Fuji Electric
Innovating Energy Technology

APPLICATION NOTE	FECA-AN-159

H-O-A with PID and a Potentiometer

Inverter type	Frenic-Eco, EcoPUMP, MEGA, Multi, Mini
Software version	All versions
Required options	---------
Related documentation	Related drive User's Manual
Author	Adam Flory
Date	04/17/2014
Revision	None

Introduction:

This application note will address the wiring and programming of a Frenic-(Eco/MEGA/MULTI/MINI) to operate from a 3 position Hand-Off-Auto switch. In Hand position the speed will be controlled by a 5KΩ potentiometer. In the Auto position the drive will operate under PID control following a 4-20mA transducer.

Addition information may be found in the User's Manual:

Frenic-MINI	MEHT530	http://www.americas.fujielectric.com/sites/default/files/MiniUM.pdf
Frenic-Multi	MEHT531	http://www.americas.fujielectric.com/sites/default/files/Multi%20User%20Manual%20MEHT531.pdf
Frenic-Eco	MEH522a	http://www.americas.fujielectric.com/sites/default/files/Eco%20User%20Manual%20MEHT532.pdf
Frenic-MEGA	MEHT536	http://www.americas.fujielectric.com/sites/default/files/MEGA%20User%27s%20Manual%20MEHT536.pdf

Wiring:

The regulator sensor with a 4-20mA output is to be connected as follows:
1) Connect drive terminal **PLC** (24VDC) to the sensor's red lead or terminal **1** (**+**)
2) Connect drive terminal **C1** (+) to the sensor's black lead or terminal **2** (**-**)
3) Connect a wire jumper between drive terminals **11** and **CM**

The 3 position switch to control operation is to be wired as followed:
1) Connect the switch in a manner that will close the connection between **FWD** and **CM** when in the **Auto** position.
2) Connect the switch in a manner that will close the connections between **FWD** and **CM,** as well as closes the connections between **X2** and **CM.**

The 5KΩ potentiometer is to be wired as followed.
1) Connect the wiper terminal (usually the center wire) of the potentiometer to drive terminal **12**.
2) Connect the high terminal of the potentiometer to terminal **13** of the drive (10.5 VDC power supply). Connect the low terminal of the potentiometer to terminal **11** of the drive (analog common). The wires on **11** and **13** may be swapped to change the operating direction of the potentiometer. *Make sure drive terminal 12 is connected to the wiper*.

Function Codes

The following table displays the parameters that need to be set in the drive to operate PID control using the keypad to set the command (target) value, and 4-20mA feedback signal.

Code	Setting	Description
F01	**1** - Voltage input on terminal 12	Potentiometer speed control in hand mode
F02	**1** – Terminal command **FWD**	Operate in the forward direction when contacts between FWD and CM are closed
F11	**FLA** set to AMP rating of the motor. Typically found on the motor's nameplate	Overload protection for the motor.
E02	**20** – X2 function HZ/PID control	Cancel PID control when contacts between X2 and CM are closed
E40	Highest value of sensor range	PID Coefficient A
E41	Lowest value of sensor range	PID Coefficient B
E43	**10** – for PID process command (SV) 12 – for PID feedback (PV) 14 – for PID output (MV)	LED Monitor (Item Selection)
E62	**5** – PID feedback value	Analog Input Terminal C1 Function Selection
J01	**1** – for normal operation (typically used) 2 – for inverse operation	PID Control Mode
J02	**0** – keypad process command	PID Process Command (how to set target value)
J03	**5** (*)	P – Proportional Gain
J04	**1** second (*)	I – Integral Time

(*)Note: These are initial settings and will need to be adjusted to provide optimum performance per the actual system characteristics and desired response. Changes should be made gradually as you will want to have stable operation with the maximum regulation; excessive settings could result in unstable operation.

Data subject to change without notice

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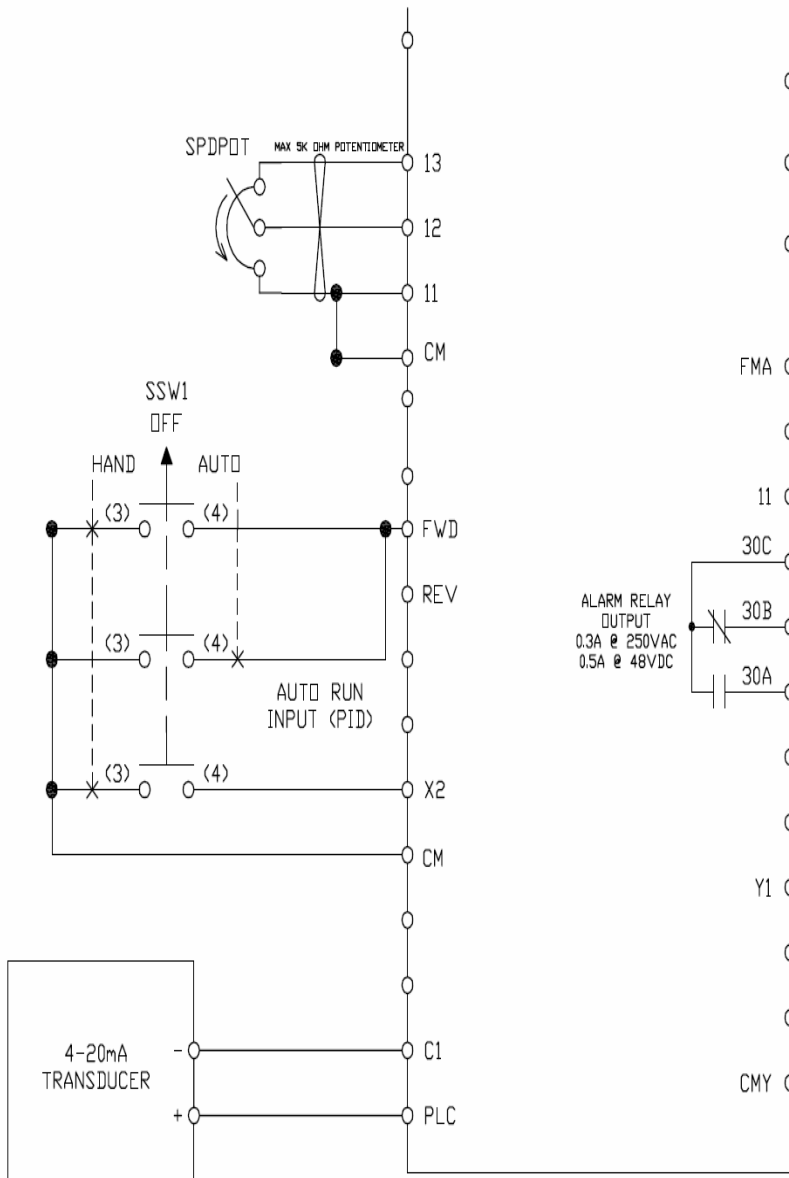
F01	1
F02	1
F11	FLA^{*1}
E02	20
E40	A^{*2}
E41	B^{*3}
E43	10
E62	5
J01	1^{*4}
J02	0
J03	5.0^{*5}
J04	1.0^{*5}

*1 F11 IS THE FLA VALUE OF THE MOTOR
*2 E40 IS THE HIGH VALUE OF THE CUSTOMER SUPPLIED TRANSDUCER
*3 E41 IS THE LOW VALUE OF THE CUSTOMER SUPPLIED TRANSDUCER
*4 J01 SET AS "1" IS FOR NORMAL OPERATION. SET J01 TO A "2 FOR INVERSE OPERATION
*5 J03 AND J04 ARE SUGGESTED BENCHMARK VALUES AND MAY ADJUSTED FOR DESIRED OPERATION.

NOTE:

"AUTO" USES A PID TRANSDUCER WITH A 4-20mA SENSOR OUTPUT
TRANSDUCER IS TO BE WIRED TO VFD TERMINALS "C1"(-) & "PLC"(+) AND GROUNDED WHEN NECESSARY
USE A JUMPER WIRE TO CONNECT "11" TO "CM"

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