

# **"F" FIRMWARE SERIAL COMMANDS**

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# ASCII SERIAL COMMANDS

## OVERVIEW

All programming done without PCX software must use the ASCII serial commands listed in this manual. There are three types of serial commands: Execution, set up, and query. Some commands may be only one type and others may be all three types.

### EXECUTION COMMANDS

An execution command is one that requires the drive to take action. This may be in the form of starting motion, stopping motion, or changing status (example: Changing velocity). Execution commands should only be used after all motion functions have been programmed through the set up commands.

### SETUP COMMANDS

Set up commands are used to program motion functions such as indexes, home cycle and jog parameters. These commands provide the means to change velocities, accel/decel rates, and distances. Set up commands are also used for I/O assignment, initialization and run time control.

### QUERY COMMANDS

Query commands are used to ask for information from the drive. The drive will respond with the value, mode type, or status that has been programmed into memory. Query commands are useful during both set up and execution.

## SERIAL COMMAND SYNTAX

All three types of serial commands must follow the syntax that is recognized by the drive. The syntax used for all serial commands is given below. If a command is not recognized or cannot be carried out, the drive will respond with a "?" as an error indication.

[ID] COMMAND [MODIFIER]      {"?" }  
                                  {"="(INFO)} CR [LF]  
                                  {(NULL) }

**ID - AXIS IDENTIFIER**      An axis identifier is only needed when more than one drive is on the serial line. If only one drive is on line the axis identifier should not be transmitted in the command string. If axis identifiers are being used, an axis identifier of "0" in the transmitted command string will address all axes.

**COMMAND**                      All serial commands consist of two ASCII characters.

**MODIFIER**                      Some serial commands require a number modifier to identify the particular parameter being addressed with the command. Throughout this manual commands that require a modifier are identified with an (mm) after the command letters.

<b>"?"</b>	Indicates a Query command. The axis will send a response in the format used for the setup command.
<b>"="</b>	Indicates a Setup command. The drive will respond with a "*".
<b>(NULL)</b>	If neither a "?" or "=" is present the command is assumed to be an execution command that requires some action.
<b>CR</b>	All commands are terminated with a carriage return <ENTER>.
<b>LF</b>	An optional line feed may be sent with the command. The line feed will always be sent after the CR if auto line feed is set on the DIP switches.

# SERIAL COMMANDS BY FUNCTION

The SERIAL COMMANDS below are grouped by the function which they perform and which PCM application modules they are designed to be used with.

FUNCTION	SERIAL COMMANDS
GAIN COMMANDS	AG, CG, DG, EG, GS, IG, LP, LR, LV, VG (Used with all PCM modules and basic drives)
HOME COMMANDS	HA, HD, HG, HI, HM, HO, HP, HR, HT (Used with all PCM modules and basic drives)
INDEX COMMANDS	AT, CO, DS, DT, DW, FD, FG, IN, IT, NI (Used with all PCM modules and basic drives)
I/O COMMANDS	BD, DD, IF, IO, IP, KJ, OD, OF, OM, OP, OT, SL (Used with all PCM modules and basic drives)
JOG COMMANDS	FJ, JA, JD, JE, JF, JG, JS, JT, SJ (Used with all PCM modules and basic drives)
LIMITS COMMANDS	AL, DL, LD, MA, ME, MV, PL, SD, TD, TL, VC, VE, VL (Used with all PCM modules and basic drives)
MISC COMMANDS	AV, BK, BR, CF, CH CM, CN, DB, DP, DU DY, EE, EM, EV, FA, FV, HF, IM, LT, NP, NT, NV, PC, PD, PE, PF, PR, PS, PY, RO, RP, RS, SC, SR, SS, ST, SV, TB, TM, TR, UN, VU, WP, WR, WT, WV, ZR, (Used with all PCM modules and basic drives)
PARALLEL INTERFACE COMMANDS	ET, ND, TE, TT, TW (Used with an IOM-1, PCM-1, 2 or 4.)
STATUS COMMANDS	AS, CC, CD, CI, CK, CP, CS, CV, DV, EP, FE, FH, FP, FS, HW, IC, ID, PH, PU, QU, TV (Used with all PCM modules and basic drives)
EXTERNAL DRIVE COMMANDS	XC, XP, XT, XV (Used with all PCM modules and basic drives)
SUSPEND COMMANDS	CL, RI, SG, SP (Used with all PCM modules and basic drives)
PCM-6 or 16 PCM-7 or 17	AA, CA, CY, DA, DO, FC, FF, FL, FO, FM, FN, FT, FZ, MC, MD, MM, MF, ML, MP, MS, MT, MZ, PA, PH, PN, PP, SF, SM, TA, TC
PCM-18	RA0 - RA3, RD0 - RD8, RR, RW0 - RW3, TN0 - TN14,
PCM-19	CE, CR, CQ, CR, CU, CX, CZ
PCM-22	AA, CQ, CY, DA, FF, FL, FM, FN, FT, FZ, KC, MF, ML, MS, MZ, PA, PH, PN, PP, QC, SF, SM, TA, TC, WV When using a PCM-22, all distance values that are normally in degrees when used with a PCM-5, 15, 6, 16 ,7 or 17 will be in "User Units".

# "F" FIRMWARE SERIAL COMMAND DESCRIPTIONS

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## Flag Key

## Flag Description

<b>E.....</b>	<b>valid execution command</b>
<b>.S.....</b>	<b>valid setup command</b>
<b>..Q.....</b>	<b>valid query command</b>
<b>...H.....</b>	<b>hexadecimal data</b>
<b>....A....</b>	<b>ascii string response/setup parameter</b>
<b>.....W...</b>	<b>word/int data</b>
<b>.....B..</b>	<b>byte data</b>
<b>.....N.</b>	<b>signed data</b>
<b>.....C</b>	<b>command letters "XX=" not echoed back</b>

"(nvp)" indicates that the command controls one or more non-volatile memory parameters  
"mm" following the command indicates that the command may use a modifier to address a particular parameter. Modifiers are decimal and default to 0 if not present.

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---

**(1) AA (nvm) .SQ..W... FOLLOWER CYCLE ADJUST**

---

Follower cycle max accel rate for adjustment (ms from zero to full speed). (Also see CY, DA)

Default: AA = 200  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(2) AG (nvm) .SQH..B.. AUTO GAIN**

---

Hex byte bit map of auto calibration flags. Bit 0 is flags auto-tach scaling when in the velocity mode. Bit 1 flags auto error gain scaling when in motion.

Default: AG = 1  
Range: 0 to 3  
Base: N/A  
PCM module: All

bit 0 - auto-tach enabled  
bit 1 - auto-error enabled  
bits 2-7 reserved for future use

---

**(3) AL (nvm) .SQ..W... ACCEL LIMIT**

---

User accel entry limit (in ms) used for thumbwheel entry. PCX may use this to limit user data entry. (also see DL, VL, PL)

Default: MAX acceleration of the particular drive (no load)  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(4) AS (nvm) .SQH..B.. AUTO SERIAL REPORTING FLAGS**

---

Hex byte bit map of auto serial reporting flags. Currently, bit 0 flags auto fault reporting ("F") and bit 1 flags auto end of sequence reporting ("P"). This command replaces "AF" and "AP" commands.

Default: AS = 0  
Range: 0 to 3  
Base: Hexadecimal  
PCM module: All

Sets the acceleration ramp slope for an index. Ramp slopes are programmed in milliseconds to the maximum system velocity. Note that the slopes are independent of index velocity("VE"). For example "VE" may be changed without affecting the index ramp slopes. Most drives have a maximum system velocity of 3000 rpm, unless this is reprogrammed by the user. (Refer to Positioning Drive Manual for maximum velocity specifications). All acceleration rates will be calculated from zero to maximum velocity (RPM) setting.

Example: The user would like to reach an index velocity of 1500 rpm in 0.5 seconds. Since the acceleration rate, in this example, is based on the maximum system velocity of 3000 rpm, the following ratio can be set up to find the desired acceleration time (AT).

$$\frac{\text{Desired Index Velocity}}{\text{Desired Time for Acceleration}} = \frac{\text{Maximum System Velocity}}{\text{Acceleration Time to be Programmed}}$$

If maximum drive velocity is 3000 RPM the equation would be as follows:

$$\text{ie: } \frac{1500 \text{ rpm}}{0.5 \text{ sec}} = \frac{3000}{\text{AT}}$$

$$\text{gives: } \text{AT} = \frac{3000 (0.5)}{1500} = 1 \text{ sec}$$

Default: AT = 1000  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(6) AV (nvm) .SQ..W... ANALOG COMMAND CHANNEL VELOCITY**

---

Analog command channel max velocity (in rpm) when in analog command mode. Defaults to calibration velocity but may be reduced independently of calibration velocity for better analog command resolution. (Also see MV)

Default: MAX velocity of particular drive  
Range: 0 to MAX velocity  
Base: Decimal  
PCM module: All

---

**(7) BD (nvm) .SQ...B.. BCD SELECT LINES**

---

Boolean flag that selects BCD program/index select line input. Defaults to FALSE (0) for binary select line input.

Default: BD=0  
Range: 0/1 (False/True)  
Base: N/A  
PCM module: All

---

**(8) BK .SQ...B.. BRAKE OVERRIDE**

---

Boolean flag (runtime only) which, when TRUE, overrides the brake being active when the bridge is disabled. (Also see BR)

Default: BK = 0  
Range: 0/1 (False/True)  
Base: N/A  
PCM module: All

---

**(9) BR .SQ...B.. BRIDGE INHIBIT**

---

Boolean flag (runtime only) which, when TRUE, will inhibit the bridge. Querying BR will return the current bridge status. (Also see BK)

Default: BR = 0  
Range: 0/1 (False/True)  
Base: N/A  
PCM module: All



---

**(10) CAmm (nvm) .SQ..W... FOLLOWER CYCLE RATIO ADJUST VELOCITY LIMITS**

---

Follower cycle ratio adjust limit (0..100%) for PCM-6. CA0 and CA1 set the positive and negative velocity change limits (scaled at RPM\*10), respectively, for pcm7.  
(Also see CY)

Default: CA=CA0=50 (PCM-6 -> 50%),  
CA0..CA1 = 10000 (PCM-7 -> 1000 RPM)  
Range: 0 to 65535  
Base: Decimal  
PCM module: PCM-6, 16, 7, 17

---

**(11) CCmm .Q...W... CURRENT COUNT**

---

Current runtime (or last) count. CC0? returns current index count, CC1? returns current program count. Counts countdown to 0.

Default: CC0..CC1= 0 to (Max Count)  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(12) CD .Q...W... CURRENT DWELL**

---

Current dwell. Returns current dwell time (in ms) for both program or index dwell.

Default: N/A  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(13) CE .Q..... CONVEYOR EXECUTING**

---

Boolean flag to query whether a conveyor cycle is currently executing. Used by PCX to determine whether or not to display TV (true velocity) vs CV (current velocity). ( see CR, CQ, CX, CZ, CE, CU, TV, CV)

Default: CE=0  
Range: 0/1 (False/True)  
Base: N/A  
PCM module: PCM-19

---

**(14) CFmm (nvm)                      ESQH.W...    ANALOG CHANNEL FULL SCALE**

---

Analog channel full scale values in hex (CF0..CF4). Full scale is measured as an offset from the channel null point. The modifier mm specifies channel number. (See CN)

Default:        CF0..CF4 = 1EF  
Range:         0 to 3FFF  
Base:          Hexadecimal  
PCM module:   All

---

**(15) CGmm (nvm)                      .SQH..B..    CURRENT GAIN**

---

Final gain (attenuation) of command current amplifier to bridge. Min, max, and default values are also available with CG1?, CG2?, and CG3?.

Default:        CG=CG0=C9, CG1=0, CG2=D0, CG3=C9  
Range:         0 to D0H  
Base:          Hexadecimal  
PCM module:   All

---

**(16) CHmm                              .Q.H.W...    ANALOG CHANNEL READING**

---

Current 10 bit hex analog channel reading (CH0?..CH4?).

Default:        N/A  
Range:         0 to 3FF  
Base:          Hexadecimal  
PCM module:   All

---

**(17) Clmm                                .Q....B..    CURRENT INDEX**

---

CI0 queries the current (or last) index that executed. CI1 queries the current (or last) cycle that executed. (See CS)

Default:        CI = 0  
Range:         0 to 31 BASE UNIT  
                  0 to 200 with a PCM Module  
Base:          Decimal  
PCM module:   All

---

**(18) CKmm .Q.H.W... CHECKSUMS**

---

Hex checksum query.

CK0? - prom  
CK1? - all nvm  
CK2? - motion info (program/index/home/cycle)  
CK3? - index/home/cycle  
CK4? - programs

Default: N/A  
Range: 0 to FFFF  
Base: Hexadecimal  
PCM module: All

---

**(19) CL E.....B.. CLEAR SUSPEND**

---

Execution command to clear an active suspend without resuming the original process.  
(See SP, SG)

Default: N/A  
Range: N/A  
Base: N/A  
PCM module: All

---

**(20) CM .SQ...B.. CALIBRATE MODE**

---

Boolean flag to enter/query whether calibrate mode is active. (See SC, EM)

Default: CM=0  
Range: 0/1 (False/True)  
Base: N/A  
PCM module: All

---

**(21) CNmm (nvm) ESQH.W... ANALOG CHANNEL NULL VALUES**

---

Analog channel 10 bit null values in hex (CN0..CN4). Modifier mm is the channel number.  
(See CF)

Default: CN0..CN4 = 1FF  
Range: 0 to 3FFF  
Base: Hexadecimal  
PCM module: All

---

**(22) COmm (nvm) .SQ..... INDEX COUNT**

---

Index repeat count. (Entries greater than 65535 are set to 65535.) A count of 65535 is taken as an infinite count. All index counts default to 0. Modifier mm is index number.

Default: CO=0  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(23) CPmm .SQ...N. COMMAND POSITION**

---

CP? always returns the absolute current position in user units. CP1? returns the position being used for display purposes (affected by ZR command or zero relative position input). "CP=" may be used to set command position to any value. (The zero position input will also set CP=0.) (See ZR, FP, FE)

Default: N/A  
Range: -2147483648 to 2147483647  
Base: Decimal  
PCM module: All

---

**(24) CQ .QS..W... CONVEYOR FLAGS (PCM-19)**

---

Sets or queries the flags for the current conveyor cycle being pointed to by CR0.

Bits 0-1: Loading Method (00=head to head, 01=tail to head, 10-11 = reserved)  
Bit 2: Single/Multiple Feeds (0=multiple, 1=single)  
Bit 3: Purge Flag (0=do not purge, 1=purge)  
Bits 4-15: Reserved for future use

Default: 1  
Range: 0..65535  
PCM module: PCM-19

---

**(25) CQmm .Q..... CYCLE QUERY (PCM-22)**

---

Query only. CQ1 = Ratio change profile limitation  
CQ2 = Velocity limit extended master length  
CQ4 = User working segment limit  
CQ8 = User ratio limit  
CQ10 = User master length limit  
CQ20 = User follower length limit

Default: N/A  
Range: 0, 2, 4, 8, 10, 20  
Base: Hexadecimal  
PCM module: PCM-22

---

**(26) CRmm .QS..W... CONVEYOR 16 BIT DECIMAL DATA**

---

Sets or queries all conveyor 16 bit decimal data (PCM-19). ( see CU, CQ, CX, CZ, CE)

CR0: points to the conveyor cycle to be queried or changed

Default: 0

Range: 0..15

CR4: Slow accel/decel time (ms)

Default: 1000

Range: 0..65536

CR5: Medium accel/decel time

Default: 1000

Range: 0..65536

CR6: Fast accel/decel time

Default: 1000

Range: 0..65536

CR7: Measuring conveyor to Feed conveyor velocity ratio

Default: 100% (1:1 ratio)

Range: 0..100

CR8: Conveyor global flags

Bit 0: Executing (query only)

Bit 1: Using Measuring Conveyor

Bits 2-15: reserved for future use

Default: 0

Range: 0..65535

PCM module: PCM-19

---

**(27) CS .Q.H.W... CURRENT PROGRAM NUMBER/STEP**

---

Returns a hex word in which the high byte is the program number and the low byte is the current program step. Program steps are therefore limited to a max of 255. (See CI, PE, PD, PS, NP)

Default: CS=0

Range: 0 to 65535

Base: Decimal

PCM module: All

---

**(28) CTmm EQ...B.. CALIBRATE TEST**

---

Executes or queries the calibration test when in the calibrate mode. (See CM)

Default: CT=0

Range: 0/1 False/True

Base: N/A

PCM module: All

---

**(29) CUmm .QS..... CONVEYOR 32 BIT DECIMAL DATA**

---

Sets or queries all conveyor 32 bit decimal data (PCM-19). ( see CR, CQ, CX, CZ, CE)

CU0: Product Spacing (user units)  
Default: 4000  
Range: 0..2147483647

CU1: Measuring Conveyor Length (user units)  
Default: 0  
Range: 0..2147483647

CU2: Feed Conveyor Length (user units)  
Default: 8000  
Range: 0..2147483647

CU3: Distance Between measuring and feed sensors (user units)  
Default: 0  
Range: 0..2147483647

CU4: Product Filter Length (user units)  
Default: 0  
Range: 0..2147483647

CU5: Product Measuring Short Length Maximum (user units)  
Default: 1000  
Range: 0..2147483647

CU6: Product Measuring Medium Length Maximum (user units)  
Default: 1000  
Range: 0..2147483647

CU7: Max steps/second used for conveyor cycles  
Default: 1000  
Range: 0..2147483647

PCM module: PCM-19

---

**(30) CVmm .Q...WN.. CURRENT COMMAND VELOCITY**

---

Returns the current velocity scaled to either VC (CV?) or VC1 (CV1?). If in the torque mode, the number returned indicates command torque. (Also see VC, DV, TV)

Default: N/A  
Range: 0 to 30000  
Base: Decimal  
PCM module: All

---

**(31) CY .SQ...B.. CYCLE EDIT NUMBER COMMAND**

---

CY sets/queries the cycle/master/profile number being edited. (Also see CI)

Default: CY=0  
Range: 0 ot 15  
Base: Decimal  
PCM module: PCM-16



---

**(32) CXmm .QS....N. CONVEYOR 32 BIT SIGNED DECIMAL DATA**

---

Sets or queries all conveyor 32 bit signed decimal data. ( see CR, CQ, CU, CZ, CE)

CX0: Product Release Offset (user units)

Default: 0  
Range: -2147483648..2147483647  
PCM module: PCM-19

---

**(33) CZ .QS...B.. CONVEYOR ACCEL/DECEL TABLE**

---

Each of 9 decimal digits indicate slow (0), medium (1), or fast (2) accel/decel rates to be used for the 9 product size categories. Refer to the accel/decel rate table in Figure 8 of the PCM-19 Operator's manual.

Default: CZ=0  
Range: 000000000 .. 222222222  
Base: Decimal  
PCM module: PCM-19

---

**(34) DA (nvm) .SQ..W... FOLLOWER CYCLE MAX DECEL**

---

Follower cycle max decel rate for adjustment (ms from full speed to zero). (Also see CY, AA)

Default: DA=200  
Range: 0 to 65535  
Base: Decimal  
PCM module: PCM-19

---

**(35) DB (nvm) .SQ..W... ANALOG DEADBAND**

---

Deadband for analog command channel. DB affects only the analog command channel and is not used for all analog channels.

Default: DB = 0  
Range: 0 to 65535  
Base: Decimal  
PCM module: All



---

**(36) DDmm (nvm) .SQ...B.. INPUT DEBOUNCE DELAY**

---

Sets the hardware input validation time (in ms) required before accepting input as having reached a new valid on/off state. DD is set by input line number (DD1..DD8, DD13..DD20), not function number.

Default: DD1..DD8, DD13..DD20 = 0  
Range: 0 to 127  
Base: Decimal  
PCM module: All

---

**(37) DGmm (nvm) .SQ.H.B.. DIFFERENTIAL GAIN**

---

Differential gain d/a value. Min, max, and default values are also available with DG1?, DG2?, and DG3?.

Default: DG=DG0=20H, DG1=0, DG2=FF, DG3=20  
Range: 0 to FFH  
Base: Hexadecimal  
PCM module: All

---

**(38) DL (nvm) .SQ..W... DECEL LIMIT**

---

User decel entry limit (in ms) used for thumbwheel entry. PCX may use this to limit user data entry. (See AL, VL, PL)

Default: MAX deceleration of the particular drive (no load)  
Range: 8 to 65535  
Base: Decimal  
PCM module: All

---

**(39) DO (nvm) .SQ..W... FOLLOWER DROPOUT ANGLE**

---

Follower cycle drop out position angle (degrees). (Also see CY)

Default: DO=0  
Range: 0 to 65535  
Base: Decimal  
PCM module: PCM-6, 16, 7 and 17

---

**(40) DP (nvm) .SQ...B.. DISTANCE DECIMAL POINT**

---

User distance decimal point position for use by PCX. (Also see VP)

Default: DP=0  
Range: 0 to 7  
Base: Decimal

PCM module: All

---

**(41) DSmm (nvm) .SQ....N. INDEX DISTANCE**

---

Index signed distance/position in user steps.

Default: 4000  
Range: -2147483648 to 2147483647  
Base: Decimal  
PCM module: All

---

**(42) DTmm (nvm) .SQ..W... INDEX DECEL RATE**

---

Index decel ramp slope (in ms from calibration velocity to zero). (Refer to AT for example.)

Default: DT = 1000  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(43) DU (nvm) .SQ.A.... DISTANCE UNITS**

---

ASCII character string (up to three chars) used by PCX for user distance units. (See VU)

Default: DU=ST  
Range: any 3 ASCII characters  
Base: N/A  
PCM module: All

---

**(44) DV .Q...W.N CURRENT D/A VELOCITY**

---

Returns the commanded velocity to the d/a converter which may differ from CV when in time scaled modes. Value returned is scaled to either VC (DV?) or VC1 (DV1?). If in the torque mode, the number returned indicates command torque. (See VC, DV, TV)

Default: N/A  
Range: N/A  
Base: Decimal  
PCM module: All

---

**(45) DWmm (nvm) .SQ..W... INDEX DWELL TIME**

---

Index dwell time (in ms).

Default: DW=0  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(46) DY (nvm) .SQ..W... POWER UP DELAY IN ms**

---

Power up delay time in ms. (Defaults to zero for all models.)

Default: DY=0  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(47) EE (nvm) .SQ...B.. EXTERNAL ENCODER COUNTING MODE**

---

External encoder counting mode for all external time and distance modes.

- 0 == count all pulses in either direction
- 1 == count cw pulses only
- 2 == count ccw pulses only
- 3 == count cw pulses only but require ccw slack to be taken up first
- 4 == count ccw pulses only but require cw slack to be taken up first
- 5-255 reserved for future use

Default: EE=0  
Range: 0 to 255  
Base: Decimal  
PCM module: All - except PCM-1

---

**(48) EGmm (nvm) .SQH.W... ERROR GAIN**

---

Run following error gain in hex. Setting EG will also clear the current up/down gain adjustment. Querying EG will return the last EG setting + the up/down gain adjustment. EG is used for following error position correction when in motion with 100h causing a 1:1 correction (ie. 1 step of feedback device position error causes a 1 bit correction the command d/a). Min, max, and default values are also available with EG1?, EG2?, and EG3?. (Also see RL)

Default: EG=EG0=100, EG1=20, EG2=150 EG3=100 (all other drives)  
EG=EG0=30, EG1=4, EG2=1000, EG3=30 (for 520 PMC drive)  
Range: 20H to 150H  
Base: Hexadecimal  
PCM module: All

---

**(49) EMmm (nvm) .SQ...B.. EXTERNAL OPERATION MODE**

---

External operating mode. EM (or EM0) sets/queries the serial control external mode setting which defaults to EM2 on power-up. EM0 is a runtime only value and is not kept in nvm. Setting EM0 when in the external operating mode will only have effect if the external mode is under serial control.

EM1 sets/queries the external override mode which is entered when the external mode override input function is activated in the external operating mode. EM2 sets/queries the external mode which is set on power up if mode is not being set from the dip- switch. EM3 is a query only command which returns the current external operating mode. (Also see PF, SC, CM)

external modes: 0 - pulse/pulse ratio  
1 - pulse/dir ratio  
2 - analog command velocity  
3 - analog command torque  
4 - ratio mode (to external encoder)  
5 - analog ratio (analog command, encoder time)

Default: EM=EM0=0, EM1=4, EM2=0, EM3=0  
Range: 0 to 5  
Base: Decimal  
PCM module: All

---

**(50) EP .Q.....N. ENCODER POSITION**

---

Returns a 32 bit number indicating the current external encoder position based upon the external counting mode. EP is a free running continuous counter. (See EE)  
EP1 returns current external encoder position in user units.

Default: N/A  
Range: -2147483648 to 2147483647  
Base: Decimal  
PCM module: All

---

**(51) ET (nvm) .SQH..B.. PARALLEL INTERFACE TYPE**

---

Sets the function of the parallel interface port. (See ND, TW, TT, TE)

0 == inactive  
1 == thumbwheels active  
2 == numeric display active  
3 == thumbwheels and numeric display active  
4 == parallel interface active

Default: ET = 0  
Range: 0 to FF  
Base: Hexadecimal  
PCM module: PCM-1, 2, 4 and IOM-1

---

**(52) EVmm (nvm) .SQ...B.. END OF INDEX NUMBER**

---

Sets the index number (other than 0) used to determine the end of index velocity for compound indexing. A zero indicates zero final velocity, otherwise the velocity of the indicated index (feed velocity if it is a registration type) is used as the final index velocity. Modifier mm is the index number.

Default: EV0..EV(*Max index*) = 0  
Range: 0 to Max index  
Base: Decimal  
PCM module: All

---

**(53) FAmm (nvm) .SQ..W... FEED ACCEL RAMP**

---

Index feed accel ramp slope (in ms from zero to calibration velocity) used for registration and feed index types. Modifier mm is index number. (See FD)

Default: FA0..FA(*Max index*) = 1000  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(54) FC (nvm) .SQ..... CYCLE CORRECTION SPAN**

---

Follower cycle correction span (user units). (See CY, FL)

Default: FC=0  
Range: 0 to 2147483647  
Base: Decimal  
PCM module: PCM-7

---

**(55) FDmm (nvm) .SQ..W... FEED DECEL RAMP**

---

Index feed decel ramp slope (in ms from calibration velocity to zero) used for registration and feed index types. Modifier mm is index number. (See FA)

Default: FD0..FD(*Max index*) = 1000  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(56) FE .Q...W.N. FOLLOWING ERROR**

---

Current following error (command position - feedback position) in hardware steps. FE is a signed value. (See CP, FP)

Default: N/A  
Range: -2147483648 to 2147483647  
Base: Decimal  
PCM module: All

---

**(57) FF (nvm) .SQH..B.. FOLLOWER CYCLE FLAGS**

---

Hex bit map of follower cycle flag information. (See CY)

- bit 0 - cycle defined by sensor
- bit 1 - auto delay angle computation (pcm7 only)
- bit 2 - variable ratio cycle (pcm6 only)
- bit 3 - variable follower correction distance/fixed master correction distance
- bits 4-7 reserved for future use

Default: FF=1  
Range: 0 to FF  
Base: Hexadecimal  
PCM module: PCM-6, 16, 7 and 17

---

**(58) FGmm ( nvm) .SQH.W... INDEX FLAGS**

---

Hex bit map of index flag information. (See VC, IT, IC)

- bit 0 - alternate velocity scaling (VC1 vice VC0)
- bit 1 - feed/registration to feed sensor 0 (default if bit 1,2, or 3 not set)
- bit 2 - feed/registration to feed sensor 1
- bit 3 - feed/registration to torque limit
- bit 4 - slip compensation index at end of index
- bit 5 - slip compensation at decel point
- bit 6 - direction from index direction input
- bit 7 - pgo delay/pulse width measured from end of accel ramp instead of decel
- bit 8 - wait for position flag
- bits 9-15 reserved for future use

Default: FG=0  
Range: 0 to FFFF  
Base: Hexadecimal  
PCM module: All



Hardware fault status query. ASCII code returned matches number displayed on seven segment drive display. (Valid only if FS indicates hardware fault.) The last hardware fault that caused entry to the fault routine may be queried with FH1? The ZP command may be used to clear last fault status. (Time of fault available through TM1?) (Also see FS, TM, ZP)

"0" - system runtime error  
"1" - rms current  
"2" - shorts  
"3" - resolver/encoder feedback fault  
"4" - voltage fault  
"5" - motor overtemp  
"6" - fuse  
"7" - bridge temp (dx)  
"9" - external drive fault input 1  
"A" - external drive fault input 2  
"B" - soft fault (large dx)  
"C" - a/c high voltage (large dx)  
"D" - a/c low voltage (large dx)  
"E" - high bus  
"F" - oct

Default: N/A  
Range: 0 to A  
Base: Hexadecimal  
PCM module: All

Hex bit map of jog flag information.

bit 0 - alternative velocity scaling (VC1 vice VC0)  
bit 7 - serial jog counter clockwise flag  
bits 1-6, 8-15 reserved for future use

Default: FJ=0  
Range: 0 to FFFF  
Base: Hexadecimal  
PCM module: All

---

**(61) FL (nvm) .SQ..... CYCLE LENGTH/INFEED SPAN**

---

Sets the follower cycle length / infeed span in user units of the current cycle. Any cycle length changed serially or via inputs will change the stored length for that cycle. Length error due to sensor errors are not stored as cycle parameters. Query: FL0 returns current set length. FL1 through FL8 returns last 8 length samples. (Also see CY, FC, ML)

Default: FL=4000  
Range: 0 to 65535  
Base: Decimal  
PCM module: PCM-6, 16, 7, 17 and 22

---

**(62) FMmm (nvm) .SQ..W... FOLLOWER/MASTER RATIO ARRAY**

---

Follower (mm even) to Master (mm odd) position ratios throughout cycle in .1 degrees. (Set up for zero phase angle.) The first entries (FM0, FM1) set the starting ratio, and are not positions. (Also see CY, FL, ML) mm = 0-127 for PCM-16 applications and 0-6 for PCM-22 applications.

FM0 - Working segment: This command sets the length of the working segment in user units. The length is a follower length which is centered around the working offset, an absolute follower position.

FM1 - Working offset: This parameter defines the position of the "cut" in user units, and is an offset from the follower zero position.

FM2 - Working ratio: This is the follower/master ratio applied during the working segment. This ratio is follower distance/master distance where distance is in user units. A fixed decimal point is assumed, where there is always 5 places left of the decimal point.

The follower limit data is applied to each of the corresponding parameter at all times, whether entered serially or changed via the increment/decrement inputs. All the limit data is 32 bit unsigned

FM3 - Upper working segment limit in user distance units

FM4 - Lower working segment limit in user distance units

FM5 - Upper working ratio limit in user distance units.

FM6 - Lower working ratio limit in user distance units.

Default: FM0=50, FM1=50, FM2=100000, FM3=2000, FM4=2,  
FM5=300000, FM6=2000  
Range: 0 to 65535  
Base: Decimal  
PCM module: PCM-6, 16, 7, 17 and 22

---

**(63) FN (nvm) .SQ...B.. FOLLOWER CYCLE SENSOR COUNT**

---

Follower cycle dividing count for products per master cycle or sensor inputs per follower cycle if using sensor. (Also see CY, FF)

Default: FN=1  
Range: 1 to 255  
Base: Decimal  
PCM module: PCM-6, 16, 7, 17 and 22

---

**(64) FO (nvm) .SQ..... CYCLE FOLLOWER OVERLAP**

---

Follower cycle allowable overlap. (See CY, FL, FC)

Default: FO=0  
Range: 0 to 255  
Base: Decimal  
PCM module: PCM-6, 16, 7 and 17

---

**(65) FP .Q.....N. FEEDBACK POSITION**

---

Current feedback position query in user units. (Command position + feedback error scaled to user units). (Also see CP, FE)

Default: N/A  
Range: -2147483648 to 2147483647  
Base: Decimal  
PCM module: All

---

**(66) FS .Q.H.W... FAULT STATUS**

---

Hex word bit map of fault status. (Also see FH, TM)

- bit 0 - system error (restart/bad opcode/etc)
- bit 1 - configuration power up error
- bit 2 - hardware error
- bit 3 - positional following error
- bit 4 - h/w cw travel limit error
- bit 5 - h/w ccw " " "
- bit 6 - s/w cw " " "
- bit 7 - s/w ccw " " "
- bit 8 - external distance error
- bit 9 - max slip error during run
- bit 10 - slip error after re-index
- bits 11-15 reserved for future use

Default: N/A  
Range: 0 to FFFF  
Base: Hexadecimal  
PCM module: All

---

**(67) FTmm (nvm) .SQ..W... FOLLOWER/MASTER PROFILE TABLE**

---

FT0 selects the master table number to be used when the follower cycle is executed. FT1 selects the profile table number to be used when the follower cycle is executed. If the current master table (which defaults to 0 on power up) does not match the follower master selection when the follower cycle is executed, the master cycle must be redefined before the cycle can run.

Default: FT0..FT1=0  
Range: 0 to 15  
Base: Decimal  
PCM module: PCM-6, 16, 7 ,17 and 22

---

**(68) FVmm (nvm) .SQ..W... FEED VELOCITY**

---

Unsigned feed velocity for the index. Velocity is in VC0 or VC1 depending on bit 0 of index flags. Direction for feed comes from index direction so that direction may be set from changing only index distance or using index direction input function. Modifier mm is the index number. (See VC, VE, FG)

Default: FV = 30  
Range: 0 to Max velocity  
Base: Decimal  
PCM module: All

---

**(69) FZ (nvm) .SQ..W... CYCLE FOLLOWER SENSOR VALID ZONE**

---

Follower cycle sensor valid zone (degrees). Sets the number of degrees +/- from the zero degree sensor point within which a sensor input is valid. (Also see CY)

Default: FZ=180  
Range: 0 to 65535  
Base: Decimal  
PCM module: PCM-6, 16, 7 ,17 and 22

---

**(70) GSmm (nvm) .SQH.W... GAIN SCALING**

---

Gain scaling values in hex. GS (or GS0) sets/queries the tach gain scaling factor used when auto tach calibration is active. GS1 sets/queries the error gain reduction scaling value used when auto error calibration is active. (Also see AG)

Default: GS=GS0=20, GS1=0  
Range: 0 to FFFF  
Base: hexadecimal  
PCM module: PCM-6, 16, 7 ,17 and 22

---

**(71) HAmm (nvm) .SQ..W... HOME ACCEL RAMP**

---

Home accel ramp slope (in ms from zero to calibration velocity). (See HD) HD mm (nvm)  
Home decel ramp slope (in ms from calibration velocity to zero). This decel ramp is used  
for all but the final home decel segment which is always 0. Modifier mm is the home  
number. (Also see HD)

Default: HA = 1000  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(72) HDmm (nvm) .SQ..W... HOME DECLE RAMP**

---

Home decel ramp slope (in ms from calibration velocity to zero) this decel ramp is used for  
all but the final home decel segment which is always 0. Modifier mm is the home number.  
(Also see HA)

Default: HD = 1000  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(73) HF .SQ...B.. SERIAL HOLD**

---

Boolean that sets/queries the runtime status of serial hold.

Default: HF = 0  
Range: 0 to 255  
Base: Decimal  
PCM module: All

---

**(74) HGmm (nvm) .SQH.W... HOME FLAGS**

---

Home flag bit map in hex. Modifier mm is home number. (Also see HI, HO, HR)

bit 0 - use VC1 velocity scaling instead of VC0  
bit 4 - zero follower position (pcm6 only)  
bit 5 - ccw mark direction  
bit 6 - ccw feed off direction  
bit 7 - ccw feed on direction  
bits 2,3,8-15 reserved for future use

Default: HG=80  
Range: 0 to FFFF  
Base: Hexadecimal  
PCM module: All

---

**(75) Hlmm (nvm) .SQ..W.N. HOME IN VELOCITY**

---

Signed home feed on velocity. Velocity is in VC0 or VC1 depending on bit 0 of home flags. Bit 6 of HG is set depending on the sign when set. (See VC, HG, HO, HR)

Default: HI =-150  
Range: -Max velocity to +Max velocity  
Base: Decimal  
PCM module: All

---

**(76) HLmm .SQ....N. HOME DISTANCE LIMIT**

---

Incremental limit distance for all home function types. Hitting the limit distance aborts the home operation, stops motion and turns on the limit distance hit output. Modifier mm is the home number 0 or 1. default distance of 0 disables the limit distance.

Default: HL0...HL1  
Range: -2147483648 TO 2147483647  
Base: Decimal  
PCM module: All

---

**(77) HMmm E..... HOME**

---

Executes home "0" or home "1" when in serial control mode. Modifier mm is the home number.

Default: N/A  
Range: N/A  
Base: N/A  
PCM module: All

---

**(78) HOmm (nvm) .SQ..W.N. HOME OFF VELOCITY**

---

Signed home feed off velocity. Velocity is in VC0 or VC1 depending on bit 0 of home flags. Bit 5 of HG is set depending on the sign when set. Modifier mm is the home number. (See VC, HG, HI, HR)

Default: HO = 30  
Range: -Max velocity to +Max velocity  
Base: Decimal  
PCM module: All

---

**(79) HPmm (nvm) .SQ....N. HOME POSITION**

---

Sets absolute position at completion of home0 or home1. If software travel limits or rotary position limits are being used, HP should be within the valid position range. Modifier mm is the home number.

Default: HP = 0  
Range: -2147483648 to 2147483647  
Base: Decimal  
PCM module: All

---

**(80) HRmm (nvm) .SQ..W.N. HOME RESOLVER VELOCITY**

---

Signed home mark velocity. Velocity is in VC0 or VC1 depending on bit 0 of home flags. Bit 4 of HG is set depending on the sign when set. Modifier mm is the home number. (See VC, HG, HI, HO, RO)

Default: HR = 15  
Range: -Max velocity to +Max velocity  
Base: Decimal  
PCM module: All

---

**(81) HTmm (nvm) .SQ...B.. HOME TYPE**

---

Sets/queries the type of home. Modifier mm is the home number.

type:           0 - home to mark  
                  1 - home on to sensor  
                  2 - home on to sensor then to mark  
                  3 - home on to sensor then off of sensor  
                  4 - home on to sensor then off of sensor then to mark  
                  5 - home on to sensor then off of sensor then on to sensor

                  Default:     HT = 0  
                  Range:       0 to 5  
                  Base:        Decimal  
PCM module:     All

---

**(82) HWmm .SQ..W... HARDWARE CONFIGURATION**

---

HW? returns the model identifier (high 4 bits of dip switch)

HW1 returns the hardware configuration information (16 bit hex): (See ID)

bit 0 - extended i/o present (iom or pcm)  
bit 1 - pcm module present  
bit 2 - sync capability  
bit 3 - parallel interface present  
bit 4 - general phasing capability  
bit 5 - random infeed phasing capability  
bit 6 - slip compensation capability  
bit 7 - external drive  
bit 8 - external drive  
bit 9 - web control (PCM-18)  
bit 10 - conveyor control (PCM-19)  
bit 11 - tension (PCM-20)  
bit 12 - encoder 2 (PCM-14)  
bit 13 - PCM EPROM memory

HW2 returns the previous model ID

HW3 returns the previous hardware configuration information

HW4 returns the previous CHECKSUM

HW5 returns the PCM memory test value at power-up (see IO13).

                  Default:     N/A  
                  Range:       0 to FFFF  
                  Base:        Hexadecimal  
PCM module:     All



---

**(83) ICmm (nvm) .SQ...B.. INDEX TORQUE CURRENT FEED LIMIT**

---

Index torque limit setting (0..200%) for use in feed/registration to torque limit. Modifier mm is the index number. (See FG, IT)

Default: IC0..IC(Max index) = 50  
Range: 0 to 200  
Base: Decimal  
PCM module: All

---

**(84) IDmm .Q..A.... DRIVER IDENTIFIER**

---

Drive ASCII identifier. ID0 returns a text string indicating the type of drive, firmware part # and revision level (See HW). ID1 returns a text string description and date of the firmware.

Default: N/A  
Range: ASCII string up to 25 characters  
Base: Decimal  
PCM module: All

---

**(85) IFmm (nvm) .SQ...B.. INPUT FUNCTION LINE NUMBER**

---

Input line assignment for the input function. Modifier mm indicates input function number and is 0 - Max input function number. Refer to the Drive Manual for a list and description of possible input function assignments. Refer to serial serial command "OF" for example. Input line numbers are 1..8, 13..20. (See IP, OF, BD, SL)

Default: IF0..IF(Max input function) = 0  
Range: 0 to Max number of inputs  
Base: Decimal  
PCM module: All

---

**(86) IG (nvm) .SQH.W... INTEGRAL ERROR GAIN**

---

Integral error gain. Used only for Master Slave modes.

Default: IG=0  
Range: 0 to FFFF  
Base: Hexadecimal  
PCM module: All



---

**(89) IOmm****.SQH.....****HARDWARE I/O**

---

Input/output monitoring (hex).

read	write
IO0? hardware inputs	IO0= set outputs
IO1? serial input status	IO1= sets serial input status
IO2? parallel data port	IO2= write parallel data port
IO3? parallel control port	IO3= write parallel control port
IO4? external control port	IO8 = sets external drive I/O
IO5? dip_switch	IO13 = sets PCM memory test location
IO6? feedback device	
IO7? external encoder	
IO8? hardware fault port	
IO9? interrupt 1 count	
IO10? interrupt 2 count	
IO11? int1 fb pos - int2 fb pos	
IO12? analog channel 5 (PCM identifier)	
IO13? PCM memory test location (should read 5AA5)	

Default:	N/A
Range:	0 to FF
Base:	Hexadecimal
PCM module:	All

---

**(90) IPmm (nvm)****.SQ...B..****INPUT FUNCTION POLARITY**

---

Input function polarity (0 == *normally off*, 1 == *normally on*). Modifier mm is input function number. NOTE: INITIATE functions must always be *normally off*. (See IF)

Default:	IP( <i>all input numbers</i> ) = 0
Range:	0 to 1
Base:	Decimal
PCM module:	All

---

**(91) ITmm (nvm) .SQ...B.. INDEX TYPE**

---

Sets or queries the Index type. Modifier mm is the index number. (Also see DS, FG, RP, IC, LD)

- 0 - incremental distance
- 1 - absolute (shortest path if rotary limits set)
- 2 - feed index (index then feed)
- 3 - registration index (feed then index)
- 4 - absolute rotary forced direction cw
- 5 - absolute rotary forced direction ccw

Default: IT0..IT(*Max index*) = 0  
Range: 0 to 5  
Base: Decimal  
PCM module: All

---

**(92) JA (nvm) .SQ..W... JOG ACCEL RAMP**

---

Jog accel ramp slope (in ms from zero to calibration velocity). (Also see JD)

Default: JA = 1000  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(93) JD (nvm) .SQ..W... JOG DECEL RAMP**

---

Jog decel ramp slope (in ms from calibration velocity to zero). (Also see JA)

Default: JD = 1000  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(94) JE (nvm) .SQ...B.. TIME BASE FOR JOGS**

---

Sets the time base to be used for jog when jogging under input line control and the jog time base input is active (defaults to 1 for encoder). JE1 sets the time base to be used for the serial jog commands. This is a runtime parameter only and is initialized to 0 (internal time) on power up. (Old JT command for serial jog time base has been eliminated.)

time bases

- 0 - internal
- 1 - external encoder
- 2 - analog channel

Default: JE=JE0=2, JE1=0  
Range: 0 to 2  
Base: Decimal  
PCM module: All

---

**(95) JF (nvm) ESQ..W... JOG FAST**

---

Unsigned jog fast velocity. Velocity is in VC0 or VC1 depending on bit 0 of jog flags. If changed while executing a fast jog, drive will adjust to the new velocity. Also used to execute a fast jog if in serial control mode and idle or jogging. (Also see VC, JG, JS)

Default: JF = 300  
Range: 0 to Max velocity  
Base: Decimal  
PCM module: All

---

**(96) JG (nvm) ESQ..W.N. JOG**

---

Signed serial jog velocity. Velocity is in VC0 or VC1 depending on bit 0 of jog flags. If changed while executing serial jog, drive will adjust to the new velocity. Also used to execute a serial jog if in serial control mode and idle or jogging. When used as an execution command a +/- may be appended for direction (default is +). (Also see VC, JF, JS)

Default: JG = 30  
Range: -Max velocity to +Max velocity  
Base: Decimal  
PCM module: All

---

**(97) JS (nvm) ESQ..W... JOG SLOW**

---

Unsigned jog slow velocity. Velocity is in VC0 or VC1 depending on bit 0 of jog flags. If changed while executing a slow jog, drive will adjust to the new velocity. Also used to execute a slow jog if in serial control mode and idle or jogging. (Also see VC, JG, JF)

Default: JS = 30  
Range: -Max velocity to +Max velocity  
Base: Decimal  
PCM module: All

---

**(98) JT .SQ...B.. SERIAL JOG TORQUE FLAG**

---

Runtime only boolean flag that, when TRUE, causes serial jog commands to execute in the torque mode instead of velocity. This flag is set to 0 (FALSE) on power up. (LV has been eliminated.)

Default: JT = 0  
Range: 0/1 (False/True)  
Base: N/A  
PCM module: All

---

**(99) KCmm .SQ..... CYCLE COUNTER COMMANDS**

---

Modifiers:

0	Current cycle count (setup and query) Write to this parameter clears Cycle Count Reached output.
1	Current batch count (setup and query) write to this parameter clears the Batch Count Reached output.
2	Cycle count limit (setup and query).
3	Batch count limit (setup and query).

Default: KC = 0  
Range:  
Base:  
PCM module: All

---

**(100) KI .SQ...B.. KILL I/O**

---

Boolean flag that disables the unit from internally writing the output port so that it may be controlled solely from serial. (Also see IO)

Default: KI=0  
Range: 0/1 (False/True)  
Base: N/A  
PCM module: All

---

**(101) LDmm (nvm) .SQ...N. LIMIT DISTANCE**

---

Incremental limit distance for feed portion of feed or registration type index. (Default of 0 indicates no limit distance.) Hitting the limit distance completes the feed portion of the move just as if it had completed normally (by sensors or torque limit reached) except that the limit distance hit output is turned on. Modifier mm is the index number.

Default: LD0..LD(Max index) = 0  
Range: -2147483648 TO 2147483647  
Base: Decimal  
PCM module: All

---

**(102) LP .SQ..W... POSITION LOOP**

---

Sets serial control of position loop on (1) / off (0).

Default: LP=1  
Range: 0 /1 (False/True)  
Base: N/A  
PCM module: All

---

**(103) LR (nvm) .SQ...B.. LINEAR RAMPS**

---

Boolean flag indicating whether linear ramp function is to be used when executing internal motion profiles. Default is 0 (FALSE) indicating non-linear (modified-sine ramping function) ramps.

Default: LR = 0  
Range: 0/1 (False/True)  
Base: N/A  
PCM module: All

---

**(104) LT .QS...B.. LINEAR RAMPS**

---

Boolean flag indicating whether torque linearization is to be activated or not. Used to minimize torque ripple.

Default: LT = 0  
Range: 0/1 (False/True)  
Base: N/A  
PCM module: All

---

**(105) LV .SQ..W... VELOCITY LOOP (TORQUE)**

---

Velocity loop control. Enables (LV=1) or Disables (LV=0) the velocity loop

Default: LV = 1  
Range: 0/1 (False/True)  
Base: Decimal  
PCM module: All

---

**(106) MA .Q..... MAXIMUM ACCEL/DECEL RAMP**

---

Maximum acceleration/deceleration ramp (from 0 to calibration velocity) for the particular drive model. Used for thumbwheel entry. PCX may use this to limit ramp entries. (Also see AT, DT, HA, HD, JA, JD)

Default: MAX acceleration for particular model (no load)  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(107) MC (nvm) .SQ...B.. MASTER CYCLE SENSOR COUNT**

---

Master cycle sensor count for sensor inputs per follower cycle if using sensor. (Also see CY, MF)

Default: MC=1  
Range: 1 to 255  
Base: Decimal  
PCM module: PCM-16, 17 and 22



---

**(108) MDmm (nvm) .SQ...W... CYCLE PGO DEGREE POSITION**

---

Position within cycle at which programmable output is updated. Position is specified in tenths of degrees. Modifier mm identifies 1 of 8 possible programmable outputs update positions throughout cycle. Cycle programmable outputs are tracked according to the master position and are updated when the master increases in position to the cycle pgo degrees position. (Also see MM, MP, MT)

Default: MD=3600 (disabled)  
Range: 0 - 3600  
Base: Decimal  
PCM Module: PCM-16,17

---

**(109) MEmm (nvm) .SQ..... MAXIMUM ERROR**

---

ME0 or ME1 sets the maximum allowable positional following error. Positional following error is measured in hardware steps of the feedback device. ME2 sets the maximum allowable slip in user units during slip compensation indexes. ME3 sets the maximum final slip window error after running the slip compensation index. (Also see FE, CP, FP, FG, SR)

Default: ME0..ME1 = 4096, ME2=4000, ME3=200  
Range: 20 to 65535  
Base: Decimal  
PCM module: All

---

**(110) MF (nvm) .SQH..B.. MASTER CYCLE FLAGS**

---

Hex bit map of master cycle flag information. bit 0 - cycle defined by sensor (Also see CY)

Default: MF=1  
Range: 0 to FF  
Base: Hexadecimal  
PCM module: PCM- 6, 16, 7, 17 and 22

---

**(111) ML (nvm) .SQ..... MASTER CYCLE LENGTH**

---

The master length will be limited at all times by this value, including when updating the length due to sensor inputs. For the PCM-22 all master length specifications are in use distance units, otherwise the units are encoder counts. (Also see CY, FL, MS)

Default: ML0=4000, ML9 = 10000, ML10 = 0  
Range: -2147483648 to 2147483647  
Base: Decimal  
PCM module: PCM-6, 16, 7, 17 and 22

---

**(112) MMmm (nvm) .SQH..B.. CYCLE PGO MASK**

---

Sets the mask pattern to determine which programmable output will be updated at the corresponding degree position. Modifier mm identifies the 1 of 8 possible programmable output updates throughout the cycle. The mask is set with a hexadecimal bit pattern of up to 8 bits. (also see MD, MP, MT)

Default: xx = 0, yy = 0  
Range: xx: 0 to 31, yy: 0 to FF  
Base: xx: Decimal yy: Hexadecimal  
PCM module: PCM-16, 17

---

**(113) MPmm (nvm) .SQH..B.. PROGRAMMABLE OUTPUT PATTERN**

---

Sets the output pattern to be set on the programmable output lines that have been selected to be updated at master cycle degree positions specified by MDmm=xxxx. For example, MP2=03 will cause the low order two programmable output lines to be turned on and the high order two lines to be turned off upon the master cycle reaching the position specified by the MD2=xxxx command. (also see MD, MM, MT)

Default: xx = 0, yy = 0  
Range: xx: 0 to 31, yy: 0 to FF  
Base: xx: Decimal, yy: Hexadecimal  
PCM module: PCM-16, 17

---

**(114) MS (nvm) .SQ...B.. MASTER CYCLE SUMMATION**

---

Master cycle averaging summation count sets the number of master cycle lengths averaged in determining base and correction ratios. (1..8) (Also see CY, ML)

Default: MS=8  
Range: 1 to 8  
Base: Decimal  
PCM module: PCM-6, 16, 7, 17 and 22

---

**(115) MTmm (nvm) .SQ..W... CYCLE PGO ON TIME (0 = LEAVE ON)**

---

Sets the pulse width of the activated cycle programmable outputs. The pulse width is in milliseconds. A pulse of 0 indicates that the pulse will remain on until turned off by another cycle programmable output command. Modifier mm is the cycle pgo position (1 of 8). (also see MD, MM, MP)

Default: OT0..OT(*Max index*) = 0  
Range: 0 to 65535  
Base: Hexadecimal  
PCM module: PCM-16

---

**(116) MVmm (nvm) .SQ..W... MAXIMUM VELOCITY**

---

Sets the drive maximum (calibration) velocity in rpm. MV1? queries the maximum allowable calibration velocity of the drive. MV2? queries the default calibration velocity of the drive. When MV is set up, AV and VL are checked to make sure they are not greater than the new MV. AV and/or VL will be set to the new MV if they are greater. (Also see VL, AV)

Default: MV0..MV2 = Max velocity of drive  
Range: 0 to Max velocity of drive  
Base: Decimal  
PCM module: All

---

**(117) MZ (nvm) .SQ..W... MASTER CYCLE VALID ZONE**

---

Master cycle sensor valid zone (degrees). Sets the number of degrees +/- from the zero degree sensor point within which a sensor input is valid. (Also see CY)

Default: MZ=180  
Range: 0 to 65535  
Base: Decimal  
PCM module: PCM-6, 16, 7, 17 and 22

---

**(118) NDmm (nvm) .SQ....N. NUMERIC DISPLAY DATA**

---

Sets up the numeric display information. (Also see ET)

- ND 0 - parameter to be displayed  
1 - decimal point position for display  
2 - insignificant digits to be eliminated from display  
3 - no "+" sign on positive numbers  
4 - integer parameter multiplier factor  
5 - integer parameter divisor factor  
6 - long integer parameter subtraction factor  
7 - display update delay

Default: ND0 - ND6 = 0, ND7 = 1

Range: ND0 = 0 - 255  
ND1 = 0 - 255  
ND2 = 0 - 255  
ND3 = 0 - 255  
ND4 = -32768 to 32767  
ND5 = -32768 to 32767  
ND6 = -2147483647 to 2147483647  
ND7 = 0 to 65535

Base: Decimal

PCM module: PCM-1, 2, 4 and IOM-1

---

**(119) NI .Q....B.. NUMBER OF INDEXES**

---

Returns the number of indexes available in the unit.

Default: NI = 32 w/o a PCM module, 200 with a PCM module

Range: 32 to 256

Base: Decimal

PCM module: All

---

**(120) NPmm .SQ..W... NUMBER OF PROGRAMS**

---

NP0? returns the number of programs available in the unit. NP1 returns the number of available program steps not already allocated to programs. (Also see PS, PE, PD)

Default: NP0= 0 w/o a PCM module, 100 with a PCM module

Range: 0 to 100

Base: Decimal

Default: NP1= 0 w/o a PCM module, Varies with PCM module

Range: 0 to 1024 with PCM-1,2,4,5 and 0 to 512 with PCM-6,7

Base: Decimal

---

**(121) NTmm (nvm) .SQH.W... ZERO TORQUE COMMAND**

---

Sets the 12 bit hex zero torque value for the command d/a when in the torque mode of operation. Min, max, and default values are also available with the NT1?, NT2?, and NT3? commands. If NT is desired to be different from NV, NT should be set after NV. (Also see NV)

Default: NT0=800, NT1=780, NT2=880, NT3=800  
Range: Min to Max (780 to 880)  
Base: Hexadecimal  
PCM module: All

---

**(122) NVmm (nvm) .SQH.W... ZERO VELOCITY**

---

Sets the 12 bit hex zero velocity value for the command d/a when in the velocity mode of operation. Min, max, and default values are also available with the NV1?, NV2?, and NV3? commands. Setting NV will also cause NT to be set to the same value for compatability purposes. (Also see NT)

Default: NV0=800, NV1=780, NV2=880, NV3=800  
Range: Min to Max (780 to 880)  
Base: Hexadecimal  
PCM module: All

---

**(123) ODmm (nvm) .SQ..W.N. PGO DELAY FROM END OF INDEX**

---

Signed delay (ms) from end of index that index pgo's should be updated. Defaults to 0 (pgo's on at end of index). A negative delay will cause outputs to be updated before end of index but if the negative delay is greater than the start of the index decel ramp, the outputs will be updated at the start of the decel ramp. Modifier mm is index number. (Also see OP, OM, OT)

Default: OD = 0  
Range: -32767 to 32767  
Base: Decimal  
PCM module: All

If PCX software is not being used, the output lines can still be assigned through direct serial commands. The serial command structure for Output assignments is shown below:

OFmm=LL, where "mm" is the output function number and "LL" is the output line number (9-12, 21-24)

OFmm=0, will un-assign output function "mm"

For example, to assign the In Motion output to output line number 9, send the following serial command:

OF02=9, where 02 = In Motion function and 9 = output line 9.

The following notes are important to remember while the Output lines are being assigned.

1. If the clear index/clear home outputs are not assigned the outputs will clear on the next commanded motion.
2. More than one output may be assigned to the same line.
3. After setting the outputs to the desired configuration, cycle power to the unit to ensure proper operation of the output functions.
4. Some output functions apply to PCM modules only.
5. Refer to the Drive Manual for a list and description of the possible output assignments.

Default: OF0..OF(*Max output*) = 0  
Range: 0 to Max output  
Base: Decima  
PCM module: All

---

**(125) OMmm (nvm) .SQH..B.. INDEX PGO MASK**

---

Sets the mask pattern to determine which programmable output will be updated (affected) at the completion of the index. (For the update to take place, the proper number of programmable output lines must be set up with the SL command and the programmable output function must be assigned to the starting line number with the OF command.) The mask is set with a hexadecimal bit pattern of up to eight bits. Modifier mm is the index number. Also see "SC" and "OF" commands.

Example: OM21=0F will cause the low four programmable outputs (if assigned) to be updated at the end of index 21. If more than four programmable output lines are being used, only the low order four lines will be affected and the others will not be changed.

For OMxx = yy

Default: xx = 0, yy = 0  
Range: xx: 0 to 31, yy: 0 to FF  
Base: xx: Decimal yy: Hexadecimal  
PCM module: All

---

**(126) OPmm (nvm) .SQH..B.. INDEX PGO PATTERN**

---

Sets the output pattern to be set on the programmable output lines that have been selected to be updated by the index. For example, OP21=03 will cause the low order two programmable output lines to be turned on and the high order two lines to be turned off upon the completion if Index 21. Modifier mm is the index number.

For OPxx = yy

Default: xx = 0, yy = 0  
Range: xx: 0 to 31, yy: 0 to FF  
Base: xx: Decimal, yy: Hexadecimal  
PCM module: All

---

**(127) OTmm (nvm) .SQ..W... PGO ON TIME (0 = LEAVE ON)**

---

Sets the pulse width of active programmable outputs that are put out by the index. The pulse width is in milliseconds. A pulse width of 0 indicates that the pattern has infinite pulse width. In this case any outputs turned on will remain on until changed by another output pattern or until a programmable output reset is received for the line. Modifier mm is index number.

Default: OT0..OT(Max index) = 0  
Range: 0 to 65535  
Base: Hexadecimal  
PCM module: All

---

**(128) PA (nvm) .SQ...B.. FOLLOWER CYCLE SUMMATION**

---

Follower cycle averaging summation count. Sets the number of follower cycle lengths averaged in determining base and correction ratios. (1..8) (Also see CY)

Default: PA=8  
Range: 1 to 8  
Base: Decimal  
PCM module: PCM-6, 16, 7, 17 and 22

---

**(129) PCmm (nvm) .SQ..... EDIT PROGRAM COUNT**

---

Sets/queries the program repeat count. All program counts default to 1. Modifier mm is the program number. (Also see PS, PE, PD, NP)

Default: PC0..PC(*Max program*) = 1  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(130) PDmm (nvm) .SQ...N. EDIT**

---

Sets/queries hex double word data for program step. Modifier mm is the program step. (Also see PE, PS, PC, NP, CS)

Default: PD0..PD(*Max program data*) = 0  
Range: -2147483648 to 2147483647  
Base: Decimal  
PCM module: All

---

**(131) PEmm (nvm) .SQ...B.. EDIT PROGRAM SETP OPCODE**

---

Sets/queries decimal byte opcode for program step. Modifier mm is the program step. (Also see PD, PS, PC, NP, CS)

Default: PE0..PE(*Max program opcode*) = 0  
Range: 0 to Max Steps/Program  
Base: Decimal  
PCM module: All



---

**(132) PF (nvm) .SQH..B.. POWER-UP FLAGS**

---

Sets a bit flag pattern used on power up. (Default=0) (HEX) bit 0 - set to 1 to power up under serial control 1 - set to 0 for mode to follow dip switches set to 1 for mode to be set to EM2 parameter on power up and for mode to be controlled through serial 2 - set to 0 for PCM-5 or PCM-6 pulses to come from an external encoder set to 0 for pulses to come from a master axis 3 - set to 0 for drives' pulses to be sent out on sync output set to 1 for master pulses to be sent out on sync output .

- bit 0 - power up in serial control
- bit 1 - external mode under serial control (Also see EM)
- bit 2 - sync input steering (from master rather than encoder input)
- bit 3 - sync output steering (from master input rather than drive)
- bit 4 - power up home lock
- bit 5 - power up jog lock
- bit 6 - Sync/Slip encoder source: When 0, encoder 1 = Sync,  
and encoder 2 = Slip  
When 1, encoder 1 = Slip,  
and encoder 2 = Sync.

Default: PF = 0  
Range: 0 to FF  
Base: Hexaecimal  
PCM module: All

---

**(133) PHmm (nvm) .SQ....N. PHASE CORRECTION**

---

Phase correction parameters for PCM-6. Modifier mm indicates the parameter as follows:

- PH0 == Phase correction deadband (scale at deg\*10)
- PH1 == Phase correction factor (%)
- PH2 == Phase correction factor for follower length (%)
- PH3 == Phase correction factor for master length (%)
- PH4 == Minimum master steps/sec for correction  
(i.e. correction is disabled if master steps/sec is less than this value)

Default PH0=0, PH1..PH3=100  
Range PH0: 0 to 3600, PH1..PH3: 0 to 100  
Base Decimal  
PCM module: All

---

**(134) PL (nvm) .SQ....N. POSITION LIMITS**

---

Sets the limits for index distances or positions in the same manner as the "TL" command. Any attempt to program an index distance or position that is outside the specified range will generate an error. (Also see AL, DL, VL)

Default: PL0=-2147483648, PL1=2147483647  
Range: -2147483648 to 2147483647  
Base: Decimal  
PCM module: All

---

**(135) PN (nvm) .SQ..W... NEGATIVE PHASE ANGLE LIMIT**

---

Max negative phase angle limit for follower cycle. (Also see CY, PP)

Default: PN=180  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(136) PP (nvm) .SQ..W... POSITIVE PHASE ANGLE LIMIT**

---

Max positive phase angle limit for follower cycle. (Also see CY, PN)

Default: PP=180  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(137) PRmm (nvm) ESQ...B.. PROGRAM**

---

Executes program if in serial control. PR also sets/queries the default program to be executed if no program select lines are assigned. PR1 sets/queries the program number to be used for the suspend auto program execution feature. (This feature used to be set with the SP command.) (Also see SP, SG)

Default: PR0=0, PR1=0  
Range: 0 to Max program  
Base: Decimal  
PCM module: All

---

**(138) PSmm (nvm) .SQ...B.. PROGRAM SIZE/EDIT PROGRAM**

---

Sets size (in steps) of program. All programs default to 0 (empty). Setting or quering PS also sets the program to be edited (with PE/PD commands) to the program addressed by PS. Increasing program size will cause NOP opcode commands to be appended to the current program. Decreasing program size will cause existing program to be truncated (steps lost from end of program). Number of program steps remaining available for new (or increasing size) programs is available through the NP1? command. Modifier mm is the program number. (Also see PE, PD, NP, CS)

Default: PS=0  
Range: 0 to Max number of program steps  
Base: Decimal  
PCM module: All

---

**(139) PU .Q...W... POWER UP COUNT**

---

Returns number of times unit has been powered up. (Also see ZP)

Default: N/A  
Range: N/A  
Base: Decimal  
PCM module: All

---

**(140) PY (nvm) .SQ...B.. DIRECTION POLARITY**

---

Hex bit map of polarity flags that sets drive and encoder polarities. When TRUE ccw motion is taken as positive direction.

bit 0 - negative drive polarity  
bit 1 - negative encoder polarity

Default: PY = 0  
Range: 0 to 1  
Base: Decimal  
PCM module: All

---

**(141) QU .Q..A...C GENERAL STATUS QUERY**

---

Returns current drive status. Returns a single ascii character without echoing the "QU".

Default: N/A  
Range: F=fault  
L=travel limit  
C=cal  
P=program excuting  
I=index  
H=home  
J=jog  
R=suspend  
S=serial command  
E=external control  
Base: N/A  
PCM module: All

---

**(142) RA1 .Q..A...C CURRENT ENCODER**

---

Current encoder change used for web ratio - query only

Range :NA  
Default :4000  
Base :10  
PCM module: All

---

**(143) RA0 .Q..A...C CURRENT RESOLVER**

---

Current resolver change used for web ratio - query only

Range NA  
Default 4000  
Base 10  
PCM Module: PCM-18

---

**(144) RA2, RA3 .Q..A...C WEB FAULT LIMITS**

---

These values determine when a web fault will occur. RA2 specifies a minimum number of encoder counts, RA3 specifies how many motor turns must occur during the minimum number of encoder counts. If the encoder change is less than the RA2 value after the RA3 number of motor turns, a web fault occurs.

Range: 0 - 65535  
Default: 0  
Base: 10  
PCM Module: PCM-18

---

**(145) RD0 .SQ..W... INITIAL ROLL DIAMETER**

---

Used by the initialize roll diameter function, this parameter specifies the diameter in web units of the roll to be used when the initialize roll function is activated. If RD8 is set to 1 then the analog roll diameter is read and used to establish the new ratio rather than this diameter.

Range: 0 - 65535 (units DU1, conversion SR6, DP1)  
Default: 0  
Base: 10  
PCM Module: PCM-18

---

**(146) RD2 .SQ..W... MINIMUM ROLL DIAMETER**

---

This parameter sets a diameter in web units which is considered to be an empty roll. The web diameter is calculated continuously. If the diameter decreases to below this value the Roll Full/Empty Output is activated.

Range: 0 - 65535 (units DU1, conversion SR6, DP1)  
Default: 0  
Base: 10  
PCM Module: PCM-18

---

**(147) RD1 .SQ..W... MAXIMUM ROLL DIAMETER**

---

This parameter sets a diameter in web units which is considered to be a full roll. The web diameter is calculated continuously. If the diameter exceeds this value the Roll Full/Empty Output is activated.

Range: 0 - 65535 (unit DU1, conversion SR6, DP1)  
Default: 0  
Base: 10  
PCM Module: PCM-18

---

**(148) RD3 .SQ..W... ROLL DIA CONVERSION OFFSET**

---

This factor, along with the Conversion Gain (RD4), describes how the drive analog input values are converted to roll diameter values. This offset is entered in web distance units as the roll diameter at 0 volts (null CN4).

Range: 0 - 65535  
Default: 0  
Base: 10  
PCM Module: PCM-18

---

**(149) RD4 .SQ..W... ROLL DIA ANALOG CONVERSION GAIN**

---

This factor, along with the Conversion Offset (RD3), describes how the drive analog input values are converted to roll diameter values. This gain is entered in web distance units as the roll diameter at 10 volts (full scale CF4).

Range: 0 - 65535 (unit DU1, conversion SR6, DP1)  
Default: 0  
Base: 10  
PCM Module: PCM-18

---

**(150) RD5 .SQ..W... WEB ROLL REDUCER RATIO**

---

This parameter is used by the Initialize Web ratio function and is necessary to determine the correct motor/encoder ratio based upon the default or read roll diameter.

Range: 1.0 - 6553.4 (ignore decimal point in string)  
Default: 1.0  
Base: 10  
PCM Module: PCM-18

---

**(151) RD6 .SQ..W... MEASURED ROLL DIAMETER**

---

This query command reads the drive analog input and converts the value to a roll diameter according to the diameter conversion offset and gain (RD3, RD4).

Range: 0 - 65535  
Default: query only  
Base: 10  
PCM Module: PCM-18

---

**(152) RD7 .SQ..W... CURRENT ROLL DIAMETER**

---

This command returns the current roll diameter in web user units according to the current web ratio and reducer value.

Range: 0 - 65535  
Default: query only  
Base: 10  
PCM Module: PCM-18

---

**(153) RD8 .SQ..W... INITIAL ROLL DIAMETER SOURCE RD8**

---

This command selects the source for the roll diameter used by the initialize roll diameter function (RR command, Input #53). 0 = fixed, 1 = analog.

Range: 0 - 1  
Default: 0  
Base: 10  
PCM Module: PCM-18

---

**(154) RLmm (nvm) .SQ..W... ERROR GAIN/OFFSET GAIN**

---

Sets the allowable range of fine loop gain adjustment from switch inputs. RL1? will return the current fine loop gain offset. (Also see EG)

Default: RL0=512, RL1=0  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(155) ROmm (nvm) .SQ..W... HOME RESOLVER OFFSET**

---

Home to mark offset from zero. For internal drives, the offset is measured clockwise from resolver zero position, for external drives, the offset is measured clockwise from the external encoder mark position. The offset is in hardware steps of the feedback device. Modifier mm is the program number. (Also see HM, HT, HR)

Default: RO0=0, RO1=0  
Range: 0 to 4096  
Base: Decimal  
PCM module: All

---

**(156) RP (nvm) .SQ..... ROTARY ABSOLUTE POSITION**

---

If non-zero, RP sets the absolute rotary position limit. Position is measured (in user steps) from 0 to RP-1. For example, RP=3600 would result in an absolute position range from 0..3599. (Old RP0, RP1 commands have been eliminated.)

Default: RP = 0 (zero indicates no limit)  
Range: 0 to 2147483647  
Base: Decimal  
PCM module: All

---

**(157) RRmm E..... INITIALIZE NEW ROLL RATIO**

---

Serial initiate of new roll ratio. Execution only. Source of new roll diameter is analog channel if initial roll diameter RD0 is 0.

Range: NA  
Default: NA  
Base: NA  
PCM Module: PCM-18

---

**(158) RS E..... RESET DRIVE**

---

Execution command to reset from fault mode. Travel limit faults may be jogged off without first having to reset the fault.

Default: N/A  
Range: N/A  
Base: N/A  
PCM Module: All

---

**(159) RW0 .SQ..W... WEB RATIO CORRECTION RATE**

---

This factor determines how the newest web ratio sample effects the web ratio. The value (n) is used as a base 2 exponent ( $2^n$ ) to select how much of the new sample is averaged into the ratio. The default of 3 is used as  $2*2*2 = 8$ , so that the new value has a 1/8 weight in the new average.

Range: 0 - 15  
Default: 3  
Base: 10  
PCM Module: PCM-18



---

**(160) RW1 .SQ..W... WEB RATIO FAST CORRECTION RATE**

---

This parameter is identical to the above WR0 and may be selected via Fast Ratio Correct input at any time. This function is used when an alternate ratio learn rate is needed.

Range: 0 - 15  
Default: 4  
Base: 10  
PCM Module: PCM-18

---

**(161) RW2 .SQ..W... WEB RATIO UPDATE INTERVAL**

---

This factor determines the sample rate for web ratio updates. Specified in motor counts, this factor is used to determine the rate at which the used web ratio will converge to changes in the sampled ratio. Used in combination with RW0.

Range: 0 - 65535  
Default: 4096  
Base: 10  
PCM Module: PCM-18

---

**(162) RW3 .SQ..W... WEB RATIO FAST UPDATE INTERVAL**

---

This factor determines the sample rate for web ratio updates in fast learn mode. Specified in motor counts, this factor is used to determine the rate at which the used web ratio will converge to changes in the sampled ratio. Used in combination with RW1.

Range: 0 - 65535  
Default: 200  
Base: 10  
PCM Module: PCM-18

---

**(163) SC .SQ...B.C SERIAL CONTROL**

---

Boolean flag to enter/query whether serial control mode is active. (Also see CM, EM)

Default: SC = 0  
Range: 0 to 1  
Base: N/A  
PCM module: All

---

**(164) SD (nvm) .SQ..W... STOP DECEL RAMP**

---

Stop decel ramp slope (in ms from calibration velocity to zero) used for stop and hold functions. (Also see TD)

Default: SD=5\*Max Accel (MA parameter)  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(165) SF (nvm) .SQ..W... SKIP FOLLOWER SENSOR ANGLE**

---

Sets the follower cycle sensor absence angle. (Also see CY, SM)

Default: SF=180  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(166) SG (nvm) .SQH..B.. SUSPEND FLAGS**

---

Suspend flag hex bit-map information. (Also see SP, PR, CL)

- bit 0 - auto program execution on suspend
- bit 1 - auto resume after program execution
- bit 2 - auto return to position before resume
- bit 3 - auto clear of suspend without resuming (after program exec if present)
- bit 4 - hold in original time base (also used for hold function)
- bit 5 - Enable automatic suspend upon fault

Default: SG = 0  
Range: 0..FF  
Base: Hexdecimal  
PCM module: All

---

**(167) SJ E..... STOP JOG**

---

Stops jog execution when in serial control mode. (Also see JG, JF, JS, ST)

Default: N/A  
Range: N/A  
Base: N/A  
PCM module: All

---

**(168) SLmm (nvm) .SQ...B.. SELECT LINES**

---

Sets the number of lines used for the multi-line i/o functions. The function assignment commands (IF, OF) set the starting line number. (Also see IF, OF, BD)

SL0 - index selects  
SL1 - program selects  
SL2 - programmable output lines  
SL3 - programmable output reset lines  
SL4 - programmable input lines (Jump/Wait Input Lines)

Default: SL0..SL4 = 0  
Range: 0 to 8  
Base: Decimal  
PCM module: All

---

**(169) SM (nvm) .SQ..W... SKIPPED MASTER SENSOR ANGLE**

---

Sets the master cycle sensor absence angle. (Also see CY, SF)

Default: SM=180  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(170) SP (nvm) .SQ...B.. SUSPEND/RESUME PROGRAM**

---

Boolean flag indicating suspend status. SP=1 will cause program suspension if executing a program in the serial control mode and the suspend function is not currently active (single level of suspend). SP=0 will end the suspend cycle if it is currently active and cause the resume sequence to start. (Also see SG, PR, CL)

Default: SP = 0  
Range: 0 to Maximum number of programs  
Base: Decimal  
PCM module: All

---

**(171) SRmm (nvm) .SQ..W... STEPS PER REV/RATIOS**

---

SR0 sets user steps per user rev. This is normally the same as user steps per hardware rev of the motor, but may be different if TR is not equal to 1. SR1 sets the number of external steps per user rev for use in the direct ratio mode. SR2 sets the slip ratio numerator (user steps) and SR3 sets the slip ratio denominator (external steps) used for slip compensation. SR4 sets the hardware steps per rev (not encoder lines) for a 520 external drive. (Also see TR, EM)

Default: SR0..SR3 = Max velocity of the particular drive  
SR4 = 4096  
Range: 50 to 65535  
Base: Decimal  
PCM module: All

---

**(172) SS (nvm) .SQ..... SYNC MASTER MAX STEPS/SEC**

---

Maximum expected external steps/sec from master sync source. (Also see SV)

Default: SS=200000  
Range: 0 to 2147483647  
Base: Decimal  
PCM module: All

---

**(173) ST E..... STOP**

---

Stops all motion execution when executing internal motion commands. (Also see SJ, PR, IN, HM, JG, JF, JS)

Default: N/A  
Range: N/A  
Base: N/A  
PCM module: All

---

**(174) SV (nvm) .SQ..W.... SYNC VELOCITY**

---

Maximum rpm when max sync frequency is being received. Programmed velocities are ratioed against SV in sync. (Also see SS)

Default: SV = Max velocity of the particular drive  
Range: 0 to Max velocity  
Base: Decimal  
PCM module: All

---

**(175) TA (nvm) .SQ..W... FOLLOWER PHASE TARGET ANGLE**

---

Follower cycle phase/target angle in .01 degrees. (Also see CY, TC)

Default: TA=0  
Range: 0 to 35999  
Base: Decimal  
PCM module: All

---

**(176) TB (nvm) .SQ..W... INTERNAL TIME BASE RATIO**

---

TB0 ratios the real time base when in the internal command mode. TB0 = 0 defaults to 0 for normal time on every power up. TB0 ranges from 0 to 65535 with 65535 being closest to full speed real time and 1 being the lowest time base possible.

TB1 sets the nvm paramater for the global analog time base override. If TB1 is non-zero, the analog voltage on channel four will ratio the time base down from full speed whenever internal operating modes are in effect (jog, home, index, program).

Default: TB0..TB1 = 0  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(177) TC (nvm) .SQ..W... PHASE/TARGET ANGLE**

---

Follower phase target angle advance/retard rate in degree/sec. (Also see CY, TA)

Default: TC=10  
Range: 0 to 65535  
Base: Decimal  
PCM module: PCM-16 and 17 only

TC0 - Phase/offset fine increment

Default: TC=10  
Range: 0 to 65535  
Base: Decimal  
PCM module: PCM-22 only

TC1 - Phase/offset coarse increment

Default: TC=100  
Range: 0 to 65535  
Base: Decimal  
PCM module: PCM-22 only

TC2 - Length change increment

Default: TC=10  
Range: 0 to 65535  
Base: Decimal  
PCM module: PCM-22

---

**(178) TD (nvm) .SQ..W... TRAVEL LIMIT DECEL RAMP**

---

Fault decel ramp slope (in ms from calibration velocity to zero) used for stopping when faults are encountered. (Also see SD)

Default: TD = 5\*Max Accel (MA parameter)  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(179) TEmm (nvm) .SQ...B.. SETUP/QUERY**

---

Sets parallel interface field information for the current field selected with the TT command. Interpretation of the parallel interface buffer will end at the first unused field. (Also see TT, TW, ET)

- TE0 - field width (0 indicates unused field)
- TE1 - starting digit of field (not counting the sign digit if present)
- TE2 - number of digits not shown (factor of 10 multiplier for each missing digit)
- TE3 - meaning/function of field data
- TE4 - starting index/field number to be changed
- TE5 - number of index/field repeats

Default: TE = 0  
Range: 0 to 255  
Base: Decimal  
PCM module: All

---

**(180) TLmm (nvm) .SQ...N. TRAVEL LIMITS**

---

TL0 sets the ccw software travel limit. TL1 sets the cw software travel limit. Software travel limits are considered disabled if TL0 = TL1. They both default to 0 (inactive). Software travel limits are not enabled in any case until a home cycle has been completed after power-up. (Also see PF)

Default: TL0=0, TL1= 0  
Range: -2147483647 to 2147483647  
Base: Decimal  
PCM module: All

---

**(181) TMmm ..Q.A.... POWER UP TIME**

---

TM0? returns the length of time that the unit has been powered up. TM1? returns the time of the last hardware fault. Response is in ascii text string in the format DDD:HH:MM (days:hours:minutes). Text string will always be nine chars long with leading zeros on days if necessary. If days is greater than 999 the string 999:00:00 will be returned. Times may be reset with the ZP command. (Also see ZP, FH)

Default: TM = Starts from zero with a new unit  
Range: N/A  
Base: N/A  
PCM module: All

---

**(182) TN0 .SQ..W... HIGH LOOP LIMIT**

---

When the loop position analog input reaches this level the High Loop Position Limit output becomes active. The output will become inactive when the loop position falls below this limit.

Range: -10000 - 10000 mV  
Default: 10000  
Base: 10  
PCM module: PCM-18

---

**(183) TN1 .SQ..W... LOW LOOP LIMIT**

---

When the loop position analog input reaches this negative level the Low Loop Position Limit output becomes active. The output will become inactive when the loop position falls below this limit.

Range: -10000 - 10000  
Default: -10000  
Base: 10  
PCM module: PCM-18

---

**(184) TN2 .SQ..W... HIGH LOOP SPAN**

---

This value defines the positive upper boundary for the range of loop correction. Between the lower range boundary defined by the "deadband" and this parameter, loop velocity correction increases linearly as the input voltage approaches this parameter. For any input voltage at or above this value the velocity trim at span is added to the command velocity.

Range :-10000 - 10000  
Default :5000  
Base :10  
PCM module: PCM-18

---

**(185) TN3 .SQ..W... LOW LOOP SPAN**

---

This value defines the negative upper boundary for the range of loop correction. Between the boundary defined by the "deadband" and this parameter, loop velocity correction decreases linearly as the input voltage approaches this parameter. For any input voltage at or below this value the velocity trim at span is subtracted from the command velocity.

Range: -10000 - 10000  
Default: -5000  
Base: 10  
PCM module: PCM-18



---

**(186) TN4 .SQ..W... HIGH DEADBAND**

---

This value defines the positive lower boundary for the range of loop correction. No positive velocity correction is made when the input voltage is below this value.

Range: -10000 - 10000  
Default: 1000  
Base: 10  
PCM module: PCM-18

---

**(187) TN5 .SQ..W... LOW DEADBAND**

---

This value defines the negative lower boundary for the range of loop correction. No negative velocity correction is made when the input voltage is above this value.

Range: -10000 - 10000  
Default: -1000  
Base: 10  
PCM module: PCM-18

---

**(188) TN6 .SQ..W... IN-MOTION VEL TRIM AT HIGH SPAN**

---

This parameter specifies the amount of velocity correction used during loop control in the positive input voltage range. The value is specified as a % of the current velocity and is the trim added when the input voltage is at or above the high span level.

For input levels between the deadband and the high span, this velocity is scaled by the offset from the deadband to the span to produce the trim value. This value is used only when the current velocity is above the "In-Motion" velocity (TN13).

Range: 0 - 1000 (0 - 100.0 %)  
Default: 0  
Base: 10  
PCM module: PCM-18

---

**(189) TN7 .SQ..W... IN-MOTION VEL TRIM AT LOW SPAN**

---

This parameter specifies the amount of velocity correction used during loop control in the negative input voltage range. The value is specified as a % of the current velocity and is the trim subtracted when the input voltage is at or above the low span level.

For input levels between the deadband and the low span, this velocity is scaled by the offset from the deadband to the span to produce the trim value. This value is used only when the current velocity is above the "In-Motion" velocity (TN13).

Range: 0 - 1000 (0 - 100.0 %)  
Default: 0  
Base: 10  
PCM module: PCM-18

---

**(190) TN8 .SQ..W... ANALOG POLARITY**

---

Selects the polarity of the PCM analog input used for loop control.

Range: 0,1 (1 = inverted)  
Default: 0  
Base: 16  
PCM module: PCM-18

---

**(191) TN9 .SQ..W... NO-MOTION VEL TRIM AT HIGH SPAN**

---

This parameter specifies the amount of web velocity correction used during loop control in the positive input voltage range. The value specified is the velocity trim added when the input voltage is at or above the high span level.

For input levels between the deadband and the high span, this velocity is scaled by the offset from the deadband to the span to produce the trim value. This value is used only when the commanded velocity is below the "In-Motion" velocity (TN13).

Range: 0 - 65535 or web velocity limit  
Default: 0  
Base: 10  
PCM module: PCM-18

---

**(192) TN10 .SQ..W... NO-MOTION VEL TRIM AT LOW SPAN**

---

This parameter specifies the amount of web velocity correction used during loop control in the negative input voltage range. The value specified is the velocity trim added when the input voltage is at or below the low span level.

For input levels between the deadband and the low span, this velocity is scaled by the offset from the deadband to the span to produce the trim value. This value is used only when the commanded velocity is below the "In-Motion" velocity (TN13).

Range: 0 - 65535 or web velocity limit  
Default: 0  
Base: 10  
PCM module: PCM-18

---

**(193) TN11 .SQ..W... WEB VEL FEED TOWARD GAIN TERM**

---

Determines amount of velocity loop feed forward. Used by center-wind only.

Range: 0 - 65535 or web velocity limit  
Default: 0  
Base: 10  
PCM module: PCM-18

---

**(194) TN12 .SQ..W... LOOP INPUT MAXIMUM SLEW RATE**

---

This term selects the maximum rate of change that the analog loop input will accept.

Range: 1 - 31250 (1 = V/sec)  
Default: 31250  
Base: 10  
PCM module: PCM-18

---

**(195) TN13 .SQ..W... TRIM VELOCITY NO-MOTION VOLTAGE**

---

This term defines the velocity level at which the loop control trim velocity source is switched. Below this level of commanded velocity the no-motion trim is used (TN9, TN10), and above this level the in-motion trim is used (TN6, TN7). The velocity compared is the current commanded velocity in any mode, and the no motion point is specified in web velocity units. There is a small amount of velocity hysteresis used when determining if "In-Motion"

Range: 1 - 65535  
Default: 0  
Base: 10  
PCM module: PCM-18

---

**(196) TN14 .SQ..W... PCM ANALOG CHANNEL VOLTAGE**

---

This query only command returns the current analog loop input voltage. Full scale and null are used to determine this value. ±Full scale is assumed to be ±10 volts. Null is set by CN5.

Range: -10.000 - 10.000  
Default: NA  
Base: 10  
PCM module: PCM-18

---

**(197) TQmm (nvm) ESQ...B.. TORQUE MONITOR RESET**

---

Torque monitor value. As an execution command TQ will turn off the torque limit hit output. As a setup or query command, TQ0 sets/queries the torque limit setting (nvm 0..200%), TQ1 sets/queries the runtime torque monitor enable(1)/disable(0). If torque monitor is turned off (TQ1=0) the torque limit hit output will also be turned off.

Default: TQ=100 TQ1=0  
Range: 0 to 200  
Base: Decimal  
PCM module: All

---

**(198) TR (nvm) .SQ...B.. TURNS PER USER REV**

---

Number of motor turns per user rev (ie. per SR0 user steps). This will normally be a small number to facilitate gear boxes that would not otherwise allow an exact number of steps at the application end. For example, a 3:1 gear box with 1.000 inch of travel could be programmed with SR=1000 and TR=3. TR \* SR should be less than 32768. TR defaults to 1. (Also see SR)

Default: TR=1  
Range: 0 to 255  
Base: Decimal  
PCM module: All

---

**(199) TTmm .SQ...B.. THUMBWHEEL SETUP**

---

Sets the parallel interface field number to be set up or queried. Defaults to 0 on power-up. Eight (TT0..TT7) are available. (Also see TE, TW, ET)

Default: TT0..TT7 = 0  
Range: 0 to 7  
Base: Decimal  
PCM module: All

---

**(200) TVmm .QW...N. TRUE VELOCITY**

---

Actual drive velocity. This will normally match CV? unless in torque mode. TV0? will return the velocity in VC0 user units, TV1 will return the velocity in VC1 units. (Also see CV, DV, VC)

Default: N/A  
Range: -Max to +max  
Base: Decimal  
PCM module: All

---

**(201) TWmm ESQ.A.... PARALLEL INTERFACE BUFFER**

---

As an execution command TW will cause the current parallel interface buffer information to be interpreted as if a thumbwheel enter data switch had been seen. TW= will set the starting buffer digit for the TW? command and defaults to 0. TW? will display the current status of the parallel interface buffer from the starting digit and may be modified to return the only a specified number of digits from this point (ie. TW5? will return five digits.) (Also see TT, TE, ET)

Default: TW = 0  
Range: 0 to 31  
Base: Decimal  
PCM module: Parallel Interface

---

**(202) UNmm (nvm) .SQ....N. NON-VOLATILE NUMBER STORAGE**

---

Signed 32 bit user non-volatile number storage. UN user numbers are useful for the user to have a place to store non-drive related numbers within the drive and can also be set from thumbwheels and are used by various program opcodes for program step data.

Default: UN=0  
Range: -2147483648 to 2147483647  
Base: Decimal  
PCM module: All

---

**(203) VCmm (nvm) .SQ..W... VELOCITY CONVERSION NUMBER**

---

Sets the user velocity conversion scale factors (0..65535). Two scale factors are available (VC0 and VC1 depending on bit 0 of the index flag parameter FG), together with associated decimal point locations for PCX purposes (VP0 and VP1). Although velocities are stored internally to .1 rpm accuracy, VC0 and VC1 are used when sending and receiving velocity information to do the necessary conversion.

(Also see VE, FV, FG, JG, JF, JS, HI, HO, HR)

Default: VC0 = Max velocity  
VC1 = 1000  
Range: 0 to 65535  
Base: Decimal  
PCM module: All

---

**(204) VEmm (nvm) .SQ..W... INDEX VELOCITY**

---

Unsigned index velocity in units of VC or VC1 depending on bit 0 of index flags. (Also see VC, FV)

Default: VE = 300  
Range: 0 to Max velocity  
Base: Decimal  
PCM module: All

---

**(205) VGmm (vnm) .SQH..B.. VELOCITY GAIN**

---

Tach gain d/a value. Min, max, and default values are also available with VG1?, VG2?, and VG3?. (Also see GS)

Default: 65H  
Range: 0 to FFH  
Base: Hexadecimal  
PCM module: All

---

**(206) VLmm (nvm) .SQ..W... VELOCITY LIMIT**

---

User velocity limit used for thumbwheel entry. PCX may use this to limit user data entry. VL (or VL0) sets/queries the limit in rpm, however the limit may be queried in units of VC (with VL1?) or VC1 (with VL2?). (Also see AL, DL, PL)

Default: VL = Max velocity of the particular drive  
Range: 0 to Max velocity  
Base: Decimal  
PCM module: All

---

**(207) VPmm (nvm) .SQ...B.. VELOCITY DECIMAL POINT**

---

User velocity decimal point position for use by PCX. Two decimal point locations may be stored (VP0 and VP1) to be associated with VC0 and VC1. (Also see VC, DP)

Default: VP0..VP1 = 0  
Range: 0 to 5  
Base: Decimal  
PCM module: All

---

**(208) VU (nvm) .SQ.A.... USER VELOCITY UNITS**

---

Ascii character string (up to three chars) used by PCX for user velocity units. Two strings may be stored (VU0 and VU1) to be associated with VC0 and VC1. (Also see VC, DU)

Default: VU = RPM  
Range: Any 3 ASCII characters  
Base: Decimal  
PCM module: All

---

**(209) WP0 (nvm) .SQ..W... POSITION WINDOW ENABLE**

---

Position Window Global Enable Flag. This flag is not used by the drive firmware, it is just stored in NVM to be read back by PCX. See WP1, WR and WT.

Default: WPO=0  
Range: 0/1 (False/True)  
Base: Decimal  
PCM module: All

---

**(210) WP1 (nvm) .SQ..W... MAXIMUM TIME LIMIT**

---

Time limit for POSITION WINDOW TIMEOUT. At the end of an index, if this time elapses before the "in position" constraints have been satisfied (see WR, WT), then the POSITION WINDOW TIMEOUT output will be turned on.

Default: 2000 ms (2 sec)  
Range: 0-65535 ms  
Base: Decimal  
PCM module: All

---

**(211) WR (nvm) .SQ..W... IN POSITION RANGE**

---

Threshold for in position state. The following error must be within this threshold for the time specified in WT in order to satisfy the "in position" constraints. See WP0, WP1, and WR.

Default: 0 user units  
Range: 0-65535 user units  
Base: Decimal  
PCM module: All

---

**(212) WT (nvm) .SQ..W... IN POSITION TIME**

---

Time required for the following error to be within WR (in position range). See WP0, WP1 and WR.

Range: 0-65535 ms  
Default: 0 ms  
Size: 16 bits  
Base: Decimal  
PCM module: All



---

**(213) WV (nvm) ..Q..... WEB VELOCITY QUERY**

---

This is a query only command which reports the current master velocity in cycles per minute.

Default: N/A  
Range: Query only  
Base: Decimal  
PCM module: All

---

**(214) XC (nvm) .SQH..B.. EXTERNAL FEEDBACK CURRENT**

---

External drive current feedback pre-scaling d/a value (8 bit hex).

Default: XC = 80H  
Range: 0 to FF  
Base: Hexadecimal  
PCM module: All

---

**(215) XP (nvm) .SQH..B.. EXTERNAL FAULT INPUT POLARITY**

---

Hex bit map of external drive fault input polarity.

bit 0 - input 1  
bit 1 - input 2

Default: XP=0  
Range: 0 to FF  
Base: Hexadecimal  
PCM module: All

---

**(216) XT (nvm) .SQ..W.... DRIVE TACH CONFIGURATION**

---

Drive tach configuration. May be set only for external drives. (Also see XV)

0 no tach feedback  
1 tach feedback (default for standard drives)  
2 reverse polarity tach feedback (valid for external drives only)

Default: XT=1 (standard drives), XT=0 (external drives)  
Range: 0 to 1 (standard drives), 0 to 2 (external drives)  
Base: Decimal  
PCM module: All

---

**(217) XV (nvm) .SQH..B.. EXTERNAL TACH SCALING GAIN**

---

External drive tach feedback pre-scaling d/a value (8 bit hex). Default = 80h. (Also see ET)

Default:	XV=80
Range:	0 to FF
Base:	Hexadecimal
PCM module:	All

---

**(218) ZR E..... ZERO RELATIVE POSITION DISPLAY**

---

Clears the relative display position to zero. Has no other effect on drive operation. (Also see CP, FP, FE)

Default:	N/A
Range:	N/A
Base:	N/A
PCM module:	All