DURANT AMBASSADOR SERIES AND ECLIPSE SERIES SERIAL COMMUNICATIONS USER'S GUIDE

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Durant RS-485 Serial Communications

OVERVIEW

The Durant Ambassador series of counters, ratemeters, productivity monitors, and speed controls are all equipped with an RS-485 serial port as a standard feature. The Durant Eclipse series of digital panel meters, temperature indicators, ratemeters, counters, and flow totalizers and controls offers a serial port as an option. This port is generally used for two purposes. First, during installation, a unit may be configured to the specific application by programming it through the serial port. Durant offers a program, called ProFile (part number 57624450), for this purpose. The second purpose for the port is once installed and running, a user may wish to gather data from one or more units into a PC. The PC can display a snap shot in time of what's going on with each machine on the factory floor and / or store the data in a report of machine utilization, process profiling, shift count, etc. These types of PC programs are written by the user, or by a third party systems integrator.

Whoever writes a custom program to communicate with an Ambassador or Eclipse will need the information in this manual. It contains the format of the command and the response, as well as the command and error code sets for each product. The program writer must know what data item(s) need to be extracted from each unit on the network. Generally, each data item will require a canned command message from the PC to the unit, which is identified by an individual address. That unit will respond with the data. The program writer must then know what to do with the data once it is received by the PC.

A network may consist of up to 100 units, and may be made up of different models of Ambassadors as well as different models of Eclipses. For instance, a molding machine may have an Ambassador productivity monitor installed for shift count and run time / down time, and also have an Eclipse temperature indicator installed for monitoring die temperature. A daily report could be generated detailing shift count, down time, and die temperature profile for up to 50 machines.

This manual consists of a hardware description of an RS-485 network, and an explanation of the command and response formats. The hardware and protocol is common to all Ambassador and Eclipse models. This manual is appended with the command sets and error messages for each Ambassador and Eclipse function.

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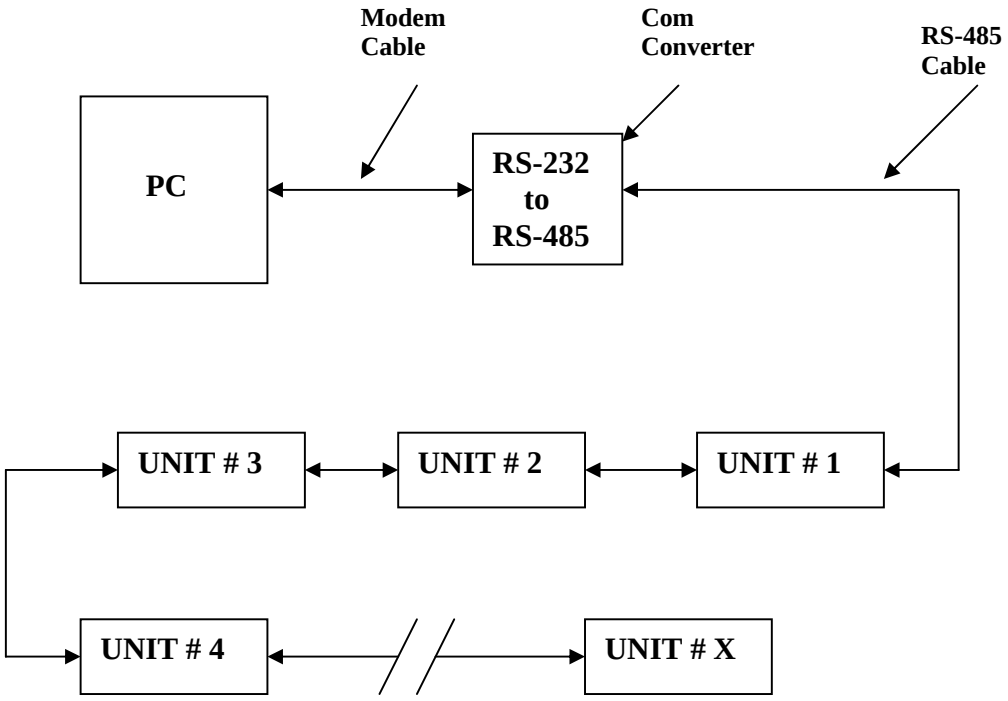
HARDWARE REQUIREMENTS



Modem cable – generally, a 9 pin M to a 9 pin F, straight-through cable, depending upon the PC's com port, and the communication converter's RS-232 port.

Com converter – converts full duplex RS-232 to half duplex RS-485. Durant part number 58801-460, or 58801-461, or equivalent.

RS-485 cable – 3 conductor, shielded cable, Belden 9925 or equivalent. Maximum distance from com converter to Unit #X is 4000 ft. A second com converter may be added as a repeater if the network length exceeds 4000 ft.

Units – Durant Ambassador and / or Eclipse series. Each unit is assigned a unique address in the range of 0-99 decimal. Addresses do not have to correspond to the unit's location on the network.

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OPERATING THEORY

Although the Ambassador 5760x-405 can initiate a transmission, none of the other models can. Generally, Ambassadors and Eclipses on the network will not speak until spoken to. The PC will transmit a command down the network. The command will contain an address. All units on the network will receive the command. After the command is transmitted, the PC will assert the RS-232 RTS handshaking line to the com converter. This will disable the com converter's internal RS-485 transmitter, and enable it's receiver.

The unit whose address is contained in the command will wait 100 msec (Ambassadors may be programmed to 2 msec), then assemble it's response and send it back up to the PC. All other units simply ignore the command. Once the PC has received the response, it turns off RTS, and is ready to send a command to the next unit.

COMMAND / RESPONSE FORMAT

Baudrate is programmable in the range of 1200 – 19.2k, and parity is programmable to odd, even, or space. All characters are ASCII and consist of 10 bits – 1 start, 7 data, 1 parity, and 1 stop.

All hexadecimal (hex) characters (A-F) must be upper case.

Decimal points in data fields must not be sent. A decimal point is recognized as a message terminator.

The command

The command consists of the following string of characters:

1. Start character (>) ASCII 62
2. Unit address, in hex for Ambassador models, in the range of 00-63H. Unit address, in decimal for Eclipse models, in the range of 00-99. The leading zero for 0-9 must be sent.
3. Command – three alphanumeric characters. Alpha characters may be upper or lower case for Ambassador models, but upper case only for Eclipse models.
4. Data, if applicable for the command. Most commands will not require data. See appendices for the command set for each model.
5. Checksum, in hex. The two least significant digits of the hex sum of the ASCII value for each character in the address, the command, and the data. See example below.
6. Termination character – either a carriage return, or a decimal point.

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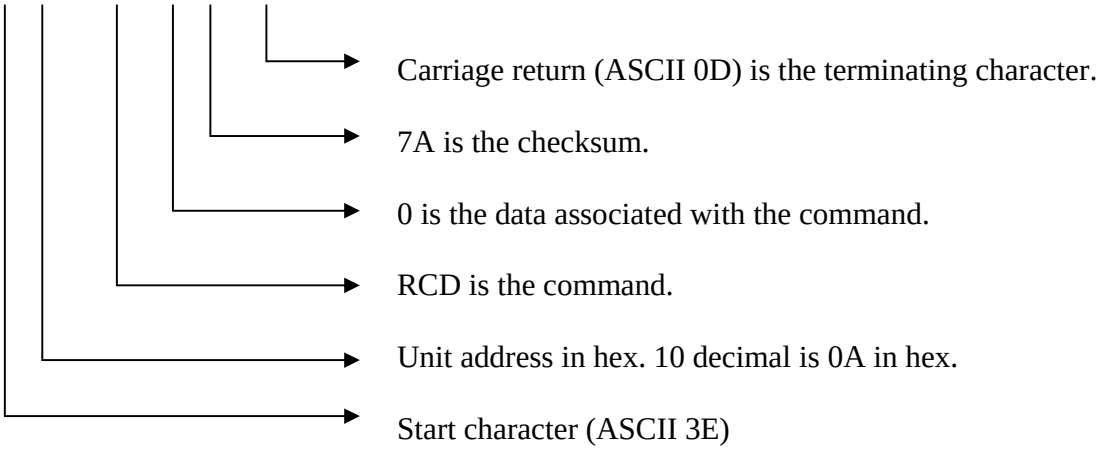
EXAMPLE: To read the count value of model 57601-403 at address 10 decimal, the serial command would be

> 0 A R C D 0 7 A (cr) - spaces shown for clarity



Calculating the checksum

Each character in the command is transmitted as a hexadecimal number assigned by ASCII. The checksum is transmitted along with the command. The receiving device calculates a checksum of the data it receives, and compares it to the transmitted checksum. If they match, the data is assumed to be good; if they don't match, the data has been corrupted. The checksum is calculated by adding the ASCII value for each character in the address, the command, and the command data, if appropriate. Only the two least significant digits of the sum are transmitted as the checksum.

EXAMPLE: Calculate the checksum for the RCD0 command sent to address 10 decimal.

> 0A RCD 0 – spaces shown for clarity

The start character > is not used for the checksum calculation.

Character	ASCII value (hex)
0	30
A	+41
R	+52
C	+43
D	+44
0	+30
	17A

The checksum is the two least significant digits of the sum (7A).

Adding the carriage return completes the string, and the entire command becomes **>0ARCD07A(cr)**

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SELECTED CHARACTERS AND ASCII VALUES IN HEX AND DECIMAL ( )

Character	Value	Character	Value	Character	Value
>	3E (63)	J	4A (74)	f	66 (102)
.	2E (46)	K	4B (75)	g	67 (103)
(cr)	0D (13)	L	4C (76)	h	68 (104)
0	30 (48)	M	4D (77)	i	69 (105)
1	31 (49)	N	4E (78)	j	6A (106)
2	32 (50)	O	4F (79)	k	6B (107)
3	33 (51)	P	50 (80)	l	6C (108)
4	34 (52)	Q	51 (81)	m	6D (109)
5	35 (53)	R	52 (82)	n	6E (110)
6	36 (54)	S	53 (83)	o	6F (111)
7	37 (55)	T	54 (84)	p	70 (112)
8	38 (56)	U	55 (85)	q	71 (113)
9	39 (57)	V	56 (86)	r	72 (114)
A	41 (65)	W	57 (87)	s	73 (115)
B	42 (66)	X	58 (88)	t	74 (116)
C	43 (67)	Y	59 (89)	u	75 (117)
D	44 (68)	Z	5A (90)	v	76 (118)
E	45 (69)	a	61 (97)	w	77 (119)
F	46 (70)	b	62 (98)	x	78 (120)
G	47 (71)	c	63 (99)	y	79 (121)
H	48 (72)	d	64 (100)	z	7A (122)
I	49 (73)	e	65 (101)	sp	20 (32)

The response

The unit whose address matches the address in the command will send back one of three possible responses:

1. A(cr) - acknowledge. The command was performed.
2. Adddddddcc(cr) - acknowledge with data. If the command was a request for data, the response will be the acknowledge character (A), the data in a fixed sized data field (ddddddd), and a two digit checksum of the characters in the data field (cc). See checksum example calculation on the next page. Decimal points in data fields are sent. Leading zeroes are sent as spaces, ASCII 20H.
3. Nee(cr) - not acknowledge (N), with a two digit error code (ee). The command was not performed because of the error detected by the unit. Error codes are listed in the appendices, along with the command sets for each type of unit.

Note that a carriage return (ASCII 0DH) is the terminating character for all responses.

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RESPONSE CHECKSUM EXAMPLE: Calculate the checksum for the response to a request for count data from a 57601403 Ambassador. The unit begins the response with the acknowledge character A, then adds the 12 character data field, C T sp sp 1 2 3 . 4 5 6 sp (spaces between characters shown for clarity). At this point, the checksum must be calculated from a string that looks like this:

ACT 123.456

The acknowledge character A is not used in the checksum calculation, only the data field. The data is in a 12 character field which consists of an identifier, CT (count), spaces, and the count value, 123.456. The 12 character field is shown below.

1	2	3	4	5	6	7	8	9	10	11	12
C	T	sp	sp	1	2	3	.	4	5	6	sp

Using the ASCII chart, the values for each character are:

43 54 20 20 31 32 33 2E 34 35 36 20

The sum of these values is 25A. The two least significant digits (5A) are used in the checksum field.

Adding the carriage return completes the string, and the entire response becomes:

ACT 123.456 5A(cr)

RUN MODE / PROGRAM MODE CONSIDERATIONS

When an Ambassador or Eclipse leaves the factory, all internal programming is set to default values. This programming determines the personality of the unit; it tells the unit how to respond to inputs, how the outputs should work, what the machine operator has access to, etc. The installer programs the unit to meet the requirements of the application. Once the unit is up and running, the installer's job is done, and internal program generally remains untouched for the unit's entire career. Now it is up to the machine operator to interact with the unit. He may enter preset values, or simply observe the display of count, or rate, or temperature, or whatever.

When the unit is powered up, it is always in one of two modes, either run mode, or program mode. The program mode is the domain of the installer, while the operator uses the unit in the run mode. This is significant because a computer can interface to the unit, through the serial port, as either an installer, or an operator. A unit may be entirely programmed through the serial port, just like an installer would do via the unit's keypad. And, run mode operator functions such as preset entry and value checking can also be accomplished serially.

All serial commands for Eclipse voltage (5770x40x and 5770x41x), current (5770x42x, 5770x43x, and 5770x44x), process (5770x45x), temperature (5770x46x), and rate (5770x47x) DPMs are valid at any time. Serial commands for all remaining Eclipse counters, and all Ambassador models, are broken down into two groups, run mode

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commands and program mode commands. Run mode commands are not valid when the unit is in the program mode. Program mode commands are not valid when the unit is in run mode. Each mode has a command which causes the unit to go into the other mode. Although it is unlikely that a unit will ever be put in the program mode once it is installed, this is still allowed. However, caution should be used. **In the program mode, the unit stops performing all run mode functions. All signal and control inputs are ignored. All outputs are turned OFF. All analog outputs go to the minimum value of 0 volts or 4 mA.**

Once a unit is returned to the run mode, it will again read its signal and control inputs. The relay and transistor outputs will remain OFF until a coincidence event or update event occurs, depending upon the output function. Analog outputs will go to the proper value at the first update.

A lock input in the active state (jumpered to DC common) will prevent entry into the program mode either through the unit's keypad, or via the serial port. A run mode serial lock command will do the same. Disconnect lock inputs and transmit the serial unlock command to access the program mode.

DURANT SERIAL COMMUNICATION UTILITY

The Durant serial communication utility (DurComm) provides the user with a diagnostic tool for serial communication between a PC and Durant Ambassador and Eclipse products. This is available from our website through the URL below:

http://www.cutler-hammer.eaton.com/unsecure/cms1/AD0-58801-002-00.ZIP

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Appendix A

Serial commands for Ambassador models 5760x400 through 5760x404

ERROR CODES

If the address in the command matches the unit address, but the command is not valid, or cannot be executed, the counter ignores the command and responds with the not acknowledge character (N), followed by a two digit error code. The error codes and their explanations are:

00 Power up error. The first valid command received by the unit after power up is not executed and not acknowledged.
01 Command not found in table or invalid command. For example, WPI received when unit is in the run mode.
02 Checksum error. Received checksum does not match the calculated checksum.
05 Invalid data. Incorrect number of characters or illegal character in the data field.
10 Lock input is active.
11 Preset edit in progress from the keypad. A serial preset cannot be sent while the preset is being changed on the keypad.
12 Command is valid for this family, but not this model, or the command is not valid for this program configuration. For instance, cannot change output timeout if output is programmed to “latched”.
13 Keypad programming is active. Cannot enter serial program mode if the unit is already in the program mode from the keypad.

RUN MODE COMMANDS

ESP Enter serial program
The unit will ignore all inputs, and turn OFF all outputs while in the program mode. Also, the display will read LOADING PROGRAM. If the unit is in the serial program mode and power is lost, it will be in the keyboard program mode when power is re-applied.
EXAMPLE
>00ESP48(cr) Causes the unit at address 00 to enter the serial program mode.
RESPONSE
A(cr)

LAL Lock all (not valid for 5760x400)
UAL Unlock all (not valid for 5760x400)
Lock all prohibits the program mode from being entered from the keypad, and also prohibits presets from being changed. Unlock all removes the serial lock. Unlock all has no effect on lock inputs. Lock commands are not stored at power down.
EXAMPLE
>11UAL44(cr) Cancels a previously issued lock all command to a unit at address 17.
RESPONSE
A(cr)

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LPG Lock program
UPG Unlock program
Lock program prohibits the program mode from being entered from the keypad. Unlock program removes the serial lock. Unlock program has no effect on lock inputs. Lock commands are not stored at power down.
EXAMPLE
>5AUPG62(cr) Cancels a previously issued lock program command to a unit at address 90.
RESPONSE
A(cr)

OCL Output control
This command causes any output(s) programmed to pick up or drop out on output control to take that state. This is the serial equivalent of an input programmed to the output control function.
EXAMPLE
>01OCL3F(cr) Causes output(s) programmed to respond to the output control signal to take the programmed state in a unit at address 01.
RESPONSE
A(cr)

RCDd Read counter data, where d is a number taken from the table below. The counter will respond with the value of the selected item.

d	Item
0	Main counter (not valid for 5760x400)
1	Batch counter (not valid for 5760x400, 5760x401, or 5760x403)
2	Totalizer (not valid for 5760x401, or 5760x403)
3	Rate
4	Preset 1 (not valid for 5760x400)
5	Preset 2 (not valid for 5760x400, 5760x401, or 5760x402)
6	Batch preset (not valid for 5760x400, 5760x402, or 5760x403)

EXAMPLE
>05RCD371(cr) Read the rate value from the unit at address 05.
RESPONSE
Addddddddddddcc(cr) Acknowledge, with 12 character data field, two character checksum of the data, and carriage return. Sample responses for all seven data items are listed below. Note that the data field is 12 characters, everything between the acknowledge and the checksum. This includes an alpha identifier, the numeric value, and spaces.

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d	Item	Response
0	Main counter	ACT 123.456 5A(cr)
1	Batch counter	ABT 123456 4B(cr)
2	Totalizer	AT 12345.678 66(cr)
3	Rate	ART 123.456 69(cr)
4	Preset 1	AP1 123.456 44(cr)
5	Preset 2	AP2 123.456 45(cr)
6	Batch preset	APB 123456 47(cr)

RCD7 Read counter data from the serial output list.
The counter has a programming sub menu called PROGRAM SERIAL OUT which allows any combination of the above run data items to be "sent" or "skipped". Those designated as SEND will be transmitted in the order shown above as a single, multi-data field response, when the unit receives the RCD7 command. This is the only run mode command that can cause more than one data item to be sent in response.
EXAMPLE
>33RCD776(cr) Send the serial output list of data items from the unit at address 51.
RESPONSE – assuming the main count, batch count, preset 1, and preset 2 are programmed to SEND, a response would consist of the acknowledge, four 12 character data fields, the two digit checksum of all the data, and a carriage return. Example:
ACT 123.456 BT 0 P1 123.456 P2 123.456 C9(cr)

RSC Reset main counter (not valid for 5760x400)
RSB Reset batch counter (not valid for 5760x400, 5760x401, or 5760x403)
RST Reset totalizer (not valid for 5760x401, or 5760x403)
These commands work the same as the reset key, or an input programmed to the above edge triggered reset function. If one or more outputs is programmed to pick up or drop out on RESET COUNT, the serial RSC command will cause that action to occur.
EXAMPLE
>00RSC48(cr) Resets the main counter in the unit at address 00.
RESPONSE
A(cr)

WP1dddddd Write preset 1 (not valid for 5760x400)
WP2dddddd Write preset 2 (not valid for 5760x400, 5760x401, or 5760x402)
WPBdddddd Write batch preset (not valid for 5760x400, 5760x401, or 5760x403)
Presets may be edited in the counter when the preset command is sent , along with the six digit value of the new preset, in the range of 000000-999999. Leading zeroes must be sent as zeroes, not spaces. No decimal point is sent.
EXAMPLE
>12WP100045001(cr) Changes preset 1 to a value of 450 in the unit at address 18.
RESPONSE
A(cr)

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STP Stop count
RSM Resume count
The stop count command causes the unit to ignore count input pulses until a resume count command is received. The stop count is not stored at power down. The unit will count input pulses when power is re-applied.
EXAMPLE
>00STP57(cr) Causes the unit at address 00 to stop counting.
RESPONSE
A(cr)

RDV Read device value
This command causes the unit to respond with identification information. It is useful for determining what type of unit is at the address that the command was sent to.
EXAMPLE
>00RDV4C(cr) Asks the unit at address 00 to identify itself.
RESPONSE – the unit responds with its family number, which in this case is "1", the software version number, "1" or greater, the hardware configuration byte, per the table below, and the serial address. Assuming that a 5760x404 was at address 00, the response would be:
A11DF004C(cr)

Model number	Hardware config byte
5760x400	18
5760x401	51
5760x402	5D
5760x403	D3
5760x404	DF

PROGRAM MODE COMMANDS

XSP Exit serial programming
This command causes the unit to store new program data, and exit the program mode into the run mode.
EXAMPLE
>00XSP5B(cr) Causes the unit at address 00 to exit the program mode.
RESPONSE
A(cr)

RPIdd Read program item, or
RPIddd
The read program item command is followed by a two or three digit program item number indicating which specific program item is to be queried. Refer to the instruction manual for the specific Ambassador model for the list of program item numbers. They are given in the section titled Serial Programming Indices. Instruction manuals come in

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the box with each unit, and are available on our web site at www.durant.com. For the RPI command, use the two or three digit number from the READ column.
EXAMPLE
>00RPI20AD(cr) Read input 1 programming selection for the unit at address 00.
RESPONSE – the unit will respond with the acknowledge, the program item number, and data which indicates the selection made for the item, followed by the checksum of the item number and data, and a carriage return. Example, assuming input 1 is programmed to be disabled:
A20092(cr)
Note: The response to the RPI command contains the same information as the Write Program Item command data. It is the item number and selection for that item. To decode the response to the RPI command, look up the item number and data in the WRITE column in the Serial Programming Indices. For instance, the item number and data from the response above is 200. Looking up WPI item 200 shows that input 1 is programmed to disabled.

WPIddd Write program item, or
WPIdddd ,or
WPIddddddd ,or
WPIddddddddd
The write program item command allows serial programming of a program menu selection. From three to eight digits of data must accompany the command, depending upon which item is being edited. The data consists of the program item number, either two or three digits, and the menu choice, which is one to six digits. The program item numbers are taken from the WRITE column of the Serial Programming Indices in the instruction manual for the unit. The menu choice for that program item is included in the WRITE column, or is given as a range of numbers.
EXAMPLE 1
>0AWPI00200000D3(cr) Programs the count scaler in the unit at address 10 to 2.00000. WPI is the command, 00 is the program item number taken from the Serial Programming Indices, and 200000 is the value chosen for the count scaler in the item's range of 000001-999999.
RESPONSE
A(cr)

EXAMPLE 2
>11WPI106E9(cr) Sets the count input mode in the unit at address 17 to solid state add / add. 10 is the program item number for count mode, and 6 is the menu selection for solid state add / add.

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Appendix B

Serial commands for Ambassador Rate / Ratio models 5715x400 through 5715x405

ERROR CODES

If the address in the command matches the unit address, but the command is not valid, or cannot be executed, the ratemeter ignores the command and responds with the not acknowledge character (N), followed by a two digit error code. The error codes and their explanations are:

00 Power up error. The first valid command received by the unit after power up is not executed and not acknowledged.
01 Command error. Command not found in command table or invalid command. For example, a program mode command was sent while the unit was in the run mode.
02 Checksum error. Received checksum does not match the calculated checksum.
05 Data error. Incorrect number of characters or illegal character in the data field.
10 Lock error. Lock input is active.
11 Alarm edit in process error. If the same alarm setpoint being edited by the WRD command is being edited at the keypad, the unit will not acknowledge the serial command.
12 Configuration error. Command is not valid for this program configuration, or is valid for this family, but not this model. For instance, the full scale value cannot be sent if the unit does not have an analog output.
13 Keypad programming error. Cannot enter serial programming mode if the unit is in the keypad programming mode.
14 Serial out list is empty. This response to the RSO command indicates the serial out list is empty because all items were deleted by the DSO command, or the list is at the default state (empty).

RUN MODE COMMANDS

ESP Enter serial program
The unit will ignore all inputs, and turn OFF all outputs while in the program mode. Also, the display will read LOADING PROGRAM. If the unit is in the serial program mode and power is lost, it will be in the keyboard program mode when power is re-applied.
EXAMPLE
>00ESP48(cr) Causes the unit at address 00 to enter the serial program mode.
RESPONSE
A(cr)

LAL Lock all
UAL Unlock all

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Lock all prohibits the program mode from being entered from the keypad, and also prohibits setpoints from being changed. Unlock all removes the serial lock. Unlock all has no effect on lock inputs. Lock commands are not stored at power down.
EXAMPLE
>11UAL44(cr) Cancels a previously issued lock all command to a unit at address 17.
RESPONSE
A(cr)

LPG Lock program
UPG Unlock program
Lock program prohibits the program mode from being entered from the keypad. Unlock program removes the serial lock. Unlock program has no effect on lock inputs. Lock commands are not stored at power down.
EXAMPLE
>5AUPG62(cr) Cancels a previously issued lock program command to a unit at address 90.
RESPONSE
A(cr)

RRDd Read run data, where d is taken from the table below. The ratemeter will respond with the value of the selected item.

d	Item
0	A rate
1	B rate
2	Ratio
3	Alarm 1 setpoint
4	Alarm 2 setpoint
5	Ratio high setpoint
6	Ratio low setpoint
7	Full scale value

EXAMPLE
>4CRRD291(cr) Read the ratio value from the unit at address 76.
RESPONSE
Addddddddddddcc(cr) Acknowledge, with 12 character data field, two character checksum, and carriage return. Note that the data field is 12 characters, everything between the acknowledge and the checksum. This includes an identifier, the numeric value, and spaces. A typical response would be:
AR/ 0.37 09(cr) – where the 12 character data field consists of the identifier, R/, the numeric value, 0.37, two or three spaces between the identifier and the value, and one space between the value and the checksum. Leading zeroes in the value are also sent as spaces.
The identifier shows which item is received. Four of the items, ratio, alarm 1, alarm 2, and analog output (full scale), are programmable, and the identifier also indicates the assignment. The list of identifiers and their meanings is:

Identifier	Description
A	A rate

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B	B rate
DF	Ratio value (ratio set to difference)
R/	Ratio value (ratio set to ratio)
%A	Ratio value (ratio set to draw in % of A)
%B	Ratio value (ratio set to draw in % of B)
AH	Alarm 1 setpoint (alarm 1 is A rate, high)
AL	Alarm 1 setpoint (alarm 1 is A rate, low)
BH	Alarm 1 setpoint (alarm 1 is B rate, high)
BL	Alarm 1 setpoint (alarm 1 is B rate, low)
aH	Alarm 2 setpoint (alarm 2 is A rate, high)
aL	Alarm 2 setpoint (alarm 2 is A rate, low)
bH	Alarm 2 setpoint (alarm 2 is B rate, high)
bL	Alarm 2 setpoint (alarm 2 is B rate, low)
RH	Ratio high alarm setpoint
RL	Ratio low alarm setpoint
F0	Full scale value (analog follows 0 offset)
FA	Full scale value (analog follows A rate)
FB	Full scale value (analog follows B rate)
FR	Full scale value (analog follows ratio)

WRDddddddd Write run data

Alarm setpoints and the full scale value may be sent to the unit. Seven data characters follow the command, the run data item number, the sign, and the five digit value. The run data item numbers are:

#	Item
3	Alarm 1 setpoint
4	Alarm 2 setpoint
5	Ratio high setpoint
6	Ratio low setpoint
7	Full scale value

The second data character is the sign. If the value is positive, this character is either a plus sign (+), or a space. If the value is negative, a minus sign (-), must occupy the second data character position. The last five characters are the value to be sent. Leading zeroes in the value must be sent. No decimal points can be sent.

EXAMPLE

>00WRD3 0002092(cr) Programs the alarm 1 setpoint to a value of 20 in the unit at address 00.

RESPONSE

A(cr)

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ASOd Add to serial out list
DSOd Delete from serial out list
The items in the serial out list are transmitted when the unit receives an RSO command. At default, the serial out list is empty. Run items may be added to the list by transmitting the ASO command and one data character, indicating which item is to be added. Similarly, items may be deleted from the list by transmitting the DSO command and one data character, indicating which item is to be deleted. The items are listed in the table below.

d	Item
0	A rate
1	B rate
2	Ratio
3	Alarm 1
4	Alarm 2
5	Ratio high
6	Ratio low
7	Full scale value

EXAMPLE
>00ASO477(cr) Adds item 4 (Alarm 2 setpoint) to the serial out list in the unit at address 00.
RESPONSE
A(cr)

RSO Read serial out list
This command causes the unit to transmit all items in the serial out list. This is the only command that can cause more than one item to be sent in a single response. The format of the response is the acknowledge character A, followed by a 12 character data field for each of the items being sent, followed by a two digit checksum of all the data fields, and terminated with a carriage return. The 12 character data field is the same as the response to the RRD command. Items are transmitted in the order of data item number in the RRD command list.
EXAMPLE
>14RSO59(cr) Read the serial out list from the unit at address 20.
RESPONSE (Assume that the serial out list contains items 0 (A rate), and 2 (ratio)).
AA 4701 DF -17 C3(cr)

RDV Read device value
This command causes the unit to respond with identification information. It is useful for determining what type of unit is at the address that the command was sent to.
EXAMPLE
>63RDV55(cr) Asks the unit at address 99 to identify itself.

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RESPONSE – the unit responds with its family number, in this case “2”, the software revision number, “1” or greater, the hardware configuration byte, per the table below, and the serial address. Assuming that a 5715x405 is at address 99, the response would be:
A213F6345(cr)

Model number	Hardware config byte
5715x400	01
5715x401	21
5715x402	0F
5715x403	2F
5715x404	1F
5715x405	3F

PROGRAM MODE COMMANDS

XSP Exit serial programming
This command causes the unit to store new program data, and exit the program mode into the run mode.
EXAMPLE
>00XSP5B(cr) Causes the unit at address 00 to exit the program mode.
RESPONSE
A(cr)

RPIdd Read program item
The read program item command is followed by a two digit program item number indicating which specific program item is to be queried. Refer to the instruction manual for the specific Ambassador model for the list of program item numbers. They are given in the section titled Serial Programming Indices. Instruction manuals come in the box with each unit, and are available on our web site at www.durant.com. For the RPI command, use the two digit number from the READ column.
EXAMPLE
>00RPI20AD(cr) Read the ratio calculation programming selection for the unit at address 00.
RESPONSE – the unit will respond with the acknowledge, the program item number, and data which indicates the selection made for the item, followed by the checksum of the item number and data, and a carriage return. Example, assuming the ratio calculation is programmed to be ratio A / B:
A20092(cr)
Note: The response to the RPI command contains the same information as the Write Program Item command data. It is the item number and selection for that item. To decode the response to the RPI command, look up the item number and data in the WRITE column in the Serial Programming Indices. For instance, the item number and data from

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the response above is 200. Looking up WPI item 200 shows that the ratio calculation is programmed to ratio A / B.

WPIddd Write program item, or
WPIdddd ,or
WPIddddd ,or
WPIdddddd ,or
WPIddddddddd
The write program item command allows serial programming of a program menu selection. From three to eight digits of data must accompany the command, depending upon which item is being edited. The data consists of the two digit program item number, and the menu choice, which is one to six digits. The program item numbers are taken from the WRITE column of the Serial Programming Indices in the instruction manual for the unit. The menu choice for that program item is included in the WRITE column, or is given as a range of numbers.
EXAMPLE 1
>0AWPI00360000DB(cr) Programs the A rate scaler in the unit at address 10 to 60.000. WPI is the command, 00 is the program item number taken from the Serial Programming Indices, 3 is the decimal point location for the A scaler, and 60000 is the number in the field, rendering a scaler of 60.000.
RESPONSE
A(cr)

EXAMPLE 2
>11WPI102E5(cr) Sets the alarm 1 assignment in the unit at address 17 to HI B RATE. 10 is the program item number for count mode, and 2 is the menu selection for HI B RATE.

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Appendix C

Serial commands for Ambassador PMC models 5720x420 and 5720x421

ERROR CODES

If the address in the command matches the unit address, but the command is not valid, or cannot be executed, the PMC ignores the command and responds with the not acknowledge character (N), followed by a two digit error code. The error codes and their explanations are:

00 Power up error. The first valid command received by the unit after power up is not executed and not acknowledged.

01 Command error. Command not found in command table or invalid command. For example, a program mode command was sent while the unit was in the run mode.

02 Checksum error. Received checksum does not match the calculated checksum.

05 Data error. Incorrect number of characters or illegal character in the data field.

10 Lock error. Lock input is active.

11 Edit in process error. If the same run mode register being edited by the WRD command is being edited at the keypad, the unit will not acknowledge the serial command.

12 Configuration error. Command is not valid for this program configuration, or is valid for this family, but not this model. For instance, the output pulse time cannot be sent if the output is programmed to latched.

13 Keypad programming error. Cannot enter serial programming mode if the unit is in the keypad programming mode.

14 Serial out list is empty. This response to the RSO command indicates that the serial out list is empty because all items were deleted by the DSO command, or the list is at the default state (empty).

15 Down input condition. The monitor will send this response to the first command it receives after a down input becomes active.

16 New reason code. The monitor will send this response to the first command it receives after a reason code entry from the keypad. If the reason code is entered serially, no error 16 will be sent.

17 Reason reset. The monitor will send this response to the first command it receives after the reason interlock has been reset from the keypad. If the reason is reset serially, no error 17 will be sent.

18 New ID data. The monitor will send this response to the first command it receives new ID data has been entered from the keypad. If the ID data is entered serially, no error 18 will be sent.

19 Process is running. This response indicates that the process started running since the last serial communication.

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RUN MODE COMMANDS

ESP Enter serial program
The unit will ignore all inputs, and turn OFF all outputs while in the program mode. Also, the display will read LOADING PROGRAM. If the unit is in the serial program mode and power is lost, it will be in the keyboard program mode when power is re-applied.
EXAMPLE
>00ESP48(cr) Causes the unit at address 00 to enter the serial program mode.
RESPONSE
A(cr)

ASOdd Add to serial out list
DSOdd Delete from serial out list
The items in the serial out list are transmitted when the unit receives an RSO command. At default, the serial out list is empty. Run items may be added to the list by transmitting the ASO command and two data characters, indicating which item is to be added. Similarly, items may be deleted from the list by transmitting the DSO command and two data characters, indicating which item is to be deleted. The items are listed in the table below.

dd	Item	dd	Item
00	Batch count	23	Rate / ideal rate
01	Batch preset	24	Cycle time
02	Batch complete	30	Prod / elapsed
03	Total	31	Down / elapsed
04	Total 2	32	Run / elapsed
05	Total 2 / total	40	Down time
10	Part number	41	Run time
11	Job number	42	Elapsed time
12	Operator ID	50	A scaler
20	Rate	51	B scaler
21	Rate units	53	R scaler
22	Ideal rate	70	Reason code

All items are added to the list when dd = 99.
EXAMPLE
>08ASO01AC(cr) Adds the batch preset to the serial out list of the unit at address 08.
RESPONSE
A(cr)

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RSO Read serial out list

All items in the serial out list are transmitted when the unit receives the RSO command. . This command can cause more than one item to be sent in a single response. The format of the response is the acknowledge character A, followed by a 12 character data field for each of the items being sent, followed by a two digit checksum of all the data fields, and terminated with a carriage return. The 12 character data field is the same as the response to the RRD command. Items are transmitted in the order of data item number in the RRD command list.

EXAMPLE

>08RSO5C(cr) Read the serial out list from the unit at address 08.

RESPONSE (Assume that the serial out list contains items 00 (batch count) and 10 (part number)).

AB 123456 PT 11000222 83(cr)

RRDd Read run data (run menu)

RRDdd Read run data (run item)

The read run data command comes in two forms. When followed by a single digit, the response will be all run items in the selected run menu. For instance, the RRD1 command will cause all items in run menu 1 to be sent, the Part Number, the Job Number, and the Operator ID. When followed by a two digit number, RRD will cause a single run item to be sent. The run menu numbers, and the run item numbers are given in the table below.

d	Run menu	dd	Run item
0	Count data		
		00	Batch count
		01	Batch preset
		02	Batch complete
		03	Total
		04	Total 2
		05	Total 2 / total
1	ID data		
		10	Part number
		11	Job number
		12	Operator ID
2	Rate data		
		20	Rate
		21	Rate units
		22	Ideal rate
		23	Rate / ideal
		24	Cycle time
3	Time efficiency data		
		31	Productivity / elapsed
		32	Down / elapsed
		33	Run / elapsed

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d	Run menu	dd	Run item
4	Time data		
		40	Down time
		41	Run time
		42	Elapsed time
5	Setup scalers		
		50	A scaler
		51	B scaler
		52	Count decimal point
		53	Rate scaler
		54	Rate decimal point
7	Reason		
		70	Reason code

EXAMPLE
>20RRD22AE(cr) Read the ideal rate from the unit at address 32.
RESPONSE
AIR 1500 21(cr) The ideal rate is 1500. The unit will respond with the acknowledge character, followed by a twelve character data field, followed by the checksum of the data field, and terminated with a carriage return. The twelve character data field contains a one or two character identifier for the run item, spaces, the value for the item, and the twelfth character is always a space. Leading zeroes are sent as spaces. If a decimal point is in the value other than the least significant place, it will be sent. The item identifiers and their descriptions are listed below.

Identifier	Description	Identifier	Description
B	Batch count	IR	Ideal rate
P	Batch preset	%I	Rate / ideal rate
BC	Time until batch complete	CT	Cycle time
T	Total	PR	Count / elapsed time
t	Total 2	D%	Down time / elapsed time
%T	Total 2 / total	R%	Run time / elapsed time
PT	Part number	DT	Down time
JB	Job number	RT	Run time
OP	Operator ID	ET	Elapsed time
R	Rate	AS	A scaler
RU	Rate units	BS	B scaler
RC	Reason code	RS	Rate scaler

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WRDddd Write run data, or
WRDdddd ,or
WRDddddddd ,or
WRDddddddddd ,or
WRDdddddddddd ,or
WRDddddddddddd

There are 13 run items which can be serially sent to the PMC. Three, four, six, eight, nine, or ten data characters follow the command. The first two characters are the item number for the particular run item to be edited. The remaining characters are the value being written. Leading zeroes must be sent. No decimal point may be sent. Only one item may be transmitted per WRD command. The following table lists the items, the command with item number, and the explanation and ranges for the value fields.

Item	Command	Value
Batch preset	WRD01	nnnnnn, where nnnnnn is in the range of 000000 to 999999
Part number	WRD10	aaaaaaaa, where each character (a)is numeric (0-9), or alpha (uppercase A-Z), or a space, underscore (_), comma (,), hyphen (-), period (.), or slash (/)
Job number	WRD11	aaaaaaaa, same range as for part number, above
Operator ID	WRD12	aaaaaaaa, same range as for part number, above
Rate units	WRD21	uu, where each character (u) is alpha (uppercase A-Z), or a space, or underscore(_)
Ideal rate	WRD22	nnnnnn, where nnnnnn is in the range of 000000 to 999999
Adjust down time	WRD43	nnnnnnt, where nnnnnn is in the range of 000000 to 999999, and t is the time units (H, M, or S uppercase)
A scaler	WRD50	nnnnnn, where nnnnnn is in the range of 000001 to 999999
B scaler	WRD51	nnnnnn, where nnnnnn is in the range of 000001 to 999999
Count decimal pt.	WRD52	d, where d is in the range of 0 to 5. The decimal point will have d digits to its right on the display.
Rate scaler	WRD53	dnnnnn, where d is the decimal point location for the rate scaler, and is in the range of 0 to 5. The decimal point will have d digits to its right in the rate scaler. nnnnn is the numeric value of the rate scaler, and nnnnn is in the range of 00001 to 99999.
Rate decimal point	WRD54	d, where d is in the range of 0 to 5. The rate decimal point will have d digits to its right on the rate display.
Reason code	WRD70	nnnn, where nnnn is in the range of 0000 to 9999

EXAMPLES
>41WRD11T32 181/B98(cr) Writes T32 181/B in the job number register in the unit at address 65.
RESPONSE
A(cr)

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>27WRD43000045MCC(cr) Adjusts the down time to 45 minutes in the unit at address 39.
RESPONSE
A(cr)

>5AWRD53360000F4(cr) Sets the rate scaler to 60.000 in the unit at address 90.
RESPONSE
A(cr)

RDV Read device value
This command causes the unit to respond with identification information. It is useful for determining what type of unit is at the address that the command was sent to.
EXAMPLE
>63RDV55(cr) Asks the unit at address 99 to identify itself.
RESPONSE – the unit responds with its family number, in this case "4", the software revision number, "4" or greater, the hardware configuration byte, per the table below, and the serial address. Assuming that a 5720x420 is at address 99, the response would be:
A443F634A(cr)

Model number	Hardware config byte
5720x420	3F
5720x421	7F

PROGRAM MODE COMMANDS

XSP Exit serial programming
This command causes the unit to store new program data, and exit the program mode into the run mode.
EXAMPLE
>00XSP5B(cr) Causes the unit at address 00 to exit the program mode.
RESPONSE
A(cr)

RPIdd Read program item
The read program item command is followed by a two digit program item number indicating which specific program item is to be queried. Refer to the instruction manual for the specific Ambassador model for the list of program item numbers. They are given in the section titled Serial Programming Indices. Instruction manuals come in the box with each unit, and are available on our web site at www.durant.com. For the RPI command, use the two digit number from the READ column.
EXAMPLE
>00RPI20AD(cr) Read the time units, for the down timer, programming selection for the unit at address 00.
RESPONSE – the unit will respond with the acknowledge, the program item number, and data which indicates the selection made for the item, followed by the checksum of the

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item number and data, and a carriage return. Example, assuming the time units is programmed to be Auto:
A20092(cr)
Note: The response to the RPI command contains the same information as the Write Program Item command data. It is the item number and selection for that item. To decode the response to the RPI command, look up the item number and data in the WRITE column in the Serial Programming Indices. For instance, the item number and data from the response above is 200. Looking up WPI item 200 shows that the time units, for the down timer, is programmed to Auto.

WPIddd Write program item, or
WPIdddd ,or
WPIddddddd ,or
The write program item command allows serial programming of a program menu selection. From three to six digits of data must accompany the command, depending upon which item is being edited. The data consists of the two digit program item number, and the menu choice, which is one, two, or four digits. The program item numbers are taken from the WRITE column of the Serial Programming Indices in the instruction manual for the unit. The menu choice for that program item is included in the WRITE column, or is given as a range of numbers.
EXAMPLE 1
>0AWPI1036002C(cr) Programs the rate zero timer in the unit at address 10 to 360.0. WPI is the command, 10 is the program item number taken from the Serial Programming Indices, and 3600 is the value for the timer, taken from the range of 0001 to 9999.
RESPONSE
A(cr)

EXAMPLE 2
>11WPI302E7(cr) Sets the input 1 assignment in the unit at address 17 to Reset Batch . 30 is the program item number for count mode, and 2 is the menu selection for Reset Batch.

SRDdd Set run display
This command sets the run mode display screen that will appear when the unit exits the program mode. If this command is not sent, the display will revert to what it was showing when the program mode was entered. The command is followed by two digits of data, the run item number (dd) found in the table for the run mode commands ASO and DSO.
EXAMPLE
>00SRD11AB(cr) Sets the run mode display to “Job Number”
RESPONSE
A(cr)

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Appendix D

Serial commands for the Strider (Ambassador) speed control models 5740x400 and 5740x401

ERROR CODES

If the address in the command matches the unit address, but the command is not valid, or cannot be executed, the PMC ignores the command and responds with the not acknowledge character (N), followed by a two digit error code. The error codes and their explanations are:

00 Power up error. The first valid command received by the unit after power up is not executed and not acknowledged.

01 Command error. Command not found in command table or invalid command. For example, a program mode command was sent while the unit was in the run mode.

02 Checksum error. Received checksum does not match the calculated checksum.

03 Input buffer overrun. The command contains more than 19 characters.

05 Data error. Incorrect number of characters or illegal character in the data field.

07 Specified limits error. The value in the data field exceeds the programmed limits for the parameter, or the item number in the data field is not valid for this family.

10 Lock error. Lock input is active.

11 Edit in process error. If the same run mode register being edited by the WRD command is being edited at the keypad, the unit will not acknowledge the serial command.

12 Configuration error. Command is not valid for this program configuration, or is valid for this family, but not this model. For instance, an alarm setpoint cannot be sent if the output is programmed to No Feedback.

13 Keypad programming error. Cannot enter serial programming mode if the unit is in the keypad programming mode.

14 Serial out list is empty. This response to the RSO command indicates that the serial out list is empty because all items were deleted by the DSO command, or the list is

If the address in the command matches the unit address, but the command is not valid, or cannot be executed, the PMC ignores the command and responds with the not acknowledge character (N), followed by a two digit error code. The error codes and their explanations are:

00 Power up error. The first valid command received by the unit after power up is not executed and not acknowledged.

01 Command error. Command not found in command table or invalid command. For example, a program mode command was sent while the unit was in the run mode.

02 Checksum error. Received checksum does not match the calculated checksum.

05 Data error. Incorrect number of characters or illegal character in the data field.

10 Lock error. Lock input is active.

11 Edit in process error. If the same run mode register being edited by the WRD command is being edited at the keypad, the unit will not acknowledge the serial command.

12 Configuration error. Command is not valid for this program configuration, or is valid

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for this family, but not this model. For instance, the output pulse time cannot be sent if the output is programmed to latched.

13 Keypad programming error. Cannot enter serial programming mode if the unit is in the keypad programming mode.

14 Serial out list is empty. This response to the RSO command indicates that the serial out list is empty because all items were deleted by the DSO command, or the list is at the default state (empty).at the default state (empty).

21 Serial control disabled. The serial control inputs have been disabled in the Serial Control program menu.

22 Drive is operating. Cannot enter serial program mode unless the unit is in the motor stopped state.

23 No feedback fast stop state is active. The unit is in the no feedback fast stop state, and Cannot be started until the no feedback fast stop latch control status bit is cleared, either by the front panel Clear key, or by the serial Clear command.

RUN MODE COMMANDS

ESP Enter serial program

The unit will ignore all inputs, and turn OFF all outputs while in the program mode. Also, the display will read LOADING PROGRAM. If the unit is in the serial program mode and power is lost, it will be in the keyboard program mode when power is re-applied.

EXAMPLE

>00ESP48(cr) Causes the unit at address 00 to enter the serial program mode.

RESPONSE

A(cr)

RSO Read serial out list

All items in the serial out list are transmitted when the unit receives the RSO command. . This command can cause more than one item to be sent in a single response. The format of the response is the acknowledge character A, followed by an eight character data field for each of the items being sent, followed by a two digit checksum of all the data fields, and terminated with a carriage return. The eight character data field is the same as the response to the RRD command. Items are transmitted in the order of data item number in the RRD command list. See RRD command, below.

EXAMPLE

>08RSO5C(cr) Read the serial out list from the unit at address 08.

RESPONSE (Assume that the serial out list contains items 01 (feedback speed) and 30 (accel time)).

ASP 1750AT 10E6(cr)

ASOdd Add to serial out list

DSOdd Delete from serial out list

The items in the serial out list are transmitted when the unit receives an RSO command. At default, the serial out list is empty. Run items may be added to the list by transmitting

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the ASO command and two data characters, indicating which item is to be added. Similarly, items may be deleted from the list by transmitting the DSO command and two data characters, indicating which item is to be deleted. The items are listed in the table below.

dd	Item	dd	Item
00	Current preset	32	1st key step
01	Feedback speed	33	Repeat key step
02	Error	40	Proportional gain
10	Preset 1	41	Integral gain
11	Preset 2	42	Trim limit
12	Jog preset 1	50	Ext ref RPM
13	Jog preset 2	51	Feedback RPM
20	Error alarm	52	Ramped ref RPM
21	Feedback alarm 1	53	Drive signal out
22	Feedback alarm 2	54	Trim out
30	Accel time		
31	Decel time		

All items are added to, or deleted from, the list when dd = 99.
EXAMPLE
>08ASO01AC(cr) Adds the feedback speed to the serial out list of the unit at address 08.
RESPONSE
A(cr)

RRDd Read run data (run menu)
RRDdd Read run data (run item)
The read run data command comes in two forms. When followed by a single digit, the response will be all run items in the selected run menu. For instance, the RRD1 command will cause all items in run menu 1 to be sent, Preset 1, Preset 2, Jog preset 1, and Jog preset 2. When followed by a two digit number, RRD will cause a single run item to be sent. The run menu numbers, and the run item numbers are given in the table below.

d	Run menu	dd	Run item
0	View menu		
		00	Current preset
		01	Feedback speed
		02	Error
1	Adjust presets menu		
		10	Preset 1
		11	Preset 2
		12	Jog preset 1
		13	Jog preset 2
2	Adjust alarms menu		
		20	Error alarm
		21	Feedback alarm 1
		22	Feedback alarm 2

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3	Adjust setup menu		
		30	Accel time
		31	Decel time
		32	1st key step
		33	Repeat key step
4	Adjust tuning menu		
		40	Proportional gain
		41	Integral gain
		42	Trim limit
5	Monitor values menu		
		50	External reference RPM
		51	Feedback RPM
		52	Ramped reference RPM
		53	Drive signal (%)
		54	Trim out (%)

EXAMPLE

>20RRD22AE(cr) Read the feedback alarm 2 value from the unit at address 32.

RESPONSE

ALO 10009C(cr) The low alarm setpoint is 1000. The unit will respond with the acknowledge character, followed by an eight character data field, followed by the checksum of the data field, and terminated with a carriage return. The eight character data field contains a two character identifier for the run item, spaces, and the value for the item. Leading zeroes are sent as spaces. If a decimal point is in the value other than the least significant place, it will be sent. The item identifiers and their descriptions are listed below. Note that some run items have more than one choice for identifier, depending upon the programmed mode (master or follower), run state or jog state, or the programming of alarm outputs.

Identifier	Description	Identifier	Description
p1	Current preset is P1	HI	Feedback alarm high setpoint
p2	Current preset is P2	NM	Feedback alarm nominal value
r1	Current preset is R1	LO	Feedback alarm low setpoint
r2	Current preset is R2	%D	Feedback alarm % deviation
j1	Current preset is J1	DV	Feedback alarm =/- deviation
j2	Current preset is J2	AT	Accel time
SP	Feedback speed is speed	DT	Decel time
FR	Feedback speed is ratio	1K	1st key step
fb	Feedback speed is fdbk RPM	RK	Repeat key step
ER	Error	Kp	Proportional gain
P1	Preset 1 (master mode)	Ki	Integral gain
R1	Preset 1 (follower mode)	TL	Trim limit
P2	Preset 2 (master mode)	XR	External reference RPM
R2	Preset 2 (follower mode)	FB	Feedback RPM
J1	Jog preset 1	RR	Ramped reference RPM
J2	Jog preset 2	DS	Drive signal %
EA	Error alarm	TR	Trim output %

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WRDdddd Write run data, or
WRDddddd ,or
WRDddddddd

There are 14 run items which can be sent to the speed control. Four, five, or six data characters follow the command. The first two characters are the item number for the particular run item to be edited. The remaining characters are the value being written. Leading zeroes must be sent. No decimal point may be sent. The following table lists the items, the command with item number, and the explanation and ranges for the value fields.

Item	Command	Value
Preset 1	WRD10	nnnn, where nnnn is in the range of 0000 to 9999
Preset 2	WRD11	nnnn, where nnnn is in the range of 0000 to 9999
Jog preset 1	WRD12	nnnn, where nnnn is in the range of 0000 to 9999
Jog preset 2	WRD13	nnnn, where nnnn is in the range of 0000 to 9999
Error alarm	WRD20	nnnn, where nnnn is in the range of 0000 to 9999
Feedback alarm 1	WRD21	nnnn, where nnnn is in the range of 0000 to 9999
Feedback alarm 2	WRD22	nnnn, where nnnn is in the range of 0000 to 9999
Accel time	WRD30	nnnn, where nnnn is in the range of 0000 to 9999
Decel time	WRD31	nnnn, where nnnn is in the range of 0000 to 9999
1st key step	WRD32	nnn, where nnn is in the range of 000 to 199
Repeat key step	WRD33	nnn, where nnn is in the range of 000 to 199
Proportional gain	WRD40	nnnn, where nnnn is in the range of 0000 to 9999
Integral gain	WRD41	nnnn, where nnnn is in the range of 0000 to 9999
Trim limit	WRD42	nn, where nn is in the range of 00 to 99

EXAMPLE
>41WRD110800BB(cr) Writes 800 as preset 2 in the unit at address 65.
RESPONSE
A(cr)

RCS Read control status

This command requests the present status of the control inputs and digital outputs, and the present operating states. The response is data in the form of eight hexadecimal digits. The response will look like this:

A12345678(ch)(cr), where A is the acknowledge character, 1-8 are the data digits, (ch) is the checksum, and (cr) is the carriage return terminating character.

The data digits were listed as 1-8 merely to show their position. Each one of these digits will be a hexadecimal number in the range of 0-F. Each hex digit is composed of four bits, representing the states of four inputs, or four outputs, or four operating states. The tables below list each digit and the parameter described by each of the four bits that make up the digit. Each bit will either be a “1” (active) or a “0” (not active). Remember that the two stop inputs, FAST STOP (NOT) and RAMPED STOP (NOT), are inverse functions; when the stop input is in the “0” state, the unit will stop.

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DIGIT 1

Decimal bit weight	8	4	2	1
Bit parameter	Input 12	Input 11	Input 10	Input 9

Note: Model 5740x400 does not have these inputs. Therefore, all inputs have a value of zero, and the digit has a value of zero.

DIGIT 2

Decimal bit weight	8	4	2	1
Bit parameter	Preset select	Input 7	Input 6	Fast stop

The preset select bit is 1 if control input 8 is active, or if the preset select serial input has been set; see RSI command.

The fast stop bit is 0 if input 5 is inactive or if the fast stop serial input has been set; see RSI command.

Model 5740x400 does not have control inputs 5-8, nor does it have the preset select serial command. For the 5740x400, digit 2 depends solely upon the state of the fast stop serial input.

DIGIT 3

Decimal bit weight	8	4	2	1
Bit parameter	Input 4	Input 3	Input 2	Start

The start bit is 1 if the start control input is active, or the run / stop serial input has been set.

DIGIT 4

Decimal bit weight	8	4	2	1
Bit parameter	Transistor 4	Transistor 3	Transistor 2	Transistor 1

The bit is a 1 if the output is ON, and a 0 if it is OFF.

DIGIT 5

Decimal bit weight	8	4	2	1
Bit parameter	No feedback latch	Error alarm	Low alarm	High alarm

DIGIT 6

Decimal bit weight	8	4	2	1
Bit parameter	Reversed	Lock control	No feedback	Zero speed

Lock control is a 1 only when the unit is programmed in the Serial Control sub menu to Serial Control Only.

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DIGIT 7

Decimal bit weight	8	4	2	1
Bit parameter	At speed	Reversing	Holding speed	Fast stopping

DIGIT 8

Decimal bit weight	8	4	2	1
Bit parameter	Ramp stopping	Jogging	Running	Stopped

EXAMPLE
>08RCS50(cr) Read the control status from the unit at address 08.
RESPONSE
A801F0082A9(cr) Input 12 is active, input 1 is active or the run stop serial input has been set, all four transistor outputs are ON, the unit is at speed, and running.

RSI Read serial inputs
WSIdd Write serial inputs
There are six serial inputs that duplicate control input functions. The inputs are transmitted as a two digit hexadecimal number. The bit location for each serial input is given in the table below.

DIGIT 1

Decimal bit weight	8	4	2	1
Bit parameter	None (always 0)	None (always 0)	Preset select	Reverse

DIGIT 2

Decimal bit weight	8	4	2	1
Bit parameter	Hold speed	Fast stop	Open loop	Run / stop

The descriptions of the 1 and 0 states of each bit are:

	1	0
Preset select	Preset 2	Preset 1
Reverse	Reverse	Forward
Hold speed	Hold speed	Adjust speed
Fast stop	Fast stop	No fast stop
Open loop	Open loop	Closed loop
Run / stop	Run	Momentary ramped stop

EXAMPLE
>20RSI50(cr) Read the serial inputs in the unit at address 32.
RESPONSE
A0A71(cr) The hold speed and open loop serial inputs are set, and all other serial inputs are OFF.

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EXAMPLE
>20WSI0AC6(cr) Write the hold speed and open loop serial inputs ON in the unit at address 32.
RESPONSE
A(cr)

RFE Read feedback and error
The control responds with the instantaneous feedback and error readings.
EXAMPLE
>00RFE3D(cr) Read the feedback and error values from the unit at address 00.
RESPONSE
A0100-0002B0(cr) The feedback RPM is 100 and the error is –2 RPM.

CLE Clear error
This command will clear certain errors. It is similar to pressing the Clear key on the front panel to clear the no feedback error.
EXAMPLE
>01CLE39(cr) Clear error in unit at address 01.
RESPONSE
A(cr)

LAL Lock all
UAL Unlock all
Lock all prohibits the program mode from being entered from the keypad, and also prohibits setpoints from being changed. Unlock all removes the serial lock. Unlock all has no effect on lock inputs. Lock commands are not stored at power down.
EXAMPLE
>11UAL44(cr) Cancels a previously issued lock all command to a unit at address 17.
RESPONSE
A(cr)

LPG Lock program
UPG Unlock program
Lock program prohibits the program mode from being entered from the keypad. Unlock program removes the serial lock. Unlock program has no effect on lock inputs. Lock commands are not stored at power down.
EXAMPLE
>5AUPG62(cr) Cancels a previously issued lock program command to a unit at address 90.
RESPONSE
A(cr)

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RDV Read device value

This command causes the unit to respond with identification information. It is useful for determining what type of unit is at the address that the command was sent to.

EXAMPLE

>63RDV55(cr) Asks the unit at address 99 to identify itself.

RESPONSE – the unit responds with its family number, in this case "5", the software revision number, "1" or greater, the hardware configuration byte, per the table below, and the serial address. Assuming that a 5740x400 is at address 99, the response would be:

A52016331(cr)

Model number	Hardware config byte
5740x400	01
5740x401	02

PROGRAM MODE COMMANDS

XSP Exit serial programming

This command causes the unit to store new program data, and exit the program mode into the run mode.

EXAMPLE

>00XSP5B(cr) Causes the unit at address 00 to exit the program mode.

RESPONSE

A(cr)

FDP Force defaults into program NOVRAM

This command causes all program mode menu items to return to factory default values.

EXAMPLE

>01FDP3B(cr) Default the program in the unit at address 01

RESPONSE

A(cr)

FDR Force defaults into run NOVRAM

This command causes all operator programmable entries in the view and adjust menus, such as presets, accel time, and alarm setpoints, to return to their factory default values.

EXAMPLE

>01FDR3D(cr) Default all run mode entries in the unit at address 01.

RESPONSE

A(cr)

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SRDaavv, or **SRDvvaa** Set run display

This command determines which run mode screen will appear on the display when the program mode is exited, and which screen will appear when the View / Adjust key is pressed. vv and aa indicate which view menu screen and adjust menu screen respectively are selected. Values for vv and aa appear in the tables below. If the first value following the SRD command is a vv, the view menu will appear when the program mode is exited, and the aa adjust menu will appear when the View / Adjust key is pressed. If the first value following the SRD command is an aa, the adjust menu will appear when the program mode is exited, followed by the vv view menu when the View / Adjust key is pressed.

VIEW MENUS	vv
Speed & Preset	00
Speed	01
Speed & Error	02

ADJUST MENUS	aa
Adjust presets	1F
PST P1	10
PST P2	11
PST J1	12
PST J2	13
Adjust alarms	2F
Error alarm	20
Feedback hi or Feedback nom	21
Feedback low or Feedback +/-	22
Adjust setup	3F
Accel	30
Decel	31
1st key step	32
Repeat key step	33
Adjust tuning	4F
Kp	40
Ki	41
Trim limit	42
Monitor values	5F
External ref	50
Feedback	51
Ramped ref	52
Drive signal	53
Trim	54

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RPIii Read program item
WPIiid… Write program item
RPI allows a PC to read the programming selection made for a particular program item, designated by the serial program index, ii. WPI writes the programming selection, d…, for a particular program item designated by the serial program index, ii. The data, d…, is one to five characters, and may be a numeric value for a scale factor, or timeout, or a selection from a list, or d… may be an alphanumeric speed or preset text identifier. The response to the RPI command contains the data, d… that would be used in the WPI command to write the programming selection, except for fixed decimal points, which can be read, but not written.
The serial programming indices are given in the programming menu tree below. The RPI index is given for each sub menu item. The WPI index column shows the index with data for each edit level choice for the sub menu item. In some cases, the data will be a range of numbers or alphanumeric characters. The data written using the WPI command is the same as the data received in response to the RPI command, except for fixed decimal points. Sub menu item RDV DATA is read only.
EXAMPLES
>01RPI07B3(cr) Read the Max Limit setting (programming index 07) in the unit at address 01.
RESPONSE
A0721000A(cr) The Max Limit setting is 2100.

>01WPI0720007A(cr) Set the Max Limit in the unit at address 01 to a value of 2000.
RESPONSE
A(cr)

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SERIAL PROGRAMMING INDICES

Main Menu	Sub Menu	RPI	Edit Level	WPI	
PROGRAM SETUP	PRESET NORMAL	00	PRESET NORMAL	000	
			PRESET INVERSE	001	
	MASTER SP=SPEED	01	MASTER SP=SPEED	010	
			FOLLOWER SP=SPEED	011	
			FOLLOWER SP=RATIO	012	
	MAX PST 2000	02	MAX PST nnnn		02dnnnn, where nnnn is a numeric value in the range of 0001-9999, and d is the decimal point location in the range of 0-3. There are d digits to the right of the decimal point in nnnn.
	P UNITS __P_	03	P UNITS __P_		03paPa, where p is either % or _, and a is an upper case letter in the range of A-Z.
	MAX SPD 2000	04	MAX SPD nnnn		04dnnnn, where nnnn is a numeric value in the range of 0001-9999, and d is the decimal point location in the range of 0-3. There are d digits to the right of the decimal point in nnnn.
	SP UNITS __P_	05	SP UNITS __P_		05paPa, where p is either % or _, and a is an upper case letter in the range of A-Z.

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Main Menu	Sub Menu	RPI	Edit Level	WPI
	MIN LMT 0 RPM	06	MIN LMT nnnn RPM	06nnnn, where nnnn is in the range of 0000-MAX LMT
	MAX LMT 2000 RPM	07	MAX LMT Nnnn RPM	07nnnn, where nnnn is in the range of MIN LMT - 9999
PROGRAM FDBK IN	FDBK IN 60 PPR	10	FDBK IN nnnn PPR	10nnnn, where nnnn is in the range of 0001-9999
	MAX FDBK 2000 RPM	11	MAX FDBK nnnn RPM	11nnnn, where nnnn is in the range of 0001 - 9999
	0 SPEED TIME 0.99	12	0 SPEED TIME 0.nn	12nn, where nn is in the range of 01-99
	NO FDBK F STOP	13	NO FDBK F STOP	130
			NO FDBK NO ACT	131
	NO FDBK TIME 0.99	14	NO FDBK TIME 0.nn	14nn, where nn is in the range of 01-99
PROGRAM FREO IN	REF IN 60 PPR	20	REF IN nnnn PPR	20nnnn, where nnnn is in the range of 0001-9999
	MAX REF 2000 RPM	21	MAX REF nnnn RPM	21nnnn, where nnnn is in the range of 0001-9999

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Main Menu	Sub Menu	RPI	Edit Level	WPI
PROGRAM INPUTS	INPUT 3 DISABLED	30	INPUT X DISABLED	300 for INPUT 3 310 for INPUT 4
	INPUT 4 DISABLED	31	INPUT X JOG	301 for INPUT 3 311 for INPUT 4
			INPUT X LOCK PGM	302 for INPUT 3 312 for INPUT 4
			INPUT X LOCK ALL	303 for INPUT 3 313 for INPUT 4
			INPUT X /F STOP	304 for INPUT 3 314 for INPUT 4
			INPUT X OPN LOOP	305 for INPUT 3 315 for INPUT 4
	1ST PST STEP 0	32	1ST PST STEP nnn	32nnn, where nnn is in the range of 000-199
	RPT PST STEP 0	33	RPT PST STEP nnn	33nnn, where nnn is in the range of 000-199

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Main Menu	Sub Menu	RPI	Edit Level	WPI
	INPUT 9 DISABLED	34	INPUT X DISABLED	340 for INPUT 9 350 for INPUT 10 360 for INPUT 11 370 for INPUT 12
	INPUT 10 DISABLED	35	INPUT X HOLD SPD	341 for INPUT 9 351 for INPUT 10 361 for INPUT 11 371 for INPUT 12
	INPUT 11 DISABLED	36	INPUT X REVERSE	342 for INPUT 9 352 for INPUT 10 362 for INPUT 11 372 for INPUT 12
	INPUT 12 DISABLED	37	INPUT X LOCK PGM	343 for INPUT 9 353 for INPUT 10 363 for INPUT 11 373 for INPUT 12
			INPUT X LOCK ALL	344 for INPUT 9 354 for INPUT 10 364 for INPUT 11 374 for INPUT 12
			INPUT X UNL ALM	345 for INPUT 9 355 for INPUT 10 365 for INPUT 11 375 for INPUT 12
			INPUT X INH LOW	346 for INPUT 9 356 for INPUT 10 366 for INPUT 11 376 for INPUT 12

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Main Menu	Sub Menu	RPI	Edit Level	WPI
PROGRAM OUTPUTS	OUT 1 DISABLED	40	OUT X DISABLED	400 for OUT 1 410 for OUT 2 420 for OUT 3 430 for OUT 4
	OUT 2 DISABLED	41	OUT X 0 SPEED	401 for OUT 1 411 for OUT 2 421 for OUT 3 431 for OUT 4
	OUT 3 DISABLED	42	OUT X AT SPEED	402 for OUT 1 412 for OUT 2 422 for OUT 3 432 for OUT 4
			OUT X REVERSED	403 for OUT 1 413 for OUT 2 423 for OUT 3 433 for OUT 4
	OUT 4 DISABLED	43	OUT X NO FDBK	404 for OUT 1 414 for OUT 2 424 for OUT 3 434 for OUT 4
			OUT X ER ALARM	405 for OUT 1 415 for OUT 2 425 for OUT 3 435 for OUT 4
			OUT X HI ALM FOLL	406 for OUT 1 416 for OUT 2 426 for OUT 3 436 for OUT 4
			OUT X HI ALM LTCH	407 for OUT 1 417 for OUT 2 427 for OUT 3 437 for OUT 4
			OUT X LOW ALM FOLL	408 for OUT 1 418 for OUT 2 428 for OUT 3 438 for OUT 4
			OUT X LOW ALM LTCH	409 for OUT 1 419 for OUT 2 429 for OUT 3 439 for OUT 4

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Main Menu	Sub Menu	RPI	Edit Level	WPI
	FDBK ALM HI / LOW	44	FDBK ALM HI / LOW	440
			FDBK ALM NOM/DIFF	441
			FDBK ALM NOM / %	442
PROGRAM DISPLAY	ALARMS HIDE	50	ALARMS HIDE	500
			ALARMS SHOW	501
	SETUP HIDE	51	SETUP HIDE	510
			SETUP SHOW	511
	TUNING HIDE	52	TUNING HIDE	520
			TUNING SHOW	521
	MON VAL HIDE	53	MON VAL HIDE	530
			MON VAL SHOW	531

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Main Menu	Sub Menu	RPI	Edit Level	WPI
PROGRAM SER PORT	SER PORT ID 0	60	SER PORT ID nn	60nn, where nn is in the range of 00-99
	BAUD 19200	61	BAUD 19200	610
			BAUD 9600	611
			BAUD 4800	612
			BAUD 2400	613
			BAUD 1200	614
			BAUD 300	615
	Tx DELAY 0.002 S	62	Tx DELAY 0.002 S	620
			Tx DELAY 0.100 S	621
	SER CTRL DISABLED	63	SER CTRL DISABLED	630
			SER CTRL ENABLED	631
			SER CTRL ONLY	632
	RDV DATA 520200	64	Not editable, read-only program item	

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Appendix E

Serial commands and programming indices for Ambassador model 5760x405

ERROR CODES

If the address in the command matches the unit address, but the command is not valid, or cannot be executed, the counter ignores the command and responds with the not acknowledge character (N), followed by a two digit error code. The error codes and their explanations are:

00 Power up error. The first valid command received by the unit after power up is not executed and not acknowledged.
01 Command not found in table or invalid command. For example, WPI received when unit is in the run mode.
02 Checksum error. Received checksum does not match the calculated checksum.
05 Invalid data. Incorrect number of characters or illegal character in the data field.
10 Lock input is active.
11 Preset edit in progress from the keypad. A serial preset cannot be sent while the preset is being changed on the keypad.
12 Command is valid for this family, but not this model, or the command is not valid for this program configuration. For instance, cannot change output timeout if output is programmed to “latched”.
13 Keypad programming is active. Cannot enter serial program mode if the unit is already in the program mode from the keypad.
14 Serial out list is empty. This response to the RSO command indicates the serial out list is empty because all items were deleted by the DSO command, or the list is at the default state (empty).

RUN MODE COMMANDS

ESP Enter serial program
FSP Force serial program

The unit will ignore all inputs, and turn OFF all outputs while in the program mode. Also, the display will read LOADING PROGRAM. If the unit is in the serial program mode and power is lost, it will be in the keyboard program mode when power is re-applied.

The force serial program command bypasses lock inputs, and also overcomes the keyboard program mode. As stated above, if power is lost while in the serial program mode, the unit will be in the keyboard program mode when power is re-applied. FSP will allow the PC to re-gain control of the counter.

EXAMPLE
>00ESP48(cr) Causes the unit at address 00 to enter the serial program mode.
RESPONSE

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A(cr)
LAL Lock all
UAL Unlock all
Lock all prohibits the program mode from being entered from the keypad, and also prohibits setpoints from being changed. Unlock all removes the serial lock. Unlock all has no effect on lock inputs. Lock commands are not stored at power down.
EXAMPLE
>11UAL44(cr) Cancels a previously issued lock all command to a unit at address 17.
RESPONSE
A(cr)

LPG Lock program
UPG Unlock program
Lock program prohibits the program mode from being entered from the keypad. Unlock program removes the serial lock. Unlock program has no effect on lock inputs. Lock commands are not stored at power down.
EXAMPLE
>5AUPG62(cr) Cancels a previously issued lock program command to a unit at address 90.
RESPONSE
A(cr)

RCDd Read control data, where the RCD command is followed by a single hex digit, d, indicating which data item is to be read. The value of d is taken from the table below. In the special case of d = D, the control will respond with all items in the serial out list. Items are put in the list either by programming them to SEND in the Program Serial Out programming menu, or by adding them to the serial out list by using the ASO command.

d	data item
0	Main counter
1	Batch counter
2	Totalizer
3	Rate
4	Preset 1
5	Preset 2
6	Preset 3
7	Preset 4
8	Batch preset
9	Rate alarm 1
A	Rate alarm 2
B	Count scaler
C	Count decimal point
D	Serial out list

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EXAMPLE
>4CRCD383(cr) Read the rate value from the unit at address 76.
RESPONSE
Addddddddddddddddddddcc(cr) Acknowledge, with data field, two character checksum, and carriage return. The data field is 20 characters in the response for the main counter, the batch counter, the totalizer, and the rate. For all other data items, the data field is 12 characters. The data field always starts with the data item identifier, and ends with a single space. The numeric data is right justified from the 19th character for main count, batch count, total, and rate, and is right justified from the 11th character for all other data items. Leading zeroes are sent as spaces. If the decimal point is used in the data item, it will be sent. Spaces are sent between the item identifier and the numeric value. Sample data fields are:
COUNT 3618.09 cc Where the identifier is COUNT (5 characters), followed by seven spaces (7 characters), followed by the numeric value 3618.09 (7 characters), followed by a single space (1 character), for a total of 20 characters. The checksum (cc) is not part of the data field, but is shown to illustrate the final space.
COUNT 123456 cc Same as the example above, except the decimal point is not used. In this case, the numeric value is only six characters, so eight spaces are sent between the identifier and the numeric value.
P1 526000 cc Where the identifier is P1 (two characters), followed by three spaces (3 characters), followed by the numeric value 526000 (6 characters), followed by a single space (1 character), for a total of 12 characters. The checksum (cc) is not part of the data field, but is shown to illustrate the final space.
COUNT 123456 P1 526000 (cc) Where two data items (main counter and preset 1) are sent in response to the RCDD command and the serial out list contains these two items. The data field in the response to the RCDD command is created by stringing the data fields of the items in the serial out list together. This sample response would have 32 characters; 20 from the data field (COUNT 123456) for the main counter, and 12 (P1 526000) from the data field for preset 1. Again, the checksum (cc) is not part of the data field, but is shown to illustrate the final space. The checksum is calculated from the 32 characters in the data field.
The identifiers and their corresponding data items are listed in the table below.

Identifier	Data item
COUNT	Main counter
BATCH	Batch counter
TOTAL	Totalizer
RATE	Ratemeter
P1	Preset 1
P2	Preset 2
P3	Preset 3
P4	Preset 4
PB	Batch preset
A1	Alarm setpoint 1
A2	Alarm setpoint 2
SC	Count scaler

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DP	Count decimal point

Note: the response to the command for decimal point location (RCDC) does not contain any numeric value, but shows the location of the decimal point in a series of dashes representing the six digits of the main counter.

EXAMPLES

DP ------ cc no decimal point

DP ---.-- cc decimal point in the hundredths position

ASOd Add to serial out list

DSOd Delete from serial out list

The items in the serial out list are transmitted when the unit receives an RSO, or RCDD command. At default, the serial out list is empty. Data items may be added to the list by transmitting the ASO command and one data character, indicating which item is to be added. Similarly, items may be deleted from the list by transmitting the DSO command and one data character, indicating which item is to be deleted. The items are listed in the table below.

d	data item
0	Main counter
1	Batch counter
2	Totalizer
3	Rate
4	Preset 1
5	Preset 2
6	Preset 3
7	Preset 4
8	Batch preset
9	Rate alarm 1
A	Rate alarm 2
B	Count scaler
C	Count decimal point

EXAMPLE

>00ASO477(cr) Adds preset 1 to the serial out list of the unit at address 00.

RESPONSE

A(cr)

RSO Read serial out list

This command causes the unit to transmit all data items in the serial out list. It is identical to the RCDD command. See RCDd command above.

EXAMPLE

>14RSO59(cr) Read the serial out list from the counter at address 20.

RESPONSE

ACOUNT 999995 BATCH 4 P1 0 PB 0 04(cr) Assuming that the serial out list contains the main count, batch count, preset 1 and the batch preset, the

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response is the main count is 999995, the batch count is 4, preset 1 is 0, and the batch preset is 0.

WP1dddddd Write preset 1
WP2dddddd Write preset 2
WP3dddddd Write preset 3
WP4dddddd Write preset 4
WPBdddddd Write batch preset
WA1dddddd Write alarm setpoint 1
WA2dddddd Write alarm setpoint 2

These commands set the value for count presets and alarm setpoints. Six digits, including leading zeroes, must be sent with the command. This is the value for the preset or setpoint being edited. Decimal points cannot be sent.

EXAMPLE
>00WP10000205A(cr) Sets preset 1 to a value of 20 in the unit at address 00.
RESPONSE
A(cr)

RSA Reset all
RSB Reset batch count
RSC Reset main count
RST Reset totalizer

These commands reset an individual count register, except in the case of RSA, which resets all three count registers. These commands are treated as momentary inputs by the control, they reset the appropriate register(s) immediately, but do not hold it in reset. Any output action programmed for RSC will occur upon receipt of the RSC or RSA command.

EXAMPLE
>08RSC50(cr) Resets the main counter in the unit at address 08.
RESPONSE
A(cr)

OC1 Output control 1
OC2 Output control 2

Outputs programmed to respond to output control 1, or output control 2, will take the appropriate state when the command is received. These commands are treated the same as output control 1 and output control 2 inputs on the control. They are momentary. The outputs retain the command state only as long as programmed to do so.

EXAMPLE
>01OC124(cr) Causes outputs programmed to respond to output control 1 to take the appropriate programmed state in the unit at address 01.
RESPONSE
A(cr)

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URA Unlatch rate alarms
ERA Enable rate alarms
These commands are treated as maintained inputs by the control. These commands perform the same function as a control input programmed to UNLATCH ALARMS. The URA command will cause rate alarms to turn OFF and remain OFF until the ERA command is received. At that time, the rate alarms are free to take the appropriate state at the next rate update.
EXAMPLE
>30URA4B(cr) Unlatches the rate alarm outputs in the unit at address 48.
RESPONSE
A(cr)

STP Stop count
RSM Resume count
The stop count command causes the unit to ignore count input pulses until a resume count command is received. The stop count is not stored at power down. The unit will count input pulses when power is re-applied.
EXAMPLE
>00STP57(cr) Causes the unit at address 00 to stop counting.
RESPONSE
A(cr)

RIO Read inputs and outputs
This command causes the control to respond with the current state of the four control inputs, and the four outputs. The states are represented by two hexadecimal digits, one for the inputs, and one for the outputs. Each hexadecimal digit is made up of four binary bits. For the inputs, the active state makes the bit a 1, inactive makes it a 0. For the outputs, the ON state makes the bit a 1, OFF makes it a 0. The bit weight for each input and output is given in the table below.

Bit weight	8	4	2	1
Control input	1	2	3	4
Output	Relay 1	Relay 2	Transistor 1	Transistor 2

The sum (in hex) of all the bit weights for active inputs gives the first data digit in the response. The sum (in hex) of all the bit weights of outputs that are ON gives the second data digit in the response. For example, if inputs 1, 3, and 4 are active, and if output transistor 2 is ON, the table would look like this:

Bit weight	8	4	2	1
Control input	1	0	1	1
Output	0	0	0	1

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The input digit in the response would be 8 + 2 + 1 = B (hex). The output digit in the response would be simply 1.
EXAMPLE
>00RIO4A(cr) Read the I/O status of the unit at address 00.
RESPONSE
AB1B4(cr) Indicating that inputs 1, 3, and 4 are active, and output transistor 2 is ON.

RDV Read device value
This command causes the unit to respond with identification information. It is useful for determining what type of unit is at the address that the command was sent to.
EXAMPLE
>63RDV55(cr) Asks the unit at address 99 to identify itself.
RESPONSE
A71DF635B(cr) The unit responds with its family number, in this case "7", the software revision number, "1" or greater, the hardware configuration byte, DF, and the serial address.

PROGRAM MODE COMMANDS

XSP Exit serial programming
This command causes the unit to store new program data, and exit the program mode into the run mode.
EXAMPLE
>00XSP5B(cr) Causes the unit at address 00 to exit the program mode.
RESPONSE
A(cr)

RPIii or **RPIiii** Read program item
WPIiid… or **WPIiiid…** Write program item
RPI allows a PC to read the programming selection made for a particular program item, designated by the serial program index, ii, or iii. WPI writes the programming selection, d…, for a particular program item designated by the serial program index, ii, or iii. The data, d…, is one to eight characters, and may be a numeric value for a scale factor, or timeout, or a selection from a list, or d… may be an alphanumeric counter or ratemeter text identifier. The response to the RPI command contains the data, d… that would be used in the WPI command to write the programming selection, except for fixed decimal points, which can be read, but not written.
The serial programming indices are two digits, ii, for all programming sub menu items except for the items in the main menu item PROGRAM OUT MODE. Here the programming selections are made one level deeper (micro menu) than in the other main menu items, and the indices reflect that by going to three digits, iii. The serial programming indices are given in the programming menu tree below. The RPI index is

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given for each sub menu or output select menu item. The WPI index column shows the index with data for each edit level choice for the sub menu or output select menu item. In some cases, the data will be a range of numbers or alphanumeric characters. The data written using the WPI command is the same as the data received in response to the RPI command, except for fixed decimal points. Sub menu item RDV DATA is read only.
EXAMPLES
>00RPI20AD(cr) Read the programmed selection for input 1 in the unit at address 00.
RESPONSE
A2059E(cr) Input 1 is programmed to RS C LVL.

>00WPI205B5(cr) Program input 1 to RS C LVL in the unit at address 00.
RESPONSE
A(cr)

> 00RPI00AB(cr) Read the C scaler from the unit at address 00.
RESPONSE
A0020000082(cr) The C scaler is 2.00000.

>00WPI00100000D1(cr) Program the C scaler to 1.00000 in the unit at address 00.
RESPONSE
A(cr)

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SERIAL PROGRAMMING INDICES

Main Menu	Sub Menu	RPI	Edit Level	WPI
PROGRAM SCALERS	C SCALER 1.00000	00	C SCALER n.nnnnn	00nnnnnn, where nnnnnn is in the range of 000001-999999
	C DEC PT - - - - - -	01	C DEC PT - - - - - -	01d, where d is in the range of 0-5. There are d digits to the right of the decimal point in the count display.
	R SCALER 1.0000	02	MASTER SP=SPEED	02dnnnnn, where nnnnn is in the range of 00001-99999, and d is in the range of 0-5. There are d digits to the right of the decimal point in nnnnn.
	R DEC PT - - - - - -	03	R DEC PT - - - - - -	03d, where d is in the range of 0-5. There are d digits to the right of the decimal point in the rate display.
	R ZERO TIME 1.0	04	R ZERO TIMEnnn.n	04nnnn, where nnnn is in the range of 0001-9999.
	R AVG TIME 1.0	05	R AVG TIMEnnn.n	05nnnn, where nnnn is in the range of 0001-99999.
PROGRAM COUNT IN	CNT & TOT A-B	10	CNT & TOT A-B	100
			CNT & TOT A+B	101
			CNT & TOT -A+B	102
			CNT & TOT A, B DIR	103
			CNT & TOT 2A, B DIR	104

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Main Menu	Sub Menu	RPI	Edit Level	WPI
			CNT & TOT A, B RST	105
			CNT & TOT QUAD X1	106
			CNT & TOT QUAD X2	107
			CNT & TOT QUAD X4	108
			TOT A CNT B	109
			TOT B CNT B	10A
	INPUT A SOLID ST	11	INPUT A SOLID ST	111
			INPUT A CONTACT	110
	INPUT B SOLID ST	12	INPUT B SOLID ST	121
			INPUT B CONTACT	120
	B RST CNT EDG	13	B RST CNT EDG	130

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Main Menu	Sub Menu	RPI	Edit Level	WPI
			B RST BCH EDG	131
			B RST TOT EDG	132
			B RST ALL EDG	133
	FINAL Pf P4	14	FINAL Pf P4	140
			FINAL Pf P3	141
			FINAL Pf P2	142
			FINAL Pf P1	143
	RESET TO ZERO	15	RESET TO ZERO	150
			RESET TO Pf ( )	151
	AUTO CYC DISABLED	16	AUTO CYC DISABLED	160
			AUTO CYC P1	161

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Main Menu	Sub Menu	RPI	Edit Level	WPI
			AUTO CYC Pf (0)	162
			AUTO CYC P1 Pf (0)	163
PROGRAM INPUTS	INPUT 1 DISABLED	20	INPUT X DISABLED	200 for INPUT 1 210 for INPUT 2 220 for INPUT 3 230 for INPUT 4
	INPUT 2 DISABLED	21	INPUT X BYP P1	201 for INPUT 1 211 for INPUT 2 221 for INPUT 3 231 for INPUT 4
	INPUT 3 DISABLED	22	INPUT X OUT CTL1	202 for INPUT 1 212 for INPUT 2 222 for INPUT 3 232 for INPUT 4
	INPUT 4 DISABLED	23	INPUT X OUT CTL2	203 for INPUT 1 213 for INPUT 2 223 for INPUT 3 233 for INPUT 4
			INPUT X RS C EDG	204 for INPUT 1 214 for INPUT 2 224 for INPUT 3 234 for INPUT 4
			INPUT X RS C LVL	205 for INPUT 1 215 for INPUT 2 225 for INPUT 3 235 for INPUT 4
			INPUT X RS B EDG	206 for INPUT 1 216 for INPUT 2 226 for INPUT 3 236 for INPUT 4

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Main Menu	Sub Menu	RPI	Edit Level	WPI
			INPUT X RS T EDG	207 for INPUT 1 217 for INPUT 2 227 for INPUT 3 237 for INPUT 4
			INPUT X RS A EDG	208 for INPUT 1 218 for INPUT 2 228 for INPUT 3 238 for INPUT 4
			INPUT X STOP CNT	209 for INPUT 1 219 for INPUT 2 229 for INPUT 3 239 for INPUT 4
			INPUT X PRINT	20A for INPUT 1 21A for INPUT 2 22A for INPUT 3 23A for INPUT 4
			INPUT X LOCK PGM	20B for INPUT 1 21B for INPUT 2 22B for INPUT 3 23B for INPUT 4
			INPUT X LOCK ALL	20C for INPUT 1 21C for INPUT 2 22C for INPUT 3 23C for INPUT 4
			INPUT X UNL ALMS	20D for INPUT 1 21D for INPUT 2 22D for INPUT 3 23D for INPUT 4

PROGRAM OUT MODE MENU

The PROGRAM OUT MODE menu has four levels, main menu, output select menu, sub menu, and edit level. All other main menu items have three levels. This means that RPI indices are three characters, and WPI indices are four characters, for the PROGRAM OUT MODE menu. The chart below will be in three columns, as above, but they will be the output select menu, the sub menu, and the edit level. The main menu item, PROGRAM OUT MODE, is understood for this item.

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Output Select	Sub Menu	RPI	Edit Level	WPI
RELAY 1 PROGRAM	OUTPUT X COUNT	300 for Relay 1 310 for Relay 2 320 for Trans 1 330 for Trans 2	OUTPUT X COUNT	3000 for Relay 1 3100 for Relay 2 3200 for Trans 1 3300 for Trans 2
RELAY 2 PROGRAM			OUTPUT X RATE	3001 for Relay 1 3101 for Relay 2 3201 for Trans 1 3301 for Trans 2
TRANS 1 PROGRAM	OUTPUT X NORMAL	303 for Relay 1 313 for Relay 2 323 for Trans 1 333 for Trans 2	OUTPUT X NORMAL	3030 for Relay 1 3130 for Relay 2 3230 for Trans 1 3330 for Trans 2
TRANS 2 PROGRAM			OUTPUT X REVERSE	3031 for Relay 1 3131 for Relay 2 3231 for Trans 1 3331 for Trans 2
	OUTPUT X LATCHED	304 for Relay 1 314 for Relay 2 324 for Trans 1 334 for Trans 2	OUTPUT X LATCHED	3040 for Relay 1 3140 for Relay 2 3240 for Trans 1 3340 for Trans 2
			OUTPUT X PULSED	3041 for Relay 1 3141 for Relay 2 3241 for Trans 1 3341 for Trans 2
	OUTPUT X PUL 1.00	305 for Relay 1 315 for Relay 2 325 for Trans 1 335 for Trans 2	OUTPUT X PUL nn.nn	305nnnn for Relay 1 315nnnn for Relay 2 325nnnn for Trans 1 335nnnn for Trans 2 where nnnn is in the range of 0001-9999.

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Output Select	Sub Menu	RPI	Edit Level	WPI
	OUTPUT X DEL 0.00	306 for Relay 1 316 for Relay 2 326 for Trans 1 336 for Trans 2	OUTPUT X DEL nn.nn	306nnnn for Relay 1 316nnnn for Relay 2 326nnnn for Trans 1 336nnnn for Trans 2 where nnnn is in the range of 0000-9999.
	OUTPUT X P1 NA	307 for Relay 1 317 for Relay 2 327 for Trans 1 337 for Trans 2	OUTPUT X P1 NA	3070 for Relay 1 3170 for Relay 2 3270 for Trans 1 3370 for Trans 2
			OUTPUT X P1 PU	3071 for Relay 1 3171 for Relay 2 3271 for Trans 1 3371 for Trans 2
			OUTPUT X P1 DO	3072 for Relay 1 3172 for Relay 2 3272 for Trans 1 3372 for Trans 2
	OUTPUT X P2 NA	308 for Relay 1 318 for Relay 2 328 for Trans 1 338 for Trans 2	OUTPUT X P2 NA	3080 for Relay 1 3180 for Relay 2 3280 for Trans 1 3380 for Trans 2
			OUTPUT X P2 PU	3081 for Relay 1 3181 for Relay 2 3281 for Trans 1 3381 for Trans 2
			OUTPUT X P2 DO	3082 for Relay 1 3182 for Relay 2 3282 for Trans 1 3382 for Trans 2
	OUTPUT X P3 NA	309 for Relay 1 319 for Relay 2 329 for Trans 1 339 for Trans 2	OUTPUT X P3 NA	3090 for Relay 1 3190 for Relay 2 3290 for Trans 1 3390 for Trans 2

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Output Select	Sub Menu	RPI	Edit Level	WPI
			OUTPUT X P3 PU	3091 for Relay 1 3191 for Relay 2 3291 for Trans 1 3391 for Trans 2
			OUTPUT X P3 DO	3092 for Relay 1 3192 for Relay 2 3292 for Trans 1 3392 for Trans 2
	OUTPUT X P4 NA	30A for Relay 1 31A for Relay 2 32A for Trans 1 33A for Trans 2	OUTPUT X P4 NA	30A0 for Relay 1 31A0 for Relay 2 32A0 for Trans 1 33A0 for Trans 2
			OUTPUT X P4 PU	30A1 for Relay 1 31A1 for Relay 2 32A1 for Trans 1 33A1 for Trans 2
			OUTPUT X P4 DO	30A2 for Relay 1 31A2 for Relay 2 32A2 for Trans 1 33A2 for Trans 2
	OUTPUT X PB NA	30B for Relay 1 31B for Relay 2 32B for Trans 1 33B for Trans 2	OUTPUT X PB NA	30B0 for Relay 1 31B0 for Relay 2 32B0 for Trans 1 33B0 for Trans 2
			OUTPUT X PB PU	30B1 for Relay 1 31B1 for Relay 2 32B1 for Trans 1 33B1 for Trans 2
			OUTPUT X PB DO	30B2 for Relay 1 31B2 for Relay 2 32B2 for Trans 1 33B2 for Trans 2

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Output Select	Sub Menu	RPI	Edit Level	WPI
	OUTPUT X OCTL1 NA	30C for Relay 1 31C for Relay 2 32C for Trans 1 33C for Trans 2	OUTPUT X OCTL1 NA	30C0 for Relay 1 31C0 for Relay 2 32C0 for Trans 1 33C0 for Trans 2
			OUTPUT X OCTL1 PU	30C1 for Relay 1 31C1 for Relay 2 32C1 for Trans 1 33C1 for Trans 2
			OUTPUT X OCTL1 DO	30C2 for Relay 1 31C2 for Relay 2 32C2 for Trans 1 33C2 for Trans 2
	OUTPUT X OCTL2 NA	30D for Relay 1 31D for Relay 2 32D for Trans 1 33D for Trans 2	OUTPUT X OCTL2 NA	30D0 for Relay 1 31D0 for Relay 2 32D0 for Trans 1 33D0 for Trans 2
			OUTPUT X OCTL2 PU	30D1 for Relay 1 31D1 for Relay 2 32D1 for Trans 1 33D1 for Trans 2
			OUTPUT X OCTL2 DO	30D2 for Relay 1 31D2 for Relay 2 32D2 for Trans 1 33D2 for Trans 2
	OUTPUT X RS C NA	30E for Relay 1 31E for Relay 2 32E for Trans 1 33E for Trans 2	OUTPUT X RS C NA	30E0 for Relay 1 31E0 for Relay 2 32E0 for Trans 1 33E0 for Trans 2
			OUTPUT X RS C PU	30E1 for Relay 1 31E1 for Relay 2 32E1 for Trans 1 33E1 for Trans 2
			OUTPUT X RS C DO	30E2 for Relay 1 31E2 for Relay 2 32E2 for Trans 1 33E2 for Trans 2

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Output Select	Sub Menu	RPI	Edit Level	WPI
	OUTPUT X A1 HI	301 for Relay 1 311 for Relay 2 321 for Trans 1 331 for Trans 2	OUTPUT X A1 HI	3010 for Relay 1 3110 for Relay 2 3210 for Trans 1 3310 for Trans 2
			OUTPUT X A1 LO	3011 for Relay 1 3111 for Relay 2 3211 for Trans 1 3311 for Trans 2
			OUTPUT X A2 HI	3012 for Relay 1 3112 for Relay 2 3212 for Trans 1 3312 for Trans 2
			OUTPUT X A2 LO	3013 for Relay 1 3113 for Relay 2 3213 for Trans 1 3313 for Trans 2
	OUTPUT X DISABLED	302 for Relay 1 312 for Relay 2 322 for Trans 1 332 for Trans 2	OUTPUT X DISABLED	3020 for Relay 1 3120 for Relay 2 3220 for Trans 1 3320 for Trans 2
			OUTPUT X FOLLOWS	3021 for Relay 1 3121 for Relay 2 3221 for Trans 1 3321 for Trans 2
			OUTPUT X LATCHED	3022 for Relay 1 3122 for Relay 2 3222 for Trans 1 3322 for Trans 2
			OUTPUT X PULSED	3023 for Relay 1 3123 for Relay 2 3223 for Trans 1 3323 for Trans 2
	OUTPUT X PUL 1.00	305 for Relay 1 315 for Relay 2 325 for Trans 1 335 for Trans 2	OUTPUT X PUL nn.nn	305nnnn for Relay 1 315nnnn for Relay 2 325nnnn for Trans 1 335nnnn for Trans 2 where nnnn is in the range of 0001-9999.

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Main Menu	Sub Menu	RPI	Edit Level	WPI
PROGRAM DISPLAY	CNT&TXT HIDE	40	CNT&TXT HIDE	400
			CNT&TXT SHOW	401
	RATE&TXT HIDE	41	RATE&TXT HIDE	410
			RATE&TXT SHOW	411
	BCH&TXT HIDE	42	BCH&TXT HIDE	420
			BCH&TXT SHOW	421
	TOT&TXT HIDE	43	TOT&TXT HIDE	430
			TOT&TXT SHOW	431
	CNT&Pc HIDE	44	CNT&Pc HIDE	440
			CNT&Pc SHOW	441

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Main Menu	Sub Menu	RPI	Edit Level	WPI
	CNT&P1 HIDE	45	CNT&P1 HIDE	450
			CNT&P1 SHOW	451
	CNT&P2 HIDE	46	CNT&P2 HIDE	460
			CNT&P2 SHOW	461
	CNT&P3 HIDE	47	CNT&P3 HIDE	470
			CNT&P3 SHOW	471
	CNT&P4 HIDE	48	CNT&P4 HIDE	480
			CNT&P4 SHOW	481
	BCH&Pb HIDE	49	BCH&Pb HIDE	490
			BCH&Pb SHOW	491

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Main Menu	Sub Menu	RPI	Edit Level	WPI
	CNT&RATE HIDE	4A	CNT&RATE HIDE	4A0
			CNT&RATE SHOW	4A1
	RATE&A1 HIDE	4B	RATE&A1 HIDE	4B0
			RATE&A1 SHOW	4B1
	RATE&A2 HIDE	4C	RATE&A2 HIDE	4C0
			RATE&A2 SHOW	4C1
	C SCALER HIDE	4D	C SCALER HIDE	4D0
			C SCALER SHOW	4D1
	C DEC PT HIDE	4E	C DEC PT HIDE	4E0
			C DEC PT SHOW	4E1

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Main Menu	Sub Menu	RPI	Edit Level	WPI
PROGRAM TEXT	CNT TXT COUNT	50	CNT TXT aaaaaaaa	50aaaaaaaa, where a is in the range of 0-9, A-Z, or "-", "/", ".", comma, or blank.
	RATE TXT RATE	51	RATE TXT aaaaaaaa	51aaaaaaaa, where a is in the range of 0-9, A-Z, or "-", "/", ".", comma, or blank.
	BCH TXT BATCH	52	BCH TXT aaaaaaaa	52aaaaaaaa, where a is in the range of 0-9, A-Z, or "-", "/", ".", comma, or blank.
	TOT TXT TOTAL	53	TOT TXT aaaaaaaa	53aaaaaaaa, where a is in the range of 0-9, A-Z, or "-", "/", ".", comma, or blank.
PROGRAM SER PORT	SER PORT ID 0	60	SER PORT ID nn	60nn, where nn is in the range of 00-99
	BAUD 19200	61	BAUD 19200	610
			BAUD 9600	611
			BAUD 4800	612
			BAUD 2400	613
			BAUD 1200	614
			BAUD 300	615

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Main Menu	Sub Menu	RPI	Edit Level	WPI
	PARITY NONE	62	PARITY NONE	620
			PARITY ODD	621
			PARITY EVEN	622
	Tx DELAY 0.002	63	Tx DELAY 0.002	630
			Tx DELAY 0.100	631
	HOST PORT	64	HOST PORT	640
			PRINTER PORT	641
PROGRAM SER OUT	COUNT SKIP	70	COUNT SKIP	700
			COUNT SEND	701
	BATCH SKIP	71	BATCH SKIP	710
			BATCH SEND	711

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Main Menu	Sub Menu	RPI	Edit Level	WPI
	TOTAL SKIP	72	TOTAL SKIP	720
			TOTAL SEND	721
	RATE SKIP	73	RATE SKIP	730
			RATE SEND	731
	P1 SKIP	74	P1 SKIP	740
			P1 SEND	741
	P2 SKIP	75	P2 SKIP	750
			P2 SEND	751
	P3 SKIP	76	P3 SKIP	760
			P3 SEND	761

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Main Menu	Sub Menu	RPI	Edit Level	WPI
	P4 SKIP	77	P4 SKIP	770
			P4 SEND	771
	PB SKIP	78	PB SKIP	780
			PB SEND	781
	A1 SKIP	79	A1 SKIP	790
			A1 SEND	791
	A2 SKIP	7A	A2 SKIP	7A0
			A2 SEND	7A1
	C SCALER SKIP	7B	C SCALER SKIP	7B0
			C SCALER SEND	7B1
	C DEC PT SKIP	7C	C DEC PT SKIP	7C0
			C DEC PT SEND	7C1

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Main Menu	Sub Menu	RPI	Edit Level	WPI
PROGRAM OPTIONS	RST KEY DISABLED	80	RST KEY DISABLED	800
			RST KEY RS C EDG	801
			RST KEY RS C LVL	802
63				
			RST KEY RS B EDG	803
Tx DELAY 0.002			RST KEY RS T EDG	804
			RST KEY RS D EDG	805
HOST PORT				
64			RST KEY RS A EDG	806
	PRNT KEY DISABLED	81	PRNT KEY DISABLED	810
			PRNT KEY ENABLED	811
	DEFAULT PROGRAM	82	LOAD DEF PROGRAM	822
	USER PROGRAM	82	RESPONSE = 0 FOR DEFAULT PROGRAM RESPONSE = 1 FOR USER PROGRAM	

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Main Menu	Sub Menu	RPI	Edit Level	WPI
	DEFAULT RUN DATA	83	LOAD DEF RUN DATA	832
	USER RUN DATA	83	RESPONSE = 0 FOR DEFAULT RUN DATA RESPONSE = 1 FOR USER RUN DATA	
	RDV DATA 71DF00	84	READ ONLY	

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Appendix F

Serial commands for Eclipse DPM models
5770x40x DC Volts
5770x41x AC Volts
5770x42x DC Amps
5770x43x AC Amps
5770x44x 5A AC
5770x450 Process signals
5770x46x Temperature
5770x47x Rate

ERROR CODES

01 Invalid command. Command was not found in table, or was sent using lower case alpha characters.
02 Checksum error. The transmitted checksum did not match the calculated checksum.
03 Buffer overrun error. The command and data fields contained more than 24 characters.
05 Data format error. An illegal character was used in the data field.
08 Parity or framing error.
16 Data out of range.

QUERY (READ) ONLY SERIAL COMMANDS

QST Query status
This command asks for the input type of the unit, the option boards installed, the mode it is in, which keys are presently pressed, and the displayed value.

EXAMPLE
>01QST5B(cr) Query the status of the unit at address 01.
RESPONSE
A507C+0018D3(cr) Acknowledge with nine character data field (507C+0018), two digit checksum of the data (D3), and carriage return.

RESPONSE DATA FORMAT
iomkddddd where
i is the input type from table below.

i	Input type
3	Volt or amp meter
4	5A AC meter
5	Process meter
6	Temperature indicator

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7	Ratemeter

o indicates installed option boards per table below.

o	Option boards
0	None
1	Relay
2	Analog out
3	Relay and analog out
4	RS-485
5	Relay and RS-485
6	Analog out and RS-485
7	Relay, analog out, and RS-485

m indicates the present mode of the unit, per table below.

m	Mode
0	Run
1	Program
2	Diagnostic

k indicates which front panel keys are pressed, per table below.

k	Keys pressed	k	Keys pressed
0	None	8	PGM
1	Down	9	PGM and down
2	Up	A	PGM and up
3	Up and down	B	PGM, up, and down
4	Right	C	PGM and right
5	Right and down	D	PGM, right, and down
6	Right and up	E	PGM, right, and up
7	Right, up, and down	F	PGM, right, up, and down

ddddd is the displayed value on the meter. For volt, amp, 5A AC, process, and temperature meters, the first "digit" is a plus or minus sign, and the remaining digits are the numeric value. Example: -0200. For ratemeters, all five digits are the numeric value. Example: 00126.

If the display shows OL (overload), this indicates that the input value exceeds the display range. The serial response ddddd field will indicate the overload condition by transmitting a direction character and the lower or upper display range limit. Volt, amp, 5A AC, and process meters use a P (plus) or M (minus) direction character. Temperature indicators use the arithmetic + and – signs. There is no overload condition for ratemeters. Examples: M9999, P9999, -1000, +3000.

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QMMd Query Max / Min

Volt, amp, 5A AC, and process meters have the max / min capture and hold feature. The QMM command asks for the max and min values. The data character d, resets the max / min registers to zero if it is 1, and does not reset the registers if it is a 0.

EXAMPLE

>01QMM07C(cr) Causes the unit at address 01 to send its max and min values, and not reset them to zero.

RESPONSE

A+2500-0150E5(cr) Acknowledge, with a ten character data field (+2500-0150), a two character checksum of the data, and a carriage return.

RESPONSE DATA FORMAT

xxxxxnnnnn where

xxxxx is the signed value of the maximum reading. The first character is the + or – sign. Example: +2500

nnnnn is the signed value of the minimum reading. The first character is the + or – sign. Example: -0150

QDV Query device version

The QDV command asks for the software program type, version, and revision of the unit.

EXAMPLE

>20QDV4D(cr) Query the unit at address 20 for its device version data.

RESPONSE

ADPMVA01R010BC(cr) Acknowledge, with eleven character data field, two digit checksum of the data, and carriage return.

RESPONSE DATA FORMAT

DPMVtvvRrrr where

t is the software program type, from the table below

t	Unit type
A	Volt, amp, 5A AC, or process meter
T	Temperature indicator
R	Ratemeter

vv is the software version

rrr is the software revision

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QUERY (READ) AND LOAD (WRITE) SERIAL COMMANDS

QPI Query program input
LPIid Load program input
The query command asks for the selection made for programmable signal inputs, and for the programmed display decimal point location. Volt, amp, and 5A AC meters do not have programmable choices, but the process meter, temp indicator, and ratemeter do. All units, except the temp indicator, have a programmable display decimal point location. However, the temp indicator does have programmable choices for the display in degrees Celcius, or Fahrenheit, or both. The response to the query command to a temp indicator will indicate the display choice.
The load command sets the input type for process meters, temp indicators, and ratemeters, and sets the display decimal point location. In the case of temp indicators, which do not display a decimal point, the load command sets the unit of measure to degrees C, or F, or both.

EXAMPLES
>33QPI50(cr) Read the programmed input selection and decimal point location for the unit at address 33.
RESPONSE
A0161(cr) Acknowledge, with two character data field (01), two character checksum, and carriage return.
>33LPI01AC(cr) Set the input selection and decimal point location (data field = 01) in the unit at address 33.
RESPONSE
A(cr)

DATA FORMAT FOR LOAD COMMAND AND QUERY RESPONSE
Example load command, data field in bold:
>33LPI**01**AC(cr)
Example response to query command, data field in bold:
A**01**61(cr)
The two character data field is in the format of **id**, where i is the input type, and d is the display decimal point location, and are taken from the tables below.

For volt, amp, and 5A AC units:

i	Input type	d	Display decimal point
0	N/A	0	XXXX
0	N/A	1	XXX.X
0	N/A	2	XX.XX
0	N/A	3	X.XXX
0	N/A	4	.XXXX

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For process meters:

i	Input type	d	Display decimal point
0	4-20 mA	0	XXXX
1	0-10 V	1	XXX.X
2	1-5 V	2	XX.XX
		3	X.XXX
		4	.XXXX

For temperature indicators:

i	Input type	d	Temp display units
0	J TC	0	F and C, power up to F
1	K TC	1	F and C, power up to C
2	T TC	2	F only
3	RTD	3	C only

For ratemeters:

i	Input calculation	d	Display decimal point
0	Rate	0	XXXXX
1	Process time	1	XXXX.X
		2	XXX.XX
		3	XX.XXX
		4	X.XXXX

QPV Query program values
LPVooooofffff Load program values (for volt, amp, 5A AC, and process meters), or
LPVdssssuuuzzz Load program values (for ratemeters)
These commands are not valid for temperature indicators. The query command asks for the programmed offset and full scale values in volt, amp, 5A AC, and process meters. For a ratemeter, the query command asks for the programmed selections for rate scaling, rate update time, and rate zero time.
The load command programs the offset and full scale values into volt, amp, 5A AC, and process meters. For a ratemeter, the load command programs the selections for rate scaling, rate update time, and rate zero time.

EXAMPLES – for volt, amp, 5A AC, and process meters (for ratemeters, see below)
>02QPV59(cr) Asks for the program values in the unit at address 02.
RESPONSE
A+0000+1999F3(cr) Acknowledge, with ten character data field (+0000+1999), two character checksum, and carriage return.
>02LPV-0200+16000E(cr) Load the offset value to – 200, and the full scale value to 1600 in the unit at address 02.
RESPONSE
A(cr)

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DATA FORMAT FOR LOAD COMMAND AND QUERY RESPONSE
Example load command, data field in bold:
>02LPV**-0200+1600**0E(cr)
Example response to query, data field in bold:
A**+0000+1999**F3(cr)
The ten character data field is in the format of **ooooofffff**, where
ooooo is the signed value for the offset. The first character must be a plus (+) or minus (-) sign, and the remaining four characters are the numeric value. Examples: -0200, +0000
fffff is the signed value for full scale. The first character must be a plus (+) or minus (-) sign, and the remaining four characters are the numeric value. Examples: -0001, +1999

EXAMPLES – for ratemeters
>00QPV57(cr) Asks for the program values in the unit at address 00.
RESPONSE
A2600000100125(cr) Acknowledge, with 11 character data field (26000001001), two character checksum, and carriage return.
>00LPV1600010001076(cr) Load the rate scale decimal point to XXX.X, the rate scale value to 6000, the rate update time to 10 seconds, and the rate zero time to 1 second.

DATA FORMAT FOR LOAD COMMAND AND QUERY RESPONSE
Example load command, data field in bold:
>00LPV**1600001000**176(cr)
Example query response, data field in bold:
A**2600000100**125(cr)
The eleven character data field is in the form of **dssssuuuzzz**, where **d** is the rate scale decimal point location, taken from the table below, **ssss** is the decimal rate scale value in the range of 0001 to 9999, **uuu** is the decimal rate update time in seconds and tenths in the range of 001 to 999, and **zzz** is the decimal rate zero time in seconds and tenths in the range of 001 to 999.

d	Rate scale decimal point
0	XXXX
1	XXX.X
2	XX.XX
3	X.XXX

QP1 Query program 1
LP1hhhhhlllll Load program 1
The query command asks for the high and low setpoints for relay 1. The load command writes the high and low setpoints for relay 1. The load command contains a ten character data field, **hhhhhlllll**. The response to the query command contains the same ten character data field. **hhhhh** is the high setpoint, and **lllll** is the low setpoint. For volt, amp, 5A AC, and process meters, the setpoints are signed, four digit values in the range of –9999 to +9999. For a value of 0000, either the + or – sign must precede the value. For temperature indicators, the setpoints are signed, four digit values in the range of

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-0999 to +2999. For a value of 0000, either the + or – sign must precede the value. For ratemeters, the setpoints are unsigned, five digit values in the range of 00000 to 99999.

EXAMPLES – for volt, amp, 5A AC, process meters, and temperature indicators
>00QP132(cr) Read the relay 1 setpoints in the unit at address 00.
RESPONSE
A+0000-0500DD(cr) Acknowledge, with ten character data field (+0000-0500), two character checksum, and carriage return.
>00LP1+1500+000009(cr) Load the relay 1 high setpoint with a value of +1500, and the relay 1 low setpoint with a value of 0.
RESPONSE
A(cr)

EXAMPLES – for ratemeters
>34QP139(cr) Read the relay 1 setpoints in the unit at address 34.
RESPONSE
A0175000100EE(cr) Acknowledge, with ten character data field (0175000100), two character checksum, and carriage return.
>10LP10100000000F(cr) Load the relay 1 high setpoint with a value of 1000, and the relay 1 low setpoint with a value of 0 in the unit at address 10.
RESPONSE
A(cr)

QP2 Query program 2
LP2hhhhhlllll Load program 2
The query command asks for the high and low setpoints for relay 2. The load command writes the high and low setpoints for relay 2. The load command contains a ten character data field, **hhhhhlllll**. The response to the query command contains the same ten character data field. **hhhhh** is the high setpoint, and **lllll** is the low setpoint. For volt, amp, 5A AC, and process meters, the setpoints are signed, four digit values in the range of –9999 to +9999. For a value of 0000, either the + or – sign must precede the value. For temperature indicators, the setpoints are signed, four digit values in the range of -0999 to +2999. For a value of 0000, either the + or – sign must precede the value. For ratemeters, the setpoints are unsigned, five digit values in the range of 00000 to 99999.

EXAMPLES – for volt, amp, 5A AC, process meters, and temperature indicators
>00QP233(cr) Read the relay 2 setpoints in the unit at address 00.
RESPONSE
A+0000-0500DD(cr) Acknowledge, with ten character data field (+0000-0500), two character checksum, and carriage return.
>00LP2+1500+00000A(cr) Load the relay 2 high setpoint with a value of +1500, and the relay 2 low setpoint with a value of 0.
RESPONSE
A(cr)

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EXAMPLES – for ratemeters
>34QP23A(cr) Read the relay 2 setpoints in the unit at address 34.
RESPONSE
A0175000100EE(cr) Acknowledge, with ten character data field (0175000100), two character checksum, and carriage return.
>10LP2010000000010(cr) Load the relay 2 high setpoint with a value of 1000, and the relay 2 low setpoint with a value of 0 in the unit at address 10.
RESPONSE
A(cr)

QPH Query program hysteresis
LPHhhh Load program hysteresis
When the displayed value crosses a setpoint, and a relay turns ON, the hysteresis value is how far the display must go back across the setpoint before the relay turns OFF. The hysteresis value is used for both high and low setpoints for both relays. The query command asks for the hysteresis value, and the load command writes the hysteresis value.

EXAMPLES
>00QPH49(cr) Read the hysteresis value in the unit at address 00.
RESPONSE
A00090(cr) Acknowledge, with three character data field (000), two character checksum, and carriage return.
>00LPH100A6(cr) Load 100 as the hysteresis value into the unit at address 00.
RESPONSE
A(cr)

QPO Query program output
LPOooooofffff Load program output
These commands deal with the offset and full scale values for the analog retransmission option. The query command asks for these values, and the load command writes them into the meter. The load command contains a ten character data field, **oooooofffff**. The response to the query command contains the same data field. **ooooo** is the offset value, and **fffff** is the full scale value. For volt, amp, 5A AC, and process meters, the offset and full scale values are signed, four digit numbers in the range of –9999 to +9999. For a value of 0000, either the + or – sign must precede the value. For temperature indicators, the values are signed, four digit numbers in the range of –0999 to +2999. For a value of 0000, either the + or – sign must precede the value. For ratemeters, the values are unsigned, five digit numbers in range of 00000 to 99999.

EXAMPLES
>57QPO5C(cr) Asks for the offset and full scale values in the unit at address 57.

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RESPONSE
A+0000+2500DD(cr) Acknowledge, with ten character data field (+0000+2500), two character checksum, and carriage return.
>22LPO-0100+20002A(cr) Load an offset value of –100, and a full scale value of +2500 into the unit at address 22.
RESPONSE
A(cr)

QPC Query program communications
LPCaabp Load program communications
The query command asks for the unit's address, baud rate, and parity, which, of course, must be known already in order to send the command. The load command is more useful. It writes the unit address, baud rate, and parity. These changes take effect after the response to the load command.

EXAMPLES
>19QPC4E(cr) Read the address, baud rate, and parity selections for the unit at address 19.
RESPONSE
A1940CE(cr) Acknowledge, with four character data field (1940), two character checksum, and carriage return.
>00LPC224007(cr) Writes the address to 22, the baud rate to 19.2 k, and the parity to none in the unit at address 00.
RESPONSE
A(cr)

DATA FORMAT FOR THE LOAD COMMAND AND QUERY RESPONSE
Example load command, data field in bold:
>00LPC**2240**07(cr)
Example response to query command, data field in bold:
A**1940**CE(cr)
The four character data field is in the format of **aabp**, where aa is the address in the range of 00-99 decimal, b is the baud rate, and p is the parity. b and p are decimal numbers, taken from the table below.

b	baud rate		p	parity
0	1200		0	none
1	2400		1	odd
2	4800		2	even
3	9600			
4	19200			

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WRITE ONLY SERIAL COMMAND

DMDd Default memory data

This command sets program parameters and / or calibration data to the factory default values. The data field, **d**, identifies which item is to be defaulted, and is taken from the table below.

d	item
0	None
1	Program parameters
2	Calibration data
3	Program parameters and calibration data

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Appendix G

Serial commands for Eclipse totalizer and count control models 5770x48x

ERROR CODES

01 Invalid command. Command was not found in table, or was sent using lower case alpha characters.
02 Checksum error. The transmitted checksum did not match the calculated checksum.
03 Buffer overrun error. The command and data fields contained more than 24 characters.
05 Data format error. An illegal character was used in the data field.
08 Parity or framing error.
10 Lock out error. A lock input was active when serial programming was attempted.
11 Keyboard edit-in-process error. The serial programming mode cannot be entered while the unit is in the programming mode, entered from the keyboard.
13 Already in mode error. The serial program mode and run mode cannot be entered if the unit is already in that mode.
15 Data out of range.

THE SERIAL COMMAND LIST

When powered up, the unit will always be in either the run mode, or the program mode. If the program mode has been entered via the keyboard, the unit will not accept any serial commands. Serial commands fall into two groups, run mode commands and program mode commands. Run mode commands are valid only when the unit is in the run mode, and program mode commands are valid only when the unit is in the serial program mode. The run mode command ESP causes the unit to go into the serial program mode, and the program mode command XSP causes the unit to go into the run mode. Two commands, QDV and QST, are valid in both modes.

RUN MODE SERIAL COMMANDS

QDV Query device version
The QDV command asks for the software program type, version, and software revision of the unit.

EXAMPLE
>03QDV4E(cr) Query the unit at address 03 for its device version data.
RESPONSE
ADPMVC01R012C0(cr) Acknowledge, with eleven character data field (DPMVC01R012), two digit checksum of the data, and carriage return.

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RESPONSE DATA FORMAT
The eleven character data field is in the format of **DPMVtvvRrrr**, where the variables **t**, **vv**, and **rrr** are specific to this unit in Durant's Eclipse line. **t** is always the letter **C**, indicating it is a counter, **vv** is a two digit number indicating software version, and **rrr** is a three digit software revision number.

QST Query status
This command asks for the input type of the unit, the option boards installed, the mode it is presently in, which keys are presently pressed, and the states of the control inputs.

EXAMPLE
>00QST5A(cr) Query the status of the unit at address 00.
RESPONSE
A87000FF(cr) Acknowledge, with five character data field (87000), checksum of the data, and carriage return.

RESPONSE DATA FORMAT
The five character data field is in the format of **iomkc**, where the variables **i**, **o**, **m**, **k**, and **c** are determined as follows:
i is the input type; for the counter version of the Eclipse, this will always be an 8.
o indicates which option boards have been installed, and comes from the table below.

o	Option boards installed
0	none
1	relay
2	analog out
3	relay and analog out
4	serial communications
5	relay and serial comm
6	analog out and serial comm
7	relay, analog out, and serial comm

m indicates mode, and comes from the table below.

m	mode
0	run
2	diagnostic
3	calibration
4	test
5	Serial program

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k indicates which keys are pressed, and comes from the table below.

k	Keys pressed	k	Keys pressed
0	none	8	view
1	down	9	view, down
2	up	A	view, up
3	up, down	B	view, up, down
4	right	C	view, right
5	right, down	D	view, right, down
6	right, up	E	view, right, up
7	right, up, down	F	view, right, up, down

c indicates which control inputs are active, and comes from the table below.

c	Active control inputs
0	none
1	input 3
2	input 2
3	inputs 2 and 3
4	input 1
5	inputs 1 and 3
6	inputs 1 and 2
7	inputs 1, 2 , and 3

QCDi Query count data
LCDiddddddd Load count data
The query command asks for the value of a particular run item (preset, count, etc.) identified by **i**. The load command writes the value of a preset or the value of pulses per item (PPI). The load command identifies the item, **i**, and contains the value to be written, **dddddd**.

EXAMPLES
>01QCD069(cr) Asks for the pulses per item value in the unit at address 01.
RESPONSE
API 0001.00 73(cr) Acknowledge, with thirteen character data field (PI 0001.00), two character checksum of the data, and carriage return.
>01LCD300001088(cr) Load the batch preset with a value of 10 in the unit at address 01.
RESPONSE
A(cr)

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DATA FIELD FORMAT FOR QUERY COMMAND

The data field for the query command is in the format of **i**, where **i** comes from the table below.

i	Run item
0	pulses per item
1	preset 1
2	preset 2
3	batch preset
4	totalizer
5	rate
6	main count
7	batch count

DATA FIELD FORMAT FOR QUERY RESPONSE

The data field in the response to the query command will always contain thirteen characters. The first one or two characters (reading from left to right) will be an alphanumeric item identifier. The next one to four characters will be spaces. The number of spaces varies to accommodate the number of characters in the item identifier and the number of characters in the value. After the space(s) comes the value of the selected run item. The value will be six to ten characters, depending upon which run item is selected. The last character in the value will always be a decimal number in the range of 0-9, and will always be in the twelfth character position. The last (thirteenth) character will always be a space. Leading zeroes in the value will be sent. If a decimal point is used in the value, it will be sent. Values for totalizer, rate, and main count will be preceded by a + or – sign. Example query commands and responses for each run item are given in the table below.

Run item	Query command	Typical response
Pulses per item	>QCD069(cr)	API 0001.00 73
Preset 1	>QCD16A(cr)	AP1 123.456 64
Preset 2	>QCD26B(cr)	AP2 654.321 65
Batch preset	>QCD36C(cr)	APB 000010 53
Totalizer	>QCD46D(cr)	AT +00000.130 71
Rate	>QCD56E(cr)	ART -86055 7B
Main count	>QCD66F(cr)	ACT +000.210 73
Batch count	>QCD770(cr)	ABT 000000 56

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DATA FIELD FORMAT FOR THE LOAD COMMAND
The data field for the load command is in the format **iddddd**, where **i** is the run item number, taken from the table above for the query command. Note that only the pulses per item and preset values can be loaded, so **i** is limited to the range of 0-3. **dddddd** is the numeric value to be loaded into the item, and is in the range of 000000-999999. Leading zeroes must be sent. Decimal points cannot be sent.

RSC Reset main counter
This command will reset the main count register.

EXAMPLE
>22RSC4C(cr) Reset the main counter in the unit at address 22.
RESPONSE
A(cr)

RST Reset totalizer
This command will reset the total count register.

EXAMPLE
>22RSTD5(cr) Reset the totalizer in the unit at address 22.
RESPONSE
A(cr)

RSB Reset batch counter
This command will reset the batch count register.

EXAMPLE
>22RSB4B(cr) Reset the batch counter in the unit at address 22.
RESPONSE
A(cr)

RSA Reset all
This command will reset the main counter, totalizer, and batch counter.
EXAMPLE
>22RSA4A(cr) Reset the main counter, totalizer, and batch counter in the unit at address 22.
RESPONSE
A(cr)

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QRO Query relay output
This command asks for the state of the relays (ON or OFF).

EXAMPLE
>54QRO5B(cr) Asks for the state of the relays in the unit at address 54.
RESPONSE
A1061(cr) Acknowledge, with two character data field, checksum of the data, and carriage return.

DATA FIELD FORMAT FOR THE QRO RESPONSE
The data field is in the format **jk**, where **j** is the state of relay 1, and **k** is the state of relay 2. **j** is 0 if relay 1 is OFF, and 1 if relay 1 is ON. **k** is 0 if relay2 is OFF, and 1 if relay 2 is ON.

URO Unlatch relay outputs
This command will cause the relays to turn ON or turn OFF, or have no effect, depending upon how the relays are programmed to respond to an Unlatch input.

EXAMPLE
>10URO57(cr) Provide the unlatch signal to the unit at address 10.
RESPONSE
A(cr)

ESP Enter serial program
This command will cause the unit to enter the serial program mode.

EXAMPLE
>13ESP4C(cr) Put the unit at address 13 in the serial programming mode.
RESPONSE
A(cr)

PROGRAM MODE SERIAL COMMANDS

QDV Query device version
The QDV command asks for the software program type, version, and software revision of the unit.

EXAMPLE
>03QDV4E(cr) Query the unit at address 03 for its device version data.
RESPONSE

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ADPMVC01R012C0(cr) Acknowledge, with eleven character data field (DPMVC01R012), two digit checksum of the data, and carriage return.

RESPONSE DATA FORMAT

The eleven character data field is in the format of **DPMVtvvRrrr**, where the variables **t**, **vv**, and **rrr** are specific to this unit in Durant's Eclipse line. **t** is always the letter **C**, indicating it is a counter, **vv** is a two digit number indicating software version, and **rrr** is a three digit software revision number.

QST Query status

This command asks for the input type of the unit, the option boards installed, the mode it is presently in, which keys are presently pressed, and the states of the control inputs.

EXAMPLE

>00QST5A(cr) Query the status of the unit at address 00.

RESPONSE

A87000FF(cr) Acknowledge, with five character data field (87000), checksum of the data, and carriage return.

RESPONSE DATA FORMAT

The five character data field is in the format of **iomkc**, where the variables **i**, **o**, **m**, **k**, and **c** are determined as follows:

i is the input type; for the counter version of the Eclipse, this will always be an 8.

o indicates which option boards have been installed, and comes from the table below.

o	Option boards installed
0	none
1	relay
2	analog out
3	relay and analog out
4	serial communications
5	relay and serial comm
6	analog out and serial comm
7	relay, analog out, and serial comm

m indicates mode, and comes from the table below.

m	mode
0	run
2	diagnostic
3	calibration
4	test
5	Serial program

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k indicates which keys are pressed, and comes from the table below.

k	Keys pressed	k	Keys pressed
0	none	8	view
1	down	9	view, down
2	up	A	view, up
3	up, down	B	view, up, down
4	right	C	view, right
5	right, down	D	view, right, down
6	right, up	E	view, right, up
7	right, up, down	F	view, right, up, down

c indicates which control inputs are active, and comes from the table below.

c	Active control inputs
0	none
1	input 3
2	input 2
3	inputs 2 and 3
4	input 1
5	inputs 1 and 3
6	inputs 1 and 2
7	inputs 1, 2 , and 3

QFCii Query function code
LFCiid… Load function code
The query command asks for the value programmed into a specific function code, identified by **ii**. The load command writes a value into a specific function code, identified by **ii**. The list of function codes, and the selection choices for each is contained in the unit's instruction manual. Instruction manuals come in the box with each unit, and are available on our website at www.durant.com. **ii** is always a two digit number, and a leading 0 must be sent for function codes 0-9. The response to the query command, and the load command both contain one to seven characters of data, **d…**, as appropriate for the specific function code. The data that is received in the query response is the same as the data that is transmitted in the load command for each function code. The data range for each function code is given in the table below.

EXAMPLES
>23QFC02A1(cr) Asks for the value for function code 02 in the unit at address 23.
RESPONSE
A10000021(cr) Acknowledge, with six character data field (100000), two character checksum of the data, and carriage return.

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>23LFC02050000C1(cr) Write the value of 050000 into function code 02 in the unit at address 23.
RESPONSE
A(cr)

QUERY RESPONSE AND LOAD COMMAND DATA RANGES
Column ii lists all Eclipse counter function codes. The Selection Range column gives the range of values for each function code as it would appear on the counter's display, or in the instruction manual. Data d… is taken from the Serial Value Range, which gives the data range as it would be received or transmitted. All Selection Value ranges with decimal points have fixed decimal point locations, except for function code 04. Decimal points are not received or transmitted. The Selection Value range for function code 04 is four digits with a movable decimal point. This is serially transmitted as five digits. The first four are the numeric value, and the last digit is the decimal point location. The last digit positions the decimal point by putting it to the left of that many digits in the value. Examples: A Selection Value of 60.00 is sent using a Serial Value of 60002. A Selection Value of 6000 is sent using a Serial Value of 60000.

ii (function code #)	Selection Value Range	Serial Value Range (d…)
00	0-2	0-2
01	0.10-9999.99	000010-999999
02	0.00001-9.99999	000001-999999
03	0-4	0-4
04	0.001-9999	00013-99990
05	0-4	0-4
06	1-99999	00001-99999
07	0-5	0-5
08	0-2	0-2
09	0-1	0-1
10	0-3	0-3
11	0-1	0-1
14	0-1	0-1
16	0-3	0-3
20	000-999	000-999
23	0-5	0-5
30	0-6	0-6
31	0.01-99.99	0001-9999
32	ddddd (d=0, 1, or 2)	ddddd (d=0, 1, or 2)
34	0-1	0-1
35	0-1	0-1
40	0-6	0-6
41	0.01-99.99	0001-9999
42	ddddd (d=0, 1, or 2)	ddddd (d=0, 1, or 2)
44	0-1	0-1
45	0-1	0-1
50	0-2	0-2

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ii (function code #)	Selection Value Range	Serial Value Range (d…)
60	00-99	00-99
61	0-4	0-4
62	0-2	0-2
70	0-3	0-3
71	-99999 to 99999	-099999 to +099999
	0 to 999999	+000000 to +999999
	-99999 to 999999	-099999 to +999999
72	-99999 to 99999	-099999 to +099999
	0 to 999999	+000000 to +999999
	-99999 to 999999	-099999 to +999999

ETMrads Enter test mode

This command will cause output relays, display segments, and display digits to turn ON, and forces the analog output to its offset (4 mA and 0V), or full scale (20 mA and 10 V) value. The displays and outputs remain in this state until altered by another ETM command, or until the test mode is exited.

EXAMPLE

>11ETM007817(cr) Turn ON all display decimal points in the unit at address 11.

RESPONSE

A(cr)

DATA FORMAT FOR THE ETM COMMAND

The four character data field is in the format **rads**, where **r** sets the states of the relays, **a** sets the analog output, **d** selects one or all of the display digits, and **s** selects one or all of the display segments. Values for r, a, d, and s are given in the tables below.

r	Relay(s) ON
0	Neither
1	Relay 1
2	Relay 2
3	Relay 1 and Relay 2

a	Analog output
0	4 mA and 0 V
1	20 mA and 10 V

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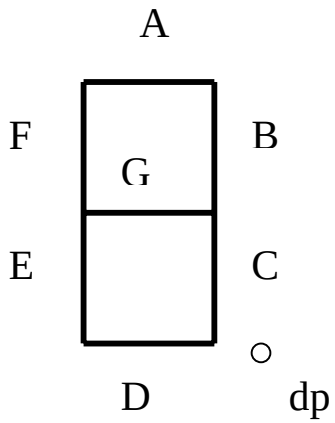
d	Display digit (**X**=ON, X=OFF)
0	XXXXXX
1	**X**XXXXX
2	X**X**XXXX
3	XX**X**XXX
4	XXX**X**XX
5	XXXX**X**X
6	XXXXX**X**
7	**XXXXXX**

s	Segments ON
0	none
1	A
2	B
3	C
4	D
5	E
6	F
7	G
8	dp
9	all



XTM Exit test mode
This command causes the unit to exit the test mode. It will return to the serial programming mode, with both relays OFF, the analog output at 4 mA and 0 V, and the display will read S PrG.

EXAMPLE
>01XTM5A(cr) Exit the test mode at address 01.
RESPONSE
A(cr)

QZO Query zero output
LZOccccvvvv Load zero output
The query command asks for the analog output offset DAC values. The load command writes the analog output offset DAC values.

EXAMPLES
>13QZO5E(cr) Asks the unit at address 13 for its analog output offset DAC values.
RESPONSE
A03FF0000AF(cr) Acknowledge, with eight character data field (03FF0000), two digit checksum of the data, and carriage return.

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>00LZO010000F0EC(cr) Write new values to the analog output offset in the unit at address 00.
RESPONSE
A(cr)

DATA FORMAT FOR THE QUERY RESPONSE AND THE LOAD COMMAND
The eight character data field is in the format **ccccvvvv**, where **cccc** is the DAC value for the offset for the 4-20 mA output, and **vvvv** is the DAC value for the offset for the 0-10 V output. **cccc** is a hexadecimal number in the range of 0000-03FF. **vvvv** is a hexadecimal number in the range of 0000-03FF.

QGO Query gain output
LGOccccvvvv Load gain output
The query command asks for the analog output full scale DAC values. The load command writes the analog output full scale DAC values.

EXAMPLES
>00QGO47(cr) Asks the unit at address 00 for its analog output full scale DAC values.
RESPONSE
A0C000FFFD5(cr) Acknowledge, with eight character data field (0C000FFF), two character checksum of the data, and carriage return.
>11LGO0C1D0FE017(cr) Write new values to the analog output full scale in the unit at address11.
RESPONSE
A(cr)

DATA FORMAT FOR THE QUERY RESPONSE AND THE LOAD COMMAND
The eight character data field is in the format **ccccvvvv**, where **cccc** is the DAC value for the full scale for the 4-20 mA output, and **vvvv** is the DAC value for the full scale for the 0-10 V output. **cccc** is a hexadecimal number in the range of 0C00-0FFF. **vvvv** is a hexadecimal number in the range of 0C00-0FFF.

XSP Exit serial program
This command causes the unit to leave the program mode, and enter the run mode.

EXAMPLE
>99XSP6D(cr) Causes the unit at address 99 to exit the serial program mode, and enter the run mode.
RESPONSE
A(cr)

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Appendix H

Serial commands for Eclipse pulse input flow totalizer and batch control models 5775x40x and 5775x41x

ERROR CODES

01 Invalid command. Command was not found in table, or was sent using lower case alpha characters.
02 Checksum error. The transmitted checksum did not match the calculated checksum.
03 Buffer overrun error. The command and data fields contained more than 24 characters.
05 Data format error. An illegal character was used in the data field.
08 Parity or framing error.
10 Lock out error. A lock input was active when serial programming was attempted.
11 Keyboard edit-in-process error. The serial programming mode cannot be entered while the unit is in the programming mode, entered from the keyboard.
13 Already in mode error. The serial program mode and run mode cannot be entered if the unit is already in that mode.
16 Data out of range.
17 Batch active. A batch cannot be started if a batch is already in progress.
21 Count scaler range error. Either the count factor or the count decimal point caused the calculated count scaler to go out of range.
22 Rate scaler range error. Either the count factor, or the rate decimal point, or the rate time units caused the calculated rate scaler to go out of range.

THE SERIAL COMMAND LIST

When powered up, the unit will always be in either the run mode, or the program mode. If the program mode has been entered via the keyboard, the unit will not accept any serial commands. Serial commands fall into two groups, run mode commands and program mode commands. Run mode commands are valid only when the unit is in the run mode, and program mode commands are valid only when the unit is in the serial program mode. The run mode command ESP causes the unit to go into the serial program mode, and the program mode command XSP causes the unit to go into the run mode. Two commands, QDV and QST, are valid in both modes.

RUN MODE SERIAL COMMANDS

QDV Query device version
The QDV command asks for the software program type, version, and software revision of the unit.

EXAMPLE
>03QDV4E(cr) Query the unit at address 03 for its device version data.
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ADPMVF01R012C3(cr) Acknowledge, with eleven character data field (DPMVC01R012), two digit checksum of the data, and carriage return.

RESPONSE DATA FORMAT

The eleven character data field is in the format of **DPMVtvvRrrr**, where the variables **t**, **vv**, and **rrr** are specific to this unit in Durant's Eclipse line. **t** is always the letter **F**, indicating it is a flow totalizer or batch control, **vv** is a two digit number indicating software version, and **rrr** is a three digit software revision number.

QST Query status

This command asks for the input type of the unit, the option boards installed, the mode it is presently in, which keys are presently pressed, and the states of the control inputs.

EXAMPLE

>00QST5A(cr) Query the status of the unit at address 00.

RESPONSE

A87000FF(cr) Acknowledge, with five character data field (87000), checksum of the data, and carriage return.

RESPONSE DATA FORMAT

The five character data field is in the format of **iomkc**, where the variables **i**, **o**, **m**, **k**, and **c** are determined as follows:

i is the input type; **i** is 0 for a totalizer, and 1 for a batch control.

o indicates which option boards have been installed, and comes from the table below.

o	Option boards installed
0	none
1	dual relay
2	analog out
3	dual relay and analog out
4	serial communications
5	dual relay and serial comm
6	analog out and serial comm
7	dual relay, analog out, and serial comm
A	relay/transistor
B	relay/transistor and analog out
C	relay/transistor and serial comm
D	relay/transistor, analog out, and serial comm

m indicates mode, and comes from the table below.

M	mode
0	run
1	front panel program
2	diagnostic
3	calibration
4	test
5	serial program

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k indicates which keys are pressed, and comes from the table below.

k	Keys pressed	k	Keys pressed
0	none	8	view
1	down	9	view, down
2	up	A	view, up
3	up, down	B	view, up, down
4	right	C	view, right
5	right, down	D	view, right, down
6	right, up	E	view, right, up
7	right, up, down	F	view, right, up, down

c indicates which control inputs are active, and comes from the table below.

c	Active control inputs	c	Active control inputs
0	none	8	Input B
1	Input 3	9	Inputs B and 3
2	Input 2	A	Inputs B and 2
3	Inputs 2 and 3	B	Inputs B, 2, and 3
4	Input 1	C	Inputs B and 1
5	Inputs 1 and 3	D	Inputs B, 1, and 3
6	Inputs 1 and 2	E	Inputs B, 1, and 2
7	Inputs 1, 2, and 3	F	Inputs B, 1, 2, and 3

QRDi Query run data
LRDidddddd Load run data

The query command asks for a run mode data item such as a preset value, a count value, the rate value, etc. The load command writes a value into a run mode item such as a preset or a count register. The run item numbers (i) are listed in the table below.

i	Run item	Comments
0	Count (K) factor	Query only
1	Preset 1	
2	Preset 2	
3	Preset 3	
4	Preset 4	
5	Total count	
6	Rate	Query only
7	Batch count	
8	Cycle count	
9	Analog out percent	Query only

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PRESET ASSIGNMENTS

If the unit has either the dual relay or the relay / transistor output board installed, there are up to four preset registers (P1, P2, P3, and P4) which hold the values at which the outputs turn ON or turn OFF, depending upon the programmed function for the output. P1 is the setpoint for output 1, and P2 is the setpoint for output 2. One output programming selection, rate high / low follows, requires two presets, one for the high setpoint and one for the low setpoint. If output 1 is programmed for rate high / low follows, P1 is the high setpoint, and P3 is the low setpoint. If output 2 is programmed for rate high / low follows, P2 is the high setpoint, and P3 is the low setpoint. If the unit is programmed for Cycle Autostop, and output 2 is NOT programmed for Cycle Setpoint Output, P4 is the cycle setpoint.

EXAMPLES

>01QRD16A(cr) Ask for the preset 1 value in the unit at address 01

RESPONSE

AP1 12345.6 84(cr) Acknowledge, with 15 character data field (P1 12345.6), two character checksum, and carriage return.

>22LRD1000550A1(cr) Set preset 1 to a value of 550 in the unit at address 22.

RESPONSE

A(cr)

DATA FORMAT FOT QUERY RESPONSE

The 15 character data field in the response to the QRD command consists of an item identifier, spaces, numeric data (the value) and a space. The item identifier is the first one or two characters. The last character is a space. Numeric data precedes the space. The number of spaces between the item identifier and the numeric data depends upon the number of characters in the identifier and the numeric data. Numeric data for all run items, except total, is six characters, or seven if a decimal point is programmed into that item. Numeric data for the total is ten characters, or eleven if a decimal point is programmed for total.

EXAMPLES

Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7	Ch 8	Ch 9	Ch 10	Ch 11	Ch 12	Ch 13	Ch 14	Ch 15
P	4	sp	sp	sp	sp	sp	sp	0	0	0	1	5	0	sp
R	T	sp	sp	sp	sp	sp	0	1	0	0	.	0	1	sp
T	sp	sp	sp	4	0	7	7	7	1	3	5	3	3	sp
T	sp	sp	0	0	0	8	3	2	4	0	7	.	6	sp

DATA FORMAT FOR THE LOAD COMMAND

The data field for the LRD command contains either seven or eleven digits, in the form of idddddd, or iddddddddddd. i is the run item number, taken from the table above. dddddd is the numeric value to be loaded into the preset register, in the range of 000000 to 999999. Leading zeroes must be sent. Decimal points cannot be sent. All loadable run item registers are six digit, except for total count, which is ten digits, ddddddddddd. The totalizer readout is programmable to be in one of four forms, six digit display of total

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divided by 1, six digit display of total divided by 10, six digit display of total divided by 100, or ten digit total. All ten digits of data must follow the LRD5 command, with six digits of display data (dddddd) preceded by 4, or 3, or 2 zeroes, depending upon the programmed totalizer choice of divide by 1, or 10, or 100, respectively. 0, 1, or 2 zeroes respectively, complete the ten digit field. If the programmed choice for the totalizer is ten digit total, ten digits of display data must be sent (ddddddddddd).
EXAMPLES
LRD50000dddddd Total divided by 1
LRD5000dddddd0 Total divided by 10
LRD500dddddd00 Total divided by 100
LRD50000000000 Ten digit total
As always, the start character (>) and two digit unit address must precede the command and data, and the two character checksum and carriage return must immediately follow the data.

RSB Reset batch count
RST Reset total count
RSC Reset cycle count
RSA Reset all counters
Resetting one or all of the counters is not valid during a batch run, or while a preset value is being edited on the unit's keyboard. The unit will respond with BATCH ACTIVE or EDIT IN PROCESS if a reset is attempted during of those two conditions. Resetting the totalizer does not reset the totalizer pulse output buffer.

EXAMPLE
>12RST5C(cr) Reset the totalizer in the unit at address 12.
RESPONSE
A(cr)

STA Start batch
STO Stop batch
QSS Query start status
These commands are only valid for batch control units. Starting a batch is not valid during a batch run, or while a preset value is being edited on the unit's keyboard. The unit will respond with BATCH ACTIVE or EDIT IN PROCESS if a start is attempted during those conditions. Stopping a batch is valid only when the unit is running a batch, or recycling. If a batch did not start, the QSS command can be used to determine if an error status prevented the start. If that is the case, the unit will respond with an error message. If that is not the case, the unit will respond with "No Err". Error messages are listed in the table below

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Message	Meaning
------	Already batching
b oFlo	Batch overflow (batch count >999999, or <-99999
t oFlo	Totalizer overflow
Fin 00	Final setpoint = 0
CYC 00	Cycle setpoint = 0
rAt Er	Rate error (rate high / low setpoint = 0)
tot 00	Totalizer setpoint = 0
Ct nEG	Batch counter negative

EXAMPLES
>00STA48(cr) Start or resume the batch in the unit at address 00
RESPONSE
A(cr)

>15STO5C(cr) Stop the batch in the unit at address 15
RESPONSE
A(cr)

>09QSS60(cr) Query the start status for the unit at address 09 (can a batch be run?)
RESPONSE
A------0E(cr) Unit is running a batch

QBE Query batch / keyboard edit mode
There are four modes the unit can be in, while in the run mode. This command asks which mode the unit is presently in.

EXAMPLE
>41QBE3D(cr) Query the batch mode in the unit at address 41
RESPONSE
A030(cr) Acknowledge, with one data character, two character checksum, and carriage return. The data character is in the range of 0-3, and comes from the table below.

Data character	Mode
0	Stopped
1	Active batching
2	Batch autorecycling
3	Keyboard editing

QIO Query inputs and outputs
The unit responds to this command with the states of its five inputs (control inputs 1, 2, and 3, and count and inhibit inputs), and its two outputs. Inputs are either in an active (1) state, or an inactive (0) state. Outputs are either ON (1) or OFF(0).

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EXAMPLE
>04QIO4D(cr) Read the status of the inputs and outputs in the unit at address 04.
RESPONSE
A001100052(cr) Acknowledge, followed by seven data characters in the form of abcdefg, a two character checksum, and carriage return. Data characters are either a 0 (inactive or OFF), or a 1 (active or ON). The assignment for each data character (abcdefg) is listed in the table below.

Character	Assignment
a	Control input 1
b	Control input 2
c	Control input 3
d	Count input
e	Inhibit input
f	Output 1
g	Output 2

QRM Query run messages
A number of run conditions can cause the unit's display to flash an alphnumeric message every five seconds. Certain combinations of programming choices can also cause a message to be displayed in the run mode. This command asks for any message that is being displayed.

EXAMPLE
>00QRM50(cr) Read the run message that is being displayed on the unit at address 00.
RESPONSE
A0060(cr) Acknowledge, with two data characters, a two digit checksum, and a carriage return. The two data characters are in the range of 00-11. The associated messages are given in the table below.

Data	Message
00	No message
01	OUt Er – An output is assigned to totalizer setpoint, and the totalizer is set to ten digit.
02	LA Err – An input is programmed to Stop, but none is programmed to Start
03	Lb Err – An input is programmed to Stop and Unlatch
04	b-3 Er – Batch autostop at cycle setpoint, but batch autocycle is disabled.
05	Ao Err – Analog output assigned to totalizer, and totalizer set to ten digit.
06	rAt Er – Rate error. Rate low / high setpoints both = 0.
07	tot 00 – Totalizer setpoint = 0.
08	b oFLo – Batch overflow. The batch counter counted >999999, or < -99999.
09	t oFLo – Total overflow. Six digit total exceeded displayed 999999.
10	PUL OF – Pulse overflow. Totalizer pulse output buffer exceeded 9999 counts.
11	Ct inH – The count inhibit input is active.

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QOA Query output assignments
This command asks for the function of the two outputs.

EXAMPLE
>31QOA45(cr) Read the output assignments from the unit at address 31.
RESPONSE
A956E(cr) Acknowledge, with two data characters, two character checksum, and carriage return. The two data characters are in the form of ab, where a is the assignment for output 1, and b is the assignment for output 2. a and b are in the range of 0-9, and come from the table below.

a or b	Assignment
0	Total setpoint
1	Rate low setpoint
2	Rate high setpoint
3	Rate low / high setpoint
4	Totalizer pulse out – high speed
5	Totalizer pulse out – medium speed
6	Totalizer pulse out – low speed
7	Batch prewarn
8	Cycle setpoint
9	Batch final

QDI Query display
This command reads what is currently on the unit's display.

EXAMPLES
>01QDI3F(cr) Read the display from the unit at address 01.
RESPONSE
A 3321.00 97(cr) Acknowledge, with nine character data field (space, six digits and decimal point, space), two character checksum, and carriage return. If no decimal point is displayed, the first two characters in the data field will be spaces.

>01QDI3F(cr) Read the display from the unit at address 01.
RESPONSE
A StArt? 8D(cr) Acknowledge, with nine character data field (space, space, six characters, space), two character checksum, and carriage return.

QFAi Query count factor
LFAi Load count factor
The query command reads the count (K) factor selection or value. The unit has two count factors loaded into it, but only one is active at any time. The value of i determines if the query is for the active count factor, or for the programmed value of one of the count

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factors, and is taken from the table below. The load commands selects which count factor is active. Count factor values cannot be loaded in the run mode.

i	Item
0	Count factor selected
1	Count factor 1 value
2	Count factor 2 value

EXAMPLES
>01QFA06B(cr) Read the count factor selection in the unit at address 01.
RESPONSE
A131(cr) Acknowledge, with one data character (from table above), two character checksum, and carriage return.

>01QFA26D(cr) Read the value for count factor in the unit at address 01.
RESPONSE
A02.000050(cr) Acknowledge, with seven character data field of the count factor value, two character checksum, and carriage return.

>01LFA266(cr) Select count factor 2 as the active count factor.
RESPONSE
A(cr)

QRO Query relay outputs
URO Unlatch relay outputs.
The query command asks for the state of the two outputs. The data field in the response to the query is two digits. The first digit is the state of output 1, and the second digit is the state of output 2. The range of the digits is 0-1, with 0 indicating OFF, and 1 indicating ON. The unlatch command turns both outputs OFF.

EXAMPLES
>33QRO58(cr) Read the state of the outputs in the unit at address 33.
RESPONSE
A0161(cr) Acknowledge, with two data digits, two character checksum, and carriage return.

>33URO6C(cr) Unlatch the outputs in the unit at address 33.
RESPONSE
A(cr)

ESP Enter serial program
This command puts the unit in the serial program mode. While in the serial program mode, the unit's display reads "S PrG", all outputs are turned OFF, the analog output

goes to its minimum value, and the keypad is disabled. Communications column programming functions take effect when the program mode is exited.

EXAMPLE
>99ESP5A(cr) Put the unit at address 99 in the serial program mode.
RESPONSE
A(cr)

SERIAL PROGRAM MODE COMMANDS

QDV Query device version
The QDV command asks for the software program type, version, and software revision of the unit.

EXAMPLE
>03QDV4E(cr) Query the unit at address 03 for its device version data.
RESPONSE
ADPMVF01R012C3(cr) Acknowledge, with eleven character data field (DPMVC01R012), two digit checksum of the data, and carriage return.

RESPONSE DATA FORMAT
The eleven character data field is in the format of **DPMVtvvRrrr**, where the variables **t**, **vv**, and **rrr** are specific to this unit in Durant's Eclipse line. **t** is always the letter **F**, indicating it is a flow totalizer or batch control, **vv** is a two digit number indicating software version, and **rrr** is a three digit software revision number.

QST Query status
This command asks for the input type of the unit, the option boards installed, the mode it is presently in, which keys are presently pressed, and the states of the control inputs.

EXAMPLE
>00QST5A(cr) Query the status of the unit at address 00.
RESPONSE
A87000FF(cr) Acknowledge, with five character data field (87000), checksum of the data, and carriage return.

RESPONSE DATA FORMAT
The five character data field is in the format of **iomkc**, where the variables **i**, **o**, **m**, **k**, and **c** are determined as follows:
i is the input type; **i** is 0 for a totalizer, and 1 for a batch control.
o indicates which option boards have been installed, and comes from the table below.

o	Option boards installed
0	none

1	dual relay
2	analog out
3	dual relay and analog out
4	serial communications
5	dual relay and serial comm
6	analog out and serial comm
7	dual relay, analog out, and serial comm
A	relay/transistor
B	relay/transistor and analog out
C	relay/transistor and serial comm
D	relay/transistor, analog out, and serial comm

m indicates mode, and comes from the table below.

M	mode
0	run
1	front panel program
2	diagnostic
3	calibration
4	test
5	serial program

k indicates which keys are pressed, and comes from the table below.

k	Keys pressed	k	Keys pressed
0	none	8	view
1	down	9	view, down
2	up	A	view, up
3	up, down	B	view, up, down
4	right	C	view, right
5	right, down	D	view, right, down
6	right, up	E	view, right, up
7	right, up, down	F	view, right, up, down

c indicates which control inputs are active, and comes from the table below.

c	Active control inputs	c	Active control inputs
0	none	8	Input B
1	Input 3	9	Inputs B and 3
2	Input 2	A	Inputs B and 2
3	Inputs 2 and 3	B	Inputs B, 2, and 3
4	Input 1	C	Inputs B and 1
5	Inputs 1 and 3	D	Inputs B, 1, and 3
6	Inputs 1 and 2	E	Inputs B, 1, and 2
7	Inputs 1, 2, and 3	F	Inputs B, 1, 2, and 3

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ETMrads Enter test mode
This command will cause output relays, display segments, and display digits to turn ON, and forces the analog output to its offset (4 mA and 0V), or full scale (20 mA and 10 V) value. The displays and outputs remain in this state until altered by another ETM command, or until the test mode is exited.

EXAMPLE
>11ETM007817(cr) Turn ON all display decimal points in the unit at address 11.
RESPONSE
A(cr)

DATA FORMAT FOR THE ETM COMMAND
The four character data field is in the format **rads**, where **r** sets the states of the relays, **a** sets the analog output, **d** selects one or all of the display digits, and **s** selects one or all of the display segments. Values for r, a, d, and s are given in the tables below.

r	Relay(s) ON
0	Neither
1	Relay 1
2	Relay 2
3	Relay 1 and Relay 2

a	Analog output
0	4 mA and 0 V
1	20 mA and 10 V

d	Display digit (**X**=ON, X=OFF)
0	XXXXXX
1	**X**XXXXX
2	X**X**XXXX
3	XX**X**XXX
4	XXX**X**XX
5	XXXX**X**X
6	XXXXX**X**
7	**XXXXXX**

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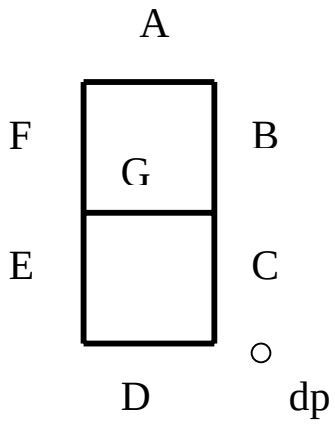
s	Segments ON
0	none
1	A
2	B
3	C
4	D
5	E
6	F
7	G
8	dp
9	all



XTM Exit test mode
This command causes the unit to exit the test mode. It will return to the serial programming mode, with both relays OFF, the analog output at 4 mA and 0 V, and the display will read S PrG.

EXAMPLE
>01XTM5A(cr) Exit the test mode at address 01.
RESPONSE
A(cr)

QZO Query zero output
LZOccccvvvv Load zero output
The query command asks for the analog output offset DAC values. The load command writes the analog output offset DAC values.

EXAMPLES
>13QZO5E(cr) Asks the unit at address 13 for its analog output offset DAC values.
RESPONSE
A03FF0000AF(cr) Acknowledge, with eight character data field (03FF0000), two digit checksum of the data, and carriage return.
>00LZO010000F0EC(cr) Write new values to the analog output offset in the unit at address 00.
RESPONSE
A(cr)

DATA FORMAT FOR THE QUERY RESPONSE AND THE LOAD COMMAND
The eight character data field is in the format **ccccvvvv**, where **cccc** is the DAC value for the offset for the 4-20 mA output, and **vvvv** is the DAC value for the offset for the 0-10 V

output. **cccc** is a hexadecimal number in the range of 0000-03FF. **vvvv** is a hexadecimal number in the range of 0000-03FF.

QGO Query gain output
LGOccccvvvv Load gain output
The query command asks for the analog output full scale DAC values. The load command writes the analog output full scale DAC values.

EXAMPLES
>00QGO47(cr) Asks the unit at address 00 for its analog output full scale DAC values.
RESPONSE
A0C000FFFD5(cr) Acknowledge, with eight character data field (0C000FFF), two character checksum of the data, and carriage return.
>11LGO0C1D0FE017(cr) Write new values to the analog output full scale in the unit at address11.
RESPONSE
A(cr)

DATA FORMAT FOR THE QUERY RESPONSE AND THE LOAD COMMAND
The eight character data field is in the format **ccccvvvv**, where **cccc** is the DAC value for the full scale for the 4-20 mA output, and **vvvv** is the DAC value for the full scale for the 0-10 V output. **cccc** is a hexadecimal number in the range of 0C00-0FFF. **vvvv** is a hexadecimal number in the range of 0C00-0FFF.

XSP Exit serial program
This command causes the unit to leave the program mode, and enter the run mode.

EXAMPLE
>99XSP6D(cr) Causes the unit at address 99 to exit the serial program mode, and enter the run mode.
RESPONSE
A(cr)

QUERY COLUMN AND LOAD COLUMN SERIAL PROGRAM COMMANDS
The remaining commands in the serial program command list read from (query), and write to (load), programming blocks. Each programming block is an individual item to be considered when configuring the unit for a specific application. For example, the batch count decimal point location, the function of control input 1, and the function of output 2 are all chosen by entering a value into a programming block. These blocks are grouped by general function into columns. For instance, all the blocks associated with programming the relays are grouped into column r, all the blocks associated with programming the analog output are grouped into column a, etc. All units have at least

three columns, F (Factors), d (defaults), and L (controL inputs and keyboard). Each of the three option boards that may be installed gets a column, A (Analog out), r (relays), and C (Communications). Batch control units get a final column, b (batch functions).
The value chosen for each block comes from a range of selections available for that block. Refer to instruction manual 57750900 for the selection list for each block. Instruction manuals come in the box with each unit, and are available on our website at wwww.durant.com.

QCFbb Query column F
LCFbbdddd Load column F
The query command reads the value programmed into block bb in column F. Column F (Factors) deals with count (K) factors, count decimal point location, and ratemeter setup parameters. There are eight blocks in column F, which means that bb is in the range 01 – 08. The load command writes a value into block bb.

EXAMPLES
>12QCF029F(cr) Read the value programmed into block 02 of column F in the unit at address 12.
RESPONSE
A1.00001F(cr) Acknowledge, with six data characters (five digits and decimal point), two character checksum, and carriage return.
>12LCF020.500088(cr) Write 0.5000 into block 02 of column F in the unit at address 12.
RESPONSE
A(cr)

DATA FIELD FOR LOAD COMMAND AND QUERY RESPONSE

Block	Description	Range
01	Count factor select	0-3
02	Count factor 1	0.0002-99999. (5 digits and dec. point)
03	Count factor 2	0.0002-99999. (5 digits and dec. point)
04	Count decimal point	0-4
05	Rate decimal point	0-4
06	Rate time base	00001-99999
07	Rate smoothing	1-9
08	Rate zero time	1-9

QCDbb Query column d
LCDbbd Load column d
The query command reads the value programmed into block bb of column d. Column d (defaults) deals with the power up display, totalizer setup, and the default programming and run value functions. There are four blocks in column d, which puts bb in the range of

01-04. However, blocks 03 and 04 cannot be queried. The load command writes values into the blocks, except block 03, which cannot be written to.

EXAMPLES
>23QCD019E(cr) Read the value of block 01 in column d in the unit at address 23.
RESPONSE
A333(cr) Acknowledge, with one digit of data, two character checksum, and carriage return.
>23LCD010C9(cr) Write 0 into block 01 of column d in the unit at address 23.
RESPONSE
A(cr)

DATA FIELD FOR LOAD COMMAND AND QUERY RESPONSE

Block	Description	Range
01	Power up display	0-4
02	Totalizer mode	0-3
04	Load defaults (load only)	1-3

QCLbb Query column L
LCLbbdddd Load column L
The query command reads the value programmed into block bb in column L. Column L deals with the functions of control inputs 1, 2, and 3, and the unit's Start, Stop, and Reset keys. There are six blocks in column L, which means that bb is in the range of 01-06. The load command writes a value into block bb.

EXAMPLES
>58QCL05B2(cr) Read the value of block 05 in column L in the unit at address 58.
RESPONSE
A1000C1(cr) Acknowledge, with four data digits, two character checksum, and carriage return.
>14LCL05110067(cr) Load the value of 1100 into block 05 in column L in the unit at address 14.
RESPONSE
A(cr)

DATA FIELD FOR LOAD COMMAND AND QUERY RESPONSE
The four digits of data in the load command and query response are in the form of sulr, where s designates start / stop functions, u designates unlatch functions, l designates lock functions, and r designates reset functions. Each of the inputs and keys can be programmed to perform one or more functions. For instance, a control input can be programmed to perform a start function, and an unlatch function, and a reset function. The range of values for each of the function categories available for each of the blocks is given in the table below.

Block	Description	Range of s	Range of u	Range of l	Range of r
01	Control input 1	0-2	0-3	0-8	0-8
02	Control input 2	0-2	0-3	0-8	0-8
03	Control input 3	0-2	0-3	0-8	0-8
04	Reset key	0	0-3	0	0-8
05	Start key	0-1	0-3	0	0-8
06	Stop key	0 or 2	0-3	0	0

QCRbb Query column r
LCRbbdd Load column r
The query command reads the value programmed into block bb of column r. Column r assigns each of the two outputs to a specific function, and also sets the timeout for the output, if the assignment is one of the timed output selections. There are four blocks in column r, therefore the range of bb is 01-04. The load command writes either a two digit assignment value into blocks 01 and 30, or a four digit timeout value into blocks 02 and 04.

EXAMPLES
>07QCR03B0(cr) Asks for the programmed assignment of output 2 in the unit at address 07.
RESPONSE
A71A9(cr) Acknowledge, two data digits, two character checksum, and carriage return.
>22LCR0405006E(cr) Set the output 2 timeout to 5.00 seconds by writing that value into block 04 of column r in the unit at address 22.
RESPONSE
A(cr)

DATA FIELD FOR LOAD COMMAND AND QUERY RESPONSE
The data field is two digits for blocks 01 and 03, and four digits for blocks 02 and 04. The ranges for the data are given in the table below.

Block	Description	Range
01	Output 1 assignment	00, 01, 10, 11, 12, 20, 21, 22, 32, 43, 53, 63, 71, 80, 81, or 91
02	Output 1 timeout	0001-9999
03	Output 2 assignment	00, 01, 10, 11, 12, 20, 21, 22, 32, 43, 53, 63, 71, 80, 81, or 91
04	Output 2 timeout	0001-9999

QCBbb Query column b
LCBbbd Load column b
The query command reads the value programmed into block bb in column b. Column b programs the batch control functions, which are not available in totalizing models

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5775x40x. There are four blocks in column, which means that bb is in the range of 01-04. The load command writes a value into block bb.

EXAMPLES
>11QCB0199(cr) Read the value programmed into block 01 of column b in the unit at address 11.
RESPONSE
A030(cr) Acknowledge, with one data digit, two character checksum, and carriage return.
>30LCB042CA(cr) Write a value of 2 into block 04 of column b in the unit at address 30.
RESPONSE
A(cr)

DATA FIELD FOR LOAD COMMAND AND QUERY RESPONSE

Block	Description	Range
01	Batch counts up, or down	0-1
02	Hide or show overrun	0-1
03	Autorecycle time	00-99
04	Cycle autostop	0-2

QCCbb Query column C
LCCbbd Load column C
The query command reads a value from a block in column C. Column C sets parameters for the serial communication option board. There are three blocks in column C, which means that bb is in the range of 01-03. The load command writes a value into block bb in column C.

EXAMPLES
>01QCC0199(cr) Read the value in block 01 of column C in the unit at address 01.
RESPONSE
A0161(cr) Acknowledge, with two data digits, two character checksum, and carriage return.
>01LCC0102F6(cr) Write a value of 02 into block 01 of column C in the unit at address 01.
RESPONSE
A(cr)

DATA FIELD FOR LOAD COMMAND AND QUERY RESPONSE

Block	Description	Range
01	Unit address	00-99
02	Baud rate	0-4
03	Parity	0-2

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QCAbb Query column A
LCAbbdddddd Load column A
The query command reads the value programmed into block bb of column A. Column A configures the analog output board option. There are three blocks in column A, which means that bb is in the range 01-03. The load command writes a value into block bb of column A.

EXAMPLES
>19QCA02A1(cr) Read the value of block 02 in column A in the unit at address 19.
RESPONSE
A00150026(cr) Acknowledge, with six data digits, two character checksum, and carriage return.
>03LCA02999999EB(cr) Write a value of 999999 into block 02 of column A in the unit at address 03.
RESPONSE
A(cr)

DATA FIELD FOR LOAD COMMAND AND QUERY RESPONSE

Block	Description	Range
01	Analog assignment	0-3
02	Offset value	000000-999999
03	Full scale value	000000-999999

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Appendix I

Serial commands for Eclipse analog input flow totalizer and batch control models 5775x42x and 5775x43x

ERROR CODES

01 Invalid command. Command was not found in table, or was sent using lower case alpha characters.
02 Checksum error. The transmitted checksum did not match the calculated checksum.
03 Buffer overrun error. The command and data fields contained more than 24 characters.
05 Data format error. An illegal character was used in the data field.
08 Parity or framing error.
10 Lock out error. A lock input was active when serial programming was attempted.
11 Keyboard edit-in-process error. The serial programming mode cannot be entered while the unit is in the programming mode, entered from the keyboard.
13 Already in mode error. The serial program mode and run mode cannot be entered if the unit is already in that mode.
16 Data out of range.
17 Batch active. A batch cannot be started if a batch is already in progress.
21 Count scaler range error. Either the count factor or the count decimal point caused the calculated count scaler to go out of range.
22 Rate scaler range error. Either the count factor, or the rate decimal point, or the rate time units caused the calculated rate scaler to go out of range.

THE SERIAL COMMAND LIST

When powered up, the unit will always be in either the run mode, or the program mode. If the program mode has been entered via the keyboard, the unit will not accept any serial commands. Serial commands fall into two groups, run mode commands and program mode commands. Run mode commands are valid only when the unit is in the run mode, and program mode commands are valid only when the unit is in the serial program mode. The run mode command ESP causes the unit to go into the serial program mode, and the program mode command XSP causes the unit to go into the run mode. Two commands, QDV and QST, are valid in both modes.

RUN MODE SERIAL COMMANDS

QDV Query device version
The QDV command asks for the software program type, version, and software revision of the unit.

EXAMPLE
>03QDV4E(cr) Query the unit at address 03 for its device version data.
RESPONSE

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ADPMVF01R012C3(cr) Acknowledge, with eleven character data field (DPMVC01R012), two digit checksum of the data, and carriage return.

RESPONSE DATA FORMAT

The eleven character data field is in the format of **DPMVtvvRrrr**, where the variables **t**, **vv**, and **rrr** are specific to this unit in Durant's Eclipse line. **t** is always the letter **F**, indicating it is a flow totalizer or batch control, **vv** is a two digit number indicating software version, and **rrr** is a three digit software revision number.

QST Query status

This command asks for the input type of the unit, the option boards installed, the mode it is presently in, which keys are presently pressed, and the states of the control inputs.

EXAMPLE

>00QST5A(cr) Query the status of the unit at address 00.

RESPONSE

A87000FF(cr) Acknowledge, with five character data field (87000), checksum of the data, and carriage return.

RESPONSE DATA FORMAT

The five character data field is in the format of **iomkc**, where the variables **i**, **o**, **m**, **k**, and **c** are determined as follows:

i is the input type; **i** is 2 for a totalizer, and 3 for a batch control.

o indicates which option boards have been installed, and comes from the table below.

o	Option boards installed
0	none
1	dual relay
2	analog out
3	dual relay and analog out
4	serial communications
5	dual relay and serial comm
6	analog out and serial comm
7	dual relay, analog out, and serial comm
A	relay/transistor
B	relay/transistor and analog out
C	relay/transistor and serial comm
D	relay/transistor, analog out, and serial comm

m indicates mode, and comes from the table below.

M	mode
0	run
1	front panel program
2	diagnostic
3	calibration
4	test
5	serial program

k indicates which keys are pressed, and comes from the table below.

k	Keys pressed	k	Keys pressed
0	none	8	view
1	down	9	view, down
2	up	A	view, up
3	up, down	B	view, up, down
4	right	C	view, right
5	right, down	D	view, right, down
6	right, up	E	view, right, up
7	right, up, down	F	view, right, up, down

c indicates which control inputs are active, and comes from the table below.

c	Active control inputs	c	Active control inputs
0	none	8	Input B
1	Input 3	9	Inputs B and 3
2	Input 2	A	Inputs B and 2
3	Inputs 2 and 3	B	Inputs B, 2, and 3
4	Input 1	C	Inputs B and 1
5	Inputs 1 and 3	D	Inputs B, 1, and 3
6	Inputs 1 and 2	E	Inputs B, 1, and 2
7	Inputs 1, 2, and 3	F	Inputs B, 1, 2, and 3

QRDi Query run data
LRDidddddd Load run data

The query command asks for a run mode data item such as a preset value, a count value, the rate value, etc. The load command writes a value into a run mode item such as a preset or a count register. The run item numbers (i) are listed in the table below.

i	Run item	Comments
0	Count (K) factor	Query only
1	Preset 1	
2	Preset 2	
3	Preset 3	
4	Preset 4	
5	Total count	
6	Rate	Query only
7	Batch count	
8	Cycle count	
9	Analog out percent	Query only

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PRESET ASSIGNMENTS

If the unit has either the dual relay or the relay / transistor output board installed, there are up to four preset registers (P1, P2, P3, and P4) which hold the values at which the outputs turn ON or turn OFF, depending upon the programmed function for the output. P1 is the setpoint for output 1, and P2 is the setpoint for output 2. One output programming selection, rate high / low follows, requires two presets, one for the high setpoint and one for the low setpoint. If output 1 is programmed for rate high / low follows, P1 is the high setpoint, and P3 is the low setpoint. If output 2 is programmed for rate high / low follows, P2 is the high setpoint, and P3 is the low setpoint. If the unit is programmed for Cycle Autostop, and output 2 is NOT programmed for Cycle Setpoint Output, P4 is the cycle setpoint.

EXAMPLES

>01QRD16A(cr) Ask for the preset 1 value in the unit at address 01

RESPONSE

AP1 12345.6 84(cr) Acknowledge, with 15 character data field (P1 12345.6), two character checksum, and carriage return.

>22LRD1000550A1(cr) Set preset 1 to a value of 550 in the unit at address 22.

RESPONSE

A(cr)

DATA FORMAT FOT QUERY RESPONSE

The 15 character data field in the response to the QRD command consists of an item identifier, spaces, numeric data (the value) and a space. The item identifier is the first one or two characters. The last character is a space. Numeric data precedes the space. The number of spaces between the item identifier and the numeric data depends upon the number of characters in the identifier and the numeric data. Numeric data for all run items, except total, is six characters, or seven if a decimal point is programmed into that item. Numeric data for the total is ten characters, or eleven if a decimal point is programmed for total.

EXAMPLES

Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7	Ch 8	Ch 9	Ch 10	Ch 11	Ch 12	Ch 13	Ch 14	Ch 15
P	4	sp	sp	sp	sp	sp	sp	0	0	0	1	5	0	sp
R	T	sp	sp	sp	sp	sp	0	1	0	0	.	0	1	sp
T	sp	sp	sp	4	0	7	7	7	1	3	5	3	3	sp
T	sp	sp	0	0	0	8	3	2	4	0	7	.	6	sp

DATA FORMAT FOR THE LOAD COMMAND

The data field for the LRD command contains either seven or eleven digits, in the form of idddddd, or iddddddddddd. i is the run item number, taken from the table above. dddddd is the numeric value to be loaded into the preset register, in the range of 000000 to 999999. Leading zeroes must be sent. Decimal points cannot be sent. All loadable run item registers are six digit, except for total count, which is ten digits, ddddddddddd. The totalizer readout is programmable to be in one of four forms, six digit display of total

divided by 1, six digit display of total divided by 10, six digit display of total divided by 100, or ten digit total. All ten digits of data must follow the LRD5 command, with six digits of display data (dddddd) preceded by 4, or 3, or 2 zeroes, depending upon the programmed totalizer choice of divide by 1, or 10, or 100, respectively. 0, 1, or 2 zeroes respectively, complete the ten digit field. If the programmed choice for the totalizer is ten digit total, ten digits of display data must be sent (ddddddddddd).
EXAMPLES
LRD50000dddddd Total divided by 1
LRD5000dddddd0 Total divided by 10
LRD500dddddd00 Total divided by 100
LRD50000000000 Ten digit total
As always, the start character (>) and two digit unit address must precede the command and data, and the two character checksum and carriage return must immediately follow the data.

RSB Reset batch count
RST Reset total count
RSC Reset cycle count
RSA Reset all counters
Resetting one or all of the counters is not valid during a batch run, or while a preset value is being edited on the unit's keyboard. The unit will respond with BATCH ACTIVE or EDIT IN PROCESS if a reset is attempted during of those two conditions. Resetting the totalizer does not reset the totalizer pulse output buffer.

EXAMPLE
>12RST5C(cr) Reset the totalizer in the unit at address 12.
RESPONSE
A(cr)

STA Start batch
STO Stop batch
QSS Query start status
These commands are only valid for batch control units. Starting a batch is not valid during a batch run, or while a preset value is being edited on the unit's keyboard. The unit will respond with BATCH ACTIVE or EDIT IN PROCESS if a start is attempted during those conditions. Stopping a batch is valid only when the unit is running a batch, or recycling. If a batch did not start, the QSS command can be used to determine if an error status prevented the start. If that is the case, the unit will respond with an error message. If that is not the case, the unit will respond with "No Err". Error messages are listed in the table below

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Message	Meaning
------	Already batching
b oFlo	Batch overflow (batch count >999999, or <-99999
t oFlo	Totalizer overflow
Fin 00	Final setpoint = 0
CYC 00	Cycle setpoint = 0
rAt Er	Rate error (rate high / low setpoint = 0)
tot 00	Totalizer setpoint = 0
Ct nEG	Batch counter negative

EXAMPLES
>00STA48(cr) Start or resume the batch in the unit at address 00
RESPONSE
A(cr)

>15STO5C(cr) Stop the batch in the unit at address 15
RESPONSE
A(cr)

>09QSS60(cr) Query the start status for the unit at address 09 (can a batch be run?)
RESPONSE
A------0E(cr) Unit is running a batch

QBE Query batch / keyboard edit mode
There are four modes the unit can be in, while in the run mode. This command asks which mode the unit is presently in.

EXAMPLE
>41QBE3D(cr) Query the batch mode in the unit at address 41
RESPONSE
A030(cr) Acknowledge, with one data character, two character checksum, and carriage return. The data character is in the range of 0-3, and comes from the table below.

Data character	Mode
0	Stopped
1	Active batching
2	Batch autorecycling
3	Keyboard editing

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QAI Query analog input
This command asks for the amplitude of the flowmeter signal in. The response will be a four digit reading of either xx.xx mA, or xx.xx V. The decimal point is not included in the response. The unit of measurement (mA or V) depends upon the programmed selection of either 4-20 mA input signal, or 0-10 V input signal

EXAMPLE
>02QAI3D(cr) Asks for the signal reading at the flow input in the unit at address 02.
RESPONSE
A115028(cr) Acknowledge, with four data digits, two character checksum, and carriage return.

QIO Query inputs and outputs
The unit responds to this command with the states of its three digital control inputs, and its two outputs. Inputs are either in an active (1), or an inactive (0) state. Outputs are either ON (1), or OFF(0).

EXAMPLE
>04QIO4D(cr) Read the status of the inputs and outputs in the unit at address 04.
RESPONSE
A01100F2(cr) Acknowledge, followed by five data digits in the form of abcde, a two character checksum, and carriage return. Data digits are either a 0 (inactive or OFF), or a 1 (active or ON). The assignment for each data digit (abcde) is listed in the table below.

Digit	Assignment
a	Control input 1
b	Control input 2
c	Control input 3
d	Output 1
e	Output 2

QRM Query run messages
A number of run conditions can cause the unit's display to flash an alphnumeric message every five seconds. Certain combinations of programming choices can also cause a message to be displayed in the run mode. This command asks for any message that is being displayed.

EXAMPLE
>00QRM50(cr) Read the run message that is being displayed on the unit at address 00.
RESPONSE
A0060(cr) Acknowledge, with two data characters, a two digit checksum, and a carriage return. The two data characters are in the range of 00-11. The associated messages are given in the table below.

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Data	Message
00	No message
01	OUt Er – An output is assigned to totalizer setpoint, and the totalizer is set to ten digit.
02	LA Err – An input is programmed to Stop, but none is programmed to Start
03	Lb Err – An input is programmed to Stop and Unlatch
04	b-3 Er – Batch autostop at cycle setpoint, but batch autocycle is disabled.
05	Ao Err – Analog output assigned to totalizer, and totalizer set to ten digit.
06	rAt Er – Rate error. Rate low / high setpoints both = 0.
07	tot 00 – Totalizer setpoint = 0.
08	b oFLo – Batch overflow. The batch counter counted >999999, or < -99999.
09	t oFLo – Total overflow. Six digit total exceeded displayed 999999.
10	PUL OF – Pulse overflow. Totalizer pulse output buffer exceeded 9999 counts.
12	P Err – Linearization table error

QOA Query output assignments
This command asks for the function of the two outputs.

EXAMPLE
>31QOA45(cr) Read the output assignments from the unit at address 31.
RESPONSE
A956E(cr) Acknowledge, with two data characters, two character checksum, and carriage return. The two data characters are in the form of ab, where a is the assignment for output 1, and b is the assignment for output 2. a and b are in the range of 0-9, and come from the table below.

a or b	Assignment
0	Total setpoint
1	Rate low setpoint
2	Rate high setpoint
3	Rate low / high setpoint
4	Totalizer pulse out – high speed
5	Totalizer pulse out – medium speed
6	Totalizer pulse out – low speed
7	Batch prewarn
8	Cycle setpoint
9	Batch final

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QDI Query display
This command reads what is currently on the unit's display.

EXAMPLES
>01QDI3F(cr) Read the display from the unit at address 01.
RESPONSE
A 3321.00 97(cr) Acknowledge, with nine character data field (space, six digits and decimal point, space), two character checksum, and carriage return. If no decimal point is displayed, the first two characters in the data field will be spaces.

>01QDI3F(cr) Read the display from the unit at address 01.
RESPONSE
A StArt? 8D(cr) Acknowledge, with nine character data field (space, space, six characters, space), two character checksum, and carriage return.

QRO Query relay outputs
URO Unlatch relay outputs.
The query command asks for the state of the two outputs. The data field in the response to the query is two digits. The first digit is the state of output 1, and the second digit is the state of output 2. The range of the digits is 0-1, with 0 indicating OFF, and 1 indicating ON. The unlatch command turns both outputs OFF.

EXAMPLES
>33QRO58(cr) Read the state of the outputs in the unit at address 33.
RESPONSE
A0161(cr) Acknowledge, with two data digits, two character checksum, and carriage return.
>33URO6C(cr) Unlatch the outputs in the unit at address 33.
RESPONSE
A(cr)

ESP Enter serial program
This command puts the unit in the serial program mode. While in the serial program mode, the unit's display reads "S PrG", all outputs are turned OFF, the analog output goes to its minimum value, and the keypad is disabled. Communications column programming functions take effect when the program mode is exited.

EXAMPLE
>99ESP5A(cr) Put the unit at address 99 in the serial program mode.
RESPONSE
A(cr)

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SERIAL PROGRAM MODE COMMANDS

QDV Query device version
The QDV command asks for the software program type, version, and software revision of the unit.

EXAMPLE
>03QDV4E(cr) Query the unit at address 03 for its device version data.
RESPONSE
ADPMVF01R012C3(cr) Acknowledge, with eleven character data field (DPMVC01R012), two digit checksum of the data, and carriage return.

RESPONSE DATA FORMAT
The eleven character data field is in the format of **DPMVtvvRrrr**, where the variables **t**, **vv**, and **rrr** are specific to this unit in Durant's Eclipse line. **t** is always the letter **F**, indicating it is a flow totalizer or batch control, **vv** is a two digit number indicating software version, and **rrr** is a three digit software revision number.

QST Query status
This command asks for the input type of the unit, the option boards installed, the mode it is presently in, which keys are presently pressed, and the states of the control inputs.

EXAMPLE
>00QST5A(cr) Query the status of the unit at address 00.
RESPONSE
A87000FF(cr) Acknowledge, with five character data field (87000), checksum of the data, and carriage return.
RESPONSE DATA FORMAT
The five character data field is in the format of **iomkc**, where the variables **i**, **o**, **m**, **k**, and **c** are determined as follows:
i is the input type; **i** is 2 for a totalizer, and 3 for a batch control.
o indicates which option boards have been installed, and comes from the table below.

o	Option boards installed
0	none
1	dual relay
2	analog out
3	dual relay and analog out
4	serial communications
5	dual relay and serial comm
6	analog out and serial comm
7	dual relay, analog out, and serial comm
A	relay/transistor
B	relay/transistor and analog out
C	relay/transistor and serial comm
D	relay/transistor, analog out, and serial comm

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m indicates mode, and comes from the table below.

M	mode
0	run
1	front panel program
2	diagnostic
3	calibration
4	test
5	serial program

k indicates which keys are pressed, and comes from the table below.

k	Keys pressed	k	Keys pressed
0	none	8	view
1	down	9	view, down
2	up	A	view, up
3	up, down	B	view, up, down
4	right	C	view, right
5	right, down	D	view, right, down
6	right, up	E	view, right, up
7	right, up, down	F	view, right, up, down

c indicates which control inputs are active, and comes from the table below.

c	Active control inputs	c	Active control inputs
0	none	8	Input B
1	Input 3	9	Inputs B and 3
2	Input 2	A	Inputs B and 2
3	Inputs 2 and 3	B	Inputs B, 2, and 3
4	Input 1	C	Inputs B and 1
5	Inputs 1 and 3	D	Inputs B, 1, and 3
6	Inputs 1 and 2	E	Inputs B, 1, and 2
7	Inputs 1, 2, and 3	F	Inputs B, 1, 2, and 3

ETMrads Enter test mode

This command will cause output relays, display segments, and display digits to turn ON, and forces the analog output to its offset (4 mA and 0V), or full scale (20 mA and 10 V) value. The displays and outputs remain in this state until altered by another ETM command, or until the test mode is exited.

EXAMPLE

>11ETM007817(cr) Turn ON all display decimal points in the unit at address 11.

RESPONSE

A(cr)

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DATA FORMAT FOR THE ETM COMMAND

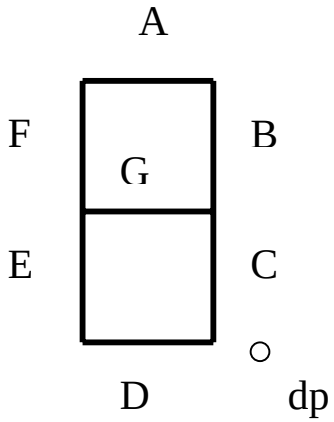
The four character data field is in the format **rads**, where **r** sets the states of the relays, **a** sets the analog output, **d** selects one or all of the display digits, and **s** selects one or all of the display segments. Values for r, a, d, and s are given in the tables below.

r	Relay(s) ON
0	Neither
1	Relay 1
2	Relay 2
3	Relay 1 and Relay 2

a	Analog output
0	4 mA and 0 V
1	20 mA and 10 V

d	Display digit (**X**=ON, X=OFF)
0	XXXXXX
1	**X**XXXXX
2	X**X**XXXX
3	XX**X**XXX
4	XXX**X**XX
5	XXXX**X**X
6	XXXXX**X**
7	**XXXXXX**

s	Segments ON
0	none
1	A
2	B
3	C
4	D
5	E
6	F
7	G
8	dp
9	all



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XTM Exit test mode
This command causes the unit to exit the test mode. It will return to the serial programming mode, with both relays OFF, the analog output at 4 mA and 0 V, and the display will read S PrG.

EXAMPLE
>01XTM5A(cr) Exit the test mode at address 01.
RESPONSE
A(cr)

QZI Query zero input
LZIccccvvvv Load zero input
The query command reads the signal input offset ADC values (the digital reading at 4 mA and 0 volts). The load command writes the signal input offset ADC values.

EXAMPLES
>00QZI54(cr) Read the signal input offset ADC values in the unit at address 00.
RESPONSE
A3E003C90B7(cr) Acknowledge, with eight character data field (3E003C90), two character checksum, and carriage return.
>00LZI40003C90F2(cr) Write 40003C90 into the signal input offset in the unit at address 00.
RESPONSE
A(cr)

DATA FORMAT FOR THE QUERY RESPONSE AND THE LOAD COMMAND
The eight character data field is in the format **ccccvvvv**, where **cccc** is the ADC value for the offset for the 4-20 mA input, and **vvvv** is the ADC value for the offset for the 0-10 V input. **cccc** is a hexadecimal number in the range of 3C00-43FF. **vvvv** is a hexadecimal number in the range of 3C00-43FF.

QGI Query gain input
LGIccccvvvv Load gain input.
The query command reads the signal input full scale ADC values (the digital reading at 20 mA and 10 volts). The load command writes the signal input full scale ADC values.

EXAMPLES
>01QGI42(cr) Read the signal input full scale values in the unit at address 01.
RESPONSE
A3E003C90B7(cr) Acknowledge, with eight character data field (3E003C90), two character checksum, and carriage return.

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>01LGI40003C90E0(cr) Write 40003C90 into the signal input full scale in the unit at address 01.
RESPONSE
A(cr)

DATA FORMAT FOR THE QUERY RESPONSE AND THE LOAD COMMAND
The eight character data field is in the format **ccccvvvv**, where **cccc** is the ADC value for the full scale for the 4-20 mA input, and **vvvv** is the ADC value for the full scale for the 0-10 V input. **cccc** is a hexadecimal number in the range of 2C00-3BFF. **vvvv** is a hexadecimal number in the range of 2C00-3BFF.

QZO Query zero output
LZOccccvvvv Load zero output
The query command asks for the analog output offset DAC values. The load command writes the analog output offset DAC values.

EXAMPLES
>13QZO5E(cr) Asks the unit at address 13 for its analog output offset DAC values.
RESPONSE
A03FF0000AF(cr) Acknowledge, with eight character data field (03FF0000), two digit checksum of the data, and carriage return.
>00LZO010000F0EC(cr) Write new values to the analog output offset in the unit at address 00.
RESPONSE
A(cr)

DATA FORMAT FOR THE QUERY RESPONSE AND THE LOAD COMMAND
The eight character data field is in the format **ccccvvvv**, where **cccc** is the DAC value for the offset for the 4-20 mA output, and **vvvv** is the DAC value for the offset for the 0-10 V output. **cccc** is a hexadecimal number in the range of 0000-03FF. **vvvv** is a hexadecimal number in the range of 0000-03FF.

QGO Query gain output
LGOccccvvvv Load gain output
The query command asks for the analog output full scale DAC values. The load command writes the analog output full scale DAC values.

EXAMPLES
>00QGO47(cr) Asks the unit at address 00 for its analog output full scale DAC values.
RESPONSE
A0C000FFFD5(cr) Acknowledge, with eight character data field (0C000FFF), two character checksum of the data, and carriage return.

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>11LGO0C1D0FE017(cr) Write new values to the analog output full scale in the unit at address11.
RESPONSE
A(cr)

DATA FORMAT FOR THE QUERY RESPONSE AND THE LOAD COMMAND
The eight character data field is in the format **ccccvvvv**, where **cccc** is the DAC value for the full scale for the 4-20 mA output, and **vvvv** is the DAC value for the full scale for the 0-10 V output. **cccc** is a hexadecimal number in the range of 0C00-0FFF. **vvvv** is a hexadecimal number in the range of 0C00-0FFF.

XSP Exit serial program
This command causes the unit to leave the program mode, and enter the run mode.

EXAMPLE
>99XSP6D(cr) Causes the unit at address 99 to exit the serial program mode, and enter the run mode.
RESPONSE
A(cr)

QUERY COLUMN AND LOAD COLUMN SERIAL PROGRAM COMMANDS
The remaining commands in the serial program command list read from (query), and write to (load), programming blocks. Each programming block is an individual item to be considered when configuring the unit for a specific application. For example, the batch count decimal point location, the function of control input 1, and the function of output 2 are all chosen by entering a value into a programming block. These blocks are grouped by general function into columns. For instance, all the blocks associated with programming the relays are grouped into column r, all the blocks associated with programming the analog output are grouped into column a, etc. All units have at least five columns, F (Factors), o (other factors), P (Points), d (defaults), and L (controL inputs and keyboard). Each of the three option boards that may be installed gets a column, A (Analog out), r (relays), and C (Communications). Batch control units get a final column, b (batch functions).
The value chosen for each block comes from a range of selections available for that block. Refer to instruction manual 57750920 for the selection list for each block. Instruction manuals come in the box with each unit, and are available on our website at wwww.durant.com.

QCFbb Query column F
LCFbbddddd Load column F
The query command reads the value programmed into block bb in column F. Column F (Factors) deals with count input selection of 4-20 mA or 0-10V, count decimal point location, and ratemeter setup parameters. There are six blocks in column F, which means that bb is in the range 01 –06. The load command writes a value into block bb.

EXAMPLES
>12QCF029F(cr) Read the value programmed into block 02 of column F in the unit at address 12.
RESPONSE
A131(cr) Acknowledge, with one data character, two character checksum, and carriage return.
>12LCF020CA(cr) Write 0 into block 02 of column F in the unit at address 12.
RESPONSE
A(cr)

DATA FIELD FOR LOAD COMMAND AND QUERY RESPONSE

Block	Description	Range
01	Count decimal point	0-4
02	Rate decimal point	0-4
03	Rate time base	00001-99999
04	Rate smoothing	1-9
05	Rate zero time	1-9
06	Signal input select	0-1

QCObb Query column o
LCObbd Load column o
The query command reads the value programmed into block bb of column o. Column o (other factors) allows selection of rate calculation via linearization or square root extraction. Column o also sets the cutoff and constant values for the square root process, and the number of points to be used for the linearization process. There are four blocks in column o, which means that bb is in the range of 01-04. The load command writes a value into block bb.

EXAMPLES
>07QCO04AE(cr) Read the value of block 04 in column o in the unit at address 07.
RESPONSE
A0969(cr) Acknowledge, with two data digits, two character checksum, and carriage return.
>11LCO0204506B(cr) Write the value of 0450 into block 02 of column o in the unit at address 11.
RESPONSE
A(cr)

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DATA FIELD FOR LOAD COMMAND AND QUERY RESPONSE

Block	Description	Range
01	Rate calculation	0-1
02	Cutoff	0400-1000 (mA) or 0000-0400 (volts)
03	Constant	0.0001-99999
04	Number of points	02-15

QCPaa Query column P
LCPaaiiiirrrrr Load column P
If the linearization method of rate calculation is selected in block 01 of column o, then the number of points, in the range of 2-15, is chosen in block 04 of column o. Column P contains the values for each point. Each point has two values, the signal level in either mA or volts, and the associated rate. Although each point has two programming blocks, the query and load commands do not access each block individually, but rather access them simultaneously by point number. This is the only command that does not access an individual block. However, the command contains the point number, aa, therefore aa is in the range of 01-15. The query command reads the signal level and rate for point aa, and the load command writes the signal level and rate for point aa.

EXAMPLES
>01QCP01A6(cr) Read the signal level and rate for point 01 in the unit at address 01.
RESPONSE
A001000000B1(cr) Acknowledge, with nine data digits, two character checksum, and carriage return.
>01LCP0100200000051(cr) Write 0100 into the signal level, and 00000 into the rate for point 01 in the unit at address 01.
RESPONSE
A(cr)

DATA FORMAT FOR THE LOAD COMMAND AND QUERY RESPONSE
The nine digit data field is in the form iiiirrrrr, where iiii is the signal level (xx.xx mA or volts), and rrrrr is the flow rate at that signal level. rrrrr is in the range of 00000-99999.

QCDbb Query column d
LCDbbd Load column d
The query command reads the value programmed into block bb of column d. Column d (defaults) deals with the power up display, totalizer setup, and the default programming and run value functions. There are four blocks in column d, which puts bb in the range of 01-04. However, blocks 03 and 04 cannot be queried. The load command writes values into the blocks, except block 03, which cannot be written to.

EXAMPLES
>23QCD019E(cr) Read the value of block 01 in column d in the unit at address 23.
RESPONSE
A333(cr) Acknowledge, with one digit of data, two character checksum, and carriage return.
>23LCD010C9(cr) Write 0 into block 01 of column d in the unit at address 23.
RESPONSE
A(cr)

DATA FIELD FOR LOAD COMMAND AND QUERY RESPONSE

Block	Description	Range
01	Power up display	0-4
02	Totalizer mode	0-3
04	Load defaults (load only)	1-3

QCLbb Query column L
LCLbbdddd Load column L
The query command reads the value programmed into block bb in column L. Column L deals with the functions of control inputs 1, 2, and 3, and the unit's Start, Stop, and Reset keys. There are six blocks in column L, which means that bb is in the range of 01-06. The load command writes a value into block bb.

EXAMPLES
>58QCL05B2(cr) Read the value of block 05 in column L in the unit at address 58.
RESPONSE
A1000C1(cr) Acknowledge, with four data digits, two character checksum, and carriage return.
>14LCL05110067(cr) Load the value of 1100 into block 05 in column L in the unit at address 14.
RESPONSE
A(cr)

DATA FIELD FOR LOAD COMMAND AND QUERY RESPONSE
The four digits of data in the load command and query response are in the form of sulr, where s designates start / stop functions, u designates unlatch functions, l designates lock functions, and r designates reset functions. Each of the inputs and keys can be programmed to perform one or more functions. For instance, a control input can be programmed to perform a start function, and an unlatch function, and a reset function. The range of values for each of the function categories available for each of the blocks is given in the table below.

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Block	Description	Range of s	Range of u	Range of l	Range of r
01	Control input 1	0-2	0-3	0-8	0-8
02	Control input 2	0-2	0-3	0-8	0-8
03	Control input 3	0-2	0-3	0-8	0-8
04	Reset key	0	0-3	0	0-8
05	Start key	0-1	0-3	0	0-8
06	Stop key	0 or 2	0-3	0	0

QCRbb Query column r
LCRbbdd Load column r
The query command reads the value programmed into block bb of column r. Column r assigns each of the two outputs to a specific function, and also sets the timeout for the output, if the assignment is one of the timed output selections. There are four blocks in column r, therefore the range of bb is 01-04. The load command writes either a two digit assignment value into blocks 01 and 30, or a four digit timeout value into blocks 02 and 04.

EXAMPLES
>07QCR03B0(cr) Asks for the programmed assignment of output 2 in the unit at address 07.
RESPONSE
A71A9(cr) Acknowledge, two data digits, two character checksum, and carriage return.
>22LCR0405006E(cr) Set the output 2 timeout to 5.00 seconds by writing that value into block 04 of column r in the unit at address 22.
RESPONSE
A(cr)

DATA FIELD FOR LOAD COMMAND AND QUERY RESPONSE
The data field is two digits for blocks 01 and 03, and four digits for blocks 02 and 04. The ranges for the data are given in the table below.

Block	Description	Range
01	Output 1 assignment	00, 01, 10, 11, 12, 20, 21, 22, 32, 43, 53, 63, 71, 80, 81, or 91
02	Output 1 timeout	0001-9999
03	Output 2 assignment	00, 01, 10, 11, 12, 20, 21, 22, 32, 43, 53, 63, 71, 80, 81, or 91
04	Output 2 timeout	0001-9999

QCBbb Query column b
LCBbbd Load column b
The query command reads the value programmed into block bb in column b. Column b programs the batch control functions, which are not available in totalizing models

5775x40x. There are four blocks in column, which means that bb is in the range of 01-04. The load command writes a value into block bb.

EXAMPLES
>11QCB0199(cr) Read the value programmed into block 01 of column b in the unit at address 11.
RESPONSE
A030(cr) Acknowledge, with one data digit, two character checksum, and carriage return.
>30LCB042CA(cr) Write a value of 2 into block 04 of column b in the unit at address 30.
RESPONSE
A(cr)

DATA FIELD FOR LOAD COMMAND AND QUERY RESPONSE

Block	Description	Range
01	Batch counts up, or down	0-1
02	Hide or show overrun	0-1
03	Autorecycle time	00-99
04	Cycle autostop	0-2

QCCbb Query column C
LCCbbd Load column C
The query command reads a value from a block in column C. Column C sets parameters for the serial communication option board. There are three blocks in column C, which means that bb is in the range of 01-03. The load command writes a value into block bb in column C.

EXAMPLES
>01QCC0199(cr) Read the value in block 01 of column C in the unit at address 01.
RESPONSE
A0161(cr) Acknowledge, with two data digits, two character checksum, and carriage return.
>01LCC0102F6(cr) Write a value of 02 into block 01 of column C in the unit at address 01.
RESPONSE
A(cr)

DATA FIELD FOR LOAD COMMAND AND QUERY RESPONSE

Block	Description	Range
01	Unit address	00-99
02	Baud rate	0-4
03	Parity	0-2

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QCAbb Query column A
LCAbbdddddd Load column A
The query command reads the value programmed into block bb of column A. Column A configures the analog output board option. There are three blocks in column A, which means that bb is in the range 01-03. The load command writes a value into block bb of column A.

EXAMPLES
>19QCA02A1(cr) Read the value of block 02 in column A in the unit at address 19.
RESPONSE
A00150026(cr) Acknowledge, with six data digits, two character checksum, and carriage return.
>03LCA02999999EB(cr) Write a value of 999999 into block 02 of column A in the unit at address 03.
RESPONSE
A(cr)

DATA FIELD FOR LOAD COMMAND AND QUERY RESPONSE

Block	Description	Range
01	Analog assignment	0-3
02	Offset value	000000-999999
03	Full scale value	000000-999999

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