M7251 Die Protect Programmable Limit Switch (DPPLS) Function Module

Instruction & Operation Manual

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MAN-M7251-DPPLS
REV 03 06/18/99

Contents

1. Introduction to the M7251 DPPLS Module

The M7251 Die Protect Programmable Limit Switch (DPPLS) Function Module is an intelligent, resolver based, 10-bit, absolute position module. It is a member of Autotech Controls' CBus family of products. This function module can be used in any of the CBusModules to interface to PLCs and AVG's PowerPanel.

The M7251 DPPLS module communicates with the programmable controller through input and output registers. Input registers give you access to the 13 die protect sensor inputs, the brake wear monitor input, brake clear, 4 counter (batch, quality, tool, total) reset inputs, 2 passwords, and the die protect fault reset. The output registers allow you to program the module's parameters from the programmable controller.

The M7251 DPPLS module communicates with AVG's multifunction PowerPanel through 2048 16-bit registers. These registers can be user mapped to monitor and configure the DPPLS functions. AVG's *u*WIN software allows the user to interface the data from the module into user defined graphic screens.

The M7251 DPPLS outputs and inputs are dependent upon the type of cradle used. The discrete outputs can be interfaced directly to external devices while the virtual outputs are mapped to internal registers. The M7251 DPPLS module has 112 ON/OFF setpoints per program and the ability to store 41 user-defined programs (setups/tools). The module offers 16 PLS Outputs, Emergency Stop, Top Stop, Fault Detection, Broken Wire Detection, Danger, and Motion Detection.

2. Specifications

Position Resolution: 1 part in 360

Update Time: 3 msec

Programmable Parameters:

Position Offset
Motion Detect Delay Time (9.99 sec. max)
Counter Presets (Batch & Quality)
End of Stroke Angle (200–359) *
Engagement Angle (0–189)
From/To Setpoints (Die Protect)
On/Off Setpoints (PLS)
Setups (Tools)
Speed Compensation
Motion Limits: High & Lo (RPM)
Brake-wear Monitor Limits: Danger (9.99 sec. max)
Sensor Type
Sensor Fault Type

Scale Factor: Scale factor is a fixed 359

Position Offset:

Programmable to 359 full scale factor value, common to all DPPLS setups (tools)

Number of PLS On/Off Setpoints:

112 per DPPLS setup (tool) (16 outputs) 7 dwells per channel — angle-on/angle-off or 1 dwell angle-on/time-off

Speed Compensation:

Programmable in units per 100 RPM, up to full value. Each DPPLS output (channel) has its own leading and trailing speed compensation. Trailing edge speed compensation not available for angle-on/time-off dwells.

Motion Detector:

Low and High motion limits, common to all PLS setups(tools), programmable from 0–999 RPM

Brake-wear Monitor:

Danger Limit, Stopping time 9.99 sec. max.

Number of PLS Outputs:

16 total — 16 discrete

Brake Input:

Used with motion and stopping time

Broken Resolver Wire Detection:

Indication for broken wire in I/O Status

* Angle in degrees where the process Counters (Batch, Quality, Tool, Total) are incremented or decremented (dependent upon Counter type).

2.1 Discrete (hard-wired) Outputs/Inputs Operation

T-Stop *
On = no fault present
Off = fault present
— Die T-Stop, batch, quality or broken wire

E-Stop
On = no fault present
Off = fault present
— Die E-Stop, brake danger, motion, broken wire

PLS Outputs
On = if current position is within the dwell (ON/OFF setpoint)
Off = if current position is outside the dwell (ON/OFF setpoint)

PE (Program Enable) Input
On = Programming Enabled (input present)
Off = Programming Disabled (input not present)

Brake Input
On = Input not present (Run Mode)
Off = Input present (Brake Mode)

Brake Clear Input
After the "stop" signal , the Brake Stop Timer begins counting. You may clear the brake timer by asserting the Brake Clear Input.

Note: The timer for the Stopping Time monitoring will start when the Brake input goes from the ON (Run Mode) to OFF (Brake Mode) state.

Sensor Inputs:
Each bit defines a different type of input sensor. Up to 13 die sensors may be programmed to the following input types: Rise, Fall, Pulse, Position High, Position Low, All High, All Low.

* The output is generated at the position the fault occurs. The machine control circuitry must handle stopping the machine at the correct position.

2.2 I/O Electrical Specifications

Customer supplied 24V power Vs+, Vs-: 20 to 30VDC @ 100 mA + current used by user's loads and inputs.

N-Channel Sinking Output *(see figure 1)*

OUTPUT LOGIC LEVELS:
Logic True: MOSFET On, 0.2V Max @ 100 mA
Logic False: MOSFET Off, 0.05 mA leakage @ 30V
Max. Current per Output: 600 mA
Max. Current per Card: 2 Amps
Output Isolation: 1500V

INPUT LOGIC LEVELS:
Logic True: 10–30 VDC
Logic False: 0–1.5 VDC
Input Isolation: 1500 V

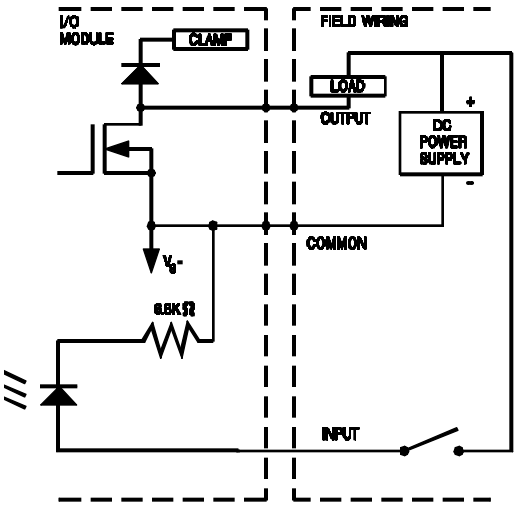


Figure 1. N-Channel Output

P-Channel Sourcing Output ***(see figure 2)***

OUTPUT LOGIC LEVELS:

Logic True: MOSFET On, 0.5V Drop @ 100 mA
Logic False: MOSFET Off, 0.05 mA leakage @ 30V
Max. Current per Output: 600 mA
Max. Current per Card: 2 Amps
Output Isolation: 1500V

INPUT LOGIC LEVELS (P-Input Sourcing):

Logic True: 10–30 VDC
Logic False: 0–1.5 VDC
Input Isolation: 1500 V

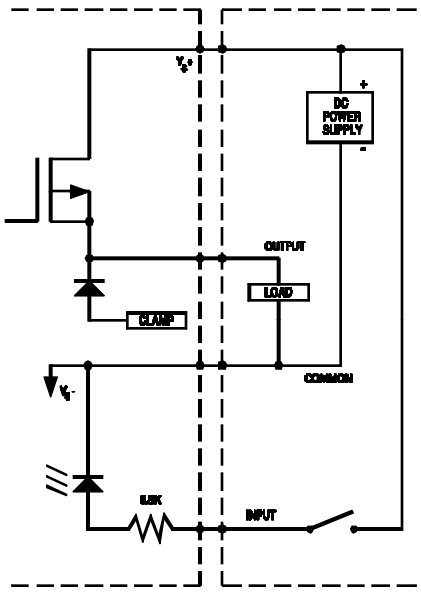


Figure 2. P-Channel Output and P-Channel Input

3. Wiring

3.1 Wiring Pinout Tables

Because the M7251 DPPLS can be plugged into a variety of Function Module Interfaces (for various PLCs and PowerPanels) the pinout cannot be specified in this manual.

Instead, table 1(next page) reflects the functional inputs and outputs that the DPPLS provides to CBus signal numbers. To determine which terminal on the Function Module Interface corresponds to a given function in the DPPLS:

a. Read the CBus Signal number from the table in this manual for that function.

b. Look up that number in the table provided in the applicable Function Module Interface Manual. That table will list the terminal pinout of the Function Module Interface vs the CBus Signal numbers.

To make this comparison even easier, the tables for Function Modules and Function Module Interfaces are published in the same size and order. This allows you to simply place them side by side and match up function and pinout at a glance.

Table 1 defines wiring for all applications in all cradles except MF2 PowerPanel Slot 2. For MF2 PowerPanel Slot 2, the signals noted with an asterisk (*) in the table are connected through the cradle D-connectors, just like slot 1. All other signals are on the I/O module's 37-pin connector, see table 2 (next page).

The pinout chart for ASY-M7250-NN11 and ASY-M7250-NN19 I/O Modules is provided in table 2. (Both of these I/O Modules are for use in the MF2 cradle slot #2 only.)

Table 1
CBUS Signal Number to DPPLS Function

CBus Signal Number	M7251 DPPLS Function
1	R1 *
2	R2 *
3	S3 Resolver *
4	S2 Resolver *
5	S1 Resolver *
6	S4 Resolver *
7	Channel 7 Output
8	Channel 8 Output
9	NC
10	NC
11	Vs- (customer supplied power return) *
12	Vs+ (customer supplied power) *
13	Channel 1 Output
14	Channel 2 Output
15	Channel 3 Output
16	Channel 4 Output
17	Channel 5 Output
18	Channel 6 Output
19	T-Stop
20	E-Stop
21	Program Enable (PE Input)
22	Brake Input
23	Brake Clear
24	Die Protect Input 1
25	Die Protect Input 2
26	Die Protect Input 3
27	Die Protect Input 4
28	Die Protect Input 5
29	NC
30	NC
31	NC
32	NC

Table 2
I/O Module to DPPLS Function

37Pin D-Sub Connector Pin #	Function
1	VS-
2	Output 2
3	Output 4
4	Output 6
5	E-Stop
6	Output 8
7	Output 10*
8	Output 12*
9	Output 14*
10	Output 16*
11	Output not used *
12	Input 10*
13	Input 8
14	Input 6
15	Input 4
16	Input 2
17	Brake Clear
18	Program Enable (PE)
19	VS+
20	Output 1
21	Output 3
22	Output 5
23	T-Stop
24	Output 7
25	Output 9
26	Output 11*
27	Output 13*
28	Output 15*
29	Input 13*
30	Input 12*
31	Input 11*
32	Input 9*
33	Input 7
34	Input 5
35	Input 3
36	Input 1
37	Brake Input

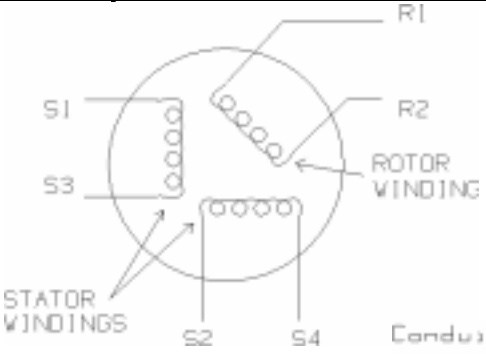
** NC for -N11 I/O module*

3.2 Resolver Wiring

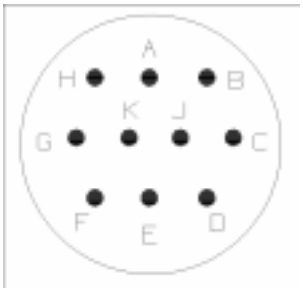
See your Function Module Interface manual for translation of CBus signal numbers to connector pins.

Table 3. Resolver Wiring

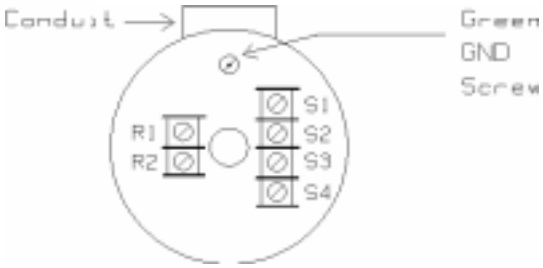
Wiring Table for Single-turn Resolvers E6R-RL101, E7R-RL101, SAC-RL100, E8R-RL101					
CBUS Signal Number	**CBL-10T22-xxxx Wire Color**	**Function**	**Resolvers with terminals**		**Resolvers with MS Connectiors Pin #**
			SAC-RL100-010	**SAC-RL100-Gxxx**	
1 2	Black/Green Green	Rotor R1 Rotor R2	R1 (RL) R2 (RH)	1 2	F E
3 5	Black/Yellow Yellow	S1 Stator S3 Stator	S1 S3	3 5	D C
4 6	Black/Blue Blue	S2 Stator S4 Stator	S2 S4	4 6	B A
	Shield	Case Ground	GND (Green Screw)	GND (Green Screw)	G
	Notes: 1. Black/Green indicates a black wire with green stripes. 2. An overall foil shielded cable with twisted pairs, (such as Autotech's cable CBL-10T22-xxxx) must be used for wiring the unit. The pairs must be formed as follows: S1 & S3, S2 & S4, R1 & R2) 3. MS Connector: MS3112E-12-10P; Mating Connector: MS3116F-12-10S (Autotech Part Number ECM-10REC-ITT). 4. MS Connector is not available with E8R series.				



Resolver Windings



MS Connector



Terminal Block

3.3 I/O Module Wiring/Pinout Table

There are several I/O module types available for use with the M7251 DPPLS. Some are for use only with the MF2 (multi-function 2 or "dual") cradle. For more information about the type and placement of an I/O module in a particular cradle, see table 4. Use table 5 to determine the amount of real I/O the particular module provides. Table 5 defines the numbers of input, output, Die Protect Input and PLS outputs available for each I/O Module Type.

Table 4.

I/O Module Type	MF PowerPanel	MF2 PowerPanel
ASY-M7250-NN10	YES	SLOT 1
ASY-M7250-NN11	NO	SLOT 2
ASY-M7250-NN19	NO	SLOT 2
ASY-M7250-NP10	YES	SLOT 1
ASY-M7250-N120	YES	SLOT 1

Table 5.

I/O Module Type	Total Inputs	Total Outputs	DP Inputs	PLS Outputs
ASY-M7250-NN10	8	10	5	8
ASY-M7250-NN11	11	10	8	8
ASY-M7250-NN19	16	19	13	16
ASY-M7250-NP10	8	10	5	8
ASY-M7250-N120	6	8	3	6

4. M7251 DPPLS Module Functions

(Note: Function Addresses are available in Section 5.)

4.1 DEFINITIONS

This section defines commonly used terms associated with the M7251 DPPLS Module programming instructions.

Tool

There are 41 distinct tools that may be pre-programmed into the M7251 DPPLS. These tools are identified by a Tool Number from 1 to 41.

Channels

There are 16 possible PLS Output Channels depending upon the type of I/O module used with your application. For more information, see Section 3.3, *I/O Module Wiring*, for further information.

Note: The first outputs are brought out through the I/O module to real output points. All 16 outputs can be accessed in the memory map.

There are 16 independent output channels, each of which contains its own setpoints to turn the output on or off at different shaft angles. Channels 1–16 also contain their own speed compensation factor so that propagation delays from output to process may be compensated.

4.2 USER DEFINED PARAMETERS

The M7251 DPPLS module has either Global or Program Specific Parameters.

Global Parameters are common to all programs. Table 6 summarizes global parameters.

Program Specific Parameters are identified with a given program number. These user defined parameters may change with program selection. Table 7 summarizes program specific parameters.

Table 6. Global Parameters

Parameter	Definition	Range
Base Offset	Counts to be added to resolver position. It is used to align resolver zero to machine zero.	0 to Scale Factor Default: 0
Motion Limits, High & Low	Motion output energizes if resolver moves within these limits.	0 to 999
Danger Limits	Danger limits for brake wear monitoring control output 8.	0 to 9.99 sec Default: 0
Motion Detect Delay Time	Time to not detect low motion when brake input goes away.	0 to 9.99 sec
Engagement Angle	Angle to 190 not to turn off E-Stop if fault.	0 to 189
Top Stop Angle	Angle to turn OFF T-Stop if fault.	200-359
Total Counter	Strokes from last reset.	0 to 4,294,967, 295
Program Number	Setup or Program number.	1 to 41 Default: 1

Table 7 . Tool Specific Parameters

Parameter	Definition	Range
Channel Type	Programmable Angle On/Time Off orAngle On/Angle Off.	N/A
Speed Compensation	A constant number in degrees to advance setpoints (dwells) based on resolver speed. Programmed in degrees per 100 RPMLeading and Trailing Edge available for Angle ON/Angle OFF, Leading Edge only for Angle ON/Time OFF.	0 to 359 Default: 0 Programmed for each channel separately.
Setpoint, ON & OFF up to as many as 16 channels, as required	The associated output is energized at ON setpoint, and de-energized at OFF setpoint or TIme-OFF.	0 to 359 Multiple dwells possible in a channel (up to 7 dwells for angle-on/angle-off or 1 dwell for angle-on/time-off) Default: 0
Die From/To Window	Window during which a die input is tested.	0 to Scale Factor
Sensor Input Type	Programmable rise, fall, pulse, position high, position low, all high, all low	N/A
Sensor Fault Type	Programmable E-Stop, T-Stop	N/A
Batch Counter Preset	Preset value that batch counter will count down from	10 digit value, 0-4,294,967,295
Batch Counter	Number of revolutions that remain before the preset number of revolutions have been completed with the current tool since the counter has been reset to the preset value.	10 digit value, 0-4,294,967,295
Quality Counter Preset	The preset value that quality counter will count down from.	10 digit value, 0-4,294,967,295
Quality Counter	Number of revolutions that remain before the preset number of revolutions have been completed with the current tool since the counter has been reset to the preset value.	10 digit value, 0-4,294,967,295
Tool Name	Eight character description of tool.	0-8 ASCII characters (maximum of 41 tool names)
Tool Counter	Number of revolutions that have been completed with the current tool since the counter has been reset (counts up from zero.)	10 digit value, 0-4,294,967,295
Input Sensor Name	16 character description of Sensor Name	0-16 ASCII characters (maximum of 13 input sensor names per tool)

4.3 Inputs and Outputs

The M7251 DPPLS utilizes a separate I/O module for input and output functions allowing the user to select either sourcing or sinking drivers. See section 3.3, *I/O Module Wiring,* for more information.

Inputs

- 13 die protect sensor inputs, 1 brake input, 1 brake clear, 1 program enable
- Internal inputs— 4 counter (batch, quality, tool, total) reset inputs, 2 passwords, 1 die protect fault reset, 1 brake clear, 1 die protect disable, inch mode, 1 batch disable, 1 quality disable

Outputs

- 16 PLS outputs, emergency stop, top stop
- Internal outputs — fault, broken wire, motion detector

4.4 Broken Wire Detector

The Broken Wire I/O Status Bit is energized when the M7251 DPPLS is operating normally and the resolver wiring is intact. If one or more of the resolver wires are broken or disconnected, the PLS outputs, and the E-Stop and T-Stop outputs will de-energize.

4.5 Built-In Tachometer and Motion Detector

The built-in tachometer and motion detector are updated over 68 times per second to provide fast, accurate indication and detection of rotary motion. The motion detector is programmed to energize an output when the machine's RPM is between the motion low and high limits.

4.6 BRAKE *(Reference figure 3 and table 8)*

Motion Detect Delay Time *(with respect to brake)*

The M7251 DPPLS provides detection and warning of resolver movement below the LOW MOTION LIMIT — 0 to 9.99 seconds.

Under normal operating conditions (brake not engaged), motion will de-energize when the RPMs fall below the motion low limit. To allow the press to start up again, the motion detection must be delayed while the press is starting. When the brake input switches from Stop to Run, the motion timer begins timing.

- If the press reaches RPM in between the motion high and motion low (before the motion time delay times out), the motion output will remain energized.

- If the RPM does not fall between motion high and motion low limits (before the motion timer times out), the motion output will de-energize.

Note: A motion fault generates an E-Stop.

Note: Low Motion Limit must be non-zero to detect Low Motion Fault

Brake Stopping Time

Stopping time is the amount of time it takes for a shaft to stop turning after the brakes are applied (0–9.99 seconds). If the shaft is turning and the brakes are applied, the "stop" signal may be wired into the Brake Input Terminal on the unit. Upon receiving this "stop" signal, the Brake Stop Timer begins counting. When stopped, the brake timer may be cleared by asserting the Brake Clear Input.

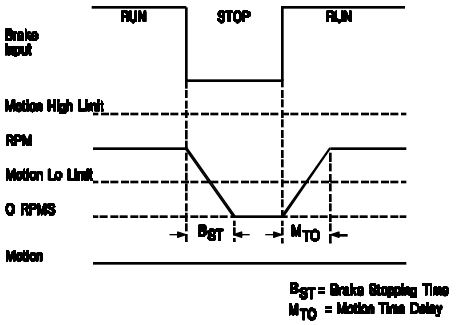


Figure 3. Brake Stopping Time and No Motion Detect

Brake Wear Monitor Time Limits

The amount of time it takes for a shaft to stop turning after the brakes are applied may be measured and compared to Danger Time Limits. This measurement can warn of brakes that are wearing out and may need to be replaced for safety reasons.

The brake "stop" signal should be wired into Brake Input Terminal on the unit. Upon receiving this "stop" signal, the Brake Stop Timer begins counting. The Brake Danger Output (I/O Status) will be ON to reflect a "Safe" condition.

If the Shaft fails to stop before reaching the Danger Time Limit, the "Danger" output condition will appear on the Brake Danger Output (I/O Status). When stopped, the brake timer may be cleared by asserting the Brake Clear Input.

Table 8. Brake Outputs

Brake Output Conditions	
Condition	***Brake Danger Output (I/O Status)***
Safe Danger	ON OFF
OFF: De-energized ON: Energized *Note: A Brake Danger generates an E-Stop.*	

4.7 Press Height
This value is the same as the position value between 0 and 180°. Between 180 and 360°, this value decreases from 180° to 0.

4.8 Fine Tune
Fine Tune the die protect windows and PLS dwells. Fine tuning in this context means the following:

- Increment a value in a location in DP RAM
- Decrement a value in a location in DP RAM
- Increment a pair of values (for retarding a dwell)
- Decrement a pair of value in two consecutive locations (for advancing a dwell)

Address of Location to be fine tuned: User puts here the address of location in Dual Port Memory map that needs to be fine tuned (set point ON or OFF address). For pair of locations (e.g., a dwell) this would be the address of first location.

Fine Tune Control Word: Bits in Control word indicates the fine tuning action — increment, decrement, etc. The function module scans the bits in the control works from right to left (from least significant to most significant bit) and acts on the first set bit it finds. Other bits, if set, will simply be ignored.

The Increment/ Decrement functions are assigned to bits in the Control Word and are as follows.

Increment On Value Once (Bit b0): When set, increment value in addressed location by 1. Function module will clear the bit after one increment. The PLC does not have to clear this bit explicitly to stop increment operation; but the PLC must toggle the bit to continuously increase the value.

Decrement On Value Once (Bit b1): When set, decrement value in addressed location by 1. Function module will clear the bit after one decrement. The PLC does not have to clear this bit explicitly to stop decrement operation; but the PLC must toggle the bit to continuously decrease the value.

Increment On/Off Values Once (Bit b2): When set, increment pair of values by 1 (address of first location in command.) Function module will clear the bit after one increment. The PLC does not have to clear this bit explicitly to stop increment operation; but the PLC must toggle the bit to continuously increase the values.

Decrement On/Off Value Once (Bit b3): When set, decrement pair of values by 1 (address of first location in command). Function module will clear the bit after one decrement. The PLC does not have to clear this bit explicitly to stop decrement operation; but the PLC must toggle the bit to continuously decrease the values.

Increment On Value Continuously (Bit b4): When set, increment value in addressed location continuously, as long as the bit is set. Function module does not clear this bit. The module will continue to increment the value as long as the bit is set. PLC must explicitly clear this bit to stop incrementing operation.

Decrement On Value Continuously (Bit b5): When set, decrement value in addressed location continuously, as long as the bit is set. Function module does not clear this bit. The module will continue to decrement the value as long as the bit is set. PLC must explicitly clear this bit to stop decrementing operation.

Increment On/Off Value Continuously (Bit b6): When set, increment pair of values continuously (address of first location in command) as long as the Bit is set. Function module does not clear this bit. The module will keep on incrementing the values as long as the bit is set. PLC must explicitly clear this bit to stop incrementing operation.

Decrement On/Off Value Continuously (Bit b7): When set, decrement pair of values by 1 (address of first location in command), as long as the bit is set. Function module does not clear this bit. The module will keep on decrementing the values as long as the bit is set. PLC must explicitly clear this bit to stop decrementing operation.

Increment Off Value Once (Bit b8): When set, increment value in addressed location by 1. Function module will clear the bit after one increment. The PLC does not have to clear this bit explicitly to stop increment operation; but the PLC must toggle the bit to continuously increase the value.

Decrement Off Value Once (Bit b9): When set, decrement value in addressed location by 1. Function module will clear the bit after one decrement. The PLC does not have to clear this bit explicitly to stop decrement operation; but the PLC must toggle the bit to continuously decrease the value.

Increment Off Value Continuously (Bit b10): When set, increment value in addressed location continuously, as long as the bit is set. Function module does not clear this bit. The module will continue to increment the value as long as the bit is set. PLC must explicitly clear this bit to stop incrementing operation.

Decrement Off Value Continuously (Bit b11): When set, decrement value in addressed location continuously, as long as the bit is set. Function module does not clear this bit. The module will continue to decrement the value as long as the bit is set. PLC must explicitly clear this bit to stop decrementing operation.

4.9 Outputs (9–16)
9–16 of the PLS Outputs, the same as PLS outputs (9–16) in 1–16, copied to be available for use with those cradle types that can not read all 16 from one location.

4.10 Die From/To Setpoints
Defines the windows to check input types in.

4.11 Input Types
Each input can be disabled. If an input is disabled, it is not monitored during operation of the press, and thus cannot generate any faults.

Up to three windows may be programmed per input. The input will be monitored in each and every programmed window if monitoring is enabled.

When a Die Protection Fault occurs, a T-Stop or E-Stop is initiated. Input type allows you to program what event the input will look for (Disable, Rise, Fall, Pulse, Position High/Low, All High/Low)

Rise and Fall
If the input is programmed as Rising, and the RISING EDGE of this input occurs within the programmed FROM-TO window (Input transition from OFF to ON), no fault will be generated. If no rising edge is detected within the window, fault output will be generated per T or E-Stop selection after the TO setpoint of the window is reached.

If the input is programmed as Falling, and no FALLING EDGE is detected within the window (Input transition from ON to OFF), the fault output will be generated per T- or E-Stop selection after the TO setpoint of the window is reached.

Pulse
If an input is programmed as PULSE (Input transisiton form OFF to ON and then from ON to OFF), both rising then falling edge has to be detected within the window. If either rising edge or falling edge, or both are missing, the fault output will be generated per T- or E-Stop selection.

All High/Low
If an input is programmed as All High (Input ON), this input has to stay high throughout the whole window. If it goes LOW anywhere within the window, fault output will be generated per T- or E-Stop selection.

If an input is programmed as All Low (Input OFF), this input has to stay low throughout the whole window. If it goes HIGH anywhere within the window, fault output will be generated per T- or E-Stop selection.

Position High/Low
Same as All High/Low, but must also see an input transition outside the window.

Disable
Each sensor can be individually disabled in the case of not using all sensors, or if a particular sensor is not working.

4.12 Sensor Name Programming

The following DUAL PORT RAM Registers are used for Sensor Name Programming:

- Sensor String Index
- Sensor Number
- Sensor Name Command
- Sensor Name
- Sensor # Name (Read Only)

Up to 36 sixteen-character names can be defined in the function module's "Name Pool." These names can be assigned to any input for any tool. The commands are assigned to bits in the Sensor Name Command word. The following commands are supported:

1. Read From Name Pool (Bit b0)
This allows the user to browse the list of sensor names. There are 36 names, the first 22 are pre-defined and the remainder are user defined. Prior to this command being issued, the user must enter a value into the Sensor String Index Register. The corresponding name for the Name Pool will then be displayed in the Sensor Name Register.

2. Read Sensor Name (Bit b1)
This allows the user to browse the currently assigned sensor names for the currently selected tool. Prior to this command being issued, the user must enter a value (1-13) into the Sensor Number Register. The name assigned to that sensor will then be displayed in the Sensor Name Registers. The index number (1-36) for this name will be displayed in the Sensor String Index Register.

3. Assign (Bit b2)
This allows the user to assign the name currently displayed in the Sensor Name Registers to the Input Sensor defined in the Sensor Number RegisThis name's index number (1-36) must be in the Sensor String Index Register prior to the Assign Name to Sensor Command is issued. If the user enters a name that is not in the Name Pool, the command will be ignored.

4. Find (Bit b3)
This allows the user to find a name from the Name Pool based on characters entered in the Sensor Name Registers. The search will start with Index #1 in the Name Pool. If a match is found, the Sensor String Index Register is updated with the first match found.

The Sensor Name Register is also updated. If no match is found, the Sensor String Index Register is set to zero and the Sensor Name Register is cleared.

5. Find Next (Bit b4)
This allows the user to search for the next matching name with the characters entered in the last find command. The input sensor name index number will be placed in the Sensor String Index Register and the Sensor Name Register is updated. If no other match is found, the Sensor String Index Register is set to zero and the Sensor Name Register is cleared.

6. Rename (Bit b5)
This allows the user to add or change names in the Name Pool. Prior to issuring this command, the user must enter the name they wish to enter in to the Sensor Name Registers. Then the user must enter the index number that he or she wishes to rename into the Sensor String Index Register.

List of Predefined Names (Index #1-22) in the Name Pool.
Air Pressure, Buckle, Endstock, Knockout, Missing, Overfeed, Slug Detect, Width, Blankfeed, Cam Drive, Eject, Lube, Oil Level, Overload, Thickness, Blow, Column Pressure, High Loop, Misfeed, Oil Pressure, Shortfeed, Transfer.

Note: Predefined names CAN BE REPLACED with user defined names.

4.13 Tool Names

Each tool will be assigned a 0 to 8 character name. The name will be stored with the tool in the DPPLS module. The currently active tool name, if so assigned, will be stored in the active program name. The following registers will be defined in dual port RAM.

DUAL PORT RAM REGISTERS

1	command
2	tool number
3–6	tool name
7	destination tool number
8	active program name

The commands are assigned to bits in the Tool Command word. The following commands will be supported:

1. FIND (Bit b0)
The DPPLS module will search the tools for the first one with a name that matches the name in the tool name registers. The search will start at tool #1. Unused characters in the search name are treated as wildcards (i.e., “TOM” will match “TOM, “TOMMY,” or “TOMORROW”). The number and name of the matching tool will be placed in the dual port RAM registers. If no match is found then the tool number register is set to zero and the tool name registers are filled with nulls (zeroes).

2. FIND NEXT (Bit b1)
The DPPLS module will search for the next tool with a name that matches the search string entered in the last find command. The search will start at the tool number specified in the tool number register. The number and name of the matching tool will be placed in the dual port RAM registers. If no match is found, then the tool number register is set to zero and the tool name registers are filled with nulls (zeroes).

3. SELECT (Bit b2)
The DPPLS module will select the tool with the name matching the name in the tool name registers as the active tool. If the name of the tool specified by the tool number register is the same as the name in the tool name registers, then that tool will be selected. Otherwise, the function module will search for a tool with a matching name, starting at tool #1. If a match is found then that tool will become the active tool, and its number and name will be placed in the tool number and tool name registers. If a match is not found, then the active tool is not changed, the tool number is set to zero and the tool name registers are filled with nulls.

4. COPY (Bit b3)
The DPPLS module will copy the tool specified in the tool number register to the tool number specified in the destination tool number register. The tool name for the destination tool will be set to spaces.

5. RENAME (Bit b4)
The name for the tool specified in the tool number register will be changed to the name in the tool name registers.

6. DELETE (Bit b5)
The DPPLS module will delete the program specified by the tool number register and the tool name register. If the name of the tool specified in the tool number register matches the name in the tool name register, then that tool will be deleted. A deleted tool is set to all zeroes. The tool name registers will be filled with nulls. If the tools name does not match the name in the tool name registers, then the tool is not deleted and the tool name registers are not changed. Note that for delete to work the match must be exact — i.e., “TOM” will only match “TOM,” it will not match “TOMMY” or “TOMORROW.”

7. READ (Bit b6)
The name for the tool specified in the tool number register will be placed in the tool name registers.

4.14 Leading and Trailing Edge Speed Compensation
Trailing Edge Speed Compensation and Leading Edge Speed Compensation allow you to dynamically advance or retard a programmable output based on a resolver speed. This is useful for compensating field device response time. Trailing Edge Speed Compensation is not available on dwells using Angle-ON/Time-OFF.

For example, consider an output driving a solenoid with a turn **ON** time of 10 ms and a turn **OFF** time of 5 ms. For this application, the output needs to be triggered accurately at 120° to 180° over a speed range of 60 RPM to 120 RPM. Table 3 (top of next page) demonstrates the effect of the speed compensation.

Note: The Leading or Trailing Edge Speed Compensation values must be a whole number.

CALCULATION:
@ 60 RPM the number of degrees per second = 360°
Therefore, in 10 ms, the resolver shaft rotates 3.6°, in 5 ms, the resolver shaft rotates 1.8°.

@ 120 RPM the number of degrees per second = 720°.
Therefore, in 10 ms, the resolver shaft rotates 7.2 degrees, and in 5 ms, the resolver shaft rotates 3.6 degrees.

EXAMPLE 1
At 60 RPM, it can be seen that a 10 ms propagation delay in the solenoid causes the output to turn On 3.6° (123.6°) after the programmed On point and a 5 ms propagation delay in the solenoid causes the output to turn off 1.8° (181.8°) after the programmed off point.

If the application is to run at 60 RPM constantly, we can use these values to adjust the setpoints to compensate for the delays in the solenoid actuation. However, in a variable speed application this no longer holds true as the propagation delays result in larger positional error at higher speed.

EXAMPLE 2
At 120 RPM, it can be seen that a 10 ms propagation delay in the solenoid causes the output to turn On 7.2° (127.2°) after the programmed On point and a 5 ms propagation delay in the solenoid causes the output to turn off 3.6° (183.6°) after the programmed off point.

Speed compensation is applied linearly over the speed range and is entered as an amount of compensation to be added over a 100 RPM range. From these examples, the speed compensation for the leading and the trailing edges can be calculated as follows:

@ 100 RPM with 10 ms propagation delay

100 RPM ÷ 60 = 1.666 revolutions per second
1.666 rps x 360 (scale factor + 1) = 600 unit per sec.
1 sec. ÷ 600 = 1.666 ms per unit

10 ms propagation delay ÷ 1.666 ms = 6.00
LE speed compensation = 6°

5 ms propagation delay ÷ 1.666 ms = 3.00
TE speed compensation = 3°

Examples 3 and 4 of table 9 demonstrate the results of the applied speed compensation.

Note: TE Speed Compensation is not available on dwells using Angle-ON/Time-OFF.

Table 9. Leading and Trailing Edge Speed Compensation

Example	Resolver Speed (RPM)	On Setpoint	Off Setpoint	Speed Compensation Enable	Leading Compensation	Trailing Edge	Output Switching Angles	Solenoid Actuation Angles
1	60	120°	180°	No	0°	0°	ON 120° OFF 180°	ON 123° OFF 182°
2	120	120°	180°	No	0°	0°	ON 120° OFF 180°	ON 127° OFF 184°
3	60	120°	180°	Yes	4°	2°	ON 116° OFF 178°	ON 120° OFF 180°
4	120	120°	180°	Yes	7°	4°	ON 113° OFF 176°	ON 120° OFF 180°

4.15 Password Levels (see Appendix A)
Password Levels are as follows:

PW1: Supervisor Restricted

- Renaming tools (if names are going to be used)
- Deleting tools
- Copy of tools
- Offset
- High Motion Limit/Low Motion Limit
- No Motion Detect Time
- Top Stop Angle
- Engagement Angle
- Reset of tool counter
- Reset of total counter
- Brake danger limit

PW2: Operator Restricted

- Selection of tools
- Search for tools
- Die Protection: changing names of die inputs (if names used), fault types, input types, windows (to,from), die protect disable, die protect reset
- PLS Restricted Channels: channel type, speed compensation, dwells (ON, OFF set points)
- Counters: change batch preset values, change quality preset values, reset batch counter, reset quality counter, batch disable, quality disable, inch mode, brake clear (from counter reset/preset), program enable.

5. DPPLS Module Addresses

Decimal Address: 132 **I/O Status (16 Bit Read Only)**

MSD[1]															LSD[1]
DPR	QD	BDA	IM	BD	X	MOT	BW	X	DPD	BC	BI	FO	ES	TS	PE

X = Not Used
PE = Program Enable
0 = No input
1 = Input present
T-S = Top Stop Output; fail safe
0 = Fault present
1 = No fault
E-S = Emergency Stop Output; fail safe
0 = Fault present
1 = No fault
FO = Fault Output (diagnostic); fail safe
0 = Fault
1 = No fault
BI = Brake Input
0 = Brake input present (Brake Mode)
1 = Brake input not present (Run Mode)
BC = Brake Clear
0 = No input
1 = Input present
DPD = Die Protect Disable
0 = No input
1 = Input present
BW = Broken Wire
0 = Broken wire fault
1 = No broken wire fault

MOT = Motion Output
0 = RPM exceeds the Motion Hi/LowLimit
1 = RPM within the Motion Hi/Low Limit
BD = Brake Danger Output; fail safe
0 = Stopping time exceeds the danger limit
1 = Stopping time is within the danger limit
IM = Inch Mode (disable die protect, speed compensation and motion detection)
0 = no input
1 = input present
BDA = Batch Disable
0 = No input
1 = Input present
QD = Quality Disable
0 = No input
1 = Input present
DPR = Die Protect Reset
0 = No input
1 = Input present

Decimal Address: 140 **Sensor Status (16 Bit Read Only)**

MSD															LSD
X	X	X	IN13	IN12	IN11	IN10	IN9	IN8	IN7	IN6	IN5	IN4	IN3	IN2	IN1

IN1 – IN13 = Input 1 through input 13

[1] **MSD = Most significant digit**
LSD = Least significant digit

Decimal Address: 160

Module Inputs (16 Bit Write Only)

MSD															LSD
DPR	QD	BDA	IM	X	X	X	X	X	DPD	X	X	X	X	BC	X

X = Not used
BC = Brake Clear
DPD = Die Protect Disable
IM = Inch Mode
BDA = Batch Disable
QD = Quality Disable
DPR = Die Protect Reset

Decimal Address: 300

Counter Reset/Preset (14 Bit Read/Write)

MSD													LSD
DPR	QD	BDA	IM	DPD	BC	X	X	X	PE	QCR	BCR	TOCR	TCR

X = Not used
TCR = Tool Count Reset to Zero (0)
TOCR = Total Count Reset to Zero (0)
BCR = Batch Count Reset to Preset
QCR = Quality Count Reset to Preset
PE = Program Enable
BC = Brake Clear
DPD = Die Protect Disable
IM = Inch Mode
BDA = Batch Disable
QD = Quality Disable
DPR = Die Protect Reset

Decimal Address: 302

Fault Status (14 Bit Read/Write)

MSD													LSD
X	IN13F	IN12F	IN11F	IN10F	IN9F	IN8F	IN7F	IN6F	IN5F	IN4F	IN3F	IN2F	IN1F

X = Not used
IN1F – IN13F = Input 1 fault through input 13 fault

Decimal Address 1492

Sensor Name Command (16 Bit Read/Write)

MSD															LSD
X	X	X	X	X	X	X	X	X	X	RSN	FNSN	FSN	ANS	RSN	RNP

X = Not used
RNP = Read Name from Name Pool
RSN = Read Sensor Name
ANS = Assign

FSN = Find
FNSN = Find Next
RSN = Rename

Decimal Address 296

Sensor Failed Status (14 Bit Read/Write)

MSD													LSD
X	S13F	S12F	S11F	S10F	S9F	S8F	S7F	S6F	S5F	S4F	S3F	S2F	S1F

S1F – S13F = Sensor 1 Failed through Sensor 13 Failed

Note: Used only when Position High (PHI) and Position Low (PLO) fail to see a transition.

Decimal Address 150

Counter Output Status (16 Bit Read Only)

MSD															LSD
X	X	X	X	X	X	X	X	X	X	X	X	X	X	BCO	QCO

X = Not used
QCO = Quality Counter Output

BCO = Batch Counter Output
1 = actual value = non-zero
2 = actual value = zero

Decimal Address 630, 662, 694, 726, 758,790, 822, 854 **Input Type (14 Bit Read/Write)**

MSD													LSD
X	X	X	X	X	X	X	ALO	AHI	PLO	PHI	PUL	FAL	RIS

X = Not used
RIS = Rise
FAL = Fall
PUL = Pulse
PHI = Position High
PLO = Position Low
AHI = All High
ALO = All Low

Note: When register is set to zero, defaults to disable

Decimal Address 1312, 1344, 1376, 1408, 1440 **Input Type (16 Bit Read/Write)**

MSD															LSD
X	X	X	X	X	X	X	X	X	ALO	AHI	PLO	PHI	PUL	FAL	RIS

X = Not used
RIS = Rise
FAL = Fall
PUL = Pulse
PHI = Position High
PLO = Position Low
AHI = All High
ALO = All Low

Note: When register is set to zero, defaults to disable

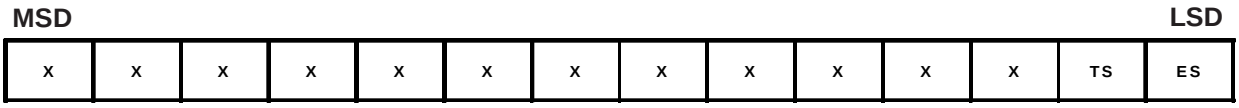
Decimal Address 256 **Read/Write Error and Address (14 Bit Read/Write)**

MSD													LSD
EADD	EADD	EADD	EADD	EADD	EADD	EADD	EADD	EADD	EADD	ENUM	ENUM	ENUM	ENUM

EADD = Error Address
ENUM = Error Number
1 = Attempt to fine tune a non-existing dwell
2 = New dwell out of range
3 = Programming a parameter during motion
4 = Value out of range
5 = Function module is busy
6 = Program enable input is not active
7 = Attempting to fine tune on a bad address
8 = Access to fine tune control word is not available
9 = Attempt to program other than first dwell during Time-Off Mode
10 = Attempting to write Ch. 7 or 8 with Brake Mode active
12 = Password 1 not enabled
13 = Password 2 not enabled

Decimal Address 632, 664, 696, 728 760, 792, 824, 856

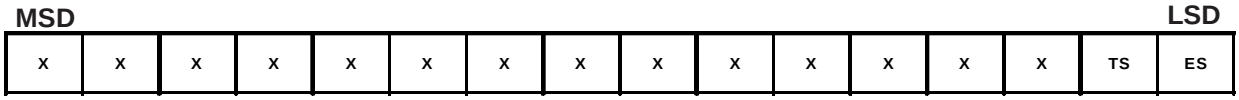
Input Fault Type (14 Bit Read/Write)



X = Not used
ES = E-Stop
TS = T-Stop
Bit 0 = 1 E-Stop
Bit 1 = 1 T-Stop

Decimal Address 1314, 1346, 1378, 1410, 1442

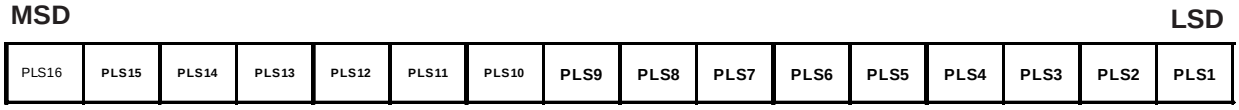
Input Fault Type (16 Bit Read/Write)



X = Not used
ES = E-Stop
TS = T-Stop
Bit 0 = 1 E-Stop
Bit 1 = 1 T-Stop

Decimal Address 134

Output (16 Bit Read Only)



X = Not used
PLS1 – PLS16 = PLS Channels 1 through 16
1 = ON, Output is turned on
0 = OFF, Output is turned off

Decimal Address 896 **Tool Command (16 Bit Read/Write)**

MSD															LSD
X	X	X	X	X	X	X	X	X	READ	DELETE	RENAM	COPY	SELECT	FIND NEXT	FIND

X = Not used

Decimal Address[2] **Group# + 256* Channel Type (14 Bit Read/Write)**

MSD													LSD
X	X	X	X	X	ALCH	X	X	X	X	X	GRP	GRP	GRP

X = Not used
ALCH = All Channels
0 = ANGE On/Off
1 = ANGE On/Time Off
GRP = Group
000 = 0
001 = 1
010 = 2
011 = 3
100 = 4

[2] Group # + 256* Chan Type's decimal address depends upon channel number (e.g., Decimal Address for Channel 1 is 324)

6. Memory Map for DPPLS Module

Decm	Hex	Type	Description
128	0080	Read Only Area	**RPM**
130	0082	Read Only Area	**Position**
132	0084	Read Only Area	**I/O Status (16 bits)**
134	0086	Read Only Area	**Outputs (1-16)**
136	0088	Read Only Area	**Stopping Time**
138	008A	Read Only Area	**Outputs (9-16)**
140	008C	Read Only Area	**Sensor Status**
150	0096	Read Only Area	**Counter Status**
152	0098	Read Only Area	**Press height**
160	00A0	Write Only Area	**Module Inputs**
162	00A2	Write Only Area	*Not used*
164	00A4	Write Only Area	**PW Entry 1**
166	00A6	Write Only Area	**PW Entry 2**
188	00BC	Write Only Area	**FineTune Location Address**
190	00BE	Write Only Area	**FineTune Control Word**
256	0100	Read/Write Area	**(addr+16* ERR)**
260	0104	Read/Write Area	**Offset**
262	0106	Read/Write Area	**High Motion Limit**
264	0108	Read/Write Area	**Low Motion Limit**
266	010A	Read/Write Area	**Program Number**
268	010C	Read/Write Area	**Danger Limit**
296	0128	Read/Write Area	**Failed Status**
298	012A	Read/Write Area	**Motion Det. Timer**
300	012C	Read/Write Area	**Cnt. Reset/Preset**
302	012E	Read/Write Area	**Fault Status**
320	0140	Read/Write Area	**LE Comp Chan 1**
322	0142	Read/Write Area	**TE Comp Chan 1**
324	0144	Read/Write Area	**PLS Ch 1 Type**
326	0146	Read/Write Area	**CH 1 SP 1 ON**
328	0148	Read/Write Area	**Ch 1 SP 1 OFF**
330	014A	Read/Write Area	**Ch 1 SP 2 ON**
332	014C	Read/Write Area	**Ch 1 SP 2 OFF**
334	014E	Read/Write Area	**Ch 1 SP 3 ON**
336	0150	Read/Write Area	**Ch 1 SP 3 OFF**
338	0152	Read/Write Area	**Ch 1 SP 4 ON**
340	0154	Read/Write Area	**Ch 1 SP 4 OFF**
342	0156	Read/Write Area	**Ch 1 SP 5 ON**
344	0158	Read/Write Area	**Ch 1 SP 5 OFF**
346	015A	Read/ Write Area	**Ch 1 SP 6 ON**
348	015C	Read/Write Area	**Ch 1 SP 6 OFF**
350	015E	Read/Write Area	**Ch 1 SP 7 ON**
352	0160	Read/Write Area	**Ch 1 SP 7 OFF**
354	0162	Read/Write Area	**LE Comp Chan 2**
356	0164	Read/Write Area	**TE Comp Chan 2**
358	0166	Read/Write Area	**PLS Ch 2 Type**
360	0168	Read/Write Area	**CH 2 SP 1 ON**
362	016A	Read/Write Area	**Ch 2 SP 1 OFF**
364	016C	Read/Write Area	**Ch 2 SP 2 ON**
366	016E	Read/Write Area	**Ch 2 SP 2 OFF**
368	0170	Read/Write Area	**Ch 2 SP 3 ON**
370	0172	Read/Write Area	**Ch 2 SP 3 OFF**
372	0174	Read/Write Area	**Ch 2 SP 4 ON**
374	0176	Read/Write Area	**Ch 2 SP 4 OFF**
376	0178	Read/Write Area	**Ch 2 SP 5 ON**
378	017A	Read/Write Area	**Ch 2 SP 5 OFF**

Decm	Hex	Type	Description
380	017C	Read/Write Area	**Ch 2 SP 6 ON**
382	017E	Read/Write Area	**Ch 2 SP 6 OFF**
384	0180	Read/Write Area	**Ch 2 SP 7 ON**
386	0182	Read/Write Area	**Ch 2 SP 7 OFF**
388	0184	Read/Write Area	**LE Comp Chan 3**
390	0186	Read/Write Area	**TE Comp Chan 3**
392	0188	Read/Write Area	**PLS Ch 3 Type**
394	018A	Read/Write Area	**Ch 3 SP 1 ON**
396	018C	Read/Write Area	**Ch 3 SP 1 OFF**
398	018E	Read/Write Area	**Ch 3 SP 2 ON**
400	0190	Read/Write Area	**Ch 3 SP 2 OFF**
402	0192	Read/Write Area	**Ch 3 SP 3 ON**
404	0194	Read/Write Area	**Ch 3 SP 3 OFF**
406	0196	Read/Write Area	**Ch 3 SP 4 ON**
408	0198	Read/Write Area	**Ch 3 SP 4 OFF**
410	019A	Read/Write Area	**Ch 3 SP 5 ON**
412	019C	Read/Write Area	**Ch 3 SP 5 OFF**
414	019E	Read/Write Area	**Ch 3 SP 6 ON**
416	01A0	Read/Write Area	**Ch 3 SP 6 OFF**
418	01A2	Read/Write Area	**Ch 3 SP 7 ON**
420	01A4	Read/Write Area	**Ch 3 SP 7 OFF**
422	01A6	Read/Write Area	**LE Comp Chan 4**
424	018A	Read/Write Area	**TE Comp Chan 4**
426	01AA	Read/Write Area	**PLS Ch 4 Type**
428	01AC	Read/Write Area	**Ch 4 SP 1 ON**
430	01AE	Read/Write Area	**Ch 4 SP 1 OFF**
432	01B0	Read/Write Area	**Ch 4 SP 2 ON**
434	01B2	Read/Write Area	**Ch 4 SP 2 OFF**
436	01B4	Read/Write Area	**Ch 4 SP 3 ON**
438	01B6	Read/Write Area	**Ch 4 SP 3 OFF**
440	01B8	Read/Write Area	**Ch 4 SP 4 ON**
442	01BA	Read/Write Area	**Ch 4 SP 4 OFF**
444	01BC	Read/Write Area	**Ch 4 SP 5 ON**
446	01BE	Read/Write Area	**Ch 4 SP 5 OFF**
448	01C0	Read/Write Area	**Ch 4 SP 6 ON**
450	01C2	Read/Write Area	**Ch 4 SP 6 OFF**
452	01C4	Read/Write Area	**Ch 4 SP 7 ON**
454	01C6	Read/Write Area	**Ch 4 SP7 OFF**
456	01C8	Read/Write Area	**LE Comp Chan 5**
458	01CA	Read/Write Area	**TE Comp Chan 5**
460	01CC	Read/Write Area	**PLS Ch 5 Type**
462	01CE	Read/Write Area	**Ch 5 SP 1 ON**
464	01D0	Read/Write Area	**Ch 5 SP 1 OFF**
466	01D2	Read/Write Area	**Ch 5 SP 2 ON**
468	01D4	Read/Write Area	**Ch 5 SP 2 OFF**
470	01D6	Read/Write Area	**Ch 5 SP 3 ON**
472	01D8	Read/Write Area	**Ch 5 SP 3 OFF**
474	01DA	Read/Write Area	**Ch 5 SP 4 ON**
476	01DC	Read/Write Area	**Ch 5 SP 4 OFF**
478	01DE	Read/Write Area	**Ch 5 SP 5 ON**
480	01E0	Read/Write Area	**Ch 5 SP 5 OFF**
482	01E2	Read/Write Area	**Ch 5 SP 6 ON**
484	01E4	Read/Write Area	**Ch 5 SP 6 OFF**
486	01E6	Read/Write Area	**Ch 5 SP 7 ON**
488	01E8	Read/Write Area	**Ch 5 SP 7 OFF**
490	01EA	Read/Write Area	**LE Comp Chan 6**
492	01EC	Read/Write Area	**TE Comp Chan 6**
494	01EE	Read/Write Area	**PLS Ch 6 Type**

Decm	Hex	Type	Description
496	01F0	Read/Write Area	**Ch 6 SP 1 ON**
498	01F2	Read/Write Area	**Ch 6 SP 1 OFF**
500	01F4	Read/Write Area	**Ch 6 SP 2 ON**
502	01F6	Read/Write Area	**Ch 6 SP 2 OFF**
504	01F8	Read/Write Area	**Ch 6 SP 3 ON**
506	01FA	Read/Write Area	**Ch 6 SP 3 OFF**
508	01FC	Read/Write Area	**Ch 6 SP 4 ON**
510	01FE	Read/Write Area	**Ch 6 SP 4 OFF**
512	0200	Read/Write Area	**Ch 6 SP 5 ON**
514	0202	Read/Write Area	**Ch 6 SP 5 OFF**
516	0204	Read/Write Area	**Ch 6 SP 6 ON**
518	0206	Read/Write Area	**Ch 6 SP 6 OFF**
520	0208	Read/Write Area	**Ch 6 SP 7 ON**
522	020A	Read/Write Area	**Ch 6 SP 7 OFF**
524	020C	Read/Write Area	**LE Comp Chan 7**
526	020E	Read/Write Area	**TE Comp Chan 7**
528	0210	Read/Write Area	**PLS Ch 7 Type**
530	0212	Read/Write Area	**Ch 7 SP 1 ON**
532	0214	Read/Write Area	**Ch 7 SP 1 OFF**
534	0216	Read/Write Area	**Ch 7 SP 2 ON**
536	0218	Read/Write Area	**Ch 7 SP 2 OFF**
538	021A	Read/Write Area	**Ch 7 SP 3 ON**
540	021C	Read/Write Area	**Ch 7 SP 3 OFF**
542	021E	Read/Write Area	**Ch 7 SP 4 ON**
544	0220	Read/Write Area	**Ch 7 SP 4 OFF**
546	0222	Read/Write Area	**Ch 7 SP 5 ON**
548	0224	Read/Write Area	**Ch 7 SP 5 OFF**
550	0226	Read/Write Area	**Ch 7 SP 6 ON**
552	0228	Read/Write Area	**Ch 7 SP 6 OFF**
554	022A	Read/Write Area	**Ch 7 SP 7 ON**
556	022C	Read/Write Area	**Ch 7 SP 7 OFF**
558	022E	Read/Write Area	**LE Comp Chan 8**
560	0230	Read/Write Area	**TE Comp Chan 8**
562	0232	Read/Write Area	**PLS Ch 8 Type**
564	0234	Read/Write Area	**Ch 8 SP 1 ON**
566	0236	Read/Write Area	**Ch 8 SP 1 OFF**
568	0238	Read/Write Area	**Ch 8 SP 2 ON**
570	023A	Read/Write Area	**Ch 8 SP 2 OFF**
572	023C	Read/Write Area	**Ch 8 SP 3 ON**
574	023E	Read/Write Area	**Ch 8 SP 3 OFF**
576	0240	Read/Write Area	**Ch 8 SP 4 ON**
578	0242	Read/Write Area	**Ch 8 SP 4 OFF**
580	0244	Read/Write Area	**Ch 8 SP 5 ON**
582	0246	Read/Write Area	**Ch 8 SP 5 OFF**
584	0248	Read/Write Area	**Ch 8 SP 6 ON**
586	024A	Read/Write Area	**Ch 8 SP 6 OFF**
588	024C	Read/Write Area	**Ch 8 SP 7 ON**
590	024E	Read/Write Area	**Ch 8 SP 7 OFF**
592	0250	Read/Write Area	**Top Stop Angle**
594	0252	Read/Write Area	**Engagement Angle**
596	0254	Read/Write Area	**Inp 1 Fault Angle**
598	0256	Read/Write Area	**Inp 2 Fault Angle**
600	0258	Read/Write Area	**Inp 3 Fault Angle**
602	025A	Read/Write Area	**Inp 4 Fault Angle**
604	025C	Read/Write Area	**Inp 5 Fault Angle**
606	025E	Read/Write Area	**Inp 6 Fault Angle**
608	0260	Read/Write Area	**Inp 7 Fault Angle**

Decm	Hex	Type	Description
610	0262	Read/Write Area	**Inp 8 Fault Angle**
612	0264	Read/Write Area	**Inp 9 Fault Angle**
614	0266	Read/Write Area	**Inp 10 Fault Angle**
616	0268	Read/Write Area	**Inp 11 Fault Angle**
618	026A	Read/Write Area	**Inp 12 Fault Angle**
620	026C	Read/Write Area	**Inp 13 Fault Angle**
630	0276	Read/Write Area	**Inp 1 Type**
632	0278	Read/Write Area	**Inp 1 Fault Type**
634	027A	Read/Write Area	**Inp 1 SP 1 ON**
636	027C	Read/Write Area	**Inp 1 SP 1 OFF**
638	027E	Read/Write Area	**Inp 1 SP 2 ON**
640	0280	Read/Write Area	**Inp 1 SP 2 OFF**
642	0282	Read/Write Area	**Inp 1 SP 3 ON**
644	0284	Read/Write Area	**Inp 1 SP 3 OFF**
646	0286	Read/Write Area	**Input 1 Trans 1**
648	0288	Read/Write Area	**Input 1 Trans 2**
650	028A	Read/Write Area	**Input 1 Trans 3**
652	028C	Read/Write Area	**Input 1 Trans 4**
654	028E	Read/Write Area	**Input 1 Trans 5**
656	0290	Read/Write Area	**Input 1 Trans 6**
658	0292	Read/Write Area	**Input 1 Trans 7**
660	0294	Read/Write Area	**Input 1 Trans 8**
662	0296	Read/Write Area	**Input 2 Type**
664	0298	Read/Write Area	**Inp 2 Fault Type**
666	029A	Read/Write Area	**Inp 2 SP 1 ON**
668	029C	Read/Write Area	**Inp 2 SP 1 OFF**
670	029E	Read/Write Area	**Inp 2 SP 2 ON**
672	02A0	Read/Write Area	**Inp 2 SP 2 OFF**
674	02A2	Read/Write Area	**Inp 2 SP 3 ON**
676	02A4	Read/Write Area	**Inp 2 SP 3 OFF**
678	02A6	Read/Write Area	**Input 2 Trans 1**
680	02A8	Read/Write Area	**Input 2 Trans 2**
682	02AA	Read/Write Area	**Input 2 Trans 3**
684	02AC	Read/Write Area	**Input 2 Trans 4**
686	02AE	Read/Write Area	**Input 2 Trans 5**
688	02B0	Read/Write Area	**Input 2 Trans 6**
690	02B2	Read/Write Area	**Input 2 Trans 7**
692	02B4	Read/Write Area	**Input 2 Trans 8**
694	02B6	Read/Write Area	**Input 3 Type**
696	02B8	Read/Write Area	**Inp 3 Fault Type**
698	02BA	Read/Write Area	**Inp 3 SP 1 ON**
700	02BC	Read/Write Area	**Inp 3 SP 1 OFF**
702	02BE	Read/Write Area	**Inp 3 SP 2 ON**
704	02C0	Read/Write Area	**Inp 3 SP 2 OFF**
706	02C2	Read/Write Area	**Inp 3 SP 3 ON**
708	02C4	Read/Write Area	**Inp 3 SP 3 OFF**
710	02C6	Read/Write Area	**Input 3 Trans 1**
712	02C8	Read/Write Area	**Input 3 Trans 2**
714	02CA	Read/Write Area	**Input 3 Trans 3**
716	02CC	Read/Write Area	**Input 3 Trans 4**
718	02CE	Read/Write Area	**Input 3 Trans 5**
720	02D0	Read/Write Area	**Input 3 Trans 6**
722	02D2	Read/Write Area	**Input 3 Trans 7**
724	02D4	Read/Write Area	**Input 3 Trans 8**
726	02D6	Read/Write Area	**Input 4 Type**
728	02D8	Read/Write Area	**Inp 4 Fault Type**
730	02DA	Read/Write Area	**Inp 4 SP 1 ON**

Decm	Hex	Type	Description
732	02DC	Read/Write Area	**Inp 4 SP 1 OFF**
734	02DE	Read/Write Area	**Inp 4 SP 2 ON**
736	02E0	Read/Write Area	**Inp 4 SP 2 OFF**
738	02E2	Read/Write Area	**Inp 4 SP 3 ON**
740	02E4	Read/Write Area	**Inp 4 SP 3 OFF**
742	02E6	Read/Write Area	**Input 4 Trans 1**
744	02E8	Read/Write Area	**Input 4 Trans 2**
746	02EA	Read/Write Area	**Input 4 Trans 3**
748	02EC	Read/Write Area	**Input 4 Trans 4**
750	02EE	Read/Write Area	**Input 4 Trans 5**
752	02F0	Read/Write Area	**Input 4 Trans 6**
754	02F2	Read/Write Area	**Input 4 Trans 7**
756	02F4	Read/Write Area	**Input 4 Trans 8**
758	02F6	Read/Write Area	**Input 5 Type**
760	02F8	Read/Write Area	**Inp 5 Fault Type**
762	02FA	Read/Write Area	**Inp 5 SP 1 ON**
764	02FC	Read/Write Area	**Inp 5 SP 1 OFF**
766	02FE	Read/Write Area	**Inp 5 SP 2 ON**
768	0300	Read/Write Area	**Inp 5 SP 2 OFF**
770	0302	Read/Write Area	**Inp 5 SP 3 ON**
772	0304	Read/Write Area	**Inp 5 SP 3 OFF**
774	0306	Read/Write Area	**Input 5 Trans 1**
776	0308	Read/Write Area	**Input 5 Trans 2**
778	030A	Read/Write Area	**Input 5 Trans 3**
780	030C	Read/Write Area	**Input 5 Trans 4**
782	030E	Read/Write Area	**Input 5 Trans 5**
784	0310	Read/Write Area	**Input 5 Trans 6**
786	0312	Read/Write Area	**Input 5 Trans 7**
788	0314	Read/Write Area	**Input 5 Trans 8**
790	0316	Read/Write Area	**Input 6 Type**
792	0318	Read/Write Area	**Inp 6 Fault Type**
794	031A	Read/Write Area	**Inp 6 SP 1 FROM**
796	031C	Read/Write Area	**Inp 6 SP 1 TO**
798	031E	Read/Write Area	**Inp 6 SP 2 FROM**
800	0320	Read/Write Area	**Inp 6 SP 2 TO**
802	0322	Read/Write Area	**Inp 6 SP 3 FROM**
804	0324	Read/Write Area	**Inp 6 SP 3 TO**
806	0326	Read/Write Area	**Inp 6 Trans 1**
808	0328	Read/Write Area	**Inp 6 Trans 2**
810	032A	Read/Write Area	**Inp 6 Trans 3**
812	032C	Read/Write Area	**Inp 6 Trans 4**
814	032E	Read/Write Area	**Inp 6 Trans 5**
816	0330	Read/Write Area	**Inp 6 Trans 6**
818	0332	Read/Write Area	**Inp 6 Trans 7**
820	0334	Read/Write Area	**Inp 6 Trans 8**
822	0336	Read/Write Area	**Inp 7 Type**
824	0338	Read/Write Area	**Inp 7 Fault Type**
826	033A	Read/Write Area	**Inp 7 SP 1 FROM**
828	033C	Read/Write Area	**Inp 7 SP 1 TO**
830	033E	Read/Write Area	**Inp 7 SP 2 FROM**
832	0340	Read/Write Area	**Inp 7 SP 2 TO**
834	0342	Read/Write Area	**Inp 7 SP 3 FROM**
836	0344	Read/Write Area	**Inp 7 SP 3 TO**
838	0346	Read/Write Area	**Inp 7 Trans 1**
840	0348	Read/Write Area	**Inp 7 Trans 2**
842	034A	Read/Write Area	**Inp 7 Trans 3**
844	034C	Read/Write Area	**Inp 7 Trans 4**
846	034E	Read/Write Area	**Inp 7 Trans 5**
848	0350	Read/Write Area	**Inp 7 Trans 6**
850	0352	Read/Write Area	**Inp 7 Trans 7**
852	0354	Read/Write Area	**Inp 7 Trans 8**
854	0356	Read/Write Area	**Inp 8 Type**
856	0358	Read/Write Area	**Inp 8 Fault Type**
858	035A	Read/Write Area	**Inp 8 SP 1 FROM**
860	035C	Read/Write Area	**Inp 8 SP 1 TO**
862	035E	Read/Write Area	**Inp 8 SP 2 FROM**
864	0360	Read/Write Area	**Inp 8 SP 2 TO**
866	0362	Read/Write Area	**Inp 8 SP 3 FROM**
868	0364	Read/Write Area	**Inp 8 SP 3 TO**
870	0366	Read/Write Area	**Inp 8 Trans 1**
872	0368	Read/Write Area	**Inp 8 Trans 2**
874	036A	Read/Write Area	**Inp 8 Trans 3**
876	036C	Read/Write Area	**Inp 8 Trans 4**
878	036E	Read/Write Area	**Inp 8 Trans 5**
880	0370	Read/Write Area	**Inp 8 Trans 6**
882	0372	Read/Write Area	**Inp 8 Trans 7**
884	0374	Read/Write Area	**Inp 8 Trans 8**
896	0380	Shared Area 1	**Tool Command**
898	0382	Shared Area 1	**Tool Number**
900	0384	Shared Area 1	**Name Char 1 & 2**
902	0386	Shared Area 1	**Name Char 3 & 4**
904	0388	Shared Area 1	**Name Char 5 & 6**
906	038A	Shared Area 1	**Name Char 7 & 8**
908	038C	Shared Area 1	**Dest Tool Number**
910	038E	Shared Area 1	**Tool Count MS**
912	0390	Shared Area 1	**Tool Count LS**
914	0392	Shared Area 1	**Total Count MS**
916	0394	Shared Area 1	**Total Count LS**
918	0396	Shared Area 1	**Batch Count MS**
920	0398	Shared Area 1	**Batch Count LS**
922	039A	Shared Area 1	**Quality Count MS**
924	039C	Shared Area 1	**Quality Count LS**
926	039E	Shared Area 1	**Batch Preset MS**
928	03A0	Shared Area 1	**Batch Preset LS**
930	03A2	Shared Area 1	**Quality Preset MS**
932	03A4	Shared Area 1	**Quality Preset LS**
934	03A6	Shared Area 1	**Cntr Inhibits 1-4**
936	03A8	Shared Area 1	**Cntr Inhibits 5-8**
938	03AA	Shared Area 1	**Cntr Inhibits 9-12**
940	03AC	Shared Area 1	**Cntr Inhibits 13**
942	03AE	Shared Area 1	**Slug Count 1**
944	03B0	Shared Area 1	**Slug Count 2**
946	03B2	Shared Area 1	**Slug Count 3**
948	03B4	Shared Area 1	**Slug Count 4**
950	03B6	Shared Area 1	**Slug Count 5**
952	03B8	Shared Area 1	**Slug Count 6**
954	03BA	Shared Area 1	**Slug Count 7**
956	03BC	Shared Area 1	**Slug Count 8**
958	03BE	Shared Area 1	**Slug Count 9**
960	03C0	Shared Area 1	**Slug Count 10**
962	03C2	Shared Area 1	**Slug Count 11**
964	03C4	Shared Area 1	**Slug Count 12**
966	03C6	Shared Area 1	**Slug Count 13**
1024	0400	Shared Area 2	**LE Comp Chan 9**

Decm	Hex	Type	Description
1026	0402	Shared Area 2	**TE Comp Chan 9**
1028	0404	Shared Area 2	**PLS CH 9 Type**
1030	0406	Shared Area 2	**CH 9 SP 1 ON**
1032	0408	Shared Area 2	**CH 9 SP 1 OFF**
1034	040A	Shared Area 2	**CH 9 SP 2 ON**
1036	040C	Shared Area 2	**CH 9 SP 2 OFF**
1038	040E	Shared Area 2	**CH 9 SP 3 ON**
1040	0410	Shared Area 2	**CH 9 SP 3 OFF**
1042	0412	Shared Area 2	**CH 9 SP 4 ON**
1044	0414	Shared Area 2	**CH 9 SP 4 OFF**
1046	0416	Shared Area 2	**CH 9 SP 5 ON**
1048	0418	Shared Area 2	**CH 9 SP 5 OFF**
1050	041A	Shared Area 2	**CH 9 SP 6 ON**
1052	041C	Shared Area 2	**CH 9 SP 6 OFF**
1054	041E	Shared Area 2	**CH 9 SP 7 ON**
1056	0420	Shared Area 2	**CH 9 SP 7 OFF**
1058	0422	Shared Area 2	**LE Comp Chan 10**
1060	0424	Shared Area 2	**TE Comp Chan 10**
1062	0426	Shared Area 2	**PLS CH 10 Type**
1064	0428	Shared Area 2	**CH 10 SP 1 ON**
1066	042A	Shared Area 2	**CH 10 SP 1 OFF**
1068	042C	Shared Area 2	**CH 10 SP 2 ON**
1070	042E	Shared Area 2	**CH 10 SP 2 OFF**
1072	0430	Shared Area 2	**CH 10 SP 3 ON**
1074	0432	Shared Area 2	**CH 10 SP 3 OFF**
1076	0434	Shared Area 2	**CH 10 SP 4 ON**
1078	0436	Shared Area 2	**CH 10 SP 4 OFF**
1080	0438	Shared Area 2	**CH 10 SP 5 ON**
1082	043A	Shared Area 2	**CH 10 SP 5 OFF**
1084	043C	Shared Area 2	**CH 10 SP 6 ON**
1086	043E	Shared Area 2	**CH 10 SP 6 OFF**
1088	0440	Shared Area 2	**CH 10 SP 7 ON**
1090	0442	Shared Area 2	**CH 10 SP 7 OFF**
1092	0444	Shared Area 2	**LE Comp Chan 11**
1094	0446	Shared Area 2	**TE Comp Chan 11**
1096	0448	Shared Area 2	**PLS CH 11 Type**
1098	044A	Shared Area 2	**CH 11 SP 1 ON**
1100	044C	Shared Area 2	**CH 11 SP 1 OFF**
1102	044E	Shared Area 2	**CH 11 SP 2 ON**
1104	0450	Shared Area 2	**CH 11 SP 2 OFF**
1106	0452	Shared Area 2	**CH 11 SP 3 ON**
1108	0454	Shared Area 2	**CH 11 SP 3 OFF**
1110	0456	Shared Area 2	**CH 11 SP 4 ON**
1112	0458	Shared Area 2	**CH 11 SP 4 OFF**
1114	045A	Shared Area 2	**CH 11 SP 5 ON**
1116	045C	Shared Area 2	**CH 11 SP 5 OFF**
1118	045E	Shared Area 2	**CH 11 SP 6 ON**
1120	0460	Shared Area 2	**CH 11 SP 6 OFF**
1122	0462	Shared Area 2	**CH 11 SP 7 ON**
1124	0464	Shared Area 2	**CH 11 SP 7 OFF**
1126	0466	Shared Area 2	**LE Comp Chan 12**
1128	0468	Shared Area 2	**TE Comp Chan 12**
1130	046A	Shared Area 2	**PLS CH 12 Type**
1132	046C	Shared Area 2	**CH 12 SP 1 ON**
1134	046E	Shared Area 2	**CH 12 SP 1 OFF**
1136	0470	Shared Area 2	**CH 12 SP 2 ON**

Decm	Hex	Type	Description
1138	0472	Shared Area 2	**CH 12 SP 2 OFF**
1140	0474	Shared Area 2	**CH 12 SP 3 ON**
1142	0476	Shared Area 2	**CH 12 SP 3 OFF**
1144	0478	Shared Area 2	**CH 12 SP 4 ON**
1146	047A	Shared Area 2	**CH 12 SP 4 OFF**
1148	047C	Shared Area 2	**CH 12 SP 5 ON**
1150	047E	Shared Area 2	**CH 12 SP 5 OFF**
1152	0480	Shared Area 2	**CH 12SP 6 ON**
1154	0482	Shared Area 2	**CH 12 SP 6 OFF**
1156	0484	Shared Area 2	**CH 12 SP 7 ON**
1158	0486	Shared Area 2	**CH 12 SP 7 OFF**
1160	0488	Shared Area 2	**LE Comp Chan 13**
1162	048A	Shared Area 2	**TE Comp Chan 13**
1164	048C	Shared Area 2	**PLS CH 13 Type**
1166	048E	Shared Area 2	**CH 13 SP 1 ON**
1168	0490	Shared Area 2	**CH 13 SP 1 OFF**
1170	0492	Shared Area 2	**CH 13 SP 2 ON**
1172	0494	Shared Area 2	**CH 13 SP 2 OFF**
1174	0496	Shared Area 2	**CH 13 SP 3 ON**
1176	0498	Shared Area 2	**CH 13 SP 3 OFF**
1178	049A	Shared Area 2	**CH 13 SP 4 ON**
1180	049C	Shared Area 2	**CH 13 SP 4 OFF**
1182	049E	Shared Area 2	**CH 13 SP 5 ON**
1184	04A0	Shared Area 2	**CH 13 SP 5 OFF**
1186	04A2	Shared Area 2	**CH 13 SP 6 ON**
1188	04A4	Shared Area 2	**CH 13 SP 6 OFF**
1190	04A6	Shared Area 2	**CH 13 SP 7 ON**
1192	04A8	Shared Area 2	**CH 13 SP 7 OFF**
1194	04AA	Shared Area 2	**LE Comp Chan 14**
1196	04AC	Shared Area 2	**TE Comp Chan 14**
1198	04AE	Shared Area 2	**PLS CH 14 Type**
1200	04B0	Shared Area 2	**CH 14 SP 1 ON**
1202	04B2	Shared Area 2	**CH 14 SP 1 OFF**
1204	04B4	Shared Area 2	**CH 14 SP 2 ON**
1206	04B6	Shared Area 2	**CH 14 SP 2 OFF**
1208	04B8	Shared Area 2	**CH 14 SP 3 ON**
1210	04BA	Shared Area 2	**CH 14 SP 3 OFF**
1212	04BC	Shared Area 2	**CH 14 SP 4 ON**
1214	04BE	Shared Area 2	**CH 14 SP 4 OFF**
1216	04C0	Shared Area 2	**CH 14 SP 5 ON**
1218	04C2	Shared Area 2	**CH 14 SP 5 OFF**
1220	04C4	Shared Area 2	**CH 14 SP 6 ON**
1222	04C6	Shared Area 2	**CH 14 SP 6 OFF**
1224	04C8	Shared Area 2	**CH 14 SP 7 ON**
1226	04CA	Shared Area 2	**CH 14 SP 7 OFF**
1228	04CC	Shared Area 2	**LE Comp Chan 15**
1230	04CE	Shared Area 2	**TE Comp Chan 15**
1232	04D0	Shared Area 2	**PLS CH 15 Type**
1234	04D2	Shared Area 2	**CH 15 SP 1 ON**
1236	04D4	Shared Area 2	**CH 15 SP 1 OFF**
1238	04D6	Shared Area 2	**CH 15 SP 2 ON**
1240	04D8	Shared Area 2	**CH 15 SP 2 OFF**
1242	04DA	Shared Area 2	**CH 15 SP 3 ON**
1244	04DC	Shared Area 2	**CH 15 SP 3 OFF**
1246	04DE	Shared Area 2	**CH 15 SP 4 ON**
1248	04E0	Shared Area 2	**CH 15 SP 4 OFF**

Decm	Hex	Type	Description
1250	04E2	Shared Area 2	**CH 14 SP 5 ON**
1252	04E4	Shared Area 2	**CH 15 SP 5 OFF**
1254	04E6	Shared Area 2	**CH 15 SP 6 ON**
1256	04E8	Shared Area 2	**CH 15 SP 6 OFF**
1258	04EA	Shared Area 2	**CH 15 SP 7 ON**
1260	04EC	Shared Area 2	**CH 15 SP 7 OFF**
1262	04EE	Shared Area 2	**LE Comp Chan 16**
1264	04F0	Shared Area 2	**TE Comp Chan 16**
1266	04F2	Shared Area 2	**PLS CH 16 Type**
1268	04F4	Shared Area 2	**CH 16 SP 1 ON**
1270	04F6	Shared Area 2	**CH 16 SP 1 OFF**
1272	04F8	Shared Area 2	**CH 16 SP 2 ON**
1274	04FA	Shared Area 2	**CH 16 SP 2 OFF**
1276	04FC	Shared Area 2	**CH 16 SP 3 ON**
1278	04FE	Shared Area 2	**CH 16 SP 3 OFF**
1280	0500	Shared Area 2	**CH 16 SP 4 ON**
1282	0502	Shared Area 2	**CH 16 SP 4 OFF**
1284	0504	Shared Area 2	**CH 16 SP 5 ON**
1286	0506	Shared Area 2	**CH 16 SP 5 OFF**
1288	0508	Shared Area 2	**CH 16 SP 6 ON**
1290	050A	Shared Area 2	**CH 16 SP 6 OFF**
1292	050C	Shared Area 2	**CH 16 SP 7 ON**
1294	050E	Shared Area 2	**CH 16 SP 7 OFF**
1312	0520	Shared Area 2	**Inp 9 Type**
1314	0522	Shared Area 2	**Inp 9 Fault Type**
1316	0524	Shared Area 2	**Inp 9 SP 1 FROM**
1318	0526	Shared Area 2	**Inp 9 SP 1 TO**
1320	0528	Shared Area 2	**Inp 9 SP 2 FROM**
1322	052A	Shared Area 2	**Inp 9 SP 2 TO**
1324	052C	Shared Area 2	**Inp 9 SP 3 FROM**
1326	052E	Shared Area 2	**Inp 9 SP 3 TO**
1328	0530	Shared Area 2	**Inp 9Trans 1**
1330	0532	Shared Area 2	**Inp 9 Trans 2**
1332	0534	Shared Area 2	**Inp 9 Trans 3**
1334	0536	Shared Area 2	**Inp 9 Trans 4**
1336	0538	Shared Area 2	**Inp 9 Trans 5**
1338	053A	Shared Area 2	**Inp 9 Trans 6**
1340	053C	Shared Area 2	**Inp 9 Trans 7**
1342	053E	Shared Area 2	**Inp 9 Trans 8**
1344	0540	Shared Area 2	**Inp 10 Type**
1346	0542	Shared Area 2	**Inp 10 Fault Type**
1348	0544	Shared Area 2	**Inp 10 SP 1 FROM**
1350	0546	Shared Area 2	**Inp 10 SP 1 TO**
1352	0548	Shared Area 2	**Inp 10 SP 2 FROM**
1354	054A	Shared Area 2	**Inp 10 SP 2 TO**
1356	054C	Shared Area 2	**Inp 10 SP 3 FROM**
1358	054E	Shared Area 2	**Inp 10 SP 3 TO**
1360	0550	Shared Area 2	**Inp 10 Trans 1**
1362	0552	Shared Area 2	**Inp 10 Trans 2**
1364	0554	Shared Area 2	**Inp 10 Trans 3**
1366	0556	Shared Area 2	**Inp 10 Trans 4**
1368	0558	Shared Area 2	**Inp 10 Trans 5**
1370	055A	Shared Area 2	**Inp 10 Trans 6**
1372	055C	Shared Area 2	**Inp 10 Trans 7**
1374	055E	Shared Area 2	**Inp 10 Trans 8**
1376	0560	Shared Area 2	**Inp 11 Type**
1378	0562	Shared Area 2	**Inp 11 Fault Type**

Decm	Hex	Type	Description
1380	0564	Shared Area 2	**Inp 11 SP 1 FROM**
1382	0566	Shared Area 2	**Inp 11 SP 1 TO**
1384	0568	Shared Area 2	**Inp 11 SP 2 FROM**
1386	056A	Shared Area 2	**Inp 11 SP 2 TO**
1388	056C	Shared Area 2	**Inp 11 SP 3 FROM**
1390	056E	Shared Area 2	**Inp 11 SP 3 TO**
1392	0570	Shared Area 2	**Inp 11 Trans 1**
1394	0572	Shared Area 2	**Inp 11 Trans 2**
1396	0574	Shared Area 2	**Inp 11 Trans 3**
1398	0576	Shared Area 2	**Inp 11 Trans 4**
1400	0578	Shared Area 2	**Inp 11 Trans 5**
1402	057A	Shared Area 2	**Inp 11 Trans 6**
1404	057C	Shared Area 2	**Inp 11 Trans 7**
1406	057E	Shared Area 2	**Inp 11 Trans 8**
1408	0580	Shared Area 2	**Inp 12 Type**
1410	0582	Shared Area 2	**Inp 12 Fault Type**
1412	0584	Shared Area 2	**Inp 12 SP 1 FROM**
1414	0586	Shared Area 2	**Inp 12 SP 1 TO**
1416	0588	Shared Area 2	**Inp 12 SP 2 FROM**
1418	058A	Shared Area 2	**Inp 12 SP 2 TO**
1420	058C	Shared Area 2	**Inp 12 SP 3 FROM**
1422	058E	Shared Area 2	**Inp 12 SP 3 TO**
1424	0590	Shared Area 2	**Inp 12 Trans 1**
1426	0592	Shared Area 2	**Inp 12 Trans 2**
1428	0594	Shared Area 2	**Inp 12 Trans 3**
1430	0596	Shared Area 2	**Inp 12 Trans 4**
1432	0598	Shared Area 2	**Inp 12 Trans 5**
1434	059A	Shared Area 2	**Inp 12 Trans 6**
1436	059C	Shared Area 2	**Inp 12 Trans 7**
1438	059E	Shared Area 2	**Inp 12 Trans 8**
1440	05A0	Shared Area 2	**Inp 13 Type**
1442	05A2	Shared Area 2	**Inp 13 Fault Type**
1444	05A4	Shared Area 2	**Inp 13 SP 1 FROM**
1446	05A6	Shared Area 2	**Inp 13 SP 1 TO**
1448	05A8	Shared Area 2	**Inp 13 SP 2 FROM**
1450	05AA	Shared Area 2	**Inp 13 SP 2 TO**
1452	05AC	Shared Area 2	**Inp 13 SP 3 FROM**
1454	05AE	Shared Area 2	**Inp 13 SP 3 TO**
1456	05B0	Shared Area 2	**Inp 13 Trans 1**
1458	05B2	Shared Area 2	**Inp 13 Trans 2**
1460	05B4	Shared Area 2	**Inp 13 Trans 3**
1462	05B6	Shared Area 2	**Inp 13 Trans 4**
1464	05B8	Shared Area 2	**Inp 13 Trans 5**
1466	05BA	Shared Area 2	**Inp 13 Trans 6**
1468	05BC	Shared Area 2	**Inp 13 Trans 7**
1470	05BE	Shared Area 2	**Inp 13 Trans 8**
1472	05C0	Shared Area 2	**Sensor String Index**
1474	05C2	Shared Area 2	**Sensor Name 1 & 2**
1476	05C4	Shared Area 2	**Sensor Name 3 & 4**
1478	05C6	Shared Area 2	**Sensor Name 5 & 6**
1480	05C8	Shared Area 2	**Sensor Name 7 & 8**
1482	05CA	Shared Area 2	**Sensor Name 9 & 10**
1484	05CC	Shared Area 2	**Sensor Name 11&12**
1486	05CE	Shared Area 2	**Sensor Name 13&14**
1488	05D0	Shared Area 2	**Sensor Name 15&16**
1490	05D2	Shared Area 2	**Sensor Number**
1492	05D4	Shared Area 2	**Snsr Name Comm.**

Decm	Hex	Type	Description
1494	05D6	Shared Area 2	**Snsr 1 Name 1 & 2**
1496	05D8	Shared Area 2	**Snsr 1 Name 3 & 4**
1498	05DA	Shared Area 2	**Snsr 1 Name 5 & 6**
1500	05DC	Shared Area 2	**Snsr 1 Name 7 & 8**
1502	05DE	Shared Area 2	**Snsr 1 Name 9 & 10**
1504	05E0	Shared Area 2	**Snsr 1 Name 11 & 12**
1506	05E2	Shared Area 2	**Snsr 1 Name 13 & 14**
1508	05E4	Shared Area 2	**Snsr 1 Name 15 & 16**
1510	05E6	Shared Area 2	**Snsr 2 Name 1 & 2**
1512	05E8	Shared Area 2	**Snsr 2 Name 3 & 4**
1514	05EA	Shared Area 2	**Snsr 2 Name 5 & 6**
1516	05EC	Shared Area 2	**Snsr 2 Name 7 & 8**
1518	05EE	Shared Area 2	**Snsr 2 Name 9 & 10**
1520	05F0	Shared Area 2	**Snsr 2 Name 11 & 12**
1522	05F2	Shared Area 2	**Snsr 2 Name 13 & 14**
1524	05F4	Shared Area 2	**Snsr 2 Name 15 & 16**
1526	05F6	Shared Area 2	**Snsr 3 Name 1 & 2**
1528	05F8	Shared Area 2	**Snsr 3 Name 3 & 4**
1530	05FA	Shared Area 2	**Snsr 3 Name 5 & 6**
1532	05FC	Shared Area 2	**Snsr 3 Name 7 & 8**
1534	05FE	Shared Area 2	**Snsr 3 Name 9 & 10**
1536	0600	Shared Area 2	**Snsr 3 Name 11 & 12**
1538	0602	Shared Area 2	**Snsr 3 Name 13 & 14**
1540	0604	Shared Area 2	**Snsr 3 Name 15 & 16**
1542	0606	Shared Area 2	**Snsr 4 Name 1 & 2**
1544	0608	Shared Area 2	**Snsr 4 Name 3 & 4**
1546	060A	Shared Area 2	**Snsr 4 Name 5 & 6**
1548	060C	Shared Area 2	**Snsr 4 Name 7 & 8**
1550	060E	Shared Area 2	**Snsr 4 Name 9 & 10**
1552	0610	Shared Area 2	**Snsr 4 Name 11 & 12**
1554	0612	Shared Area 2	**Snsr 4 Name 13 & 14**
1556	0614	Shared Area 2	**Snsr 4 Name 15 & 16**
1558	0616	Shared Area 2	**Snsr 5 Name 1 & 2**
1560	0618	Shared Area 2	**Snsr 5 Name 3 & 4**
1562	061A	Shared Area 2	**Snsr 5 Name 5 & 6**
1564	061C	Shared Area 2	**Snsr 5 Name 7 & 8**
1566	061E	Shared Area 2	**Snsr 5 Name 9 & 10**
1568	0620	Shared Area 2	**Snsr 5 Name 11 & 12**
1570	0622	Shared Area 2	**Snsr 5 Name 13 & 14**
1572	0624	Shared Area 2	**Snsr 5 Name 15 & 16**
1574	0626	Shared Area 2	**Snsr 6 Name 1 & 2**
1576	0628	Shared Area 2	**Snsr 6 Name 3 & 4**
1578	062A	Shared Area 2	**Snsr 6 Name 5 & 6**
1580	062C	Shared Area 2	**Snsr 6 Name 7 & 8**
1582	062E	Shared Area 2	**Snsr 6 Name 9 & 10**
1584	0630	Shared Area 2	**Snsr 6 Name 11 & 12**
1586	0632	Shared Area 2	**Snsr 6 Name 13 & 14**
1588	0634	Shared Area 2	**Snsr 6 Name 15 & 16**
1590	0636	Shared Area 2	**Snsr 7 Name 1 & 2**
1592	0638	Shared Area 2	**Snsr 7 Name 3 & 4**
1594	063A	Shared Area 2	**Snsr 7 Name 5 & 6**
1596	063C	Shared Area 2	**Snsr 7 Name 7 & 8**
1598	063E	Shared Area 2	**Snsr 7 Name 9 & 10**
1600	0640	Shared Area 2	**Snsr 7 Name 11 & 12**
1602	0642	Shared Area 2	**Snsr 7 Name 13 & 14**
1604	0644	Shared Area 2	**Snsr 7 Name 15 & 16**
1606	0646	Shared Area 2	**Snsr 8 Name 1 & 2**
1608	0648	Shared Area 2	**Snsr 8 Name 3 & 4**
1610	064A	Shared Area 2	**Snsr 8 Name 5 & 6**
1612	064C	Shared Area 2	**Snsr 8 Name 7 & 8**

Decm	Hex	Type	Description
1614	064E	Shared Area 2	**Snsr 8 Name 9 & 10**
1616	0650	Shared Area 2	**Snsr 8 Name 11 & 12**
1618	0652	Shared Area 2	**Snsr 8 Name 13 & 14**
1620	0654	Shared Area 2	**Snsr 8 Name 15 & 16**
1622	0656	Shared Area 2	**Snsr 9 Name 1 & 2**
1624	0658	Shared Area 2	**Snsr 9 Name 3 & 4**
1626	065A	Shared Area 2	**Snsr 9 Name 5 & 6**
1628	065C	Shared Area 2	**Snsr 9 Name 7 & 8**
1630	065E	Shared Area 2	**Snsr 9 Name 9 & 10**
1632	0660	Shared Area 2	**Snsr 9 Name 11 & 12**
1634	0662	Shared Area 2	**Snsr 9 Name 13 & 14**
1636	0664	Shared Area 2	**Snsr 9 Name 15 & 16**
1638	0666	Shared Area 2	**Snsr 10 Name 1 & 2**
1640	0668	Shared Area 2	**Snsr 10 Name 3 & 4**
1642	066A	Shared Area 2	**Snsr 10 Name 5 & 6**
1644	066C	Shared Area 2	**Snsr 10 Name 7 & 8**
1646	066E	Shared Area 2	**Snsr 10 Name 9 & 10**
1648	0670	Shared Area 2	**Snsr 10 Name 11&12**
1650	0672	Shared Area 2	**Snsr 10 Name 13&14**
1652	0674	Shared Area 2	**Snsr 10 Name 15&16**
1654	0676	Shared Area 2	**Snsr 11 Name 1 & 2**
1656	0678	Shared Area 2	**Snsr 11 Name 3 & 4**
1658	067A	Shared Area 2	**Snsr 11 Name 5 & 6**
1660	067C	Shared Area 2	**Snsr 11 Name 7 & 8**
1662	067E	Shared Area 2	**Snsr 11 Name 9 & 10**
1664	0680	Shared Area 2	**Snsr 11 Name 11&12**
1666	0682	Shared Area 2	**Snsr 11 Name 13&14**
1668	0684	Shared Area 2	**Snsr 11 Name 15&16**
1670	0686	Shared Area 2	**Snsr 12 Name 1 & 2**
1672	0688	Shared Area 2	**Snsr 12 Name 3 & 4**
1674	068A	Shared Area 2	**Snsr 12 Name 5 & 6**
1676	068C	Shared Area 2	**Snsr 12 Name 7 & 8**
1678	068E	Shared Area 2	**Snsr 12 Name 9 & 10**
1680	0690	Shared Area 2	**Snsr 12 Name 11&12**
1682	0692	Shared Area 2	**Snsr 12 Name 13&14**
1684	0694	Shared Area 2	**Snsr 12 Name 15&16**
1686	0696	Shared Area 2	**Snsr 13 Name 1 & 2**
1688	0698	Shared Area 2	**Snsr 13 Name 3 & 4**
1690	069A	Shared Area 2	**Snsr 13 Name 5 & 6**
1692	069C	Shared Area 2	**Snsr 13 Name 7 & 8**
1694	069E	Shared Area 2	**Snsr 13 Name 9 & 10**
1696	06A0	Shared Area 2	**Snsr 13 Name 11&12**
1698	06A2	Shared Area 2	**Snsr 13 Name 13&14**
1700	06A4	Shared Area 2	**Snsr 13 Name 15&16**
1702	06A6	Shared Area 2	**Curr.Tool Name 182**
1704	06A8	Shared Area 2	**Curr. Tool Name 384**
1706	06AA	Shared Area 2	**Curr. Tool Name 586**
1708	06AC	Shared Area 2	**Curr. Tool Name 788**

7. Processor Programming

Programming the module from the processor involves sending the module a set of commands. Each command tells the module to perform a single action. As an example, a single action may be storing a new value for a parameter.

The module is fully programmable from the processor when the PE (Program Enable) is enabled. Passwords may be required in addition to, or instead of, Program Enable. The processor programs the module by sending commands through the output Registers assigned to the modules' slot. The module replies to the program command by sending status information back to the processor through the input Registers. These commands along with the published Memory Map give a PLC programmer complete access to the module.

8. Troubleshooting Table

Symptoms	Possible Causes
Unable to program unit parameters	1. Is the Program Enable Input (PE) false? (i.e., the voltage level at the customer VS+/VS- input is incorrect.) 2. Is the machine moving? Programming of several parameters (Program Number) is disabled if the resolver is turning faster than 3 RPM. 3. Have the required passwords been entered?
Program memory is changing by itself.	1. Has the tool number been changed to a different number? 2. Have proper grounding and shielding practices been applied? 3. Is the Program Enable input TRUE? While this will not cause the program to change itself Ñ keeping it FALSE when not actually programming the unit ensures that the memory cannot be programmed.
Outputs are shifting or turning ON/Off sooner then they should.	1. Programming speed compensation can cause the output to shift and turn the output On/Off sooner then its programmed value. 2. Remove or insert 0 in the speed compensation of this output to eliminate this effect.
Position and RPM readings are incorrect.	1. Is the resolver correclty wired? Follow the steps below for a quick check. a. turn power off to M7251 DPPLS unit. b. with terminal block (containing terminal 12-22) removed from unit, measure with ohm meter the following: term. 6 to term. 5 (R1 to R2) = 15 to 50 ohms term. 1 to term. 3 (S1 to S3) = 50 to 150 ohms term. 4 to term. 2 (S4 to S2) = 50 to 150 ohms
Broken wire bit in I/O status word.	1. Is the resolver cable properly grounded and shielded? Supply (VS+, VS-) less than 20 VDC? 2. Is resolver wiring correct ? Follow instructions for ohming out resolver wiring above.
Mechanical Zero drifts.	1. Is the mechanical resolver linkage loose? 2. Has the offset value been changed?
If all fails Ñ	Call AVG Technical Support @ 1 (800) TEC-ENGR

9. How to Order

Function Modules

ASY-M7251-DPLS ..... 3 Digit, 16 Outputs, Die Protect, programmable limit switch module (master)
ASY-S7251-DPLS ..... Slave (must be used with master PLS or Decoder)

I/O Modules

ASY-M7250-NN10 ..... N-Channel Sinking transistor outputs
ASY-M7250-NP10 ..... P-Channel Sourcing transistor outputs
ASY-M7250-NN11 ..... PowerPanel MF2 N-Channel I/O module
ASY-M7250-NN19 ..... PowerPanel MF2 N-Channel I/O module
ASY-M7250-N120 ..... PowerPanel N-Channel, CBus I/O module

Reference tables 4 and 5 on page 6 (section 3.3) of this manual to determine the I/O module type for your application.

Compatible Transducer/Resolvers

The M7251 DPPLS requires a single turn resolver as an input device, such as Autotech's RL100, RL101, RL500, RL501, E1R, E7R, E8R or E9R series of resolvers. Please see appropriate Position Transducer Manual (e.g., MAN-RPXDU-000, MAN-E1/9R-010, MAN-RL501-500) for complete ordering information on resolvers, cables, and appropriate accessories.

Cable *(See appropriate Position Transducer Manual for ordering cable)*

CBL-10T22-Cxxx ..... 22AWG, 10 conductor (5 twisted pairs) overall foil shielded cable, without connector. "xxx" length must be ordered as 010, 020,050 feet and increments of 50 feet, i.e. 100, 150, etc.)

CBL-10T22-Mxxx ..... 22 AWG, 10 conductor (5 twisted pairs) overall foil shielded cable, with 10 pin MS connector (ECM-10REC-ITT) on one end. "xxx" length must be ordered as 010, 020, 050 feet and increments of 50 feet (i.e., 100, 150, etc.)

WARRANTY

Autotech Controls warrant their products to be free from defects in materials or workmanship for a period of one year from the date of shipment, provided the products have been installed and used under proper conditions. The defective products must be returned to the factory freight prepaid and must be accompanied by a Return Material Authorization (RMA) number. The Company's liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company's option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Autotech Controls harmless from, defend, and indemnify Autotech Controls against damages, claims, and expenses arising out of subsequent sales of Autotech Controls' products or products containing components manufactured by Autotech Controls and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or subcontractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.No warranties expressed or implied are created with respect to The Company's products except those expressly contained herein. The customer acknowledges the disclaimers and limitations contained and relies on no other warranties or affirmations.

CAUTION

Autotech Controls' products are carefully engineered and rigorously tested to provide many years of reliable operation. However, any solid-state device may fail or malfunction sometime. The user must ensure that his system design has built-in redundancies if Autotech Controls' product is being used in applications where a failure or malfunction of the unit may directly threaten life or cause human injury. The system should be so designed that a single failure or malfunction does not create an unsafe condition. Regularly scheduled inspections, at least once a week, should be made to verify that the redundant circuits are fully functional. All faults should be immediately corrected by repair or replacement of the faulty unit. In addition, the user may have to comply with OSHA, ANSI, state or local standards of safety. The user of Autotech Controls' products assumes all risks of such use and indemnifies Autotech Controls against any damages.

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