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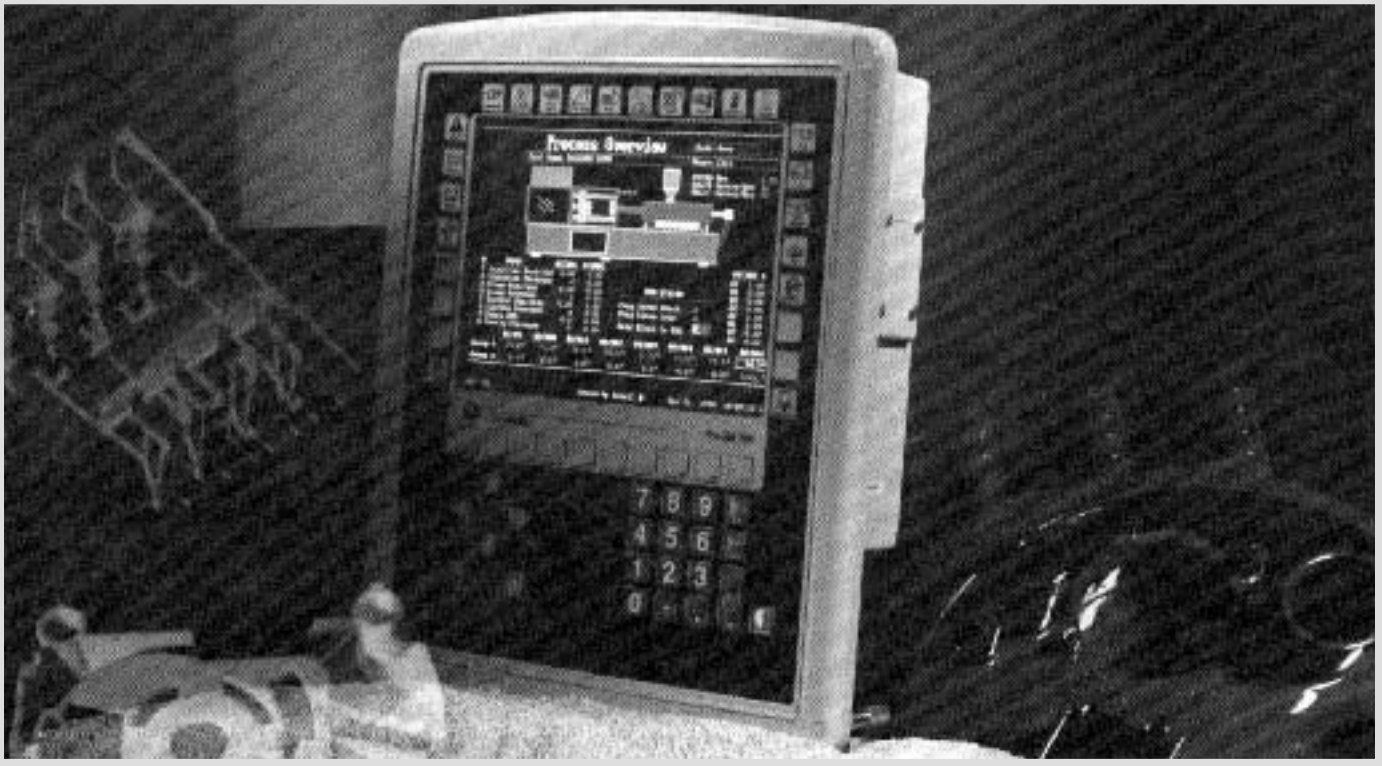
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Pro-Set 700
Injection Molding Control System
(Catalog Number 6500-PS7TE, -PS7EE)

Product Data



With Co-injection and/or Process Trace options

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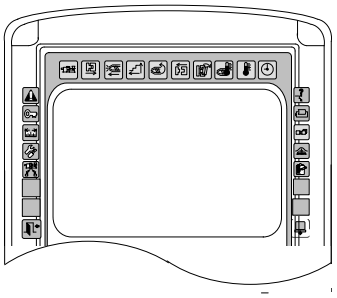
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Benefits

As a high-volume injection molder of tight-tolerance plastic parts, you want to make as many quality parts as possible in the shortest amount of time. And you want to do it with minimal setup time initially or for repeat production orders, and with minimal intervention from a machine operator. You'd also like the control system to automatically compensate for process variables to maintain tight tolerances and minimize scrap. You expect all of this from an integrated control system.

The Allen-Bradley Pro-Set 700 Injection Molding Control System gives you these features – and more.



Access Sets of Screens at the Touch of a Button

Setting up profiles and configuring devices is easy with Pro-Set 700 Operator Interface function keys. The Operator Interface has been designed with SPI standard icons on the front panel. Just one touch of these icons displays the menus you need to set up the system. The Operator Interface contains a powerful 486-based computer. And it's environmentally sealed for continuous use in industrial environments, helping to minimize your downtime.

The Operator Interface is available in your choice of backlit color (thin-film transistor) or monochrome electroluminescent displays.



Achieve Precise Control with Specialized Modules and ERC

The combination of Pro-Set 700 software and the Plastic Molding Module (Cat. No. 1771-QDC) and optional Co-injection Module (Cat. No. 1771-QI) give you precise control of your injection molding process from plastication to finished part. These modules provide the latest technology for exclusive dedicated process control with Allen-Bradley's proven PLC-5® programmable controller.

The QDC and QI modules automatically compensates for machine and process variations with Allen-Bradley's patented Expert Response Compensation (ERC)™ feature. ERC, an adaptive learning capability, provides the most advanced form of closed-loop control in the plastics industry.

During each machine cycle, ERC compares actual machine process variables with desired setpoints. ERC adjusts the control output to hydraulic amplifiers to compensate for differences between actual and desired values. As a result, you get:

- greater profile stability
- higher production yields
- lower scrap rates

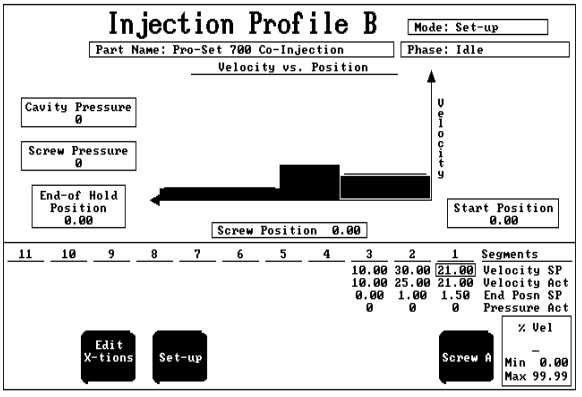
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Customize your Application with Programming Flexibility

Pro-Set 700 software lets you add or change screen displays to supplement the package we provide. Starting with the basic system, you can add or remove screens or data-entry fields on most screens, specify variables, and add helpful graphics such as block diagrams. You can configure the software for additional process modules and customize screen displays for their use.

Profile the Action of Screw, Clamp, and Ejector for Faster Cycles

You can program the operation of the screw, clamp, and ejectors for faster and smoother molding cycles. We give you "profiling" screens where you subdivide the action into segments, each having a pressure or velocity amplitude. For example:

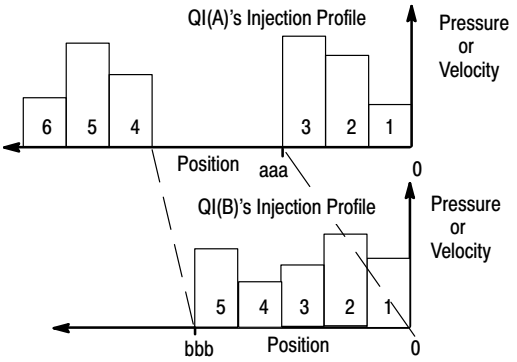


Use Co-injection for Specialized Molding Applications

With the optional co-injection module (Cat. No. 1771-QI), you can sequence the operation of dual injection heads. We give you these combinations of dual operation of screws A and B:

- B follows A for fast (10ms) transitions from A to B
- B interrupts A
  – at positions (aaa and bbb) that you select
  – with A's suspended outputs either closed loop, fixed, or turned off

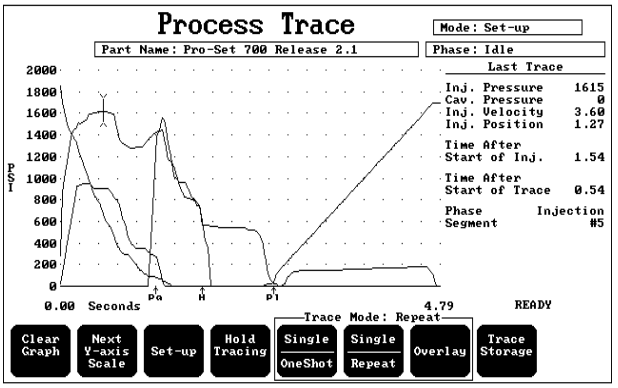
For example: B interrupts A at position aaa with this sequence:



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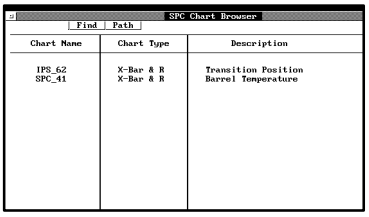
Apply Process Trace for Consistently Superior Performance

The optional Process Trace software lets you compare the trace of current injection performance (typically during setup) with the trace of “superior” performance saved from a previous job. The operator interface reads data table files collected by QDC or QI modules during injection and plots them on the process trace screen. You fine-tune current injection parameters until its trace matches that of previous superior performance.



Achieve Repeatability and Throughput with High-quality Results

For a high-volume producer, nothing’s more important than repeatability, maximum production at highest quality, and minimum setup time. Pro-Set 700 helps you achieve this. Once you set up to run a part, you save the setups in the mold/part library for future use. So you’re assured of the same setup data every time. You reduce setup time to the fine tuning. You’re ready to run sooner.



To monitor the quality of the production parts, you can use the built-in Statistical Process Control (SPC) capability. No need to manually chart your process. You record and chart measured variables online for real-time results. You can identify potential problems right away, reducing downtime and improving quality.

Backed by Allen-Bradley Training and Support

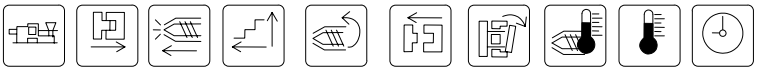
At Allen-Bradley, we back everything we sell with training and support. For more information, contact your local Allen-Bradley sales office or distributor.

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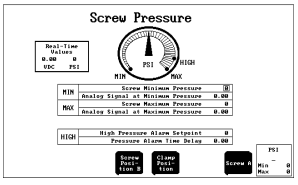
Summary of Features and Benefits

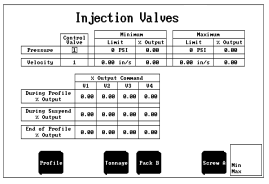
With the Pro-Set 700 Injection Molding Control System, you can:

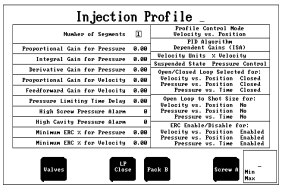
- Use an operator interface with state-of-the-art technology and pre-loaded software to set up and run the machine
- Press SPI icons to quickly access menu-driven sets of display screens for configuring modules, loading setup parameters, and profiling various phases of the molding cycle. For example:

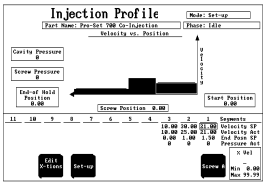


- Configure QDC and QI modules for various phases of the molding cycle relatively quickly and easily with menu-driven sets of display screens. For example:

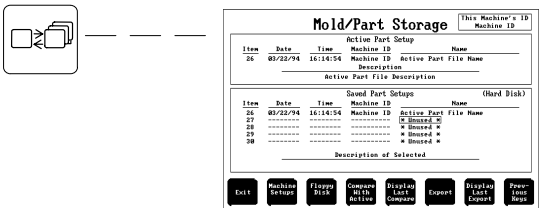




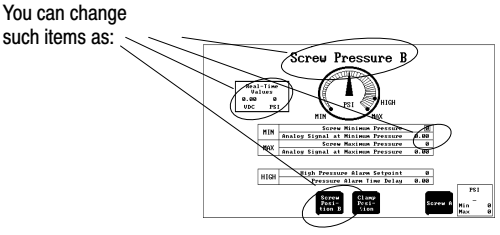




- Download mold/part setups from hard drive or floppy to change from one mold run to the next with minimum downtime



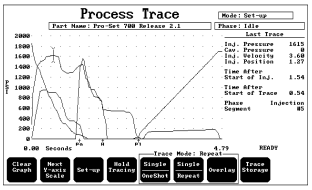
- Create custom display screens, function key titles, and data fields to customize the display to specific requirements. For example:

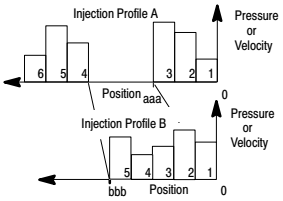


- Use specialized modules to control the screw, clamp, ejectors, SPI interface, and zone temperatures, with best and latest technology:
  – 1771-QDC for controlling the molding process
  – 1771-QI for controlling co-injection
  – 1771-TCM for controlling temperature zones
  – 1771-SPI for communication protocol with other devices
- Apply the patented ERC feature to automatically compensate for process variables on selected machine phases to control the molding process more precisely

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- Order process trace or co-injection options for further customization

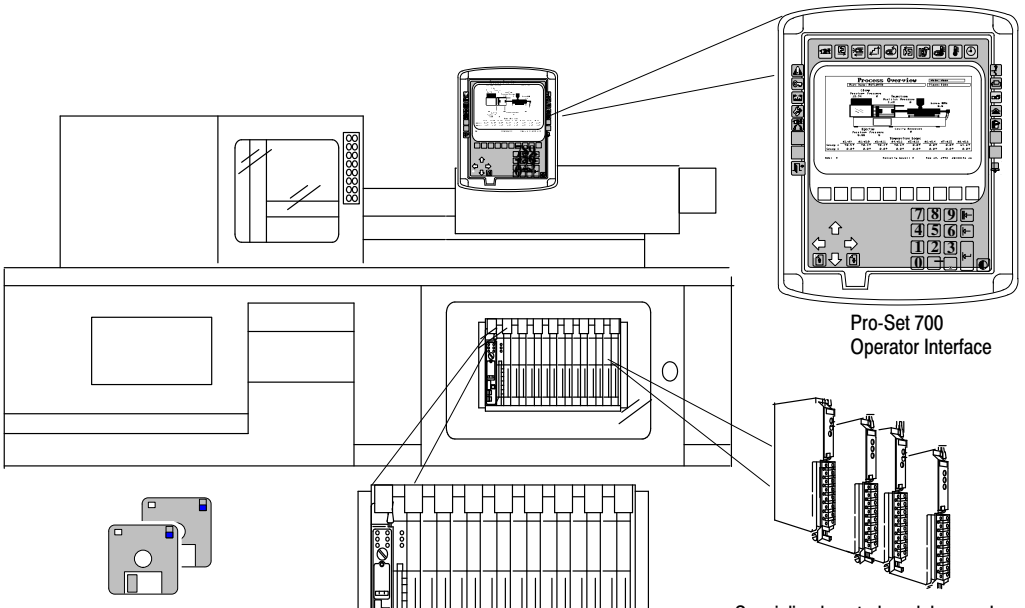




- Record SPC and/or C_{pk} data during mold runs to substantiate the quality of parts produced
- Use the same familiar Allen-Bradley PLC-5 hardware as currently used on your production floor so as not to incur additional expenses associated with training and spare stock

System Components

Pro-Set 700 Software is pre-loaded in the Operator Interface at the factory. The core package and additional modules that you purchase for this control system are listed in Suggested Equipment, below.



Pro-Set 700 Operator Interface

Pro-Set 700 software, including ladder logic to interface with QI, QDC, SPI and TCM modules, text files to customize screens for your application, and optional process trace for tracking injection variables.

PLC-5 processor, I/O chassis, I/O modules, and power supply

Specialized control modules, such as
- QDC Plastic Molding Module(s)
- QI Co-injection Molding Modules (optional)
- TCM Temperature Control Module(s)
- SPI Protocol Interface Module (optional)

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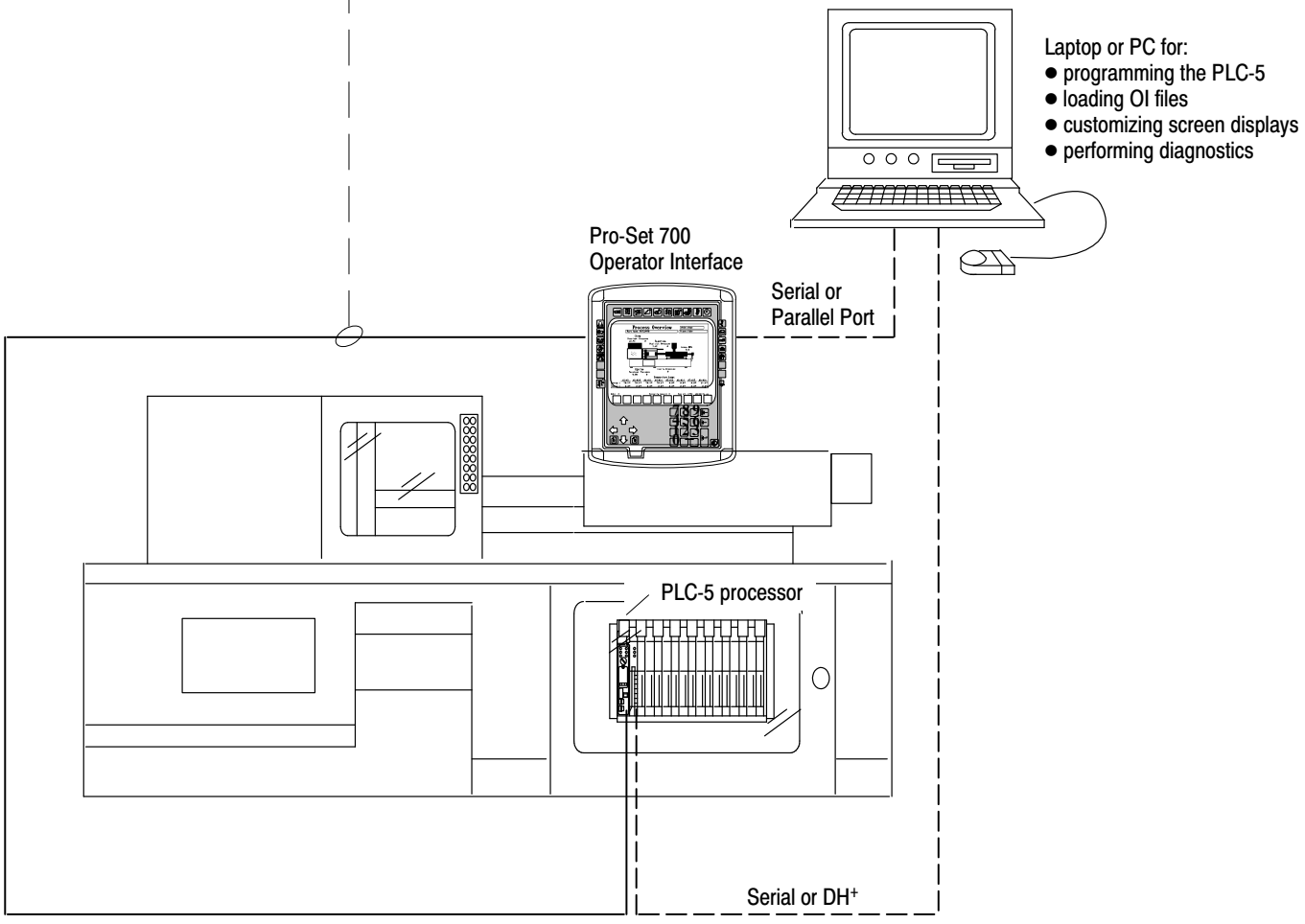
System Communications

Pro-Set 700 Software provides communication between the operator interface (OI) and the PLC-5 processor with a choice of communication modes depending on your choice of equipment.

Mode:	Equipment Required:	Connect on OI:	Connect on PLC-5:
Serial	enhanced PLC-5	serial port COM B	serial port, channel 0
Data Highway Plus	1784-KTX card in OI	1784-KTX card	DH+ port
Ethernet	PLC-5/40E or /80E	ethernet port	ethernet port

For ethernet manuals, refer to 1785-6.5.12, 1785-5.9, 6190-6.5.36, and 3rd-party FTP Software™

During system integration, engineering personnel can use a laptop or personal computer for on-line or off-line programming of the operator interface and the PLC-5 processor.

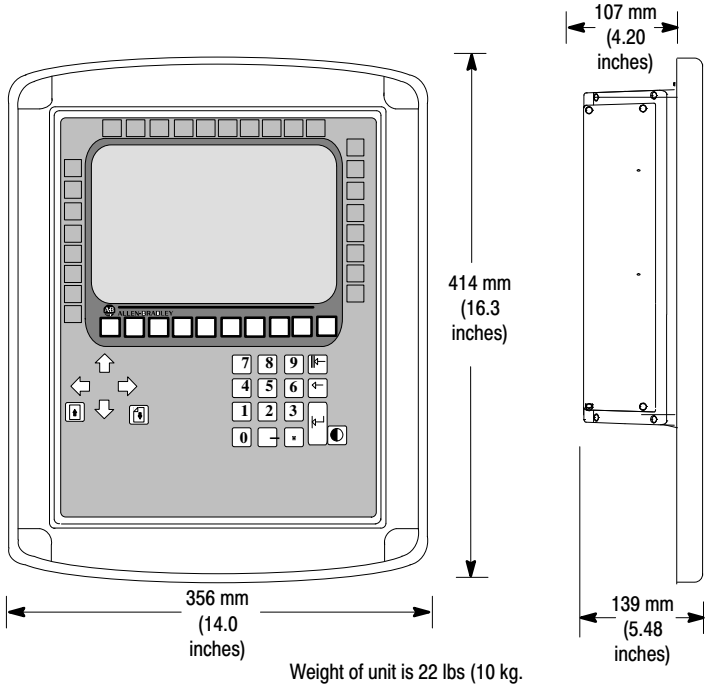


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Mounting Dimensions of the Operator Interface

You can mount the Operator Interface (Cat. No. 6500-PS7TE) in a rack or panel cut-out, or on a flat surface. Here are box and panel mounting dimensions:

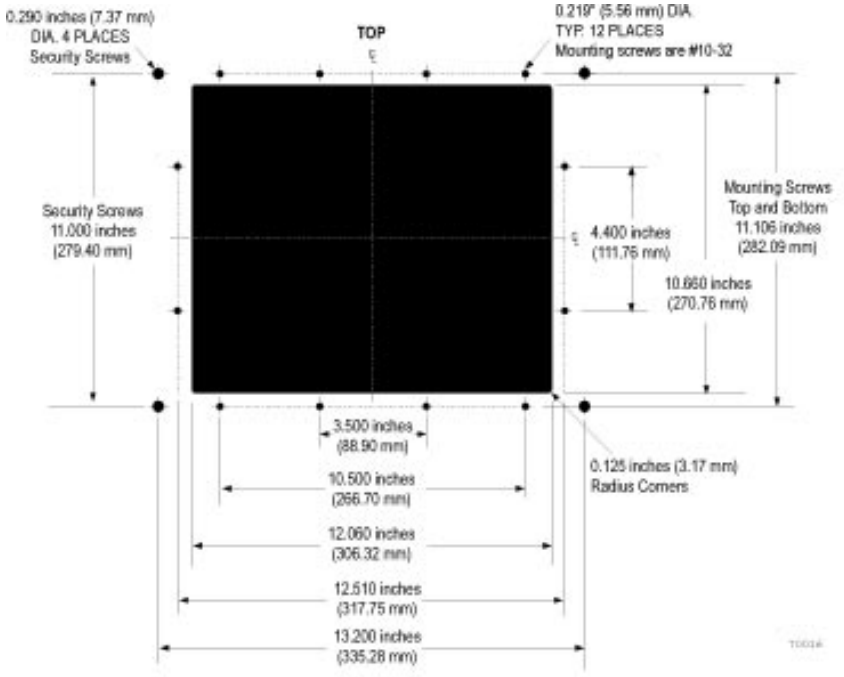
Figure 1
Box Dimensions



Weight of unit is 22 lbs (10 kg.

70013

Figure 2
Mounting Dimensions



Important: Allow for a mounting depth of 5.25" for adequate ventilation, or greater for warmer enclosures.

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Suggested Equipment

Select the Operator Interface with either a color TFT or monochrome EL display, and other devices based on your application requirements. For pricing information, contact your sales office or distributor.

Typical Hardware

The typical minimum control system includes these devices:

Description:	Catalog Number:
Flat panel Operator Interface with pre-loaded software – Color TFT or – Monochrome (black and white)	 6500-PS7TE, or 6500-PS7EE
PLC-5/30B processor	1785-L30B/C
Plastic Molding Module (QDC module)	1771-QDC
SPI Protocol Module	1771-SPI
8-loop Temperature Control Module (TCM)	1771-TCM
ac or dc I/O modules (as needed, such as)	1771-IAD, IBD, 1771-OAD, OBD
12-slot I/O chassis	1771-A3B
Power supply	1771-P4S

Optional Software and Modules

Add these options based on your system requirements:

Description:	Catalog Number:
Co-injection Modules (2 required)	1771-QI
Co-injection Software	6500-PS7COINJ
Process Trace Software	6500-PS7PT

Specifications

Mold/Part Storage

Number of part files	99 (hard drive or each floppy drive)
Name field size	Up to 30 characters
Description field size	Up to 50 characters
Part tracking	Machine ID stored with part file
Functions supported	Copy, compare, save, restore, transfer to/from floppy, export

Statistical Process Control (SPC)

Print capability	Yes
Chart types	X-bar/Range X-bar/Σ Histogram Pareto Individual and Moving Average or Range

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Operator Interface (6500-PS7EE or -PS7TE)

Display type	Flat panel, touch-sensitive, back lighted – Cat. No. 6500-PS7TE for color TFT – Cat. No. 6500-PS7EE for monochrome EL (blk/wht)
User screens	Menu-driven; tag-based (user customizable)
Display size	8.31" (21.1 cm) wide by 6.22" (15.8 cm) high
Touch resolution	display area: 640x480, touchsurround: 256x256
Display contrast ratio	TFT @: 60:1, EL @ 30:1
Display viewing angle (horiz.)	TFT @ ± 35°, EL @ ± 30°,
Display backlight	10,000 hrs, serviced from front of unit
Display controller	Local bus interface, 32-bit VGA flat panel – horizontal resolution: 640 pixels – vertical resolution: 480 pixels – video memory: 512K
Floppy disk controller	PC/AT compatible, 3.5" drives, r/w 1.44MB disks
Processor	486DX4-100
Operating system	MS-DOS® 6.22
Storage disk	210 MB
Expansion slots	2 PC/AT-compliant 16-bit 3/4-length for 9.5" cards 12W for TFT units, 8W for EL units (total, both slots)
Ports	2 serial; 1 parallel; 2 ethernet
Communications	Ethernet female DC-15 connector for AUI cables RJ-45 connector for 10Base-T twisted-pair cables Serial two 16550-compatible asynchronous channels – COM A (male DB-25) for COM1, COM3, or OFF (RS-232E, RS422, or RS485; 110–115.2 bps FD Parallel female DB-25, bi-directional port for printer, etc.
Supports this equipment	External floppy drive Keyboard Color printer for screen prints
Power, ac	115/230V ac (autosensing) @ 50/60 Hz
Power, dc	10.5V dc @ 6A to 30V dc @ 2A (optional PS)
Battery	Lithium, 3V dc, 7-year operating life
Clock	Real time, 32.768 khz crystal, battery powered
Environmental operating conditions Temperature Relative humidity Altitude Shock Vibration	 0 to 50° C (32 to 122° F) 50° C, 95% (without condensation) 10,000 ft (3,048 meters) 15G, 11ms pulse 5-57 Hz 0.006" peak displacement 58-2000 Hz 1.0G acceleration
Environmental storage conditions Temperature Altitude Shock Vibration	 –25° C to +60° C (–13° F to +140° F) 40,000 ft (12,192 meters) 30G, 11ms pulse 5-57 Hz 0.015" peak displacement 58-2000 Hz 2.5G acceleration
Size, mounting, and weight	see figures 1 and 2 (page 8)

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Plastic Molding Module (1771-QDC)
Co-injection Module (1771-QI)

Operating modes	QDC: select inject, inject/clamp, clamp/eject, inject/clamp/eject QI: inject mode only
Injection profiles	up to 10-step injection profiles (boost) – velocity vs position – velocity vs position (pressure limited) – pressure vs position – pressure vs time
Co-injection Sequence (QI only)	Screw B follows screw A, or Screw B interrupts screw A Suspended outputs can be off, fixed, or programmed
Injection transitions (boost cut-off)	Time or ram position Ram or cavity pressure
Pack/Hold profiles	up to 5-step pack and up to 5-step hold profiles – ram pressure vs time – cavity pressure vs time
Plastication profiles	up to 10-step plastication profiles (extrude) – backpressure vs position – backpressure vs time – screw RPM vs position – screw RPM vs time
Clamp profiles (QDC only)	up to 9-step close and 2-step low-pressure-close profiles up to 9-step open and 2-step open-slow profiles – velocity vs position – pressure vs position
Eject profiles (QDC only)	up to 3-step advance (with tip strokes and advance dwell) and 3-step retract profiles – velocity vs position – pressure vs position
Loop control	Open loop or closed loop with PID and FF Expert Response Compensation (ERC)
Inputs	4 analog: 4-20 mA, 1 to +5V dc, 0 to +10V dc
Input impedance	Voltage: 50K ohms differential or 25K ohms common mode Current: 250 ohms
Loss-of-input detection	Loss of position or pressure – open or shorted for 4-20 mA and 1-5V dc sensors – open for 0-10V dc sensors
I/O resolution	12-bit binary
I/O accuracy (lin, gain, offset)	0.1%FS @ 25° C, and ±50ppm/° C of FS
I/O isolation	1500V rms between chassis and wiring-arm terminals, and between input and output terminals
Outputs	4 analog: 4-20 mA, 0-10V dc, -10 to +10V dc
Output loading	Voltage: 5 mA maximum for any range Current: 15V dc compliance (supports a maximum current-loop impedance of 750 ohms)
Output overload protection	protects against short circuit for one minute (maximum)
Alarms	Process and programming
Environmental conditions Operating temperature Storage temperature Relative humidity Thermal dissipation	 0 to 60° C (32 to 140° F) –40 to 85° C (–40 to 185° F) 5 to 95% (without condensation) 21 BTU/hr (outputs full ON)
Update time	2 msec
Calibration interval	6 months for first interval, 1 year for subsequent intervals
Backplane current load	1.2A (maximum)
Backplane keying	Between 20 and 22, and between 26 and 28
Wiring arm	1771-WF

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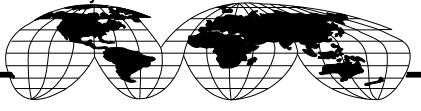
Temperature Control Module (1771-TCM)

Temperature loops (PID)	8 individually isolated
Input range (selectable)	±105mV
	Type B: 300 to 1800°C (572 to 3272°F) Type E: –270 to 1000°C (–454 to 1832°F) Type J: –210 to 1200°C (–346 to 2192°F) Type K: –270 to 1372°C (–454 to 2502°F) Type R: –50 to 1768°C (–58 to 3214°F) Type S: –50 to 1768°C (–58 to 3214°F) Type T: –270 to 400°C (–454 to 752°F)
Maximum input resolution (obtained by rescaling input data to counts)	3.3µV/bit @ 15 bits with sign bit Type E, J, K, T 0.1°C (0.2°F) for commonly used ranges Type B, R, S: 0.3°C (0.6°F) for commonly used ranges
Thermocouple linearization	IPTS-68 standard, NBS MN-125
Cold junction compensation	0 to 70°C ±0.25°C
Default Display Resolution	0.1°C (0.1°F)
Input impedance	> 10 MΩ
Input filtering	6-pole low-pass hardware filter
A/D resolution	16 bits or 15 bits plus sign bit
Open input detection	upscale
Time to detect open input	5s (maximum)
Open TC leakage current	< 10 nA (maximum)
Isolation voltage	1000V dc between input channels and input to backplane
Input overvoltage protection	140V ac rms continuous
Normal mode rejection (50/60Hz)	50dB / 60dB (minimum)
Common mode rejection (60Hz)	150dB (typical)
Drift: offset and gain	±0.50µV/°C and ±35ppm/°C (maximum)
Input bandwidth	9Hz
Update time (8 loops)	1s
TPO update time (block-transfer)	100ms (typical) — 500ms (maximum)
TPO update time (single-transfer)	20ms (maximum for heat/cool)
Settling time to within 0.1% of FS	125ms (maximum)
Non-linearity	0.02% of full range (maximum)
Accuracy with calibration	0.01% of FS @ 25°C (typical), 0.05% (maximum)
Under/Overrange threshold	± 103.0mV
Environmental conditions Operating temperature Rate of ambient change Storage temperature Relative humidity	 0 to 60° C (32 to 140° F) above 0.5°C/minute may temporarily degrade performance –40 to 85° C (–40 to 185° F) 5 to 95% (without condensation)
Calibration interval	6 months for first interval, 1 year for subsequent intervals
Backplane current load	1.0A (maximum)
Backplane keying	Between 26 and 28, and between 32 and 34
Connecting cables	1771-NC6 @ 1.8m (6 ft) or 1771-NC15 @.6m (15 ft)

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Allen-Bradley Headquarters, 1201 South Second Street, Milwaukee, WI 53204 USA, Tel: (1) 414 382-2000 Fax: (1) 414 382-4444

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