First-Out Annunciation with the NXF4000

Carlo Zaskorski, Product Manager

The 15 digital inputs on the NXF4000 can be used as a first-out annunciator if wired and programmed properly. Typically, not all digital inputs are available as some may be used for other dedicated features such as valve proving, airflow switch and fuel valve end switch. Usually at least ten digital inputs will be available for first-out annunciation. Both the recycle and non-recycle limits can be annunciated.

Two relays must be added to the wiring for this method to work. One relay is connected to the end of the non-recycle limits. The other is an off-delay timer with a control signal. This type of timer will close the contacts whenever there is voltage on the control signal input (trigger). Removing the trigger voltage will keep the contacts closed for the duration of the setpoint before opening. The normally open contacts of the relay added will be used to turn the timer trigger on. The normally open contacts of the timer will complete the non-recycle limit circuit "3-P" (P15-4 to P5-10).

The setpoint of the timer should only be one second. The purpose of this timer is to delay the opening of the non-recycle limit input P5-10 very briefly so that the correct digital input reverts the unit to standby or triggers a lockout before a general LOST P5.10 INPUT lockout is issued.

The message shown while in standby or lockout will be FORCED iXX, with XX representing the digital input number. This allows for determining which specific limit is open. See examples of the messages below.

STANDBY	s01
FORCED	i01
SETPOINT 1	100psi
PCV VALUE	53psi

Message while in standby. FORCED i01 represents the limit LOW WATER AUTO RESET.

<FAULT HISTORY	
FAULT REPETITION	0
*** ALARM #	71 ***
FORCED i06	

Message when locked out. FORCED i06 represents the limit HIGH PRESSURE.

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METHOD OF CONTROL

The digital inputs have an option called GENERIC that can be used to hold the control in standby (recycle limits) or trigger a lockout (non-recycle limits) when the input state is 0 (OFF).

It is important to note that in the microprocessor, the inputs are scanned in order from DI1 to DI15. Since all the recycle and non-recycle limits are in series, wiring the first-out annunciation should begin with DI1 for the first recycle limit. The last non-recycle limit should be connected to the highest value digital input used for annunciation. The burner control switch should also be connected to a dedicated input.

Reserve all the highest inputs from DI15 in reverse order for other dedicated functions such as airflow switch, airflow switch check, valve proving and/or fuel valve end switches.
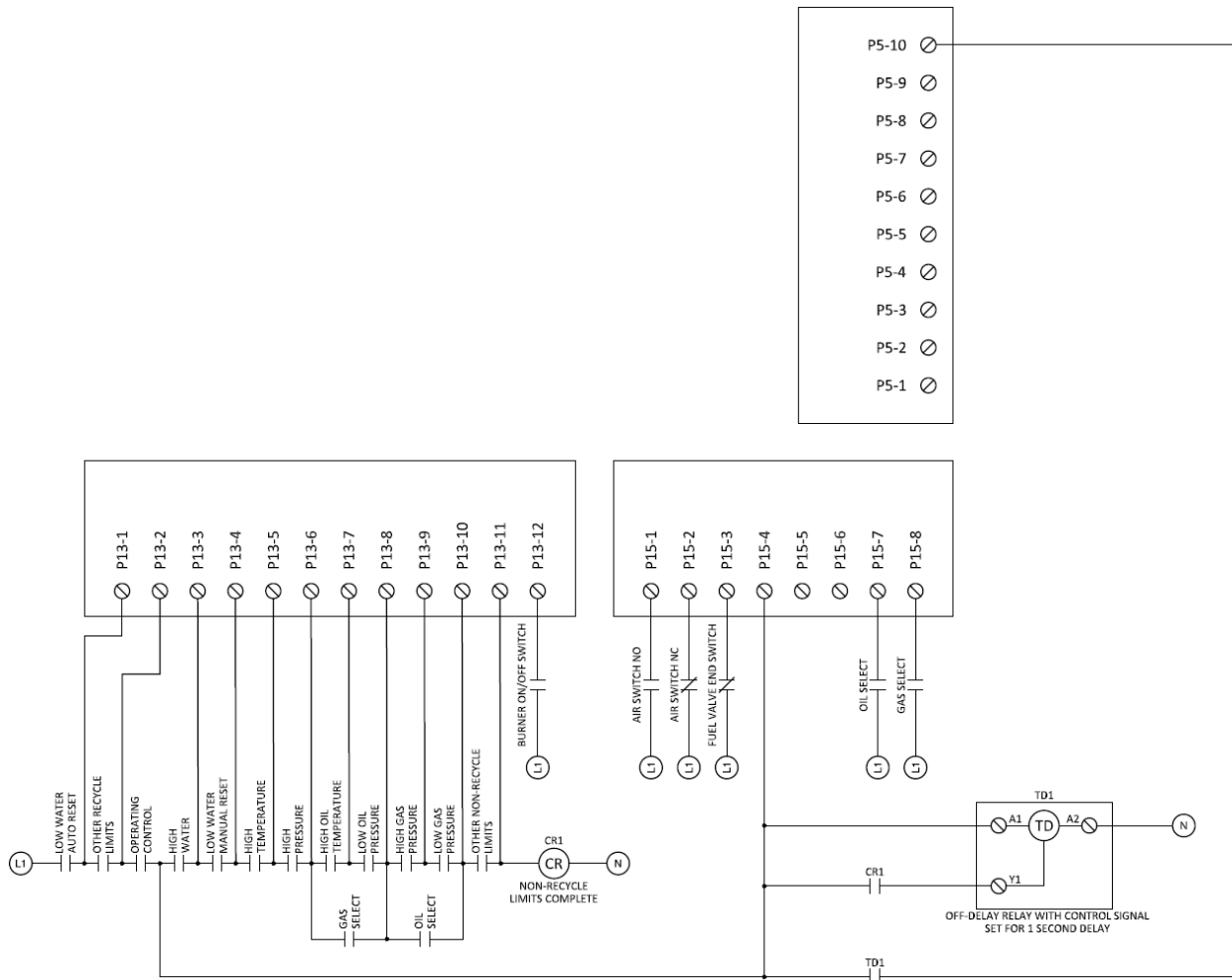
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WIRING

This is an example of wiring that can be used. Adjust accordingly for the quantity of available digital inputs as well as the quantities of recycle and non-recycle limits. Multiple limits can also be connected where a single limit is shown – the specific message will simply refer to a group of limits rather than a single limit. This will still allow for quicker troubleshooting in a no-start condition.

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PROGRAMMING

These programming examples reference the wiring example in the previous section.

Programming the recycle limit inputs to revert the control to standby.

> *DIGITAL INPUT SETUP → (DI 1)(DI 2) → USE → GENERIC*
> *DIGITAL INPUT SETUP → (DI 1)(DI 2) → GOTO → STANDBY 1S*
> *DIGITAL INPUT SETUP → (DI 1)(DI 2) → ACTION → OR*
> *DIGITAL INPUT SETUP → (DI 1)(DI 2) → STATE → ALL*
> *DIGITAL INPUT SETUP → (DI 1)(DI 2) → INPUT STATE → 0*

Programming the non-recycle limit inputs to lockout. Note that the state chosen is AFTER HF PURGE. That indicates that these inputs are only monitored for lockout after the high fire purge. Since the GOTO selected is lockout, select the profiles that each input applies to under ASSIGNMENT.

> *DIGITAL INPUT SETUP → (DI 3)…(DI 11) → USE → GENERIC*
> *DIGITAL INPUT SETUP → (DI 3)…(DI 11) → STATE → AFTER HF PURGE*
> *DIGITAL INPUT SETUP → (DI 3)…(DI 11) → ACTION → OR*
> *DIGITAL INPUT SETUP → (DI 3)…(DI 11) → INPUT STATE → 0*
> *DIGITAL INPUT SETUP → (DI 3)…(DI 11) → GOTO → LOCKOUT*
> *DIGITAL INPUT SETUP → (DI 3)…(DI 11) → ASSIGNMENT → (profiles)*

The burner control switch can be set to be the one on the keypad, an external switch or both together. If an external switch is used, connect it after all the recycle and non-recycle limits to L1 as shown for DI12 in the wiring example.

Also note in the wiring example that the operating control is not connected to any of the programmable digital inputs. This is because it connects directly to P15-4, and if P15-4 is open the message will be OPER CNTRL OPENED.

ADDITIONAL RELAY DETAILS

Relay CR1 (non-recycle limits complete) can be any type of electro-mechanical relay that has a line voltage coil. There must be at least one normally open contact. The coil of this relay should be connected after the last non-recycle limit.

Timer TD1 (non-recycle limits complete with one second off-delay) can be a single- or multi-function timer, but it must support the "off-delay with control signal" function. The timer can either be a DIN-rail or a plug-in base type. An example of a timer that can be used is the Schneider Electric RE22R2MMU multi-function timer set to function C, or the Schneider Electric RE22R1CMR which is a single-function timer fixed to function C.

In the sequence chart, U represents power to TD1. This should be connected to the end of the recycle limits (P15-4) and is represented as A1 in the wiring example. Y1 represents the control signal, and this should have P15-4 connected to it through the normally open contact of relay CR1. R1 represents the relay output of TD1. Whenever U and the trigger Y1 are powered, R1 will be closed. When power is removed from Y1, R1 will stay closed for duration T, which is typically set using dials or DIP switches. For this application the duration should only be set to one second. If power is removed from U, R1 will open immediately.

FUNCTION C
OFF-DELAY WITH CONTROL SIGNAL
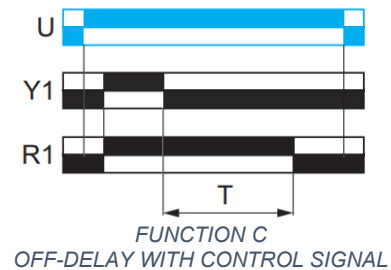
Functionally, this timer and relay will apply power to P5-10 whenever the non-recycle limits are complete and remove power from P5-10 one second after the non-recycle limits open. This gives the microprocessor enough time to select the correct digital input for the standby or lockout message.