP CPU and one Model 2203 Input/Output Module.

3. Slot limit.

4. Requires Model 2346 distribution board.

5. Requires Model 2886 RS-232 connector to use the second communication port.

### I/O

- Up to 512 digital I/O, 256 analog I/O<sup>1</sup>
- 16 PLS outputs (main CPU). Actuation rate = 1 msec
- Quadrature encoder input with 32-bit counter and 2 high-speed registration inputs
- On board I/O - 4 Digital Inputs and 4 Digital Outputs

### Motion

- Up to 16 axes of servo<sup>1</sup>
- Servo update rate: up to 488 µsec
- Up to 4 MHz quadrature encoder feedback

### Communication

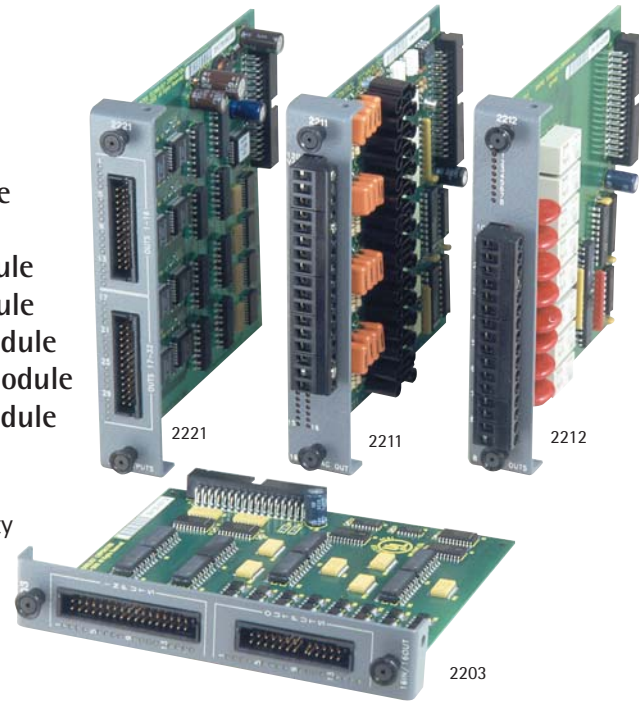
- Ethernet connectivity supports TCP/IP, UDP
- DeviceNet
- Up to 13 RS-232 connections at rates up to 38.4 Kbps<sup>1</sup>

# 2700 Digital I/O Modules

Digital I/O control

Model 2201	32 Channel Input Module
Model 2202A	24 Channel Output Module
Model 2203	16In/16Out Module
Model 2203 SRC	16In/16Out Sourcing Module
Model 2210	16 Channel AC Input Module
Model 2211	16 Channel AC Output Module
Model 2212	8 Channel Relay Output Module
Model 2221	32 Channel DC Output Module

- ▶ High density I/O, low cost per I/O point
- ▶ Opto-isolation and other features for high reliability in harsh environments
- ▶ DC and AC models available



## Specifications - Model 2201/2202A/2203/2221 Modules

Absolute Maximum Ratings	Min	Typical	Max
Applied input voltage - Note 1	0 VDC		27.0 VDC
Applied output voltage - Note 2	0 VDC		24.0 VDC
Output current			
Single output			500 mA
Total limit			5 Amps
<b>Specifications - Inputs</b>			
Input "off" voltage ( $I_i = 0$ mA)		24.0 VDC	26.4 VDC
Input "on" current ( $V_i = 0$ V)		-2.10 mA	-2.85 mA
Input "on" current threshold ( $V_i = 8$ V typ)		-1.0 mA	-1.85 mA
Input "off" current (typ leakage current allowable)			-250 $\mu$ A
<b>Specifications - Outputs 2202A/2221</b>			
Output "on" voltage ( $I_o = 500$ mA)		1.2 VDC	1.8 VDC
Output "off" leakage (applied $V = 24$ V) - Note 3		1.0 $\mu$ A	10 $\mu$ A
<b>Specifications - Outputs 2203</b>			
Output "on" voltage ( $I_o = 500$ mA)		0.8 VDC	1.8 VDC
Output "off" leakage (applied $V = 24$ V) - Note 3		0.01 $\mu$ A	0.75 $\mu$ A

- Notes:** 1. Under normal operation, no external input voltage is applied - inputs should be externally switched to the input common.  
 2. An on-board protection diode returns to +24 V from each output.  
 3. In the off state, unconnected outputs are internally pulled to +5 V through a diode and an LED indicator.

# 2700 Modules

## Digital I/O control

### Model 2203 SRC 16 In/16 Out Sourcing Module

#### Specifications – Model 2203 SRC Module

Absolute Maximum Ratings	Min	Typical	Max
Applied input voltage – Note 1	22.0 VDC	24.0 VDC	27.0 VDC
Applied output voltage – Note 2	0 VDC		24.0 VDC
Output current			500 mA DC
Single output			5 A
Total limit			
<b>Operating Characteristics</b>			
Output "on" voltage ( $I_o = 500$ mA)		22.8 VDC	23.0 VDC
Output "off" leakage (applied voltage = 24 VDC)		1 $\mu$ A DC	100 $\mu$ A DC
Input "off" voltage ( $I_i = 0$ mA)		0 VDC	
Input "on" current ( $V_i = 24$ V)		2.10 mA DC	3.00 mA DC
Input "on" current threshold ( $V_i = 11$ V typ)	3.0 mA DC	3.5 mA DC	
Input "off" current (typ leakage current allowable)		250 $\mu$ A DC	

**Notes:** 1. Under normal operation, no external voltage is applied. Inputs should be externally switched to +24 VDC.  
2. An on-board protection diode returns to each output from the +24 V Return.

### Model 2210 16 Channel AC Input Module

### Model 2211 16 Channel AC Output Module

#### Specifications – Model 2210, 2211 Modules

Absolute Maximum Ratings	Min	Typical	Max
Applied input voltage (2210)			135.0 VAC
Voltage applied to common terminal (2211)		135.0 VAC	
Output current - single output (2211)			0.75 A AC
Total module limit (2211)			10.0 A AC
<b>Operating Characteristics</b>			
<b>Model 2210 Module</b>			
Input threshold voltage		58.0 VAC	70.0 VAC
Input "on" current ( $V_i = 120$ VAC)	2.0 mA AC	4.5 mA AC	5.5 mA AC
<b>Operating Characteristics</b>			
<b>Model 2211 Module</b>			
Output "on" voltage drop		1.6 VAC	2.2 VAC
Output "off" leakage current ( $V_o = 0$ VAC)	4.7 mA AC	5.7 mA AC	

### Model 2212 8 Channel Relay Output Module

#### Specifications – Model 2212 Module

Absolute Maximum Ratings	Min	Typical	Max
Switching voltage (DC)			30 VDC
Switching voltage (AC)			250 VAC
Maximum switching current			5 A
Operate time		5 msec	
Release time		4 msec	

# 2700 Analog I/O Modules

Advanced analog I/O control

## Model 2220 Analog I/O Module

- ▶ 8 analog in, 8 analog out, 8 digital out
- ▶ On-board threshold triggering

### Application Specific Versions

- Model 2220-100 1 Hz filter for load cell/pressure transducer
- Model 2220-101 10 Hz filter for high noise environments
- Model 2220-102 1 Hz filter and on-board PID for temperature control
- Model 2220-103 Unfiltered and on-board PID for fast response



## Specifications - Model 2220 Modules

Absolute Maximum Ratings	Min	Typical	Max
Maximum analog input voltage			±15VDC
Minimum analog output load resistance	2.0kΩ		
Maximum output current			60mA
Precision 10 volt reference output			500mA
Digital outputs (per output)			1500 volts
Analog isolation - voltage withstand (one minute duration max.)			
<b>Analog Input Specifications</b>			
Differential input range	-10.000000 VDC		+10.000000 VDC
Common mode voltage range	-10 VDC		+10 VDC
Input resistance		10 MΩ	
Input resolution (15-bit)		.00305 %FS	
Input accuracy (25°C, 8-sample filtering)		.00305 %FS	
Input conversion time (asynchronous)		2.083 msec	
Input filter settings (2220) (default = 1 sample)	2.083 msec		533.248 msec
Threshold triggering response (Analog input to digital output response)		2.25 msec	
<b>Analog Output Specifications</b>			
Output voltage range	-10.000 VDC		10.000 VDC
Output resolution		2.44 mV	
<b>Digital Output Specifications</b>			
On voltage (I <sub>o</sub> = 500 mA)	0.8 VDC		1.2 VDC
Off leakage (applied V = 24 VDC)	1 μA DC		100 μA DC
Maximum output current - Note 1			500 mA DC

**Note:** 1. All digital outputs are short circuit and over-current protected.



# 2700 Analog I/O Modules

Standard analog I/O control

Model 2207 16 Channel Analog Input Module (0-10 VDC 1 part in 1000; 4-20 mA 1 part in 160)

Model 2207A 16 Channel Analog Input Module (0-10 VDC 1 part in 1000; 4-20 mA 1 part in 800)

Model 2207B 16 Channel Analog Input Module (0-10 VDC 1 part in 1000; 4-20 mA 1 part in 350)

Model 2209 Analog Output Module ( $\pm 10$  VDC 1 part in 4096)

## Specifications – Models 2207, 2207A, 2207B Modules

Absolute Maximum Ratings	Min	Typical	Max
Applied input voltage - Note 1	0 VDC		27.0 VDC
Power supply capacity (+15 VDC)			100 mA
Reference output current (10.00 V)			26 mA
Reference voltage			
Nominal output voltage		+10.000 VDC	
Accuracy		$\pm 4.88$ mV	$\pm 9.76$ mV
<b>Analog Input Specifications</b>			
Input characteristics - normal mode			
Nominal sensing range	0 VDC		+10.00 VDC
Resolution		0.01 VDC	
Accuracy		$\pm 0.01$ VDC	$\pm 0.03$ VDC
Input current		0.01 $\mu$ A	1.0 $\mu$ A
Input characteristics - differential mode			
Common-mode voltage range	0 VDC		6.00 VDC
Nominal gain range	280		575
Input offset voltage adjust.		$\pm 4.5$ mV	
Input impedance		10 k	

**Note:** 1. Application of a negative voltage will result in erroneous readings.

## Specifications – Model 2209 Module

Absolute Maximum Ratings	Min	Typical	Max
Output load resistance	2.0 k $\Omega$		
Power supply capacity ( $\pm 15$ VDC) - Note 1			60 mA
Reference output capacity (+10.000 VDC)			100 $\mu$ A
<b>Analog Output Specifications</b>			
Analogue output voltage ranges			
Unipolar, 10 V span	0.000 VDC		+10.000 VDC
Bipolar, 10 V span	-5.000 VDC		+5.00 VDC
Bipolar, 20 V span	-10.000 VDC		+10.000 VDC
Output resolution			
10 V span setting		2.44 mV	
20 V span setting		4.88 mV	
Output accuracy			
10 V span setting		$\pm 2.44$ mV	$\pm 4.88$ mV
20 V span setting		$\pm 4.88$ mV	$\pm 9.76$ mV
Power supply output			
Negative supply voltage	-15.75 VDC		-14.25 VDC
Positive supply voltage	+14.25 VDC		+15.75 VDC
Reference output voltage	9.900 VDC		10.100 VDC

**Note:** 1. The external capacity of the on-board  $\pm 15$  volt supply must be reduced by the amount drawn from the analog outputs.

# 2700 Motion Modules

## Stepper control

### Model 2206-1 Single Axis Stepper Motor Module

### Model 2206-2 Dual Axis Stepper Motor Module

- ▶ Supports full-, half-, and microstepping drives
- ▶ Close coupling of 2206 CPU and controller's main CPU provides dynamic, on-the-fly reprofiling, with current theoretical position and velocity available on demand
- ▶ Use of servo command language supports absolute positioning, relative positioning and continuous velocity-based moves. Automatic home-seeking also supported.
- ▶ Motion parameters can be derived from any other controller resource and organized in a data table, accelerating system design and job customization
- ▶ Motor tuning may be accomplished in minutes



## Specifications – Model 2206-1 and 2206-2 Modules

Absolute Maximum Ratings	Min	Typ	Max
+5 V Supply output current - Note 1 (for powering external drive inputs)			96 mA
Pulse and direction outputs			
Low $V_{OL}$ ( $I_{OL} = 24$ mA)	0.36 VDC		0.44 VDC
High $V_{OH}$ ( $I_{OH} = 24$ mA)	4.44 VDC		5.25 VDC
Pulse width (jumper configurable)			
For microstepping drives		1.3 $\mu$ sec	
For half- and full-step drives		34 $\mu$ sec	
Auxiliary inputs			
Off voltage ( $I_i = 0$ mA) - Note 2		24.0 VDC	26.4 VDC
On current ( $V_i = 0$ V)		2.1 mA	2.5 mA
Threshold			
Low-to-high		8.5 VDC	
High-to-low		7.5 VDC	
<b>Performance Specifications</b>			
Velocity range	4 Steps/sec		250,000 Steps/sec
Resolution of max. velocity setting		3.9 Steps/sec	
Accel. and decel. settings			130,000,000 Steps/sec <sup>2</sup>
Resolution of accel/decel setting		15.3 Steps/sec <sup>2</sup>	
Position range	-2,147,483,648 Steps		2,147,483,647 Steps
Relative motion command range	-2,147,483,648 Steps		2,147,483,647 Steps

- Notes:** 1. Powered from the controller's 24 V supply.  
2. Dependent on the controller's auxiliary supply voltage (24 V typ).

For programming flexibility, the 2206 uses the following Quickstep™ servo commands: Profile Servo, Turn Servo, Stop Servo, Search and Zero Servo, Zero Servo, Monitor Servo, If Servo, and Store Servo.

Each axis provides six auxiliary inputs, each with an LED indicator, performing the following functions:

- SOFT STOP - stops motor motion.
- FWD-LIM - inhibits motion in the forward direction.
- REV-LIM - inhibits motion in the reverse direction.
- HOME - establishes a home (zero) reference point for absolute positioning.
- JOG CW and JOG CCW - turns the motor cw or ccw at the programmed rate.
- START - A programmable option replacing JOG CW that allows a motion to wait for this input.

# 2700 Motion Modules

## Servo control

### Model 2219-1.5 Single Axis Servo Control Module

### Model 2219-2 Dual Axis Servo Control Module

- ▶ Advanced servo features: electronic gearing, move-on-gear, registration, multi-count automatic homing
- ▶ Multiple loop control with velocity and acceleration feedforward plus filter modes to resolve difficult stability problems and expedite tuning
- ▶ Differential quadrature and differential index/marker encoder inputs
- ▶ Six dedicated inputs/axis (HOME, START, KILL, FWD-LIM, REV-LIM, REGISTRATION)



Model 2219

## Specifications – Model 2219 Module

Absolute Maximum Ratings	Min	Typical	Max
<b>Performance Specifications – Note 1</b>			
2219 maximum velocity setting	1 count/sec		4,000,000 counts/sec
Accel. and decel. settings	1 count/sec <sup>2</sup>		130,000,000 counts/sec <sup>2</sup>
Position range (+/- 1 count)	-2,147,483,648 counts		2,147,483,647 counts
2219 servo loop update		488 μsec	
Encoder input voltage	0.0 VDC		+5.0 VDC
<b>I/O Specifications</b>			
<b>Command Outputs</b>			
Nominal voltage range	-10.0 VDC		+10.0 VDC
Command load resistance	2 kΩ		
2219 resolution (13-bit) 1LSB		2.44 mV	
<b>Differential Encoder Inputs</b>			
Nominal input range (max 500 mA/module)		0.0 VDC	+5.0 VDC
Open-circuit voltage (I <sub>i</sub> = 0 mA)		5.0 VDC	5.38 VDC
Logic-low current (V <sub>i</sub> = 0 V)		1.1 mA	1.2 mA
<b>Registration Auxiliary Input</b>			
Off voltage (I <sub>i</sub> = 0 mA) - Note 3		24.0 VDC	26.4 VDC
On current (V <sub>i</sub> = 0 V)		-2.28 mA	
<b>Threshold</b>			
Low-to-high		5.1 VDC	
High-to-low		4.9 VDC	

- Notes:**
1. In Performance Specifications, the term "count" refers to one edge transition on either encoder input for that axis. Velocity resolution within 1 count/sec.
  2. PID parameters are programmed as relative values in the range of 0 to 255. Acceleration (A<sub>ff</sub>) and Velocity feedforward (V<sub>ff</sub>) range from 0 to 32767.
  3. Dependent on controller auxiliary supply voltage (24 V typ).
  4. Ratio Range for both axis following and ratio control is +1 to 32767 minimum and +32767 to 1 maximum. Depending on the application, high ratios may result in instability.

# 2700 Communication Modules

## Ethernet Modules

### Model 2217T Networking Communications Module

- ▶ Ethernet 10BaseT support and two RS-232 ports; supports CTNET protocol

### Model 2717 Networking Communications Module

- ▶ 10/100Base T support, two RS-232 ports and:
  - Provides patented Internet/Intranet access to plant floor data
  - Supports TCP/IP, UDP and CTNET protocols<sup>1</sup>
  - Enables desktop monitoring and control from standard browsers



Model 2717

## Specifications - Model 2217 Module

Description	Min	Typical	Max
<b>Absolute Maximum Ratings</b>			
Current draw from on-board +5 V Supply			110 mA DC
<b>Operating Characteristics</b>			
RS-232 transmitters		±5 VDC	±12 VDC
RS-232 receivers	±3 VDC		±12 VDC
Ethernet transceivers (10 Megabits/sec) - Note 2			1.5 VAC PP
<b>CTNET Performance Specifications</b>			
<b>Host communications</b>			
Single register transaction from 2217		1-2 msec	
Single register transaction from 2703AP - Note 3		3-5 msec	
16-register read from 2700AP - Note 3		6-7 msec	
50-register read from 2700AP - Note 3		8-9 msec	
<b>Peer-to-peer communications</b>			
Single register transaction from 2217		9-11 msec	
Single register transaction from 2703AP		10-13 msec	

- Notes:**
1. Not all protocols can run concurrently.
  2. This conforms to IEEE Standard 802.3.
  3. This value is derived with high communications priority active or when one task is running.

## Specifications - Model 2717 Module

Description	Min	Typical	Max
<b>Operating Characteristics</b>			
RS-232 transmitters		±5 VDC	±12 VDC
RS-232 receivers	±3 VDC		±12 VDC
Common mode voltage range	-10 VDC		+10 VDC
RS-485 common mode rejection	-7 VDC		+12 VDC
RS-485 hysteresis		70 mVDC	
Ethernet transceivers (10/100 Megabits/sec) - Note 1			1.5 VAC PP

## Performance Specifications

Description	CTNET	UDP	TCP/IP
<b>Host Communications in msec</b>			
Single-register transaction from 2717	1-2	2-4	3.5-4
Single-register transaction from 2703AP	3-5	5-8	7-10
16-register read from 2700AP - Note 2	6-7	9-11	10-12
50-register read from 2700AP - Note 2	8-9	10-12	11-13

- Notes:**
1. This conforms to IEEE Standard 802.3.
  2. This value is derived with high communications priority active or when one task is running.



# 2700 Communication Modules

## DeviceNet™ and serial modules

### Model 2716D DeviceNet module

- ▶ Controller may be configured as master, slave or both
- ▶ Monitor mode identifies and interrogates any device on the DeviceNet network; nodes selectable via on-board switches
- ▶ Supports bit-strobe, poll, change-of-state, cyclic, and explicit messaging
- ▶ 125K, 250K, and 500K baud rates are supported
- ▶ ODVA compliant



Model 2716D

### Specifications – Model 2716D Module

Absolute Maximum Ratings	Min	Typical	Max
Current draw from on-board +5V supply			250 mA DC
<b>RS-232 Operating Characteristics</b>			
RS-232 transmitters		±5 VDC	±12 VDC
RS-232 receivers	±3 VDC		±12 VDC
Common mode voltage range	-10 VDC		+10 VDC
<b>RS-485 Operating Characteristics</b>			
RS-485 common mode rejection	-7 VDC		+12 VDC
RS-485 hysteresis - Note 1		70 mVDC	

**Note:** 1. Combined impedance is less than 1 RS-485 load, up to 32 devices on a bus

## Serial Modules

### Model 2716 RS-232 Communications Module

- ▶ Two RS-232 ports plus an additional RS-485 port
- ▶ Six baud rates from 1200 to 38,400 supported
- ▶ Special purpose registers can read individual characters from port's buffer or parse out numeric data from ASCII strings
- ▶ Independent 32-bit processor offloads communications tasks from main CPU for better performance



Model 2716

### Specifications – Model 2716 Module

RS-232 Operating Characteristics	Min	Typical	Max
RS-232 transmitters		±5 VDC	±12 VDC
RS-232 receivers	±3 VDC		±12 VDC
Common mode voltage range	-10 VDC		+10 VDC
<b>RS-485 Operating Characteristics</b>			
RS-485 common mode rejection	-7 VDC		+12 VDC
RS-485 hysteresis - Note 1		70 mVDC	

**Note:** 1. Combined impedance is less than 1 RS-485 load, up to 32 devices on a bus

# 2700 Series Automation Controllers

## Configuring your 2700 controller

The 2700AP-5, -10, and -16 can accommodate 5, 10, and 16 modules respectively. The following modules are compatible with all models of the 2700:

### Supported Modules

- Models 2201, 2202, 2203, 2203SRC, and 2221 DC Input and Output Modules
- Model 2206 Single or Dual-axis Stepping Motor Modules
- Models 2207 and 2209 Analog Input and Output Modules
- Models 2210 and 2211 AC Input and Output Modules
- Model 2212 8-channel Relay Modules
- Model 2220 Precision Analog Input and Output Modules
- Model 2219 Servo Control Modules
- Models 2216 and 2716 Dual Channel RS-232 Modules
- Model 2716D DeviceNet Modules
- Model 2217 and 2717 Ethernet Communications Modules

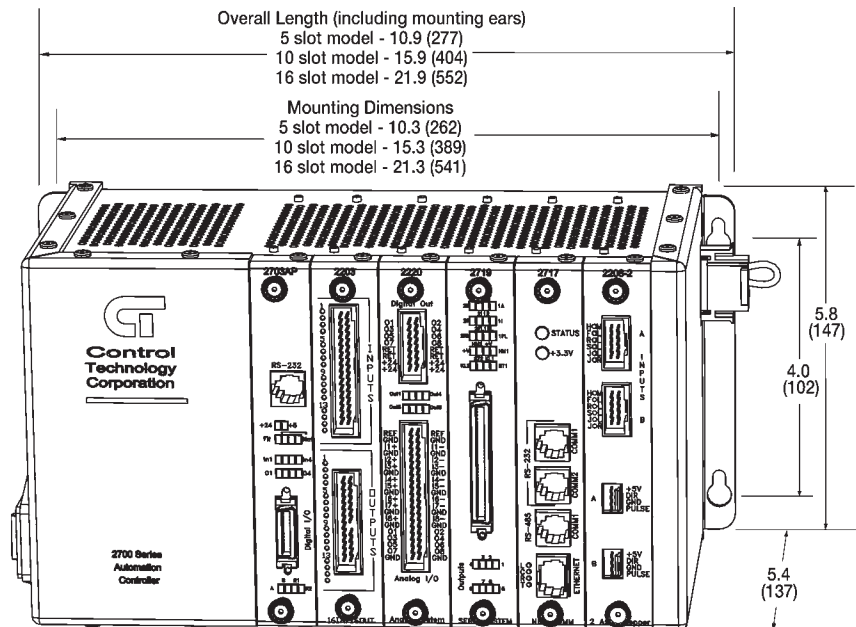
Refer to pages 6 - 13 for further specifications of these modules. Recommended accessories for each module are listed on the following page.

## Specifications - Model 2700 Controller

Absolute Maximum Ratings	Min	Typical	Max
<b>A.C. Voltage Range</b>			
120 V Mode 50/60Hz	100.0 VAC	120.0 VAC	132.0 VAC
240 V Mode 50/60Hz	200.0 VAC	240.0 VAC	264.0 VAC
<b>Current Requirement</b>			
120 V Mode		0.9 Amp	1.5 Amp
240 V Mode		0.45 Amp	0.75 Amp
<b>Power Supply Capacities</b>			
+24 V I/O supply			1.5 Amp
+5 V logic supply			5.0 Amp
RS-232 transmitters	±3 VDC	±5 VDC	±12 VDC
RS-232 receivers	±3 VDC	±5 VDC	±12 VDC
Common mode voltage range	-10 VDC		+10 VDC
Encoder power-supply capacity (+5V)			250.0 mA
CPU power requirement (5V)		0.4 Amp	0.6 Amp
Lithium-cell RAM (typical 5 yrs. unpowered)		128K Bytes	

### Dimensions

Dimensions are in inches (mm).

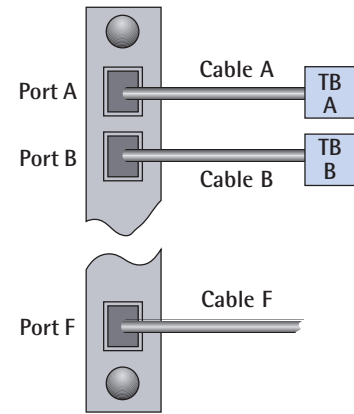


# 2700 Series Automation Controllers

## Model 2700 ordering guide

### Accessory Ordering

The table below lists the accessories recommended for each of the 2700's modules. Ports on each module are designated by the letters A, B, C, D, E, F, starting with "A" for the first port at the top of the faceplate and continuing down for all other ports present on that faceplate. Example: the 2206-2's third port from the top of the faceplate is port C. It is a Stepper (pulse/direction signals) port and it requires a cable whose part number is 2287. Terminal blocks are only applicable to ports A and B on selected modules and are not listed for any other ports.



**2700 Module Connection Table**

Module #	Module Description	Connector Kit (1)	Cable A	TB A	Cable B	TB B	Cable C	Cable D	Cable E	Cable F
2201	32 Channel Input Module	2251	DI 2276	2376**	DI 2276	2376**	-	-	-	-
2202A	24 Channel Output Module	2252	DO(16) 2275	2375**	DO(8) 2274	2375**	-	-	-	-
2203	16In/16Out Module	2253	DI 2276	2376**	DO 2275	2375**	-	-	-	-
2203 SRC	16In/16Out Module	2253	DI 2276	-	DO 2275	-	-	-	-	-
2206-1	Single Axis Stepper Module	2256-1	DedIn 2270	-	Step 2287	-	-	-	-	-
2206-2	Dual Axis Stepper Module	2256-2	DedIn 2270	-	DedIn 2270	-	Step 2287	Step 2287	-	-
2207 (all models)	16 Channel Analog Input Module	2257	AI 2278	-	-	-	-	-	-	-
2209	Analog Output Module	2259	AO 2279	-	-	-	-	-	-	-
2210, 2211, 2212	AC I/O - Relay Output Module	N/A	Front pluggable Terminal Block included w/ module							
2219-1.5, 1CF	Single Axis Servo Control Module 1.5 or Cam following	2269-1	Cmd 2289C	-	Enc 2289E	-	DedIn 2289L	-	-	-
2219-2	Dual Axis Servo Control Module	2269-2	Cmd 2289C	-	Cmd 2289C	-	Enc 2289E	Enc 2289E	DedIn 2289L	DedIn 2289L
2220 (pig tail cables)	Analog I/O Module	2260	DO 2273	-	AI/AO 2280	-	-	-	-	-
2220	Analog I/O Module (thermocouple configuration)	N/A	AO 2331	2334 (J or K) or 2335 (J, K or -)	Signal 2332	-	-	-	-	-
2221	32 Channel Output Module	2252	DO 2275	2375**	DO 2275	2375**	-	-	-	-
2703AP	2700AP CPU	-	-	Ser(2) 2886	Dist Block 2346-CBL	Dist Block 2346	-	-	-	-

Port types:

DI = Digital Input

DO = Digital Output. #Inputs specified in parentheses.

DedIn = Dedicated Input

Step = Stepper (pulse/direction signals)

AI = Analog Input

AO = Analog Output

Cmd = Command

Enc = Encoder

Signal = Signal

Ser(2) = RS-232 splitter

Dist block = Distribution block

(1) connector kits include enough mating connectors and pins for the entire module

\*\* Terminal Block and Cable Set

# 2601 Series Automation Controller

Full featured, ultra-compact controller

- ▶ Multitasking, with up to 28 parallel tasks running simultaneously
- ▶ 16 digital inputs and 16 digital outputs
- ▶ Fully optically isolated I/O
- ▶ Fast State Language programming using Quickstep
- ▶ Dual serial ports



Model 2601



## Model 2601-Automation Designer Kit

The 2601 Series Automation Kit is designed to introduce you to CTC's family of products. The kit includes:

- 2601 Automation Controller
- Quickstep for Windows SE
- Distribution blocks and power supply cable

Quickstep for Windows SE is a special edition of Quickstep designed for the 2601 controller. Programs developed with Quickstep SE may be upgraded to run on other CTC controller models.

The 2601 Automation Controller is a high-performance control system whose small size conceals a range of resources and capabilities usually found only in much larger and more costly systems.

- 988 storage registers, including 500 non-volatile registers
- A Data Table capable of storing over 8000 numbers in a two-dimensional array
- Two integrated RS-232 communications ports for concurrent connection to the programming computer and the operator's touchscreen
- Eight input-linkable counters, user resettable millisecond counter
- 1024 program steps
- Two high-speed (rates up to 3500 Hz) outputs

These capabilities combine to allow you to build additional power into machines, which in the past could not cost-justify a controller of this caliber. For example:

- Run a diagnostic routine in parallel with your main program, detecting problems before they occur.
- Collect production data and communicate it to a computer, for logging or display.
- Connect an operator interface to a serial port, and have full interactive control of machine parameters.



# 2601 Series Automation Controller

Full featured, ultra-compact controller

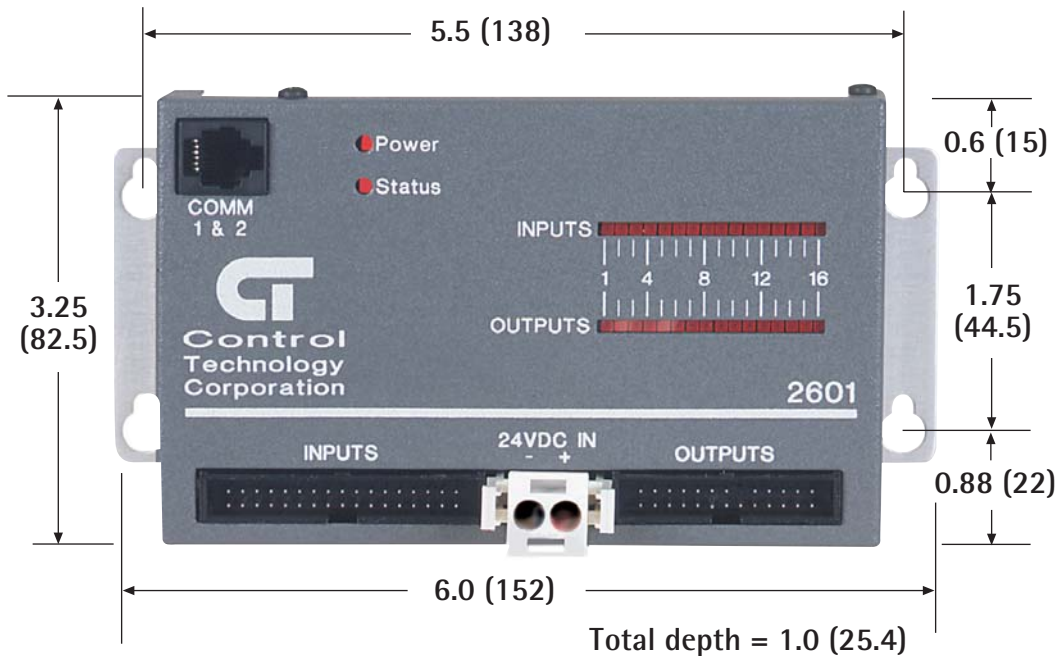
## Specifications – Model 2601 Controller

Absolute Maximum Ratings	Min	Typical	Max
Applied power supply voltage ( $V_{PS}$ )	18 VDC	24 VDC	27 VDC
Applied output voltage - Note 2	0 VDC		$V_{PS}$ VDC
Output current			
Single output			500 mA DC
Total limit		5 A DC	
<b>Specifications</b>			
Current requirement ( $V_{PS} = 24$ V)	50 mA	100 mA	210 mA
User memory capacity (10 year battery backed RAM)			24K Bytes
Input off voltage ( $I_i = 0$ mA)		$V_{PS}$ VDC	
Input on current ( $V_i = 0$ V, with $V_{PS} = 24$ V)		-2.3 mA DC	-3.00 mA DC
Input on current threshold ( $V_{PS} = 24$ V)		-1.35 mA DC	-1.75 mA DC
Input off current (typical leakage allowed)			-250 $\mu$ A DC
Output on voltage ( $I_o = 500$ mA)	0.6 VDC	0.8 VDC	1.2 VDC
Output off leakage (applied V = 24 v)	0.01 $\mu$ A DC		0.75 $\mu$ A DC

- Notes:**
- Under normal operation, no external input voltage should be applied - inputs should be externally switched to the input common.
  - An onboard protection diode returns to +24 V from each output.
  - All power requirements are worst case, with all inputs and outputs activated.

## Dimensions

Dimensions are in inches (mm).



# MultiPro Family of Automation Controllers

Powerful integrated control in a compact package

- ▶ Extensive multitasking capability
- ▶ Advanced motion control
- ▶ Extensive toolset for control applications
- ▶ Ethernet/DeviceNet communications
- ▶ High-speed processing for demanding applications

Master your machine automation projects faster and better with the powerful MultiPro™ family of stand-alone, +24 VDC powered automation controllers. Processing speeds have been increased by a factor of three over earlier models, delivering impressive response times. All models have two RS-232 ports, providing simultaneous operator interface, programming and diagnostics. MultiPro's impressive set of automation features simplifies and accelerates development where you need to integrate analog, digital and motion control. Compact size, choice of communications and pricing make the MultiPro easy to design into applications where space and budget are constrained.



## True Multiprocessing for High Performance

MultiPro delivers high-performance control by dedicating individual CPUs to the analog I/O subsystem, motion controller, communications processor, and main controller. MultiPro's efficient hardware design enables you to achieve high-performance machine control without endless hours of software optimization. Individual processors deliver repeatable, high precision results, while the overall control strategy is orchestrated by your Quickstep control program, which is capable of performing up to 28 simultaneous tasks.

## Extreme versatility in a small package... under one programming environment

*The small footprint, only 5.9" high by 5.3" overall width by 5.5" deep, makes the MultiPro family a uniquely compact series of powerful machine controllers.*

*Designed for industrial environments, the units are rugged and components have been selected for their reliability under factory conditions.*



# MultiPro Family of Automation Controllers

## Choose from Thirteen Ready-to-Use Controller Configurations

Model No.	Description	Digital inputs	Digital outputs	Analog inputs	Analog outputs	Servo axes	PLS	Registration	Cam following	Axis following	Stepping motor axes	RS-232 ports	Network support
2644	MultiPro+ MC	16	24	8	8	N/A	N/A	N/A	N/A	N/A	N/A	2	Ethernet
2645	MultiPro+ Dual Stepper	16	16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2	2	Ethernet
2646	MultiPro MC Dual Servo	16	24	8	8	2	16	2	N/A	1	N/A	2	N/A
2647	MultiPro+ Dual Servo	16	16	N/A	N/A	2	16	2	N/A	1	N/A	2	Ethernet
2647-1.5	MultiPro+ 1.5 Servo	16	16	N/A	N/A	1.5	16	1	N/A	1	N/A	2	Ethernet
2647-1CF	MultiPro+ Cam Servo	16	16	N/A	N/A	1	16	1	1	1	N/A	2	Ethernet
2648	MultiPro Dual Servo w/o Ethernet	16	16	N/A	N/A	2	16	2	N/A	1	N/A	2	N/A
2649	MultiPro 64 I/O Dual Servo	32	32	N/A	N/A	2	16	2	N/A	1	N/A	2	N/A
2650	MultiPro Quad Servo	16	16	N/A	N/A	4	16	4	N/A	2	N/A	2	N/A
2651	MultiPro Dual Servo with DeviceNet	16	16	N/A	N/A	2	16	2	N/A	1	N/A	2	DeviceNet
2652	MultiPro Dual Stepper	16	16	N/A	N/A	N/A	N/A	2	N/A	N/A	2	2	N/A
2654	MultiPro 32 I/O Quad Stepper	16	16	N/A	N/A	N/A	N/A	4	N/A	N/A	4	2	N/A
2655	MultiPro 64 I/O Dual Stepper	32	32	N/A	N/A	N/A	N/A	2	N/A	N/A	2	2	N/A

## Specifications - MultiPro Controllers

### Controller characteristics

Specifications	Min	Typical	Max
Power input range	22 VDC	24	27 VDC
Current requirement at 24 VDC		.45 A	.6 A
User memory capacity (Lithium-cell RAM, typical 5 yrs unpowered)		32KB	

*The main CPU is a Hitachi SH2 processor running at 24.576 MHz.*

### Typical performance specifications

Sense input, jump to new step, change output		.5 msec	
Perform multiplication (between volatile registers)		.3 msec	
Change servo profile		1.0 msec	
Time delay duration, 10 msec programmed		10.08 msec	
Time delay duration, 1 sec programmed		1.001 sec	
Software counters		750 Hz	

# MultiPro Family of Automation Controllers

## Digital I/O characteristics

Absolute maximum ratings	Min	Typical	Max
Applied input voltage - Note 1	0 VDC		27.0 VDC
Applied output voltage - Note 2	0 VDC		24.0 VDC
Output current			
Single output			500 mA
Total module limit			5 A
<b>Digital output specifications</b>			
Output on voltage ( $I_o = 500$ mA)		0.8 VDC	1.8 VDC
Output off leakage (applied V = 24 V) - Note 3		0.01 $\mu$ A	0.75 $\mu$ A
<b>Digital input specifications</b>			
Input off voltage ( $I_i = 0$ mA)		24.0 VDC	26.4 VDC
Input on current ( $V_i = 0$ V)		-2.10 mA	-2.85 mA
Input on current threshold ( $V_i = 8$ V typ)		-1.0 mA	-1.85 mA
Input off current (typ leakage current allowable)			-250 $\mu$ A

- Notes:** 1. Under normal operation, no external input voltage is applied – inputs should be externally switched to the input common.  
 2. An on-board protection diode returns to +24 V from each input.  
 3. In the off state, unconnected outputs are internally pulled to +5 V through a diode and an LED indicator.

## Analog I/O characteristics

Absolute maximum ratings	Min	Typical	Max
Maximum analog input voltage			$\pm 15$ VDC
Minimum analog output load resistance	2.0 k $\Omega$		
Maximum output current			
Precision 10V reference output			25 mA
Digital outputs (per output)			500 mA
Analog isolation - voltage withstand (one minute duration max.)			1500 V
<b>Analog output specifications</b>			
Output voltage range	-10.000 VDC		10.000 VDC
Output resolution		2.44 mV	
Output settling time			
-10.000 to +10.000 V		.2 msec	
0 to 5.000 V		.1 msec	
<b>Analog input specifications</b>			
Differential input range	-10.000000 VDC		+10.000000 VDC
Common mode voltage range	-10 VDC		+10 VDC
Input resistance		10 M $\Omega$	
Input resolution (15-bit)		.00305 %FS	
Input accuracy (25°C, 8-sample filtering)		.00305 %FS	
Input conversion time (asynchronous)		2.083 msec	
Input filter settings (default = 1 sample)	2.083 msec		533.248 msec
Threshold triggering response (analog input to digital output response)		2.25 msec	
<b>Digital output specifications</b>			
On voltage ( $I_o = 500$ mA)	0.8 VDC		1.2 VDC
Off leakage (applied V = 24 VDC)	1 $\mu$ ADC		100 $\mu$ ADC
Maximum output current - Note 1			500 mADC

- Note:** 1. All digital outputs are short circuit and over-current protected.



# MultiPro Family of Automation Controllers

## Stepper motor controller characteristics

Absolute maximum ratings	Min	Typical	Max
+5V supply output current - Note 1 (for powering external drive inputs)			96 mA
<b>Specifications</b>			
Pulse and direction outputs			
Low $V_{OL}$ ( $I_{OL} = 24$ mA)	0.36 VDC		0.44 VDC
High $V_{OH}$ ( $I_{OH} = 24$ mA)	4.44 VDC		5.25 VDC
Pulse width (jumper configurable)			
For microstepping drives		1.3 msec	
For half- and full-step drives		34 msec	
Axis control inputs			
Off voltage ( $I_i = 0$ mA) - Note 2		24.0 VDC	26.4 VDC
On current ( $V_i = 0$ V)		2.1 mA	2.5 mA
Threshold			
Low-to-high		8.5 VDC	
High-to-low		7.5 VDC	
<b>Performance specifications</b>			
Maximum velocity setting	1 step/sec		250,000 steps/sec
Resolution of max. velocity setting		3.9 steps/sec	
Accel. and decel. settings			130,000,000 steps/s <sup>2</sup>
Resolution of accel./decel. setting		15.3 steps/sec <sup>2</sup>	
Position range (absolute mode)	-2,147,483,648 steps		2,147,483,647 steps
Relative motion command range	-2,147,483,648 steps		2,147,483,647 steps

- Notes:** 1. Powered from the controller's 24 V supply.  
2. Dependent on the controller's auxiliary supply voltage (24 V typ)

### Commands – MultiPro Stepper and Servo Models

For programming flexibility the MultiPro Dual and Quad Stepper use Quickstep servo commands: Profile Servo, Turn Servo, Stop Servo, Search and Zero Servo, Zero Servo, Monitor Servo, If Servo, and Store Servo.

The MultiPro Dual and Quad Steppers and Servo models also support commands for three modes of operation: absolute positioning, relative positioning, and velocity (continuous). Automatic home-seeking modes are also supported. Instantaneous position and error data may be obtained at any time for servo models, allowing implementation of self-teaching and fault monitoring programs.

Each axis provides six axis control inputs, for performing the following functions:

**SOFT STOP** – stops motor motion.

**FWD-LIM** – inhibits motion in the forward direction.

**REV-LIM** – inhibits motion in the reverse direction.

**HOME** – establishes a home (zero) reference point for absolute positioning.

**JOG CW or JOG CCW (stepper only)** – turns the motor cw or ccw at the programmed rate.

**START** – for stepper models, this command is a programmable option replacing JOG CW that allows a motion to wait for this input. For servo models, any motion may optionally be programmed to wait for this input.

**REGISTRATION (servo only)** – accurately captures the servo position and, if desired, can alter the move.

## Servo motor controller characteristics

Absolute maximum ratings	Min	Typical	Max
Command load resistance	2 k $\Omega$		
Encoder input voltage	0.0 VDC		+5.0 VDC
Encoder (+5V) supply output current (total for each pair of axes)			500 mA
<b>Specifications</b>			
Command outputs			
Nominal voltage range	-10.0 VDC		+10.0 VDC
Differential encoder inputs			
Nominal input range	0.0 VDC		+5.0 VDC
Open-circuit voltage ( $I_i = 0$ mA)		5.0 VDC	5.38 VDC
Logic-low current ( $V_i = 0$ V)		1.1 mA	1.2 mA
Axis control inputs (except registration)			
Off voltage ( $I_i = 0$ mA) - Note 1		24.0 VDC	26.4 VDC
On current ( $V_i = 0$ V)		2.12 mA	
Threshold			
Low-to-high		5.1 VDC	
High-to-low		4.9 VDC	
Registration auxiliary input			
Off voltage ( $I_i = 0$ mA)		24.0 VDC	26.4 VDC
On current ( $V_i = 0$ V)		2.28 mA	
Threshold			
Low-to-high		5.1 VDC	
High-to-low		4.9 VDC	
<b>Performance specifications</b>			
Maximum velocity setting	1 step/sec		4,000,000 steps/sec
Resolution of max. velocity setting		1 step/sec	
Accel. and decel. settings	1 step/sec <sup>2</sup>		130,000,000 steps/sec <sup>2</sup>
Resolution of accel./decel. setting		1 step/sec <sup>2</sup>	
Position range (absolute mode)	-2,147,483,648 steps		2,147,483,647 steps
Relative motion command range	-2,147,483,648 steps		2,147,483,647 steps
Position registration accuracy		$\pm 1$ count	

- Notes:**
1. Dependent on controller auxiliary supply voltage (24 V typ).
  2. PID parameters are programmed as relative values in the range of 0 to 255. Acceleration ( $A_{ff}$ ) and Velocity feedforward ( $V_{ff}$ ) range from 0 to 32767.
  3. In Performance Specifications, the term *Step* refers to one edge transition on either encoder input for that axis.
  4. Ratio range for both axis following and ratio control is  $\pm 1:32767$  minimum and  $\pm 32767:1$  maximum. Depending on the application, high ratios may result in instability.
  5. Servo commands available are listed on the previous page.

## Communications characteristics

RS-232 communications	Min	Typical	Max
RS-232 transmitters		$\pm 9$ VDC	$\pm 12$ VDC
RS-232 receivers	$\pm 3$ VDC		$\pm 12$ VDC
<b>Ethernet communications</b>			
Transceivers 10 Megabit/sec conforming to IEEE 802.3 standard			1.5 AC PP
Total nodes supported		999 nodes	
Total nodes per segment		30 nodes	
Cable length per segment		185 meters	
Cable length per network		925 meters	
<b>DeviceNet communications</b>			
DeviceNet power	11 VDC	24 VDC	28 VDC
DeviceNet load		100 mA	150 mA
<b>Network performance considerations</b>			
Host communications			
16-register read			9-12 msec
50-register read			10-13 msec

# Software

## Quickstep for Windows programming and debugging software

Rapidly moving your project from an idea to a highly integrated, world-class control system is the goal of Quickstep for Windows. Using Quickstep, your machine design team can program, debug, and tune the performance of your automated equipment in less time than ever before. Quickstep combines a clear language structure, a simple programming interface, and powerful diagnostic tools to enable you to respond quickly to new automation demands. The point-and-click simplicity of the Quickstep editor reduces training requirements, while state language programming makes your programs understandable to all members of your design and operating team. Operating in the familiar Windows environment, Quickstep is the best and easiest solution for automated equipment programming.



- **Accelerated and intuitive program development**

Quickstep provides a language structure that emulates the way the designer thinks about a machine. The flow-diagram structure of the Quickstep state language ensures you that the time elapsed from Quickstep programming to trouble-free operation is substantially reduced.

- **Efficient and easy-to-use programming interface**

Quickstep enables you to create a program with a series of point-and-click selections of instructions or instruction parameters – no error-prone typing or tedious menus. Since Quickstep enters the instructions, syntax errors are virtually eliminated.

- **Powerful real-time diagnostics and monitoring**

Debugging is simplified with easily understood status displays and high-level error explanations, plus you can adjust many values while your machine runs, greatly reducing the time required to perfect your program. The dynamic display of internal resources as well as the ability to dynamically tune a machine's performance make Quickstep an unbeatable diagnostic and monitoring tool.

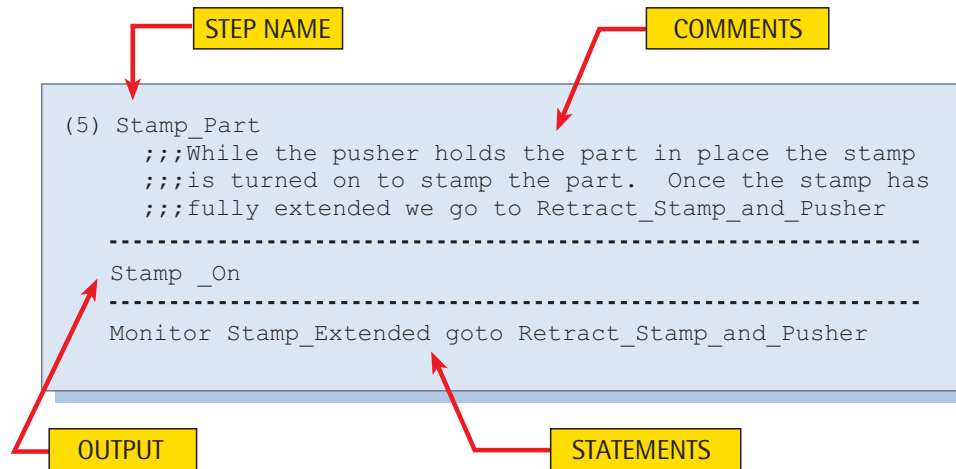
# Software

## Quickstep state language programming

### Clear state language programming

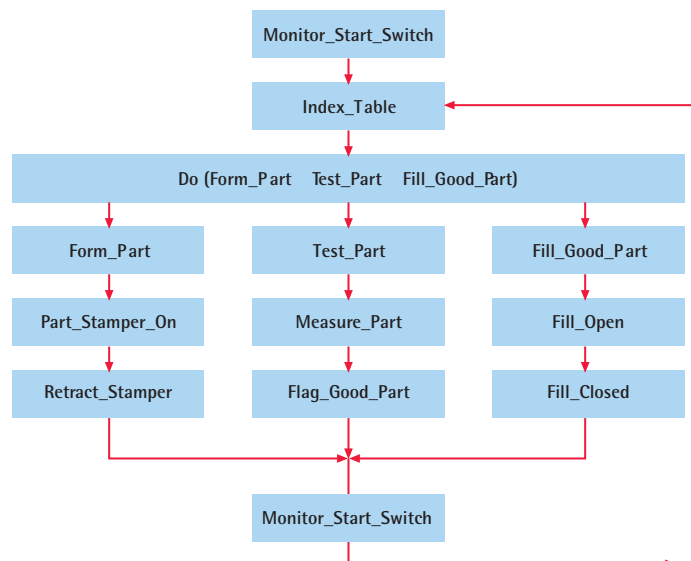
The Quickstep state language emulates the way a designer views a machine and designs an automation program. Quickstep programs are composed of steps, similar to the blocks of a flow diagram. Each step is given a meaningful name, and has the ability to change output states, monitor inputs, make decisions and perform other automation functions. Quickstep programs are composed of sequences of these steps.

A Quickstep Programming Step is divided into four sections: the **Step Name** section, the **Comments** section, the **Output** section and the **Statements** section.



### Simplifies complex tasks

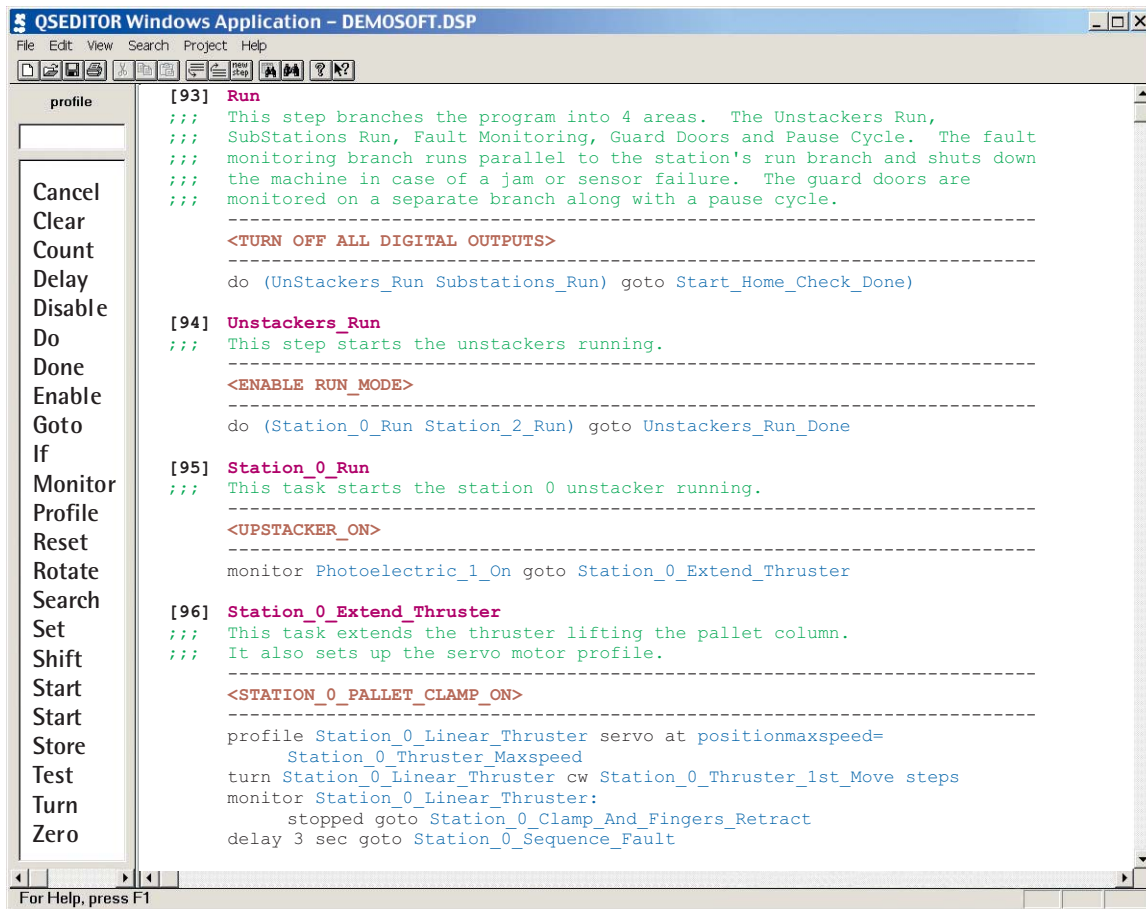
When programming complex machines, you can use multitasking to split up your program into several independent tasks. Up to 84 tasks may be run simultaneously, each operating completely asynchronously, as though a separate controller were executing each program. Tasks may intercommunicate, however, using any of the controller's shared resources: numeric registers, flags, etc. This modular approach to development helps clarify your programs and simplifies debugging and maintenance.



State language enables you to flowchart and program your machine according to the events, or states, that the machine undergoes as it runs. In this example, parts at three stations on an index table are respectively stamped, tested, and sent to a collection bucket. Multitasking enables the three stations to operate concurrently, yet ensures that the index table does not advance until all three stations have completed their tasks.

# Software

## Quickstep Editor



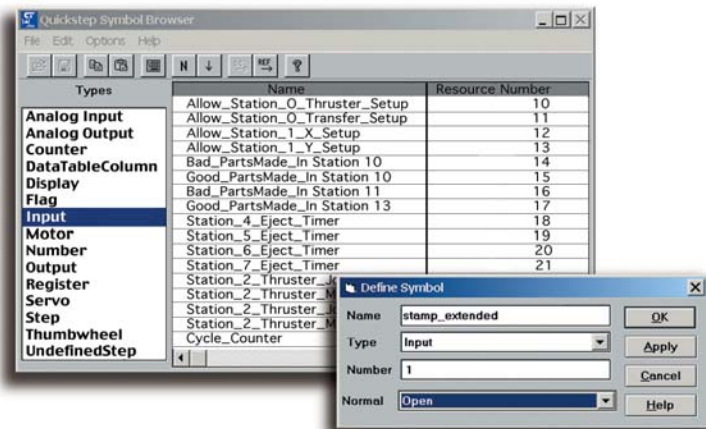
### Program entry made easy

The Quickstep Editor automatically builds each new instruction for you. A simple click on the instruction menu, and the full instruction is displayed in the editing window. Placeholders are provided for each instruction parameter, and a customized menu of choices is presented for each one. Using this approach, programming effort is minimized and syntax errors are eliminated. Plus, the Quickstep Editor provides many convenient editing tools, including a symbolic name browser, data table editor, and extensive online help.

### Customizing your program

The Symbol Browser enables you to create a symbolic name for every controller resource you use in your Quickstep program. These include inputs, outputs, registers, flags, analog points, servos and others. Resources are then accessed by name in your program, making it virtually self-documenting. This simplifies writing your program, as well as debugging, maintaining, and communicating it to others.

You can also use the Symbol Browser to perform a global update of the resource value assigned to a symbolic name, eliminating the nightmare of editing a program when I/O lists change during development.





# Software

## Control step by step

Quickstep enables you to design your program in the same way that your machine process operates: in sequential steps, or events. Quickstep also supports object-oriented programming techniques such as subroutines, which further enable you to reuse and modify code easily.

### [2] MoveToGetPartPosition

```
;;; Move the Robot to the next  
;;; location of receiving tray.  
;;; Wait for the robot to stop.
```

**EnableXAxis**

**EnableYAxis**

```
store Part + 1 to Part  
store Part to TableIndex  
turn XAxis to XPickPosition  
turn YAxis to YPickPosition  
monitor (and XAxis:stopped  
YAxis:stopped) goto Next
```

### [3] GetPart

```
;;; run the subroutine that picks  
;;; up the chip
```

**VacuumOn**

```
do (PickPart) goto Next
```

### [4] PositionPart

```
;;; run the subroutine MovePart that  
;;; positions the chip over the vision  
;;; system, tests it and returns  
;;; PartStatus (Good or Bad)
```

**IndicateMotion**

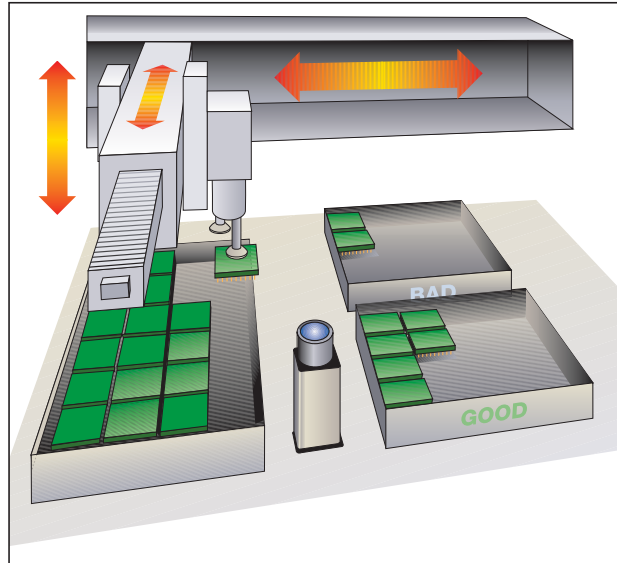
```
do (MovePart) goto Next
```

### [5] TestGood/Bad

```
;;; if the part is good, jump to the  
;;; statement that moves it to the  
;;; good tray. If the part is bad,  
;;; jump to the statement that moves  
;;; it to the bad tray
```

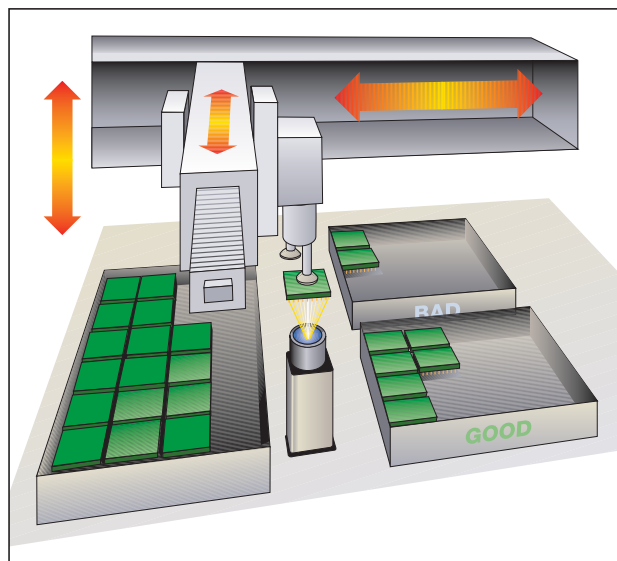
**<NO CHANGE IN DIGITAL OUTPUTS>**

```
if PartStatus=Good goto  
MoveToGoodTray  
if PartStatus=Bad goto MoveToBadTray
```



#### Step 3

After indexing the robot to the next cell in the receiving tray, the robot picks up the part.



#### Step 4

The subroutine MovePart runs, which moves the chip over the vision system, tests whether the leads are positioned correctly, and returns a value of Good or Bad for the part.

# Software

## Control step by step

### [6] MoveToGoodTray

```
;;; index the position in the good  
;;; tray to the next empty cell  
;;; wait for the robot to stop
```

---

```
GoodPartLightOn  
BadPartLightOff
```

---

```
store GoodPart + 1 to GoodPart  
store GoodPart to TableIndex  
turn XAxis to XPickPosition  
turn YAxis to YPickPosition  
monitor (and XAxis:stopped  
YAxis:stopped) goto PutPart
```

### [7] MoveToBadTray

```
;;; index the position in the bad  
;;; tray to the next empty cell  
;;; wait for the robot to stop
```

---

```
BadPartLightOn  
GoodPartLightOff
```

---

```
store BadPart + 1 to BadPart  
store BadPart to TableIndex  
turn XAxis to XPickPosition  
turn YAxis to YPickPosition  
monitor (and XAxis:stopped  
YAxis:stopped) goto PutPart
```

### [8] PutPart

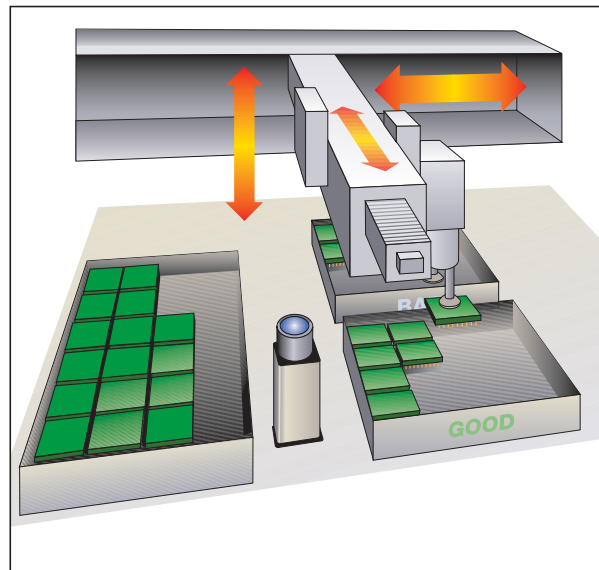
```
;;; drop the part into the cell  
;;; return the robot to the  
;;; receiving tray to process  
;;; the next chip
```

---

```
<NO CHANGE IN DIGITAL OUTPUTS>
```

---

```
do (PlacePart) goto MoveToGetPartPosition
```



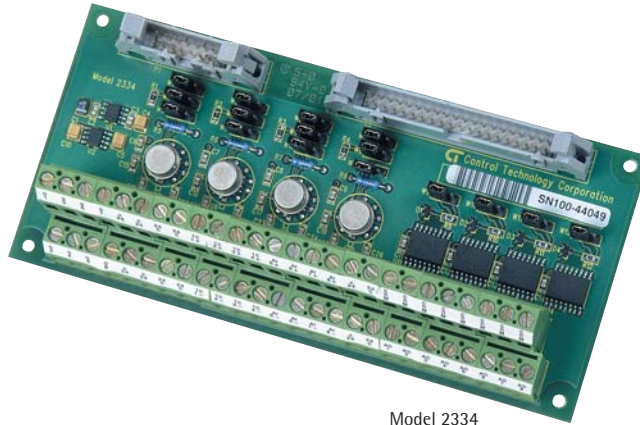
### Steps 6, 7 and 8

*If the part is Good, the robot moves the part to the Good tray (Step 6) and then proceeds to the next directed step (Step 7). In step 8, the robot drops the part in the cell and then returns back to the receiving tray to pick up the next chip.*

# Accessories

## Analog interface modules

- ▶ Combines thermocouple, 4-20mA, and  $\pm 10$  VDC I/O on a single board
- ▶ Tuning from operator console with no programming
- ▶ Supports up to 88 independent PID loops per controller

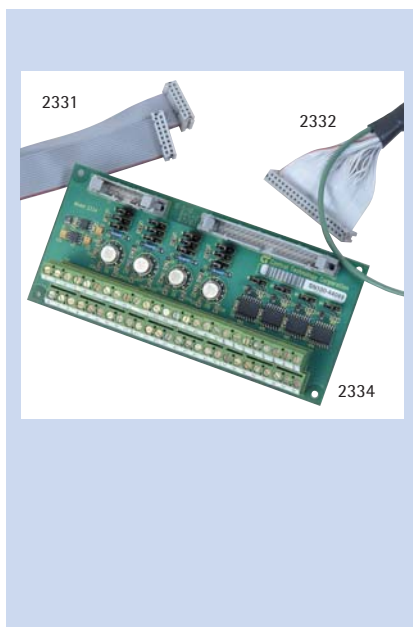


Model 2334

## Analog Interface Module Specifications

Model	Configurable Inputs				Configurable Outputs			Fixed Inputs		Fixed Outputs
	Thermocouple (J or K)	Current 4-20mA	Voltage $\pm 10$ VDC	# Input Channels	Current 4-20mA	Voltage $\pm 10$ VDC	# Output Channels	# Voltage Inputs $\pm 10$ VDC	# Voltage Outputs $\pm 10$ VDC	# Digital Outputs 24VDC
2334-J	J	Yes	Yes	4	Yes	Yes	4	4	4	8
2334-K	K	Yes	Yes	4	Yes	Yes	4	4	4	8
2335-J	J	Yes	Yes	8	N/A	N/A	N/A	N/A	8	8
2335-K	K	Yes	Yes	8	N/A	N/A	N/A	N/A	8	8
2335	N/A	Yes	Yes	8	N/A	N/A	N/A	N/A	8	8

## Cables, Connectors, Terminal Blocks, Connector Kits, etc.



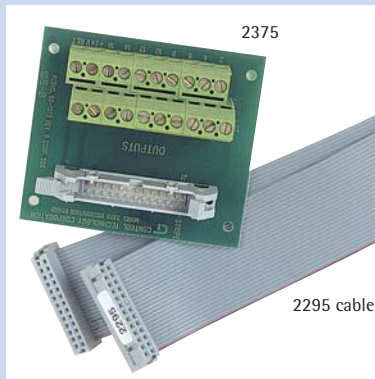
Model	Description
2000 PWR AC Power Cord	Power cord for use with all Rack Style 2000 Series Controllers (supplied with controllers).
2251 Connector Kit for 2201	Connector kit for 32 channel digital input module. Contains connectors and pins.
2252 Connector Kit for 2202	Connector kit for 24 channel digital output module. Contains connectors and pins.
2253 Connector Kit for 2203	Connector kit for 16 input/16 output module. Contains connectors and pins. <i>NOT SUPPORTED IN 2601</i>
2256-1 Connector Kit for 2206-1	Connector kit for single-axis stepper motor module. Contains connectors and pins.
2256-2 Connector Kit for 2206-2	Connector kit for dual-axis stepper motor module. Contains connectors and pins.

## Cables, Connectors, Terminal Blocks, Connector Kits, etc.

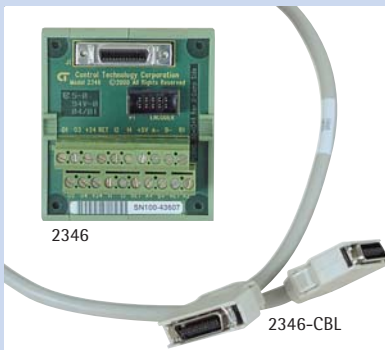


Model	Description
2257 Connector Kit for 2207	Connector kit for 16 channel analog input module. Contains connectors and pins.
2259 Connector Kit for 2209	Connector kit for 8 channel analog input module. Contains connectors and pins.
2260 Connector Kit for 2220	Connector kit for analog I/O module. Contains connectors and pins.
2269-1 Connector Kit for 2219-1	Connector kit for single-axis, servo control board. Contains connectors and pins.
2269-2 Connector Kit for 2219-2	Connector kit for dual-axes, servo control board. Contains connectors and pins.
2270 Limit Switch Pigtail for 2205	Connector with 6' unterminated wires for convenient wiring to model 2205/2206 dedicated inputs. (10 conductor)
2274 8 Output Pigtail	(6') Connector with unterminated wires for convenient wiring to model 2202.
2275 16 Output Pigtail	(6') Connector with unterminated wires for convenient wiring to models 2202, 2203 and 2221. <i>NOT SUPPORTED IN 2601</i>
2276 16 Input Pigtail	(6') connector with unterminated wires for convenient wiring to models 2201 and 2203. <i>NOT SUPPORTED IN 2601</i>
2278 Analog Input Pigtail	(6') connector with unterminated wires for convenient wiring to model 2207.
2279 Analog Output Pigtail	(6') connector with unterminated wires for convenient wiring to model 2209.
2280 Analog Input/Output Pigtail	(6') connector with unterminated wires for convenient wiring to model 2220.
2287 Output Cable for 2206	(12') connector with unterminated wires for convenient wiring of pulse and direction outputs of the 2206 Stepper Motor Control Module.
2289C Command Cable for 2219	(12') connector with unterminated wires for convenient wiring to model 2219 command output(s).

## Cables, Connectors, Terminal Blocks, Connector Kits, etc.



Model	Description
2289E Encoder Pigtail for 2219	(6') Connector w/underminated wires for convenient wiring to the encoder inputs on the 2219 servo control board.
2289L Limit Switch Pigtail for 2219	Connector with 6' unterminated wires for convenient wiring to model 2219's dedicated inputs.
2295 16 Output Ribbon Cable	(3') 26 pin flat ribbon cable with connectors for 2700 Series DC output modules.
2296 16 Input Ribbon Cable	(3') 34 pin flat ribbon cable with connectors for 2700 Series DC input modules.
2331	Output cable for 2334 and 2335.
2332	Signal cable for 2334 and 2335.
2346 Distribution Block	Provides screw terminal connection for digital I/O registration and encoder inputs.
2346-CBL Cable for Distribution Block	2' cable with high density connector on each end for connection of distribution board to 2703AP module.
2375 Screw Terminal Distribution Block-Output	For point-to-point wiring with 2202, 2203, 2221, 2601 outputs. Includes 2295 3' ribbon cable.
2376 Screw Terminal Distribution Block-Input	For point-to-point wiring with 2201, 2203, 2601 inputs. Includes 2296 3' ribbon cable.
2653 Connector Kit for 2601	Connector kit for 16 inputs and 16 outputs on model 2601. Contains connectors and pins.
2675 16 Output Pigtail for 2601	(6') connector with unterminated wires for convenient wiring to 2601 inputs.
2676 16 Input Pigtail for 2601	(6') connector with unterminated wires for convenient wiring to 2601 outputs.
2685 Power Supply Pigtail for 2601	Connector with 6' unterminated wires for connecting an external power supply to the model 2601.
2695 Connector Kit for 2601 PS	Connector kit for 2601 power supply input.





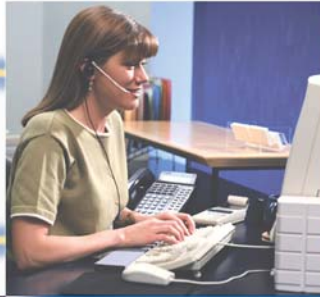
## Cables, Connectors, Terminal Blocks, Connector Kits, etc.



Model	Description
2699 Retainer Bracket Kit	Retainer Bracket to relieve cables wired from CTC I/O modules.
2880B RS-232 Modular Jack Adapter	DB-9 female adapter which plugs into IBM-PC compatible RS-232 port and provides a modular jack connector.
2880M RS-232 Modular Jack Adapter	DB-25 male adapter that routes RS-232 signals to modular jack format. For use with 4170 and 4180 touch screens.
2881 Modular Jack Cable	(7') Cable with "modular jack" connector on each end for use as a programming cable with 2200/2600/2700 Series.
2882 Modular Jack Cable	(15') cable with "modular jack" connector on each end for use as a programming cable for 2700 series.
2883 Modular Jack Cable	(25') cable with "modular jack" connector on each end, for use as a programming cable for the 2700 Series.
2885 Pigtail for External Supply	Connector with 6' unterminated wires for connecting an external power supply to the 2700 Series.
2886 Communications Connector/2601	Provides access to second RS-232 port on 2601 controllers and 2700AP controllers.
2895 Connector Kit for External PS	Connector kit for 2700 external supply input. Contains pins.

Visit our website [www.ctc-control.com](http://www.ctc-control.com) for detailed manuals and technical information.

All specifications are at 25° C unless otherwise noted.  
 Operating temperature range for all CTC hardware is specified as 0° - 50° C.  
 Storage temperature range for all CTC hardware is specified as -20° - 80° C.  
 Refer to datasheets posted on CTC's Web site for power requirements and other more detailed specifications on all of our products.



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