EMERSON
Industrial Automation

Application Note
CTAN #230

The Application Note is pertinent to the Unidrive Classic Family

Zero Speed Reference Start Interlock

Background

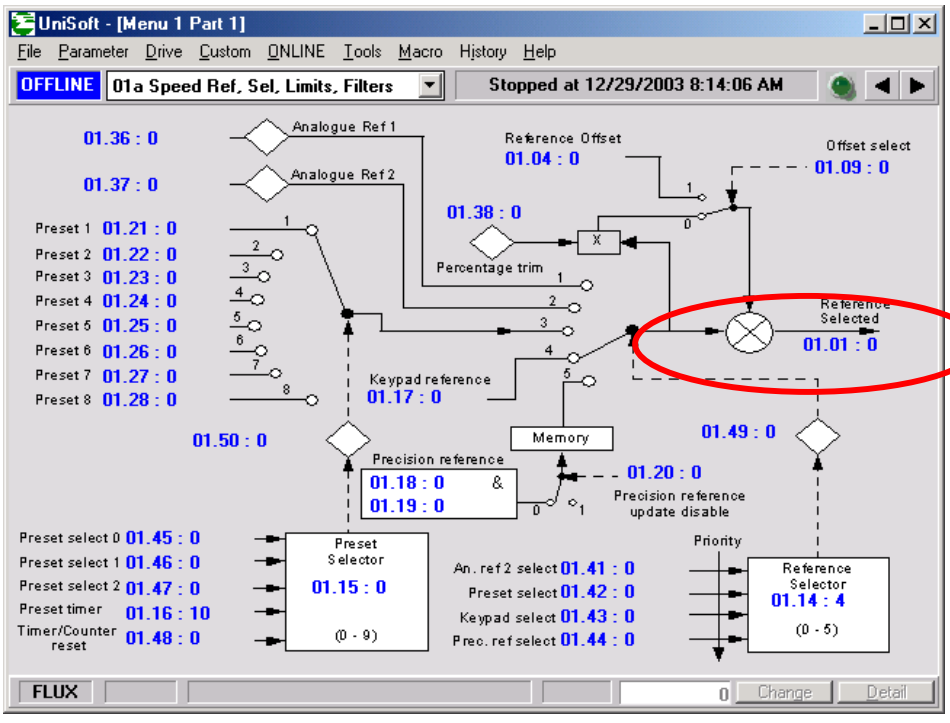
For many applications it is desirable to prevent the drive from being started if the speed reference (typically a Speed Pot) is not at 0 or its minimum setting. In the old days this was accomplished by purchasing a pot that had a switch built into it. In this manner, the drive Start button would not make it through to the drive Start input unless this switch on the pot was closed (which would occur if the pot was turned down to zero).

A similar function can be configured within the Unidrive by employing some of the free programmable functions. This application note will discuss how to achieve the Zero Speed Reference Start Interlock function.

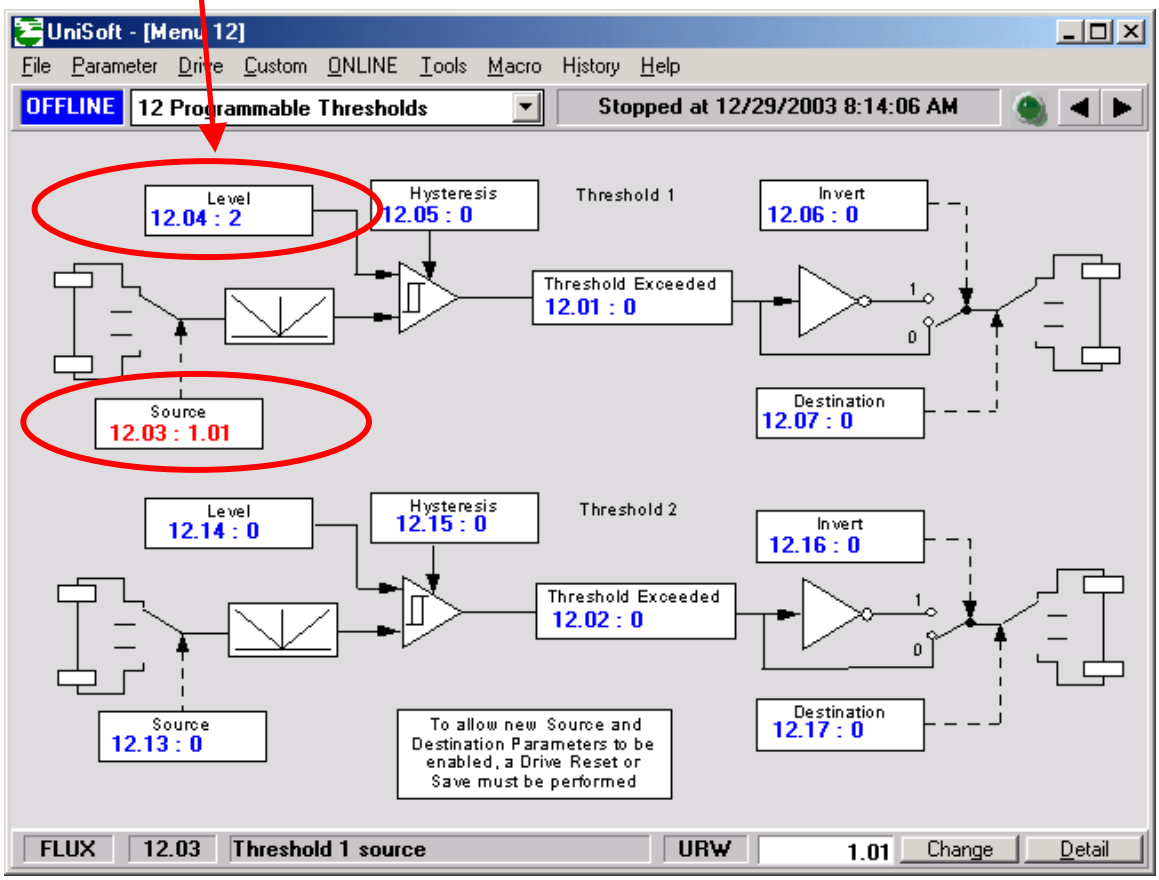
Implementation

The first thing we must do is create a logic bit that will become active when the Speed Reference is near zero. This can be accomplished by using one of the built-in Magnitude Comparators located in menu 12.

The Speed Reference can be read at location #1.01.



So we would set one of the Magnitude Comparators to watch #1.01 and change its state (which can be observed in #12.01) when #1.01 exceeds the % amount placed into the Level setpoint.



The next thing we need to create is an AND function that makes an output when the :

Speed Reference is at (or near 0) <u>AND</u> the Drive is Commanded to Start

The can be accomplished by intercepting the drive Start Input and ANDing it with #12.01 from above.

Important

By the way, it should be noted that **the Zero Speed Reference Start Interlock function should only be implemented when the Drive is set up to have a 3-Wire Start/Stop circuit** as shown below.

A 2-wire On/Off switch type setup is somewhat unsafe with Zero Reference Interlock schemes because, one might flip the RUN switch, but with the Reference not at zero the drive won't actually start but it would be armed and ready however. If one were to step away and come back to the drive at a later time, the drive would still be armed. If the speed pot were taken to zero, the drive would suddenly become active by movement of the speed pot. It is normally considered bad practice to turn a drive on with a Speed pot.

A 3-wire scenario offers much more in the way of safety, because the drive will not come on until the Start button is depressed and (with Zero Reference Interlock) the speed reference is at (or near) zero.

The factory default for the Unidrive is for RUN input to be at terminal 27 which would also typically be for a 2-wire situation. We can make some slight configuration changes to utilize this input pin for our START input.

However, we need to assign a STOP input.

If we did not need an external/Remote Fault Reset pushbutton we could use pin 25. In this example I elected to use pin 29 as I did not need a Local/Remote reference select function. So we can make this the STOP input.

Unidrive Parameter Help Guide

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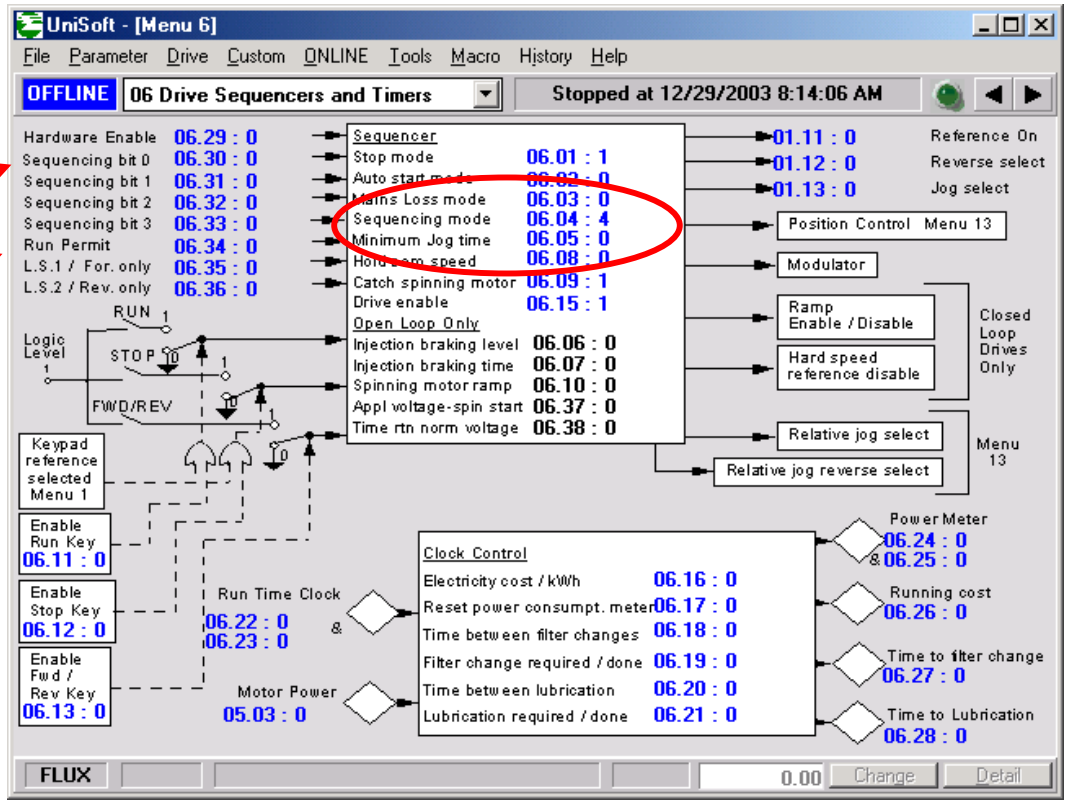
Unidrive Terminal Connections

21	Reserved.	
22	+24V supply.	
23	0V digital.	
24	**(F1)** Digital input / output 1. *At-speed outut (open loop)* *Zero Speed (closed)*	08.10, 08.12
25	**(F2)** Digital input / output 2. *RESET input*	08.13, 08.15
26	**(F3)** Digital input / output 3. *JOG Select input*	08.16, 08.18
27	**(F4)** Digital input 1. *RUN FORWARD input*	08.19
28	**(F5)** Digital input 2. *RUN REVERSE input*	08.21
29	**(F6)** Digital input 3. *Local/Remote select input*	08.23
30	External Trip (open loop) Enable (closed loop)	

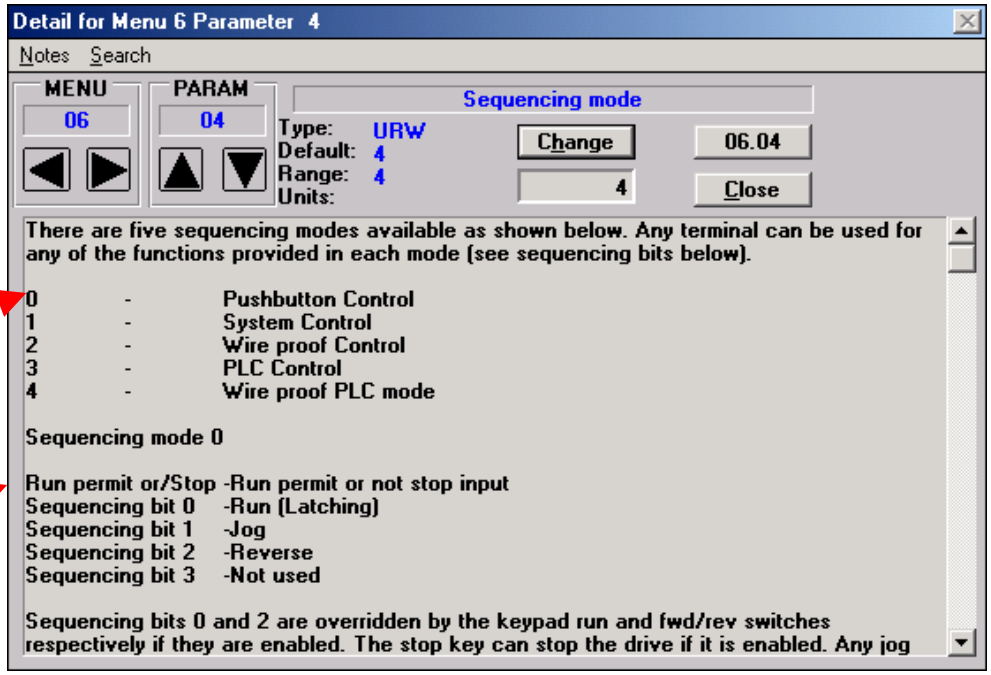
In order to set up for a 3-wire Start/Stop (latching) situation, we must set up the Sequencing Mode parameter #6.04. It is defaulted to a 4 which is a 2-wire non-latching situation.

RUN

STOP



Mode 0 should work well for our 3-wire (latching) needs. Note that **START** will be Sequencing Bit 0 and the **STOP** will be by **RUN PERMIT**.



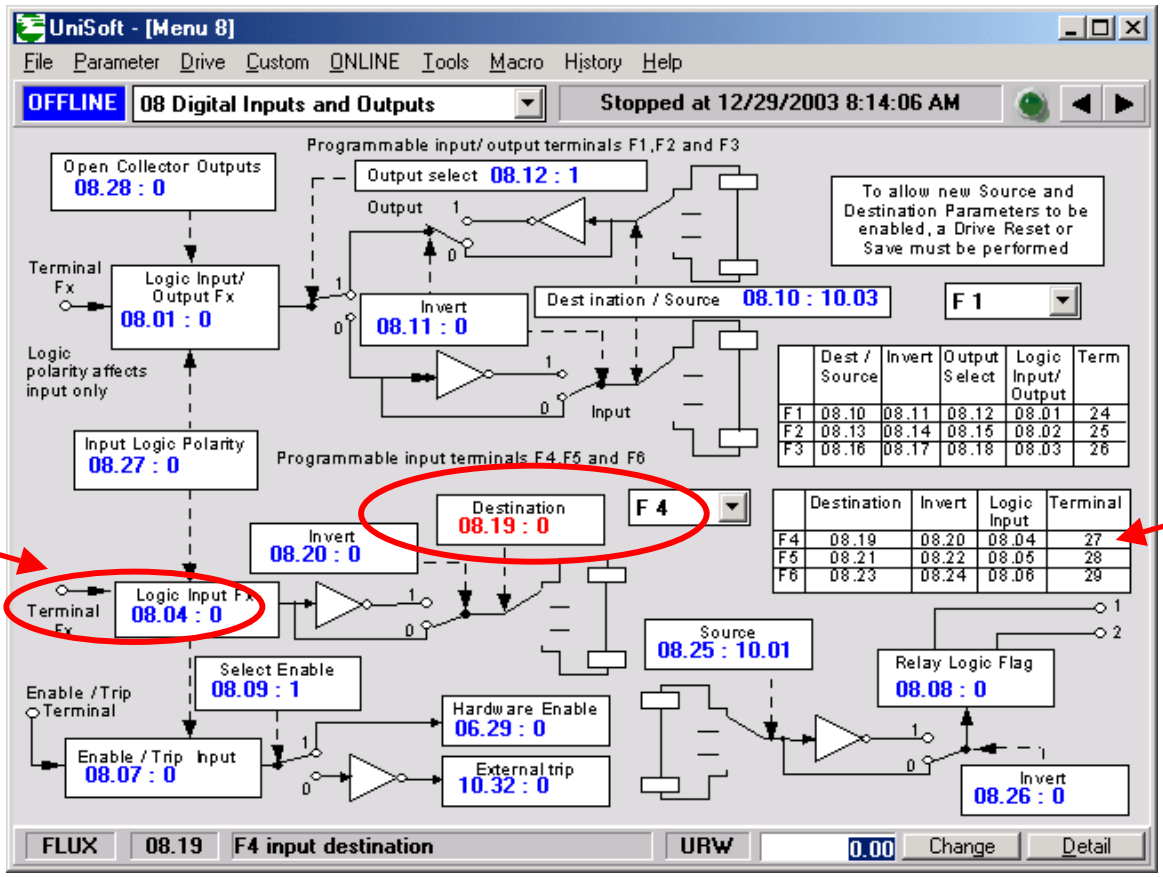
Input Assignments

As far as actual input assignments we need to do 2 things:

1) Un-assign the RUN assignment coming in on pin 27 being directed to Sequencing bit 0 – parameter #6.30.
2) Direct the selected input for STOP to the RUN PERMIT bit #6.34

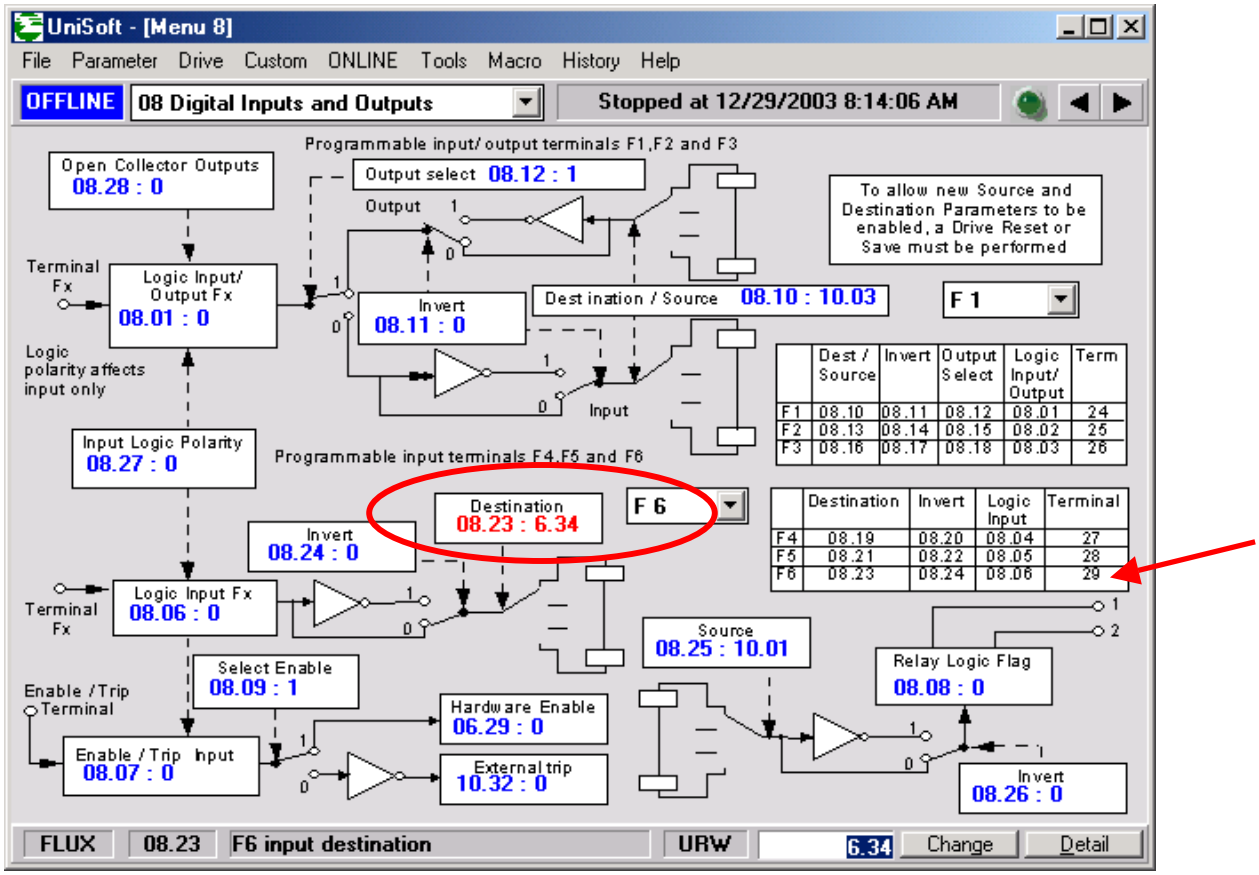
This is easier shown on the Menu 8 diagram. Pin 27 is referred to as the F4 input and its default destination was #6.30. To un-assign this destination you would enter a 0.00 into #8.19.

START bit



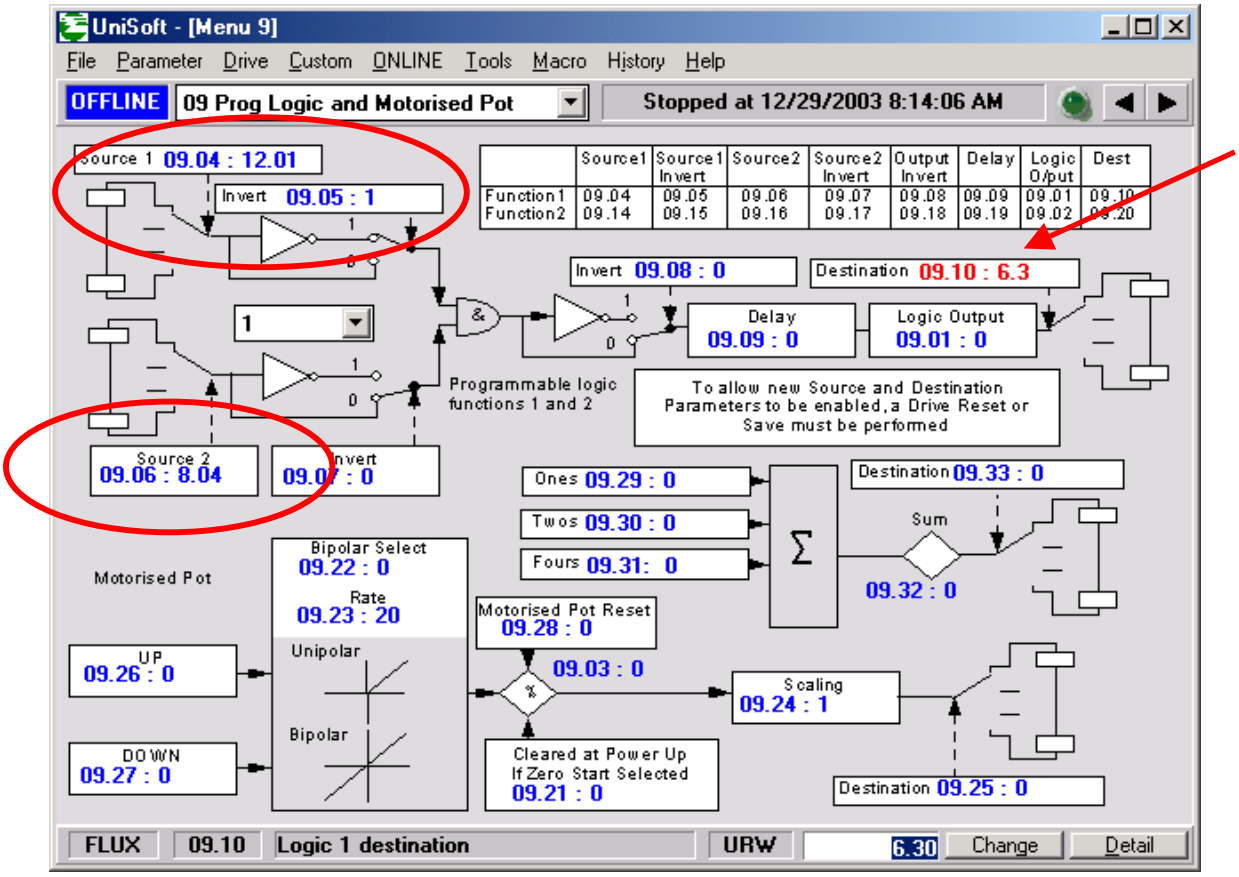
Input Assignments-con't

Now to get the STOP input assigned (really RUN PERMIT), we decided to use pin 29 of F6. So we would direct that input to #6.34.



The Final ANDing

All that should be remaining is to create the actual **AND** function as described earlier. We will go get the result of the Magnitude Comparator #12.01 then AND it with the START bit from #8.04 . Keep in mind that the Comparator #12.01 will indicate a 1 when the Speed Reference is greater than the Level Setpoint in #12.04. we need the opposite. We want a 1 when the Speed Reference is near or equal to 0. Therefore, we will invert the input associated with #12.01.



The result of this AND'd function can now be directed to cause a "latched" RUN by directing to #6.30.

A summary of settings for this scenario based on the inputs selected in this example are shown below.

Parameter	Value	Description
#12.03	1.01	Look at Speed Reference
#12.04	2-5	Comparator Level Setting – adjustable as required
#6.04	0	Sequencing Mode for Pushbutton Controls - latching
#8.19	0.00	Un-Assign the original destination of 6.30 RUN
#8.23	6.34	Assign pin 29 F4 to RUN PERMIT to become our /STOP
#9.04	12.01	Get the result of the Comparator
#9.05	1	Invert the result of the Comparator
#9.06	8.04	Get the START input request from pin 27 F4 input
#9.10	6.30	Direct the AND result to the RUN sequence bit 0

After entering parameters perform a Store.

Questions ?? Ask the Author:

Author: **Ray McGranor** **e-mail :** ray.mcgranor@emersonct.com
(716)-774-0093