ALLEN-BRADLEY

Plastic Molding Module

(Cat. No. 1771-QDC)

Clamp and Eject Mode

Important User Information

Because of the variety of uses for this product and because of the differences between solid state products and electromechanical products, those responsible for applying and using this product must satisfy themselves as to the acceptability of each application and use of this product. For more information, refer to publication SGI–1.1 (Safety Guidelines For The Application, Installation and Maintenance of Solid State Control).

The illustrations, charts, and layout examples shown in this manual are intended solely to illustrate the text of this manual. Because of the many variables and requirements associated with any particular installation, Allen–Bradley Company cannot assume responsibility or liability for actual use based upon the illustrative uses and applications.

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Throughout this manual we make notes to alert you to possible injury to people or damage to equipment under specific circumstances.

ATTENTION: Tells readers where people may be hurt, machinery may be damaged, or economic loss can occur if procedures are not followed properly.

ATTENTION helps you:

- identify a hazard
- avoid the hazard
- recognize the consequences

Important: Identifies information that is especially important for successful application and understanding of the product.

Important: We recommend you frequently backup your application programs on appropriate storage medium to avoid possible data loss.

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Summary of Changes

Summary of Changes

We revised this publication to include changes due to upgrading the 1771-QDC/B module to a 1771-QDC/C.

For These Changes	Refer to Page or Chapter
Loss-of-sensor detection input range changed back to 0.00 to 10V dc	3-6, 3-11 A-3, A-4
Added the section, Record I/O Ranges	2-1
Added data codes to configuration worksheets.	Chapter 3 and Appendix A
Reversed the order of chapters 3 and 4 to present the download procedure for the MCC block before the download procedure for the other data blocks. Revised the download procedure for the MCC block (chapter 3) and for other command blocks (chapter 4).	Chapters 3 and 4
Changed the chapter title to better describe the task.	Chapter 6
Added data codes to Configuration Block worksheets. Added headers to improve the organization	Chapter 7 and Appendix A Chapter 7
Added data codes to Profile Block worksheets. Added headers to improve the organizatrion	Chapter 8 and Appendix A Chapter 8
Placed 2-page worksheets on facing pages	Chapter 8
Changed the title Test Your Values to Test for Linearity.	Chapter 9
Changed our recommendation on module calibration.	11-3
Added Block ID codes to blank worksheets.	Appendix A
Revised the index.	Index
Minor corrections	as found

To Help You Find Changes

To help you find these changes, we added change bars as shown to the left.

Using This Manual

Manual Objectives

Use this preface to familiarize yourself with this manual so you can use it effectively. This manual shows you how to apply the QDC module to your molding machine in the minimum length of time.

Since this manual is task oriented, we recommend that you perform these tasks in the following order:

Perform this task:	As discussed in this chapter:
Browse through the entire manual to become familiar with its contents.	All chapters
Overview of clamp and eject operation: how the QDC module controls the clamp and eject phases of your injection molding system.	Chapter 1
Install the QDC module. This includes such tasks as wiring and setting jumpers.	Chapter 2
Configure the QDC module mode to match your specific application. This includes configuring your QDC module to communicate to the different inputs and outputs.	Chapter 3
Overview of remaining configuration procedures that you are to perform through the remainder of this manual.	Chapter 4
Jog the Clamp and Ejector. This task requires jog setpoints to be configured along with jog pressure alarm setpoints.	Chapter 5
Set up communications between your PLC and the QDC module. This task includes selecting command and status bits that you use when writing your ladder logic.	Chapter 6
Load initial configuration values for the QDC module. This task requires you to determine and enter values into the clamp and ejector configuration blocks.	Chapter 7
Load your initial profile values for the QDC module. This task is performed in preparation to run and span your machine's valves.	Chapter 8
Span your clamp and ejector valves. This is done using set-output and open-loop modes.	Chapter 9
Tune the machine in closed-loop mode.	Chapter 10
Troubleshoot problems that may occur during module operation.	Chapter 11
Refer to this appendix for a blank copy of each worksheet contained in this manual.	Appendix A

Audience

Before attempting to apply the QDC module to a molding machine we assume that you are:

- an injection molding professional
- an experienced programmer (especially with A-B PLC-5 processors)
- familiar with hydraulics

Use of Terms

We use these abbreviations:

Abbreviated Name:	Item:
QDC module	1771-QDC Plastic Molding Module
PLC Processor	PLC-5 Programmable Controller
T47 or T50 terminal	1784-T47 or 1784-T50 Industrial Terminal
Pro-Set™ 600 Software	Pro-Set 600 Injection Molding Operator Interface Software (6500-PS600)
PanelView™ Terminal	PanelView Operator Interface Terminal (2711-KC1)
ERC™	Expert Response Compensation

The following table presents other terms we use in this manual:

Term:	Definition:
Selected Valve	In multi-valve systems, depending on the configured profile, the QDC module controls one valve and presets the setting of the remaining valves to produce molding-machine profiles. We call the valve being controlled by the QDC module's algorithms the selected valve. Multiple axis of control, such as the clamp and ejector cylinders, may require additional control valves.
Un-selected Valves	In multi-valve systems, depending on the configured profile, the QDC module controls one valve and presets the remaining valves to produce molding-machine profiles. We call the valves that are preset with an open loop percentage setpoint the un-selected valves.
Profile	A group of mold/part setpoints which define a given machine operation to the QDC module.
Command Block	Blocks downloaded from the PLC data table to the QDC module to make configuration changes or to initiate machine actions.
Status Block	Blocks used by the QDC module to relay information to the PLC processor about the QDC module's current operating status.
Profile Block	Command block containing mold/part setpoints.
Configuration Block	Command block containing machine setpoints.
Direct Acting Valve	An analog control valve that delivers increasing velocity or pressure with increasing signal input.
Reverse Acting Valve	An analog control valve that delivers increasing velocity or pressure with decreasing signal input.

Command Blocks

Command blocks provide the parameters that control machine operation. Command blocks are transferred from the PLC processor to the QDC module by means of block transfer write (BTW) instructions in software ladder logic. Command block abbreviations are:

Acronym:	Description:
MCC	Module Configuration Block
JGC	Jog Configuration Block
FCC	First Clamp Close Configuration Block
SCC	Second Clamp Close Configuration Block
TCC	Third Clamp Close Configuration Block
LPC	Low Press Clamp Close Configuration Block
CPC	Clamp Close Profile Block
FOC	First Clamp Open Configuration Block
SOC	Second Clamp Open Configuration Block
TOC	Third Clamp Open Configuration Block
OSC	Clamp Open Slow Configuration Block
OPC	Clamp Open Profile Block
EAC	Ejector Advance Configuration Block
ERC	Ejector Retract Configuration Block
EPC	Ejector Profile Block
DYC	Dynamic Command Block
CLC	Clamp & Eject ERC Values Block

Status Blocks

Status blocks report current status of molding-machine operation. Status blocks are returned from the QDC module to the PLC processor by means of block transfer read (BTR) instructions in software ladder logic. Status block abbreviations are:

Acronym:	Description:
SYS	System Status Block
CPS	Clamp Close Profile Status Block
OPS	Clamp Open Profile Status Block
EPS	Ejector Profile Status Block
CLS	Clamp & Eject ERC Values Status Block

Word and Bit Numbering

The QDC module stores data in command and status blocks. Each word location in a command or status block is identified by an alphanumeric code containing the block acronym and word number. For example, word 09 of the Module Configuration Command Block (MCC) is identified as MCC09.

Identify bits in a word location by adding bit numbering to the abbreviated word location. For example:

Specific: MCC09-B15 **General:** MCCxx-Byy

where:

- MCC = Module Configuration Command Block
- xx=word number (01-64)
- B = bit identifier
- yy = bit number (00-15)

Related Publications

The following table lists documentation necessary for the successful application of the QDC Module:

Publication #:	**Use this documentation**:	**To:**
1785-6.6.1	PLC-5 Family Programmable Controller Installation Manual	Install the PLC processor and I/O modules.
6200-N8.001	6200 PLC-5 Programming Software Documentation Set	Select instructions and organize memory when writing ladder logic to run your machine.
1771-6.5.88	Plastic Molding Module Reference Manual	Information on block transfers between PLC processor and QDC module. Also, information on PLC data transfer logic.
1771-6.5.85 1771-6.5.86 1771-6.5.93	Plastic Molding Module User Manual for other modes	Configure, program, install, and operate your QDC module to control molding operations.
1771-4.10	Plastic Molding Module Application Guide	Help select the module mode and match your QDC module to your hydraulic layout.

Reference information for the QDC module is contained in a separate document titled "Plastic Molding Module Reference Manual". Take time now to familiarize yourself with this reference manual's content and purpose. The four sections, in brief, include:

- a summary of each data block used by the QDC module for all command and status blocks (abbreviated command and status blocks)
- the programming error codes returned by the QDC module on a block by block basis as well as recommended procedures to correct these errors
- a detailed listing and explanation of each command word and bit used by the QDC module, as well as each status word and bit returned from the QDC module
- operational, mechanical, electrical, and environmental specifications about your module

If you have purchased the Pro-Set 600 software, you also need the following documentation:

Publication #:	Use this documentation:	To:
6500-6.5.11	Pro-Set 600 Software Designer's Guide	Select the Pro-Set 600 software that matches the requirements of your molding machine.
6500-6.5.12	Pro-Set 600 Software Assembly Manual	Transfer your Pro-Set 600 software from a floppy to your hard drive. Add overlays into your PLC processor and PanelView application files.
6500-6.5.13	Pro-Set 600 Software Overlay Installation Manual	Install Pro-Set 600 overlay(s) into your application files.
6500-6.5.14	Pro-Set 600 Software Customization Manual	Customize your Pro-Set 600 build for your machine control requirements.
6500-6.5.15	Pro-Set 600 Software Reference Manual	Support customizing your software control system.

Chapter 1

Overview of the Clamp and Eject Mode

Chapter Objectives

This chapter presents an overview of the 1771-QDC Plastic Molding Module's Clamp and Eject Mode. A summary of clamp and eject features is followed by sample applications of the QDC Module in Clamp and Eject Mode.

Important: This manual assumes you have already read your Plastic Molding Module Application Guide (pub. no. 1771-4.10) and have chosen Clamp and Eject as your QDC module's mode of operation.

Clamp and Eject Mode Operation

When you select the Clamp and Eject mode of operation, you can use the following phases:

Table 1.A
Glossary of Clamp and Eject Mode

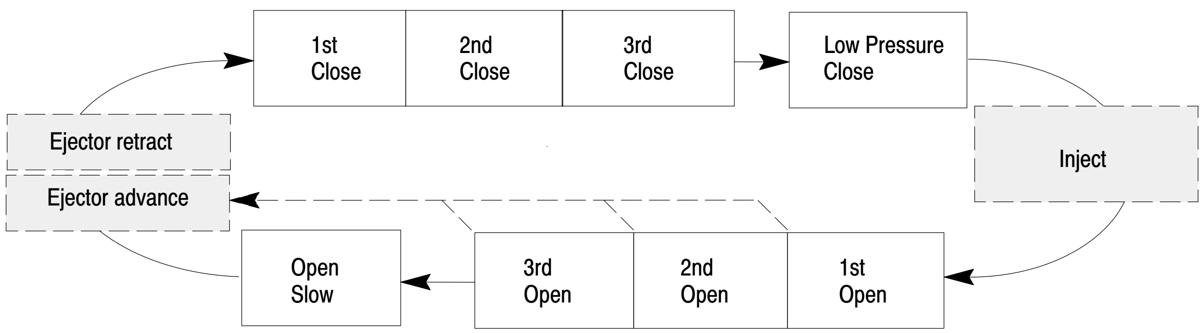
Clamp Phase:	**Description:**
1st Close 2nd Close 3rd Close	You can program a single-step clamp-close profile and not use a second or third profile. Or, you can program up to three clamp-close profiles that let you do the following at up to three different points in the clamp-close phase: • pick up a third mold plate • set cores • pick up or drop out pumps to change clamp speed or pressure
Low Pressure Close	To guard against damaging the mold when the two mold surfaces make contact and to detect part obstructions, you close the mold slowly with low pressure in closed-loop or open-loop control. Low Pressure Close can only be controlled through a pressure vs. position profile.
1st Open 2nd Open 3rd Open	You can program a single-step clamp-open profile and not use a second or third profile. Or, you can program up to three clamp-open profiles that let you do the following at up to three different points in the clamp-open phase: • drop out a third mold plate • pull cores • drop out or pick up pumps to change clamp speed or pressure
Open Slow	To decelerate the moving platen to accurately position it before ejecting of the part.
Eject Phase:	**Description:**
Ejector Advance	You advance the ejector in a single-step or in multiple steps using closed-loop or open-loop control. Multiple strokes may be programmed.
Ejector Retract	You retract the ejector in a single-step or in multiple steps using closed-loop or open-loop control. Multiple strokes may be programmed.
Tip Strokes	You can shake the part off the ejector tip by programming rapid single-stroke interim ejector cycles starting after the first advance stroke and ending before the last retract stroke.
Forward Dwell	You can pause after the first advance stroke or before the last retract stroke to let a robot remove the part when the ejectors are extended.

Clamp Control

You control clamp operation with these phases:

- clamp close
- low pressure close
- clamp open
- open slow

Figure 1.1
Clamp Portion of a Typical Machine Cycle



Clamp Close

Three separate clamp close profiles may be configured:

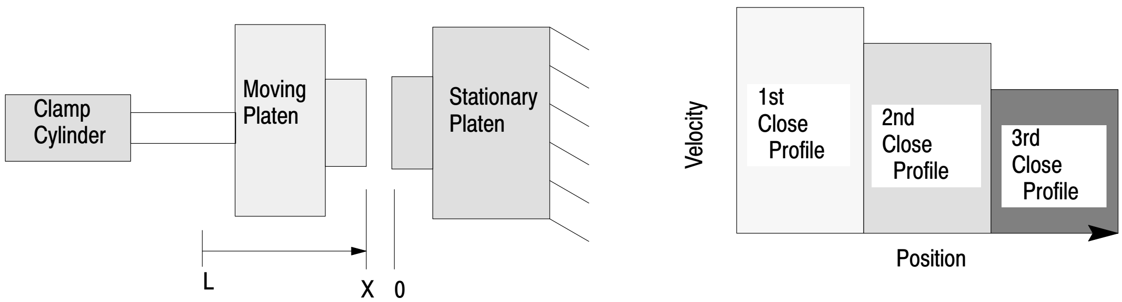
- first close
- second close
- third close

You may select from these control modes:

- velocity vs. position
- pressure vs. position

Use Clamp Close to move the platen from the fully open position (L) to some position X at a relatively high velocity or pressure. X is a position relatively close to the stationary platen yet far enough away to allow deceleration into Low Pressure Close. This prevents the platens from coming together at a high velocity.

Figure 1.2
Example Clamp Close

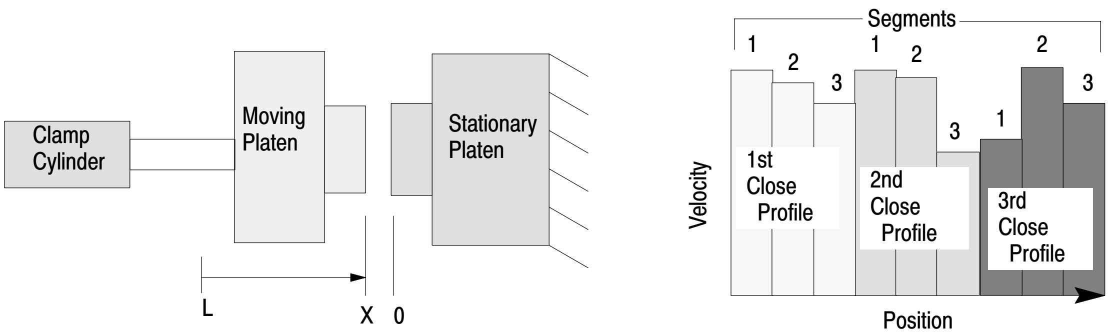


Three different close profiles have been provided to allow you to initiate the following operations between profiles:

- pick up the 3rd plate of a mold (on a floating 3-plate mold) or set cores
- program other events for all valves
- either automatically bridge between profiles or allow user programming to decide when to begin the next profile

Each of these three profiles is subdivided into three position segments (shown above each profile as in Figure 1.3). You can change clamp velocity or pressure up to three times in each profile, or up to nine times for the entire clamp close phase.

Figure 1.3
Example Clamp Close Position Segments



Important: You may use as many or as few profiles and/or segments within profiles as needed for your molding application. If using a single close fast motion, use the first segment of the 1st close profile. The Low Pressure Close Profile must follow.

After completing the last segment in each profile, the QDC module either switches immediately to the next programmed segment of the next desired profile or waits for a command from your PLC program to continue.

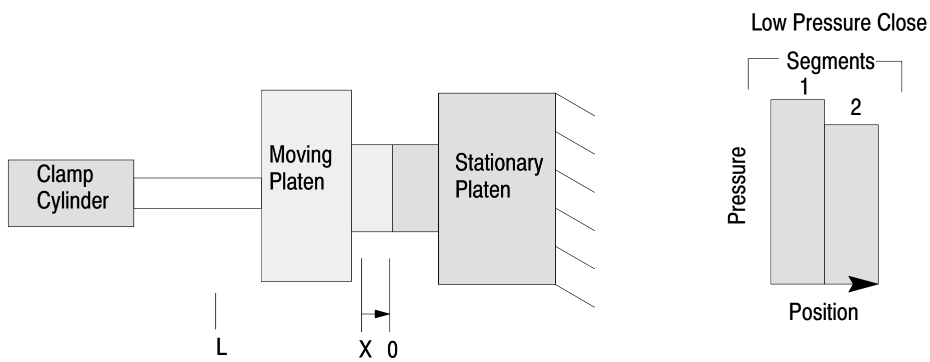
After completing the last configured close profile, the QDC module either switches immediately to the first programmed segment of Low Pressure Close, or waits for a command from your PLC program to continue.

Low Pressure Close

Use the Low Pressure Close Profile to decelerate closing motion to guard against damaging the mold halves and detect for part obstructions. The pressure setpoint that you select to control low pressure close should prohibit the mold from fully closing if there is an obstruction. Up to two low pressure close profile segments may be used.

You will use the pressure vs. position control mode for low pressure close.

Figure 1.4
Example Low Pressure Close



Important: If you need only one Low Pressure Close segment, configure the 1st segment of the Low Pressure Close Profile.

The QDC notifies your PLC program when this profile is complete and automatically uses end-of low pressure close set-output values to build tonnage (on a hydraulic machine) or lockup your toggle (on a toggle machine).

Clamp Open

You can open the mold fast with three profiles of the Clamp Open phase:

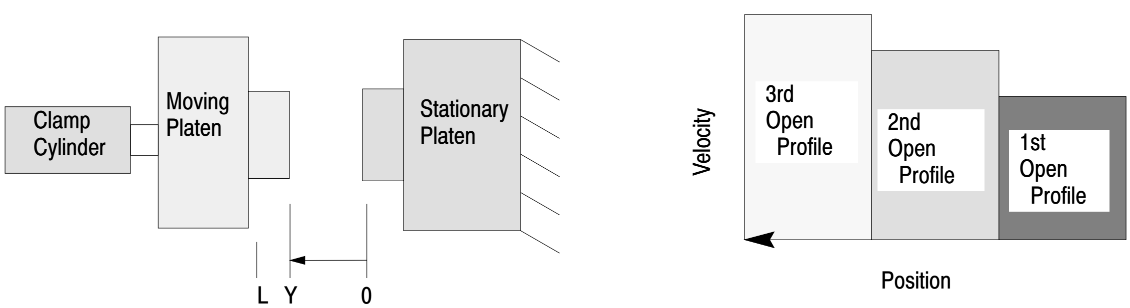
- first open
- second open
- third open

You may select from these control modes:

- velocity vs. position
- pressure vs. position

Use Clamp Open to move the platen from the fully closed position (0) to some position Y at a relatively high velocity or pressure. Y is a position relatively close to your fully open position (L), yet far enough away to allow deceleration into Open Slow. This is to increase positioning accuracy at the full open position (L).

Figure 1.5
Example Clamp Open

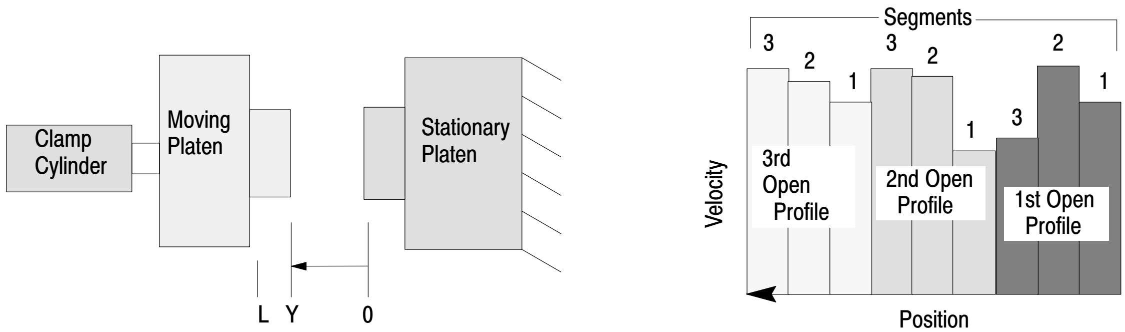


Three different open profiles have been provided to allow you to initiate the following operations between profiles:

- drop off the third plate of a mold (on a floating 3-plate mold) or pull cores
- program other events for all valves
- either automatically bridge between profiles or allow user programming to decide when to begin the next profile.

Each of these three profiles is subdivided into three position segments (shown above each profile in Figure 1.6). You can change clamp velocity or pressure up to three times in each profile, or up to nine times for the entire clamp open phase.

Figure 1.6
Example Clamp Open Position Segments



Important: You may use as many or as few profiles and/or segments within profiles as needed. If using a single open motion, use the first segment of the 1st open profile. The Open Slow Profile must follow.

After completing the last segment in each profile, the QDC module either switches immediately to the next programmed segment of the next programmed profile or waits for a command from your PLC program to continue.

After completing the last configured open profile, the QDC module either switches immediately to the first programmed segment of Open Slow, or waits for a command from your PLC program to continue.

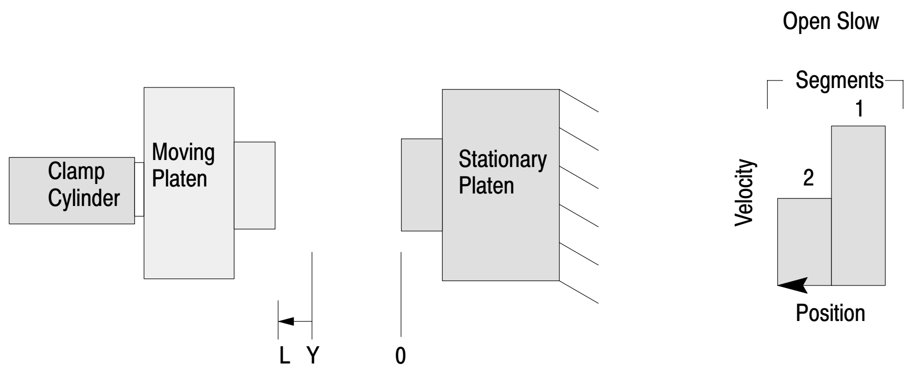
Open Slow

Use the Open Slow Profile to accurately position the clamp for ejecting the part(s). You may decelerate clamp motion twice with this profile using up to two profile segments.

You may select from these control modes:

- velocity vs. position
- pressure vs. position

Figure 1.7
Example Open Slow



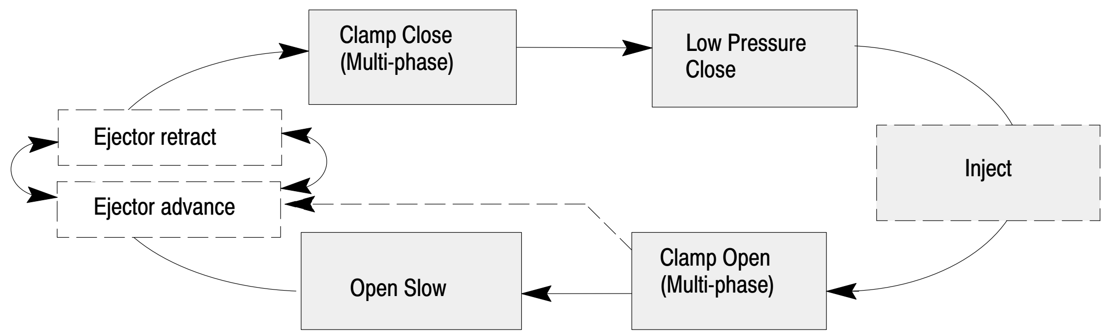
Important: If you need only one open slow motion, configure only the 1st segment of the Open Slow Profile.

Ejector Control

In this section, we describe Eject operation for expelling parts from the mold. The operation consists of:

- ejector advance
- ejector retract

Figure 1.8
Clamp and Eject Portion of a Typical Machine Cycle



Ejector Advance

The QDC module starts advancing the ejector after detecting either one of these events that you configure/program:

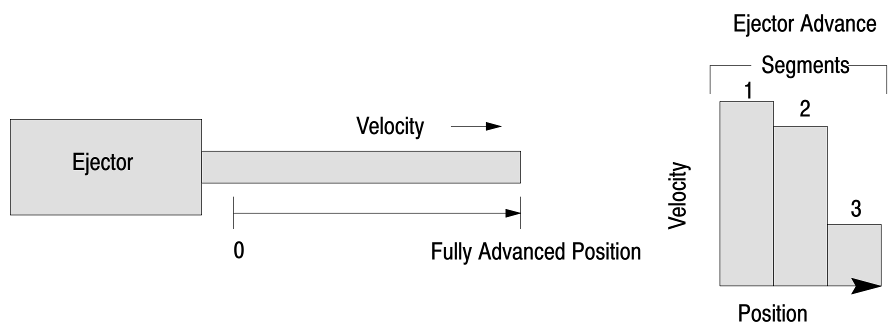
- clamp position reaching a pre-determined setpoint
- command from the user PLC program

You may advance the ejector while the clamp is still opening the mold, or wait until the mold is fully open.

Up to three ejector advance profile segments may be used. You may select from these control modes:

- velocity vs. position
- pressure vs. position

Figure 1.9
Example Ejector Advance



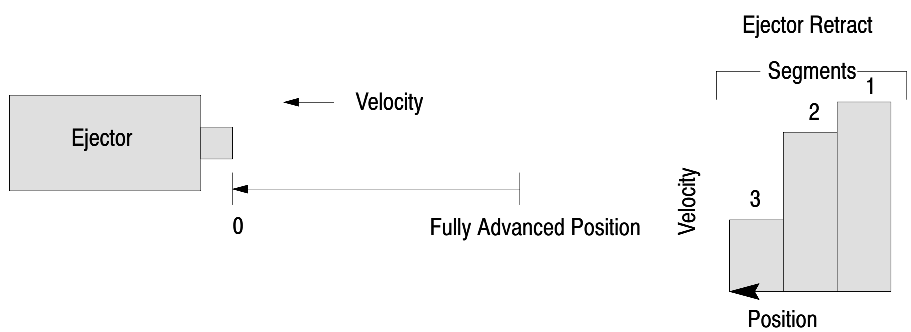
Important: If you need only one ejector advance motion, configure only the 1st Advance segment.

Ejector Retract

After the ejector advance is completed, ejector retract is executed. Similar to advancing the ejector, you retract it with up to three profile segments. You may select from these control modes:

- velocity vs. position
- pressure vs. position

Figure 1.10
Example Ejector Retract

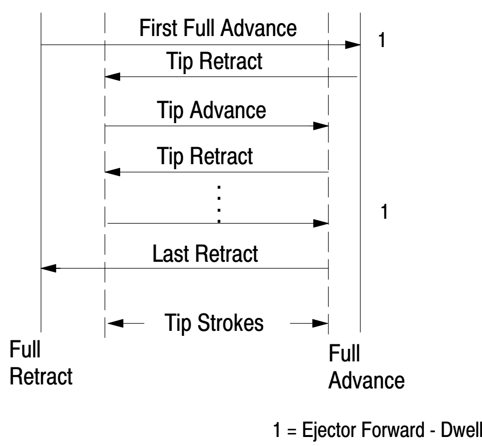


Other Eject Features

The QDC Module gives you the following additional features:

- the ability to repeat the ejector cycle a number of times, changing from advance to retract determined either automatically or by command from your PLC program
- Ejector Forward Dwell - the ability to pause after completing the first or last ejector advance stroke. Use this feature so a robot can pick off a part when ejectors are fully extended
- Ejector "Tip" Strokes - the ability to "shake" the part off the ejector. You may program interim single-segment advance and retract tip strokes that occur after the first advance stroke and before the last retract stroke

Figure 1.11
Advance, Retract and Tip Strokes



Chapter 2

Install the QDC Module

Chapter Objectives

This chapter guides you through the process of installing your QDC module to assure reliable, safe performance. Major topics described in this chapter include how to:

- set module jumpers
- key your I/O rack
- install your module
- wire I/O devices to your module
- ground your system
- plan for E-STOPs and Machine Interlocks

Record I/O Ranges

To match your QDC module to your I/O devices, record the I/O ranges of your I/O devices on Worksheet 2-A. You will use this information in this chapter for setting jumper plugs, and in chapter 3 to configure the module's inputs and outputs with software.

Circle or check your selections for I/O ranges on Worksheet 2-A.

Worksheet 2-A
Record I/O Ranges

I/O Connection:	Voltage 1:	Voltage 2:	Current:
Input 1 (Ejector position)	0 to 10V dc	1 to 5V dc	4 to 20 mA
Input 2 (Ejector pressure)	0 to 10V dc	1 to 5V dc	4 to 20 mA
Input 3 (Clamp position)	0 to 10V dc	1 to 5V dc	4 to 20 mA
Input 4 (Clamp pressure)	0 to 10V dc	1 to 5V dc	4 to 20 mA
Output 1	-10 to 10V dc	0 to 10V dc	4 to 20 mA
Output 2	-10 to 10V dc	0 to 10V dc	4 to 20 mA
Output 3	-10 to 10V dc	0 to 10V dc	4 to 20 mA
Output 4	-10 to 10V dc	0 to 10V dc	4 to 20 mA

Set Module Jumpers

Before installing the QDC module, you must use jumper plugs to configure the I/O ranges that you selected with Worksheet 2-A.

Access and Position the Jumpers

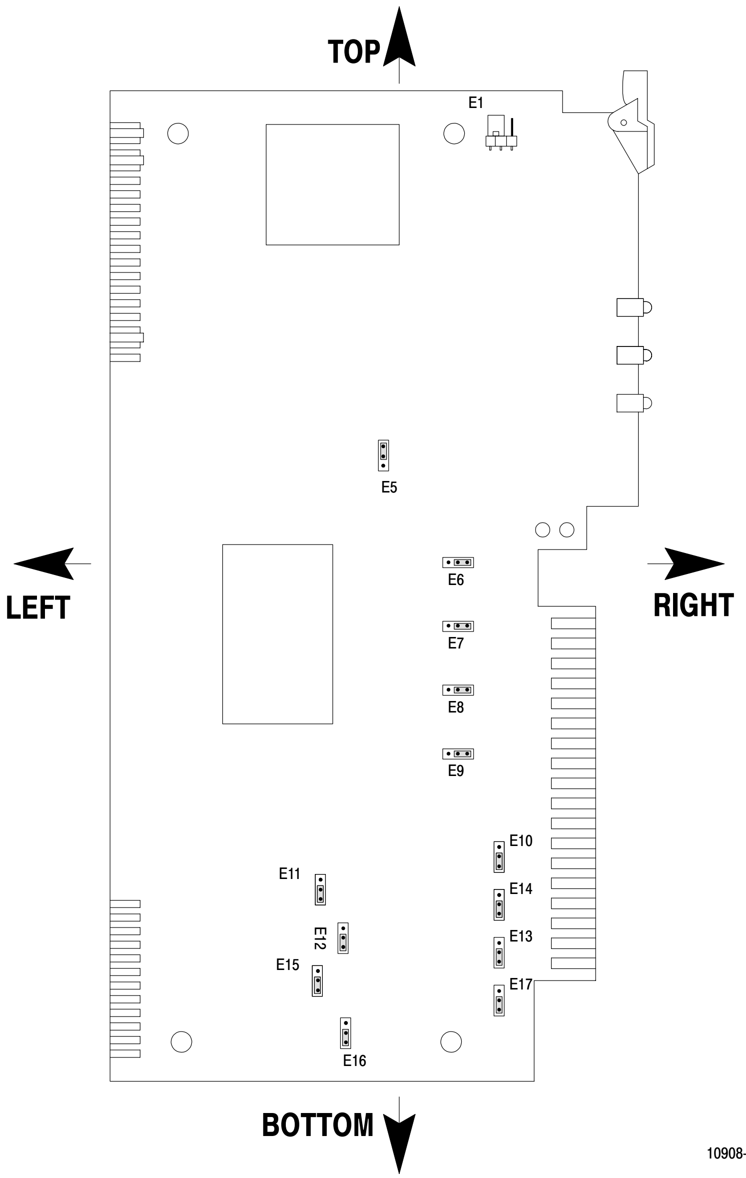
Access the jumpers and set them as follows:

ATTENTION: To avoid damage to internal circuits, observe handling precautions and rid yourself of any electrostatic charge. Also, this should be done on an anti-static work station.

---

1. Remove the label-side cover plate by removing the four screws.
2. Remove the circuit board from the module housing by removing the two screws located center-front at the swingarm catch.
3. Carefully turn over the circuit board so it is oriented as in figure 2.1. Handle it by the edges to avoid touching conductors or components.
4. Locate the jumpers (Figure 2.1).
5. Set the jumper plugs as shown in Table 2.A using a small needle-nose pliers (Figure 2.1).
6. After setting the jumper plugs, re-assemble the module.

Figure 2.1
Jumper Locations on the QDC Module's Circuit Board



Important: We define jumper plug positions as left, right, top, and bottom. This represents the position of the jumper plug on the 3-pin connector relative to the orientation of the circuit board shown above.

Table 2.A
Jumper Settings

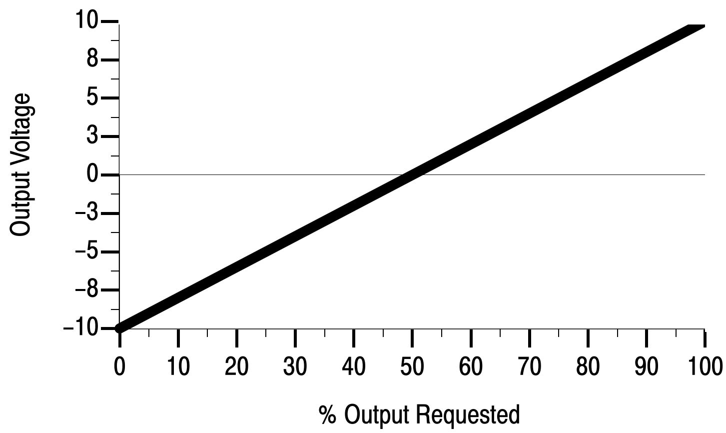
Jumper:	Function:	Setting:
E1	Run/Calibrate	Calibrate = right Run = left[1]
E5	I/O Density	Standard = top[1] Do not use bottom position
E6 E7 E8 E9	Input 1 (Ejector position) Input 2 (Ejector pressure) Input 3 (Clamp position) Input 4 (Clamp pressure)	Voltage = right[1] Current = left
E10 E14 E13 E17	Output 1 (Valve 1) Output 2 (Valve 2) Output 3 (Valve 3) Output 4 (Valve 4)	Current = top Voltage = bottom[1]
E11 E12 E15 E16	Output Range 1 (Valve 1) Output Range 2 (Valve 2) Output Range 3 (Valve 3) Output Range 4 (Valve 4)	–10 to +10V dc = top 0 to +10V dc or 4 to 20mA = bottom[1]

[1] Factory Defaults

Important: If you select current output with jumper plugs E10, E14, E13, and/or E17, then you must select the 4 to 20mA jumper position with E11, E12, E15, and/or E16.

ATTENTION: If an output is unconnected, set the jumper (E11, E12, E15, and/or E16) that corresponds to that output to 0 - 10V dc (bottom position). Setting the jumpers for –10 to +10V dc and later configuring the output as "unconnected" may cause the QDC module to output –10V dc on that channel. This occurs when the system is stopped or when a system reset occurs and all outputs are forced to 0% (i.e. 0% output equals –10V dc).

Important: Selecting –10 to +10V dc with jumper E11, E12, E15, and/or E16 sets the QDC module for bi-directional valve operation. The relationship to percentage output is as follows:



Key Your I/O Chassis

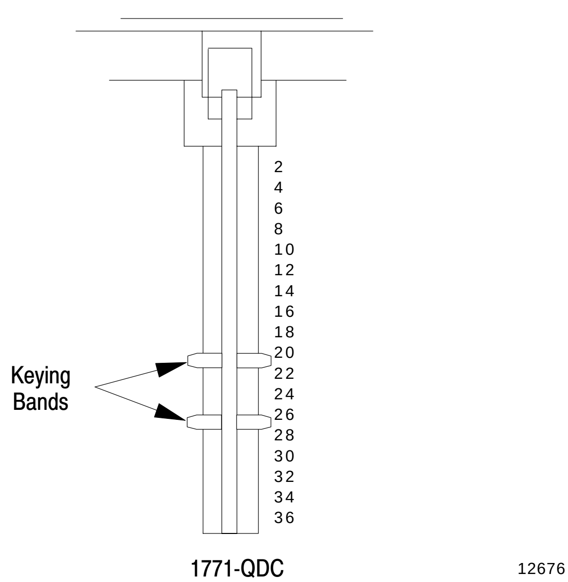
Use the plastic keying bands, shipped with each I/O chassis, for keying I/O slots to accept only one type of module. This is done to prevent the inadvertent installation of the wrong module into the wrong slot.

The QDC module is slotted in two places on the rear edge of the circuit board. The position of the keying bands on the backplane connector must correspond to these slots to allow insertion of the module.

Place keying bands between the following terminal numbers labeled on the backplane connector of your I/O chassis (see Figure 2.2):

- between 20 and 22
- between 26 and 28

Figure 2.2
Keying Positions



Install Your QDC Module

To install your QDC module in an I/O chassis, complete the following:

1. First, turn off power to the I/O chassis.

ATTENTION: Remove power from the 1771 I/O chassis backplane and wiring arm before removing or installing a QDC module.

Failure to remove power from the backplane could cause injury or equipment damage due to possible unexpected operation.

Failure to remove power from the backplane or wiring arm could cause module damage, degradation of performance, or injury.

2. Place the module in the plastic guides on the top and bottom of the slot that slides the module into position.

Important: Be aware that Pro-Set 600 software expects your Clamp and Eject QDC module to be placed in slot 1 of your I/O rack. If you choose to install your QDC module in some other slot, some modifications to your PLC application program may be necessary (refer to your Pro-Set 600 documentation for details).

3. Do not force the module into its backplane connector. Apply firm, even pressure on the module to seat it properly.

4. Snap the chassis latch over the top of the module to secure it.

5. Connect the wiring arm to the module.

Wire the QDC Module

Use the swingarm (1771-WF) supplied with the QDC module to wire I/O devices (Figure 2.3). The field wiring arm lets you install or remove the QDC module from the I/O chassis without rewiring. Swingarm terminals are numbered in descending order, from the top down, starting with terminal 18 (Table 2.B).

Figure 2.3
I/O Wiring and Grounding

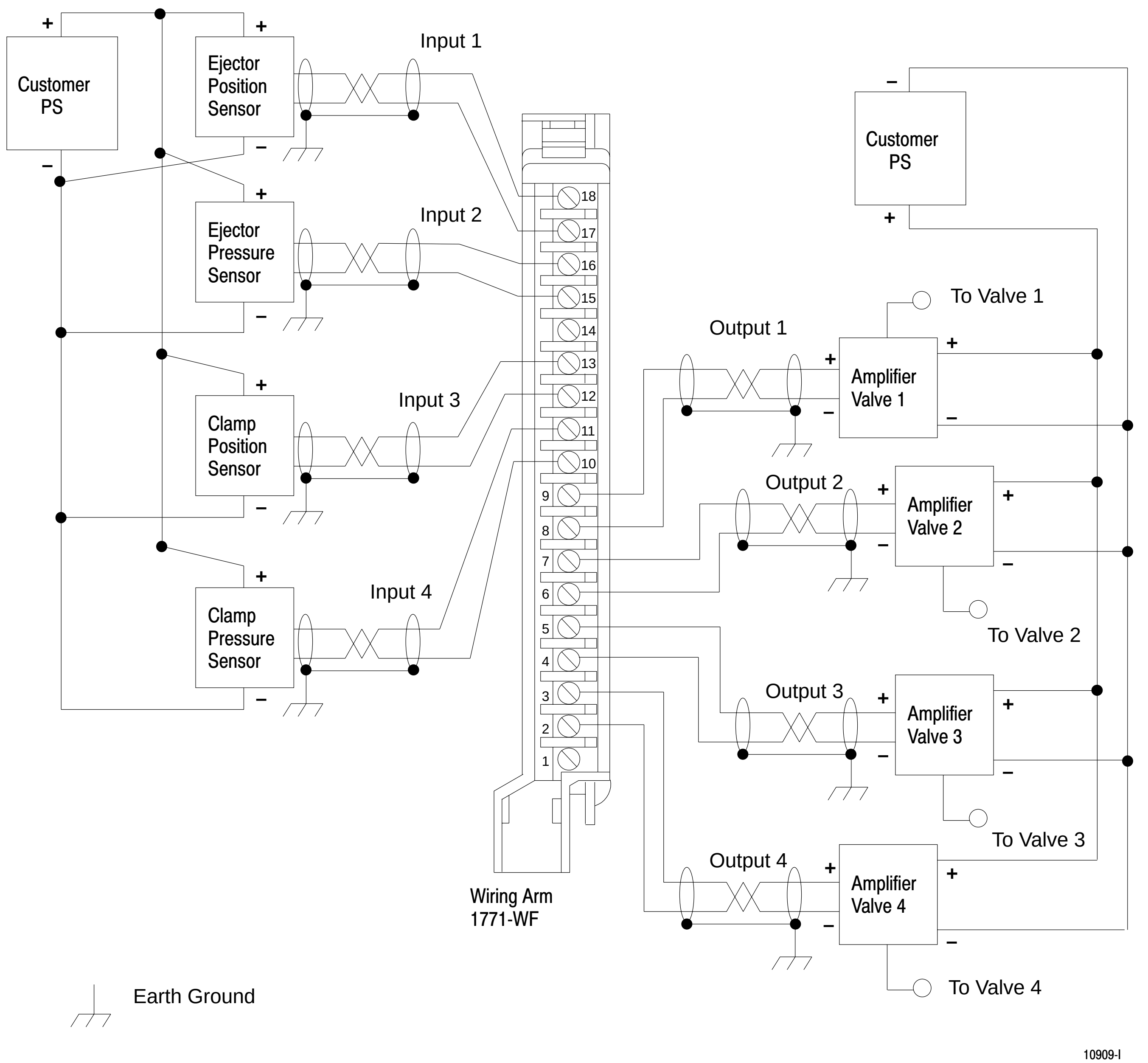


Table 2.B
Clamp and Eject Mode
I/O Terminal Designations

Transducer:	I/O Designation:	Terminal:
Ejector position	Input 1 (+) (–)	18 17
Ejector pressure	Input 2 (+) (–)	16 15
	Input common	14
Clamp position	Input 3 (+) (–)	13 12
Clamp pressure	Input 4 (+) (–)	11 10
Valve 1	Output 1 (+) Output common	09 08
Valve 2	Output 2 (+) Output common	07 06
Valve 3	Output 3 (+) Output common	05 04
Valve 4	Output 4 (+) Output common	03 02
Not used		01

ATTENTION: The QDC module has ESD protection to 20KV, but you can damage the module by accidental application of the wrong voltage to the I/O terminals. Do not exceed:

This voltage:	On these terminals:	When in:
+12V dc	input (18 thru 10)	any mode
±12V dc	output (09 thru 02)	voltage mode
+24V dc	output (09 thru 02)	current mode

Ground and Shield Your I/O Devices

Analog inputs and outputs are sensitive to electrical noise interference. Take care to shield them properly.

Guidelines:

- Use 22-gage (or larger) twisted-pair cable, 100% shielded with drain wire, such as Belden 8761 (or equivalent). For cable distances over 50 ft, use 18-gage cable such as Belden 8760 (or equivalent)
- Ground the cable shield at one end only; generally at the sensor or amplifier end, not at the I/O chassis (see Figure 2.4 and Figure 2.5)

Figure 2.4
Shielding Differential Inputs

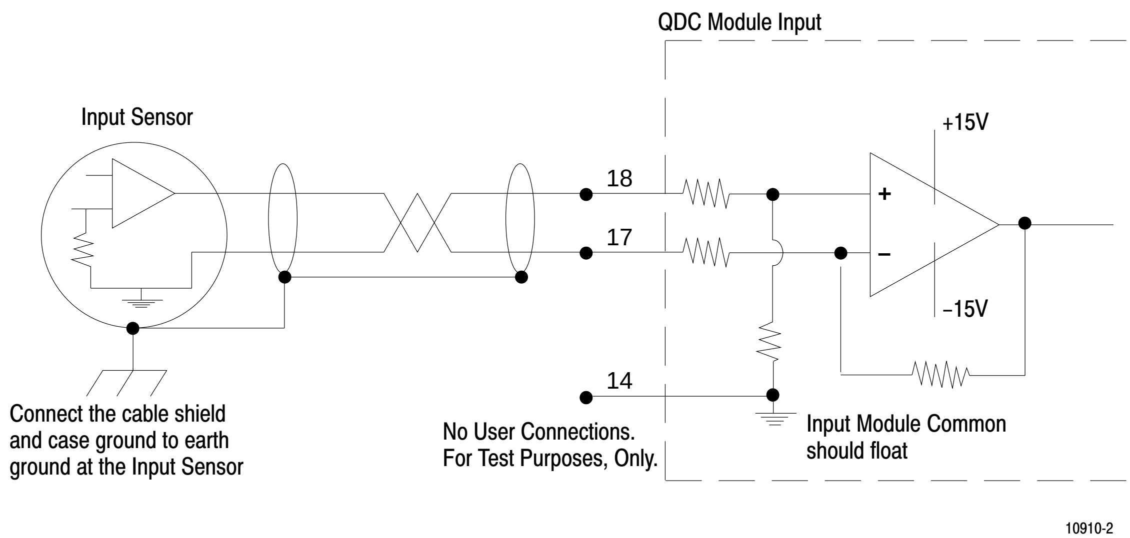
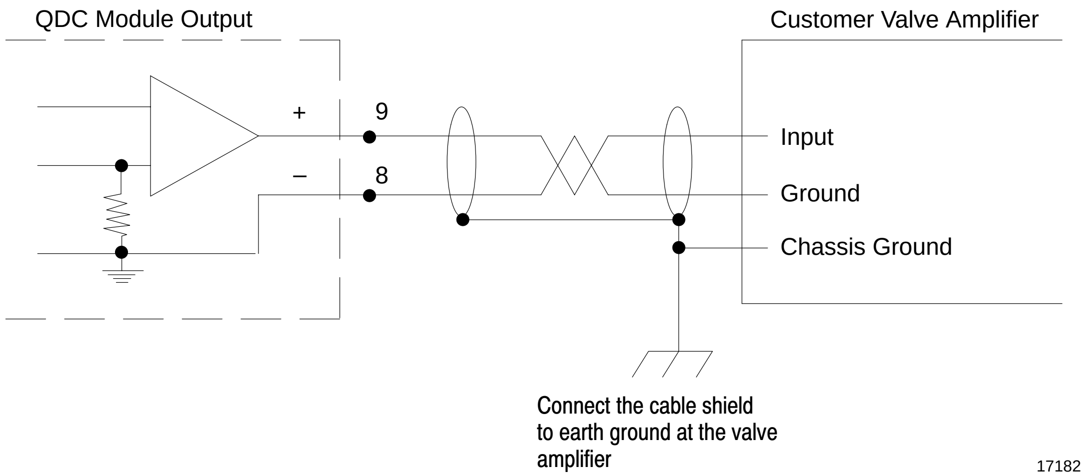


Figure 2.5
Shielding Single-ended Outputs



- ground the cable shields to a low-impedance earth ground of less than 1/8 ohm
- do not connect any ground to input common (terminal 14) except as specified below under Grounding Exceptions
- place high-voltage class A wiring and low-voltage class B wiring in separate grounded conduits
- in parallel runs, separate the class A and B conduit by at least 1 foot
- where conduit runs must cross, cross them at right angles

For additional grounding recommendations, refer to the Allen-Bradley Programmable Controller Wiring and Grounding Guidelines (pub. no. 1770-4.1).

Exceptions

If you experience unacceptable electrical noise interference, then try one or both of the following alternative grounding connections:

- connect the input cable shield to input common (terminal 14) after disconnecting the shield from the transducer
- connect the output cable shield to output common (terminal 8, 6, 4, and/or 2) after disconnecting it from the valve amplifier

Plan for E-STOPs and Machine Interlocks

You must consider the installation of Emergency Stop switches and machine interlocks when performing the following system tasks:

- designing your system
- assembling mechanical/hydraulic components
- wiring system components
- developing system ladder logic

ATTENTION: The Electrical Standard for Industrial Machinery (NFPA 79-1987) requires an emergency stop that, when actuated, shall de-energize all electrical power circuits which provide electrical energy to sustain machine motion. Maintained contact "Emergency Stop" push buttons are recommended.

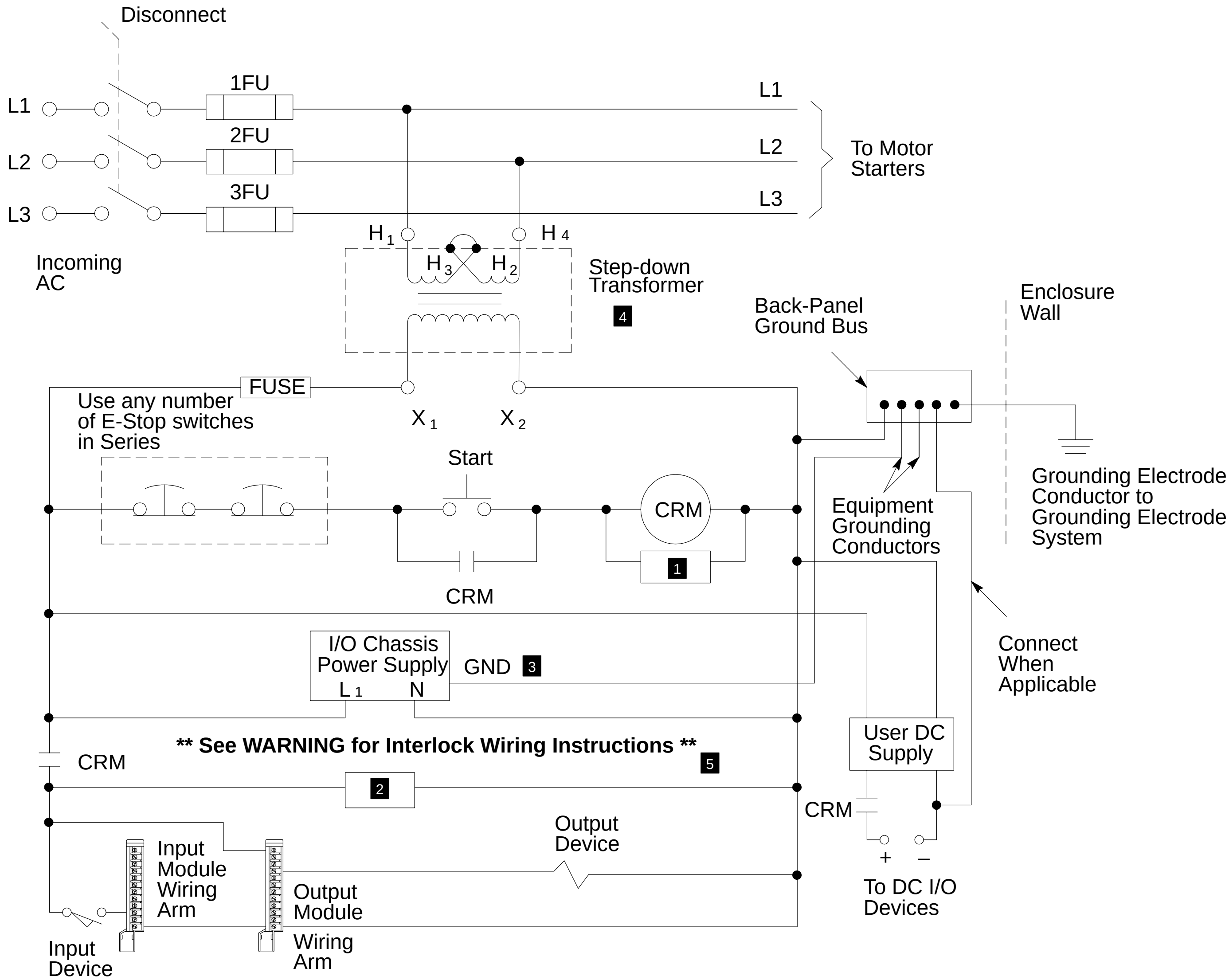
ATTENTION: The American National Standard for Plastics Machinery -- Horizontal Injection Molding Machines -- for Construction, Care, and Use (ANSI B151.1-1984) requires hydraulic, mechanical, and electrical interlocks to prevent inadvertent clamp closing with a safety gate in an open position.

In addition, we strongly recommend that the electrical interlocks consist of redundant devices and that the control circuit be so arranged that malfunction or improper sequencing of either redundant device prevents further operation of the machine.

ATTENTION: NEMA Standards Publication ICS1.1, Safety guidelines for the Application, Installation, and Maintenance of Solid State Control recommends that the emergency stop and safety gate electrical interlocks should directly control their appropriate functions through an electromechanical device independent of the solid state logic.

The next page shows an illustration of a typical grounded PLC power distribution circuit. For ungrounded systems or for more information on grounding and wiring guidelines, refer to Allen-Bradley Programmable Controller Wiring and Grounding Guidelines (pub. no. 1770-4.1) .

Figure 2.6
Typical PLC Power Distribution with Interlocks



1 To minimize EMI generation, you should connect a suppression network: for 120V AC, use Allen-Bradley cat. no. 700-N24; for 220/240V AC, use cat. no. 599-KA04.

2 To minimize EMI generation, you should connect a suppression network: for 120V AC, use Allen-Bradley cat. no. 599-K04; for 220/240V AC, use cat. no. 599-KA04.

3 For a power supply with a groundable chassis, this represents connection to the chassis only. For a power supply without a groundable chassis, this represents connection to both the chassis and the GND terminal.

4 In many applications, a second transformer provides power to the input circuits and power supplies for isolation from the output circuits.

5
- Reference the current NEC code and ANSI B151.1 for additional wiring guidelines.
- To minimize EMI generation, suppression networks should be connected across coils of electromagnetic devices.

10907-I

Chapter 3

Configure the QDC Module's Inputs and Outputs

Chapter Objectives

Your QDC module needs to know the characteristics of your clamp and ejector sensors. In this chapter, we describe how to determine these characteristics and download them to the QDC module. Topics include:

- signal ranges from pressure and position sensors
- minimum and maximum sensor signals corresponding to minimum and maximum pressures and positions
- alarm values and travel limits

We describe how to configure the QDC module in these sections:

- select module parameters and I/O ranges
- determine initial sensor configuration values
- download configuration values to the QDC module
- use the set-output operation to move the clamp and ejector
- complete sensor configuration
- optional sensor configurations

Important: You must properly configure the QDC module using procedures in this chapter before attempting further configurations.

Important: If you have not already done so, install Pro-Set 600 software. The procedures in this and the next several chapters assume that you have.

Command and Status Blocks Used

The following table contains a list of command blocks you are to configure throughout the course of this chapter. You may reference these command blocks in sections 1 and 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88).

Block:	Type:	Use in this Chapter:	Pro-Set 600 Files:
Module Configuration (MCC)	Command	Configure Module I/O operating parameters	B35
Module Configuration (MCC)	Command	Select Input Ranges for I/O	B35
Module Configuration (MCC)	Command	Select Output Ranges for I/O	B35
Module Configuration (MCC)	Command	Determine Initial Sensor Configuration values	N41
Module Configuration (MCC)	Command	Determine Software Travel Limits	N41
Module Configuration (MCC)	Command	Enter Pressure-alarm and Time-delay Setpoints	N41

Select Module Parameters and I/O Ranges

You select module parameters and I/O ranges by setting configuration bits in control words. First determine and write down correct settings using Worksheet 3-A thru Worksheet 3-C as follows:

To Configure:	In Control Word:	Starting At Pro-Set 600 Address:	Use this Worksheet:
Module Parameters	MCC02	B35/528	Worksheet 3-A
Input Range	MCC03	B35/544	Worksheet 3-B
Output Range	MCC04	B35/560	Worksheet 3-C

Worksheet 3-A
Selecting Module Parameters

Control Word MCC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B35/bit	543	542	541	540	539	538	537	536	535	534	533	532	531	530	529	528
Value	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Select System Operation with bits 05 and 04
Clamp and Eject 1 0

Select Single-unit Operation with bit 03 = 1
(0 generates a programming error)

Select English = 0 or
metric = 1 with bit 00

Example: If you select Clamp and Eject operation with English units:
MCC02 = 00000000 00101000

Selecting I/O Ranges for your Sensors

Next, configure the QDC module's I/O ranges to match the machine sensors and valves. Refer to Worksheet 2-A from chapter 2 which you filled out when setting the QDC module's jumpers. Apply this information to Worksheet 3-B for input ranges and Worksheet 3-C for output ranges.

Worksheet 3-B
Selecting Input Ranges for your Sensors

Control Word MCC03-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B35/bit	559	558	557	556	555	554	553	552	551	550	549	548	547	546	545	544
Value	1	1	1	1	1	1	1	1								

Select Input 4 (Clamp Pressure) Range with bits 07, 06
Select Input 3 (Clamp Position) Range with bits 05, 04
Select Input 2 (Ejector Pressure) Range with bits 03, 02
Select Input 1 (Ejector Position) Range with bits 01, 00

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Input Range		
0 – 10V dc	0	0
1 – 5V dc	0	1
4 – 20 mA	1	0
Not connected	1	1

Example: If you select an input range of 4-20mA for all four inputs,
MCC03 = 11111111 10101010.

Important: Software input/output selections must match the jumper settings for each respective input/output.

Worksheet 3-C
Selecting Output Ranges for your Valves

Control Word MCC04-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B35/bit	575	574	573	572	571	570	569	568	567	566	565	564	563	562	561	560
Value	1	1	1	1	1	1	1	1								

Select Output 4 Range with bits 07, 06
Select Output 3 Range with bits 05, 04
Select Output 2 Range with bits 03, 02
Select Output 1 Range with bits 01, 00

Output Range		
−10 to +10 vdc	0	0
0 to +10 vdc	0	1
4 to 20 mA	1	0
Not connected	1	1

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Example: If you select 0-10 vdc for all four output ranges,
MCC04 = 11111111 01010101.

Important: Software input/output selections must match the jumper settings for each respective input/output.

Determine Initial Sensor-configuration Values

To determine initial sensor configuration values, refer to Table 3.A, and to the specifications that accompanied your sensors, valves, and cylinders. Write down applicable values on Worksheet 3-D.

Important: You must enter floating-point numbers and percentages as integers, so we recommend that you write them in Worksheet 3-D in the following format: Use an assumed decimal point position that depends on the range value. For example:

If the Range is:	And You Want to Enter this Value:	Use this Format:
0 - 099.99%	75%	07500
0 - 99.99 inch	7.32 inch	00732
0 - 0999.9 mm	432.6 mm	4326
4.00 - 020.00 mA	16mA	01600
0 - 010.00 vdc	5.6 vdc	00560
0 - 009.99 sec	0.47 sec	00047
0 - 09999 PSI	321 PSI	00321
0 - 0999.9 Bar	222 Bar	2220

Table 3.A
Determining Initial Sensor-configuration Values for Worksheet 3-D

Category:	If:	Then Use a Value Equal to:
Minimum Position (Lines 1 and 9)	N/A	zero
Maximum Position (Lines 2 and 10)	the mold is fully closed, the position is zero and the ejector retract position is zero	full travel of the sensor
Analog Signal @ Min Position (Line 3 and 11)	your sensors are forward-acting	low end of your selected range
	your sensors are reverse-acting	high end of your selected range
Analog Signal @ Max Position (Line 4 and 12)	your sensors are forward-acting	high end of your selected range
	your sensors are reverse-acting	low end of your selected range
Minimum Pressure (Lines 5 and 13)	N/A	minimum range value specified by the manufacturer
Maximum Pressure (Lines 6 and 14)	N/A	maximum range value specified by the manufacturer

Table 3.A (continued)
Determining Initial Sensor-configuration Values for Worksheet 3-D

Category:	If:	Then Use a Value Equal to:
Analog Signal @ Min Pressure	your sensors are forward-acting	low end of your selected range
(Lines 7 and 15)	your sensors are reverse-acting	high end of your selected range
Analog Signal @ Max Pressure	your sensors are forward-acting	high end of your selected range
(Lines 8 and 16)	your sensors are reverse-acting	low end of your selected range

Worksheet 3-D
Determining Initial Sensor-configuration Values

Enter Your Initial Values Here

Input	Control Word	Pro-Set 600 Addr.	Value	Description	Units
1	MCC37	N41:33	0	Minimum Ejector Position	Ejector Axis Measured from zero [1]
	MCC38	N41:34		Maximum Ejector Position	Ejector Axis Measured from zero [1]
	MCC39	N41:35		Analog Signal @ Min Ejector Position	Input Signal Range [2]
	MCC40	N41:36		Analog Signal @ Max Ejector Position	Input Signal Range [2]
2	MCC45	N41:41	0	Minimum Ejector Pressure	Ejector Pressure [3]
	MCC46	N41:42		Maximum Ejector Pressure	Ejector Pressure [3]
	MCC47	N41:43		Analog Signal @ Min Ejector Pressure	Input Signal Range [2]
	MCC48	N41:44		Analog Signal @ Max Ejector Pressure	Input Signal Range [2]
3	MCC23	N41:19	0	Minimum Clamp Position	Clamp Axis Measured from zero [1]
	MCC24	N41:20		Maximum Clamp Position	Clamp Axis Measured from zero [1]
	MCC25	N41:21		Analog Signal @ Min Clamp Position	Input Signal Range [2]
	MCC26	N41.22		Analog Signal @ Max Clamp Position	Input Signal Range [2]
4	MCC31	N41:27	0	Minimum Clamp Pressure	Clamp Pressure [3]
	MCC32	N41:28		Maximum Clamp Pressure	Clamp Pressure [3]
	MCC33	N41:29		Analog Signal @ Min Clamp Pressure	Input Signal Range [2]
	MCC34	N41:30		Analog Signal @ Max Clamp Pressure	Input Signal Range [2]

[1] Incremental Distance
00.00 to 99.99 Inches
000.0 to 999.9 Millimeters

[2] Input Signal Range
00.00 to 10.00V dc or
01.00 to 05.00V dc or
04.00 to 20.00MADC

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

Download MCC Values to the QDC Module

Use this download procedure now and later in this chapter. The procedure requires you to complete the following general steps:

- enter MCC values into the PLC-5 data table
- download them to the QDC module (PLC-5 processor in run mode)
- correct any data entry (programming) errors

Next we describe the general steps:

Enter MCC Values into Your PLC-5 Data Table

With your programming terminal, enter values from Worksheet 3-A thru Worksheet 3-D into your PLC-5 data table as follows:

1. Switch the PLC-5 processor to program mode.

2. Display your PLC-5 data table.

3. Locate the data file for storing the MCC block. PLC-5 data table word addresses are listed on the worksheets.

4. Enter the value for each word and bit.

When you enter bit selections in words prefixed with file identifier B (example: B34), the PLC-5 processor automatically switches the radix to binary format so you can conveniently enter binary data.

Download MCC Values to the QDC Module

To download the MCC block to the QDC module, switch the PLC-5 processor from program to run mode. Pro-Set 600 software downloads the MCC block to the QDC module for you.

Important: You can verify that the MCC block was successfully downloaded or that you made a data entry (programming) error by evaluating the following words that Pro-Set 600 software continuously reports to the PLC-5 processor.

If:	And:	Then:
SYS01-B08 = 1 (B34/8)	N/A	QDC module accepted a valid MCC.
SYS19-B00 = 1 (B34/288)	SYS61 = 1 (ID code for MCC block stored in N40:213)	You made a programming error in MCC. Read the error code in SYS62 (N40:214) , and look up the error in Section 2 of QDC Module Reference Manual, publication 1771-6.5.88.

Important: Pro-Set 600 software downloads all command blocks when your PLC-5 processor enters run mode after a valid MCC block is accepted. All programming errors reported in SYS62 (N40:214) are referenced to the MCC block until SYS01-B08 = 1.

Correct Any Data-entry (Programming) Errors in MCC

Upon receipt of the MCC block, the QDC module tests data for data-entry errors, such as a value out of range. When it detects an error, the QDC module halts operation until you correct the error. For a complete list of error codes to help you correct a programming error, refer to Section 2 of the Plastic Molding Module Reference Manual, publication 1771-6.5.88.

You must correct errors by entering the changed configuration values into your PLC-5 data table and downloading the new values to the QDC module as outlined above. Pro-Set 600 software continues to attempt to download the MCC block to the QDC module until an MCC block is accepted and the QDC module returns SYS01-B08 = 1.

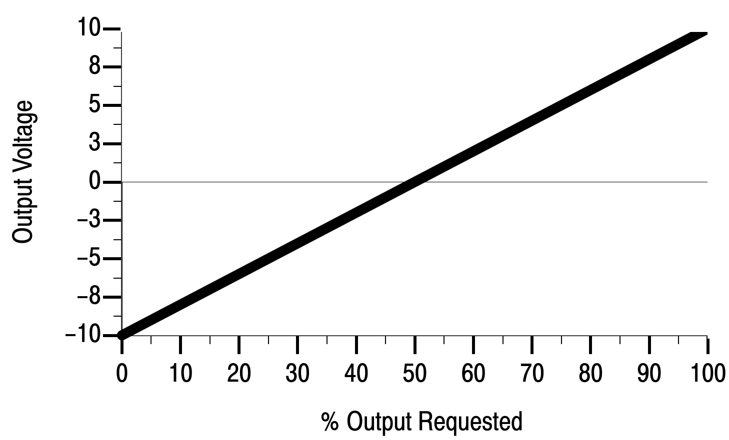
Important: The QDC module must receive a valid MCC block before you can download additional blocks.

Use the Set-output Operation to Move the Clamp and Ejector

To finish configuring the QDC module, you actuate the clamp and ejector with the QDC module's set-output operation. **Set-output** applies percentage output values to your valves to move your clamp or ejector cylinder in a controllable fashion. You apply a percentage output signal to each module output so you can move each actuator over its intended range. Sensor spanning values can then be refined per the actual values monitored by the QDC module.

ATTENTION: Do not rely on pressure valves connected to the QDC module for pressure relief. Use them only for pressure control below the setting of the system pressure-relief valve.

ATTENTION: A value of zero in set-output words N41:121 - N41:124 does not necessarily correspond to zero pressure or flow. If you have configured jumper E11, E12, E15, and/or E16 for bi-directional valve operation, an output of 0% gives –10vdc, 50% gives 0vdc (see chart). Amplifier electronics or spool-null offsets may also allow pressure or flow at zero volts signal input. Consult your valve and amplifier specifications for more details.



ATTENTION: As soon as you enable set-output operation, the QDC module's outputs drive the connected valves according to the values you entered into DYC09 - DYC12 (Pro-Set 600 words N41:121 - N41:124). Be sure these values RESULT IN NO MOVEMENT until you adjust them one-at-a-time with your programming terminal in the procedures that follow.

Actuating the Clamp and Ejector with Set-output Operation

1. Enter values that result in no motion in these DYC words:

Output:	In Data Word:	At Pro-Set 600 Address:
1	DYC09	N41:121
2	DYC10	N41:122
3	DYC11	N41:123
4	DYC12	N41:124

2. Enable set-output operation by entering a 1 in DYC01-B08 (Pro-Set 600 address B35/392). The QDC module sets outputs 1 - 4 to percentage values that you entered in DYC09 - DYC12 respectively.

3. With your programming terminal, slowly increase the %-output value of one output as you observe the corresponding movement.

Important: The DYC is constantly transferred to the QDC module by Pro-Set 600 software, so changes you make to %-output values are immediately implemented.

Complete your Sensor Configuration

Complete the procedure for configuring the QDC module to match its sensors by spanning them over their intended range with the machine in operation. Here we describe how you determine:

- clamp position sensor values
- ejector position sensor values
- clamp pressure sensor values
- ejector pressure sensor values

In the procedures that follow, measure and record:

- minimum and maximum positions
- corresponding signal values
- minimum and maximum pressures
- corresponding signal values

After determining these values, write them down on Worksheet 3-E.

Important: You must complete this configuration before proceeding to any other chapters on module configuration.

Worksheet 3-E
Final Sensor-configuration Values

Enter Your Final Sensor-configuration Values Here

Input	Control Word	Pro-Set 600 Addr.	Value	Description	Units
1	MCC37	N41:33	0	Minimum Ejector Position	Ejector Axis Measured from zero [1]
	MCC38	N41:34		Maximum Ejector Position	Ejector Axis Measured from zero [1]
	MCC39	N41:35		Analog Signal @ Min Ejector Position	Input Signal Range [2]
	MCC40	N41:36		Analog Signal @ Max Ejector Position	Input Signal Range [2]
2	MCC45	N41:41	0	Minimum Ejector Pressure	Ejector Pressure [3]
	MCC46	N41:42		Maximum Ejector Pressure	Ejector Pressure [3]
	MCC47	N41:43		Analog Signal @ Min Ejector Pressure	Input Signal Range [2]
	MCC48	N41:44		Analog Signal @ Max Ejector Pressure	Input Signal Range [2]
3	MCC23	N41:19	0	Minimum Clamp Position	Clamp Axis Measured from zero [1]
	MCC24	N41:20		Maximum Clamp Position	Clamp Axis Measured from zero [1]
	MCC25	N41:21		Analog Signal @ Min Clamp Position	Input Signal Range [2]
	MCC26	N41:22		Analog Signal @ Max Clamp Position	Input Signal Range [2]
4	MCC31	N41:27	0	Minimum Clamp Pressure	Clamp Pressure [3]
	MCC32	N41:28		Maximum Clamp Pressure	Clamp Pressure [3]
	MCC33	N41:29		Analog Signal @ Min Clamp Pressure	Input Signal Range [2]
	MCC34	N41:30		Analog Signal @ Max Clamp Pressure	Input Signal Range [2]

[1] Incremental Distance
00.00 to 99.99 Inches
000.0 to 999.9 Millimeters

[2] Input Signal Range
00.00 to 10.00V dc or
01.00 to 05.00V dc or
04.00 to 20.00MADC

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

Determine Clamp Position Sensor Values

Important: The following procedure and subsequent set-up information must be utilized for every different mold used on a hydraulic machine. On a toggle clamp (with die height adjust), it must be completed only once.

ATTENTION: Incorrect values entered in DYC09 through DYC12 may result in rapid clamp motion and potential damage to your mold and cylinder seals. We strongly recommend utilizing a "dummy" mold on hydraulic machines and no mold on toggle machines.

To complete the configuration for your clamp position sensor, do the following:

Important: If your position sensor has zero and span potentiometers to set the zero reference and linear resolution, do so during this procedure.

1. Move the clamp forward until it reaches its mechanical close stop. This is the zero position.

2. Remove clamp pressure and/or flow to stop clamp movement.

3. Record this position value (usually 0000) on line 9 of Worksheet 3-E for MCC23.

4. With your programming terminal, read the signal level returned in SYS35 (Pro-Set 600 address N41:187) from your position sensor. You may wish to zero your position sensor at this time.

5. Record this value on line 11 of Worksheet 3-E for MCC25 (should be at minimum signal if you zeroed your position sensor in step 4).

6. Move the clamp backward to the mechanical open stop.

7. Remove clamp pressure and/or flow to stop clamp movement.

8. Measure the distance travelled by the clamp.

9. Record this distance on line 10 of Worksheet 3-E for MCC24.

10. With your programming terminal, read the signal level returned in SYS35 (Pro-Set 600 address N41:187) from your positioning sensor. You may wish to span your position sensor at this time.

11. Record this value on line 12 of Worksheet 3-E for MCC26.

You may now download your adjusted values to the QDC module using the MCC download procedure presented earlier in this chapter.

Determine Ejector Position Sensor Values

ATTENTION: Make sure your clamp is open sufficiently to allow full ejector travel before proceeding.

To complete the configuration for your ejector position sensor, do the following:

Important: If your position sensor has zero and span potentiometers to set the zero reference and linear resolution, do so during this procedure.

1. Move the ejector backward to the mechanical retract stop. This is the zero position.

2. Remove ejector pressure and/or flow to stop ejector movement.

3. Record this position value (usually 0000) on line 1 of Worksheet 3-E for MCC37.

4. With your programming terminal, read the signal level returned in SYS33 (Pro-Set 600 address N41:185) from your position sensor. You may wish to zero your position sensor at this time.

5. Record this value on line 3 of Worksheet 3-E for MCC39 (should be at minimum signal if you zeroed your position sensor in step 4).

6. Move the ejector forward to the mechanical advance stop.

7. Remove ejector pressure and/or flow to stop ejector movement.

8. Measure the distance travelled by the ejector.

9. Record this distance on line 2 of Worksheet 3-E for MCC38.

10. With your programming terminal, read the signal level returned in SYS33 (Pro-Set 600 address N41:185) from your positioning sensor. You may wish to span your sensor at this time.

11. Record this value on line 4 of Worksheet 3-E for MCC40.

12. Return your ejector to the fully retracted position.

You may now download your adjusted values to the QDC module using the MCC download procedure presented earlier in this chapter.

Determine Values for the Clamp Pressure Sensor (if used)

To complete the configuration for your clamp pressure sensor, enter minimum and maximum pressures and corresponding signal levels from manufacturer's specifications in MCC31 - MCC34. Most applications require no further spanning. If your application requires greater accuracy, follow the procedure below:

1. Release system pressure to obtain minimum pressure at the clamp.

2. Read the pressure gauge at the clamp.

3. Record this minimum pressure value (usually 0000) on line 13 of Worksheet 3-E for MCC31.

4. With your programming terminal, read the signal level returned in SYS36 (Pro-Set 600 address N41:188) from your pressure sensor. You may wish to zero your pressure sensor at this time.

5. Record this signal level on line 15 of Worksheet 3-E for MCC33 (should be at min signal if you zeroed your pressure sensor in step 4).

ATTENTION: Use extreme caution during the next steps because you stress the hydraulic system to its maximum rated pressure. Loose fittings or faulty components could fail, causing possible damage to equipment and/or injury to personnel.

---

6. Re-torque all hydraulic connections and joints before proceeding.

7. Boost system pressure to obtain maximum pressure at the clamp.

Max system pressure may be obtained by positioning the clamp at full open while keeping the clamp open valve in the maximum open position. This forces the cylinder to press against the mechanical limits of its travel and builds max system pressure. Also, if you wish, you may move the clamp to its full forward (mold close) position, and allow full system pressure to force the mold closed.

8. Read the pressure gauge at the clamp (maximum system pressure should be read at full open or full close) while the clamp is mechanically bound from moving further.

9. Record this maximum pressure on line 14 of Worksheet 3-E for MCC32.

10. With your programming terminal, read the signal level returned in SYS36 (Pro-Set 600 address N41:188) from your pressure sensor. You may wish to span your pressure sensor at this time.

11. Record this signal level on line 16 of Worksheet 3-E for MCC34.

12. Release pressure.

You may now download your adjusted values to the QDC module using the MCC download procedure presented earlier in this chapter.

Determine Values for the Ejector Pressure Sensor (if used)

⚠ **ATTENTION:** Make sure your clamp is sufficiently open to allow full travel of the ejectors without obstruction.

To complete the configuration for your ejector pressure sensor, enter minimum and maximum pressures and corresponding signal levels from manufacturer's specifications in MCC45 - MCC48. If you require greater accuracy, follow this procedure:

1. Release system pressure to obtain minimum pressure at the ejector.

2. Read the pressure gauge at the ejector.

3. Record this minimum pressure value (usually 0000) on line 5 of Worksheet 3-E for MCC45.

4. With your programming terminal, read the signal level returned in SYS34 (Pro-Set 600 address N41:186) from your pressure sensor. You may wish to zero your pressure sensor at this time.

5. Record this signal level on line 7 of Worksheet 3-E for MCC47 (should be min signal if you zeroed your pressure sensor in step 4).

⚠ **ATTENTION:** Use extreme caution during the next steps because you stress the hydraulic system to its maximum rated pressure. A rupture could occur, causing possible damage to equipment and/or injury to personnel.

---

6. Re-torque all hydraulic connections and joints before proceeding.

7. Boost system pressure to obtain maximum pressure at the ejector.

Max system pressure may be obtained by positioning the ejector at its fully advanced or retracted position while keeping the valve open that causes motion in that direction. This forces the cylinder to press against the mechanical limits of its travel and builds max system pressure.

8. Read the pressure gauge at the ejector (for maximum pressure reading ejector must be fully forward while the ejector is mechanically bound from moving farther).

9. Record this maximum pressure on line 6 of Worksheet 3-E for MCC46.

10. With your programming terminal, read the signal level returned in SYS34 (Pro-Set 600 address N41:186) from your pressure sensor. You may wish to span your sensor at this time.

11. Record this signal level on line 8 of Worksheet 3-E for MCC48.

12. Release pressure.

You may now download your adjusted values to the QDC module using the MCC download procedure presented earlier in this chapter.

Optional Configurations

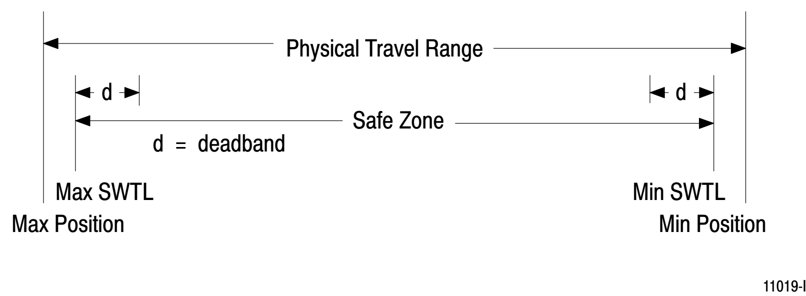
Your QDC module also gives the option of configuring the following features:

Use this Option:	For this Benefit:
Software Travel Limits	to guard against damaging the mold assembly or seals
Pressure Alarm Time Delay	to warn of excessive pressure without nuisance alarms
Digital Filter	to compensate for noise on position inputs

Configure Software Travel Limits

You may want to use the software restrictions to stop the travel of your clamp or ejector before either reaches its maximum limits (configured earlier in this chapter).

Figure 4.1
Software Restrictions



During normal machine operation and whenever your cylinder travels outside the safe zone (outside the specified software travel limits, SWTL), the QDC module:

- sets an alarm status bit
- forces its outputs to zero
- ignores all profile commands (allowing only set-output and jogs) until you jog the cylinder back through the deadband into the safe zone at either end

The deadband guards against sensor noise flickering the SWTL alarms and requires that the operator jog the cylinder a set distance away from the software overtravel. We recommend a value of 00.10 inch as a starting deadband. Your sensor may require a greater deadband.

ATTENTION: The QDC module ignores SWTL alarms when jogging or when performing a set-output operation.

Configure the QDC module for SWTL as follows:

1. Determine these SWTL values for clamp and/or ejector travel with respect to the range of physical travel.
   - SWTL deadband
   - Maximum SWTL
   - Minimum SWTL
2. Record non-zero SWTL values on Worksheet 3-F. Zero values disable the corresponding SWTLs.

ATTENTION: Leaving your SWTL settings at zero (MCC27, MCC28, MCC41, MCC42) inhibits the QDC module from performing this safety function.

Worksheet 3-F
SWTL Configuration Values

Enter Your SWTL Configuration Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
MCC27	N41:23		Clamp Minimum SWTL	Clamp Axis Measured from zero [1]
MCC28	N41:24		Clamp Maximum SWTL	Clamp Axis Measured from zero [1]
MCC29	N41:25	10	Clamp SWTL Deadband	As noted [1]
MCC41	N41:37		Ejector Minimum SWTL	Ejector Axis Measured from zero [1]
MCC42	N41:38		Ejector Maximum SWTL	Ejector Axis Measured from zero [1]
MCC43	N41:39	10	Ejector SWTL Deadband	As noted [1]

[1] Incremental Distance
00.00 to 99.99 Inches
000.0 to 999.9 Millimeters

You may now download your adjusted values to the QDC module using the MCC download procedure presented earlier in this chapter.

Set Up Maximum Pressure Alarms and Time Delays

The QDC module continuously monitors clamp and ejector pressure inputs. When it detects that the pressure equals or exceeds a preset pressure alarm setpoint, the QDC module sets an alarm bit. A setpoint of zero disables the associated alarm.

To guard against nuisance alarms caused by noise spikes or pressure transients, you can set a time-delay so the QDC module must monitor continuous excessive pressure for an amount of time before setting the high pressure alarm. A setpoint of zero disables this delay.

Configure the QDC module for pressure alarms as follows:

1. Determine these values for clamp and/or ejector pressure alarms:
   - pressure-alarm setpoint
   - time-delay setpoint

2. Record non-zero setpoints on Worksheet 3-G for the pressure alarms and time delays you want to use.

3. Download them to the QDC module using the procedures presented earlier in this chapter.

Worksheet 3-G
Pressure-alarm and Time-delay Setpoints

Enter Your Pressure-alarm and Time-delay Values Here ↓

Control Word	Pro-Set 600 Addr.	Value	Description	Units
MCC35	N41:31		Clamp Pressure-alarm Setpoint	Clamp Pressure [2]
MCC36	N41:32		Clamp-pressure Time-delay Setpoint	Time Measured in Seconds [1]
MCC49	N41:45		Ejector Pressure-alarm Setpoint	Ejector Pressure [2]
MCC50	N41:46		Ejector-pressure Time-delay Setpoint	Time Measured in Seconds [1]

[1] Time
00.00 to 00.99 Seconds

[2] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

Configure a Digital Filter for Position Inputs from Clamp and Ejector

You can enable an optional digital filter on position inputs. This filter is used to reduce electrical noise from potentiometer-type position sensors or other external noise picked up by your input circuits.

To determine if you need a digital filter, move the clamp or ejector very slowly. With your programming terminal, look for erratic position numbers reported for clamp and/or ejector position by examining these words:

For this Input:	In Word:	Look at this Pro-Set 600 Address:
Clamp	SYS27	N41:179
Ejector	SYS25	N41:177

Configure the QDC Module for a Digital Input Filter as follows:

To determine the time constant (0 - 00.10 sec), start with a small value such as 00.01. A value of zero disables the filter.

To Filter this Input:	In Word:	Enter a Filter Time Constant in:
Clamp	MCC30	N41:26
Ejector	MCC44	N41:40

ATTENTION: Increasing the value of the time constant decreases the QDC module's capability to respond quickly to travel limits and/or to accurately locate programmed positions. This could result in damaging the mold assembly with possible personal injury. We recommend keeping time filter entries under 00.10.

For example, with a clamp velocity of 20"/sec, a 00.01 time constant allows 0.20" of travel before the QDC module can react to a travel limit.

Important: If you have a noisy potentiometer-type position sensor and digital filtering slows the QDC module's response time too much, consider replacing the sensor with a non-contact, linear-displacement type.

Download the time constants to the QDC module using the procedures presented earlier in this chapter.

Chapter 4

Overview of Remaining Configuration Procedures

Chapter Objectives

This chapter introduces you to the remaining procedures necessary to successfully configure your QDC module. You must follow the procedures in the given order. Please use this chapter as a guide.

Configuration Concepts

The QDC module communicates with your PLC-5 processor through “Blocks”. Blocks are made up of several 16-bit words stored in the PLC-5 data table. These areas of the PLC data table are accessed by the QDC module through the 1771 backplane. There are two types of blocks:

- Command Blocks - these blocks are downloaded from the PLC data table to the QDC module to make configuration changes or initiate machine actions
- Status Blocks - These blocks are used by the QDC module to relay information to the PLC processor about the QDC module’s current operating status

The configuration process detailed over the next several chapters makes extensive use of command and status blocks. You will:

- enter important operating data into all applicable command blocks
- read machine operating data in status blocks to assist you in the configuration procedures

Command Blocks

The QDC module is configured through a series of blocks known as command blocks. Command blocks are an area of the PLC data table containing machining commands, set-up, and operating information for the QDC module. On power-up, or when initiated by a user, command blocks are downloaded from the PLC data table to the QDC module.

There are two basic types of command blocks. They are presented in the following table:

Type:	Which Contain:	Examples:
Configuration Blocks	Information necessary to configure your module to run a certain portion of a profile	Valve spanning information for the 1st clamp close profile
Profile Blocks	Actual process setpoints necessary to produce a desired part.	1st clamp close profile operating setpoints

Status Blocks

The QDC module returns critical operating status and values to the PLC data table through status blocks. Like configuration blocks, status blocks are areas of PLC data table. Status blocks, however, contain actual machine operation information rather than machine setpoints and action commands.

Type:	Which Contain:	Examples:
Status Blocks	Information about machine operation and QDC module operating status.	The molding machine is currently performing an ejection operation.

Special Command and Status Blocks

A few special command and status blocks are the Module Configuration Block, Dynamic Command Block, and the System Status Block.

Types:	Description:	Examples:
Module Configuration Block (MCC)	Contains configuration information used throughout all phases of machine operation	Sensor spanning information and global alarm setpoints
Dynamic Command Block (DYC)	Includes all commands necessary to jog, run, and stop any applicable machine phase or operation.	Request that the ejectors advance
System Status Block (SYS)	Returns to the PLC processor information relevant to common module parameters.	Actual voltages and engineering units read back at the four QDC module inputs

Overview of the Remaining Configuration Procedures

Configuration procedures detailed over the next several chapters are outlined below. The procedures are sequential in nature: configuration information determined in initial chapters is needed in later chapters.

Step:	Procedure:	Enter this Information:	Refer to:
1	Jog Your Machine	Machine jog pressure and flow setpoints are entered into the Jog Configuration (JGC) block. You actually jog your clamp and ejector with commands in the Dynamic Command Block (DYC) to further refine your jog configuration. Jog pressure alarm setpoints are configured.	Chapter 5
2	Write a PLC Program to Coordinate Phases	The QDC module offers many machine operation options to meet nearly any injection molding machine's requirements. PLC ladder logic is required to cycle the machine in the desired manner.	Chapter 6
3	Enter Values in Clamp and Eject Configuration Blocks	Valves/Outputs responsible for controlling pressure or flow, Valve spanning values, Ramp rates.	Chapter 7 (Refined in Chapters 9 & 10)
4	Enter Initial Clamp and Eject Profile Values	Initial machine operation setpoints (pressure, velocity, position, time setpoints, other part-specific information)	Chapter 8 (Procedurally tuned in Chapters 9 & 10)
5	Span your Machine's Valves	Configuration parameters necessary to accurately span your clamp and eject valves are modified. Profile Pressure Alarms are set.	Chapter 9
6	Tune Your Machine	Topics to consider when machine and part tuning are discussed.	Chapter 10

Enter Data Table Values and Download Command Blocks

We refer to these procedures throughout this manual whenever you must:

- enter data table values
- download command blocks

Enter Values into Your PLC- Data Table

With your programming terminal, enter worksheet values into your PLC-5 data table as follows:

1. Switch the PLC-5 processor to `PROGRAM` mode.

2. Display your PLC-5 data table

3. Locate the data files for storing the subject block as specified on individual worksheets.

4. Enter the value for each word and bit.

When you set bits in words prefixed with file identifier B (example: B34), the PLC-5 processor automatically switches the radix to binary format.

Download Command Blocks

Use this procedure to send one or more command blocks from PLC-5 data table to QDC module while leaving the PLC-5 processor in Run mode. (As an alternative, Pro-Set 600 software forces the PLC-5 processor to download *all* command blocks to the QDC module when you switch the processor from `PROGRAM` to `RUN` or power it up.)

Important: The following procedure does NOT apply to the MCC block. It has its own download procedure described in chapter 3.

Important: Before you can use the following procedure, you must first have successfully downloaded a valid MCC block to the QDC module.

We define the following data words and functions used in the procedure to download command blocks.

This Word:	At Address:	Provides this Function:
DYC61	N40:173	Requests that the QDC module return an error if it finds one in the designated data block. The QDC module reports the error in SYS61 and SYS62.
SYS61	N40:213	The QDC module reports the ID of the data block containing the error (identified in SYS62). This word will match a non-zero DYC61.
SYS62	N40:214	The QDC module reports the error code in this word. This error code relates to the data block whose ID is reported in SYS61.

Learn the following procedure because you will use it often.

1. For the block you want to download (subject block), get its ID number from Table 4.A and enter it into DYC61.

Table 3.A
Information Required to Download a Command Block

Block to Download:	Pro-Set 600 Block ID.:	Pro-Set 600 Download Bit B21/:	Companion Block:
JGC	02	1	
FCC	03	2	CPC
SCC	04	3	CPC
TCC	05	4	CPC
LPC	06	5	CPC
CPC	07	6	
FOC	17	17	OPC
SOC	18	18	OPC
TOC	19	19	OPC
OSC	20	20	OPC
OPC	21	21	
EAC	22	22	EPC
ERC	23	23	EPC
EPC	24	24	

2. Confirm that the QDC module returns the ID in SYS61.

Important: If the value returned in SYS61 is NOT the ID number you entered, you have an error in the MCC or DYC block:

If SYS61 has this value:	This block has errors:	Fix them as follows:
1	MCC	Refer to chapter 3 “Correct Any Data-entry Errors in MCC”
25	DYC	Go to steps 8 and 9 of this procedure.

- Fix MCC and DYC errors before starting the download procedure
- MCC and DYC errors are corrected when SYS61≠ 1 or 25, but when SYS61=DYC61=ID number of the subject block

When you have done all three:	Then:
1. Corrected all errors in MCC and DYC blocks 2. Entered the ID of the subject block in DYC61 3. Downloaded the subject block	The QDC module immediately reports any programming errors it detected in the subject block

3. Start the download procedure by setting the corresponding download bit (Table 4.A) in your PLC-5 data table.

4. Watch the bit you set in step 3 and wait for Pro-Set 600 software to reset it to zero. This indicates the PLC-5 processor has transferred the block to the QDC module.

5. Observe the value of SYS62 (N40:214) in your PLC-5 data table:
   - If SYS62 = 0, the QDC module detected no errors. Go to step 6.
   - If SYS62 ≠ 0, the QDC module detected an error. Go to step 8.

6. Since the QDC module did not detect a programming error, check Table 4.A to see if the subject block has a required companion block.

Important: When downloading multiple subject blocks that share the same companion block, you may download the companion block:

- after each subject block
- once after the last subject block

To simplify troubleshooting your data entry (programming) errors during initial configuration procedures, we recommend that you download the companion block after each subject block. Otherwise, the procedure to correct multiple errors becomes too complex.

7. Complete the procedure as follows:

   a. If subject block has a required companion block, return to step 2 and repeat the procedure for the next block or companion block.

   b. If the subject block is the companion block, download it. Return to step 2 to download additional blocks if required.

8. The QDC module detected a programming error. Interpret the error code returned by the QDC module in SYS62. The code identifies the first detected programming error in the subject block whose ID is reported in SYS61 (N40:213). Refer to Section 2 of the Plastic Molding Module Reference Manual (publication 1771-6.5.88) for how to interpret and correct the cause of programming errors.

9. Correct the error in the PLC-5 data table corresponding to the subject block. Since you may have more than one programming error in the subject block, return to step 4 and repeat the download procedure until you have corrected all errors in this block. Then SYS62 = 0.

Chapter 5

Jog Your Machine

Chapter Objectives

Jogging your machine is similar to operating it in set output; percent output values are applied to your four QDC module outputs in order to obtain the desired motion. The jog configuration block (JGC) allows you to set up jog parameters for your QDC outputs for close and open clamp jogging and advance and retract jogging of the ejector.

Although the QDC module may not be directly controlling your machine's screw or injection cylinder jogs, your hydraulics may require valves connected to your Clamp and Ejector QDC outputs to go to a certain position to assure proper screw and inject cylinder jog functions. The QDC jog configuration block allows you to set up these indirect jog values.

This chapter describes how to:

- configure all jog block values necessary to jog your clamp and ejector
- test these jog values and make changes if necessary
- configure values which may indirectly affect your machine's screw and inject cylinder jogs

Command and Status Blocks Used

Block:	Type:	Is Used to Do This:	Pro-Set 600 Files Used:
Dynamic (DYC)	Command	Execute jogs	B35
Jog (JGC)	Command	Set jog set output values and jog alarm setpoints	N41
System (SYS)	Status	View jog alarms Check for command block programming errors	B35, N41

Determine Initial Clamp and Ejector Jog Values

Worksheet 5-A outlines all values necessary to successfully configure your QDC module for clamp and ejector jogs. Enter initial values to allow minimal actuator motion during jogs. Later in this chapter, we gradually increase these values until we reach the desired jog values.

At this time, also enter in jog high pressure setpoints in Worksheet 5-A. The QDC module sets an alarm any time clamp or ejector pressure equals or exceeds the respective value during clamp and ejector jogs. A zero entry inhibits alarm actuation.

Important: High clamp pressure and high ejector pressure alarms (set in chapter 3), are also active during jog functions.

Worksheet 5-A
Initial Clamp and Eject Jog Configuration Values

Enter Your Initial Values Here → Value

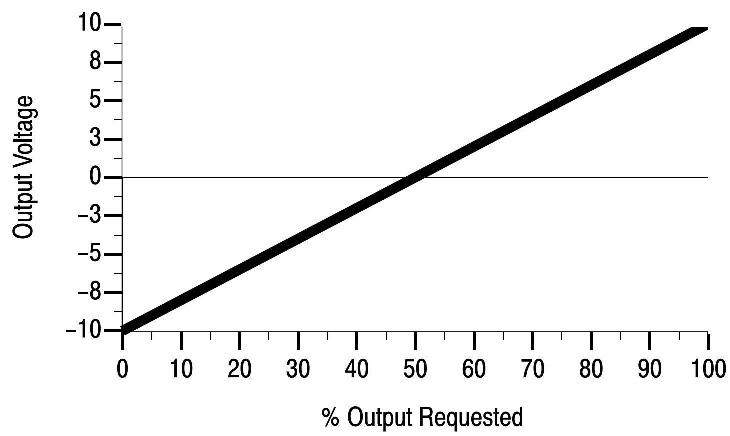
Control Block Word	Pro-Set 600 Addr.	Value	Description	Units
Clamp, Forward Jog				
JGC33	N41:89		Set Output Values Output #1	% Signal Output [2]
JGC34	N41:90		Output #2	% Signal Output [2]
JGC35	N41:91		Output #3	% Signal Output [2]
JGC36	N41:92		Output #4	% Signal Output [2]
Clamp, Reverse Jog				
JGC41	N41:97		Set Output Values Output #1	% Signal Output [2]
JGC42	N41:98		Output #2	% Signal Output [2]
JGC43	N41:99		Output #3	% Signal Output [2]
JGC44	N41:100		Output #4	% Signal Output [2]
Ejector, Advance Jog				
JGC49	N41:105		Set Output Values Output #1	% Signal Output [2]
JGC50	N41:106		Output #2	% Signal Output [2]
JGC51	N41:107		Output #3	% Signal Output [2]
JGC52	N41:108		Output #4	% Signal Output [2]
Ejector, Retract Jog				
JGC57	N41:113		Set Output Values Output #1	% Signal Output [2]
JGC58	N41:114		Output #2	% Signal Output [2]
JGC59	N41:115		Output #3	% Signal Output [2]
JGC60	N41:116		Output #4	% Signal Output [2]
Jog Pressure Alarms				
JGC07	N41:63		Clamp Jog Pressure Alarm Setpoint	Clamp pressure [1]
JGC08	N41:64		Ejector Jog Pressure Alarm Setpoint	Ejector pressure [1]

[1] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[2] % Signal Output
00.00 to 99.99 %

ATTENTION: Up to 4 different valves may be connected to your QDC module for clamp and eject control. Although all 4 may not be directly involved with clamp and eject jogs, consider their indirect effects when setting jog set output values.

ATTENTION: A value of 0 entered in your data table does not necessarily correspond to zero pressure or flow. For an output configured ± 10VDC, an output of 50% corresponds to zero volts signal output (see the following graph). Amplifier electronics or spool offsets may also be designed such that zero volts signal input does not result in no flow or pressure. Please consult your valve and amplifier specifications for more details.



Enter and Download Initial Clamp and Eject Jog Values

Utilizing the same procedure outlined in chapter 3, enter your initial clamp and eject jog values in Worksheet 5-A. To download the Jog Configuration block (JGC), refer to the download procedure outlined in chapter 4.

Jog Your Machine

Word 1 in the Dynamic Command block (DYC01) is used to enable and disable individual jogs. Word 1 in the System Status block (SYS01) may also be used to monitor the QDC module's reaction to jog commands. Below are two quick cross-reference tables identifying the jog enable and status bits for the clamp and ejector:

Table 5.A
Clamp and Eject Jog Enable Bits

Command Block Word:	Pro-Set 600 Address:	Description:
DYC01-B12	B35/396	Execute Clamp Jog Forward
DYC01-B13	B35/397	Execute Clamp Jog Reverse
DYC01-B14	B35/398	Execute Ejector Jog Advance
DYC01-B15	B35/399	Execute Ejector Jog Retract

Table 5.B
Clamp and Eject Jog Status Bits

Status Block Word:	Pro-Set 600 Address:	Description:
SYS01-B12	B35/12	Clamp Jog Forward in Progress
SYS01-B13	B35/13	Clamp Jog Reverse in Progress
SYS01-B14	B35/14	Ejector Jog Advance in Progress
SYS01-B15	B35/15	Ejector Jog Retract in Progress

Take time now to develop ladder logic (independent of Pro-Set 600 software) to jog the clamp and ejector with the QDC module. You need to monitor switches on your operator control panel, and set corresponding command bits.

We provide a programming example (Figure 5.1) for jog control for instructional purposes only. Your application-specific programming may vary significantly from this example.

Important: You may also need to develop ladder logic that changes the direction of clamp and ejector travel hydraulically when you command the QDC module to jog in reverse.

Figure 5.1
Example Jog Programming

```
Rung 6:0
| EMERGENCY                                                          DYC02/15  |
|   STOP                                                            ********** |
| CONDITION                                                          SOFTWARE  |
|  EXISTS                                                             E–STOP   |
|     B3                                                               B35     |
+----] [---------------------------------------------------------------( )-----+
|       0                                                              415     |
Rung 6:1
|   CYCLE   |          |DIRECTION                                   DYC01/12   |
|  CONTROL  | MANUAL   |SOLENOIDS                                   ********** |
|  SELECTOR |CLAMP JOG |ALIGNED TO                                  CLAMP JOG  |
| (A/S/M) IN| FORWARD  |MOVE CLAMP                                   FORWARD   |
|  “MANUAL” | ALLOWED  |FORWARD                                      COMMAND   |
|   I:003       B11       B11                                          B35     |
+----] [--------] [--------] [-----------------------------------------( )-----+
|      05          5         11                                        396     |
Rung 6:2
|   CYCLE   |          |DIRECTION                                   DYC01/13   |
|  CONTROL  | MANUAL   |SOLENOIDS                                   ********** |
|  SELECTOR |CLAMP JOG |ALIGNED TO                                  CLAMP JOG  |
| (A/S/M) IN| REVERSE  |MOVE CLAMP                                   REVERSE   |
|  “MANUAL” | ALLOWED  |REVERSE                                      COMMAND   |
|   I:003       B11       B11                                          B35     |
+----] [--------] [--------] [-----------------------------------------( )-----+
|      05          6         12                                        397     |
Rung 6:3
|   CYCLE   | MANUAL   |DIRECTION                                   DYC01/14   |
|  CONTROL  | EJECTOR  |SOLENOIDS                                   ********** |
|  SELECTOR |  JOG     |ALIGNED TO                                  EJECT JOG  |
| (A/S/M) IN| ADVANCE  |ADVANCE                                      ADVANCE   |
|  “MANUAL” | ALLOWED  |EJECTOR                                      COMMAND   |
|   I:003       B11       B11                                          B35     |
+----] [--------] [--------] [-----------------------------------------( )-----+
|      05          7         13                                        398     |
Rung 6:4
|   CYCLE   | MANUAL   |DIRECTION                                   DYC01/15   |
|  CONTROL  | EJECTOR  |SOLENOIDS                                   ********** |
|  SELECTOR |  JOG     |ALIGNED TO                                  EJECT JOG  |
| (A/S/M) IN| RETRACT  |RETRACT                                      RETRACT   |
|  “MANUAL” | ALLOWED  |EJECTOR                                      COMMAND   |
|   I:003       B11       B11                                          B35     |
+----] [--------] [--------] [-----------------------------------------( )-----+
|      05          8         14                                        399     |
```

Jog your clamp and ejector in both the advance and retract directions. Experiment with the values entered in the Jog Configuration block (JGC) until you obtain the desired jog operation.

The JGC must be downloaded to the QDC module each time a value in the command block is changed for the new value to take effect. Refer to the download procedure outlined in chapter 4.

If You Observe This Condition:	Then Make This Adjustment:
Rough Jerky Acceleration/Deceleration (Hammering hydraulics)	1) Decrease jog pressure 2) Decrease jog setpoint
Sluggish Acceleration/Deceleration	1) Boost jog pressure

Configure Jogs for the Screw and Injection Cylinder

Although this QDC module may not be directly controlling your machine's screw or injection cylinder jogs, your hydraulics may require valves connected to this QDC module's outputs to go to a certain position to assure proper screw and injection cylinder jog functions. The QDC jog configuration block allows you to set up these indirect jog values.

1. Whenever the appropriate inject cylinder or screw jog bit is set in dynamic control block word 1 (DYC01), the jog configuration block (JGC) values corresponding to the respective jog are applied to the QDC outputs.

2. In Worksheet 5-B, enter values which must be applied to the Clamp and Eject QDC module in order to successfully execute injection cylinder and screw rotate jogs.

Important: Jog-specific high pressure alarms **are not** activated in a Clamp and Eject QDC module during screw rotate and inject cylinder jogs.

Worksheet 5-B
Inject and Screw Rotate Jog Configuration Values (for Clamp and Eject Mode)

Enter Your Initial Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
Inject, Forward Jog				
JGC17	N41:73		Set Output Values Output #1	Percent Signal Output [1]
JGC18	N41:74		Output #2	Percent Signal Output [1]
JGC19	N41:75		Output #3	Percent Signal Output [1]
JGC20	N41:76		Output #4	Percent Signal Output [1]
Inject, Reverse Jog				
JGC25	N41:81		Set Output Values Output #1	Percent Signal Output [1]
JGC26	N41:82		Output #2	Percent Signal Output [1]
JGC27	N41:83		Output #3	Percent Signal Output [1]
JGC28	N41:84		Output #4	Percent Signal Output [1]
Screw Rotate Jog				
JGC09	N41:65		Set Output Values Output #1	Percent Signal Output [1]
JGC10	N41:66		Output #2	Percent Signal Output [1]
JGC11	N41:67		Output #3	Percent Signal Output [1]
JGC12	N41:68		Output #4	Percent Signal Output [1]

[1] Percent Signal Output
00.00 to 99.99 %

Download Jog Configuration Block (JGC)

Utilizing the same procedure outlined in chapter 3, enter your initial inject and screw rotate jog values in Worksheet 5-B. To download this block , refer to the download procedure outlined in chapter 4.

Word 1 in the Dynamic Command block (DYC01) is used to enable and disable individual jogs. Word 1 in the System Status Block (SYS01) may also be used to monitor the QDC module's reaction to jog commands. Below are two quick cross-reference tables identifying the jog enable and status bits for the inject cylinder and screw rotate:

Table 5.C
Inject Cylinder and Screw Rotate Jog Enable Bits

Control Block Word:	Pro-Set 600 Address:	Description:
DYC01-B09	B35/393	Execute Screw Rotate Jog
DYC01-B10	B35/394	Execute Inject Cylinder Jog Forward
DYC01-B11	B35/395	Execute Inject Cylinder Jog Reverse

Table 5.D
Inject Cylinder and Screw Rotate Jog Status Bits

Status Block Word:	Pro-Set 600 Address:	Description:
SYS01-B09	B35/9	Screw Rotate Jog in Progress
SYS01-B10	B35/10	Inject Cylinder Jog Forward in Progress
SYS01-B11	B35/11	Inject Cylinder Jog Reverse in Progress

Chapter 6

Select Command and Status Bits to Sequence Machine Operation

Chapter Objectives

In this chapter, we provide you with tables of command and status bits that you use to write ladder logic to:

- monitor input devices on your Ready Panel or operator station
- step your QDC module through machine cycles

We suggest how to access your logic requirements and how to use bit tables to write your machine's sequential ladder logic based on those logic requirements. This ladder logic depends on your machine's hydraulic configuration.

Assess Your Logic Requirements

You must add your own ladder logic according to your machine's sequencing requirements.

If you need to:	Then you must add:
Execute clamp-open and clamp-close phases without interruption	no additional ladder logic
Execute the ejector profile without interruption	no additional ladder logic
Jog your machine	ladder logic (see chapter 5)
Stop at the end of a profile	ladder logic to start the next profile
Start a profile on command	ladder logic
Stop and notify at the end of the ejector stroke	ladder logic to continue the ejector profile

Important: We present information about command and status bits in this chapter. For your convenience, a cross-reference between Pro-Set 600 software and QDC module bit addresses is listed in Table 6.I and Table 6.J at the end of this chapter. If you need a more thorough description of these bits, refer to section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88).

Use Bit Tables

Table 6.A lists the tables included in this chapter along with specific information found in each:

Table 6.A
Bit Table Summary

	Type of Function:	What the Table Contains:	How You Implement Commands:
Table 6.B	Manual (non-profiled)	Command and status bits to control and monitor manual jog, direct set-output, and stop	To enable: set command bit (0 to 1) To terminate: reset command bit (1 to 0)
Table 6.C	Automatic (profiled)	Command bits to control profiles	To enable: toggle command bit (0 to 1 to 0). Terminated by the QDC module automatically. To force early termination: set stop bit (0 to 1), or initiate another automatic function.
Table 6.D	Automatic (profiled)	Status and command bits to link automatic functions during a machine cycle	Input conditions and permissives to initiate subsequent machine movements: (1 = enabled, 0 = disabled)
Table 6.E	Automatic (profiled)	Command bits to interrupt clamp movement	see table
Table 6.F	Automatic (profiled)	Miscellaneous status bits to trigger clamp action	0 = disabled, 1 = enabled
Table 6.G	Automatic (profiled)	Command bits to enable/disable ejector profiles	see table
Table 6.H	Automatic (profiled)	Miscellaneous status bits to trigger ejector action	0 = disabled, 1 = enabled
Table 6.I	---	Status bits for clamp and eject mode	see table
Table 6.J	---	Command bits for clamp and eject mode	see table

Table 6.B
Command and Status Bits for Manual Control in Clamp and Eject Mode

To Initiate this action:	Set this bit:	The QDC module sets this bit during execution:
Unassigned # 1 Jog	DYC01-B09	SYS01-B09
Unassigned # 2 Jog	DYC01-B10	SYS01-B010
Unassigned # 3 Jog	DYC01-B11	SYS01-B11
Clamp Forward Jog	DYC01-B12	SYS01-B12
Clamp Reverse Jog	DYC01-B13	SYS01-B13
Ejector Advance Jog	DYC01-B14	SYS01-B14
Ejector Retract Jog	DYC01-B15	SYS01-B15
Direct Set-output	DYC01-B08	SYS01-B08
Stop	DYC02-B15	SYS02-B15

Table 6.C
Command Bits for Automatic Functions in Clamp and Eject Mode

To initiate this profile/movement:	Toggle this bit:	Or the profile/movement starts automatically after:	If this bit is Reset:
1st Clamp Close	DYC02-B00	–	–
2nd Clamp Close	DYC02-B01	1st Clamp Close	CPC03-B08
3rd Clamp Close	DYC02-B02	2nd Clamp Close	CPC03-B09
Low Pressure Close	DYC02-B03	3rd Clamp Close	CPC03-B10
1st Clamp Open	DYC02-B10	–	–
2nd Clamp Open	DYC02-B11	1st Clamp Open	OPC03-B08
3rd Clamp Open	DYC02-B12	2nd Clamp Open	OPC03-B09
Clamp Open Slow	DYC02-B13	3rd Clamp Open	OPC03-B10
First Ejector Advance	DYC02-B14	On Clamp Position During Open	EPC03-B08 and EPC03-B09
Ejector Continue	DYC03-B15	Previous Ejector Stroke	EPC03-B12

Table 6.D
Status and Command Bit Interaction for Automatic Functions in Clamp and Eject Mode

For this Profile/Movement:	During Execution this bit is:		At Completion this bit is:		At completion If this command bit is:	Then this status bit is:
	SET	**RESET**	**SET**	**RESET**	**also SET**	**also SET**
1st Clamp Close	SYS21-B00	SYS02-B00	SYS02-B00	SYS21-B00	CPC03-B08	SYS22-B00
2nd Clamp Close	SYS21-B01	SYS02-B01	SYS02-B01	SYS21-B01	CPC03-B09	SYS22-B01
3rd Clamp Close	SYS21-B02	SYS02-B02	SYS02-B02	SYS21-B02	CPC03-B10	SYS22-B02
Low Pressure Close	SYS21-B03	SYS02-B03	SYS02-B03	SYS21-B03	---	SYS22-B03
1st Clamp Open	SYS21-B10	SYS02-B10	SYS02-B10	SYS21-B10	OPC03-B08	SYS22-B10
2nd Clamp Open	SYS21-B11	SYS02-B11	SYS02-B11	SYS21-B11	OPC03-B09	SYS22-B11
3rd Clamp Open	SYS21-B12	SYS02-B12	SYS02-B12	SYS21-B12	OPC03-B10	SYS22-B12
Clamp Open Slow	SYS21-B13	SYS02-B13	SYS02-B13	SYS21-B13	---	SYS22-B13
Ejector Advance	SYS21-B14	SYS02-B14	SYS**21**-B14	SYS**02**-B14	EPC03-B12	SYS22-B14
Intermediate Ejector Retract	SYS21-B14	SYS02-B14	SYS**21**-B14	SYS**02**-B14	EPC03-B12	SYS22-B15
Final Ejector Retract	SYS21-B14	SYS02-B14	SYS02-B14	SYS21-B14	---	SYS22-B15

Table 6.E
Command Bits to Interrupt Clamp Movement Between Profiles

Bit Description:	QDC Block Addr.:
0 = start 2nd clamp close profile @ end-of 1st 1 = stop and set-output @ end-of 1st	CPC03-B08
0 = start 3rd clamp close profile @ end-of 2nd 1 = stop and set-output @ end of 2nd	CPC03-B09
0 = start LP close profile @ end-of 3rd 1 = stop and set-output @ end-of 3rd	CPC03-B10
0 = start 2nd clamp open profile @ end-of 1st 1 = stop and set-output @ end-of 1st	OPC03-B08
0 = start 3rd clamp open profile @ end-of 2nd 1 = stop and set-output @ end-of 2nd	OPC03-B09
0 = start clamp open slow profile @ end-of 3rd 1 = stop and set-output @ end-of 3rd	OPC03-B10

Table 6.F
Miscellaneous Status Bits to Trigger New Clamp Events

Reason for Using:	Bit Description:	QDC Block Addr.:
To drop pump adders, or shift solenoids	Clamp in mold-protect zone	SYS03-B00
To add pump adders, or shift solenoids for tonnage build or lock-up	Mold safe	SYS03-B01
To start inject cycle	Tonnage complete	SYS03-B02
To drop pump adders, or shift solenoids	Clamp in open-slow zone	SYS03-B06
To idle the machine until starting next action	Mold fully open	SYS03-B07
To prevent starting next cycle when machine is in auto mode	Open-dwell timer is timing	SYS03-B09
To start next cycle with machine in auto mode	Cycle complete	SYS03-B11
To re-open the clamp when the part is stuck	LP close watchdog time-out	SYS04-B03

Table 6.G
Command Bits to Enable or Disable Ejector Profiles

Bit Description:	QDC Block Addr.:
0 = start ejector profile on clamp position 1 = start ejector profile on command	EPC03-B08
0 = ejector profile enabled 1 = ejector profile disabled	EPC03-B09
0 = run ejector profile without interruption 1 = stop and notify @ end of ejector stroke	EPC03-B12

Table 6.H
Miscellaneous Status Bits to Trigger New Ejector Events

Reason for Using:	Bit Description:	QDC Block Addr.:
To shift solenoids before starting next ejector stroke after the 1st advance stroke	Ejector profile stopped at end of stroke	SYS03-B08
To prevent starting ejector retract	Ejector forward dwell timer is timing	SYS03-B10
To start ejector retract	Ejector fully advanced	SYS03-B12
To start ejector retract when tip stroking is ON	Ejector is beyond tip advance position	SYS03-B13
To start ejector advance when tip stroking is ON	Ejector is inside tip retract position	SYS03-B14
To start ejector advance	Ejector fully retracted	SYS03-B15

Table 6.I
Status Bits for Clamp and Eject Mode

Category:	Bit Status (when = 1):	QDC Block Addr.:	Pro-Set Addr.:
Jog Status	unassigned # 1 jog	SYS01-B09	B35/09
	unassigned # 2 jog	SYS01-B10	B35/10
	unassigned # 3 jog	SYS01-B11	B35/11
	executing clamp forward jog	SYS01-B12	B35/12
	executing clamp reverse jog	SYS01-B13	B35/13
	executing ejector advance jog	SYS01-B14	B35/14
	executing ejector retract jog	SYS01-B15	B35/15
Profile Complete	1st clamp close profile complete	SYS02-B00	B35/16
	2nd clamp close profile complete	SYS02-B01	B35/17
	3rd clamp close profile complete	SYS02-B02	B35/18
	LP close profile complete	SYS02-B03	B35/19
	1st clamp open profile complete	SYS02-B10	B35/26
	2nd clamp open profile complete	SYS02-B11	B35/27
	3rd clamp open profile complete	SYS02-B12	B35/28
	clamp open slow profile complete	SYS02-B13	B35/29
	ejector profile complete	SYS02-B14	B35/30
Busy Status	no action (outputs at zero)	SYS02-B15	B35/31
Miscellaneous Status	clamp in mold protection zone	SYS03-B00	B35/32
	mold safe	SYS03-B01	B35/33
	tonnage complete	SYS03-B02	B35/34
	clamp in open-slow zone	SYS03-B06	B35/38
	mold open	SYS03-B07	B35/39
	ejector stopped at end of stroke	SYS03-B08	B35/40
	mold open dwell timer is timing	SYS03-B09	B35/41
	ejector forward dwell timer is timing	SYS03-B10	B35/42
	cycle complete	SYS03-B11	B35/43
	ejector fully advanced	SYS03-B12	B35/44
	ejector beyond tip advance position	SYS03-B13	B35/45
	ejector inside tip retract position	SYS03-B14	B35/46
	ejector fully retracted	SYS03-B15	B35/47

Table 6.I (continued)

Category:	Bit Status (when = 1):	QDC Block Addr.:	Pro-Set Addr.:
Watchdog Status	1st clamp close watchdog timed out	SYS04-B00	B35/48
	2nd clamp close watchdog timed out	SYS04-B01	B35/49
	3rd clamp close watchdog timed out	SYS04-B02	B35/50
	LP close watchdog timed out	SYS04-B03	B35/51
	1st clamp open watchdog timed out	SYS04-B10	B35/58
	2nd clamp open watchdog timed out	SYS04-B11	B35/59
	3rd clamp open watchdog timed out	SYS04-B12	B35/60
	clamp open slow watchdog timed out	SYS04-B13	B35/61
	ejector watchdog timed out	SYS04-B14	B35/62
	tonnage watchdog timed out	SYS04-B15	B35/63
Profile Status	executing 1st close profile	SYS21-B00	B35/320
	executing 2nd close profile	SYS21-B01	B35/321
	executing 3rd close profile	SYS21-B02	B35/322
	executing LP close profile	SYS21-B03	B35/323
	executing 1st clamp open profile	SYS21-B10	B35/330
	executing 2nd clamp open profile	SYS21-B11	B35/331
	executing 3rd clamp open profile	SYS21-B12	B35/332
	executing clamp open slow profile	SYS21-B13	B35/333
	executing ejector profile	SYS21-B14	B35/334
End-of Profile Set-output Status	executing end-of 1st clamp close set-output	SYS22-B00	B35/336
	executing end-of 2nd clamp close set-output	SYS22-B01	B35/337
	executing end-of 3rd clamp close set-output	SYS22-B02	B35/338
	executing end-of LP close set-output	SYS22-B03	B35/339
	executing end-of 1st clamp open set-output	SYS22-B10	B35/346
	executing end-of 2nd clamp open set-output	SYS22-B11	B35/347
	executing end-of 3rd clamp open set-output	SYS22-B12	B35/348
	executing end-of clamp open slow set-output	SYS22-B13	B35/349
	executing end-of ejector advance set-output	SYS22-B14	B35/350
	executing end-of ejector retract set-output	SYS22-B15	B35/351

Table 6.J
Command and Configuration Bits for Clamp and Eject Mode

Operation:	**Function Enabled (when = 1):**	**QDC Block Addr.:**	**Pro-Set Addr.:**
Non-profiled	execute set-output	DYC01-B08	B35/392
Action Commands	execute unassigned # 1 jog	DYC01-B09	B35/393
	execute unassigned # 2 jog	DYC01-B10	B35/394
	execute unassigned # 3 jog	DYC01-B11	B35/395
	execute clamp forward jog	DYC01-B12	B35/396
	execute clamp reverse jog	DYC01-B13	B35/397
	execute ejector advance jog	DYC01-B14	B35/398
	execute ejector retract jog	DYC01-B15	B35/399
Profile Action	execute 1st clamp close profile	DYC02-B00	B35/400
Commands	execute 2nd clamp close profile	DYC02-B01	B35/401
	execute 3rd clamp close profile	DYC02-B02	B35/402
	execute LP clamp close profile	DYC02-B03	B35/403
	execute 1st clamp open profile	DYC02-B10	B35/410
	execute 2nd clamp open profile	DYC02-B11	B35/411
	execute 3rd clamp open profile	DYC02-B12	B35/412
	execute clamp open slow profile	DYC02-B13	B35/413
	execute ejector profile	DYC02-B14	B35/414
Stop Command	execute all stop (outputs = zero)	DYC02-B15	B35/415
Miscellaneous	reset tonnage watchdog timer	DYC03-B00	B35/416
Commands	reset SYS01-B08	DYC03-B08	B35/424
	reset latched alarms	DYC03-B09	B35/425
	reset complete bits	DYC03-B10	B35/426
	continue ejector profile	DYC03-B15	B35/431
Logical Bridge	set-output @ end-of 1st clamp close profile (0 = start 2nd clamp close profile)	CPC03-B08	B37/296
	set-output @ end-of 2nd clamp close profile (0 = start 3rd clamp close profile)	CPC03-B09	B37/297
	set-output @ end-of 3rd clamp close profile (0 = start clamp LP close profile)	CPC03-B10	B37/298
	set-output @ end-of 1st clamp open profile (0 = start 2nd clamp open profile)	OPC03-B08	B37/616
	set-output @ end-of 2nd clamp open profile (0 = start 3rd clamp open profile)	OPC03-B09	B37/617
	set-output @ end-of 3rd clamp open profile (0 = start clamp open slow profile)	OPC03-B10	B37/618
	set-output @ end-of all ejector strokes (0 = start each new stroke @ end of previous)	EPC03-B12	B39/172

Table 6.J (continued)

Operation:	Function Enabled (when = 1):	QDC Block Addr.:	Pro-Set Addr:
Configured Protection from Clamp-zone Overrun	If a clamp close profile overruns the mold protection zone: 0 = start LP-close profile 1 = stop and zero outputs	CPC03-B11	B37/299
	If a clamp open profile overruns the clamp open slow zone 0 = start open slow profile 1 = stop and zero outputs	OPC03-B11	B37/619
Additional Ejector Configuration	start ejector profile on command from PLC processor (0 = start ejector profile on position during clamp open profile)	EPC03-B08	B39/168
	disable ejector profile (0 = enable ejector profile)	EPC03-B09	B39/169
	change intermediate strokes to tip strokes (0 = all ejector strokes are full strokes)	EPC03-B13	B39/173
	execute forward dwell after 1st advance stroke (0 = execute forward dwell after last advance stroke)	EPC03-B15	B39/175

Chapter 7

Load Initial Configuration Values

Chapter Objectives

This chapter describes how to prepare the machine to run clamp and ejector control profiles. Major topics include how to:

- use configuration command block worksheets
- set your accel/decel ramp rates
- set pressure control limits
- set velocity control limits
- enter and downloading your worksheet values

This chapter helps you determine and enter values into the clamp and ejector configuration blocks. The configuration blocks provide the QDC module with information on how you want to run your clamp and ejectors.

Important: Do not start this chapter until you have:

- spanned your sensors, and moved hydraulic cylinders (chapter 3)
- jogged the clamp and ejector (chapter 5)

Command and Status Blocks Used

The following table contains a list of command blocks you are to configure throughout the course of this chapter. You may reference these command blocks in Sections 1 and 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88). The following table also provides you with important information for getting ready to run profiles:

Command and Status Blocks used in this Chapter:	Type:	Used in this chapter to:	Pro-Set 600 Files:
First Clamp Close (FCC)	Command	Enter Configuration Values	B37, N43
Second Clamp Close (SCC)	Command	Enter Configuration Values	B37, N43
Third Clamp Close (TCC)	Command	Enter Configuration Values	B37, N43
Low Pressure Close (LPC)	Command	Enter Configuration Values	B37, N43
First Clamp Open (FOC)	Command	Enter Configuration Values	B37, N43
Second Clamp Open (SOC)	Command	Enter Configuration Values	B37, N43
Third Clamp Open (TOC)	Command	Enter Configuration Values	B37, N43
Clamp Open Slow (OSC)	Command	Enter Configuration Values	B37, N43
Ejector Advance (EAC)	Command	Enter Configuration Values	B39, N45
Ejector Retract (ERC)	Command	Enter Configuration Values	B39, N45
System Status (SYS)	Status	View Programming Errors	B35, N41

Use Configuration Command Block Worksheets

This chapter walks you through a configuration procedure that helps you fill out all of the following configuration block worksheets. Worksheets for each of the command blocks are given followed by the information to fill them in later in this chapter.

Configure Clamp and Eject Blocks

Ten different blocks need to be configured before you are ready to enter profile setpoint values in chapter 8. Worksheets to configure each of these blocks are given later in this chapter. These blocks and worksheets are:

- **Clamp Close**

  1. First Clamp Close (FCC)

  2. Second Clamp Close (SCC)

  3. Third Clamp Close (TCC)

  4. Low Pressure Close (LPC)

- **Clamp Open**

  1. First Clamp Open (FOC)

  2. Second Clamp Open (SOC)

  3. Third Clamp Open (TOC)

  4. Clamp Open Slow (OSC)

- **Ejectors**

  1. Ejector Advance (EAC)

  2. Ejector Retract (ERC)

The QDC module incorporates close fast functionality with three separate close profiles (refer to chapter 1 of this manual for more information):

- First Close (FCC)
- Second Close (SCC)
- Third Close (TCC)

By allowing up to three separate, segmented profiles, the QDC module increases your mold closing control flexibility. Also, the final clamp close profile, characterized by pressure control, is Low Pressure Close (LPC).

The QDC module incorporates Break-Away Open and Open Fast functionality through the use of three separate open profiles:

- First Clamp Open (FOC)
- Second Clamp Open (SOC)
- Third Clamp Open (TOC)

The QDC module controls Open Slow utilizing the Clamp Open Slow (OSC) profile. Ejector Advance (EAC) and Ejector Retract (ERC) are also configured in this chapter.

Important:

- The majority of the configuration parameters are similar from block to block. For example, all phases need the "selected" valve identified for pressure control, and the set-output values for all "unselected" valves need to be identified. Because of this, worksheets for each configuration block are found at the beginning of the chapter.

- At the beginning of each configuration section, please note the control block and words which contain this configuration parameter. After each section is discussed, fill in values for the mentioned words in the appropriate worksheets that follow.

- The valve spanning procedure in chapter 9 of this manual requires preset values in many of the configuration block words. The worksheets on the following pages have many of the required initial values already filled in for you. Other words require that you enter values based on your machine's specific hydraulic configuration.

Worksheet 7-A
First Clamp Close (FCC) Configuration Block

Control Word FCC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1

FCC Block Identifier

Control Word FCC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Value	0	0	0	0	0	0	0	0	1				0			

Pressure Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Velocity Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Pressure Algorithm Selection
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-A (continued)

First Clamp Close (FCC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
FCC05	N43:1	1000	Minimum ERC™ Percentage--Velocity	Percent [8]
FCC06	N43:2	1000	Minimum ERC™ Percentage--Pressure	Percent [8]
FCC08	N43:4	0	Profile Watchdog Timer Preset	Time [1]
FCC09	N43:5	*	Output #1 Set-Output Value during Profile	Percent Signal Output [4]
FCC10	N43:6	*	Output #2 Set-Output Value during Profile	Percent Signal Output [4]
FCC11	N43:7	*	Output #3 Set-Output Value during Profile	Percent Signal Output [4]
FCC12	N43:8	*	Output #4 Set-Output Value during Profile	Percent Signal Output [4]
FCC17	N43:13	0	Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC18	N43:14	0	Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC19	N43:15	0	Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC20	N43:16	0	Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC25	N43:21	0	Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC26	N43:22	0	Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC27	N43:23	0	Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC28	N43:24	0	Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC33	N43:29	*	Output #1 Set-Output Value at End-of Profile	Percent Signal Output [4]
FCC34	N43:30	*	Output #2 Set-Output Value at End-of Profile	Percent Signal Output [4]
FCC35	N43:31	*	Output #3 Set-Output Value at End-of Profile	Percent Signal Output [4]
FCC36	N43:32	*	Output #4 Set-Output Value at End-of Profile	Percent Signal Output [4]
FCC41	N43:37	0	Pressure Minimum Control Limit	Pressure [3]
FCC42	N43:38	System Pressure	Pressure Maximum Control Limit	Pressure [3]
FCC43	N43:39	*	Selected Pressure Valve Output for Minimum	Percent Signal Output [4]
FCC44	N43:40	*	Selected Pressure Valve Output for Maximum	Percent Signal Output [4]
FCC45	N43:41	0	Velocity Minimum Control Limit	Velocity along Axis [2]
FCC46	N43:42	Max Velocity per OEM specs*	Velocity Maximum Control Limit	Velocity along Axis [2]
FCC47	N43:43	*	Selected Velocity Valve Output for Minimum	Percent Signal Output [4]
FCC48	N43:44	*	Selected Velocity Valve Output for Maximum	Percent Signal Output [4]
FCC49	N43:45	100	Proportional Gain for Pressure Control	None
FCC50	N43:46	400	Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
FCC51	N43:47	0	Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
FCC52	N43:48	200	Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
FCC53	N43:49	0	Feed Forward Gain for Velocity Control	None
FCC57	N43:53	0	Profile High Pressure Alarm Setpoint	Pressure [3]

[1] Time
00.00 to 99.99 Seconds

[2] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[4] Percent Signal Output
00.00 to 99.99

[5] Percent Signal Output per Second
0000 to 9999

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

*Refer to the appropriate section later in this chapter for information on this parameter

Worksheet 7-B
Second Clamp Close (SCC) Configuration Block

Control Word SCC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
Value	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

Bits 07–00: SCC Block Identifier

Control Word SCC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80
Value	0	0	0	0	0	0	0	0	1				0			

Bits 06–04: Pressure Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bits 02–00: Velocity Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bit 07: Pressure Algorithm Selection
0 = Dependent Gains
1 = Independent Gains

Code:

Code	
(blank box)	Your value
0 or 1 (shaded box)	Required initial value loaded by Pro-Set 600

Worksheet 7-B (continued)
Second Clamp Close (SCC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
SCC05	N43:61	1000	Minimum ERC™ Percentage--Velocity	Percent [8]
SCC06	N43:62	1000	Minimum ERC™ Percentage--Pressure	Percent [8]
SCC08	N43:64	0	Profile Watchdog Timer Preset	Time [1]
SCC09	N43:65	*	Output #1 Set-Output Value during Profile	Percent Signal Output [4]
SCC10	N43:66	*	Output #2 Set-Output Value during Profile	Percent Signal Output [4]
SCC11	N43:67	*	Output #3 Set-Output Value during Profile	Percent Signal Output [4]
SCC12	N43:68	*	Output #4 Set-Output Value during Profile	Percent Signal Output [4]
SCC17	N43:73	0	Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC18	N43:74	0	Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC19	N43:75	0	Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC20	N43:76	0	Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC25	N43:81	0	Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC26	N43:82	0	Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC27	N43:83	0	Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC28	N43:84	0	Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC33	N43:89	*	Output #1 Set-Output Value at End-of Profile	Percent Signal Output [4]
SCC34	N43:90	*	Output #2 Set-Output Value at End-of Profile	Percent Signal Output [4]
SCC35	N43:91	*	Output #3 Set-Output Value at End-of Profile	Percent Signal Output [4]
SCC36	N43:92	*	Output #4 Set-Output Value at End-of Profile	Percent Signal Output [4]
SCC41	N43:97	0	Pressure Minimum Control Limit	Pressure [3]
SCC42	N43:98	System Pressure	Pressure Maximum Control Limit	Pressure [3]
SCC43	N43:99	*	Selected Pressure Valve Output for Minimum	Percent Signal Output [4]
SCC44	N43:100	*	Selected Pressure Valve Output for Maximum	Percent Signal Output [4]
SCC45	N43:101	0	Velocity Minimum Control Limit	Velocity along Axis [2]
SCC46	N43:102	Max Velocity per OEM specs*	Velocity Maximum Control Limit	Velocity along Axis [2]
SCC47	N43:103	*	Selected Velocity Valve Output for Minimum	Percent Signal Output [4]
SCC48	N43:104	*	Selected Velocity Valve Output for Maximum	Percent Signal Output [4]
SCC49	N43:105	100	Proportional Gain for Pressure Control	None
SCC50	N43:106	400	Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
SCC51	N43:107	0	Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
SCC52	N43:108	200	Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
SCC53	N43:109	0	Feed Forward Gain for Velocity Control	None
SCC57	N43:113	0	Profile High Pressure Alarm Setpoint	Pressure [3]

[1] Time
00.00 to 99.99 Seconds

[2] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[4] Percent Signal Output
00.00 to 99.99

[5] Percent Signal Output per Second
0000 to 9999

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

*Refer to the appropriate section later in this chapter for information on this parameter

Worksheet 7-C
Third Clamp Close (TCC) Configuration Block

Control Word TCC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128
Value	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1

Bits 07–00: TCC Block Identifier

Control Word TCC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	159	158	157	156	155	154	153	152	151	150	149	148	147	146	145	144
Value	0	0	0	0	0	0	0	0	1				0			

Bits 06–04: Pressure Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bits 02–00: Velocity Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bit 07: Pressure Algorithm Selection
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-C (continued)
Third Clamp Close (TCC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
TCC05	N43:121	1000	Minimum ERC™ Percentage--Velocity	Percent [8]
TCC06	N43:122	1000	Minimum ERC™ Percentage--Pressure	Percent [8]
TCC08	N43:124	0	Profile Watchdog Timer Preset	Time [1]
TCC09	N43:125	*	Output #1 Set-Output Value during Profile	Percent Signal Output [4]
TCC10	N43:126	*	Output #2 Set-Output Value during Profile	Percent Signal Output [4]
TCC11	N43:127	*	Output #3 Set-Output Value during Profile	Percent Signal Output [4]
TCC12	N43:128	*	Output #4 Set-Output Value during Profile	Percent Signal Output [4]
TCC17	N43:133	0	Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC18	N43:134	0	Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC19	N43:135	0	Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC20	N43:136	0	Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC25	N43:141	0	Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC26	N43:142	0	Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC27	N43:143	0	Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC28	N43:144	0	Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC33	N43:149	*	Output #1 Set-Output Value at End-of Profile	Percent Signal Output [4]
TCC34	N43:150	*	Output #2 Set-Output Value at End-of Profile	Percent Signal Output [4]
TCC35	N43:151	*	Output #3 Set-Output Value at End-of Profile	Percent Signal Output [4]
TCC36	N43:152	*	Output #4 Set-Output Value at End-of Profile	Percent Signal Output [4]
TCC41	N43:157	0	Pressure Minimum Control Limit	Pressure [3]
TCC42	N43:158	System Pressure	Pressure Maximum Control Limit	Pressure [3]
TCC43	N43:159	*	Selected Pressure Valve Output for Minimum	Percent Signal Output [4]
TCC44	N43:160	*	Selected Pressure Valve Output for Maximum	Percent Signal Output [4]
TCC45	N43:161	0	Velocity Minimum Control Limit	Velocity along Axis [2]
TCC46	N43:162	Max Velocity per OEM specs*	Velocity Maximum Control Limit	Velocity along Axis [2]
TCC47	N43:163	*	Selected Velocity Valve Output for Minimum	Percent Signal Output [4]
TCC48	N43:164	*	Selected Velocity Valve Output for Maximum	Percent Signal Output [4]
TCC49	N43:165	100	Proportional Gain for Pressure Control	None
TCC50	N43:166	400	Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
TCC51	N43:167	0	Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
TCC52	N43:168	200	Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
TCC53	N43:169	0	Feed Forward Gain for Velocity Control	None
TCC57	N43:173	0	Profile High Pressure Alarm Setpoint	Pressure [3]

[1] Time
00.00 to 99.99 Seconds

[2] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[4] Percent Signal Output
00.00 to 99.99

[5] Percent Signal Output per Second
0000 to 9999

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

*Refer to the appropriate section later in this chapter for information on this parameter

Worksheet 7-D
Clamp Low Pressure Close (LPC) Configuration Block

Control Word LPC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	207	206	205	204	203	202	201	200	199	198	197	196	195	194	193	192
Value	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0

Bits 07–00: LPC Block Identifier

Control Word LPC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	223	222	221	220	219	218	217	216	215	214	213	212	211	210	209	208
Value	0	0	0	0	0	0	0	0	1				0	0	0	0

Bits 06–04: Pressure Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bit 07: Pressure Algorithm Selection
0 = Dependent Gains
1 = Independent Gains

Code:

Code	
(blank box)	Your value
0 or 1 (shaded box)	Required initial value loaded by Pro-Set 600

Worksheet 7-D (continued)
Clamp Low Pressure Close (LPC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
LPC06	N43:182	1000	Minimum ERC™ Percentage--Pressure	Percent [7]
LPC07	N43:183	0	Tonnage Watchdog Timer Preset	Time [1]
LPC08	N43:184	0	Profile Watchdog Timer Preset	Time [1]
LPC09	N43:185	*	Output #1 Set-Output Value during Profile	Percent Signal Output [3]
LPC10	N43:186	*	Output #2 Set-Output Value during Profile	Percent Signal Output [3]
LPC11	N43:187	*	Output #3 Set-Output Value during Profile	Percent Signal Output [3]
LPC12	N43:188	*	Output #4 Set-Output Value during Profile	Percent Signal Output [3]
LPC17	N43:193	0	Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC18	N43:194	0	Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC19	N43:195	0	Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC20	N43:196	0	Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC25	N43:201	0	Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC26	N43:202	0	Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC27	N43:203	0	Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC28	N43:204	0	Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC33	N43:209	*	Output #1 Set-Output Value at End-of Profile	Percent Signal Output [3]
LPC34	N43:210	*	Output #2 Set-Output Value at End-of Profile	Percent Signal Output [3]
LPC35	N43:211	*	Output #3 Set-Output Value at End-of Profile	Percent Signal Output [3]
LPC36	N43:212	*	Output #4 Set-Output Value at End-of Profile	Percent Signal Output [3]
LPC41	N43:217	0	Pressure Minimum Control Limit	Pressure [2]
LPC42	N43:218	System Pressure	Pressure Maximum Control Limit	Pressure [2]
LPC43	N43:219	*	Selected Pressure Valve Output for Minimum	Percent Signal Output [3]
LPC44	N43:220	*	Selected Pressure Valve Output for Maximum	Percent Signal Output [3]
LPC49	N43:225	100	Proportional Gain for Pressure Control	None
LPC50	N43:226	400	Integral Gain for Pressure Control	Inverse Time (Algorithm) [5]
LPC51	N43:227	0	Derivative Gain for Pressure Control	Time (Algorithm) [6] Time [1]
LPC57	N43:233	0	Profile High Pressure Alarm Setpoint	Pressure [2]

[1] Time
00.00 to 99.99 Seconds

[2] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[3] Percent Signal Output
00.00 to 99.99

[4] Percent Signal Output per Second
0000 to 9999

[5] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[6] Time (Algorithm)
00.00 to 99.99 Minutes

[7] Percent
00.00 to 99.99

*Refer to the appropriate section later in this chapter for information on this parameter

Worksheet 7-E
First Clamp Open (FOC) Configuration Block

Control Word FOC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	335	334	333	332	331	330	329	328	327	326	325	324	323	322	321	320
Value	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1

FOC Block Identifier (bits 07–00)

Control Word FOC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	351	350	349	348	347	346	345	344	343	342	341	340	339	338	337	336
Value	0	0	0	0	0	0	0	0	1				0			

Pressure Control Valve (bits 06–04)
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Velocity Control Valve (bits 02–00)
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Pressure Algorithm Selection (bit 07)
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1 (shaded box)	Required initial value loaded by Pro-Set 600

Worksheet 7-E (continued)
First Clamp Open (FOC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
FOC05	N43:301	1000	Minimum ERC™ Percentage--Velocity	Percent [8]
FOC06	N43:302	1000	Minimum ERC™ Percentage--Pressure	Percent [8]
FOC08	N43:304	0	Profile Watchdog Timer Preset	Time [1]
FOC09	N43:305	*	Output #1 Set-Output Value during Profile	Percent Signal Output [4]
FOC10	N43:306	*	Output #2 Set-Output Value during Profile	Percent Signal Output [4]
FOC11	N43:307	*	Output #3 Set-Output Value during Profile	Percent Signal Output [4]
FOC12	N43:308	*	Output #4 Set-Output Value during Profile	Percent Signal Output [4]
FOC17	N43:313	0	Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC18	N43:314	0	Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC19	N43:315	0	Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC20	N43:316	0	Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC25	N43:321	0	Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC26	N43:322	0	Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC27	N43:323	0	Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC28	N43:324	0	Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC33	N43:329	*	Output #1 Set-Output Value at End-of Profile	Percent Signal Output [4]
FOC34	N43:330	*	Output #2 Set-Output Value at End-of Profile	Percent Signal Output [4]
FOC35	N43:331	*	Output #3 Set-Output Value at End-of Profile	Percent Signal Output [4]
FOC36	N43:332	*	Output #4 Set-Output Value at End-of Profile	Percent Signal Output [4]
FOC41	N43:337	0	Pressure Minimum Control Limit	Pressure [3]
FOC42	N43:338	System Pressure	Pressure Maximum Control Limit	Pressure [3]
FOC43	N43:339	*	Selected Pressure Valve Output for Minimum	Percent Signal Output [4]
FOC44	N43:340	*	Selected Pressure Valve Output for Maximum	Percent Signal Output [4]
FOC45	N43:341	0	Velocity Minimum Control Limit	Velocity along Axis [2]
FOC46	N43:342	Max Speed per OEM specs*	Velocity Maximum Control Limit	Velocity along Axis [2]
FOC47	N43:343	*	Selected Velocity Valve Output for Minimum	Percent Signal Output [4]
FOC48	N43:344	*	Selected Velocity Valve Output for Maximum	Percent Signal Output [4]
FOC49	N43:345	100	Proportional Gain for Pressure Control	None
FOC50	N43:346	400	Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
FOC51	N43:347	0	Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
FOC52	N43:348	200	Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
FOC53	N43:349	0	Feed Forward Gain for Velocity Control	None
FOC57	N43:353	0	Profile High Pressure Alarm Setpoint	Pressure [3]

[1] Time
00.00 to 99.99 Seconds

[2] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[4] Percent Signal Output
00.00 to 99.99

[5] Percent Signal Output per Second
0000 to 9999

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

*Refer to the appropriate section later in this chapter for information on this parameter

Worksheet 7-F
Second Clamp Open (SOC) Configuration Block

Control Word SOC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	399	398	397	396	395	394	393	392	391	390	389	388	387	386	385	384
Value	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0

Bits 07–00: SOC Block Identifier

Control Word SOC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	415	414	413	412	411	410	409	408	407	406	405	404	403	402	401	400
Value	0	0	0	0	0	0	0	0	1				0			

Bits 06–04: Pressure Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bits 02–00: Velocity Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bit 07: Pressure Algorithm Selection
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-F (continued)
Second Clamp Open (SOC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
SOC05	N43:361	1000	Minimum ERC™ Percentage--Velocity	Percent [8]
SOC06	N43:362	1000	Minimum ERC™ Percentage--Pressure	Percent [8]
SOC08	N43:364	0	Profile Watchdog Timer Preset	Time [1]
SOC09	N43:365	*	Output #1 Set-Output Value during Profile	Percent Signal Output [3]
SOC10	N43:366	*	Output #2 Set-Output Value during Profile	Percent Signal Output [3]
SOC11	N43:367	*	Output #3 Set-Output Value during Profile	Percent Signal Output [3]
SOC12	N43:368	*	Output #4 Set-Output Value during Profile	Percent Signal Output [3]
SOC17	N43:373	0	Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC18	N43:374	0	Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC19	N43:375	0	Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC20	N43:376	0	Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC25	N43:381	0	Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC26	N43:382	0	Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC27	N43:383	0	Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC28	N43:384	0	Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC33	N43:389	*	Output #1 Set-Output Value at End-of Profile	Percent Signal Output [3]
SOC34	N43:390	*	Output #2 Set-Output Value at End-of Profile	Percent Signal Output [3]
SOC35	N43:391	*	Output #3 Set-Output Value at End-of Profile	Percent Signal Output [3]
SOC36	N43:392	*	Output #4 Set-Output Value at End-of Profile	Percent Signal Output [3]
SOC41	N43:397	0	Pressure Minimum Control Limit	Pressure [2]
SOC42	N43:398	System Pressure	Pressure Maximum Control Limit	Pressure [2]
SOC43	N43:399	*	Selected Pressure Valve Output for Minimum	Percent Signal Output [3]
SOC44	N43:400	*	Selected Pressure Valve Output for Maximum	Percent Signal Output [3]
SOC45	N43:401	0	Velocity Minimum Control Limit	Velocity along Axis [5]
SOC46	N43:402	Max Velocity per OEM specs*	Velocity Maximum Control Limit	Velocity along Axis [5]
SOC47	N43:403	*	Selected Velocity Valve Output for Minimum	Percent Signal Output [3]
SOC48	N43:404	*	Selected Velocity Valve Output for Maximum	Percent Signal Output [3]
SOC49	N43:405	100	Proportional Gain for Pressure Control	None
SOC50	N43:406	400	Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
SOC51	N43:407	0	Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
SOC52	N43:408	200	Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
SOC53	N43:409	0	Feed Forward Gain for Velocity Control	None
SOC57	N43:413	0	Profile High Pressure Alarm Setpoint	Pressure [2]

[1] Time
00.00 to 99.99 Seconds

[2] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[3] Percent Signal Output
00.00 to 99.99

[4] Percent Signal Output per Second
0000 to 9999

[5] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

*Refer to the appropriate section later in this chapter for information on this parameter

Worksheet 7-G
Third Clamp Open (TOC) Configuration Block

Control Word TOC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	463	462	461	460	459	458	457	456	455	454	453	452	451	450	449	448
Value	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1

TOC Block Identifier

Control Word TOC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	479	478	477	476	475	474	473	472	471	470	469	468	467	466	465	464
Value	0	0	0	0	0	0	0	0	1				0			

Pressure Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Velocity Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Pressure Algorithm Selection
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-G (continued)
Third Clamp Open (TOC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
TOC05	N43:421	1000	Minimum ERC™ Percentage--Velocity	Percent [8]
TOC06	N43:422	1000	Minimum ERC™ Percentage--Pressure	Percent [8]
TOC08	N43:424	0	Profile Watchdog Timer Preset	Time [1]
TOC09	N43:425	*	Output #1 Set-Output Value during Profile	Percent Signal Output [3]
TOC10	N43:426	*	Output #2 Set-Output Value during Profile	Percent Signal Output [3]
TOC11	N43:427	*	Output #3 Set-Output Value during Profile	Percent Signal Output [3]
TOC12	N43:428	*	Output #4 Set-Output Value during Profile	Percent Signal Output [3]
TOC17	N43:433	0	Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC18	N43:434	0	Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC19	N43:435	0	Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC20	N43:436	0	Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC25	N43:441	0	Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC26	N43:442	0	Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC27	N43:443	0	Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC28	N43:444	0	Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC33	N43:449	*	Output #1 Set-Output Value at End-of Profile	Percent Signal Output [3]
TOC34	N43:450	*	Output #2 Set-Output Value at End-of Profile	Percent Signal Output [3]
TOC35	N43:451	*	Output #3 Set-Output Value at End-of Profile	Percent Signal Output [3]
TOC36	N43:452	*	Output #4 Set-Output Value at End-of Profile	Percent Signal Output [3]
TOC41	N43:457	0	Pressure Minimum Control Limit	Pressure [2]
TOC42	N43:458	System Pressure	Pressure Maximum Control Limit	Pressure [2]
TOC43	N43:459	*	Selected Pressure Valve Output for Minimum	Percent Signal Output [3]
TOC44	N43:460	*	Selected Pressure Valve Output for Maximum	Percent Signal Output [3]
TOC45	N43:461	0	Velocity Minimum Control Limit	Velocity along Axis [5]
TOC46	N43:462	Max Velocity per OEM specs*	Velocity Maximum Control Limit	Velocity along Axis [5]
TOC47	N43:463	*	Selected Velocity Valve Output for Minimum	Percent Signal Output [3]
TOC48	N43:464	*	Selected Velocity Valve Output for Maximum	Percent Signal Output [3]
TOC49	N43:465	100	Proportional Gain for Pressure Control	None
TOC50	N43:466	400	Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
TOC51	N43:467	0	Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
TOC52	N43:468	200	Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
TOC53	N43:469	0	Feed Forward Gain for Velocity Control	None
TOC57	N43:473	0	Profile High Pressure Alarm Setpoint	Pressure [2]

[1] Time
00.00 to 99.99 Seconds

[2] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[3] Percent Signal Output
00.00 to 99.99

[4] Percent Signal Output per Second
0000 to 9999

[5] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

*Refer to the appropriate section later in this chapter for information on this parameter

Worksheet 7-H
Clamp Open Slow (OSC) Configuration Block

Control Word OSC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	527	526	525	524	523	522	521	520	519	518	517	516	515	514	513	512
Value	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0

OSC Block Identifier (bits 07–00)

Control Word OSC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	543	542	541	540	539	538	537	536	535	534	533	532	531	530	529	528
Value	0	0	0	0	0	0	0	0	1				0			

Pressure Control Valve (bits 06–04)
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Velocity Control Valve (bits 02–00)
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Pressure Algorithm Selection (bit 07)
0 = Dependent Gains
1 = Independent Gains

Code:

Code	
(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-H (continued)
Clamp Open Slow (OSC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
OSC05	N43:481	1000	Minimum ERC™ Percentage--Velocity	Percent [8]
OSC06	N43:482	1000	Minimum ERC™ Percentage--Pressure	Percent [8]
OSC08	N43:484	0	Profile Watchdog Timer Preset	Time [1]
OSC09	N43:485	*	Output #1 Set-Output Value during Profile	Percent Signal Output [4]
OSC10	N43:486	*	Output #2 Set-Output Value during Profile	Percent Signal Output [4]
OSC11	N43:487	*	Output #3 Set-Output Value during Profile	Percent Signal Output [4]
OSC12	N43:488	*	Output #4 Set-Output Value during Profile	Percent Signal Output [4]
OSC17	N43:493	0	Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC18	N43:494	0	Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC19	N43:495	0	Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC20	N43:496	0	Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC25	N43:501	0	Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC26	N43:502	0	Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC27	N43:503	0	Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC28	N43:504	0	Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC33	N43:509	*	Output #1 Set-Output Value at End-of Profile	Percent Signal Output [4]
OSC34	N43:510	*	Output #2 Set-Output Value at End-of Profile	Percent Signal Output [4]
OSC35	N43:511	*	Output #3 Set-Output Value at End-of Profile	Percent Signal Output [4]
OSC36	N43:512	*	Output #4 Set-Output Value at End-of Profile	Percent Signal Output [4]
OSC41	N43:517	0	Pressure Minimum Control Limit	Pressure [3]
OSC42	N43:518	System Pressure	Pressure Maximum Control Limit	Pressure [3]
OSC43	N43:519	*	Selected Pressure Valve Output for Minimum	Percent Signal Output [4]
OSC44	N43:520	*	Selected Pressure Valve Output for Maximum	Percent Signal Output [4]
OSC45	N43:521	0	Velocity Minimum Control Limit	Velocity along Axis [2]
OSC46	N43:522	Max Velocity per OEM specs*	Velocity Maximum Control Limit	Velocity along Axis [2]
OSC47	N43:523	*	Selected Velocity Valve Output for Minimum	Percent Signal Output [4]
OSC48	N43:524	*	Selected Velocity Valve Output for Maximum	Percent Signal Output [4]
OSC49	N43:525	100	Proportional Gain for Pressure Control	None
OSC50	N43:526	400	Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
OSC51	N43:527	0	Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
OSC52	N43:528	200	Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
OSC53	N43:529	0	Feed Forward Gain for Velocity Control	None
OSC57	N43:533	0	Profile High Pressure Alarm Setpoint	Pressure [3]

[1] Time
00.00 to 99.99 Seconds

[2] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[4] Percent Signal Output
00.00 to 99.99

[5] Percent Signal Output per Second
0000 to 9999

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

*Refer to the appropriate section later in this chapter for information on this parameter

Worksheet 7-I
Ejector Advance (EAC) Configuration Block

Control Word EAC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B39/bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Value	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0

EAC Block Identifier

Control Word EAC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B39/bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Value	0	0	0	0	0	0	0	0	1				0			

Pressure Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Velocity Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Pressure Algorithm Selection
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-I (continued)
Ejector Advance (EAC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
EAC05	N45:1	1000	Minimum ERC™ Percentage--Velocity	Percent [8]
EAC06	N45:2	1000	Minimum ERC™ Percentage--Pressure	Percent [8]
EAC08	N45:4	0	Profile Watchdog Timer Preset	Time [1]
EAC09	N45:5	*	Output #1 Set-Output Value during Advance	Percent Signal Output [4]
EAC10	N45:6	*	Output #2 Set-Output Value during Advance	Percent Signal Output [4]
EAC11	N45:7	*	Output #3 Set-Output Value during Advance	Percent Signal Output [4]
EAC12	N45:8	*	Output #4 Set-Output Value during Advance	Percent Signal Output [4]
EAC17	N45:13	0	Output #1 Acceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC18	N45:14	0	Output #2 Acceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC19	N45:15	0	Output #3 Acceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC20	N45:16	0	Output #4 Acceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC25	N45:21	0	Output #1 Deceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC26	N45:22	0	Output #2 Deceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC27	N45:23	0	Output #3 Deceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC28	N45:24	0	Output #4 Deceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC33	N45:29	*	Output #1 Set-Output Value at End-of Advance	Percent Signal Output [4]
EAC34	N45:30	*	Output #2 Set-Output Value at End-of Advance	Percent Signal Output [4]
EAC35	N45:31	*	Output #3 Set-Output Value at End-of Advance	Percent Signal Output [4]
EAC36	N45:32	*	Output #4 Set-Output Value at End-of Advance	Percent Signal Output [4]
EAC41	N45:37	0	Pressure Minimum Control Limit	Pressure [3]
EAC42	N45:38	System Pressure	Pressure Maximum Control Limit	Pressure [3]
EAC43	N45:39	*	Selected Pressure Valve Output for Minimum	Percent Signal Output [4]
EAC44	N45:40	*	Selected Pressure Valve Output for Maximum	Percent Signal Output [4]
EAC45	N45:41	0	Velocity Minimum Control Limit	Velocity along Axis [2]
EAC46	N45:42	Max Velocity per OEM specs*	Velocity Maximum Control Limit	Velocity along Axis [2]
EAC47	N45:43	*	Selected Velocity Valve Output for Minimum	Percent Signal Output [4]
EAC48	N45:44	*	Selected Velocity Valve Output for Maximum	Percent Signal Output [4]
EAC49	N45:45	100	Proportional Gain for Pressure Control	None
EAC50	N45:46	400	Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
EAC51	N45:47	0	Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
EAC52	N45:48	200	Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
EAC53	N45:49	0	Feed Forward Gain for Velocity Control	None
EAC57	N45:53	0	Profile High Pressure Alarm Setpoint	Pressure [3]

[1] Time
00.00 to 99.99 Seconds

[2] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[4] Percent Signal Output
00.00 to 99.99

[5] Percent Signal Output per Second
0000 to 9999

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

*Refer to the appropriate section later in this chapter for information on this parameter

Worksheet 7-J
Ejector Retract (ERC)Configuration Block

Control Word ERC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B39/bit	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
Value	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1

Bits 07–00: ERC Block Identifier

Control Word ERC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B39/bit	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80
Value	0	0	0	0	0	0	0	0	1				0			

Bits 06–04: Pressure Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bits 02–00: Velocity Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bit 07: Pressure Algorithm Selection
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-J (continued)
Ejector Retract (ERC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
ERC05	N45:61	1000	Minimum ERC™ Percentage--Velocity	Percent [8]
ERC06	N45:62	1000	Minimum ERC™ Percentage--Pressure	Percent [8]
ERC09	N45:65	*	Output #1 Set-Output Value during Retract	Percent Signal Output [4]
ERC10	N45:66	*	Output #2 Set-Output Value during Retract	Percent Signal Output [4]
ERC11	N45:67	*	Output #3 Set-Output Value during Retract	Percent Signal Output [4]
ERC12	N45:68	*	Output #4 Set-Output Value during Retract	Percent Signal Output [4]
ERC17	N45:73	0	Output #1 Acceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC18	N45:74	0	Output #2 Acceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC19	N45:75	0	Output #3 Acceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC20	N45:76	0	Output #4 Acceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC25	N45:81	0	Output #1 Deceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC26	N45:82	0	Output #2 Deceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC27	N45:83	0	Output #3 Deceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC28	N45:84	0	Output #4 Deceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC33	N45:89	*	Output #1 Set-Output Value at End-of Retract	Percent Signal Output [4]
ERC34	N45:90	*	Output #2 Set-Output Value at End-of Retract	Percent Signal Output [4]
ERC35	N45:91	*	Output #3 Set-Output Value at End-of Retract	Percent Signal Output [4]
ERC36	N45:92	*	Output #4 Set-Output Value at End-of Retract	Percent Signal Output [4]
ERC41	N45:97	0	Pressure Minimum Control Limit	Pressure [3]
ERC42	N45:98	System Pressure	Pressure Maximum Control Limit	Pressure [3]
ERC43	N45:99	*	Selected Pressure Valve Output for Minimum	Percent Signal Output [4]
ERC44	N45:100	*	Selected Pressure Valve Output for Maximum	Percent Signal Output [4]
ERC45	N45:101	0	Velocity Minimum Control Limit	Velocity along Axis [2]
ERC46	N45:102	Max Velocity per OEM specs*	Velocity Maximum Control Limit	Velocity along Axis [2]
ERC47	N45:103	*	Selected Velocity Valve Output for Minimum	Percent Signal Output [4]
ERC48	N45:104	*	Selected Velocity Valve Output for Maximum	Percent Signal Output [4]
ERC49	N45:105	100	Proportional Gain for Pressure Control	None
ERC50	N45:106	400	Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
ERC51	N45:107	0	Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
ERC52	N45:108	200	Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
ERC53	N45:109	0	Feed Forward Gain for Velocity Control	None

[1] Time
00.00 to 99.99 Seconds

[2] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[4] Percent Signal Output
00.00 to 99.99

[5] Percent Signal Output per Second
0000 to 9999

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

*Refer to the appropriate section later in this chapter for information on this parameter

Procedure to Determine and Record Worksheet Values

Follow this procedure to complete each worksheet.

1. Decide which profiles you will and will not use.
2. Read the text for the subject parameter.
3. Determine your initial value for that parameter and add it to each corresponding worksheet at the listed configuration word address.

Important: Block identifier codes are already recorded for you.

Determine Bit Selections: Assign Module Outputs for Your Control Valves

Selected Velocity Control Valve
(FCC02, SCC02, TCC02, FOC02, SOC02, TOC02, OSC02, EAC02, ERC02)

The QDC module is capable of controlling clamp and ejector movement using a velocity versus position algorithm. Since up to four valves may be connected to your QDC module, you must inform the QDC module what valve you want it to control when utilizing this algorithm. Enter the appropriate values into your configuration worksheets depending on your valve configuration.

B02	B01	B00	Selects:
0	0	0	Output #1 Used for Velocity Control
0	0	1	Output #2 Used for Velocity Control
0	1	0	Output #3 Used for Velocity Control
0	1	1	Output #4 Used for Velocity Control

Selected Pressure Control Valve
(FCC02, SCC02, TCC02, LPC02, FOC02, SOC02, TOC02, OSC02, EAC02, ERC02)

The QDC module can also control clamp and ejector movement using a pressure versus position algorithm (This is the only algorithm possible in the Low Pressure Close profile). Again, you must inform the QDC module what valve you want it to control when utilizing this algorithm. Enter the appropriate values into your configuration worksheets depending on your valve configuration.

B06	B05	B04	Selects:
0	0	0	Output #1 Used for Pressure Control
0	0	1	Output #2 Used for Pressure Control
0	1	0	Output #3 Used for Pressure Control
0	1	1	Output #4 Used for Pressure Control

Select the Type of PID Algorithm

Pressure Algorithm Selection
(FCC02, SCC02, TCC02, LPC02, FOC02, SOC02, TOC02, OSC02, EAC02, ERC02)

When executing pressure vs. position profiles, the QDC module can use one of two types of PID algorithms: dependent gains (ISA) or independent gains (Allen-Bradley).

If B07 = :	Then it uses:
0	Dependent Gains (ISA)
1	Independent Gains (A-B)

Dependent gains (ISA):
$$Output = Kc[(E) + 1/Ti \int_0^t (E)dt + Td*d(E)/dt]$$

Independent gains (AB):
$$Output = Kp(E) + Ki \int_0^t (E)dt + Kd*d(E)/dt$$

Comparison of Gain Constants

Compare standard and independent gains constants as follows:

Dependent Gains Constants:	Independent Gains Constants:
Controller Gain Kc (dimensionless)	Proportional Gain Kp (dimensionless)
Reset Term 1/Ti (minutes per repeat)	Integral Gain Ki (inverse seconds)
Rate Term Td (minutes)	Derivative Term Kd (seconds)

Other variables used in any algorithm choice include:

Output = Percentage of full scale
E = Error (scaled) SP-PV (Setpoint-Process Variable)
PV = Process Variable (scaled)

Convert from standard to independent gain constants by substituting controller gain (Kc), reset (1/Ti), and rate (Td) values in the following;

$$Kp = Kc \text{ unitless}$$

$$Ki = \frac{Kc}{60\ Ti} \text{ inverse seconds}$$

$$Kd = Kc(Td)60 \text{ seconds}$$

We recorded bit 07 = 1 for A-B independent gains on the worksheets. The closed-loop tuning procedures in chapter 10 assume this selection.

Important: If, after attempting to tune your pressure loops using the procedure in chapter 10, you believe your application requires the use of dependant gain (ISA) pressure algorithms, refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for information on this option.

Determine Word Selections: Set ERC Values and Timer Presets

Expert Response Compensation Minimum Percentage - Velocity (FCC05, SCC05, TCC05, FOC05, SOC05, TOC05, OSC05, EAC05, ERC05)

The QDC module utilizes a proprietary, enhanced control scheme called Expert Response Compensation. Expert Response Compensation (ERC) accounts for changes in your machine, machine hydraulics, raw materials, and other process variables. Using an exclusive algorithm, ERC adjusts the control scheme to counterbalance changes, both abrupt upsets and long term deviations, to your process.

Enter 1000 (10%) for each ERC Velocity Minimum Percentage. A detailed discussion of this type of setpoint is presented in chapter 10 assist you in selecting the correct, final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Expert Response Compensation Minimum Percentage - Pressure (FCC06, SCC06, TCC06, LPC06, FOC06, SOC06, TOC06, OSC06, EAC06, ERC06)

A minimum Expert Response Compensation value must be entered for pressure control algorithms just as it was for velocity control. Again, we recommend a starting value of 10%.

Enter 1000 (10%) for each ERC Pressure Minimum Percentage. A detailed discussion of this type of setpoint is presented in chapter 10 to assist you in selecting the correct, final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Tonnage Watchdog Timer Preset
(LPC07)

The QDC module starts an internal Tonnage watchdog timer every time it completes execution of Low Pressure Close. The QDC module stops this timer when clamp pressure exceeds the tonnage preset (CPC63).

You are asked to enter a Watchdog Timer setpoint in word LPC07. Any time the internal timer's accumulated value is equal to or greater than this value, the QDC module sets the Tonnage Watchdog Timer alarm bit (SYS04-B15). An entry of 0 in LPC07 inhibits actuation of this alarm.

Enter 0 for the Tonnage Watchdog Timer Preset. Additional information to assist you in selecting the final value required by your application may be obtained by referencing Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88).

Profile Watchdog Timer Preset
(FCC08, SCC08, TCC08, LPC08, FOC08, SOC08, TOC08, OSC08, EAC08)

The QDC module starts an internal watchdog timer every time it initiates execution of a new profile. The QDC module stops this timer and resets the accumulated value to zero (after reporting the accumulated value back to the PLC processor in the appropriate status block) each time it concludes execution of the profile.

You are asked to enter a Watchdog Timer setpoint in word 08 of the subject blocks. Any time the accumulated value of the internal timer is equal to or greater than the value you place in the respective word, the QDC module sets an appropriate Watchdog Timer alarm bit (SYS04-B00, SYS04-B01, SYS04-B02, SYS04-B03, SYS04-B10, SYS04-B11, SYS04-B12, SYS04-B13, or SYS04-B14 respectively) in the system status block. An entry of 0 inhibits actuation of this alarm.

Important: The Ejector Advance (EAC08) Watchdog Timer Preset watches over the entire ejector profile (Ejector Advance and Ejector Retract), not just Ejector Advance.

Enter 0 for each Profile Watchdog Timer Preset. A detailed discussion of this type of setpoint is in chapter 10 to assist you in selecting the correct, final values required by your application. Additional information may also be obtained by referencing Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88).

Determine Unselected Valve Set-output Values

Unselected Valve Set-output Values
(FCC09 - 12, SCC09 - 12, TCC09 - 12, LPC09 - 12, FOC09 - 12, SOC09 - 12, TOC09 - 12, OSC09 - 12, EAC09 - 12, ERC09 - 12)

Earlier in this chapter, you told the QDC module which of its four outputs were being used to control pressure and flow profiles. Your machine hydraulics probably require that the remaining valves connected to your QDC module assume a certain state when one of the two selected valves is being used for control.

Words 09 through 12 of the respective configuration blocks define these set-output values. The QDC module sets its outputs for all unselected valves to the values in these words each time it initiates execution of the appropriate profile. **The QDC module ignores the unselected valve set-output value associated with the "selected" profile valve.**

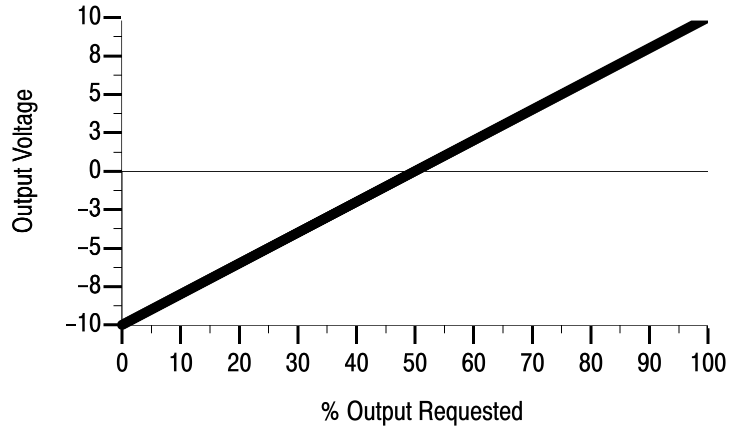
Important: If the QDC module is commanded to initiate execution of any of the four Clamp Open profiles when the ejector profile is in progress, the executing Clamp Open profile takes control of all the unselected valves in the ejector profile and the QDC module does not access the data in words 09 through 12 for either EAC or ERC unless the interrupting Clamp Open profile is completed before the ejector profile is completed. Likewise, if the QDC module is commanded to initiate execution of an Ejector Profile during its execution of any of the four Clamp Open profiles, the executing Clamp Open profile surrenders control of only the "selected" ejector profile valve. **In general, clamp open profile** unselected valve values **take precedence over ejector profile** unselected valve values.

Table 7.A presents unselected valve setpoints you may wish to use, depending on your machines valve types and the desired profile action.

Table 7.A
Unselected Valve Setpoints

If the unselected valve controls:	And the unselected valve configuration is:	And during the profile the valve is:	And you require during the profile:	Then Enter:
Pressure	Uni-directional	Direct acting	Maximum Pressure	9999
Pressure	Uni-directional	Direct acting	Medium Pressure	7500 to 5000
Pressure	Uni-directional	Direct acting	Low Pressure	5000 to 2500
Pressure	Uni-directional	Direct acting	Minimum Pressure	0
Pressure	Uni-directional	Reverse acting	Maximum Pressure	0
Pressure	Uni-directional	Reverse acting	Medium Pressure	2500 to 5000
Pressure	Uni-directional	Reverse acting	Low Pressure	5000 to 7500
Pressure	Uni-directional	Reverse acting	Minimum Pressure	9999
Flow	Uni-directional	Direct acting	Maximum Flow	9999
Flow	Uni-directional	Direct acting	Medium Flow	7500 to 5000
Flow	Uni-directional	Direct acting	Low Flow	5000 to 2500
Flow	Uni-directional	Direct acting	Minimum Flow	0
Flow	Uni-directional	Reverse acting	Maximum Flow	0
Flow	Uni-directional	Reverse acting	Medium Flow	2500 to 5000
Flow	Uni-directional	Reverse acting	Low Flow	5000 to 7500
Flow	Uni-directional	Reverse acting	Minimum Flow	9999
Flow	Bi-directional	Direct acting	Maximum Flow	9999
Flow	Bi-directional	Direct acting	Medium Flow	8750 to 7500
Flow	Bi-directional	Direct acting	Low Flow	7500 to 6250
Flow	Bi-directional	Direct acting	Minimum Flow	5000
Flow	Bi-directional	Reverse acting	Maximum Flow	0
Flow	Bi-directional	Reverse acting	Medium Flow	1250 to 2500
Flow	Bi-directional	Reverse acting	Low Flow	2500 to 3750
Flow	Bi-directional	Reverse acting	Minimum Flow	5000

Figure 7.1
Set-Output Operations



ATTENTION: A value of zero in set-output words does not necessarily correspond to zero pressure or flow. If you have configured jumper E11, E12, E15, and/or E16 for bi-directional valve operation, an output of 0% gives –10V dc, 50% gives 0V dc. Amplifier electronics or spool-null offsets may also allow pressure or flow at zero volts signal input. Consult your valve and amplifier specifications for more details.

Enter values for all Unselected Valve Set-outputs that are representative of the signal output percentages required to drive the unselected valves during the respective profiles. The valve spanning procedures presented in chapter 9 require that your unselected valves be driven by a signal level similar to how they are set during a normal production run. A detailed discussion of this type of setpoint is presented in chapter 10 to highlight the process considerations that impend modification of these parameters. Additional information may also be obtained by referencing Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88).

Set your Accel/Decel Ramp Rates

As you read the following sections, fill in the values for the mentioned words in the worksheets. Depending on the clamp and ejector profiles required by your application, ramp rates may be necessary to provide smooth actuator motion. The QDC module provides you with multi-stepped profiles to reduce the need for ramp rates. We recommend starting with a value of zero for all ramp rates and altering them only if rough, jerky motion occurs during profile tuning.

ATTENTION: Using ramps inhibits effective closed-loop control, ERC calculations, and reduces QDC module control capability. Use ramps only if machine operation mandates.

Acceleration Ramp Rates

(FCC17 - 20, SCC17 - 20, TCC17 - 20, LPC17 - 20, FOC17 - 20, SOC17 - 20, TOC17 - 20, OSC17 - 20, EAC17 - 20, ERC17 - 20)

The QDC module utilizes these acceleration ramp rates when moving its outputs from one setpoint to a higher setpoint during execution of the appropriate profile. These ramp rates are effective for both selected and unselected valves. A ramp rate of zero disables ramping, and the QDC module "steps" directly from setpoint to setpoint.

Enter 0 for all Acceleration Ramp Rates. The valve spanning procedures presented in chapter 9 require no ramping. A detailed discussion of this type of setpoint is presented in chapter 10 to assist you in selecting the correct, final values required by your application. Additional information may also be obtained by referencing Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88).

Deceleration Ramp Rates

(FCC25 - 28, SCC25 - 28, TCC25 - 28, LPC25 - 28, FOC25 - 28, SOC25 - 28, TOC25 - 28, OSC25 - 28, EAC25 - 28, ERC25 - 28)

The QDC module utilizes these deceleration ramp rates when moving its outputs from one setpoint to a lower setpoint during execution of the appropriate profile. These ramp rates are effective for selected and unselected valves. A ramp rate of zero disables ramping, and the QDC module "steps" directly from setpoint to setpoint.

Enter 0 for all Deceleration Ramp Rates. The valve spanning procedures presented in chapter 9 require no ramping. A detailed discussion of this type of setpoint is presented in chapter 10 to assist you in selecting the correct, final values required by your application. Additional information may also be obtained by referencing Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88).

Determine Set-output Values for End of Profiles

End-of Profile Set-output Values (FCC33 - 36, SCC33 - 36, TCC33 - 36, LPC33 - 36, FOC33 - 36, SOC33 - 36, TOC33 - 36, OSC33 - 36, EAC33 - 36, ERC33 - 36)

The QDC module sets its outputs equal to these set-output values every time it completes the appropriate profile or ejector stroke and other configurations do not require the QDC module to "bridge" to the next logical profile or stroke. These outputs remain in effect until the next logical profile begins or the module is stopped using DYC02-B15. The ramp rates defined above are in effect for output movement to these set-output values.

Enter values for all End-of Profile Set-outputs that correspond to zero pressure or flow. The valve spanning procedures presented in chapter 9 require these initial values. A detailed discussion of this type of setpoint is presented in chapter 10 to assist you in selecting the correct, final values required by your application. Additional information may also be obtained by referencing Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88).

Set Pressure Control Limits

As you read the following sections, fill in the values for the mentioned words in the worksheets. Setting pressure control limits performs two functions:

- spanning your selected valve outputs to allow effective open loop and closed loop control
- allowing users with reverse-acting valves to configure their system accordingly

Your injection machine manufacturer typically provides you with all necessary values to configure these limits.

Pressure Minimum Control Limit
(FCC41, SCC41, TCC41, LPC41, FOC41, SOC41, TOC41, OSC41, EAC41, ERC41)

The value in this word corresponds to the minimum "controllable" pressure during profile or stroke execution. This word operates in conjunction with the selected pressure valve minimum output (word 43) below. The QDC module expects this pressure when setting the selected pressure valve to the percentage output defined by word 43.

Enter 0 for each Pressure Minimum Control Limit. The valve spanning procedures presented in chapter 9 require these initial values in order to assist you in selecting the correct, final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Pressure Maximum Control Limit
(FCC42, SCC42, TCC42, LPC42, FOC42, SOC42, TOC42, OSC42, EAC42, ERC42)

The value in this word corresponds to the maximum "controllable" pressure during profile or stroke execution. This word operates in conjunction with the selected pressure valve maximum output (word 44) below. The QDC module expects this pressure when setting the selected pressure valve to the percentage output defined by word 44.

Enter a value for each Pressure Maximum Control Limit equal to the maximum pressure available through the selected pressure control valve. The valve spanning procedures presented in chapter 9 require these initial values in order to assist you in selecting the correct, final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Selected Pressure Valve Output for Minimum
(FCC43, SCC43, TCC43, LPC43, FOC43, SOC43, TOC43, OSC43, EAC43, ERC43)

This word operates in conjunction with the minimum pressure control limit (word 41). Enter in this word the signal output percentage that the QDC module uses to drive the selected pressure valve to minimum pressure during any pressure vs. position profile or stroke. The QDC module expects a pressure equal to word 41 when setting the selected pressure valve to this percentage output.

If your selected pressure valve is:	Then the value in word 43 should be:	And during the profile or stroke, the QDC module does not drive the valve with a % output:
Direct Acting	less than the value in word 44	less than word 43
Reverse Acting	greater than the value in word 44	greater than word 43

Reference the above table and enter one of the following for each Selected Pressure Valve Minimum Output:

- 0 (0%) for uni-directional direct acting valves
- 5000 (50%) for bi-directional valves
- 9999 (100%) for uni-directional reverse acting valves

The valve spanning procedures presented in chapter 9 required these initial values in order to assist you in selecting the correct, final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference manual (pub. no. 1771-6.5.88) for more information.

Selected Pressure Valve Output for Maximum
(FCC44, SCC44, TCC44, LPC44, FOC44, SOC44, TOC44, OSC44, EAC44, ERC44)

This word operates in conjunction with the maximum pressure control limit (word 42). Enter in this word the signal output percentage that the QDC module uses to drive the selected pressure valve to maximum pressure during any pressure vs. position profile or stroke. The QDC module expects a pressure equal to word 42 when setting the selected pressure valve to this percentage output.

If your selected pressure valve is:	Then the value in word 44 should be:	And during the profile or stroke, the QDC module does not drive the valve with a % output:
Direct Acting	greater than the value in word 43	greater than word 44
Reverse Acting	less than the value in word 43	less than word 44

Reference the above table and enter one of the following for each Selected Pressure Valve Maximum Output:

- 9999 (100%) for uni-directional direct acting valves
- 0 (0%) or 9999 (100%) for bi-directional valves (dependant upon desired direction of motion)
- 0 (0%) for uni-directional reverse acting valves

The valve spanning procedures presented in chapter 9 require these initial values in order to assist you in selecting the correct, final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Set Velocity Control Limits

As you read the following sections, fill in the values for the mentioned words in the worksheets. Setting velocity control limits performs the same function as setting pressure control limits.

Velocity Minimum Control Limit
(FCC45, SCC45, TCC45, FOC45, SOC45, TOC45, OSC45, EAC45, ERC45)

The value in this word corresponds to the minimum "controllable" velocity during profile or stroke execution. This word operates in conjunction with the selected velocity valve minimum output (word 47) below. The QDC module expects this velocity when setting the selected velocity valve to the percentage output defined by word 47.

Enter 0 for each Velocity Minimum Control Limit. The valve spanning procedures presented in chapter 9 require these initial values in order to assist you in selecting the correct, final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Velocity Maximum Control Limit
(FCC46, SCC46, TCC46, FOC46, SOC46, TOC46, OSC46, EAC46, ERC46)

The value in this word corresponds to the maximum "controllable" velocity during profile or stroke execution. This word operates in conjunction with the selected velocity valve maximum output (word 48) below. The QDC module expects this velocity when setting the selected velocity valve to the percentage output defined by word 48.

Enter a value for each Velocity Maximum Control Limit equal to the maximum cylinder speed per your OEM specifications. The valve spanning procedures presented in chapter 9 require these initial values in order to assist you in selecting the correct, final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Selected Velocity Valve Output for Minimum
(FCC47, SCC47, TCC47, FOC47, SOC47, TOC47, OSC47, EAC47, ERC47)

This word operates in conjunction with the minimum velocity control limit (word 45). Enter in this word the signal output percentage that the QDC module uses to drive the selected velocity valve to minimum velocity during any velocity vs. position profile or stroke. The QDC module expects a velocity equal to word 45 when setting the selected velocity valve to this percentage output.

If your selected velocity valve is:	Then the value in word 47 should be:	And during the profile or stroke, the QDC module does not drive the valve with a % output:
Direct Acting	less than the value in word 48	less than word 47
Reverse Acting	greater than the value in word 48	greater than word 47

Reference the above table and enter one of the following for each Selected Velocity Valve Minimum Output:

- 0 (0%) for uni-directional direct acting valves
- 5000 (50%) for bi-directional valves
- 9999 (100%) for uni-directional reverse acting valves

The valve spanning procedures presented in chapter 9 require these initial values in order to assist you in selecting the correct, final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Selected Velocity Valve Output for Maximum
(FCC48, SCC48, TCC48, FOC48, SOC48, TOC48, OSC48, EAC48, ERC48)

This word operates in conjunction with the minimum velocity control limit (word 46). Enter in this word the signal output percentage that the QDC module uses to drive the selected velocity valve to maximum velocity during any velocity vs. position profile or stroke. The QDC module expects a velocity equal to word 46 when setting the selected velocity valve to this percentage output.

If your selected velocity valve is:	Then the value in word 48 should be:	And during the profile or stroke, the QDC module does not drive the valve with a % output:
Direct Acting	greater than the value in word 47	greater than word 48
Reverse Acting	less than the value in word 47	less than word 48

Reference the above chart and enter one of the following for each Selected Velocity Valve Maximum Output:

- 9999 (100%) for uni-directional direct acting valves
- 0 (0%) or 9999 (100%) for bi-directional valves(dependant upon desired direction of motion)
- 0 (0%) for uni-directional reverse acting valves

The valve spanning procedures presented in chapter 9 require these initial values in order to assist you in selecting the correct, final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Set Profile Gain Constants and Pressure Alarm Setpoints

Profile Gain Constants
(FCC49 - 53, SCC49 - 53, TCC49 - 53, LPC49 - 51, FOC49 - 53, SOC49 - 53, TOC49 - 53, OSC49 - 53, EAC49 - 53, ERC49 - 53)

The QDC module’s PID and velocity feedforward(VelFF) algorithms are different from classic PID and VelFF algorithms. The algorithm gain constants are typically lower than those used to control a traditional process that reacts to setpoints changes.

Enter the default values from the worksheets for all Profile Tuning Constants. The closed-loop tuning procedures presented in chapter 10 require these initial values in order to assist you in selecting the correct, final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Profile Pressure Alarm Setpoint
(FCC57, SCC57, TCC57, LPC57, FOC57, SOC57, TOC57, OSC57, EAC57)

The QDC module compares real-time clamp (or ejector) pressure against this entry when executing the appropriate profile. The QDC module sets an alarm bit (SYS05-B12, B13, B14, B15, SYS06-B09 B10, B11, B12, B13 respectively) any time clamp (or ejector) pressure equals or exceeds this entry during execution of the respective profile. A zero entry inhibits this alarm.

Important: EAC57 serves as the pressure alarm setpoint for both ejector advance and ejector retract.

Enter 0 for each Profile Pressure Alarm Setpoint. A detailed discussion of these setpoints is presented in chapter 10 to assist you in selecting the correct final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub.1771-6.5.88) for more information.

Enter and Download your Worksheet Values

After entering all values into the 10 configuration worksheets, use the same PLC data table entry and download procedure presented in chapter 4.

1. Enter all worksheet values into your PLC-5 data table.

Important: Be sure that you have not altered any setpoints, and that you have entered each and every setpoint exactly as on the worksheets.

2. Use the procedure described in chapter 4 to download command blocks to the QDC module. For your convenience, we repeat download information from chapter 4.

Important: Do not download companion blocks at this time.

Block to Download:	Pro-Set 600 Block ID.:	Pro-Set 600 Download Bit B21/:
FCC	03	2
SCC	04	3
TCC	05	4
LPC	06	5
CPC	07	6
FOC	17	17
SOC	18	18
TOC	19	19
OSC	20	20
OPC	21	21
EAC	22	22
ERC	23	23
EPC	24	24

Chapter 8

Load Initial Profile Values for Machine Tuning

Chapter Objectives

In the previous chapters, you entered information into configuration blocks necessary for your clamp and eject profiles to run properly. This chapter describes how to load actual profile setpoints for clamp and ejector operations.

After you read this chapter, you should have determined and entered the following:

- Clamp Close Profile (CPC)
- Clamp Open Profile (OPC)
- Ejector Profile (EPC)

Command and Status Blocks Used

The following table contains a list of command blocks you are to configure throughout the course of this chapter. You may reference these command blocks in Sections 1 and 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88).

Block:	Type:	Use in this Chapter:	Pro-Set 600 Files:
Clamp Close Profile (CPC)	Command	Enter Clamp Close Profile Values	B37, N43
Clamp Open Profile (OPC)	Command	Enter Clamp Open Profile Values	B37, N43
Ejector Profile (EPC)	Command	Enter Ejector Profile Values	B39, N45

Determine and Enter Setpoints for the Clamp Close Profile (CPC)

The following two pages contain worksheets for the Clamp Close Profile (one worksheet for bit entries and one for word entries). The valve spanning procedure in chapter 9 requires specific values in certain block entries. We have already entered those values for you on your worksheets. All parameters which required an entry based on your specific machine are discussed briefly below the worksheet; and they are discussed in detail in later chapters.

Worksheet 8-A
Clamp Close (CPC) Profile Block

Control Word CPC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/ bit	271	270	269	268	267	266	265	264	263	262	261	260	259	258	257	256
Value	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1

Bits 07–00: CPC Block Identifier

Control Word CPC03-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	303	302	301	300	299	298	297	296	295	294	293	292	291	290	289	288
Value	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1

Bit 14: Velocity Units
0 = Percent Velocity
1 = Inches (mm)/Second

Bit 11: Mold Protection
0 = Start LPC on Zone Overrun
1 = Stop and Zero Outputs on Zone Overrun

Bits 10, 09, 08 (TCC, SCC, FCC): Logical Bridge
0 = Start Next Profile at end
1 = Stop and Set-Output at end

Bits 04, 02, 00 (TCC, SCC, FCC): Algorithm
0 = Vel/Pos
1 = Press/Pos

Control Word CPC04-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	319	318	317	316	315	314	313	312	311	310	309	308	307	306	305	304
Value	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1

Bits 15, 13–08: Expert Response Compensation
0 = ON
1 = OFF

bit 15 = Press/Pos LPC
bit 13 = Press/Pos TCC
bit 12 = Vel/Pos TCC
bit 11 = Press/Pos SCC
bit 10 = Vel/Pos SCC
bit 09 = Press/Pos FCC
bit 08 = Vel/Pos FCC

Bits 07, 05–00: Open/Closed Loop Selection
0 = Closed Loop
1 = Open Loop

bit 07 = Press/Pos LPC
bit 05 = Press/Pos TCC
bit 04 = Vel/Pos TCC
bit 03 = Press/Pos SCC
bit 02 = Vel/Pos SCC
bit 01 = Press/Pos FCC
bit 00 = Vel/Pos FCC

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 8-A (continued)

Clamp Close (CPC) Profile Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
CPC09	N43:245	0	FCC Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC10	N43:246	0	FCC Segment 1 Pressure Setpoint	Pressure [3]
CPC11	N43:247	*	FCC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
CPC12	N43:248	0	FCC Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC13	N43:249	0	FCC Segment 2 Pressure Setpoint	Pressure [3]
CPC14	N43:250	*	FCC End-of-Segment 2 Position Setpoint	Incremental Distance [4]
CPC15	N43:251	0	FCC Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC16	N43:252	0	FCC Segment 3 Pressure Setpoint	Pressure [3]
CPC17	N43:253	*	FCC End-of-Segment 3 Position Setpoint	Incremental Distance [4]
CPC18	N43:254	0	SCC Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC19	N43:255	0	SCC Segment 1 Pressure Setpoint	Pressure [3]
CPC20	N43:256	0	SCC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
CPC21	N43:257	0	SCC Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC22	N43:258	0	SCC Segment 2 Pressure Setpoint	Pressure [3]
CPC23	N43:259	0	SCC End-of-Segment 2 Position Setpoint	Incremental Distance [4]
CPC24	N43:260	0	SCC Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC25	N43:261	0	SCC Segment 3 Pressure Setpoint	Pressure [3]
CPC26	N43:262	0	SCC End-of-Segment 3 Position Setpoint	Incremental Distance [4]
CPC27	N43:263	0	TCC Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC28	N43:264	0	TCC Segment 1 Pressure Setpoint	Pressure [3]
CPC29	N43:265	0	TCC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
CPC30	N43:266	0	TCC Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC31	N43:267	0	TCC Segment 2 Pressure Setpoint	Pressure [3]
CPC32	N43:268	0	TCC End-of-Segment 2 Position Setpoint	Incremental Distance [4]
CPC33	N43:269	0	TCC Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC34	N43:270	0	TCC Segment 3 Pressure Setpoint	Pressure [3]
CPC35	N43:271	0	TCC End-of-Segment 3 Position Setpoint	Incremental Distance [4]
CPC37	N43:273	0	LPC Segment 1 Pressure Setpoint	Pressure [3]
CPC38	N43:274	0	LPC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
CPC40	N43:276	0	LPC Segment 2 Pressure Setpoint	Pressure [3]
CPC61	N43:297	*	Start LPC Position Setpoint	Incremental Distance [4]
CPC62	N43:298	*	Mold Safe Position Setpoint	Incremental Distance [4]
CPC63	N43:299	0	Tonnage Complete Pressure Setpoint	Pressure [3]

[1] Clamp Percent of Maximum Velocity
00.00 to 99.99

[2] Clamp Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Bar

[3] Clamp Pressure
0000 to 9999 PSI

[4] Clamp Axis Measured from MCC27 (if non-zero) or MCC23
00.00 to 99.99 Inches
00.00 to 999.9 Millimeters

* Refer to the appropriate section later in this chapter for information on this parameter

Determine Bit Selections for Worksheet 8-A

The following sections describe how to complete Worksheet 8-A. After each section is discussed, fill in values for the mentioned words or bits.

Clamp Close Profile Block Identifier (CPC01)
The first eight bits of this word are used to identify it as the first word in a series of words used to define the clamp close profile. These first eight bits must be set at 00000111.

Clamp Close General Definition (CPC03)
The following bits of CPC03 determine how you define clamp close profiles and how they are executed. All other bits of CPC03 should remain zero.

- **BIT 14** selects how velocity setpoint values for the clamp close operation are interpreted by the QDC module.
  0 = Percent Velocity
  1 = Inches or Millimeters per second
  Select 1 for bit 14.
- **BIT 11** controls the QDC modules reaction if the profile configuration forces the QDC module to move the clamp into the Mold Protection Zone while executing 1st or 2nd or 3rd clamp close.
  0 = Start executing low pressure close if zone overrun occurs.
  1 = Stop and zero outputs if zone overrun occurs.
  Select 0 for bit 11.
- **BIT 10, 09, and 08** control the logical bridge (the action the QDC module takes when it has completed a profile). BIT 10 configures third clamp close, BIT 09 configures second clamp close, and BIT 08 configures first clamp close. Set these bits when it is necessary to perform some external operation between two profiles.
  0 = Start next Profile when this profile is complete
  1 = Stop and set-output to end-of profile values when this profile is complete
  Select 0 for bits 10, 09, and 08.
- **BIT 04, 02, and 00** select which algorithm is utilized by the QDC module for each profile. BIT 04 configures third clamp close, BIT 02 configures second clamp close, and BIT 00 configures first clamp close.
  0 = Velocity vs. Position algorithm
  1 = Pressure vs. Position algorithm
  Select 1 for bits 04, 02, and 00.

Expert Response and Open/Closed Loop Selections (CPC04)
The following BITs of CPC04 determine if expert response is turned on and also selects whether or not the QDC module uses closed-loop control during the clamp close operation.

- **BITs 15, 13, 12, 11, 10, 09, and 08** are used to select expert response compensation for the different clamp close profiles. Expert Response Compensation (ERC) accounts for changes in your machine, machine hydraulics, raw materials, and other process variables. Using an exclusive algorithm, ERC adjusts the control scheme to counterbalance changes to your process, both abrupt upsets and long term deviations. Refer to Worksheet 8-A or Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for the relationship between which bits configure which clamp close profiles
  0 = Expert response compensation ON
  1 = Expert response compensation OFF
  At this time, select 1 for bits 15, 13, 12, 11, 10, 09, and 08.
- **BITs 07, 05, 04, 03, 02, 01, and 00** are used to select the loop operation for the different clamp close profiles. In open-loop mode a set valve position is used to move the cylinder, and no sensor feedback is used. When in closed-loop mode, sensor feedback is used to control the valve regulating your pressure or velocity. Refer to the Worksheet 8-A or Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for the relationship between which bits configure which clamp close profiles.
  0 = Closed-Loop mode
  1 = Open-Loop mode
  At this time, select 1 for bits 07, 05, 04, 03, 02, 01, and 00.

Determine Word Values for Worksheet 8-A

Mold Safe Position Setpoint (CPC62)
The Mold Safe Position Setpoint (CPC62) defines to the QDC module the clamp position when the mold halves mate. The QDC module uses this clamp position as the End-of Low Pressure Close position setpoint. If this position is reached while the QDC module is executing the Clamp Low Pressure Close Profile, the QDC module immediately terminates the Clamp Low Pressure Close Profile and sets its outputs to LPC33 - LPC36.

To determine mold safe, we recommend you jog your clamp closed until the two mold halves mate and observe the value in SYS27 (Pro-Set 600 address N41:179). Use this value as an initial CPC62 mold safe position.

Refer to Section 3 of the Plastic Molding Module Reference manual (pub. no. 1771-6.5.88) for more information.

Start LPC Position Setpoint (CPC61)
This clamp position is used by the QDC module as protection against running a Clamp Close Profile into the Mold Protection Zone. If this position is reached while the QDC module is executing any of the first three Clamp Close Profiles, the QDC module immediately terminates execution of the ongoing Clamp Close profile and either:

- begins Low Pressure Close
- sets its outputs to zero (depending on the state of CPC03-B11, the Mold Protection Zone Overrun Bit)

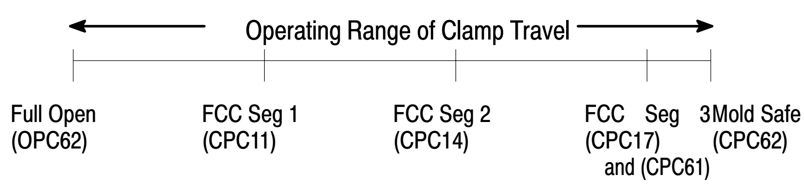
Enter a value for the Start LPC Position Setpoint that corresponds to a safe distance away from Mold Safe (CPC62). We recommend an initial value significantly larger than the Start LPC Position Setpoint you would typically use during normal machine operation. A detailed discussion of this setpoint is presented in chapter 10 to assist you in selecting the correct, final value required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

End-of Segment Position Setpoints
(CPC11, CPC14, CPC17, CPC20, CPC23, CPC26, CPC29, CPC32, CPC35, CPC38)

Configure only the first clamp close profile segments. Enter values for segments of second, third, and low pressure close profiles equal to zero (CPC20, CPC23, CPC26, CPC29, CPC32, CPC35, and CPC38 should all be zero). Determine End-of Segment Position Setpoint Values for first clamp close as follows:

> Jog the mold to its full open position and observe the value in SYS27 (Pro-Set 600 address N41:179). Subtract the value you entered for Start LPC Position Setpoint (CPC61) from SYS27. Divide this difference into three equal sections. The dividing line of each section should be entered into the end-of-segment position setpoints for segments 1, 2, and 3.

Important: Keep in mind that these positions are all absolute distances measured from zero. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.



Velocity Setpoints
(CPC09, CPC12, CPC15, CPC18, CPC21, CPC24, CPC27, CPC30, CPC33)
Use these words when configuring Velocity vs. Position profiles. Each velocity is used between the last completed clamp segment, and the End-of Segment position setpoint.

Enter 0 for each Velocity Setpoint Value. The valve spanning procedures presented in chapter 9 require these initial values. A detailed discussion of these setpoints is presented in chapter 10 to assist you in selecting the correct final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub.1771-6.5.88) for more information.

Pressure Setpoints (CPC10, CPC13, CPC16, CPC19, CPC22, CPC25, CPC28, CPC31, CPC34, CPC37, CPC40)
Use these words when configuring Pressure vs. Position profiles. Enter pressure in PSI or Bar. Each pressure is used to control the axis between the last completed clamp segment, and the End-of Segment position setpoint.

Enter 0 for each Pressure Setpoint Value. The valve spanning procedures presented in chapter 9 require these initial values. A detailed discussion of these setpoints is presented in chapter 10 to assist you in selecting the correct final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub.1771-6.5.88) for more information.

Tonnage Complete Pressure Setpoint (CPC63)
The QDC module compares clamp pressure against the value you enter here when the clamp position is less than or equal to CPC62. The QDC module sets master status bit SYS03-B02 when clamp pressure equals or exceeds this entry when the clamp position is less than or equal to CPC62.

Enter 0 for the Tonnage Watchdog Timer Preset. The valve spanning procedures presented in chapter 9 require this initial value in order to assist you in selecting the correct final value required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. 1771-6.5.88) for more information.

Enter and Download Your Worksheet Values

Enter the completed Worksheet 8-A values into your PLC data table. Using the procedure discussed in chapter 4, download the values to the QDC module.

Important: Check SYS61 and SYS62 for programming errors, and correct as necessary. **Make sure no programming errors exist before proceeding.**

Determine and Enter Clamp Open Profile (OPC)

The following two pages contain worksheets for the Clamp Open Profile (one worksheet for bit entries and one for word entries). The valve spanning procedure in chapter 9 requires specific values in certain block entries. We have already entered those values for you on your worksheets. All parameters which require an entry based on your specific machine are discussed after the worksheet; and in detail in later chapters.

Worksheet 8-B
Clamp Open (OPC) Profile Block

Control Word OPC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	591	590	589	588	587	586	585	584	583	582	581	580	579	578	577	576
Value	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1

Bits 07–00: OPC Block Identifier

Control Word OPC03-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	623	622	621	620	619	618	617	616	615	614	613	612	611	610	609	608
Value	0	1	0	0	0	0	0	0	0	1	0	1	0	1	0	1

Bit 15: Mold Open Dwell Start
0 = Start open dwell timer when mold open
1 = Start open dwell timer when mold open and ejectors done

Bit 14: Velocity Units
0 = Percent Velocity
1 = Inches (mm)/Second

Bit 11: Zone Overrun
0 = Start Clamp Open Slow on Zone Overrun
1 = Stop and Zero Outputs on Zone Overrun

Bits 10, 09, 08 (TOC, SOC, FOC): Logical Bridge
0 = Start Next Profile at end
1 = Stop and Set-Output

Bits 06, 04, 02, 00 (OSC, TOC, SOC, FOC): Algorithm
0 = Vel/Pos
1 = Press/Pos

Control Word OPC04-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	639	638	637	636	635	634	633	632	631	630	629	628	627	626	625	624
Value	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Bits 15–08: Expert Response Compensation
0 = ON
1 = OFF

Bits 07–00: Open/Closed Loop Selection
0 = Closed Loop
1 = Open Loop

bit 15 = Press/Pos OSC
bit 14 = Vel/Pos OSC
bit 13 = Press/Pos TOC
bit 12 = Vel/Pos TCC
bit 11 = Press/Pos SOC
bit 10 = Vel/Pos SOC

bit 09 = Press/Pos FOC
bit 08 = Vel/Pos FOC
bit 07 = Press/Pos OSC
bit 06 = Vel/Pos OSC

bit 05 = Press/Pos TOC
bit 04 = Vel/Pos TOC
bit 03 = Press/Pos SOC
bit 02 = Vel/Pos SOC
bit 01 = Press/Pos FOC
bit 00 = Vel/Pos FOC

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 8-B (continued)
Clamp Open (OPC) Profile Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
OPC09	N43:545	0	FOC Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC10	N43:546	0	FOC Segment 1 Pressure Setpoint	Pressure [3]
OPC11	N43:547	*	FOC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
OPC12	N43:548	0	FOC Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC13	N43:549	0	FOC Segment 2 Pressure Setpoint	Pressure [3]
OPC14	N43:550	*	FOC End-of-Segment 2 Position Setpoint	Incremental Distance [4]
OPC15	N43:551	0	FOC Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC16	N43:552	0	FOC Segment 3 Pressure Setpoint	Pressure [3]
OPC17	N43:553	*	FOC End-of-Segment 3 Position Setpoint	Incremental Distance [4]
OPC18	N43:554	0	SOC Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC19	N43:555	0	SOC Segment 1 Pressure Setpoint	Pressure [3]
OPC20	N43:556	0	SOC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
OPC21	N43:557	0	SOC Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC22	N43:558	0	SOC Segment 2 Pressure Setpoint	Pressure [3]
OPC23	N43:559	0	SOC End-of-Segment 2 Position Setpoint	Incremental Distance [4]
OPC24	N43:560	0	SOC Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC25	N43:561	0	SOC Segment 3 Pressure Setpoint	Pressure [3]
OPC26	N43:562	0	SOC End-of-Segment 3 Position Setpoint	Incremental Distance [4]
OPC27	N43:563	0	TOC Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC28	N43:564	0	TOC Segment 1 Pressure Setpoint	Pressure [3]
OPC29	N43:565	0	TOC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
OPC30	N43:566	0	TOC Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC31	N43:567	0	TOC Segment 2 Pressure Setpoint	Pressure [3]
OPC32	N43:568	0	TOC End-of-Segment 2 Position Setpoint	Incremental Distance [4]
OPC33	N43:569	0	TOC Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC34	N43:570	0	TOC Segment 3 Pressure Setpoint	Pressure [3]
OPC35	N43:571	0	TOC End-of-Segment 3 Position Setpoint	Incremental Distance [4]
OPC36	N43:572	0	OSC Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC37	N43:573	0	OSC Segment 1 Pressure Setpoint	Pressure [3]
OPC38	N43:574	0	OSC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
OPC39	N43:575	0	OSC Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC40	N43:576	0	OSC Segment 2 Pressure Setpoint	Pressure [3]
OPC61	N43:597	*	Start OSC Position Setpoint	Incremental Distance [4]
OPC62	N43:598	*	Mold Open Position Setpoint	Incremental Distance [4]
OPC63	N43:599	0	Mold Open Dwell Timer Preset	Time [5]

[1] Clamp Percent of Maximum Velocity
00.00 to 99.99

[2] Clamp Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Bar

[3] Clamp Pressure
0000 to 9999 PSI

[4] Clamp Axis Measured from MCC27 (if non-zero) or MCC23
00.00 to 99.99 Inches
00.00 to 999.9 Millimeters

[5] Time
00.00 to 99.99 Seconds

* Refer to the appropriate section later in this chapter for information on this parameter

Determine Bit Selections for Worksheet 8-B

The following sections describe how to complete Worksheet 8-B. After each section is discussed, fill in values for the mentioned words or bits.

Clamp Open Profile Block Identifier (OPC01)
The first eight bits of this word are used to identify it as the first word in a series of words used to define the clamp open profile. These first eight bits must be set at 00010101.

Clamp Open General Definition (OPC03)
The following BITs of OPC03 determines how you define clamp open profiles and how they are executed. All other bits of OPC03 should remain zero.

- **BIT 15** selects when the open dwell timer starts. The state of this bit informs the QDC module when to start its internal mold open dwell timer.
  0 = starts dwell timer when OSC is complete
  1 = starts dwell timer when ejector profile is complete and mold is open
- **BIT 14** selects how velocity setpoint values for the clamp open operation are interpreted by the QDC module.
  0 = Percent Velocity
  1 = Inches or Millimeters per second
  At this time, select 1 for bit 14.
- **BIT 11** controls the QDC module's reaction if the profile configuration forces the QDC module to move the clamp into the Open Slow Zone while executing 1st or 2nd or 3rd clamp open.
  0 = Start executing open slow if zone overrun occurs
  1 = Stop and zero outputs if zone overrun occurs
  At this time, select 0 for bit 11.
- **BITs 10, 09, and 08** control the logical bridge (the action the QDC module takes when it has completed a profile). BIT 10 configures third clamp open, BIT 09 configures second clamp open, and BIT 08 configures first clamp open. Set these bits when it is necessary to perform some external operation between two profiles.
  0 = Start next Profile when this profile is complete
  1 = Stop and set-output to end-of profile values when this profile is complete
  At this time, select 0 for bits 10, 09, and 08.
- **BITs 06, 04, 02, and 00** select which algorithm is utilized by the QDC module for each profile. BIT 06 configures open slow, BIT 04 configures third clamp open, BIT 02 configures second clamp open, and BIT 00 configures first clamp open.
  0 = Velocity vs Position algorithm
  1 = Pressure vs Position algorithm
  At this time, select 1 for bits 06, 04, 02, and 00.

Expert Response and Open/Closed Loop Selections (OPC04)
The following BITs of OPC04 determine if expert response is turned on and also select whether or not the QDC module uses closed-loop control during the clamp open operation.

- **BITs 15, 14, 13, 12, 11, 10, 09, and 08** are used to select expert response compensation for the different clamp open profiles. Expert Response Compensation (ERC) accounts for changes in your machine, machine hydraulics, raw materials, and other process variables. Using an exclusive algorithm, ERC adjusts the control scheme to counterbalance changes to your process, both abrupt upsets and long term deviations. Refer to Worksheet 8-B or Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for the relationship between which bits configure which clamp open profiles.
  0 = Expert response compensation ON
  1 = Expert response compensation OFF
  At this time, select 1 for bits 15, 14, 13, 12, 11, 10, 09, and 08.
- **BITs 07, 06, 05, 04, 03, 02, 01, and 00** are used to select the loop operation for the different clamp open profiles. In open-loop mode, a set valve position is used to move the cylinder, and no sensor feedback is used. When in closed-loop mode, sensor feedback is used to control the valve regulating your pressure or velocity. Refer to Worksheet 8-B or Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for the relationship between which bits configure which clamp open profiles.
  0 = Closed-Loop mode
  1 = Open-Loop mode
  At this time, select 1 for bits 07, 06, 05, 04, 03, 02, 01, and 00.

Determine Word Values for Worksheet 8-B

Mold Open Position Setpoint (OPC62)
The Mold Open Position Setpoint (OPC62) defines to the QDC module the clamp position when the clamp is fully open. The QDC module uses this clamp position as the End-of Open Slow position setpoint. If this position is reached while the QDC module is executing the Open Slow Profile, the QDC module immediately terminates the Open Slow Profile and sets its outputs in OPC33-OPC36.

To determine mold open, we recommend you jog your clamp to its maximum open position and observe the value in SYS27 (Pro-Set 600 address N41:179). Use this value as an initial OPC62 mold open position.

Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Start OSC Position Setpoint (OPC61)
This clamp position is used by the QDC module as protection against running a Clamp Open Profile into the Open Slow Zone. If this position is reached while the QDC module is executing any of the first three Clamp Open Profiles, the QDC module immediately terminates execution of the ongoing Clamp Open profile and either:

- begins Open Slow
- sets its outputs to zero (depending on the state of OPC03-B11, the Open Slow Zone Overrun Bit)

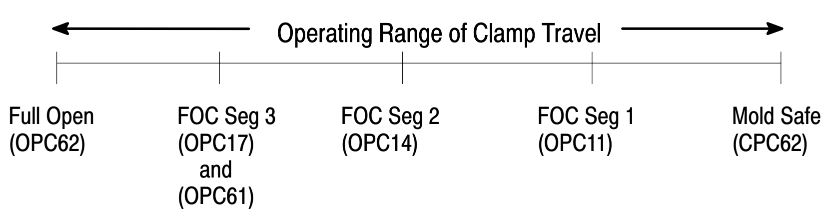
Enter a value for the Start OSC Position Setpoint that corresponds to a safe distance away from Mold Open (OPC62). We recommend an initial value which yields a significantly greater open slow deceleration zone than the Start OSC Position Setpoint you would typically use during normal machine operation. A detailed discussion of this setpoint is presented in chapter 10 to assist you in selecting the correct, final value required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

End-of Segment Position Setpoints (OPC11, OPC14, OPC17, OPC20, OPC23, OPC26, OPC29, OPC32, OPC35, OPC38)
Configure only the first clamp open profile segments. Enter values for segments of second, third, and open slow profiles equal to zero (OPC20, OPC23, OPC26, OPC29, OPC32, OPC35, and OPC38 should all be zero). Determine End-of Segment Position Setpoint Values for first clamp open as follows:

1. Subtract the mold safe position setpoint (CPC62) from the value you entered for Start OSC Position Setpoint (OPC61).

2. Divide this difference into three equal sections. The dividing line of each section should be entered into the end-of-segment position setpoints for segments 1, 2, and 3.

Important: Keep in mind that these positions are all absolute distances measured from zero. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.



Velocity Setpoints (OPC09, OPC12, OPC15, OPC18, OPC21, OPC24, OPC27, OPC30, OPC33, OPC36, OPC39)
Use these words when configuring Velocity vs. Position profiles. Each velocity is used between the last completed clamp segment, and the End-of Segment position setpoint.

Enter 0 for each Velocity Setpoint Value. The valve spanning procedures presented in chapter 9 require these initial values. A detailed discussion of these setpoints is presented in chapter 10 to assist you in selecting the correct, final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Pressure Setpoints (OPC10, OPC13, OPC16, OPC19, OPC22, OPC25, OPC28, OPC31, OPC34, OPC36, OPC40)
Use these words when configuring Pressure vs. Position profiles. Enter pressure in PSI or Bar. Each pressure is used to control the axis between the last completed clamp segment, and the End-of Segment position setpoint.

Enter 0 for each Pressure Setpoint Value. The valve spanning procedures presented in chapter 9 require these initial values. A detailed discussion of these setpoints is presented in chapter 10 to assist you in selecting the correct, final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Mold Open Dwell Timer Preset (OPC63)
The QDC module starts an internal Mold Open Dwell Timer dependent on the state of OPC03-B15.

Enter 0 for the Mold Open Dwell Timer Preset. For additional information in selecting the correct, final value required by your application, refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88).

Enter and Download your Worksheet Values

Enter completed Worksheet 8-B values into your PLC data table using the procedure discussed in chapter 4. Download the values to the QDC module.

Check SYS61 and SYS62 for programming errors, and correct as necessary. **Make sure no programming errors exist before proceeding.**

Determine and Enter Ejector Profile (EPC)

The following two pages contain worksheets for the Ejector Profile (one worksheet for bit entries and one for word entries). The valve spanning procedure in chapter 9 requires specific values in certain block entries. We have already entered those values for you on your worksheets. All parameters which require an entry based on your specific machine are discussed briefly below the worksheet, and in detail in later chapters.

Worksheet 8-C
Ejector (EPC) Profile Block

Control Word EPC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B39/bit	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128
Value	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0

EPC Block Identifier (bits 07–00)

Control Word EPC03-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B39/bit	175	174	173	172	171	170	169	168	167	166	165	164	163	162	161	160
Value	0	1	0	*	0	0	0	1	0	0	0	0	0	0	0	1

Forward Dwell (bit 15)
0=Apply Forward Dwell on Final Stroke
1=Apply Forward Dwell on Initial Stroke

Velocity Units (bit 14)
0 = Percent Velocity
1 = Inches (mm)/Second

Ejector Tip Strokes (bit 13)
0 = All Strokes to be Full Strokes
1 = Intermediate Strokes to be Tip Strokes

Stop and Notify (bit 12)
0 = Ejector Profile to Run without Interruption
1 = QDC to “Stop-and-Notify” at end of Stroke

Ejector Profile (bit 09)
0 = Ejector profile enabled
1 = Ejector profile disabled

Logical Bridge (bit 08)
0 = Start Profile on Clamp Position During Open
1 = Start Profile on Command

Algorithm (bit 00)
0 = Vel/Pos
1 = Press/Pos

Control Word EPC04-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B39/bit	191	190	189	188	187	186	185	184	183	182	181	180	179	178	177	176
Value	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1

Expert Response Compensation (bits 09, 08)
0 = ON
1 = OFF

bit 09 = Press/Pos
bit 08 = Vel/Pos

Open/Closed Loop Selection (bits 01, 00)
0 = Closed Loop
1 = Open Loop

bit 01 = Press/Pos
bit 00 = Vel/Pos

Code:

Code	
(blank box)	Your value
0 or 1 (shaded box)	Required initial value loaded by Pro-Set 600

Worksheet 8-C (continued)
Ejector (EPC) Profile Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
EPC09	N45:125	0	Full Advance Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC10	N45:126	0	Full Advance Segment 1 Pressure Setpoint	Pressure [3]
EPC11	N45:127	0	End of Full Advance Segment 1 Position Setpoint	Incremental Distance [4]
EPC12	N45:128	0	Full Advance Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC13	N45:129	0	Full Advance Segment 2 Pressure Setpoint	Pressure [3]
EPC14	N45:130	0	End of Full Advance Segment 2 Position Setpoint	Incremental Distance [4]
EPC15	N45:131	0	Full Advance Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC16	N45:132	0	Full Advance Segment 3 Pressure Setpoint	Pressure [3]
EPC21	N45:137	0	Tip Retract Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC22	N45:138	0	Tip Retract Pressure Setpoint	Pressure [3]
EPC23	N45:139	0	End of Tip Retract Position Setpoint	Incremental Distance [4]
EPC27	N45:143	0	Tip Advance Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC28	N45:144	0	Tip Advance Pressure Setpoint	Pressure [3]
EPC29	N45:145	0	End of Tip Advance Position Setpoint	Incremental Distance [4]
EPC33	N45:149	0	Full Retract Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC34	N45:150	0	Full Retract Segment 1 Pressure Setpoint	Pressure [3]
EPC35	N45:151	0	End of Full Retract Segment 1 Position Setpoint	Incremental Distance [4]
EPC36	N45:152	0	Full Retract Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC37	N45:153	0	Full Retract Segment 2 Pressure Setpoint	Pressure [3]
EPC38	N45:154	0	End of Full Retract Segment 2 Position Setpoint	Incremental Distance [4]
EPC39	N45:155	0	Full Retract Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC40	N45:156	0	Full Retract Segment 3 Pressure Setpoint	Pressure [3]
EPC57	N45:173	0	Ejector Forward Dwell timer Preset	Time [5]
EPC59	N45:175	*	Ejector Fully Advanced Position Setpoint	Incremental Distance [4]
EPC60	N45:176	*	Ejector Fully Retracted Position Setpoint	Incremental Distance [4]
EPC61	N45:177	*	Clamp Position for Start of Eject Profile	Incremental Distance [6]
EPC62	N45:178	*	Clamp Position for Ejector Inhibit	Incremental Distance [6]
EPC63	N45:179	*	Ejector Position for Clamp Close Enable	Incremental Distance [4]
EPC64	N45:180	1	Ejector Strokes Required	Number of Strokes

[1] Ejector Percent of Maximum Velocity
00.00 to 99.99

[2] Ejector Velocity along Axis
00.00 to 99.99 Inches per Second

[3] Ejector Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[4] Clamp Axis Measured from MCC27
(if non-zero) or MCC23
00.00 to 99.99 Inches
00.00 to 999.9 Millimeters

[5] Time
00.00 to 99.99 Seconds

[6] Clamp Axis Measured from MCC27
(if non-zero) or MCC23
00.00 to 99.99 Inches
000.0 to 999.9 Millimeters

* Refer to the appropriate section later in this chapter for information on this parameter

Determine Bit Selections for Worksheet 8-C

The following sections describe how to complete Worksheet 8-C. After each section is discussed, fill in values for the mentioned words or bits.

Ejector Profile Block Identifier (EPC01)
The first eight bits of this word are used to identify it as the first word in a series of words used to define the ejector profile. These first eight bits must be set at 00011000.

Ejector General Definition (EPC03)
The following BITs of EPC03 determine how you define the ejector profile and how it is executed. All other bits of EPC03 should remain zero.

- **BIT 15** selects when the ejector forward dwell starts. The state of this bit informs the QDC module when to start its internal ejector forward dwell timer.
  0 = starts dwell after final advance stroke
  1 = starts dwell after initial advance stroke
  At this time, select 0 for bit 15.

- **BIT 14** selects how velocity setpoint values for the ejector operation are interpreted by the QDC module.
  0 = Percent Velocity
  1 = Inches or Millimeters per second
  At this time, select 1 for bit 14.

- **BIT 13** informs the QDC module what type of intermediate ejector strokes are required if EPC64 is greater than one.
  0 = All Ejector Strokes to be Full Strokes
  1 = Intermediate Ejector Strokes to be Tip Strokes
  At this time, select 0 for bit 13.

- **BIT 12** controls the QDC modules reaction when it completes any advance or retract stroke during the Ejector profile.
  0 = Ejector Profile to run without interruption
  1 = QDC module set-outputs and notifies PLC processor at end-of stroke
  Your initial selection for the state of this bit depends upon the configuration of your ejector hydraulic circuit.

If the QDC module has control of all the valves in your ejector circuit that are required to change the direction of ejector travel, select 0 for bit 12 (the QDC module has the control capability during the Ejector Profile to initiate each subsequent retract/advance stroke upon completion of the preceding advance/retract stroke). Your PLC ladder logic needs only to toggle DYC02-B14 (Pro-Set 600 address B35/414) in order to command the QDC module to execute the entire Ejector Profile. An example of this configuration is when the direction of ejector travel is determined by a bi-directional flow valve connected to the QDC module.

If the QDC module **does not** have control of all of the valves in your ejector circuit that are required to change the direction of ejector travel, select 1 for bit 12 (the QDC module does not have the control capability during the Ejector Profile to initiate each subsequent retract/advance stroke upon completion of the preceding advance/retract stroke). Your PLC ladder logic has to operate the ejector directional valves not connected to the QDC module in order to “assist” the QDC module in its execution of the Ejector Profile. The following is a partial list of the interactive command and status bits that are provided to program a “Stop-and-Notify” Ejector Profile in your PLC ladder logic.

Control Word:	Pro-Set 600 address:	Performs this action:
DYC02-B14	B35/414	Execute Ejector Profile
DYC03-B15	B35/431	Continue Ejector Profile
SYS03-B08	B35/40	Ejector Profile Stopped at End-of Stroke
SYS03-B10	B35/42	Ejector Forward Dwell Timer timing
SYS21-B14	B35/334	Ejector Profile in Progress
SYS22-B14	B35/350	Ejector End-of Advance set-output in Progress
SYS22-B15	B35/351	Ejector End-of Retract set-output in Progress

Refer to chapter 6 in this manual for additional information on this type of ladder logic programming.

An example of the “Stop-and-Notify” configuration is when direction of ejector travel is determined by discrete solenoid valves connected to PLC outputs.

At this time, make the selection for bit 12 required by your ejector hydraulic configuration.

- **BIT 09** controls the QDC modules ability to perform any profiled ejector movement.
  0 = QDC module executes profiled ejector action as required (Ejectors enabled or ON)
  1 = QDC module does not execute any profiled ejector action (Ejectors disabled or OFF)
  At this time, select 0 for bit 09.

- **BIT 08** controls when the QDC module initiates Ejector Profiles.
  0 = QDC module starts the Ejector Profile based upon clamp position during the Clamp Open Profiles
  1 = QDC module starts the Ejector Profile on command from the PLC processor
  At this time, select 1 for bit 08.

- **BIT 00** selects which algorithm is utilized by the QDC module for the Ejector Profile.
  0 = Velocity vs. Position algorithm
  1 = Pressure vs. Position algorithm
  At this time, select 1 for bit 00.

Expert Response and Open/Closed Loop Selections (EPC04)
The following BITs of EPC04 determine if expert response is turned on and also select whether or not the QDC module uses closed-loop control during the ejector operation.

- **BITs 09 and 08** are used to select expert response compensation for the different ejector profiles. Expert Response Compensation (ERC) accounts for changes in your machine, machine hydraulics, raw materials, and other process variables. Using an exclusive algorithm, ERC adjusts the control scheme to counterbalance changes to your process, both abrupt upsets and long term deviations. Bit 09 configures the Pressure vs. Position Ejector Profile and bit 08 configures the Velocity vs. Position Ejector Profile.
  0 = Expert response compensation ON
  1 = Expert response compensation OFF
  At this time, select 1 for bits 09 and 08.

- **BITs 01 and 00** are used to select the loop operation for the different ejector profiles. In open-loop mode a set valve is used to move the cylinder, and no sensor feedback is used. When in closed-loop mode, sensor feedback is used to control the valve regulating your pressure or velocity. Bit 09 selects the loop operation for the Pressure vs. Position Ejector Profile, and bit 08 selects the loop operation for the Velocity vs. Position Ejector Profile.
  0 = Closed-Loop mode
  1 = Open-Loop mode
  At this time, select 1 for bits 01 and 00.

Determine Word Values for Worksheet 8-C

Ejector Fully Advanced Position Setpoint (EPC59)
The Ejector Fully Advanced Position Setpoint (EPC59) defines to the QDC module the ejector position when fully extended. The QDC module uses this ejector position as the End of Full Advance position setpoint. If this position is reached while the QDC module is executing a Full Advance Ejector Stroke, the QDC module immediately terminates the advance stroke and checks the state of EPC03-B12 in order to determine its next action.

To determine ejector advanced, we recommend you jog your ejector to its maximum advanced position and observe the value in SYS25 (Pro-Set 600 address N41:177). Use this value as an initial EPC59 fully advanced position.

Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Ejector Fully Retracted Position Setpoint (EPC60)
The Ejector Fully Retracted Position Setpoint (EPC60) defines to the QDC module the ejector position when fully retracted. The QDC module uses this ejector position as the End-of Full Retract position setpoint. If this position is reached while the QDC module is executing a Full Retract Ejector Stroke, the QDC module immediately terminates the retract stroke and checks the state of EPC03-B12 in order to determine its next action.

To determine ejector retracted, we recommend you jog your ejector to its minimum retracted position and observe the value in SYS25 (Pro-Set 600 address N41:177). Use this value as an initial EPC60 fully retracted position.

Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Ejector Position for Clamp Close Enable (EPC63)
This ejector position is used by the QDC module as protection against initiating (or continuing) any Clamp Close Profile when the ejector is not “safe”.

- If the ejector position is greater than this setpoint when the QDC module is commanded to initiate a Clamp Close Profile, the command is ignored and the QDC module sets alarm bit SYS14/B08 (Pro-Set 600 address B35/216).
- If the ejector attains a position greater than this setpoint during QDC module execution of a Clamp Close Profile, the QDC module sets its outputs to zero and set alarm bit SYS14-B08 (Pro-Set 600 address B35/216).

To determine this ejector position, we recommend you jog your clamp closed until the two mold halves mate. Now jog your ejector to its maximum advanced position while being constrained by the closed mold and observe the value in SYS25 (Pro-Set 600 address N41:177). Use this value as an initial EPC63 clamp close enable position.

ATTENTION: Verify that your ejector jog pressure and flow values are set low enough to ensure the ejector pins are not damaged when advancing against the closed clamp.

A detailed discussion of this setpoint is presented in chapter 10 to assist you in selecting the correct final value required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Clamp Position for Ejector Inhibit (EPC62)
This clamp position is used by the QDC module as protection against initiating (or continuing) any Ejector Profile when the "daylight" is not adequate for ejector action.

- If the clamp position is equal to or less than this setpoint when the QDC module is commanded to initiate or continue an Ejector Profile, the command is ignored and the QDC module sets alarm bit SYS14-B09 (Pro-Set 600 address B35/217).
- If the clamp attains a position equal to or less than this setpoint during QDC module execution of an Ejector Profile, the QDC module sets its outputs to zero and sets alarm bit SYS14-B09 (Pro-Set 600 address B35/217).

To determine this clamp position, we recommend you jog your clamp open, measuring with a ruler the gap between the two mold halves. When the measured value is equal to the ejector fully advanced position setpoint (EPC 59), observe the position reported in SYS27 (Pro-Set 600 address N41:179). Use this SYS27 observed value as an initial EPC62 clamp close enable position.

A detailed discussion of this setpoint is presented in chapter 10 to assist you in selecting the correct, final value required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

End-of Segment Position Setpoints (EPC11, EPC14, EPC23, EPC29, EPC35, EPC38)
At this time, we are configuring only the 1st full advance segment and the 1st full retract segment. Since the QDC module uses EPC59 and EPC60 as the End-of Full Advance and End-of Full Retract positions (respectively), all other position setpoints should be set to zero.

Enter 0 for all other position setpoints (EPC11, EPC14, EPC23, EPC29, EPC35, EPC38).

Velocity Setpoints (EPC09, EPC12, EPC15, EPC21, EPC27, EPC33, EPC36, EPC39)
Use these words when configuring Velocity vs. Position profiles. Each velocity is used between the last completed ejector segment, and the End-of Segment position setpoint.

Enter 0 for each Velocity Setpoint Value. The valve spanning procedures presented in chapter 9 require these initial values. A detailed discussion of this type of setpoint is presented in chapter 10 to assist you in selecting the correct, final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Pressure Setpoints (EPC10, EPC13, EPC16, EPC22, EPC28, EPC34, EPC37, EPC40)
Use these words when configuring Pressure vs. Position profiles. Enter pressure in PSI or Bar. Each pressure is used to control the axis between the last completed ejector segment, and the End-of Segment position setpoint.

Enter 0 for each Pressure Setpoint Value. The valve spanning procedures presented in chapter 9 require these initial values. A detailed discussion of this type of setpoint is presented in chapter 10 to assist you in selecting the correct, final values required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Clamp Position for Start of Ejector Profile (EPC61)
This setpoint is used by the QDC module as the clamp position at which to start the ejector action during any Clamp Open Profile if EPC03-B08 = 0.

Enter a value for the Clamp Position for Start of Ejector Profile equal to the Mold Open Position (OPC62). A detailed discussion of this setpoint is presented in chapter 10 to assist you in selecting the correct, final value required by your application. Refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88) for more information.

Ejector Forward Dwell Timer Preset (EPC57)
The QDC module starts an internal Ejector Forward Dwell Timer dependent upon the state of EPC03-B15.

Enter 0 for the Ejector Forward Dwell Timer Preset. For additional information to assist you in selecting the correct, final value required by your application, refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88).

Ejector Strokes Required (EPC64)
The QDC module uses this entry as a counter preset to determine how many times the ejector position must attain one of its advanced positions (EPC59 or EPC29) during the Ejector Profile before the QDC module is allowed to initiate the final "full retract" portion of the Ejector Profile.

A zero entry inhibits the entire Ejector Profile.

Enter 1 for Ejector Strokes Required. The valve spanning procedures presented in chapter 9 require this initial value. For additional information to assist you in selecting the correct, final value required by your application, refer to Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88).

Enter and Download your Worksheet Values

Enter the completed Worksheet 8-C values into your PLC data table using the procedure discussed in chapter 4. Download the values to the QDC module.

Check SYS61 and SYS62 for programming errors, and correct as necessary. **Make sure no programming errors exist before proceeding.**

Chapter 9

Span Your Clamp and Ejector Valves

Chapter Objectives

This chapter describes how to span your clamp and ejector valves using set-output operation and test out your spanning running simple open-loop profiles. (In previous chapters, you have configured command blocks, entered initial profiles, and programmed PLC command bit interaction as prerequisites to running profiles).

ATTENTION: Before proceeding, make sure you have completed configuration procedures in all previous chapters. Failure to do so could result in unpredictable machine operation, and may cause injury to equipment or personnel.

This chapter describes how to span your:

- low pressure close valve
- clamp close pressure valve(s)
- clamp close velocity valve(s)
- clamp open pressure valve(s)
- clamp open velocity valve(s)
- ejector pressure valve(s)
- ejector velocity valve(s)

To help you perform these tasks, this chapter also describes how to:

- run your machine in open-loop
- alter valve spanning configuration values to tune machine performance
- set Clamp and Ejector Profile Pressure Alarms

Command and Status Blocks Used

The following table contains a list of command blocks you are to configure throughout the course of this chapter. You may reference these command blocks in sections 1 and 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88).

Block:	Type:	Used in this Chapter to:	Pro-Set 600 Files:
System (SYS)	Status	View Programming Errors View Clamp Position View Ejector Position	B35, N41
Clamp Close Profile (CPC)	Command	Enter Clamp Close Profile Values	B37, N43
Clamp Open Profile (OPC)	Command	Enter Clamp Open Profile Values	B37, N43
Ejector Profile (EPC)	Command	Enter Ejector Profile Values	B39, N45
Dynamic Command Block (DYC)	Command	Initiate Profile Execution	B37, N43
First Clamp Close (FCC)	Command	Enter First Clamp Close Values	B37, N43
Second Clamp Close (SCC)	Command	Enter Second Clamp Close Values	B37, N43
Third Clamp Close (TCC)	Command	Enter Third Clamp Close Values	B37, N43
Clamp Low Press Close (LPC)	Command	Enter Clamp Low Press Close Values	B37, N43
First Clamp Open (FOC)	Command	Enter First Clamp Open Values	B37, N43
Second Clamp Open (SOC)	Command	Enter Second Clamp Open Values	B37, N43
Third Clamp Open (TOC)	Command	Enter Third Clamp Open Values	B37, N43
Clamp Open Slow (OSC)	Command	Enter Clamp Open Slow Values	B37, N43
Ejector Advance (EAC)	Command	Enter Ejector Advance Values	B39, N45
Ejector Retract (ERC)	Command	Enter Ejector Retract Values	B39, N45

ATTENTION: As with any machine start-up, make sure a test mold is installed in the machine. Programming errors, configuration errors, or hydraulic problems could lead to machine damage or injury to personnel.

ATTENTION: Make sure all machine guards and shields are in place before proceeding.

Important: Maintain the same initialization values that you entered in previous chapters except where noted in the text.

Span Your Low Pressure Close Valve

We recommend you first span your Low Pressure Close Pressure Valve. Do this in five parts:

- Revise/confirm critical values for pressure valve spanning
- Span your Low Pressure Close Pressure Valve
- Test your values
- Set up tonnage (on hydraulic clamps) and holding pressure (on toggle clamps)
- Set pressure alarm setpoints

Important: Many injection molding machine OEMs and hydraulic valve manufacturers provide data regarding valve spanning (working range) for a particular valve on their machine. If valve spanning information is available from your OEM for your machine's pressure valve during Low Pressure Close, enter the values into LPC41-44, and proceed to the section in this chapter on Setting Tonnage.

Revising/Confirming Critical Values

Over the last two chapters, you entered values into configuration blocks and profile blocks necessary to run clamp close profiles in open-loop. At this time, review the current values of the critical settings identified below. New parameters which need to be set are also identified. **Maintain the same configuration and profile values entered over the last two chapters unless directed to do so otherwise in this chapter.**

Verify that all entries made from the previous two chapters are correct. For the Low Pressure Close Profile, your current configuration should:

- Disable Expert Response Compensation (CPC04-B15 = 1)
- Identify the selected pressure control valve (LPC02)
- Identify Unselected Valve Set-Output Values (LPC09-12)
- Enable Open-Loop Control (CPC04-B07 = 1)
- Disable all ramping with 0 as ramp accel and decel setpoints (LPC17-20 for accel, LPC25-28 for decel)
- Identify pressure control limits (LPC41-42) and corresponding min and max outputs (LPC43-44)
- Identify Start LPC Position Setpoint (CPC61)
- Identify Mold Safe Position Setpoint (CPC62)

- Select Start LPC on Zone Overrun (CPC03-B11 = 0)

If current settings do not match our recommended values from previous chapters, we suggest you correct these values now using the download procedure discussed in chapter 4.

Span Your Low Pressure Close Pressure Valve

Span your Low Pressure Close Pressure vs. Position Profile for smooth operation at the highest desired LPC pressure. Do this by finding the optimum values for LPC41-LPC44 using the values given above and the procedure below.

Optimal pressure reference values are determined using set-output:

1. Jog your clamp to the full close position (mold halves mated).

2. Align all other machine hydraulics to simulate clamp Low Pressure Close. For example, if certain pumps should be disabled during Low Pressure Close, disable them at this time. If a certain valve alignment should exist during Low Pressure Close, line the valves up accordingly at this time.

3. Enter a value to produce minimum pressure into the set-output word (DYC09, DYC10, DYC11, or DYC12) corresponding to the selected valve for clamp Low Pressure Close. Enter all other unselected valve set-output values to what you would normally use during Low Pressure Close (copy LPC09-12 into DYC09-12).

ATTENTION: A value of 0 entered in your data table does not necessarily correspond to zero pressure or flow. For example, a bi-directional valve would require a set-output value of 50% (5000) to obtain 0 PSI. Amplifier electronics or valve spools may also be designed such that 0 volts signal input does not correspond to no flow or pressure. Please consult your valve and amplifier specifications for more details.

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4. Enable set-output by transitioning DYC01-B08 (Pro-Set 600 address B35/392) from a 0 to a 1.

5. Observe the pressure reported back in SYS28 (Pro-Set 600 address N41:180).

- If this pressure is greater than zero, marginally adjust the selected LPC valve set-output value in an attempt to obtain zero pressure feedback. Stop the adjustments when you observe the smallest pressure attainable. This procedure may be required on a bi-directional valve with a spool offset.

- If this pressure is zero, marginally adjust the selected LPC valve set-output value until the observed pressure feedback just becomes greater than zero, and then re-adjust the value until you just observe zero again. This procedure may be required on a uni-directional valve with no response at low signal levels.

6. Once you are satisfied you have obtained the lowest possible pressure (bi-directional valve), or the highest possible signal at zero pressure (uni-directional valve), copy the pressure observed in SYS28 (usually 0 PSI or Bar) into LPC41 (Pro-Set 600 address N43:217), the Low Pressure Close Minimum Control Limit.

7. While maintaining this minimum pressure, observe the actual valve set-output value in the System Status Block (SYS41-SYS44, Pro-Set 600 addresses N41:193 - N41:196) that corresponds to your selected LPC valve. Copy this value into LPC43 (Pro-Set 600 address N43:219), the Selected Low Pressure Close Valve Output for Minimum.

8. Begin increasing the selected LPC valve set-output value in 5% increments while observing the clamp pressure in SYS28. Stop adjusting the value when the observed clamp pressure is equal to the maximum low pressure close pressure that you run on this machine. In most cases, this value is substantially less than the maximum obtainable system pressure.

9. Enter this observed maximum low pressure close pressure (from SYS28) into LPC42 (Pro-Set 600 address N43:218), the Maximum Low Pressure Close Control Limit.

10. While maintaining this maximum low pressure close pressure, observe the actual valve set-output value in the System Status Block (SYS41 - SYS44, Pro-Set 600 addresses N41:193 - N41:196) that corresponds to your selected LPC valve. Copy this value into LPC44 (Pro-Set 600 address N43:220), the Selected Low Pressure Close Valve Output for Maximum.

11. Disable set-output by transitioning DYC01-B08 (Pro-Set 600 address B35/392) from a 1 to a 0.

12. Download your LPC changes to the QDC module (refer to chapter 4 for detailed instructions).

Test Your Low Pressure Close Pressure Valve for Linearity

1. Select a pressure setpoint for Low Pressure Close which is typical of the pressure you would run during machine operation. Enter this setpoint into CPC37 (Pro-Set 600 address N43:273).

2. Download changes to the QDC module (refer to chapter 4 for detailed instructions).

3. Jog your clamp to a position just outside the Low Pressure Close start position (CPC61).

4. Enable Low Pressure Close (DYC02-B03, Pro-Set 600 address B35/403). The clamp should move from its start position through the Low Pressure Close profile. If no motion is observed, check the following:

- Verify that none of your clamp or ejector overtravel alarms are set. The QDC module inhibits clamp low pressure close if SYS07-B00 through SYS07-B05 are set.
- Verify that the ejector is inside the ejector position for clamp close enable (EPC63).
- Verify that no programming error codes exist in SYS61 and SYS62.

5. Upon completion of Low Pressure Close, observe the pressure reported back for low pressure close segment 1 (CPS37, Pro-Set 600 address N43:689). If the observed pressure is not approximately equal to the setpoint entered in CPC37, then check:

- Is your high volume pump dropping out early enough?
- Are any high volume solenoids which may be in the circuit dropping out at the correct time?

If the observed pressure CPS37 is still not representative of the setpoint (within 20% of CPC37), your pressure valve is not linear over the desired range of operation .

If:	And Your Selected Valve is:	Then:
CPS37 was less than CPC37	Direct Acting	Increase LPC44 by 5%
	Reverse Acting	Decrease LPC44 by 5%
CPS37 was more than CPC37	Direct Acting	Decrease LPC44 by 5%
	Reverse Acting	Increase LPC44 by 5%

Repeat steps 2 through 5 as necessary.

What You Have Accomplished

The valve spanning procedure you just completed has:

- defined the range of pressure available during Low Pressure Close
- informed the QDC module of the signal level needed to drive the selected low pressure close valve for any requested open-loop pressure:

% of Signal Level Entered In:	Drives the selected valve to produce:
LPC43	Pressure (usually 0) in LPC41
LPC44	Pressure in LPC42

Now, for all open-loop Low Pressure Close profiles, the QDC module:

- drives the selected clamp pressure valve between the signal limits imposed by LPC43 and LPC44
- assumes a linear relationship between Low Pressure Close clamp pressure and the signal output

Set Tonnage on Hydraulic Clamps and Hold Pressure on Toggle Clamps

Once the clamp has completed Low Pressure Close, you have the ability to use the Low Pressure Close End-of-Profile set output values to build tonnage on your hydraulic clamp (this same procedure is also used to apply pressure to your toggle clamp during lock-up and injection).

1. Jog your clamp to the full close position (mold halves mated).

2. Enter a value that should produce minimum clamp pressure into the set-output word (DYC09, DYC10, DYC11, or DYC12) corresponding to your clamp tonnage (lock-up) pressure valve.

3. Set the other three values equal to the set-output values you would normally use during tonnage (from LPC33-36).

ATTENTION: A value of 0 entered in your data table does not necessarily correspond to zero pressure or flow. For example, a bi-directional valve would require a set-output value of 50% (5000) to obtain 0 PSI. Amplifier electronics or valve spools may also be designed such that 0 volts signal input does not correspond to no flow or pressure. Please consult your valve and amplifier specifications for more details.

4. Align all other machine hydraulics to simulate clamp tonnage. For example, if certain pumps are turned off during tonnage, turn them off at this time. If a certain valve alignment exists during tonnage, line the valves up accordingly at this time.

5. Enable set-output by transitioning DYC01-B08 (Pro-Set 600 address B35/392) from a 0 to a 1.

6. Begin increasing the set-output word which controls pressure in 5% increments while observing the clamp pressure (SYS28, Pro-Set 600 address N41:180). Stop increasing the value when the observed clamp pressure is equal to the desired tonnage pressure for your machine. If the desired pressure cannot be reached, evaluate your settings for the other three set-output words, and verify they are set properly.

7. Enter the resultant set-output values from DYC09-12 into LPC33-36. These values are applied to your connected valves when the clamp completes Low Pressure Close.

8. Disable set-output by transitioning DYC01-B08 (Pro-Set 600 address B35/392) from a 1 to a 0.

9. Enter the desired tonnage pressure for your machine (step 6) into the Tonnage Complete Pressure Setpoint (CPC63, Pro-Set 600 address N43:299).

10. Download your changes to the QDC module (refer to chapter 4 for detailed instructions).

Set Pressure Alarm Setpoints

After spanning your Low Pressure Close pressure valve, set your Low Pressure Close maximum pressure alarm (LPC57, Pro-Set 600 address N43:233) equal to a value you feel should not occur during Low Pressure Close. Make sure this value is not greater than the Low Pressure Close Maximum Control Limit (LPC42, Pro-Set 600 address N43:218). Entering a value of 0 disables this alarm.

Download changes to the QDC module. If necessary, refer to Download Procedure in chapter 4.

Span Your Clamp Close Pressure Valve(s)

We recommend that you next tune the First, Second, and Third Clamp Close for clamp close pressure performance. Do this in four parts:

- Revise/confirm critical values for pressure valve spanning
- Span your clamp close pressure valve(s)
- Test your values
- Set pressure alarm setpoints

Important: Many injection molding machine OEMs and hydraulic valve manufacturers provide data regarding valve spanning (working range) for a particular valve on their machine. If valve spanning information is available from your OEM for your machine's pressure valve during clamp close operations, enter the values into FCC41-44, SCC41-44, and TCC41-44, and proceed to the section in this chapter on setting Clamp Close pressure alarm setpoints.

Revise/Confirm Critical Values

Over the last two chapters, you entered values into configuration blocks and profile blocks necessary to run clamp close profiles in open-loop. At this time, review the current values of the critical settings identified below. New parameters which need to be set are also identified. **Maintain the same configuration and profile values entered over the last two chapters unless directed to do so otherwise in this chapter.**

Verify that all entries made from the previous two chapters are correct. For Clamp Close Profiles, your current configuration should:

- Disable Expert Response Compensation (CPC04)
- Identify the selected pressure control valve(s) (FCC02, SCC02, TCC02)
- Identify Unselected Valve Set-Output Values (FCC09-12, SCC09-12, TCC09-12)
- Select Pressure vs. Position Control (CPC03)
- Enable Open-Loop Control (CPC04)
- Logically Bridge all Clamp Close Profiles (CPC03)
- Disable all ramping with 0 as ramp accel and decel setpoints (FCC17-20, SCC17-20, TCC17-20 for accel, FCC25-28, SCC25-28, TCC25-28 for decel)
- Identify pressure control limits (FCC41-42, SCC41-42, TCC41-42) and corresponding min and max outputs (FCC43-44, SCC43-44, TCC43-44)

- Identify, all end-of segment position setpoints (CPC11, CPC14, CPC17, CPC20, CPC23, CPC26, CPC29, CPC32, CPC35, CPC38). These should remain unchanged from the initial settings
- Select start LPC on Zone Overrun (CPC03-B11 = 0)
- Identify Start LPC Position Setpoint (CPC61)

If current settings do not match our recommended values from previous chapters, we suggest you correct these values now using the download procedure discussed in chapter 4.

Span Your Clamp Close Pressure Valve(s)

Span your Clamp Close Pressure vs. Position Profiles for smooth operation at the highest desired clamp pressure. Do this by finding the optimum values for FCC41-44, SCC41-44, and TCC41-44 using the values given above and the procedure below.

Optimal pressure reference values are determined using set-output.

1. Jog your clamp to the full close position (mold halves mated)

2. Align all other machine hydraulics to simulate Clamp Close. For example, if certain pumps are enabled during Clamp Close high speed operations and disabled during Low Pressure Close, enable them at this time. If a certain valve alignment exists during Clamp Close, line the valves up accordingly at this time.

3. Enter a value that should produce minimum pressure into the set-output word (DYC09, DYC10, DYC11, or DYC12) corresponding to the selected valve for Clamp Close pressure control. Enter all other unselected valve set-output values to what you would normally use during Clamp Close (reference FCC09-12, SCC09-12, and TCC09-12).

ATTENTION: A value of 0 entered in your data table does not necessarily correspond to zero pressure or flow. For example, a bi-directional valve would require a set-output value of 50% (5000) to obtain 0 PSI. Amplifier electronics or valve spools may also be designed such that 0 volts signal input does not correspond to no flow or pressure. Please consult your valve and amplifier specifications for more details.

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4. Enable set-output by transitioning DYC01-B08 (Pro-Set 600 address B35/392) from a 0 to a 1.

5. Observe the pressure reported back in SYS28 (Pro-Set 600 address N41:180).

- If this pressure is greater than zero, marginally adjust the selected Clamp Close valve set-output value in an attempt to obtain zero pressure feedback. Stop the adjustments when you observe the smallest pressure attainable. This procedure may be required on a bi-directional valve with a spool offset.
- If this pressure is zero, marginally adjust the selected Clamp Close valve set-output value until the observed pressure feedback just becomes greater than zero, and then re-adjust the value until you just observe zero again. This procedure may be required on a uni-directional valve with no response at low signal levels.

6. Once you are satisfied you have obtained the lowest possible pressure (bi-directional valve), or the highest possible signal at zero pressure (uni-directional valve), copy the pressure observed in SYS28 (usually 0 PSI or Bar) into FCC41, SCC41, and TCC41 (Pro-Set 600 addresses N43:37, N43:97, and N43:157), the Clamp Close Minimum Pressure Control Limits.

7. While maintaining this minimum pressure, observe the actual valve set-output value in the System Status Block (SYS41-SYS44, Pro-Set 600 addresses N41:193-N41:196) that corresponds to your selected Clamp Close pressure valve. Copy this value into FCC43, SCC43, and TCC43 (Pro-Set 600 addresses N43:39, N43:99, and N43:159), the Selected Clamp Close Pressure Valve Outputs for Minimum.

8. Begin increasing the selected Clamp Close valve set-output value in 5% increments while observing the clamp pressure in SYS28. Stop adjusting the value when the observed clamp pressure no longer increases with an increase in the set-output command value. The pressure now observed in SYS28 is the maximum obtainable Clamp Close pressure.

9. Enter this observed maximum Clamp Close pressure (from SYS28) into FCC42, SCC42, and TCC42 (Pro-Set 600 addresses N43:38, N43:98, and N43:158), the Maximum Clamp Close Pressure Control Limits.

10. While maintaining this maximum Clamp Close pressure, observe the actual valve set-output value in the System Status Block (SYS41-SYS44, Pro-Set 600 addresses N41:193-N41:196) that corresponds to your selected Clamp Close pressure valve. Copy this value into FCC44, SCC44, and TCC44 (Pro-Set 600 addresses N43:40, N43:100, and N43:160), the Selected Clamp Close Pressure Valve Outputs for Maximum.

11. Disable set-output by transitioning DYC01-B08 (Pro-Set 600 address B35/392) from a 1 to a 0.

12. Download your changes to the QDC module (refer to chapter 4 for detailed instructions).

Test Your Clamp Close Pressure Valve(s) for Linearity

1. Select pressure setpoints for Clamp Close that are typical of the pressures you would run during normal machine operation. Enter these setpoints into CPC10, CPC13, and CPC16 (Pro-Set 600 addresses N43:246, N43:249, and N43:252).

2. Download changes to the QDC module (refer to chapter 4 for detailed instructions).

3. Jog your clamp to the full open position.

4. Enable First Clamp Close (DYC02-B00, Pro-Set 600 address B35/400). The clamp should move from its start position through the First Clamp Close profile, and then execute Low Pressure Close. If no motion is observed, check the following:

- Verify that none of your clamp or ejector overtravel alarms are set. The QDC module inhibits clamp close if SYS07-B00 through SYS07-B05 are set
- Verify that the ejector is inside the ejector position for clamp close enable (EPC63)
- Verify that no programming error codes exist in SYS61 and SYS62

5. Upon completion of Clamp Close, observe the pressure reported back for 1st clamp close segment 2 (CPS13, Pro-Set 600 address N43:665). If the observed pressure is not approximately equal to the setpoint entered in CPC13, then check:

- Was your valve and solenoid alignment the same for Clamp Close profile execution and Clamp Close action in set-output?

If the observed pressure CPS13 is still not representative of the setpoint (within 20% of CPC13), your pressure valve is not linear over the desired range of operation.

If:	And Your Selected Valve is:	Then:
CPS13 was less than CPC13	Direct Acting	Increase FCC44, SCC44, TCC44 by 5%
	Reverse Acting	Decrease FCC44, SCC44, TCC44 by 5%
CPS13 was more than CPC13	Direct Acting	Decrease FCC44, SCC44, TCC44 by 5%
	Reverse Acting	Increase FCC44, SCC44, TCC44 by 5%

Repeat steps 2 through 5 as necessary.

What You Have Accomplished
The valve spanning procedure you just completed has:

- defined the range of pressure available during First, Second and Third Clamp Close
- informed the QDC module of the signal level needed to drive the selected clamp pressure valve(s) for any requested open-loop pressure:

% of Signal Level Entered In:	Drives the selected valve to Produce:
FCC43, SCC43, TCC43	Pressure (usually 0) in FCC41, SCC41, and TCC41
FCC44, SCC44, TCC44	Pressure in FCC42, SCC42, and TCC42

Now, for all open-loop pressure-controlled First, Second, and Third clamp close profiles, the QDC module:

- drives the selected clamp pressure valve between the signal limits imposed by FCC43 and FCC44, or SCC43 and SCC44, or TCC43 and TCC44
- assumes a linear relationship between clamp pressure and the signal outputs

Set Pressure Alarm Setpoints

After spanning your Clamp Close pressure valve(s), set your Clamp Close maximum pressure alarms (FCC57, SCC57, TCC57) equal to values you feel should not occur during the respective Clamp Close profiles. Make sure none of these values are greater than their respective Clamp Close Maximum Pressure Control Limits (FCC42, SCC42, TCC42). Entering a value of 0 disables these alarms.

Download changes to the QDC module. If necessary, refer to the Download Procedure in chapter 4.

Span Your Clamp Close Velocity (Flow) Valve(s)

We recommend that you next span the clamp close velocity (flow) valve(s). Do this in three parts:

- Revise/confirm critical values for velocity valve spanning
- Span your clamp close velocity (flow) valve(s)
- Test your values

Important: Many injection molding machine OEMs and hydraulic valve manufacturers provide data regarding valve spanning (working range) for a particular valve on their machine. If valve spanning information is available from your OEM for your machine's flow valve during clamp close operations, enter the values into FCC45-48, SCC45-48, and TCC45-48, and proceed to the section in this chapter on spanning your Clamp Open Pressure Valve(s).

Revise/Confirm Critical Values

Over the last two chapters you entered values into configuration blocks and profile blocks necessary to run clamp close profiles in open-loop. At this time, review the current values of the critical settings identified below. New parameters which need to be set are also identified. **Maintain the same configuration and profile values entered over the last two chapters unless directed to do so otherwise in this chapter.**

Verify all entries made from the previous two chapters are correct. For Clamp Close Profiles, your current configuration should:

- Disable Expert Response Compensation™ (CPC04)
- Select Inches (mm)/second as the Velocity Units (CPC03)
- Identify the selected velocity control valve(s) (FCC02, SCC02, TCC02)
- Identify Unselected Valve Set-output Values (FCC09-12, SCC09-12, TCC09-12)
- Enable Open-loop Control (CPC04)
- Logically Bridge all Clamp Close Profiles (CPC03)
- Disable all ramping with 0 as ramp accel and decel setpoints (FCC17-20, SCC17-20, TCC17-20 for accel, FCC25-28, SCC25-28, TCC25-28 for decel)
- Identify velocity control limits (FCC45-46, SCC45-46, TCC45-46) and corresponding min and max outputs (FCC47-48, SCC47-48, TCC47-48)
- Identify all end-of segment position setpoints (CPC11, CPC14, CPC17, CPC20, CPC23, CPC26, CPC29, CPC32, CPC35, CPC38)
- Select Start LPC on Zone Overrun (CPC03-B11 = 0)
- Identify Start LPC Position Setpoint (CPC61)

If current settings do not match our recommended values from previous chapters, we suggest you correct these values now using the download procedure discussed in chapter 4.

Span Your Clamp Close Velocity Valve(s)

1. Obtain a copy of the flow rate curves provided by your flow valve manufacturer. The flow rate curves graphically illustrate the flow through a valve at different voltage or input current levels and at different pressure drops across the valve's spool.

2. From the above curves, determine the minimum and maximum clamp close flows available from your flow valve at the pressure you would normally run during clamp close operation. Record these flows, along with the input voltages/current associated with them.

3. Convert the min and max flows obtained from your flow curve to clamp cylinder velocities. This is done by:

$$\text{Clamp Cylinder Velocity (in/sec)} = \frac{\text{Flow (in}^3\text{/sec)}}{\text{Area (in}^2\text{)}}$$

- where area is the inside diameter of the cylinder. This area may be different for the rod and piston ends of the cylinder:

$$\text{Area (no Rod)} = \pi \left(\frac{\text{I.D. of cylinder}}{2}\right)^2$$

$$\text{Area for Rod End} = \pi \left(\frac{\text{I.D. of cylinder}}{2}\right)^2 - \pi \left(\frac{\text{Rod diameter}}{2}\right)^2$$

- The flow assumes no restrictions on the exhaust port of the cylinder.

4. Enter the minimum velocities (usually 0) from the above calculation into FCC45, SCC45, and TCC45. Enter the maximum velocities into FCC46, SCC46, and TCC46.

5. Divide the voltage/current corresponding to minimum velocities by the full range of the clamp close valve(s) input level to determine the percent signal outputs for minimum. Enter these values into FCC47, SCC47, and TCC47.

6. Divide the voltage/current corresponding to maximum velocities by the full range of the clamp close valve(s) input level to determine the percent signal outputs for maximum. Enter these values into FCC48, SCC48, and TCC48.

7. Download changes to the QDC module (refer to chapter 4 for detailed instructions).

Test Your Clamp Close Velocity Valve(s) for Linearity

1. Select velocity vs. position control for the entire Clamp Close operation by resetting (= 0) the following three bits:

- CPC03-B00 (Pro-Set 600 address B37/288)
- CPC03-B02 (Pro-Set 600 address B37/290)
- CPC03-B04 (Pro-Set 600 address B37/292)

2. Select velocity setpoints for Clamp Close that are typical of the velocities you would run during normal machine operation. Enter these setpoints into CPC09, CPC12, and CPC15 (Pro-Set 600 addresses N43:245, N43:248, and N43:251).

3. Download changes to the QDC module (refer to chapter 4 for detailed instructions).

4. Jog your clamp to the full open position.

5. Enable First Clamp Close (DYC02-B00, Pro-Set 600 address B35/400). The clamp should move from its start position through the First Clamp Close profile, and then execute Low Pressure Close. If no motion is observed, check the following:

- Verify that none of your clamp or ejector overtravel alarms are set. The QDC module inhibits clamp close if SYS07-B00 through SYS07-B05 are set
- Verify that the ejector is inside the ejector position for clamp close enable (EPC63)
- Verify that no programming error codes exist in SYS61 and SYS62

6. Upon completion of Clamp Close, observe the velocity reported back for 1st clamp close segment 2 (CPS12, Pro-Set 600 address N43:664). This velocity should be relatively close to the setpoint you entered in CPC12 (Pro-Set 600 address N43:248). If the observed velocity is not within 25% of the setpoint:

- Verify you chose the correct values from your flow rate curves supplied by your flow valve manufacturer
- Verify your calculations

If the actual velocity is still not representative of your setpoint, your flow valve is not linear over the range of your setpoint

If:	And your Selected Valve is:	Then:
CPS12 was less than CPC12	Direct Acting	Increase FCC48, SCC48, and TCC48 by 5%
	Reverse Acting	Decrease FCC48, SCC48, and TCC48 by 5%
CPS12 was more than CPC12	Direct Acting	Decrease FCC48, SCC48, and TCC48 by 5%
	Reverse Acting	Increase FCC48, SCC48, and TCC48 by 5%

Repeat steps 3 through 6 as necessary.

What You Have Accomplished

The valve spanning procedure you just completed has:

- defined the range of velocity available during any clamp close profile
- informed the QDC module of the signal level needed to drive the selected clamp velocity valve(s) for any requested open-loop velocity:

% of Signal Level Entered In:	Drives the Selected Valve to Produce:
FCC47, SCC47, TCC47	Velocity (usually 0) in FCC45, SCC45, and TCC45
FCC48, SCC48, TCC48	Velocity in FCC46, SCC46, TCC46

Now, for all open-loop, velocity-controlled clamp close profiles, the QDC module:

- drives the selected clamp velocity valve between the signal limits imposed by FCC47 and FCC48, or SCC47 and SCC48, or TCC47 and TCC48
- assumes a linear relationship between clamp speed and the signal outputs

Span Your Clamp Open Pressure Valve(s)

We recommend that you next tune the First, Second, and Third Clamp Open, and Open Slow, for clamp open pressure performance. Do this in four parts:

- Revise/confirm critical values for pressure valve spanning
- Span your clamp open pressure valve(s)
- Test your values
- Set pressure alarm setpoints

Important: Many injection molding machine OEMs and hydraulic valve manufacturers provide data regarding valve spanning (working range) for a particular valve on their machine. If valve spanning information is available from your OEM for your machine's pressure valve during clamp open operations, enter the values into FOC41-44, SOC41-44, TOC41-44, and OSC41-44, and proceed to the section in this chapter on setting Clamp Open pressure alarm setpoints.

Revise/Confirm Critical Values

Over the last two chapters, you entered values into configuration blocks and profile blocks necessary to run clamp open profiles in open-loop. At this time, review the current values of the critical settings identified below. New parameters which need to be set are also identified. **Maintain the same configuration and profile values entered over the last two chapters unless directed to do so otherwise in this chapter.**

Verify that all entries made from the previous two chapters are correct. For Clamp Open Profiles, your current configuration should:

- Disable Expert Response Compensation™ (OPC04)
- Identify the selected pressure control valve(s) (FOC02, SOC02, TOC02, OSC02)
- Identify Unselected Valve Set-Output Values (FOC09-12, SOC09-12, TOC09-12, OSC09-12)
- Select Pressure vs. Position Control (OPC03)
- Enable Open-Loop Control (OPC04)
- Logically Bridge all Clamp Open Profiles (OPC03)
- Disable all ramping with 0 as ramp accel and decel setpoints (FOC17-20, SOC17-20, TOC17-20, OSC17-20 for accel, FOC25-28, SOC25-28, TOC25-28, OSC25-28 for decel)
- Identify pressure control limits (FOC41-42, SOC41-42, TOC41-42, OSC41-42) and corresponding min and max outputs (FOC43-44, SOC43-44, TOC43-44, OSC43-44)

- Identify all end-of segment position setpoints (OPC11, OPC14, OPC17, OPC20, OPC23, OPC26, OPC29, OPC32, OPC35, OPC38). These should remain unchanged from the initial settings
- Identify Mold Full Open Position Setpoint (OPC62)
- Identify Start OSC Position Setpoint (OPC61)
- Select Start OSC on Zone Overrun (OPC03-B11 = 0)

If current settings do not match our recommended values from previous chapters, we suggest you correct these values now using the download procedure discussed in chapter 4.

Span Your Clamp Open Pressure Valve(s)

Span your Clamp Open Pressure vs. Position Profiles for smooth operation at the highest desired clamp pressure. Do this by finding the optimum values for FOC41-44, SOC41-44, TOC41-44, and OSC41-44 using the values given above and the procedure below.

Optimal pressure reference values are determined using set-output.

1. Jog your clamp to the full open position (mold halves mated).

2. Align all other machine hydraulics to simulate Clamp Open. For example, if certain pumps are enabled during Clamp Open operations, enable them at this time. If a certain valve alignment exists during Clamp Open, line the valves up accordingly at this time.

Important: If valve alignment or pressure availability is different for Clamp Open and the Open Slow portion of clamp open, the following procedure should be repeated twice: once for high speed Clamp Open, and once for Open Slow. (FOC, SOC, and TOC values are filled in for high speed Clamp Open; and OSC values are filled in during OSC configuration.)

3. Enter a value that should produce minimum pressure into the set-output word (DYC09, DYC10, DYC11, or DYC12) corresponding to the selected valve for Clamp Open pressure control. Enter all other unselected valve set-output values to what you would normally use during Clamp Open (reference FOC09-12, SOC09-12, TOC09-12, OSC09-12).

ATTENTION: A value of 0 entered in your data table does not necessarily correspond to zero pressure or flow. For example, a bi-directional valve would require a set-output value of 50% (5000) to obtain 0 PSI. Amplifier electronics or valve spools may also be designed such that 0 volts signal input does not correspond to no flow or pressure. Please consult your valve and amplifier specifications for more details.

4. Enable set-output by transitioning DYC01-B08 (Pro-Set 600 address B35:392) from a 0 to a 1.

5. Observe the pressure reported back in SYS28 (Pro-Set 600 address N41:180).

- If this pressure is greater than zero, marginally adjust the selected Clamp Open valve set-output value in an attempt to obtain zero pressure feedback. Stop the adjustments when you observe the smallest pressure attainable. This procedure may be required on a bi-directional valve with a spool offset.

- If this pressure is zero, marginally adjust the selected Clamp Open valve set-output value until the observed pressure feedback just becomes greater than zero, and then re-adjust the value until you just observe zero again. This procedure may be required on a uni-directional valve with no response at low signal levels.

6. Once you are satisfied you have obtained the lowest possible pressure (bi-directional valve), or the highest possible signal at zero pressure (uni-directional valve), copy the pressure observed in SYS28, (usually 0 PSI or Bar) into FOC41, SOC41, TOC41, and OSC41 (Pro-Set 600 addresses N43:337, N43:397, N43:457, and N43:517), the Clamp Open Minimum Pressure Control Limits.

7. While maintaining this minimum pressure, observe the actual valve set-output value in the System Status Block (SYS41-SYS44, Pro-Set 600 addresses N41:193 - N41:196) that corresponds to your selected Clamp Open pressure valve. Copy this value into FOC43, SOC43, TOC43, and OSC43 (Pro-Set 600 addresses N43:339, N43:399, N43:459, and N43:519), the Selected Pressure Valve Outputs for Minimum.

8. Begin increasing the selected Clamp Open valve set-output value in 5% increments while observing the clamp pressure in SYS28. Stop adjusting the value when the observed clamp pressure no longer increases with an increase in the set-output command value. The pressure now observed in SYS28 is the maximum obtainable Clamp Open pressure.

9. Enter this observed maximum Clamp Open pressure (from SYS28) into FOC42, SOC42, TOC42, and OSC42 (Pro-Set 600 addresses N43:338, N43:398, N43458, and N43:518), the Clamp Open Maximum Pressure Control Limits.

10. While maintaining this maximum Clamp Open pressure, observe the actual valve set-output value in the System Status Block (SYS41-SYS44, Pro-Set 600 addresses N41:193-N41:196) that corresponds to your selected Clamp Open pressure valve. Copy this value into FOC44, SOC44, TOC44, and OSC44 (Pro-Set 600 addresses N43:340, N43:400, N43:460, and N43:520), the Selected Clamp Open Pressure Valve Outputs for Maximum.

11. Disable set-output by transitioning DYC01-B08 (Pro-Set 600 address B35:392) from a 1 to a 0.

12. Download your changes to the QDC module (refer to chapter 4 for detailed instructions).

Test Your Clamp Open Pressure Valve(s) for Linearity

1. Select pressure setpoints for Clamp Open that are typical of the pressures you would run during normal machine operation. Enter these setpoints into OPC10, OPC13, OPC16, and OPC37 (Pro-Set 600 addresses N43:546, N43:549, N43:552, and N43:573).

2. Download changes to the QDC module (refer to chapter 4 for detailed instructions).

3. Jog your clamp to the full close position (mold halves mated).

4. Enable First Clamp Open (DYC02-B10, Pro-Set 600 address B35/410). The clamp should move from its start position through the First Clamp Open profile, and then execute Open Slow. If no motion is observed, check the following:

- Verify that none of your clamp or ejector overtravel alarms are set. The QDC module inhibits clamp open if SYS07-B00 through SYS07-B05 are set
- Verify that no programming error codes exist in SYS61 and SYS62

5. Upon completion of Clamp Open, observe the pressure reported back for 1st clamp open segment 2 (OPS13, Pro-Set 600 address N43:721). If the observed pressure is not approximately equal to the setpoint entered in OPC13, then check:

- Was your valve and solenoid alignment the same for Clamp Open profile execution and Clamp Open action in set-output?

If the observed pressure OPS13 is still not representative of the setpoint (within 20% of OPC13), your pressure valve is not linear over the desired range of operation.

If:	And Your Selected Valve is:	Then:
OPS13 was less than OPC13	Direct Acting	Increase FOC44, SOC44, TOC44, and OSC44 by 5%
	Reverse Acting	Decrease FOC44, SOC44, TOC44, and OSC44 by 5%
OPS13 was more than OPC13	Direct Acting	Decrease FOC44, SOC44, TOC44, and OSC44 by 5%
	Reverse Acting	Increase FOC44, SOC44, TOC44, and OSC44 by 5%

Repeat steps 2 through 5 as necessary.

What You Have Accomplished
The valve spanning procedure you just completed has:

- defined the range of pressure available during any clamp open profile
- informed the QDC module of the signal level needed to drive the selected clamp pressure valve(s) for any requested open-loop pressure:

% of Signal Level Entered In:	Drives the Selected Valve to Produce:
FOC43,SOC43,TOC43,OSC43	Pressure (Usually 0) in FOC41, SOC41, TOC41, and OSC41
FOC44,SOC44,TOC44,OSC44	Pressure in FOC42, SOC42, TOC42, and OSC42

Now, for all open-loop pressure-controlled clamp open profiles, the QDC module:

- drives the selected clamp pressure valve between the signal limits imposed by FOC43 and FOC44, or SOC43 and SOC44, or TOC43 and TOC44, or OSC43 and OSC44
- assumes a linear relationship between clamp pressure and the signal outputs

Set Pressure Alarm Setpoints

After spanning your Clamp Open pressure valve(s), set your Clamp Open maximum pressure alarms (FOC57, SOC57, TOC57, OSC57) equal to values you feel should not occur during the respective Clamp Open profiles. Make sure none of these values are greater than their respective Clamp Open Maximum Pressure Control Limits (FOC42, SOC42, TOC42, OSC42). Entering a value of 0 disables this alarm.

Download changes to the QDC module. If necessary, refer to the Download Procedure in chapter 4.

Span Your Clamp Open Velocity (Flow) Valve(s)

We recommend that you next tune the clamp open velocity (flow) valve(s). Do this in three parts:

- Revise/confirm critical values for velocity valve spanning
- Span your clamp open velocity (flow) valve(s)
- Test your values

Important: Many injection molding machine OEMs and hydraulic valve manufacturers provide data regarding valve spanning (working range) for a particular valve on their machine. If valve spanning information is available from your OEM for your machine's flow valve during clamp open operations, enter the values into FCC45-48, SCC45-48, TCC45-48, and OSC45-48 and proceed to the section in this chapter on spanning your Ejector Advance and Ejector Retract Pressure Valve(s).

Revise/Confirm Critical Values

Over the last two chapters you entered values into configuration blocks and profile blocks necessary to run clamp open profiles in open-loop. At this time, review the current values of the critical settings identified below. New parameters which need to be set are also identified. **Maintain the same configuration and profile values entered over the last two chapters unless directed to do so otherwise in this chapter.**

Verify that all entries made from the previous two chapters are correct. For Clamp Open Profiles, your current configuration should:

- Disable Expert Response Compensation™ (OPC04)
- Select Inches (mm)/second as the Velocity Units (OPC03)
- Identify the selected velocity control valve(s) (FOC02, SOC02, TOC02, OSC02)
- Identify Unselected Valve Set-Output Values (FOC09-12, SOC09-12, TOC09-12, OSC09-12)
- Enable Open-Loop Control (OPC04)
- Logically Bridge all Clamp Open Profiles (OPC03)
- Disable all ramping with 0 as ramp accel and decel setpoints (FOC17-20, SOC17-20, TOC17-20, OSC17-20 for accel, FOC25-28, SOC25-28, TOC25-28, OSC25-28 for decel)
- Identify velocity control limits (FOC45-46, SOC45-46, TOC45-46, OSC45-46) and corresponding min and max outputs (FOC47-48, SOC47-48, TOC47-48, OSC47-48)
- Identify all end-of segment position setpoints (OPC11, OPC14, OPC17, OPC20, OPC23, OPC26, OPC29, OPC32, OPC35, OPC38)
- Select Start OSC on Zone Overrun (OPC03-B11 = 0)
- Identify Start OSC Position Setpoint (OPC61)

If current settings do not match our recommended values from previous chapters, we suggest you correct these values now using the download procedure discussed in chapter 4.

Span Your Clamp Open Velocity Valve(s)

1. Obtain a copy of the flow rate curves provided by your flow valve manufacturer. The flow rate curves graphically illustrate the flow through a valve at different voltage or input current levels and at different pressure drops across the valve's spool.

2. From the above curves, determine the minimum and maximum clamp open flows available from your flow valve at the pressure you would normally run during clamp open operation. Record these flows, along with the input voltages/current associated with them.

Important: During machine operation, If your application typically sets the pressure during Clamp Open Slow different from the pressure set during Clamp Open Fast operations, record values for both pressures. Complete the following exercises for both sets of data points. (Open Slow values are recorded in all words with the OSC prefix, and Clamp Open Fast values are recorded in words with FOC, SOC and TOC prefixes).

3. Convert the min and max flows obtained from your flow curve to clamp cylinder velocities. This is done by:

$$\text{Clamp Cylinder Velocity (in/sec)} = \frac{\text{Flow (in}^3\text{/sec)}}{\text{Area (in}^2\text{)}}$$

- where area is the inside diameter of the cylinder. This area may be different for the rod and piston ends of the cylinder:

$$\text{Area (no Rod)} = \pi \left(\frac{\text{I.D. of cylinder}}{2} \right)^2$$

$$\text{Area for Rod End} = \pi \left(\frac{\text{I.D. of cylinder}}{2} \right)^2 - \pi \left(\frac{\text{Rod diameter}}{2} \right)^2$$

- The flow assumes no restrictions on the exhaust port of the cylinder.

4. Enter the minimum velocities (usually 0) from the above calculation into FOC45, SOC45, TOC45, and OSC45. Enter the maximum velocities into FOC46, SOC46, TOC46, and OSC46.

5. Divide the voltage/current corresponding to minimum velocities by the full range of the clamp open valve(s) input level to determine the percent signal outputs for minimum. Enter these values into FOC47, SOC47, TOC47, and OSC47.

6. Divide the voltage/current corresponding to maximum velocities by the full range of the clamp open valve(s) input level to determine the percent signal outputs for maximum. Enter these values into FOC48, SOC48, TOC48, and OSC48.

7. Download changes to the QDC module (refer to chapter 4 for detailed instructions).

Test Your Clamp Open Velocity Valve(s) for Linearity

1. Select velocity vs. position control for the entire Clamp Open operation by resetting (= 0) the following four bits:

- OPC03-B00 (Pro-Set 600 address B37:608)
- OPC03-B02 (Pro-Set 600 address B37:610)
- OPC03-B04 (Pro-Set 600 address B37:612)
- OPC03-B06 (Pro-Set 600 address B37:614)

2. Select setpoints for Clamp Open that are typical of the velocities you would run during normal machine operation. Enter these setpoints into OPC09, OPC12, OPC15, and OPC36 (Pro-Set 600 addresses N43:545, N43:548, N43:551, and N43:572).

3. Download changes to the QDC module (refer to chapter 4 for detailed instructions).

4. Jog your clamp to the full close position (mold halves mated).

5. Enable First Clamp Open (DYC02-B10, Pro-Set 600 address B35/410). The clamp should move from its start position through the First Clamp Open Profile, and then execute Open Slow. If no motion is observed, check the following:

- Verify that none of your clamp or ejector overtravel alarms are set. The QDC module inhibits clamp open if SYS07-B00 through SYS07-B05 are set
- Verify that no programming error codes exist in SYS61 and SYS62

6. Upon completion of Clamp Open, observe the velocity reported back for 1st clamp open segment 2 (OPS12, Pro-Set 600 address N43:720). This velocity should be relatively close to the setpoint you entered in OPC12 (Pro-Set 600 address N43:548). If the observed velocity is not within 25% of the setpoint:

- Verify you chose the correct values from your flow rate curves supplied by your flow valve manufacturer
- Verify your calculations

If the actual velocity is still not representative of your setpoint, your flow valve is not linear over the range of your setpoint

If:	And Your Selected Valve is:	Then:
OPS12 was less than OPC12	Direct Acting	Increase FOC48, SOC48, TOC48, and OSC48 by 5%
	Reverse Acting	Decrease FOC48, SOC48, TOC48, and OSC48 by 5%
OPS12 was more than OPC12	Direct Acting	Decrease FOC48, SOC48, TOC48, and OSC48 by 5%
	Reverse Acting	Increase FOC48, SOC48, TOC48, and OSC48 by 5%

Repeat steps 3 through 6 as necessary.

What You Have Accomplished
The valve spanning procedure you just completed has:

- defined the range of velocity available during any clamp open profile
- informed the QDC module of the signal level needed to drive the selected clamp velocity valve(s) for any requested open-loop velocity:

% of Signal Level Entered In:	Drives the Selected Valve to Produce:
FOC47, SOC47, TOC47, OSC47	Velocity (usually 0) in FOC45, SOC45, TOC45, and OSC45
FOC48, SOC48, TOC48, OSC48	Velocity in FOC46, SOC46, TOC46, and OSC46

Now, for all open-loop velocity-controlled clamp open profiles, the QDC module:

- drives the selected clamp velocity valve between the signal limits imposed by FOC47 and FOC48, or SOC47 and SOC48, or TOC47 and TOC48, or OSC47 and OSC48.
- assumes a linear relationship between clamp speed and the signal outputs

Span Your Ejector Pressure Valve(s)

We recommend that you next tune the Ejector Profile for pressure performance. Do this in four parts:

- Revise/confirm critical values for pressure valve spanning
- Span your ejector pressure valve(s)
- Test your values
- Set pressure alarm setpoints

Important: Many injection molding machine OEMs and hydralic valve manufacturers provide data regarding valve spanning (working range) for a particular valve on their machine. If valve spanning information is available from your OEM for your machine's pressure valve during ejector operations, enter the values into EAC41-44 and ERC41-44, and proceed to the section in this chapter on setting Ejector pressure alarm setpoints.

Revise/Confirm Critical Values

Over the last two chapters, you entered values into configuration blocks and profile blocks necessary to run ejector profiles in open-loop. At this time, review the current values of the critical settings identified below. New parameters which need to be set are also identified. **Maintain the same configuration and profile values entered over the last two chapters unless directed to do so otherwise in this chapter.**

Verify that all entries made from the previous two chapters are correct. For the Ejector Profile, your current configuration should:

- Disable Expert Response Compensation (EPC04)
- Identify the selected pressure control valve(s) (EAC02, ERC02)
- Identify Unselected Valve Set-Output Values (EAC09-12, ERC09-12)
- Select Pressure vs. Position Control (EPC03)
- Enable Open-Loop Control (EPC04)
- Disable all ramping with 0 as ramp accel and decel setpoints (EAC17-20, ERC17-20 for accel, EAC25-28, ERC25-28 for decel)
- Identify pressure control limits (EAC41-42, ERC41-42) and corresponding min and max outputs (EAC43-44, ERC43-44)
- Identify all end-of segment position setpoints (EPC11, EPC14, EPC23, EPC29, EPC35, EPC38). These should remain zero from the initial settings
- Identify Ejector Advanced Position Setpoint (EPC59)
- Identify Ejector Retracted Position Setpoint (EPC60)
- Enable Ejectors to start on command (EPC03-B08 = 1 and EPC03-B09 = 0)

If current settings do not match our recommended values from previous chapters, we suggest you correct these values now using the download procedure discussed in chapter 4.

Span Your Ejector Pressure Valve(s)

Span your Ejector Pressure vs. Position Profile for smooth operation at the highest desired ejector pressure. Do this by finding the optimum values for EAC41-44 and ERC41-44 using the values given above and the procedure below.

Optimal pressure reference values are determined using set-output.

Ejector Advance

1. Jog your ejectors to the full advanced position.

2. Align all other machine hydraulics to simulate Ejector Advance. For example, if certain pumps are enabled during Ejector Advance, enable them at this time. If a certain valve alignment exists during Ejector Advance, line the valves up accordingly at this time.

3. Enter a value that should produce minimum pressure into the set-output word (DYC09, DYC10, DYC11, or DYC12) corresponding to the selected valve for Ejector Advance pressure control. Enter all other unselected valve set-output values to what you would normally use during Ejector Advance (copy EAC09-12 into DYC09-12).

ATTENTION: A value of 0 entered in your data table does not necessarily correspond to zero pressure or flow. For example, a bi-directional valve would require a set-output value of 50% (5000) to obtain 0 PSI. Amplifier electronics or valve spools may also be designed such that 0 volts signal input does not correspond to no flow or pressure. Please consult your valve and amplifier specifications for more details.

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4. Enable set-output by transitioning DYC01-B08 (Pro-Set 600 address B35/392) from a 0 to a 1.

5. Observe the pressure reported back in SYS26 (Pro-Set 600 address N41:178).

- If this pressure is greater than zero, marginally adjust the selected Ejector Advance valve set-output value in an attempt to obtain zero pressure feedback. Stop the adjustments when you observe the smallest pressure attainable. This procedure may be required on a bi-directional valve with a spool offset.

- If this pressure is zero, marginally adjust the selected Ejector Advance valve set-output value until the observed pressure feedback just becomes greater than zero, and then re-adjust the value until you just observe zero again. This procedure may be required on a uni-directional valve with no response at low signal levels.

6. Once you are satisfied you have obtained the lowest possible pressure (bi-directional valve), or the highest possible signal at zero pressure (uni-directional valve), copy the pressure observed in SYS26 (usually 0 PSI or Bar) into EAC41 (Pro-Set 600 address N45:37), the Minimum Ejector Advance Pressure Control Limit.

7. While maintaining this minimum pressure, observe the actual valve set-output value in the System Status Block (SYS41-SYS44, Pro-Set 600 addresses N41:193-N41:196) that corresponds to your selected Ejector Advance pressure valve. Copy this value into EAC43 (Pro-Set 600 address N45:39), the Selected Ejector Advance Pressure Valve Output for Minimum.

8. Begin increasing the selected Ejector Advance valve set-output value in 5% increments while observing the ejector pressure in SYS26. Stop adjusting the value when the observed ejector pressure no longer increases with an increase in the set-output command value. The pressure now observed in SYS26 is the maximum obtainable Ejector Advance pressure.

9. Enter this observed maximum Ejector Advance pressure (from SYS26) into EAC42 (Pro-Set 600 address N45:38), the Maximum Ejector Advance Pressure Control Limit.

10. While maintaining this maximum Ejector Advance pressure, observe the actual valve set-output value in the System Status Block (SYS41-SYS44, Pro-Set 600 addresses N41:193-N41:196) that corresponds to your selected Ejector Advance pressure valve. Copy this value into EAC44 (Pro-Set 600 address N45:40), the Selected Ejector Advance Pressure Valve Output for Maximum.

11. Disable set-output by transitioning DYC01-B08 (Pro-Set 600 address B35/392) from a 1 to a 0.

12. Download your changes to the QDC module (refer to chapter 4 for detailed instructions).

Ejector Retract

1. Jog your ejectors to the full retracted position.

2. Align all other machine hydraulics to simulate Ejector Retract. For example, if certain pumps are enabled during Ejector Retract, enable them at this time. If a certain valve alignment exists during Ejector Retract, line the valves up accordingly at this time.

3. Enter a value that should produce minimum pressure into the set-output word (DYC09, DYC10, DYC11, or DYC12) corresponding to the selected valve for Ejector Retract pressure control. Enter all other unselected valve set-output values to what you would normally use during Ejector Retract (copy ERC09-12 into DYC09-12).

ATTENTION: A value of 0 entered in your data table does not necessarily correspond to zero pressure or flow. For example, a bi-directional valve would require a set-output value of 50% (5000) to obtain 0 PSI. Amplifier electronics or valve spools may also be designed such that 0 volts signal input does not correspond to no flow or pressure. Please consult your valve and amplifier specifications for more details.

4. Enable set-output by transitioning DYC01-B08 (Pro-Set 600 address B35/392) from a 1 to a 0.

5. Observe the pressure reported back in SYS26 (Pro-Set 600 address N41:178).

   - If this pressure is greater than zero, marginally adjust the selected Ejector Retract valve set-output value in an attempt to obtain zero pressure feedback. Stop the adjustments when you observe the smallest pressure attainable. This procedure may be required on a bi-directional valve with a spool offset.

   - If this pressure is zero, marginally adjust the selected Ejector Retract valve set-output value until the observed pressure feedback just becomes greater than zero, and then re-adjust the value until you just observe zero again. This procedure may be required on a uni-directional valve with no response at low signal levels.

6. Once you are satisfied you have obtained the lowest possible pressure (bi-directional valve), or the highest possible signal at zero pressure (uni-directional valve), copy the pressure observed in SYS26 (usually 0 PSI or Bar) into ERC41 (Pro-Set 600 address N45:97), the Minimum Ejector Retract Pressure Control Limit.

7. While maintaining this minimum pressure, observe the actual valve set-output value in the System Status Block (SYS41-SYS44, Pro-Set 600 addresses N41:193-N41:196) that corresponds to your selected Ejector Retract pressure valve. Copy this value into ERC43 (Pro-Set 600 address N45:99), the Selected Ejector Retract Pressure Valve Output for Minimum.

8. Begin increasing the selected Ejector Retract valve set-output value in 5% increments while observing the ejector pressure in SYS26. Stop adjusting the value when the observed ejector pressure no longer increases with an increase in the set-output command value. The pressure now observed in SYS26 is the maximum obtainable Ejector Retract pressure.

9. Enter this observed maximum Ejector Retract pressure (from SYS26) into ERC42 (Pro-Set 600 address N45:98), the Maximum Ejector Retract Pressure Control Limit.

10. While maintaining this maximum Ejector Retract pressure, observe the actual valve set-output value in the System Status Block (SYS41-SYS44, Pro-Set 600 addresses N41:193-N41:196) that corresponds to your selected Ejector Retract pressure valve. Copy this value into ERC44 (Pro-Set 600 address N45:100), the Selected Ejector Retract Pressure Valve Output for Maximum.

11. Disable set-output by transitioning DYC01-B08 (Pro-Set 600 address B35/392) from a 1 to a 0.

12. Download your changes to the QDC module (refer to chapter 4 for detailed instructions).

Test Your Ejector Pressure Valve(s) for Linearity

1. Select pressure setpoints for Ejector Advance and Ejector Retract that are typical of the pressures you would run during normal machine operation. Enter these setpoints into EPC10 and EPC34 (Pro-Set 600 addresses N45:126 and N45:150).

2. Download changes to the QDC module (refer to chapter 4 for detailed instructions).

3. Jog your ejector to the fully retracted position.

4. Enable the Ejector Profile (DYC02-B14, Pro-Set 600 address B35/414). The ejector should move through its advance and retract stroke. If no motion is observed, check the following:

- Verify that none of your clamp or ejector overtravel alarms are set. The QDC module inhibits ejector profiles if SYS07-B00 through SYS07-B05 are set
- Verify that no programming error codes exist in SYS61 and SYS62

5. Upon completion of the Ejector Profile, observe the pressures reported back for Ejector Advance and Ejector Retract segment 1 (EPS10, Pro-Set 600 address N45:182, and EPS34, Pro-Set 600 address N45:206). If the observed pressures are not approximately equal to the setpoints entered in EPC10 and EPC34, then check:

- Was your valve and solenoid alignment the same for Ejector profile execution and Ejector action in set-output?

If the observed pressures (EPS10 and EPS34) are still not representative of the setpoints (within 20% of EPC10 and EPC34), your pressure valve is not linear over the desired range of operation.

If:	And Your Selected Valve is:	Then:
EPS10 was less than EPC10	Direct Acting	Increase EAC44 by 5%
	Reverse Acting	Decrease EAC44 5%
EPS10 was more than EPC10	Direct Acting	Decrease EAC44 5%
	Reverse Acting	Increase EAC44 by 5%
EPS34 was less than EPC34	Direct Acting	Increase ERC44 by 5%
	Reverse Acting	Decrease ERC44 5%
EPS34 was more than EPC34	Direct Acting	Decrease ERC44 5%
	Reverse Acting	Increase ERC44 by 5%

Repeat steps 2 through 5 as necessary.

What You Have Accomplished
The valve spanning procedure you just completed has:

- defined the range of pressure available during any ejector profile
- informed the QDC module of the signal level needed to drive the selected ejector pressure valve(s) for any requested open-loop pressure:

% of Signal Level Entered In:	Drives the Selected Valve to Produce:
EAC43 and ERC43	Pressure (usually 0) in EAC41 and ERC41
EAC44 and ERC44	Pressure in EAC42 and ERC42

Now, for all open-loop pressure-controlled ejector profiles, the QDC module:

- drives the selected ejector pressure valve between the signal limits imposed by EAC43 and EAC44, or ERC43 and ERC44
- assumes a linear relationship between ejector pressure and the signal outputs

Set Pressure Alarm Setpoints

After spanning your Ejector pressure valve(s), set your Ejector Profile maximum pressure alarm EAC57 equal to a value you feel should not occur during either Ejector Advance or Ejector Retract. Make sure this value is not greater than the Ejector Advance and Ejector Retract Maximum Pressure Control Limits (EAC42, ERC42). Entering a value of 0 disables this alarm.

Download changes to the QDC module. If necessary, refer to the Download Procedure in chapter 4.

Span Your Ejector Velocity (Flow) Valve(s)

We recommend that you next span your ejector velocity (flow) valve(s). Do this in three parts:

- Revise/confirm critical values for velocity valve spanning
- Span your ejector velocity (flow) valve(s)
- Test your values

Important: Many injection molding machine OEMs and hydraulic valve manufacturers provide data regarding valve spanning (working range) for a particular valve on their machine. If valve spanning information is available from your OEM for your machine's flow valve during ejector operations, enter the values into EAC45-EAC48 and ERC45-ERC48, and proceed to chapter 10.

Revise/Confirm Critical Values

Over the last two chapters you entered values into configuration blocks and profile blocks necessary to run ejector profiles in open-loop. At this time, review the current values of the critical settings identified below. New parameters which need to be set are also identified. **Maintain the same configuration and profile values entered over the last two chapters unless directed to do so otherwise in this chapter.**

Verify that all entries made from the previous two chapters are correct. For the Ejector Profile, your current configuration should:

- Disable Expert Response Compensation (EPC04)
- Select Inches (mm)/second as the Velocity Units (EPC03)
- Identify the selected velocity control valve(s) (EAC02, ERC02)
- Identify Unselected Valve Set-output Values (EAC09-12, ERC09-12)
- Enable Open-loop Control (EPC04)
- Disable all ramping with 0 as ramp accel and decel setpoints (EAC17-20, ERC17-20 for accel, EAC25-28, ERC25-28 for decel)
- Identify velocity control limits (EAC45-46, ERC45-46) and corresponding min and max outputs (EAC47-48, ERC47-48).
- Identify all end-of segment position setpoints (EPC11, EPC14, EPC23, EPC29, EPC35, EPC38)
- Identify Ejector Advanced Position Setpoint (EPC59)
- Identify Ejector Retracted Position Setpoint (EPC60)
- Enable Ejectors to start on command (EPC03-B08 = 1 and EPC03-B09 = 0)

If current settings do not match our recommended values from previous chapters, we suggest you correct these values now using the download procedure discussed in chapter 4.

Span Your Ejector Velocity Valve(s)

1. Obtain a copy of the flow rate curves provided by your flow valve manufacturer. The flow rate curves graphically illustrate the flow through a valve at different voltage or input current levels and at different pressure drops across the valve's spool.

2. From the above curves, determine the minimum and maximum ejector advance and ejector retract flows available from your flow valve at the pressure you would normally run during ejector operation. Record these flows, along with the input voltages/current associated with them.

3. Convert the min and max flows obtained from your flow curve to clamp cylinder velocities. This is done by:

$$\text{Clamp Cylinder Velocity (in/sec)} = \frac{\text{Flow (in}^3\text{/sec)}}{\text{Area (in}^2\text{)}}$$

- where area is the inside diameter of the cylinder. This area may be different for the rod and piston ends of the cylinder:

$$\text{Area (no Rod)} = \pi \left(\frac{\text{I.D. of cylinder}}{2}\right)^2$$

$$\text{Area for Rod End} = \pi \left(\frac{\text{I.D. of cylinder}}{2}\right)^2 - \pi \left(\frac{\text{Rod diameter}}{2}\right)^2$$

- The flow assumes no restrictions on the exhaust port of the cylinder.

4. Enter the minimum velocities (usually 0) from the above calculation into EAC45 and ERC45. Enter the maximum velocities into EAC46 and ERC46.

5. Divide the voltage/current corresponding to minimum velocities by the full range of the ejector valve(s) input level to determine the percent signal outputs for minimum. Enter these values into EAC47 and ERC47.

6. Divide the voltage/current corresponding to maximum velocities by the full range of the ejector valve(s) input level to determine the percent signal outputs for maximum. Enter these values into EAC48 and ERC48.

7. Download changes to the QDC module (refer to chapter 4 for detailed instructions).

Test Your Ejector Velocity Valve(s) for Linearity

1. Select velocity vs. position control for the Ejector profile by EPC03-B00 = 0 (Pro-Set 600 address B39/160).

2. Select velocity setpoints for Ejector Advance and Ejector Retract that are typical of the velocities you would run during normal machine operation. Enter these setpoints into EPC09 and EPC33 (Pro-Set 600 addresses N45:125 and N45:149).

3. Download changes to the QDC module (refer to chapter 4 for detailed instructions).

4. Jog your ejector to the fully retracted position.

5. Enable the Ejector profile (DYC02-B14, Pro-Set 600 address B35/414). The ejector should move through its advance and retract stroke. If no motion is observed, check the following:

- Verify that none of your clamp or ejector overtravel alarms are set. The QDC module inhibits ejector profiles if SYS07-B00 through SYS07-B05 are set
- Verify that no programming error codes exist in SYS61 and SYS62

6. Upon completion of the Ejector profile, observe the velocities reported back for Ejector Advance and Ejector Retract segments 1 (EPS09, Pro-Set 600 address N45:181, and EPS33, Pro-Set 600 address N45:205). These velocities should be relatively close to the setpoints you entered in EPC09 and EPC33 (Pro-Set 600 addresses N45:125, N45:149). If the oberved velocities are not within 25% of the setpoints:

- Verify you chose the correct values from your flow rate curves supplied by your flow valve manufacturer
- Verify your calculations

If the actual velocities are still not representative of your setpoints, your flow valve is not linear over the range of your setpoints.

If:	And Your Selected Valve is:	Then:
EPS09 was less than EPC09	Direct Acting	Increase EAC48 by 5%
	Reverse Acting	Decrease EAC48 5%
EPS09 was more than EPC09	Direct Acting	Decrease EAC48 5%
	Reverse Acting	Increase EAC48 by 5%
EPS33 was less than EPC33	Direct Acting	Increase ERC48 by 5%
	Reverse Acting	Decrease ERC48 5%
EPS33 was more than EPC33	Direct Acting	Decrease ERC48 5%
	Reverse Acting	Increase ERC48 by 5%

Repeat steps 3 through 6 as necessary.

What You Have Accomplished

The valve spanning procedure you just completed has:

- defined the range of velocity available during any ejector profile
- informed the QDC module of the signal level needed to drive the selected ejector velocity valve(s) for any requested open-loop velocity:

% of Signal Level Entered In:	Drives the Selected Valve to Produce:
EAC47 and ERC47	Velocity (usually 0) in EAC45 and ERC45
EAC48 and ERC48	Pressure in EAC46 and ERC46

Now, for all open-loop, velocity-controlled ejector profiles, the QDC module:

- drives the selected ejector velocity valve between the signal limits imposed by EAC47 and EAC48, or ERC47 and ERC48
- assumes a linear relationship between ejector speed and the signal outputs

Chapter 10

Tune Your Machine

Chapter Objectives

In the previous chapter, rough open loop profiles were run as part of the valve spanning process. This chapter presents guidelines to assist you in refining your configuration and profile block values to optimize machine performance for actual production runs.

In this chapter, we address closed-loop tuning considerations as well as profile block and configuration block parameters whose set-up and configuration require specific considerations not mentioned previously in this manual or in Section 3 of the Plastic Molding Module Reference Manual (pub. no. 1771-6.5.88). More information on the parameters discussed in this chapter may be found in chapters 7 through 9 of this manual and in Sections 1 and 3 of the Plastic Molding Module Reference Manual.

Important: Make sure you consider the impact of all configuration block and profile block parameters (not just those addressed in this chapter) before running parts on your plastic molding machine.

Chapter Assumptions

Most molders share common clamp and ejector movement objectives which are outlined below. Guidelines and recommendations for various configuration and profile block parameters are presented in this chapter with these objectives in mind.

Clamp Control Objectives

Most molders share the following objectives when tuning their clamp operation and setting up parts for various molds. These objectives apply to both toggle and hydraulic machines.

- **Repeatable mold full open position**. The advent of automated part removal from mold cavities has made repeatable mold full open positioning a process necessity.
- **Precise pressure control during Low Pressure Close**. This precise control is necessary to detect obstructions to full mold closure and to prevent mold damage. Recent advances in control technology now allow this function to be performed utilizing closed-loop algorithms so as not to rely completely on hydraulic components and circuit design.

- **High speed clamp operation**. Molders wish to achieve minimal machine cycle time while achieving repeatable mold positioning and precise Low Pressure Close control.
- **Smooth clamp operation**. Jerky, abrupt clamp movements can cause damage to clamp mechanisms as well as accelerate wear on machine hydraulics.

Ejector Control Objectives

Most molders share the following objectives when tuning their ejector operation:

- **High certainty of parts ejection**. Parts which are not automatically and completely ejected can cause machine downtime and equipment damage.
- **Part quality protection**. Care must be taken not to damage the parts when ejecting them from the mold cavities.
- **Repeatable ejection position**. The advent of automated part removal from mold cavities has made repeatable ejector advance positioning a process necessity.
- **High speed ejector operation while meeting the above objectives**. Molders wish to achieve minimal machine cycle time while insuring part quality, achieving repeatable ejector advance positioning, and positive part ejection.

Open-loop or Closed-loop?

In previous chapters, all profile execution has been accomplished with the QDC control algorithms disabled (open-loop). Most finished parts run much more consistently if the QDC module is allowed to operate the Clamp and Ejector Profiles using closed-loop control.

Important: With few exceptions, all profiles should be executed utilizing closed-loop control when running actual machine production.

Use Open-Loop control when:

- spanning valves and trouble-shooting machine performance
- pressure sensors are not available to use as feedback when running pressure controlled profiles

Use Closed-Loop control when:

- repeatable clamp and ejector performance is required

What to do Next

The remainder of this chapter is presented in two major sections:

- In Closed-loop Tuning we discuss the use and effect of the QDC module's closed-loop tuning constants and present a procedural discussion on how to determine their proper settings for your plastic molding process. If your application does not require operating in closed-loop, you do not need to refer to this section, and may proceed to the section entitled Other Tuning Considerations.
- In Other Tuning Considerations we discuss the use and effect of many of the other QDC module setpoint parameters. This section is presented in a "discussion" format rather than a procedural format similar to previous chapters. The discussions in this section assume familiarity with conventions, terminologies, and procedures used in the Injection Molding Industry and previously in this User's Manual.

If you Need Information on:	Reference:
Downloading modified parameter values from your PLC processor to your QDC module	Chapter 4
Definitions of configuration block parameters	Chapter 7 PMMRM Section 1 PMMRM Section 3
Definitions of profile block parameters	Chapter 8 PMMRM Section 1 PMMRM Section 3
PLC data table cross reference to QDC command and status block words	PMMRM Section 1

Tune in Closed-loop Mode

Determining appropriate tuning constants for your closed-loop clamp and ejector movements is essential to ensure smooth, repeatable operation. Because of the type of dynamic loads present when cycling an injection molding clamp mechanism, tuning constants large enough to achieve strict adherence to profile pressure and velocity setpoints are not always desirable.

Important: When altering the profile (stroke) tuning constants for closed-loop clamp and ejector control, the user should strive to utilize the lowest possible settings that yield repeatable, high speed clamp and ejector cycles.

In chapter 7 of this manual, you entered our recommended closed-loop tuning constants into the configuration blocks. These values are normally sufficient to produce the desired clamp and ejector performance when cycling your machine in closed-loop. If you need to modify the default closed-loop tuning constants, remember the following:

- The QDC module's velocity control and ERC algorithms should not be used if a FeedForward tuning constant is applied to the velocity loop

Important: Never use FeedForward and ERC conjunctively to control the same velocity loop.

- The QDC module's pressure control algorithm differs from classic PID algorithms. For this reason, the loop integral term should generally be larger than the loop proportional term upon completion of the tuning process.
- Disable ramping and ERC during tuning procedures.
- Reset the QDC module's internal ERC values before attempting to modify closed-loop profile (stroke) tuning constants.

ERC values for all clamp and ejector profiles may be reset by accessing the data table in your PLC processor and setting DYC05-B15 (Pro-Set 600 address B35/463) equal to "1". The bit is reset to "0" after the ERC reset has been accomplished.

Tuning constants differ not only between clamp and ejector profiles, but also between profiles (strokes) with different directions of travel. The dynamics of the loads being moved, as well as the differing hydraulic characteristics of the circuits in forward and reverse directions, warrant separate tuning considerations for all profiles (strokes).

Tune Closed-loop Pressure Control

Important: Only those clamp and ejector profiles which you run using closed-loop pressure vs. position control require pressure loop tuning (for example, Low Pressure Close should be tuned per the discussion below). If you never run a profile under closed-loop pressure control (you are utilizing velocity control instead), pressure tuning constants do not need to be adjusted.

While full PID control is available for both clamp and ejector pressure control algorithms, the majority of applications require only proportional and integral control.

Important: In most cases, adding a derivative term to the QDC module's pressure control algorithms makes the control too sensitive and does not enhance the loop stability.

When tuning QDC pressure vs. position loops, we recommend first tuning your proportional gain, and then adding an integral term. Tuning any loop is greatly simplified when an oscilloscope is available to connect to your module's output driving the selected valve.

We assume the same objective in tuning a pressure loop utilizing a scope as without it. Maximum control is desired without introducing so much gain that the machine hydraulics hammer and wear.

If an oscilloscope is available, connect it to your selected clamp (ejector) pressure control valve at this time and proceed to the section in this chapter on Tuning pressure loops with an oscilloscope.

Tune pressure loops without an oscilloscope

Before you begin tuning your pressure loops, confirm the following:

- Pressure vs. position is selected
- Closed-loop is selected
- ERC is disabled
- ERC values have been reset
- Ramping is disabled
- All setpoint changes have been download to the QDC module

ATTENTION: Prior to running clamp profiles, refer to chapter 8 to verify that the appropriate Low Pressure Close Zone Overrun or Open Slow Zone Overrun setpoints and bit selections are entered properly and downloaded to the QDC module. Do this to minimize the possibility of mold or machine damage.

Enter an operational profile representative of the movement characteristics you desire for your production cycle. Zero the appropriate integral and derivative term(s) associated with the profile(s), leaving the proportional term(s) at the default settings you entered in chapter 7.

Run several cycles of the profile(s) while observing the profile actuals returned in the appropriate status block. Also pay attention to the hydraulic hoses leading to the cylinder being controlled (noting abnormal flexing or pulsing).

If:	Then:
Observed actuals are consistently well below profile setpoints	Increase proportional term(s)
Observed actuals are consistently well above profile setpoints	Decrease proportional term(s)
Excessive hammering and vibration is observed in the cylinder's hydraulic lines	Decrease proportional term(s)

Important: Each change to a tuning constant requires you to download your changes to the QDC module. Refer to the Download Procedure outlined in chapter 4.

Repeat the profile(s) cycles after each change to the proportional term(s) until observed actuals are close to setpoints without hammering and vibration in the controlling cylinder's hydraulic lines.

Without modifying the proportional term(s) determined by the above procedure, slowly begin increasing the appropriate integral term(s) while running machine cycles until the observed profile pressure actuals are overshooting the profile setpoints. Now decrease the integral term(s) until the overshoot is no longer observed.

If you cannot make your observed pressures actuals match your entered setpoints, verify your Unselected Valve Set-output Values are correct for your application (Refer to chapter 7 and the discussion later in this chapter).

Tune Pressure Loops with an Oscilloscope

Before you begin tuning your pressure loops, confirm the following:

- Pressure vs. position is selected
- Closed-loop is selected
- ERC is disabled
- ERC values have been reset
- Ramping is disabled
- All setpoint changes have been download to the QDC module

ATTENTION: Prior to running clamp profiles, refer to chapter 8 to verify that the appropriate Low Pressure Close Zone Overrun or Open Slow Zone Overrun setpoints and bit selections are entered properly and downloaded to the QDC module. Do this to minimize the possibility of mold or machine damage.

Enter an operational profile representative of the movement characteristics you desire for your production cycle. Zero the appropriate integral and derivative term(s) associated with the profile(s), leaving the proportional term(s) at the default settings you entered in chapter 7.

Run several cycles of the profile(s) while observing the oscilloscope trace.

Ideally, for each step of a multi-stepped profile, the oscilloscope trace rises (or falls) quickly to a controlled level and then "flattens out". "Bounce" or "chatter" when rising (or falling) is undesirable.

If:	Then:
Your scope trace for any given profile step never levels off (it is either rising or falling for the entire step)	Increase proportional term(s)
Your scope trace for any given profile step rises (or falls) quickly and then "bounces" or "chatters" around a voltage/current	Decrease proportional term(s)
Excessive hammering and vibration is observed in the cylinder's hydraulic lines	Decrease proportional term(s)

Important: Each change to a tuning constant requires you to download your changes to the QDC module. Refer to the Download Procedure outlined in chapter 4.

Repeat the profile(s) cycles after each change to the proportional term(s) until observed oscilloscope traces quickly level off without any bouncing or chattering.

Without modifying the proportional term(s) determined by the above procedure, slowly begin increasing the appropriate integral term(s) while running machine cycles until significant "overshoots" are observed on the oscilloscope trace. Now decrease the integral term(s) until the overshoot is no longer observed.

If you cannot alter your proportional and integral term(s) such that observed oscilloscope traces quickly level off without any bouncing or chattering, verify your Unselected Valve Set-output Values are correct for your application (Refer to chapter 7 and the discussion later in this chapter).

Tune Closed-loop Velocity Control

Important: Only those clamp and ejector profiles which you run using closed-loop velocity vs. position control require velocity loop tuning. If you never run a profile under closed-loop velocity control (you are utilizing pressure control instead), velocity tuning constants do not need to be adjusted.

While full proportional and feedforward control is available for both clamp and ejector velocity control algorithms, the majority of applications require only proportional control with the feedforward term left at zero.

Important: In many cases, adding a feedforward term to the QDC module's velocity control algorithms makes the control too sensitive and does not enhance the loop stability.

When tuning QDC velocity vs. position loops, we recommend first tuning your proportional gain, and then adding feedforward only if it is required. Tuning any loop is greatly simplified when an oscilloscope is available to connect to your module's output driving the selected valve.

We assume the same objective in tuning a velocity loop utilizing a scope as without it. Maximum control is desired without introducing so much gain that the machine hydraulics hammer and wear.

If an oscilloscope is available, connect it to your selected clamp (ejector) velocity control valve at this time, and proceed to the section in this chapter on Tuning velocity loops with an oscilloscope.

Tune Velocity Loops without an Oscilloscope

Before you begin tuning your velocity loops, confirm the following:

- Velocity vs. position is selected
- Closed-loop is selected
- ERC is disabled
- ERC values have been reset
- Ramping is disabled
- All setpoint changes have been download to the QDC module

ATTENTION: Prior to running clamp profiles, refer to chapter 8 to verify that the appropriate Low Pressure Close Zone Overrun or Open Slow Zone Overrun setpoints and bit selections are entered properly and downloaded to the QDC module. Do this to minimize the possibility of mold or machine damage.

Enter an operational profile representative of the movement characteristics you desire for your production cycle. Zero the appropriate velocity feedforward term(s) associated with the profile(s), leaving the proportional term(s) at the default settings you entered in chapter 7.

Run several cycles of the profile(s) while observing the profile actuals returned in the appropriate status block. Also pay attention to the hydraulic hoses leading to the cylinder being controlled.

If:	Then:
Observed actuals are consistently well below profile setpoints	Increase proportional term(s)
Observed actuals are consistently well above profile setpoints	Decrease proportional term(s)
Excessive hammering and vibration is observed in the cylinder's hydraulic lines	Decrease proportional term(s)

Important: Each change to a tuning constant requires you to download your changes to the QDC module. Refer to the Download Procedure outlined in chapter 4.

Repeat the profile(s) cycles after each change to the proportional term(s) until observed actuals are close to setpoints without hammering and vibration in the controlling cylinder's hydraulic lines.

If you cannot make your observed velocity actuals match your entered setpoints, verify your Unselected Valve Set-output Values are correct for your application (Refer to chapter 7 and the discussion later in this chapter).

If you are satisfied with your Unselected Valve Set-output Values and still cannot match your observed velocities to the desired setpoints, your control may require a small feedforward gain. Without modifying the proportional term(s) determined by the above procedure, slowly begin increasing the appropriate velocity feedforward term(s) while running machine cycles until the observed profile velocity actuals are satisfactorily close to the entered setpoints.

Important: Do not enable ERC if you must use velocity feedforward gain(s) to adequately tune your velocity profile(s).

Tune velocity loops with an oscilloscope

Before you begin tuning your velocity loops, confirm the following:

- Velocity vs. position is selected
- Closed-loop is selected
- ERC is disabled
- ERC values have been reset
- Ramping is disabled
- All setpoint changes have been download to the QDC module

ATTENTION: Prior to running clamp profiles, refer to chapter 8 to verify that the appropriate Low Pressure Close Zone Overrun or Open Slow Zone Overrun setpoints and bit selections are entered properly and downloaded to the QDC module. Do this to minimize the possibility of mold or machine damage.

Enter an operational profile representative of the movement characteristics you desire for your production cycle. Zero the appropriate velocity feedforward term(s) associated with the profile(s), leaving the proportional term(s) at the default settings you entered in chapter 7.

Run several cycles of the profile(s) while observing the oscilloscope trace.

Ideally, for each step of a multi-stepped profile, the oscilloscope trace rises (or falls) quickly to a controlled level and then "flattens out". "Bounce" or "chatter" when rising (or falling) is undesirable.

If:	Then:
Your scope trace for any given profile step never levels off (it is either rising or falling for the entire step)	Increase proportional term(s)
Your scope trace for any given profile step rises (or falls) quickly and then "bounces" or "chatters" around a voltage/current	Decrease proportional term(s)
Excessive hammering and vibration is observed in the cylinder's hydraulic lines	Decrease proportional term(s)

Important: Each change to a tuning constant requires you to download your changes to the QDC module. Refer to the Download Procedure outlined in chapter 4.

Repeat the profile(s) cycles after each change to the proportional term(s) until observed oscilloscope traces quickly level off without any bouncing or chattering.

If you cannot alter your velocity proportional term(s) such that observed oscilloscope traces quickly level off without any bouncing or chattering, verify your Unselected Valve Set-output Values are correct for your application (Refer to chapter 7 and the discussion later in this chapter).

If you are satisfied with your Unselected Valve Set-output Values and still cannot get the observed oscilloscope traces to quickly level off without any bouncing or chattering, your control may require a small feedforward gain. Without modifying the proportional term(s) determined by the above procedure, slowly begin increasing the appropriate velocity feedforward term(s) while running machine cycles until the observed oscilloscope traces quickly level off without any bouncing or chattering.

Important: Do not enable ERC if you must use velocity feedforward gain(s) to adequately tune your velocity profile(s).

Other Tuning Considerations

In this section, we discuss the use and effect of many of the QDC module setpoint parameters. This section is presented in a "discussion" format rather than a procedural format similar to previous chapters and sections. The discussions that follow assume familiarity with conventions, terminologies, and procedures used in the Injection Molding Industry and previously in this User's Manual.

ERC Control

In previous chapters, all profile execution has been accomplished with the QDC module's ERC algorithms disabled (off). The QDC module utilizes a proprietary, enhanced control scheme called Expert Response Compensation. Expert Response Compensation (ERC) accounts for changes in your machine dynamics, machine hydraulics, raw materials, and other process variables. Using an exclusive algorithm, ERC adjusts the open-loop and closed-loop control algorithms to counter-balance changes to your process, both abrupt upsets and long term deviations.

Expert Response Compensation should be utilized whenever strict adherence to pressure or velocity profile setpoints is absolutely required during clamp and ejector operation. It is not necessarily required when your primary objective is repeatable, high speed clamp and ejector movement. It typically is not required to achieve repeatable mold full open and ejector full advance positioning when running at any obtainable velocity.

Important: Expert Response Compensation should not be enabled until a control loop is already properly tuned and under control.

Important: When controlling the clamp and ejectors, we do not recommend enabling ERC control unless extreme adherence to velocity or pressure setpoints is absolutely required.

Enable ERC when:

- Strict adherence to velocity or pressure (not position) setpoints is required. One example of when ERC may be of great value is during closed-loop Low Pressure Close control, when it is absolutely undesirable to exceed the pressure setpoint.

Disable ERC when:

- You cannot achieve repeatable clamp and ejector performance.
- Your primary clamp and ejector control objective is repeatable positioning. Without ERC, the QDC module may not be able to “land” the clamp or ejector on precisely the position you programmed; however, it overshoots the programmed position by an absolutely repeatable amount that is relative to cylinder speed and the QDC module’s two millisecond scan time.
- You have not yet tuned the machine to run accurately under closed-loop control.
- Jerky, abrupt clamp motion is observed after enabling ERC control. This usually occurs when ERC has been added to a control loop that has not been properly tuned. The ERC algorithm begins to correct for improper tuning, and incidentally causes the clamp or ejector to run in a rough fashion while the QDC module obtains the desired control.
- When utilizing excessively slow profile (stroke) acceleration or deceleration ramp rates in an attempt to “smooth” the clamp or ejector operation. Ramp rates and ERC do not always function properly together, and care should be taken whenever utilizing both for conjunctive control.

Expert Response Compensation Minimum Percentages

Expert Response Compensation minimum percentages are utilized by the QDC module only when ERC is enabled. Leave these entries at the default values recommended in chapter 7 if you have decided not to enable ERC control. The ERC percentage minimum percentage tells the QDC module to what extent to utilize ERC from machine cycle to cycle. If you require ERC control of your clamp or ejector, consider the following:

If ERC is enabled (on) and:	**Then:**
The actual velocity or pressure reported in the appropriate status block swings wildly around the setpoint from cycle to cycle	Decrease ERC minimum %
The actual velocity or pressure reported in the appropriate status block takes several cycles to achieve the desired setpoint	Increase ERC minimum %

Unselected Valve Set-output Values

In chapter 7 of this manual, guidelines were presented to assist you in determining Unselected Valve Set-output Values (words 09 through 12 in configuration command blocks) prior to spanning your machine valves in chapter 9. The percent signal output values in these words are the signal level sent to all outputs that are not selected to be under control of the QDC module’s algorithm during each respective profile.

You were instructed in chapter 7 to enter values into these words that were representative of the signal output percentages required to drive the unselected valves during the respective profiles. These default values that you selected should be sufficient to allow you to obtain the desired clamp and ejector control. Although different part set-ups and other process considerations may require that you modify your Unselected Valve Set-output Values during a particular profile (stroke), these setpoints normally need adjustment only if you are unable to obtain your desired closed-loop control by modification of the appropriate profile (stroke) tuning constants.

Important: Unselected Valve Set-output Values should be changed only after attempting to achieve desired closed-loop control by adjusting the appropriate profile (stroke) tuning constants.

Important: Large changes to your Unselected Valve Set-output Values may require re-spanning the selected valve for that profile. Reference chapter 9 for detailed valve spanning procedures.

If you believe your Unselected Valve Set-output Values are adversely affecting your ability to obtain quality closed-loop control:

If your Selected valve controls:	And you observe:	Then:
Pressure	Profile segment pressures substantially greater than setpoint	Decrease the flow available during the profile by appropriately modifying the set-output value driving the flow valve.
Pressure	Profile segment pressures substantially less than setpoint	Increase the flow available during the profile by appropriately modifying the set-output value driving the flow valve.
Velocity	Profile segment velocities substantially greater than setpoint	Decrease the pressure available during the profile by appropriately modifying the set-output value driving the pressure valve.
Velocity	Profile segment velocities substantially less than setpoint	Increase the flow available during the profile by appropriately modifying the set-output value driving the pressure valve.

Logical Bridging and End-of Profile (Stroke) Set-output Values

The default configurations entered in chapter 8 instructed you to “logically bridge” all of your clamp profiles. This had the effect of forcing your QDC module to run each successive profile upon completion of the previous in each direction of movement.

If required by your application, you may configure your QDC module to “stop” upon completion of any profile (stroke) and provide fixed, defined signals to each of its four outputs while awaiting further commands from your PLC processor. Disabling logical bridges and configuring End-of Profile (Stroke) Set-output Values allow you to apply voltages (currents) at each of the outputs after successful completion of any profile (stroke). Recall in chapter 9 that we used End-of Low Pressure Close Set-output Values to achieve tonnage on hydraulic clamps and holding pressure on toggle clamps.

End-of Profile (Stroke) Set-output Values have many potential uses. Among them:

- Setting cores between clamp close profiles
- Pulling cores between clamp open profiles
- Third plate drop-off and pick-up
- Building tonnage/holding pressure on the clamp prior to injection

- Decreasing available ejector circuit volume after your clamp is fully open
- Adjusting flow through a variable pump after clamp operations are complete
- Configuring your ejector hydraulic circuit to a “rest” or “pre-load” state prior to switching directional valves through the PLC processor and continuing the Ejector Profile

When configuring End-of Profile (Stroke) Set-output Values, remember:

- The QDC module ignores End-of Profile (Stroke) Set-output Values on all profiles (strokes) that are “bridged” to the next logical profile (stroke)
- After the QDC module outputs End-of Profile (Stroke) Set-output Values, these outputs remain in effect until the QDC module is commanded to initiate another movement, or until the “stop” command is asserted

Acceleration and Deceleration Ramp Rates

The default (zero) ramp rate values entered in chapter 7 disabled the QDC module’s ramping capabilities. This had the effect of forcing your QDC module to “step” from setpoint to setpoint during each profile (stroke).

If required by your application, you may configure your QDC module to ramp its outputs during any profile (stroke). The QDC module uses configured acceleration and deceleration ramp rates when moving all of its outputs from setpoint to setpoint during (not prior to) execution of any profile (stroke).

ATTENTION: The QDC ramp rates are not affected until the QDC module is actually executing the profile with configured ramp rates. **Ramp rates entered into LPC have no effect until the clamp actually enters the Mold Protection Zone.** The QDC ramp rates are time based and use of excessively slow (small setpoint) ramp rates inhibit effective closed-loop control, reduce ERC calculation accuracy, and limit QDC control capability. Use ramps only if machine operation mandates.

Figure 10.1
Example Clamp Close Profiles with Acc/Dec ramps

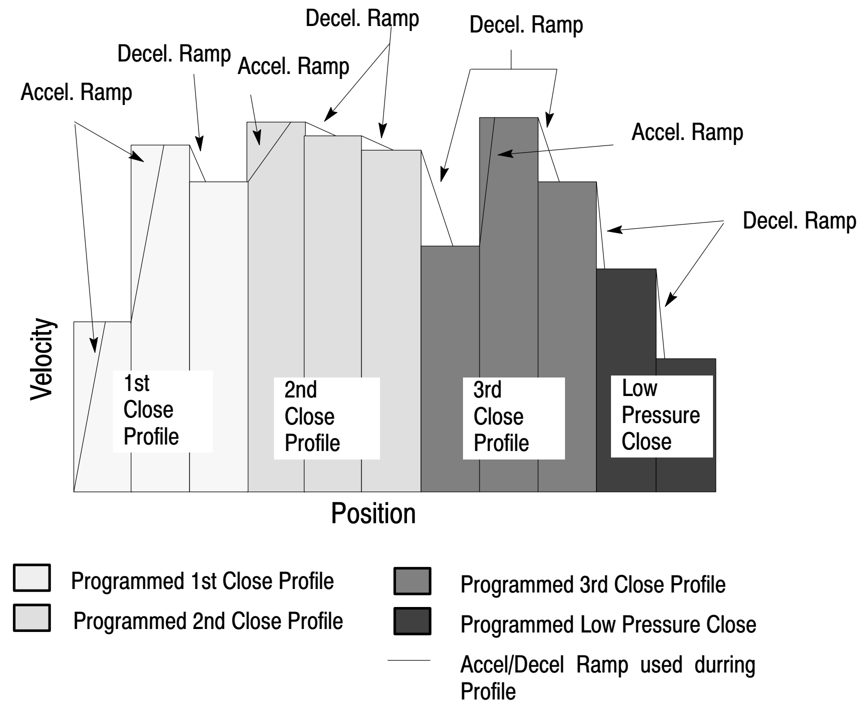
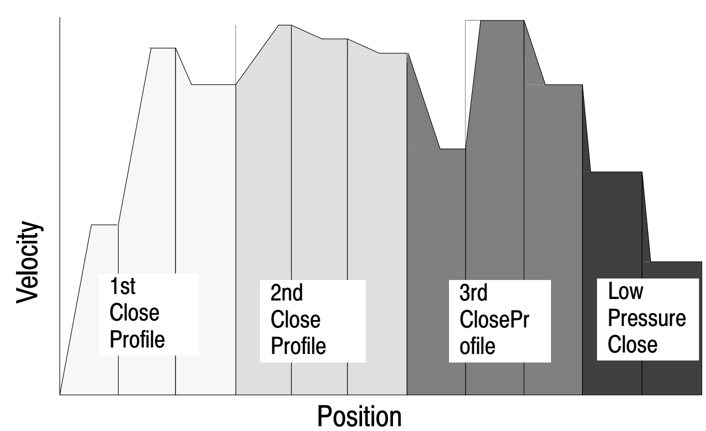


Figure 10.2
Actual Velocity Setpoint Profile when above Acc/Dec ramps are used



You can configure clamp and ejector ramp rates in order to:

- Smooth out jerky motion present during large increases or decreases in clamp/ejector pressure or flow
- Decelerate the clamp during a close profile **prior to** Low Pressure Close. This may prevent possible mold or machinery damage or excessive wear when your application requires moving toward the Mold Protection Zone at relatively high velocities during the clamp close operation.
- Decelerate the clamp during an open profile **prior to** Open Slow. This may enhance your full open position repeatability when your application requires moving toward the Open Slow Zone at relatively high velocities during the clamp open operation.

If your application requires the use of ramp rates, remember:

- Ramp rates should never be applied until you have already tuned all applicable clamp and ejector pressure and velocity loops.
- Ramp rates can be applied to both selected and unselected valves. Therefore, even though you may be controlling velocity, you can ramp clamp pressure during a close profile **prior to** executing Low Pressure Close.
- Ramp rates and ERC do not always function properly together, and care should be taken whenever utilizing both for conjunctive control.
- Use of slow ramp rates may make the pressure and velocity actuals returned to the appropriate status blocks appear to be out of control, since the actuals reported back per profile segment include the time spent ramping up/down from the old valve signal to the desired new signal level.
- The QDC module uses a respective profiles ramp rates upon entry into profile execution as well as when stepping from segment to segment in that profile. As an example, Second Clamp Close ramp rates are utilized after completion of First Clamp Close when transitioning to the first segment setpoint in Second Clamp Close, and when transitioning from segment to segment within Second Clamp Close.
- QDC ramp rates are entered in units of 0 to 9999% signal output per second (note that there is no decimal point). A ramp rate entry of 9999 allows the output to move “full range” in 10 milliseconds, while a ramp rate entry of 99 forces the QDC module to consume a full second if it is required to “full stroke” an output.

End-of Segment Position Setpoints

End-of Segment Position Setpoints are dictated by the particular mold, clamp, and ejector configuration on your plastic molding machine. In general:

You are not required to enter any clamp or ejector End-of Segment Position Setpoints. If your profile setpoint entries are configured without End-of Segment Position Setpoints, the following are observed during all clamp and ejector movements.

- "Execute First Clamp Close" commands received by the QDC module cause the module to immediately begin execution of the profile using any non-zero entry in CPC09 (velocity) or CPC10 (pressure) as the profile setpoint. First close motion continues until the clamp reaches the protective Start Low Pressure Close Position (CPC61). At that time the QDC module either stops and zeroes outputs (CPC03-B11 = 1), or begins execution of the Low Pressure Close Profile (CPC03-B11 = 0) continuing to the configured Mold Safe Position (CPC62)

- "Execute First Clamp Open" commands received by the QDC module cause the module to immediately begin execution of the profile using any non-zero entry in OPC09 (velocity) or OPC10 (pressure) as the profile setpoint. First open motion continues until the clamp reaches the protective Start Open Slow Position (OPC61). At that time, the QDC module either stops and zeroes outputs (OPC03-B11 = 1), or begins execution of the Open Slow Profile (OPC03-B11 = 0) continuing to the configured Mold Fully Open Position (OPC62)

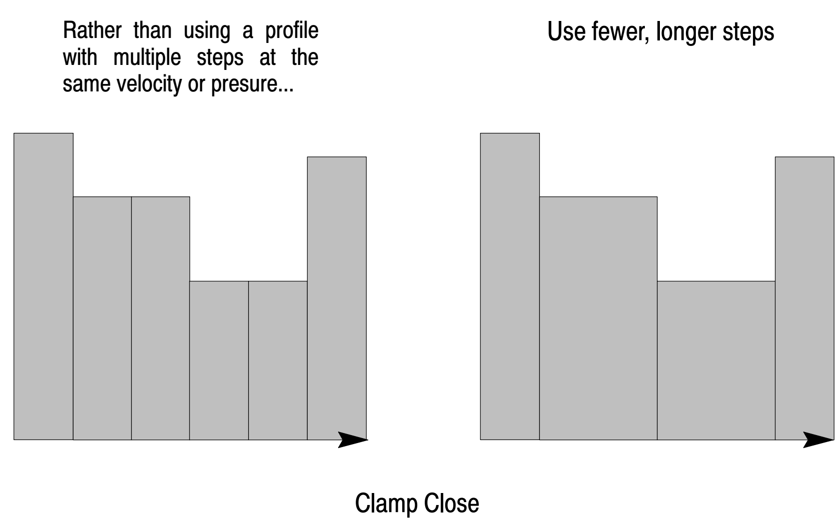
- "Execute Ejector Profile" commands received by the QDC module cause the module to immediately begin execution of Ejector Advance using the value in EPC09 (velocity) or EPC10 (pressure) as the profile setpoint, and continuing to the configured Ejector Fully Advanced Position (EPC59). If logically bridged to Ejector Retract, the module then begins execution of Ejector Retract using the value in EPC33 (velocity) or EPC34 (pressure) as the profile setpoint, and continuing to the configured Ejector Fully Retracted Position (EPC60)

During normal operation, the only required Clamp End-of Segment Position Setpoints are a single End-of-Segment Position Setpoint for First Clamp Close to identify the operational Start Low Pressure Close position and a single End-of Segment Position Setpoint for First Clamp Open to identify the operational Start Open Slow position. If additional profile segments are desired (with the same Unselected Valve Set-output Values), begin with the 2nd segment of First Clamp Close for clamp close profiles and the 2nd segment of First Clamp Open for open profiles. Use all of the segments available in First Clamp Close and First Clamp Open before utilizing any in Second and Third (unless you require different Unselected Valve Set-output Values for successive segments).

Realize that any increase in “fast” clamp profile segment velocities or pressures could affect your clamp’s ability to react similarly when it reaches the Start Low Pressure Close or Start Open Slow positions. If you increase a velocity or pressure setpoint in a “fast” clamp close (open) profile, we recommend that you increase (decrease) the Start Low Pressure Close (Open Slow) Position, at least temporarily, to assure a successful Low Pressure Close (Open Slow) and mold closure (opening).

In order to reduce machine cycle time, you do not want to open the clamp any farther than necessary to successfully eject the part(s). Make sure the clamp opens enough to allow full ejector advance.

If you are using the same velocity or pressure setpoints on sequential profile segments, it is better to have a single velocity or pressure segment for that setpoint.



Profile Velocity Setpoints

In general, you choose velocity setpoints to move the clamp as quickly as possible without damaging the machine, mold, or parts. Because of the nature of the large dynamic load on the clamp, configuring the clamp to operate at extremely high speeds should be approached with extreme caution. The moving platen/mold combination, once accelerated to high speeds, is extremely difficult to slow down in a short period of time.

When configuring velocity profiles:

- Start with relatively low velocity setpoints, and....
- Incrementally increase those setpoints while observing clamp motion and repeatability at critical positions in the cycle

Because of the physics involved with inertia and momentum as they apply to the movement of large masses, remember:

- Unless it is a long duration segment, you are consistently below setpoint on the first clamp close/open profile segment. It takes time for the hydraulics to overcome the clamp's inertia and build up adequate pressure and flow to move the clamp at the requested speed.
- Your second and third clamp close/open profiles segments run consistently higher than setpoint when requesting high speeds. Once the mass of the platen/mold combination gains momentum, it is very difficult to decelerate the load to the requested speed.

Low Pressure Close Pressure Setpoints

In general, use Low Pressure Close pressure setpoints that are low enough to allow unplanned obstructions (such as sprues or un-ejected parts) to resist mold closure and halt clamp movement before it reaches the mold safe position. The expiration of the Low Pressure Close watchdog timer can then be used to signal the PLC processor that a mold protection fault has occurred.

Start Clamp Low Pressure Close Position Setpoint (CPC61)

This clamp position is used by the QDC module as protection against running a Clamp Close profile into the Mold Protection Zone. Although it can be used as an operational setpoint when CPC03-B11 = 0 (see discussion of End-of-Segment Position Setpoints above), it is intended for use as an absolute protection position to guard against profile entry errors. This position should be determined and set by qualified personnel, and is therefore not presented on any Pro-Set 600 screens.

Ideally, this position should be calculated by determining:

- With the clamp closing at its maximum configurable velocity and pressure, what minimal distance is required for the QDC module to safely assume pressure control prior to the two mold halves mating.
- By setting this clamp position as stated, you can virtually eliminate the possibility of damaging your mold when clamp close velocity, pressure, or position setpoints are changed.

ATTENTION: On hydraulic (non-toggle) clamp mechanisms, this parameter should be re-adjusted to account for mold thickness each time a different mold is installed.

Start Clamp Open Slow Position Setpoint (OPC61)

This clamp position is used by the QDC module as protection against running a Clamp Open profile into the Open Slow Zone. Although it can be used as an operational setpoint OPC03-B11 = 0 (see discussion of End-of Segment Position Setpoints above), it is intended for use as an absolute protection position to guard against profile entry errors. This position should be determined and set by qualified personnel, and is therefore not presented on any Pro-Set 600 screens.

Ideally, this position should be calculated by determining:

- With the clamp opening at its maximum configurable velocity and pressure, what minimal distance is required for the QDC module to safely assume control prior to the mold reaching the full open position
- By setting this clamp position as stated, you can virtually eliminate the possibility of damaging your clamp mechanism when clamp open velocity, pressure, or position setpoints are changed

This parameter should be re-adjusted each time a different mold is installed.

Ejector Position for Clamp Close Enable (EPC63)

This position is used by the QDC module as protection against initiating (or continuing) any Clamp Close Profile when the ejector is not "safely" retracted. The QDC module requires this parameter to help insure that operator error or ladder logic mistakes cannot initiate a close operation when the ejector is advanced. It also helps protect against the fact that bi-directional proportional flow valves which cannot be "centered", as well as delays in the shifting of directional solenoid valves, sometimes allow the ejector to slightly "float" out after they have been fully retracted.

In chapter 8, you determined the maximum "safe" ejector position for Clamp Close Enable by jogging the ejectors against a fully closed mold.

Important: If ejector tooling or the mold is changed on your machine, the procedure in chapter 8 should be repeated and this value recalculated to assure ejector tooling is not damaged on mold closure.

Clamp Position for Ejector Inhibit (EPC62)

This clamp position is used by the QDC module as protection against initiating (or continuing) any Ejector Profile when the clamp "daylight" is not adequate for full ejector action. Nominally, this clamp position should be equal to:

- The Mold Safe Position (CPC62)

  plus

- The ejector full stroke length (EPC59 minus EPC60)

Important: Tooling and set-up modifications which cause either of these two distances to change require recalculation of this clamp position.

Clamp Position for Start of Ejector Profile (EPC61)

If "start on position" (EPC03-B08 = 0) is selected for ejector profile execution rather than "start on command" (EPC03-B08 = 1), the QDC module immediately begins execution of the Ejector Profile once this position is reached during its execution of any Clamp Open Profile.

Any position greater than EPC62 is satisfactory for this clamp position, and initiating ejector movement before the clamp is fully open has generally become accepted in the industry as a legitimate method to be employed by a molder attempting to reduce his overall machine cycle time.

ATTENTION: If your machine shares hydraulic flow between the clamp and ejector manifolds, operating the two cylinders in tandem decreases the accuracy of the valve spanning parameters determined in chapter 9 and the tuning constants determined earlier in this chapter. In closed-loop mode, the QDC module will attempt to fully open both the ejector and clamp flow valves to maintain velocity setpoints. When the clamp reaches the full open position and full flow is again made available to the ejector, closed loop operation may result in unstable ejector movement. Use extreme caution when operating the clamp and ejector in tandem on machines that share fluid between the two cylinders in closed loop with ERC enabled.

Pressure Alarm Setpoints

The QDC monitors process pressures and compare them against two different types of high pressure alarm setpoints. Pressures are compared to absolute pressure alarm setpoints (configured in the MCC - refer to chapter 4) on a continuous basis and without regard to current machine mode or operational cycle. Pressures are compared to profile pressure alarm setpoints (configured in the respective configuration blocks - refer to chapter 7) only during the execution of the subject profile. In general:

- Use absolute pressure alarms to detect dangerously high pressure conditions. We recommend these alarm setpoints be set well above normal operating levels while still below levels that could result in machinery damage or danger to personnel. Program your PLC ladder logic to stop the QDC module and place the machine in a safe condition if one of these alarms is triggered

- Use profile pressure alarms to detect abnormally high pressure conditions. We recommend these alarm setpoints be set only marginally above the highest pressure expected during any acceptable iteration of the subject profile while still low enough to be indicative of process problems. Program your PLC ladder logic to interrupt the process or signal the machine operator to determine corrective action if one of these alarms is triggered

Profile Watchdog Timer Presets

Set your Profile Watchdog Timer presets after your machine is running repeatable quality parts. Set them only marginally longer than the repetitive duration of the subject profile. Expiration of these timers can then be used as an early alert to operators that a process problem may be developing.

Watchdog time-outs may also be used in your PLC ladder logic to automatically initiate a corrective action. For example, your PLC could monitor the Low Pressure Close profile watchdog and initiate a re-open, re-eject, and close re-try if it times-out during profile execution.

Chapter 11

Troubleshoot with LED's

Chapter Objectives

This chapter gives you information on how to:

- troubleshoot your QDC module using LED indicators
- calibrate your QDC module

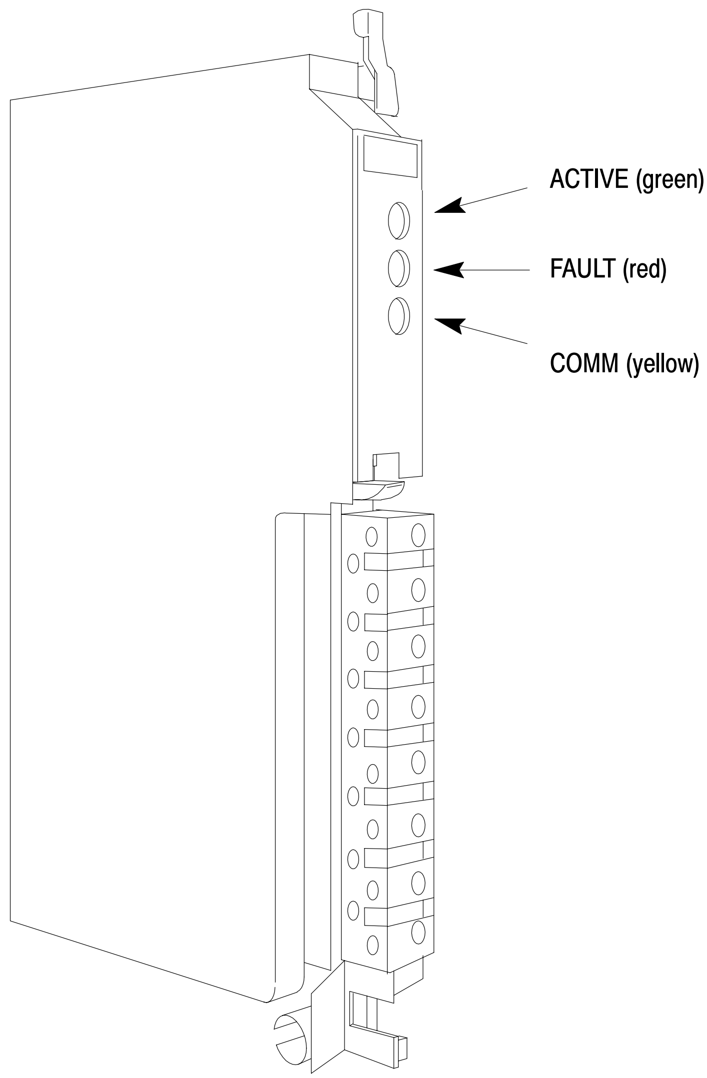
Use LED's to Troubleshoot Your QDC Module

The front panel of the QDC module contains three Light Emitting Diodes (LEDs). These LED's can be used to troubleshoot some basic problems that may occur during integration or operation of the QDC module. Each LED is a different color for easy identification.

Color of LED:	Identified as:
Green	ACTIVE
Red	FAULT
Yellow	COMM

The QDC module's three LED's are located on the front panel of the module as shown on Figure 11.1.

Figure 11.1
QDC Module LED's



The following table shows the meaning of the QDC module's LEDs. The QDC module monitors its own operation and reports detected conditions by illuminating its LED's in the following combinations:

Table 11.A
LED Indicator Conditions

ACTIVE	FAULT	COMM	Condition:	We recommend that you:
Flashing	Off	Off	Power-up. The QDC module has completed its power-up diagnostics, the QDC module hardware and firmware are OK, and the QDC module is awaiting download of the MCC block.	Download the MCC. Pro-Set 600 downloads the MCC when you switch your PLC from program mode to run mode.
Flashing	Red	Yellow	Software Error. The QDC hardware and firmware are OK, the last BTW received by the QDC module had a recognizable Block ID, but the last MCC received by the QDC module contained a programming error.	Use the MCC download procedure in chapter 3 to correct any MCC programming errors.
Flashing	Red	Off	Software Error. The QDC hardware and firmware are OK, but the last BTW received by the QDC module did not have a recognizable Block ID, and the last MCC received by the QDC module contained a programming error.	1) Use the MCC download procedure in chapter 3 to correct any MCC programming errors. 2) Verify Block ID's in your PLC BTW data files.
Flashing	Flashing	Flashing	You put the Run/Calibrate jumper (E1) in the Calibrate position.	Put jumper E1 in the Run position (chapter 2).
Green	Off	Yellow	Normal operation. The QDC hardware and firmware are OK, no programming errors exist, and the last command data block received by the QDC module had a recognizable Block ID.	Nothing.
Green	Off	Off	Software Error. The QDC hardware and firmware are OK, no programming errors exist, but the last command data block received by the QDC module did not have a recognizable Block ID.	Verify Block ID's in your PLC Block transfer write data files.
Green	Red	Yellow	Limited operation. The QDC hardware and firmware are OK, the last command data block received by the QDC module had a recognizable Block ID, but a programming error(s) exists.	Use the download procedure outlined in chapter 4 to determine and correct programming errors.
Green	Red	Off	Software Error. The QDC hardware and firmware are OK, but a programming error(s) exists, and the last command data block received by the QDC module did not have a recognizable Block ID.	1) Use the download procedure in chapter 4 to determine and correct programming errors. 2) Verify Block ID's in your PLC Block transfer write data files.
Off	Off	Flashing	Communications Error. The QDC hardware and firmware are OK, but the module is not completing continuous transmission of status data blocks to the host PLC processor. The QDC module is inoperable until continuous BTR communication is re-established with the host PLC processor.	1) Verify your PLC is in run mode. 2) Reseat your QDC module in the I/O chassis. 3) Check for PLC ladder programming problems.
Off	Red	Yellow or Off	Hardware fault. The QDC module is inoperable.	1) Cycle power to the QDC module. 2) Replace the QDC module and return it for factory repair.

Module Calibration

The QDC module was calibrated at the factory before shipment. We recommend that you re-calibrated it every two years. Use the calibration procedure in the Reference Manual, publication 1771-6.5.88 dated November 1992, or return it to the factory with this order number: 1771-QDC/(Rev Letter) – CAL.

Appendix A

Blank Worksheets

Worksheet 3-A
Selecting Module Parameters

Control Word MCC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B35/bit	543	542	541	540	539	538	537	536	535	534	533	532	531	530	529	528
Value	0	0	0	0	0	0	0	0	0	0				0	0	

Select System Operation with bits 05 and 04
Clamp and Eject 1 0

Select Single-unit Operation with bit 03 = 1
(0 generates a programming error)

Select English = 0 or
metric = 1 with bit 00

Code:

[ ] Your value

[0 or 1] Required initial value loaded by Pro-Set 600

Example: If you select Clamp and Eject operation with English units:
MCC02 = 00000000 00101000

Worksheet 3-B
Selecting Input Ranges for your Sensors

Control Word MCC03-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B34/bit	559	558	557	556	555	554	553	552	551	550	549	548	547	546	545	544
Value	1	1	1	1	1	1	1	1								

Select Input 4 (Clamp Pressure) Range with bits 07, 06
Select Input 3 (Clamp Position) Range with bits 05, 04
Select Input 2 (Ejector Pressure) Range with bits 03, 02
Select Input 1 (Ejector Position) Range with bits 01, 00

Input Range		
0 – 10V dc	0	0
1 – 5V dc	0	1
4 – 20 mA	1	0
Not connected	1	1

Code:

[ ] Your value

[0 or 1] Required initial value loaded by Pro-Set 600

Example: If you select an input range of 4-20mA for all four inputs,
MCC03 = 11111111 10101010.

Worksheet 3-C
Selecting Output Ranges for your Valves

Control Word MCC04-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B35/bit	575	574	573	572	571	570	569	568	567	566	565	564	563	562	561	560
Value	1	1	1	1	1	1	1	1								

Select Output 4 Range with bits 07, 06
Select Output 3 Range with bits 05, 04
Select Output 2 Range with bits 03, 02
Select Output 1 Range with bits 01, 00

Code:

☐	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Output Range
to +10 vdc 0 0
0 to +10 vdc 0 1
4 to 20 mA 1 0
Not connected 1 1
–10

Example: If you select 0-10 vdc for all four output ranges,
MCC04 = 11111111 01010101.

Worksheet 3-D
Determining Initial Sensor-configuration Values

Enter Your Initial Values Here

Input	Control Word	Pro-Set 600 Addr.	Value	Description	Units
1	MCC37	N41:33		Minimum Ejector Position	Ejector Axis Measured from zero [1]
	MCC38	N41:34		Maximum Ejector Position	Ejector Axis Measured from zero [1]
	MCC39	N41:35		Analog Signal @ Min Ejector Position	Input Signal Range [2]
	MCC40	N41:36		Analog Signal @ Max Ejector Position	Input Signal Range [2]
2	MCC45	N41:41		Minimum Ejector Pressure	Ejector Pressure [3]
	MCC46	N41:42		Maximum Ejector Pressure	Ejector Pressure [3]
	MCC47	N41:43		Analog Signal @ Min Ejector Pressure	Input Signal Range [2]
	MCC48	N41:44		Analog Signal @ Max Ejector Pressure	Input Signal Range [2]
3	MCC23	N41:19		Minimum Clamp Position	Clamp Axis Measured from zero [1]
	MCC24	N41:20		Maximum Clamp Position	Clamp Axis Measured from zero [1]
	MCC25	N41:21		Analog Signal @ Min Clamp Position	Input Signal Range [2]
	MCC26	N41.22		Analog Signal @ Max Clamp Position	Input Signal Range [2]
4	MCC31	N41:27		Minimum Clamp Pressure	Clamp Pressure [3]
	MCC32	N41:28		Maximum Clamp Pressure	Clamp Pressure [3]
	MCC33	N41:29		Analog Signal @ Min Clamp Pressure	Input Signal Range [2]
	MCC34	N41:30		Analog Signal @ Max Clamp Pressure	Input Signal Range [2]

[1] Incremental Distance
00.00 to 99.99 Inches
000.0 to 999.9 Millimeters

[2] Input Signal Range
00.00 to 10.00V dc or
01.00 to 05.00V dc or
04.00 to 20.00MADC

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

Worksheet 3-E
Final Sensor-configuration Values

Enter Your Final Sensor-configuration Values Here

Input	Control Word	Pro-Set 600 Addr.	Value	Description	Units
1	MCC37	N41:33		Minimum Ejector Position	Ejector Axis Measured from zero [1]
	MCC38	N41:34		Maximum Ejector Position	Ejector Axis Measured from zero [1]
	MCC39	N41:35		Analog Signal @ Min Ejector Position	Input Signal Range [2]
	MCC40	N41:36		Analog Signal @ Max Ejector Position	Input Signal Range [2]
2	MCC45	N41:41		Minimum Ejector Pressure	Ejector Pressure [3]
	MCC46	N41:42		Maximum Ejector Pressure	Ejector Pressure [3]
	MCC47	N41:43		Analog Signal @ Min Ejector Pressure	Input Signal Range [2]
	MCC48	N41:44		Analog Signal @ Max Ejector Pressure	Input Signal Range [2]
3	MCC23	N41:19		Minimum Clamp Position	Clamp Axis Measured from zero [1]
	MCC24	N41:20		Maximum Clamp Position	Clamp Axis Measured from zero [1]
	MCC25	N41:21		Analog Signal @ Min Clamp Position	Input Signal Range [2]
	MCC26	N41:22		Analog Signal @ Max Clamp Position	Input Signal Range [2]
4	MCC31	N41:27		Minimum Clamp Pressure	Clamp Pressure [3]
	MCC32	N41:28		Maximum Clamp Pressure	Clamp Pressure [3]
	MCC33	N41:29		Analog Signal @ Min Clamp Pressure	Input Signal Range [2]
	MCC34	N41:30		Analog Signal @ Max Clamp Pressure	Input Signal Range [2]

[1] Incremental Distance
00.00 to 99.99 Inches
000.0 to 999.9 Millimeters

[2] Input Signal Range
00.00 to 10.00V dc or
01.00 to 05.00V dc or
04.00 to 20.00MADC

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

Worksheet 3-F
SWTL Configuration Values

Enter Your SWTL Configuration Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
MCC27	N41:23		Clamp Minimum SWTL	Clamp Axis Measured from zero [1]
MCC28	N41:24		Clamp Maximum SWTL	Clamp Axis Measured from zero [1]
MCC29	N41:25		Clamp SWTL Deadband	As noted [1]
MCC41	N41:37		Ejector Minimum SWTL	Ejector Axis Measured from zero [1]
MCC42	N41:38		Ejector Maximum SWTL	Ejector Axis Measured from zero [1]
MCC43	N41:39		Ejector SWTL Deadband	As noted [1]

[1] Incremental Distance
00.00 to 99.99 Inches
000.0 to 999.9 Millimeters

Worksheet 3-G
Pressure-alarm and Time-delay Setpoints

Enter Your Pressure-alarm and Time-delay Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
MCC35	N41:31		Clamp Pressure-alarm Setpoint	Clamp Pressure [2]
MCC36	N41:32		Clamp-pressure Time-delay Setpoint	Time Measured in Seconds [1]
MCC49	N41:45		Ejector Pressure-alarm Setpoint	Ejector Pressure [2]
MCC50	N41:46		Ejector-pressure Time-delay Setpoint	Time Measured in Seconds [1]

[1] Time Measured in Seconds
00.00 to 00.99
000.0 to 999.9 Bar

[2] Pressure
0000 to 9999 PSI

Worksheet 5-A

Initial Clamp and Eject Jog Configuration Values

Enter Your Initial Values Here

Control Block Word	Pro-Set 600 Addr.	Value	Description	Units
Clamp, Forward Jog				
JGC33	N41:89		Set Output Values Output #1	% Signal Output [2]
JGC34	N41:90		Output #2	% Signal Output [2]
JGC35	N41:91		Output #3	% Signal Output [2]
JGC36	N41:92		Output #4	% Signal Output [2]
Clamp, Reverse Jog				
JGC41	N41:97		Set Output Values Output #1	% Signal Output [2]
JGC42	N41:98		Output #2	% Signal Output [2]
JGC43	N41:99		Output #3	% Signal Output [2]
JGC44	N41:100		Output #4	% Signal Output [2]
Ejector, Advance Jog				
JGC49	N41:105		Set Output Values Output #1	% Signal Output [2]
JGC50	N41:106		Output #2	% Signal Output [2]
JGC51	N41:107		Output #3	% Signal Output [2]
JGC52	N41:108		Output #4	% Signal Output [2]
Ejector, Retract Jog				
JGC57	N41:113		Set Output Values Output #1	% Signal Output [2]
JGC58	N41:114		Output #2	% Signal Output [2]
JGC59	N41:115		Output #3	% Signal Output [2]
JGC60	N41:116		Output #4	% Signal Output [2]
Jog Pressure Alarms				
JGC07	N41:63		Clamp Jog Pressure Alarm Setpoint	Clamp pressure [1]
JGC08	N41:64		Ejector Jog Pressure Alarm Setpoint	Ejector pressure [1]

[1] Pressure
0000 to 9999 PSI or
000.0 to 999.9 Bar

[2] % Signal Output
00.00 to 99.99 %

Worksheet 5-B

Inject and Screw Rotate Jog Configuration Values (for Clamp and Eject mode)

Enter Your Initial Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
Inject, Forward Jog				
JGC17	N41:73		Set Output Values Output #1	% Signal Output [1]
JGC18	N41:74		Output #2	% Signal Output [1]
JGC19	N41:75		Output #3	% Signal Output [1]
JGC20	N41:76		Output #4	% Signal Output [1]
Inject, Reverse Jog				
JGC25	N41:81		Set Output Values Output #1	% Signal Output [1]
JGC26	N41:82		Output #2	% Signal Output [1]
JGC27	N41:83		Output #3	% Signal Output [1]
JGC28	N41:84		Output #4	% Signal Output [1]
Screw Rotate Jog				
JGC09	N41:65		Set Output Values Output #1	% Signal Output [1]
JGC10	N41:66		Output #2	% Signal Output [1]
JGC11	N41:67		Output #3	% Signal Output [1]
JGC12	N41:68		Output #4	% Signal Output [1]

[1] % Signal Output
00.00 to 99.99 %

Worksheet 7-A
First Clamp Close (FCC) Configuration Block

Control Word FCC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1

FCC Block Identifier (bits 07–00)

Control Word FCC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Value	0	0	0	0	0	0	0	0					0			

Pressure Control Valve (bits 06–04)
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Velocity Control Valve (bits 02–00)
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Pressure Algorithm Selection (bit 07)
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-A (continued)
First Clamp Close (FCC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
FCC05	N43:1		Minimum ERC™ Percentage--Velocity	Percent [8]
FCC06	N43:2		Minimum ERC™ Percentage--Pressure	Percent [8]
FCC08	N43:4		Profile Watchdog Timer Preset	Time [1]
FCC09	N43:5		Output #1 Set-Output Value during Profile	Percent Signal Output [4]
FCC10	N43:6		Output #2 Set-Output Value during Profile	Percent Signal Output [4]
FCC11	N43:7		Output #3 Set-Output Value during Profile	Percent Signal Output [4]
FCC12	N43:8		Output #4 Set-Output Value during Profile	Percent Signal Output [4]
FCC17	N43:13		Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC18	N43:14		Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC19	N43:15		Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC20	N43:16		Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC25	N43:21		Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC26	N43:22		Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC27	N43:23		Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC28	N43:24		Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FCC33	N43:29		Output #1 Set-Output Value at End-of-Profile	Percent Signal Output [4]
FCC34	N43:30		Output #2 Set-Output Value at End-of-Profile	Percent Signal Output [4]
FCC35	N43:31		Output #3 Set-Output Value at End-of-Profile	Percent Signal Output [4]
FCC36	N43:32		Output #4 Set-Output Value at End-of-Profile	Percent Signal Output [4]
FCC41	N43:37		Pressure Minimum Control Limit	Pressure [3]
FCC42	N43:38		Pressure Maximum Control Limit	Pressure [3]
FCC43	N43:39		Selected Pressure Valve Output for Minimum	Percent Signal Output [4]
FCC44	N43:40		Selected Pressure Valve Output for Maximum	Percent Signal Output [4]
FCC45	N43:41		Velocity Minimum Control Limit	Velocity along Axis [2]
FCC46	N43:42		Velocity Maximum Control Limit	Velocity along Axis [2]
FCC47	N43:43		Selected Velocity Valve Output for Minimum	Percent Signal Output [4]
FCC48	N43:44		Selected Velocity Valve Output for Maximum	Percent Signal Output [4]
FCC49	N43:45		Proportional Gain for Pressure Control	None
FCC50	N43:46		Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
FCC51	N43:47		Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
FCC52	N43:48		Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
FCC53	N43:49		Feed Forward Gain for Velocity Control	None
FCC57	N43:53		Profile High Pressure Alarm Setpoint	Pressure [3]

1 Time
00.00 to 99.99 Seconds

2 Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

3 Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

4 Percent Signal Output
00.00 to 99.99

5 Percent Signal Output per Second
0000 to 9999

6 Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

7 Time (Algorithm)
00.00 to 99.99 Minutes

8 Percent
00.00 to 99.99

Worksheet 7-B
Second Clamp Close (SCC) Configuration Block

Control Word SCC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
Value	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

Bits 07–00: SCC Block Identifier

Control Word SCC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80
Value	0	0	0	0	0	0	0	0					0			

Bit 07: Pressure Algorithm Selection
0 = Dependent Gains
1 = Independent Gains

Bits 06–04: Pressure Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bits 02–00: Velocity Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Code:

(blank)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-B (continued)
Second Clamp Close (SCC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
SCC05	N43:61		Minimum ERC™ Percentage--Velocity	Percent [8]
SCC06	N43:62		Minimum ERC™ Percentage--Pressure	Percent [8]
SCC08	N43:64		Profile Watchdog Timer Preset	Time [1]
SCC09	N43:65		Output #1 Set-Output Value during Profile	Percent Signal Output [4]
SCC10	N43:66		Output #2 Set-Output Value during Profile	Percent Signal Output [4]
SCC11	N43:67		Output #3 Set-Output Value during Profile	Percent Signal Output [4]
SCC12	N43:68		Output #4 Set-Output Value during Profile	Percent Signal Output [4]
SCC17	N43:73		Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC18	N43:74		Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC19	N43:75		Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC20	N43:76		Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC25	N43:81		Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC26	N43:82		Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC27	N43:83		Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC28	N43:84		Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
SCC33	N43:89		Output #1 Set-Output Value at End-of-Profile	Percent Signal Output [4]
SCC34	N43:90		Output #2 Set-Output Value at End-of-Profile	Percent Signal Output [4]
SCC35	N43:91		Output #3 Set-Output Value at End-of-Profile	Percent Signal Output [4]
SCC36	N43:92		Output #4 Set-Output Value at End-of-Profile	Percent Signal Output [4]
SCC41	N43:97		Pressure Minimum Control Limit	Pressure [3]
SCC42	N43:98		Pressure Maximum Control Limit	Pressure [3]
SCC43	N43:99		Selected Pressure Valve Output for Minimum	Percent Signal Output [4]
SCC44	N43:100		Selected Pressure Valve Output for Maximum	Percent Signal Output [4]
SCC45	N43:101		Velocity Minimum Control Limit	Velocity along Axis [2]
SCC46	N43:102		Velocity Maximum Control Limit	Velocity along Axis [2]
SCC47	N43:103		Selected Velocity Valve Output for Minimum	Percent Signal Output [4]
SCC48	N43:104		Selected Velocity Valve Output for Maximum	Percent Signal Output [4]
SCC49	N43:105		Proportional Gain for Pressure Control	None
SCC50	N43:106		Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
SCC51	N43:107		Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
SCC52	N43:108		Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
SCC53	N43:109		Feed Forward Gain for Velocity Control	None
SCC57	N43:113		Profile High Pressure Alarm Setpoint	Pressure [3]

[1] Time
00.00 to 99.99 Seconds

[2] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[4] Percent Signal Output
00.00 to 99.99

[5] Percent Signal Output per Second
0000 to 9999

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

Worksheet 7-C
Third Clamp Close (TCC) Configuration Block

Control Word TCC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128
Value	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1

TCC Block Identifier (bits 07–00)

Control Word TCC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	159	158	157	156	155	154	153	152	151	150	149	148	147	146	145	144
Value	0	0	0	0	0	0	0	0					0			

Pressure Control Valve (bits 06–04)
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Velocity Control Valve (bits 02–00)
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Pressure Algorithm Selection (bit 07)
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-C (continued)

Third Clamp Close (TCC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
TCC05	N43:121		Minimum ERC™ Percentage--Velocity	Percent [8]
TCC06	N43:122		Minimum ERC™ Percentage--Pressure	Percent [8]
TCC08	N43:124		Profile Watchdog Timer Preset	Time [1]
TCC09	N43:125		Output #1 Set-Output Value during Profile	Percent Signal Output [4]
TCC10	N43:126		Output #2 Set-Output Value during Profile	Percent Signal Output [4]
TCC11	N43:127		Output #3 Set-Output Value during Profile	Percent Signal Output [4]
TCC12	N43:128		Output #4 Set-Output Value during Profile	Percent Signal Output [4]
TCC17	N43:133		Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC18	N43:134		Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC19	N43:135		Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC20	N43:136		Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC25	N43:141		Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC26	N43:142		Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC27	N43:143		Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC28	N43:144		Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
TCC33	N43:149		Output #1 Set-Output Value at End-of-Profile	Percent Signal Output [4]
TCC34	N43:150		Output #2 Set-Output Value at End-of-Profile	Percent Signal Output [4]
TCC35	N43:151		Output #3 Set-Output Value at End-of-Profile	Percent Signal Output [4]
TCC36	N43:152		Output #4 Set-Output Value at End-of-Profile	Percent Signal Output [4]
TCC41	N43:157		Pressure Minimum Control Limit	Pressure [3]
TCC42	N43:158		Pressure Maximum Control Limit	Pressure [3]
TCC43	N43:159		Selected Pressure Valve Output for Minimum	Percent Signal Output [4]
TCC44	N43:160		Selected Pressure Valve Output for Maximum	Percent Signal Output [4]
TCC45	N43:161		Velocity Minimum Control Limit	Velocity along Axis [2]
TCC46	N43:162		Velocity Maximum Control Limit	Velocity along Axis [2]
TCC47	N43:163		Selected Velocity Valve Output for Minimum	Percent Signal Output [4]
TCC48	N43:164		Selected Velocity Valve Output for Maximum	Percent Signal Output [4]
TCC49	N43:165		Proportional Gain for Pressure Control	None
TCC50	N43:166		Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
TCC51	N43:167		Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
TCC52	N43:168		Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
TCC53	N43:169		Feed Forward Gain for Velocity Control	None
TCC57	N43:173		Profile High Pressure Alarm Setpoint	Pressure [3]

1 Time
00.00 to 99.99 Seconds

2 Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

3 Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

4 Percent Signal Output
00.00 to 99.99

5 Percent Signal Output per Second
0000 to 9999

6 Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

7 Time (Algorithm)
00.00 to 99.99 Minutes

8 Percent
00.00 to 99.99

Worksheet 7-D
Clamp Low Pressure Close (LPC) Configuration Block

Control Word LPC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	207	206	205	204	203	202	201	200	199	198	197	196	195	194	193	192
Value	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0

LPC Block Identifier (bits 07–00)

Control Word LPC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	223	222	221	220	219	218	217	216	215	214	213	212	211	210	209	208
Value	0	0	0	0	0	0	0	0					0	0	0	0

Pressure Control Valve (bits 06–04)
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Pressure Algorithm Selection (bit 07)
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-D (continued)

Clamp Low Pressure Close (LPC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
LPC06	N43:182		Minimum ERC™ Percentage--Pressure	Percent [7]
LPC07	N43:183		Tonnage Watchdog Timer Preset	Time [1]
LPC08	N43:184		Profile Watchdog Timer Preset	Time [1]
LPC09	N43:185		Output #1 Set-Output Value during Profile	Percent Signal Output [3]
LPC10	N43:186		Output #2 Set-Output Value during Profile	Percent Signal Output [3]
LPC11	N43:187		Output #3 Set-Output Value during Profile	Percent Signal Output [3]
LPC12	N43:188		Output #4 Set-Output Value during Profile	Percent Signal Output [3]
LPC17	N43:193		Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC18	N43:194		Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC19	N43:195		Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC20	N43:196		Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC25	N43:201		Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC26	N43:202		Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC27	N43:203		Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC28	N43:204		Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
LPC33	N43:209		Output #1 Set-Output Value at End-of-Profile	Percent Signal Output [3]
LPC34	N43:210		Output #2 Set-Output Value at End-of-Profile	Percent Signal Output [3]
LPC35	N43:211		Output #3 Set-Output Value at End-of-Profile	Percent Signal Output [3]
LPC36	N43:212		Output #4 Set-Output Value at End-of-Profile	Percent Signal Output [3]
LPC41	N43:217		Pressure Minimum Control Limit	Pressure [2]
LPC42	N43:218		Pressure Maximum Control Limit	Pressure [2]
LPC43	N43:219		Selected Pressure Valve Output for Minimum	Percent Signal Output [3]
LPC44	N43:220		Selected Pressure Valve Output for Maximum	Percent Signal Output [3]
LPC49	N43:225		Proportional Gain for Pressure Control	None
LPC50	N43:226		Integral Gain for Pressure Control	Inverse Time (Algorithm) [5]
LPC51	N43:227		Derivative Gain for Pressure Control	Time (Algorithm) [6] Time [1]
LPC57	N43:233		Profile High Pressure Alarm Setpoint	Pressure [2]

[1] Time
00.00 to 99.99 Seconds

[2] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[3] Percent Signal Output
00.00 to 99.99

[4] Percent Signal Output per Second
0000 to 9999

[5] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[6] Time (Algorithm)
00.00 to 99.99 Minutes

[7] Percent
00.00 to 99.99

Worksheet 7-E
First Clamp Open (FOC) Configuration Block

Control Word FOC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	335	334	333	332	331	330	329	328	327	326	325	324	323	322	321	320
Value	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1

FOC Block Identifier

Control Word FOC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	351	350	349	348	347	346	345	344	343	342	341	340	339	338	337	336
Value	0	0	0	0	0	0	0	0					0			

Pressure Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Velocity Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Pressure Algorithm Selection
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-E (continued)
First Clamp Open (FOC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
FOC05	N43:301		Minimum ERC™ Percentage--Velocity	Percent [8]
FOC06	N43:302		Minimum ERC™ Percentage--Pressure	Percent [8]
FOC08	N43:304		Profile Watchdog Timer Preset	Time [1]
FOC09	N43:305		Output #1 Set-Output Value during Profile	Percent Signal Output [4]
FOC10	N43:306		Output #2 Set-Output Value during Profile	Percent Signal Output [4]
FOC11	N43:307		Output #3 Set-Output Value during Profile	Percent Signal Output [4]
FOC12	N43:308		Output #4 Set-Output Value during Profile	Percent Signal Output [4]
FOC17	N43:313		Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC18	N43:314		Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC19	N43:315		Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC20	N43:316		Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC25	N43:321		Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC26	N43:322		Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC27	N43:323		Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC28	N43:324		Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
FOC33	N43:329		Output #1 Set-Output Value at End-of-Profile	Percent Signal Output [4]
FOC34	N43:330		Output #2 Set-Output Value at End-of-Profile	Percent Signal Output [4]
FOC35	N43:331		Output #3 Set-Output Value at End-of-Profile	Percent Signal Output [4]
FOC36	N43:332		Output #4 Set-Output Value at End-of-Profile	Percent Signal Output [4]
FOC41	N43:337		Pressure Minimum Control Limit	Pressure [3]
FOC42	N43:338		Pressure Maximum Control Limit	Pressure [3]
FOC43	N43:339		Selected Pressure Valve Output for Minimum	Percent Signal Output [4]
FOC44	N43:340		Selected Pressure Valve Output for Maximum	Percent Signal Output [4]
FOC45	N43:341		Velocity Minimum Control Limit	Velocity along Axis [2]
FOC46	N43:342		Velocity Maximum Control Limit	Velocity along Axis [2]
FOC47	N43:343		Selected Velocity Valve Output for Minimum	Percent Signal Output [4]
FOC48	N43:344		Selected Velocity Valve Output for Maximum	Percent Signal Output [4]
FOC49	N43:345		Proportional Gain for Pressure Control	None
FOC50	N43:346		Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
FOC51	N43:347		Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
FOC52	N43:348		Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
FOC53	N43:349		Feed Forward Gain for Velocity Control	None
FOC57	N43:353		Profile High Pressure Alarm Setpoint	Pressure [3]

[1] Time
00.00 to 99.99 Seconds

[2] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[4] Percent Signal Output
00.00 to 99.99

[5] Percent Signal Output per Second
0000 to 9999

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

Worksheet 7-F
Second Clamp Open (SOC) Configuration Block

Control Word SOC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	399	398	397	396	395	394	393	392	391	390	389	388	387	386	385	384
Value	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0

Bits 07–00: SOC Block Identifier

Control Word SOC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	415	414	413	412	411	410	409	408	407	406	405	404	403	402	401	400
Value	0	0	0	0	0	0	0	0					0			

Bits 06–04: Pressure Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bits 02–00: Velocity Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bit 07: Pressure Algorithm Selection
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-F (continued)

Second Clamp Open (SOC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	units
SOC05	N43:361		Minimum ERC™ Percentage--Velocity	Percent [8]
SOC06	N43:362		Minimum ERC™ Percentage--Pressure	Percent [8]
SOC08	N43:364		Profile Watchdog Timer Preset	Time [1]
SOC09	N43:365		Output #1 Set-Output Value during Profile	Percent Signal Output [3]
SOC10	N43:366		Output #2 Set-Output Value during Profile	Percent Signal Output [3]
SOC11	N43:367		Output #3 Set-Output Value during Profile	Percent Signal Output [3]
SOC12	N43:368		Output #4 Set-Output Value during Profile	Percent Signal Output [3]
SOC17	N43:373		Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC18	N43:374		Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC19	N43:375		Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC20	N43:376		Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC25	N43:381		Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC26	N43:382		Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC27	N43:383		Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC28	N43:384		Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
SOC33	N43:389		Output #1 Set-Output Value at End-of-Profile	Percent Signal Output [3]
SOC34	N43:390		Output #2 Set-Output Value at End-of-Profile	Percent Signal Output [3]
SOC35	N43:391		Output #3 Set-Output Value at End-of-Profile	Percent Signal Output [3]
SOC36	N43:392		Output #4 Set-Output Value at End-of-Profile	Percent Signal Output [3]
SOC41	N43:397		Pressure Minimum Control Limit	Pressure [2]
SOC42	N43:398		Pressure Maximum Control Limit	Pressure [2]
SOC43	N43:399		Selected Pressure Valve Output for Minimum	Percent Signal Output [3]
SOC44	N43:400		Selected Pressure Valve Output for Maximum	Percent Signal Output [3]
SOC45	N43:401		Velocity Minimum Control Limit	Velocity along Axis [5]
SOC46	N43:402		Velocity Maximum Control Limit	Velocity along Axis [5]
SOC47	N43:403		Selected Velocity Valve Output for Minimum	Percent Signal Output [3]
SOC48	N43:404		Selected Velocity Valve Output for Maximum	Percent Signal Output [3]
SOC49	N43:405		Proportional Gain for Pressure Control	None
SOC50	N43:406		Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
SOC51	N43:407		Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
SOC52	N43:408		Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
SOC53	N43:409		Feed Forward Gain for Velocity Control	None
SOC57	N43:413		Profile High Pressure Alarm Setpoint	Pressure [2]

[1] Time
00.00 to 99.99 Seconds

[2] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[3] Percent Signal Output
00.00 to 99.99

[4] Percent Signal Output per Second
0000 to 9999

[5] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

Worksheet 7-G
Third Clamp Open (TOC) Configuration Block

Control Word TOC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	463	462	461	460	459	458	457	456	455	454	453	452	451	450	449	448
Value	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1

Bits 07–00: TOC Block Identifier

Control Word TOC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	479	478	477	476	475	474	473	472	471	470	469	468	467	466	465	464
Value	0	0	0	0	0	0	0	0					0			

Bits 06–04: Pressure Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bits 02–00: Velocity Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bit 07: Pressure Algorithm Selection
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-G (continued)

Third Clamp Open (TOC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
TOC05	N43:421		Minimum ERC™ Percentage--Velocity	Percent [8]
TOC06	N43:422		Minimum ERC™ Percentage--Pressure	Percent [8]
TOC08	N43:424		Profile Watchdog Timer Preset	Time [1]
TOC09	N43:425		Output #1 Set-Output Value during Profile	Percent Signal Output [3]
TOC10	N43:426		Output #2 Set-Output Value during Profile	Percent Signal Output [3]
TOC11	N43:427		Output #3 Set-Output Value during Profile	Percent Signal Output [3]
TOC12	N43:428		Output #4 Set-Output Value during Profile	Percent Signal Output [3]
TOC17	N43:433		Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC18	N43:434		Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC19	N43:435		Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC20	N43:436		Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC25	N43:441		Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC26	N43:442		Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC27	N43:443		Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC28	N43:444		Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [4]
TOC33	N43:449		Output #1 Set-Output Value at End-of-Profile	Percent Signal Output [3]
TOC34	N43:450		Output #2 Set-Output Value at End-of-Profile	Percent Signal Output [3]
TOC35	N43:451		Output #3 Set-Output Value at End-of-Profile	Percent Signal Output [3]
TOC36	N43:452		Output #4 Set-Output Value at End-of-Profile	Percent Signal Output [3]
TOC41	N43:457		Pressure Minimum Control Limit	Pressure [2]
TOC42	N43:458		Pressure Maximum Control Limit	Pressure [2]
TOC43	N43:459		Selected Pressure Valve Output for Minimum	Percent Signal Output [3]
TOC44	N43:460		Selected Pressure Valve Output for Maximum	Percent Signal Output [3]
TOC45	N43:461		Velocity Minimum Control Limit	Velocity along Axis [5]
TOC46	N43:462		Velocity Maximum Control Limit	Velocity along Axis [5]
TOC47	N43:463		Selected Velocity Valve Output for Minimum	Percent Signal Output [3]
TOC48	N43:464		Selected Velocity Valve Output for Maximum	Percent Signal Output [3]
TOC49	N43:465		Proportional Gain for Pressure Control	None
TOC50	N43:466		Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
TOC51	N43:467		Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
TOC52	N43:468		Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
TOC53	N43:469		Feed Forward Gain for Velocity Control	None
TOC57	N43:473		Profile High Pressure Alarm Setpoint	Pressure [2]

[1] Time
00.00 to 99.99 Seconds

[2] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[3] Percent Signal Output
00.00 to 99.99

[4] Percent Signal Output per Second
0000 to 9999

[5] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

Worksheet 7-H
Clamp Open Slow (OSC) Configuration Block

Control Word OSC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	527	526	525	524	523	522	521	520	519	518	517	516	515	514	513	512
Value	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0

Bits 07–00: OSC Block Identifier

Control Word OSC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	543	542	541	540	539	538	537	536	535	534	533	532	531	530	529	528
Value	0	0	0	0	0	0	0	0					0			

Bits 06–04: Pressure Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bits 02–00: Velocity Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bit 07: Pressure Algorithm Selection
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-H (continued)
Clamp Open Slow (OSC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
OSC05	N43:481		Minimum ERC™ Percentage--Velocity	Percent [8]
OSC06	N43:482		Minimum ERC™ Percentage--Pressure	Percent [8]
OSC08	N43:484		Profile Watchdog Timer Preset	Time [1]
OSC09	N43:485		Output #1 Set-Output Value during Profile	Percent Signal Output [4]
OSC10	N43:486		Output #2 Set-Output Value during Profile	Percent Signal Output [4]
OSC11	N43:487		Output #3 Set-Output Value during Profile	Percent Signal Output [4]
OSC12	N43:488		Output #4 Set-Output Value during Profile	Percent Signal Output [4]
OSC17	N43:493		Output #1 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC18	N43:494		Output #2 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC19	N43:495		Output #3 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC20	N43:496		Output #4 Acceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC25	N43:501		Output #1 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC26	N43:502		Output #2 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC27	N43:503		Output #3 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC28	N43:504		Output #4 Deceleration Ramp Rate during Profile	Percent Signal Output per Second [5]
OSC33	N43:509		Output #1 Set-Output Value at End-of-Profile	Percent Signal Output [4]
OSC34	N43:510		Output #2 Set-Output Value at End-of-Profile	Percent Signal Output [4]
OSC35	N43:511		Output #3 Set-Output Value at End-of-Profile	Percent Signal Output [4]
OSC36	N43:512		Output #4 Set-Output Value at End-of-Profile	Percent Signal Output [4]
OSC41	N43:517		Pressure Minimum Control Limit	Pressure [3]
OSC42	N43:518		Pressure Maximum Control Limit	Pressure [3]
OSC43	N43:519		Selected Pressure Valve Output for Minimum	Percent Signal Output [4]
OSC44	N43:520		Selected Pressure Valve Output for Maximum	Percent Signal Output [4]
OSC45	N43:521		Velocity Minimum Control Limit	Velocity along Axis [2]
OSC46	N43:522		Velocity Maximum Control Limit	Velocity along Axis [2]
OSC47	N43:523		Selected Velocity Valve Output for Minimum	Percent Signal Output [4]
OSC48	N43:524		Selected Velocity Valve Output for Maximum	Percent Signal Output [4]
OSC49	N43:525		Proportional Gain for Pressure Control	None
OSC50	N43:526		Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
OSC51	N43:527		Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
OSC52	N43:528		Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
OSC53	N43:529		Feed Forward Gain for Velocity Control	None
OSC57	N43:533		Profile High Pressure Alarm Setpoint	Pressure [3]

[1] Time
00.00 to 99.99 Seconds

[2] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[4] Percent Signal Output
00.00 to 99.99

[5] Percent Signal Output per Second
0000 to 9999

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

Worksheet 7-I
Ejector Advance (EAC) Configuration Block

Control Word EAC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B39/bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Value	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0

Bits 07–00: EAC Block Identifier

Control Word EAC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B39/bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Value	0	0	0	0	0	0	0	0					0			

Bits 06–04: Pressure Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bits 02–00: Velocity Control Valve
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Bit 07: Pressure Algorithm Selection
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-I (continued)

Ejector Advance (EAC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
EAC05	N45:1		Minimum ERC™ Percentage--Velocity	Percent [8]
EAC06	N45:2		Minimum ERC™ Percentage--Pressure	Percent [8]
EAC08	N45:4		Profile Watchdog Timer Preset	Time [1]
EAC09	N45:5		Output #1 Set-Output Value during Advance	Percent Signal Output [4]
EAC10	N45:6		Output #2 Set-Output Value during Advance	Percent Signal Output [4]
EAC11	N45:7		Output #3 Set-Output Value during Advance	Percent Signal Output [4]
EAC12	N45:8		Output #4 Set-Output Value during Advance	Percent Signal Output [4]
EAC17	N45:13		Output #1 Acceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC18	N45:14		Output #2 Acceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC19	N45:15		Output #3 Acceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC20	N45:16		Output #4 Acceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC25	N45:21		Output #1 Deceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC26	N45:22		Output #2 Deceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC27	N45:23		Output #3 Deceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC28	N45:24		Output #4 Deceleration Ramp Rate during Advance	Percent Signal Output per Second [5]
EAC33	N45:29		Output #1 Set-Output Value at End-of-Advance	Percent Signal Output [4]
EAC34	N45:30		Output #2 Set-Output Value at End-of-Advance	Percent Signal Output [4]
EAC35	N45:31		Output #3 Set-Output Value at End-of-Advance	Percent Signal Output [4]
EAC36	N45:32		Output #4 Set-Output Value at End-of-Advance	Percent Signal Output [4]
EAC41	N45:37		Pressure Minimum Control Limit	Pressure [3]
EAC42	N45:38		Pressure Maximum Control Limit	Pressure [3]
EAC43	N45:39		Selected Pressure Valve Output for Minimum	Percent Signal Output [4]
EAC44	N45:40		Selected Pressure Valve Output for Maximum	Percent Signal Output [4]
EAC45	N45:41		Velocity Minimum Control Limit	Velocity along Axis [2]
EAC46	N45:42		Velocity Maximum Control Limit	Velocity along Axis [2]
EAC47	N45:43		Selected Velocity Valve Output for Minimum	Percent Signal Output [4]
EAC48	N45:44		Selected Velocity Valve Output for Maximum	Percent Signal Output [4]
EAC49	N45:45		Proportional Gain for Pressure Control	None
EAC50	N45:46		Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
EAC51	N45:47		Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
EAC52	N45:48		Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
EAC53	N45:49		Feed Forward Gain for Velocity Control	None
EAC57	N45:53		Profile High Pressure Alarm Setpoint	Pressure [3]

[1] Time
00.00 to 99.99 Seconds

[2] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[4] Percent Signal Output
00.00 to 99.99

[5] Percent Signal Output per Second
0000 to 9999

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

Worksheet 7-J
Ejector Retract (ERC)Configuration Block

Control Word ERC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B39/bit	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
Value	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1

ERC Block Identifier (bits 07–00)

Control Word ERC02-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B39/bit	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80
Value	0	0	0	0	0	0	0	0					0			

Pressure Control Valve (bits 06–04)
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Velocity Control Valve (bits 02–00)
000 = Output 1
001 = Output 2
010 = Output 3
011 = Output 4

Pressure Algorithm Selection (bit 07)
0 = Dependent Gains
1 = Independent Gains

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 7-J (continued)
Ejector Retract (ERC) Configuration Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
ERC05	N45:61		Minimum ERC™ Percentage--Velocity	Percent [8]
ERC06	N45:62		Minimum ERC™ Percentage--Pressure	Percent [8]
ERC09	N45:65		Output #1 Set-Output Value during Retract	Percent Signal Output [4]
ERC10	N45:66		Output #2 Set-Output Value during Retract	Percent Signal Output [4]
ERC11	N45:67		Output #3 Set-Output Value during Retract	Percent Signal Output [4]
ERC12	N45:68		Output #4 Set-Output Value during Retract	Percent Signal Output [4]
ERC17	N45:73		Output #1 Acceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC18	N45:74		Output #2 Acceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC19	N45:75		Output #3 Acceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC20	N45:76		Output #4 Acceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC25	N45:81		Output #1 Deceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC26	N45:82		Output #2 Deceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC27	N45:83		Output #3 Deceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC28	N45:84		Output #4 Deceleration Ramp Rate during Retract	Percent Signal Output per Second [5]
ERC33	N45:89		Output #1 Set-Output Value at End-of-Retract	Percent Signal Output [4]
ERC34	N45:90		Output #2 Set-Output Value at End-of-Retract	Percent Signal Output [4]
ERC35	N45:91		Output #3 Set-Output Value at End-of-Retract	Percent Signal Output [4]
ERC36	N45:92		Output #4 Set-Output Value at End-of-Retract	Percent Signal Output [4]
ERC41	N45:97		Pressure Minimum Control Limit	Pressure [3]
ERC42	N45:98		Pressure Maximum Control Limit	Pressure [3]
ERC43	N45:99		Selected Pressure Valve Output for Minimum	Percent Signal Output [4]
ERC44	N45:100		Selected Pressure Valve Output for Maximum	Percent Signal Output [4]
ERC45	N45:101		Velocity Minimum Control Limit	Velocity along Axis [2]
ERC46	N45:102		Velocity Maximum Control Limit	Velocity along Axis [2]
ERC47	N45:103		Selected Velocity Valve Output for Minimum	Percent Signal Output [4]
ERC48	N45:104		Selected Velocity Valve Output for Maximum	Percent Signal Output [4]
ERC49	N45:105		Proportional Gain for Pressure Control	None
ERC50	N45:106		Integral Gain for Pressure Control	Inverse Time (Algorithm) [6]
ERC51	N45:107		Derivative Gain for Pressure Control	Time (Algorithm) [7] Time [1]
ERC52	N45:108		Proportional Gain for Velocity Control	Inverse Time (Algorithm) [6]
ERC53	N45:109		Feed Forward Gain for Velocity Control	None

[1] Time
00.00 to 99.99 Seconds

[2] Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Millimeters per Sec

[3] Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[4] Percent Signal Output
00.00 to 99.99

[5] Percent Signal Output per Second
0000 to 9999

[6] Inverse Time (Algorithm)
00.00 to 99.99 Minutes
00.00 to 99.99 Seconds

[7] Time (Algorithm)
00.00 to 99.99 Minutes

[8] Percent
00.00 to 99.99

Worksheet 8-A
Clamp Close (CPC) Profile Block

Control Word CPC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/ bit	271	270	269	268	267	266	265	264	263	262	261	260	259	258	257	256
Value	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1

CPC Block Identifier

Control Word CPC03-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	303	302	301	300	299	298	297	296	295	294	293	292	291	290	289	288
Value	0		0	0					0	0	0		0		0	

Velocity Units
0 = Percent Velocity
1 = Inches (mm)/Second

TCC SCC FCC

TCC SCC FCC

Mold Protection
0 = Start LPC on Zone Overrun
1 = Stop and Zero Outputs on Zone Overrun

Algorithm
0 = Vel/Pos
1 = Press/Pos

Logical Bridge
0 = Start Next Profile at end
1 = Stop and Set-Output at end

Control Word CPC04-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	319	318	317	316	315	314	313	312	311	310	309	308	307	306	305	304
Value		0								0						

Expert Response Compensation
0 = ON
1 = OFF

bit 15 = Press/Pos LPC
bit 13 = Press/Pos TCC
bit 12 = Vel/Pos TCC
bit 11 = Press/Pos SCC
bit 10 = Vel/Pos SCC
bit 09 = Press/Pos FCC
bit 08 = Vel/Pos FCC

Open/Closed Loop Selection
0 = Closed Loop
1 = Open Loop

bit 07 = Press/Pos LPC
bit 05 = Press/Pos TCC
bit 04 = Vel/Pos TCC
bit 03 = Press/Pos SCC
bit 02 = Vel/Pos SCC
bit 01 = Press/Pos FCC
bit 00 = Vel/Pos FCC

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 8-A (continued)
Clamp Close (CPC) Profile Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
CPC09	N43:245		FCC Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC10	N43:246		FCC Segment 1 Pressure Setpoint	Pressure [3]
CPC11	N43:247		FCC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
CPC12	N43:248		FCC Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC13	N43:249		FCC Segment 2 Pressure Setpoint	Pressure [3]
CPC14	N43:250		FCC End-of-Segment 2 Position Setpoint	Incremental Distance [4]
CPC15	N43:251		FCC Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC16	N43:252		FCC Segment 3 Pressure Setpoint	Pressure [3]
CPC17	N43:253		FCC End-of-Segment 3 Position Setpoint	Incremental Distance [4]
CPC18	N43:254		SCC Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC19	N43:255		SCC Segment 1 Pressure Setpoint	Pressure [3]
CPC20	N43:256		SCC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
CPC21	N43:257		SCC Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC22	N43:258		SCC Segment 2 Pressure Setpoint	Pressure [3]
CPC23	N43:259		SCC End-of-Segment 2 Position Setpoint	Incremental Distance [4]
CPC24	N43:260		SCC Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC25	N43:261		SCC Segment 3 Pressure Setpoint	Pressure [3]
CPC26	N43:262		SCC End-of-Segment 3 Position Setpoint	Incremental Distance [4]
CPC27	N43:263		TCC Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC28	N43:264		TCC Segment 1 Pressure Setpoint	Pressure [3]
CPC29	N43:265		TCC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
CPC30	N43:266		TCC Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC31	N43:267		TCC Segment 2 Pressure Setpoint	Pressure [3]
CPC32	N43:268		TCC End-of-Segment 2 Position Setpoint	Incremental Distance [4]
CPC33	N43:269		TCC Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
CPC34	N43:270		TCC Segment 3 Pressure Setpoint	Pressure [3]
CPC35	N43:271		TCC End-of-Segment 3 Position Setpoint	Incremental Distance [4]
CPC37	N43:273		LPC Segment 1 Pressure Setpoint	Pressure [3]
CPC38	N43:274		LPC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
CPC40	N43:276		LPC Segment 2 Pressure Setpoint	Pressure [3]
CPC61	N43:297		Start LPC Position Setpoint	Incremental Distance [4]
CPC62	N43:298		Mold Safe Position Setpoint	Incremental Distance [4]
CPC63	N43:299		Tonnage Complete Pressure Setpoint	Pressure [3]

[1] Clamp Percent of Maximum Velocity
00.00 to 99.99
000.0 to 999.9 Millimeters per Second

[2] Clamp Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Bar

[3] Clamp Pressure
0000 to 9999 PSI

[4] Clamp Axis Measured from MCC27 (if non-zero) or MCC23
00.00 to 99.99 Inches
00.00 to 999.9 Millimeters

Worksheet 8-B
Clamp Open (OPC) Profile Block

Control Word OPC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	591	590	589	588	587	586	585	584	583	582	581	580	579	578	577	576
Value	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1

Bits 07–00: OPC Block Identifier

Control Word OPC03-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	623	622	621	620	619	618	617	616	615	614	613	612	611	610	609	608
Value			0	0					0		0		0		0	

Bit 15: Mold Open Dwell Start
0 = Start open dwell timer when mold open
1 = Start open dwell timer when mold open and ejectors done

Bit 14: Velocity Units
0 = Percent Velocity
1 = Inches (mm)/Second

Bit 11: Zone Overrun
0 = Start Clamp Open Slow on Zone Overrun
1 = Stop and Zero Outputs on Zone Overrun

Bits 10, 09, 08 (TOC SOC FOC): Logical Bridge
0 = Start Next Profile at end
1 = Stop and Set-Output

Bits 06, 04, 02, 00 (OSC TOC SOC FOC): Algorithm
0 = Vel/Pos
1 = Press/Pos

Control Word OPC04-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B37/bit	639	638	637	636	635	634	633	632	631	630	629	628	627	626	625	624
Value																

Bits 15–08: Expert Response Compensation
0 = ON
1 = OFF

bit 15 = Press/Pos OSC
bit 14 = Vel/Pos OSC
bit 13 = Press/Pos TOC
bit 12 = Vel/Pos TCC
bit 11 = Press/Pos SOC
bit 10 = Vel/Pos SOC
bit 09 = Press/Pos FOC
bit 08 = Vel/Pos FOC

Bits 07–00: Open/Closed Loop Selection
0 = Closed Loop
1 = Open Loop

bit 07 = Press/Pos OSC
bit 06 = Vel/Pos OSC
bit 05 = Press/Pos TOC
bit 04 = Vel/Pos TOC
bit 03 = Press/Pos SOC
bit 02 = Vel/Pos SOC
bit 01 = Press/Pos FOC
bit 00 = Vel/Pos FOC

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 8-B (continued)

Clamp Open (OPC) Profile Block

Enter Your Values Here

Control Word	Pro-Set 600 Addr.	Value	Description	Units
OPC09	N43:545		FOC Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC10	N43:546		FOC Segment 1 Pressure Setpoint	Pressure [3]
OPC11	N43:547		FOC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
OPC12	N43:548		FOC Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC13	N43:549		FOC Segment 2 Pressure Setpoint	Pressure [3]
OPC14	N43:550		FOC End-of-Segment 2 Position Setpoint	Incremental Distance [4]
OPC15	N43:551		FOC Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC16	N43:552		FOC Segment 3 Pressure Setpoint	Pressure [3]
OPC17	N43:553		FOC End-of-Segment 3 Position Setpoint	Incremental Distance [4]
OPC18	N43:554		SOC Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC19	N43:555		SOC Segment 1 Pressure Setpoint	Pressure [3]
OPC20	N43:556		SOC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
OPC21	N43:557		SOC Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC22	N43:558		SOC Segment 2 Pressure Setpoint	Pressure [3]
OPC23	N43:559		SOC End-of-Segment 2 Position Setpoint	Incremental Distance [4]
OPC24	N43:560		SOC Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC25	N43:561		SOC Segment 3 Pressure Setpoint	Pressure [3]
OPC26	N43:562		SOC End-of-Segment 3 Position Setpoint	Incremental Distance [4]
OPC27	N43:563		TOC Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC28	N43:564		TOC Segment 1 Pressure Setpoint	Pressure [3]
OPC29	N43:565		TOC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
OPC30	N43:566		TOC Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC31	N43:567		TOC Segment 2 Pressure Setpoint	Pressure [3]
OPC32	N43:568		TOC End-of-Segment 2 Position Setpoint	Incremental Distance [4]
OPC33	N43:569		TOC Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC34	N43:570		TOC Segment 3 Pressure Setpoint	Pressure [3]
OPC35	N43:571		TOC End-of-Segment 3 Position Setpoint	Incremental Distance [4]
OPC36	N43:572		OSC Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC37	N43:573		OSC Segment 1 Pressure Setpoint	Pressure [3]
OPC38	N43:574		OSC End-of-Segment 1 Position Setpoint	Incremental Distance [4]
OPC39	N43:575		OSC Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
OPC40	N43:576		OSC Segment 2 Pressure Setpoint	Pressure [3]
OPC61	N43:597		Start OSC Position Setpoint	Incremental Distance [4]
OPC62	N43:598		Mold Open Position Setpoint	Incremental Distance [4]
OPC63	N43:599		Mold Open Dwell Timer Preset	Time [5]

[1] Clamp Percent of Maximum Velocity
00.00 to 99.99
000.0 to 999.9 Millimeters per Second

[2] Clamp Velocity along Axis
00.00 to 99.99 Inches per Second
000.0 to 999.9 Bar

[3] Clamp Pressure
0000 to 9999 PSI

[4] Clamp Axis Measured from MCC27 (if non-zero) or MCC23
00.00 to 99.99 Inches
00.00 to 999.9 Millimeters

[5] Time
00.00 to 99.99 Seconds

Worksheet 8-C
Ejector (EPC) Profile Block

Control Word EPC01-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B39/bit	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128
Value	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0

Bits 07–00: EPC Block Identifier

Control Word EPC03-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B39/bit	175	174	173	172	171	170	169	168	167	166	165	164	163	162	161	160
Value					0	0			0	0	0	0	0	0	0	

Bit 15 – Forward Dwell
0=Apply Forward Dwell on Final Stroke
1=Apply Forward Dwell on Initial Stroke

Bit 14 – Velocity Units
0 = Percent Velocity
1 = Inches (mm)/Second

Bit 13 – Ejector Tip Strokes
0 = All Strokes to be Full Strokes
1 = Intermediate Strokes to be Tip Strokes

Bit 12 – Stop and Notify
0 = Ejector Profile to Run without Interruption
1 = QDC to “Stop-and-Notify” at end of Stroke

Bit 09 – Ejector Profile
0 = Ejector profile enabled
1 = Ejector profile disabled

Bit 08 – Logical Bridge
0 = Start Profile on Clamp Position During Open
1 = Start Profile on Command

Bit 00 – Algorithm
0 = Vel/Pos
1 = Press/Pos

Control Word EPC04-Bxx	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Pro-Set 600 Addr. B39/bit	191	190	189	188	187	186	185	184	183	182	181	180	179	178	177	176
Value	0	0	0	0	0	0			0	0	0	0	0	0		

Bits 09, 08 – Expert Response Compensation
0 = ON
1 = OFF

bit 09 = Press/Pos
bit 08 = Vel/Pos

Bits 01, 00 – Open/Closed Loop Selection
0 = Closed Loop
1 = Open Loop

bit 01 = Press/Pos
bit 00 = Vel/Pos

Code:

(blank box)	Your value
0 or 1	Required initial value loaded by Pro-Set 600

Worksheet 8-C (continued)
Ejector (EPC) Profile Block

Enter Your Values Here → Value

Control Word	Pro-Set 600 Addr.	Value	Description	Units
EPC09	N45:125		Full Advance Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC10	N45:126		Full Advance Segment 1 Pressure Setpoint	Pressure [3]
EPC11	N45:127		End of Full Advance Segment 1 Position Setpoint	Incremental Distance [4]
EPC12	N45:128		Full Advance Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC13	N45:129		Full Advance Segment 2 Pressure Setpoint	Pressure [3]
EPC14	N45:130		End of Full Advance Segment 2 Position Setpoint	Incremental Distance [4]
EPC15	N45:131		Full Advance Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC16	N45:132		Full Advance Segment 3 Pressure Setpoint	Pressure [3]
EPC21	N45:137		Tip Retract Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC22	N45:138		Tip Retract Pressure Setpoint	Pressure [3]
EPC23	N45:139		End of Tip Retract Position Setpoint	Incremental Distance [4]
EPC27	N45:143		Tip Advance Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC28	N45:144		Tip Advance Pressure Setpoint	Pressure [3]
EPC29	N45:145		End of Tip Advance Position Setpoint	Incremental Distance [4]
EPC33	N45:149		Full Retract Segment 1 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC34	N45:150		Full Retract Segment 1 Pressure Setpoint	Pressure [3]
EPC35	N45:151		End of Full Retract Segment 1 Position Setpoint	Incremental Distance [4]
EPC36	N45:152		Full Retract Segment 2 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC37	N45:153		Full Retract Segment 2 Pressure Setpoint	Pressure [3]
EPC38	N45:154		End of Full Retract Segment 2 Position Setpoint	Incremental Distance [4]
EPC39	N45:155		Full Retract Segment 3 Velocity Setpoint	Percent of Maximum Velocity [1] or Velocity along Axis [2]
EPC40	N45:156		Full Retract Segment 3 Pressure Setpoint	Pressure [3]
EPC57	N41:173		Ejector Forward Dwell timer Preset	Time [5]
EPC59	N41:175		Ejector Fully Advanced Position Setpoint	Incremental Distance [4]
EPC60	N41:176		Ejector Fully Retracted Position Setpoint	Incremental Distance [4]
EPC61	N41:177		Clamp Position for Start of Eject Profile	Incremental Distance [6]
EPC62	N41:178		Clamp Position for Ejector Inhibit	Incremental Distance [6]
EPC63	N41:179		Ejector Position for Clamp Close Enable	Incremental Distance [4]
EPC64	N45:180		Ejector Strokes Required	Number of Strokes

[1] Ejector Percent of Maximum Velocity
00.00 to 99.99
000.0 to 999.9 Millimeters per Second

[2] Ejector Velocity along Axis
00.00 to 99.99 Inches per Second

[3] Ejector Pressure
0000 to 9999 PSI
000.0 to 999.9 Bar

[4] Clamp Axis Measured from MCC27 (if non-zero) or MCC23
00.00 to 99.99 Inches
00.00 to 999.9 Millimeters

[5] Time
00.00 to 99.99 Seconds

[6] Clamp Axis Measured from MCC27 (if non-zero) or MCC23
00.00 to 99.99 Inches
000.0 to 999.9 Millimeters

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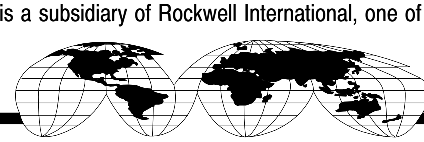

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