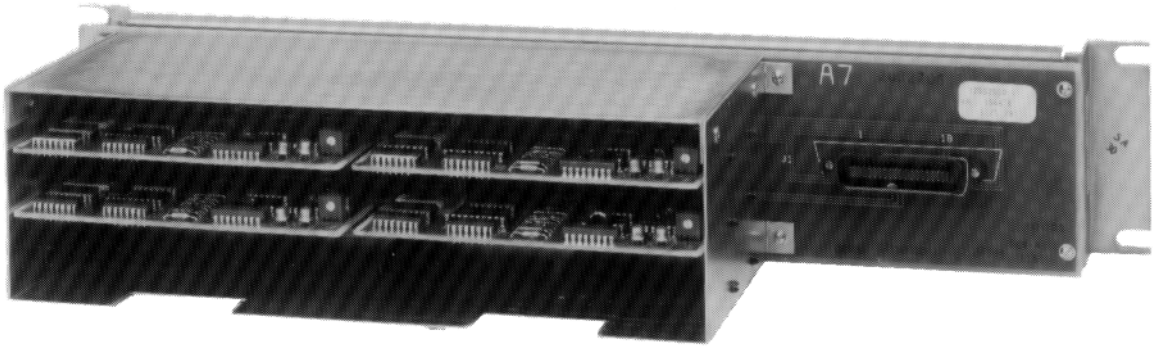
Output Holder for MOD 30ML™ **Application Guide**

Description and Application of
1726F Output Holder



MicroMod
AUTOMATION

MicroMod Automation, Inc.

The Company

MicroMod Automation is dedicated to improving customer efficiency by providing the most cost-effective, application-specific process solutions available. We are a highly responsive, application-focused company with years of expertise in control systems design and implementation.

We are committed to teamwork, high quality manufacturing, advanced technology and unrivaled service and support.

The quality, accuracy and performance of the Company's products result from over 100 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology.

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△ **Warning.** An instruction that draws attention to the risk of injury or death.

✎ **Note.** Clarification of an instruction or additional information.

Caution. An instruction that draws attention to the risk of the product, process or surroundings.

i **Information.** Further reference for more detailed information or technical details.

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1. Warning Labels on containers and packages must be observed.
2. Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given or injury or death could result.
3. Normal safety procedures must be taken to avoid the possibility of an accident occurring when operating in conditions of high
4. pressure and/or temperature.
5. Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
6. When disposing of chemicals, ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual may be obtained from the Company address on the back cover, together with servicing and spares information.

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INTRODUCTION

SCOPE

This book is one of a series that discusses the application of MOD 30ML™ to commonly encountered process control loops. This book discusses use of the 1726F Output Holder with the MOD 30ML controller.

The primary purpose of this document is to identify the function of the output holder, how to connect an output holder card to the MOD 30ML Controller and how the output holder compound strategy interfaces with the hardware. Connection diagrams and list are supplied to show how the 1726F Output Holder is connected to the MOD 30ML.

FIRMWARE VERSIONS

The process examples in this book are applicable to all firmware versions of the instruments.

RELATED INFORMATION

Before actually configuring an instrument, you should be familiar with the information contained in the following publications:

- IB-1800R-OPR - MOD 30ML Multiloop Controller Operation Guide
- IB-1800R-APP - MOD 30ML Functions Data Base Reference Guide
- IB-1800-INS - MOD 30ML Multiloop Controller Installation Guide
- IB-1800-M30 - MOD 30ML Multiloop Controller Replacement for MOD 30 Instruments Installation Guide

TECHNICAL SPECIFICATIONS

Output Holder Panel 1725F

Width - 19-inches (483-mm)	Weight - 4 lbs. 9-1/2 oz. (2.08 kg) max.
Depth - 6-inches (153-mm)	Panel Capacity - 6 Output Holders
Height - 3-1/2-inches (89-mm)	

Output Holder Card 1726F

Analog Input

Span (0 to 100%)	4 to 20mA
Lower Limit	2.72mA
Upper Limit	21.28mA

Analog Output (I OUT)

Span (0 to 100%)	4 to 20mA
Lower Limit (-8%)	2.72mA
Upper Limit (+ 108%)	21.2BmA

Current Return (I RETURN)

Span (0 to 100%)	1 to 5mA
Lower Limit (- 8%)	0.68mA
Upper Limit (+ 108%)	5.32mA

Calibrated Accuracy (% of span)

I OUT, Run Mode (with respect to analog input)	± 0.5% max.
I OUT, Hold Mode (with respect to run mode analog input)	± 1.0% max.
I RETURN, Run Mode (with respect to analog input span)	± 0.7% max.
I RETURN, Hold Mode (with respect to run mode analog input span)	± 1.2% max.

Input/Output Characteristics

Analog Input Resistance	250 ohms typical
Analog Output (I OUT) Resistance	50k ohms min.
Open Circuit Output Voltage	24V dc max.
Output Ripple (100kHz)	1 % peak

Analog Output Load Capability

Resistance	800 ohms max.
Capacitance	10 uF max.
Inductance	10 H max.

Power Supply Requirements

Normal Operating Range	23V dc to 28V dc
Allowable Operating Range	16V dc to 28V dc
Allowable Ripple	1.0V P-P
Maximum Current	85mA dc

Environmental Requirements

Operating Temperature	+ 41°F (+ 5°C) to 122°F(50°C)

Physical Characteristics

Width	5-1/2-in. (140-mm)
Depth	4-3/8-in. (111-mm)
Height	13/16-in. (21-mm)
Weight	0.2 lbs. (85.5g)

OUTPUT HOLDER PURPOSE

GENERAL

For safe operation some processes require that valve position be maintained above a closed position even when a controller might be removed for service or replacement. The Output Holders task is to identify a controller output fault and to maintain the last good value to the field control device for safe operation. When the controllers output signal to the output holder is restored and again valid the output holder must return control of the field device to the controller. Under normal operation i.e.; the controllers output is good, the controllers output is passed through the output holder to the field control device unaffected.

From the example above, it can be understood that if an output holder has taken control of a field device signal due to a controller being removed, when the controller is replaced there could be a “bump” to the control valve if the controllers output is not first brought equal to or “synchronized” to that of the output holder. To prevent this bump from happening the controller must first be aware of the output holders output value and make its output equal to it before the controller can turn its output on.

The MOD 30ML Output Holder Compound strategy demonstrated in this document is designed to identify that an output holder exists in the controllers output circuit and how to synchronize its output value to that of the output holders output prior to turning the controllers output on.

The 1726F Output Holder card can be used on as many as three MOD 30ML control loops.

1726F THEORY OF OPERATION

Figure 1 shows a block diagram of the 1726F Output Holder operation.

The controllers output is fed into the output holder as a 4-20 milliamp signal where it is converted to a 1-5 Vdc value by the I/V Converter circuit. This signal is then fed to the Analog MUX, Input Monitor and Input Conditioner circuits.

The Input Monitor circuit compares the input signal to a low limit of -8%. The result of this block is a “Run/Hold” selection signal which is used by the Analog MUX circuit to select the controllers output or hold value as the value to be sent to the field.

The Up/Down circuit compares the controllers output as conditioned by the Input Conditioner circuit to that of the hold value. Its resultant signal causes the Up/Down Counter to either increment or decrement its count based on whether the controllers input is higher or lower than that of the hold value. The goal is maintain the hold value equal to that of the controller output during normal operation.

The Clock Control circuit gates the Clock signal through to the clock input of the Up/Down Counter. When the Analog MUX selects the hold value as the value to be sent to the field then the Clock Control circuit blocks the clock pulses from reaching the Up/Down Counter, thereby causing the hold value to become steady. While the controllers output

Output Holder Purpose

value is being sent to the field the Clock Control permits the clock pulses to reach the D/A Converter causing it to float with the controllers output value.

The Up/Down Counter counts clock pulses and either increments or decrements the count value at its parallel output.

The D/A Converter receives the counters value and converts it to a 1-5 Vdc signal. This value is in turn sent to the Analog MUX circuit through the Output Conditioning circuit.

The V/I Converter circuit converts the 1-5 Vdc signal to 4-20 milliamp output and 1-5 milliamp Return signals to be used by the field and controller respectively.

The Return line is sent back to the controller and is used to synchronize its output to that of the output holder in order to cause bumpless transfer when a controller is first brought on line.

The Sense line is generated on the output holder card and is nothing more than a dc common. This signal is sent back to the controller and is used to determine if an output holder card is present.

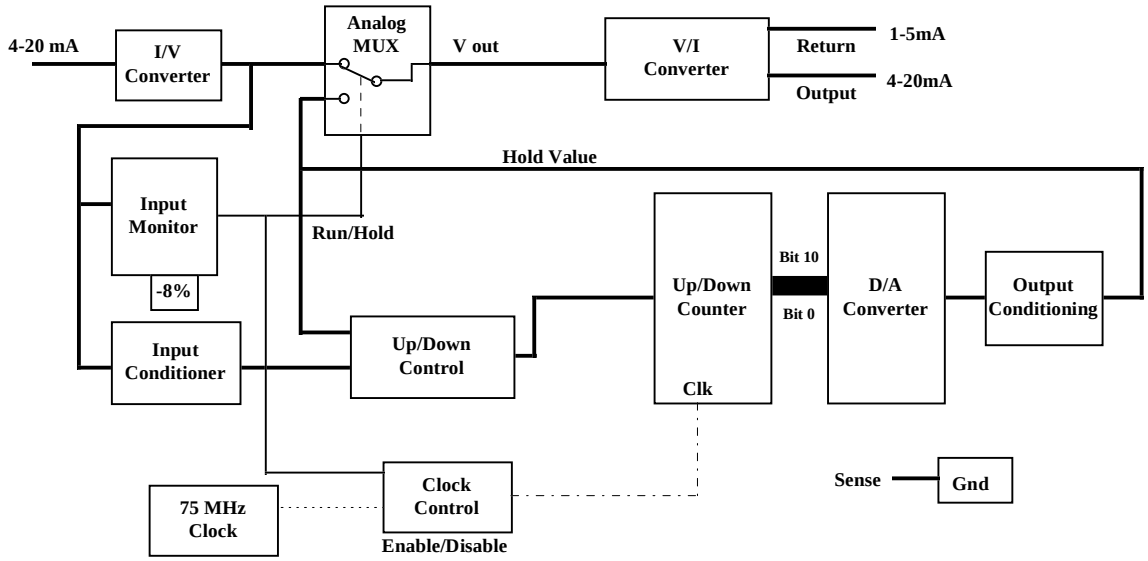

Figure 1. Basic Functional Block Diagram

WIRING & CONNECTIONS

Figure 2 provides a generic reference as to the signal paths between the controller and the 1726F Output Holder card. Table 1 provides a complete output holder wire color and signal listing as viewed from the 1751FZ output holder cable. This is required to provide detailed wire connection for multiple output holder applications to a single controller.

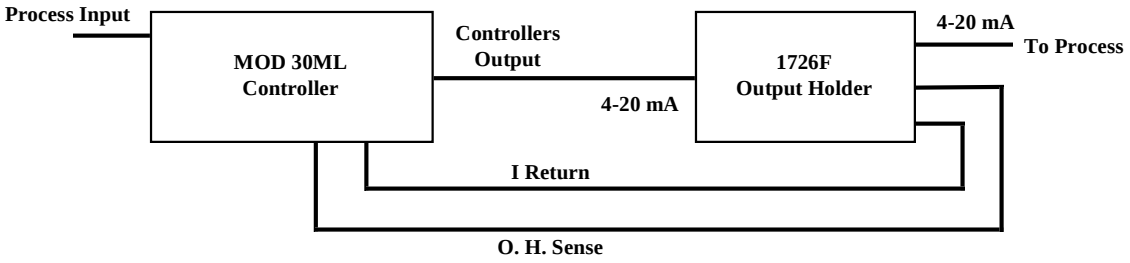

Figure 2. Generic Output Holder Connection Diagram

For the Sense and Return signals to be received by the MOD 30ML Controller two inputs are required. The input types are:

- non 2-wire current input
- digital input (2006AZ)

The current input is used for the Return signal and is configured for 1-5 milliamps. The 2006AZ digital input module is used to bring in the Sense signal.

The exact wire connections for a particular MOD 30ML Controller output holder application depend on how many outputs are being held and where the Sense and Return I/O points for each loop are located on the controller. If Built In Analog Input #2 is not being used for control it may be set up for 1-5 milliamps non 2-wire and used to bring in the Return signal. In all cases the Sense signal will require the installation of a 2006AZ digital input module.

Output Holder Purpose

Table 1. Output Holder Cable Wire Definitions

Twisted Pair #	Colors	P1 Conn. Pin #	Connection	Note
1	wht	1	O.H.#3 sense	
	blu	19	O.H.#3 return	
2	wht	2	O.H.#3 input	
	org	20	O.H.#3 output	
3	wht	3	O.H.#3 24Vdc	
	grn	21	O.H.#3 ckt. common	1
4	wht	4	O.H.#2 sense	
	brn	22	O.H.#2 return	
5	wht	5	O.H.#2 input	
	slate	23	O.H.#2 output	
6	red	6	O.H.#2 24Vdc	
	blu	24	O.H.#2 ckt. common	1
7	red	7	O.H.#1 sense	
	org	25	O.H.#1 return	
8	red	8	O.H.#1 input	
	grn	26	O.H.#1 output	
9	red	9	O.H.#1 24Vdc	
	brn	27	O.H.#1 ckt. common	1
10	red	10	O.H.#6 sense	
	slate	28	O.H.#6 return	
11	blk	11	O.H.#6 input	
	blu	29	O.H.#6 output	
12	blk	12	O.H.#6 24Vdc	
	org	30	O.H.#6 ckt. common	1
13	blk	13	O.H.#5 sense	
	grn	31	O.H.#5 return	
14	blk	14	O.H.#5 input	
	brn	32	O.H.#5 output	
15	blk	15	O.H.#5 24Vdc	
	slate	33	O.H.#5 ckt. common	1
16	yel	16	O.H.#4 sense	
	blu	34	O.H.#4 return	
17	yel	17	O.H.#4 input	
	org	35	O.H.#4 output	
18	yel	18	O.H.#4 24Vdc	
	grn	36	O.H.#4 ckt. common	1

Note:
1. Be sure this is common with the controllers DC common.

MOD 30ML APPLICATION

GENERAL

Figure 3 shows a block diagram of the output holder compound strategy. This strategy contains the PID, display and I/O for one loop. When using this compound you will be required to complete a few strategy changes to make it fit your application. These changes are outlined in **Loading the Compound**.

The purpose of the output holder compound is to cause the control loop output to synchronize its output to that of the output holder before turning its field output on. This will in turn cause a bumpless transfer. This happens only when the controller first initializes at power up.

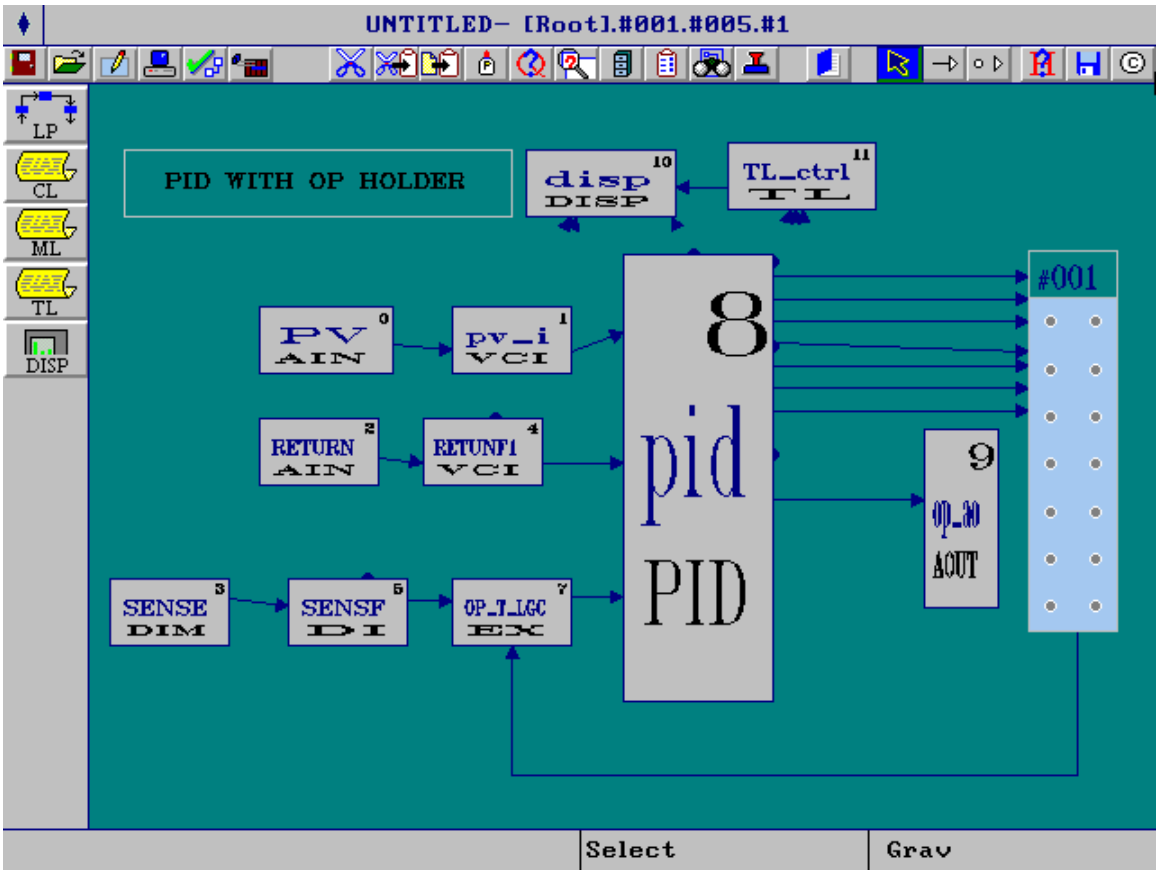

Figure 3. Output Holder Compound

LOADING THE COMPOUND

The following procedure assumes that the Application Builder is open, you are in a Loop Block and the output holder compound is located in the compounds directory of the Application Builder.

To load the output holder compound (PID_OPH.CSM):

1. Select the Compounds icon  located at the top of the screen using the right mouse key (see Figure 1).

2. Select Load 

from the Compounds menu. A directory menu will appear. If the output holder compound has been saved in the compounds directory of the Application Builder you should select that directory now. Otherwise select the drive or directory that the output holder compound is located in.

3. Double click on the output holder compound (PID_OPH.CSM) to load it in your strategy.

4. Answer NO to the question “Do you wish to retain block occurrence numbers”. You should now have a block on your screen that is labeled “CPD”.

5. Select the CPD block once to high-light the block. Select the Query icon  and then select the block again. Enter a loop name in the “Block Tag” field. Click “enter” to save it.

6. Double click on the block to open it. Figure 3 shows what the output holder with PID loop strategy looks like.

7. Double click on the DISP block and enter your tag in the “Display Tag” field and then select “enter” from the DISP block to save it. This same tag name must be entered in the DIF block.

8. Click the blue diamond  in the upper left hand corner of the screen twice to move up two levels.

9. Double click on the DIF block to open it.

10. Click once on the “Edit Display List” arrow. The program will open to a text editor. Type in the tag name that you placed in the DISP block display tag field (Step 7). It must be in quotation marks and be typed exactly like it appears in the DISP block. An example is as follows; “TIC-100”;. Be sure to include the semi-colon at the end of the tag name. Select “Exit” from the “File“ menu and save the text file. Exit the DIF block by selecting “Enter”.

11. Make the “RUNINIT” connection between the IF block and the output holder compound block before returning to the loop compound. To do this select the connection tool  at the top of the screen and select “RUNINIT” from the IF connection block. Complete the connection by selecting the oval loop compound. A

menu will appear with the tag name you gave the output holder compound. Select that tag and hit "OK". A new menu will appear with the attribute "RUNINIT" in it. Select "RUNINIT". The connection is now complete. Release the connection tool by clicking the right mouse key.

12. Double click on the oval loop block to return to the compound block. Enter all of the necessary engineering values in the Input Conditioning and PID blocks.

NOTE: Caution must be exercised if reassigning I/O in the output holder strategy. The execution order for the blocks of this strategy are specific for the configuration to work properly. Table 2 shows an example of block execution order.

Table 2. Block Execution Order

Tag Name	Type	Exec	Occur
PV	AIN	0	1
pv_i	VCI	1	1
RETURN	AIN	2	2
SENSE	DIM	3	1
RETURNF1	VCI	4	2
SENSF	DI	5	1
#001	CIB	6	0
OP_T_LGC	EX	7	1
pid	PID	8	1
op_ao	AOUT	9	1
disp	DISP	10	1
TL_ctrl	LT	11	1
Notes	DESC	12	0

Note that the process variable input, Return input, Sense input, and OP_T_LGC expression block must run prior to the PID block. The Return and Sense inputs must run prior to the OP_T_LGC expression block. The PID block must run prior to the analog output. If using the PID and Output Holder compound and making new I/O assignments, be sure the block execution order is as shown in Table 2.

Block execution order can be altered using the Execution/Occurrence tool  located on the top menu, left side.

1. Click once on the  tool and select "manual". A table will appear that shows the execution order and occurrence numbers.

2. Change the block execution order by selecting the execution order field next to the block you wish to change and entering the appropriate execution values. Remember that no two blocks can have the same execution order number. If you change one block to read an execution order number that is currently assigned to that of another block you must also change the original block with that number.

OUTPUT HOLDER COMPOUND THEORY OF OPERATION

When the instrument powers up the process value is read first followed by the Return and Sense inputs. The expression block “OP_T_LGC” is executed next with a result that becomes true when both the sense and run initialization inputs are true. The sense input will always be true when an output holder card is present. The run initialization input is true for only a moment when the instrument first powers up. The output of the expression block is connected to the track command input of the PID block. For this brief moment that the expression block output is true the PID block output will track the Return input connected to its track source. The PID block uses this output value until told to change based on automatic or manual manipulation. This PID output value is sent to the output block causing the output blocks output current to be equal to that of the Output Holder output.

The Return input block is set up to receive 1 to 5 milliamps. Its input conditioning block converts this to 0 to 100 as engineering units that correspond to the PID block output.

The initial value of the Sense input block and its corresponding input conditioning block are set to false. As well the output blocks initial value is also set to zero. This permits the output holder card to maintain control of the field device until the controllers output is synchronized to the output holders output.

The TL_ctrl” tune list permits front face changes of the P,I&D values.

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