

## *Databank – Technical Note*

# **Use of High Speed Counter Function HIOEN in FX5U**

### **Introduction**

PLCs of the FX range have historically allowed high speed signals (faster than the scan time) to be connected to a group of the PLCs inputs. Whilst it is still possible to use equivalents of the traditional high speed counter functions C235 to C255, LC35 to LC 55, similar functions are available using the HIOEN function. The advantages of this instruction are that it uses a parameterisation approach, uses Special Registers and Special Relays for its internal resources, saving programming and reducing use of other resources.

This example shows the steps needed to enable a high speed counter function using CH1, which is the hardware input X0.

In order to use an input as a High Speed Input, it must not be mentioned in the program explicitly, so there is no instruction in the program using X0 if channel 1 is used a high speed input.

### **Equipment**

The equipment needed here is an FX5U PLC. The S/S terminal is connected to the 0V and a switch wired between X0 and 24V. A PC running GX Works 3 and Ethernet connection lead are also needed.

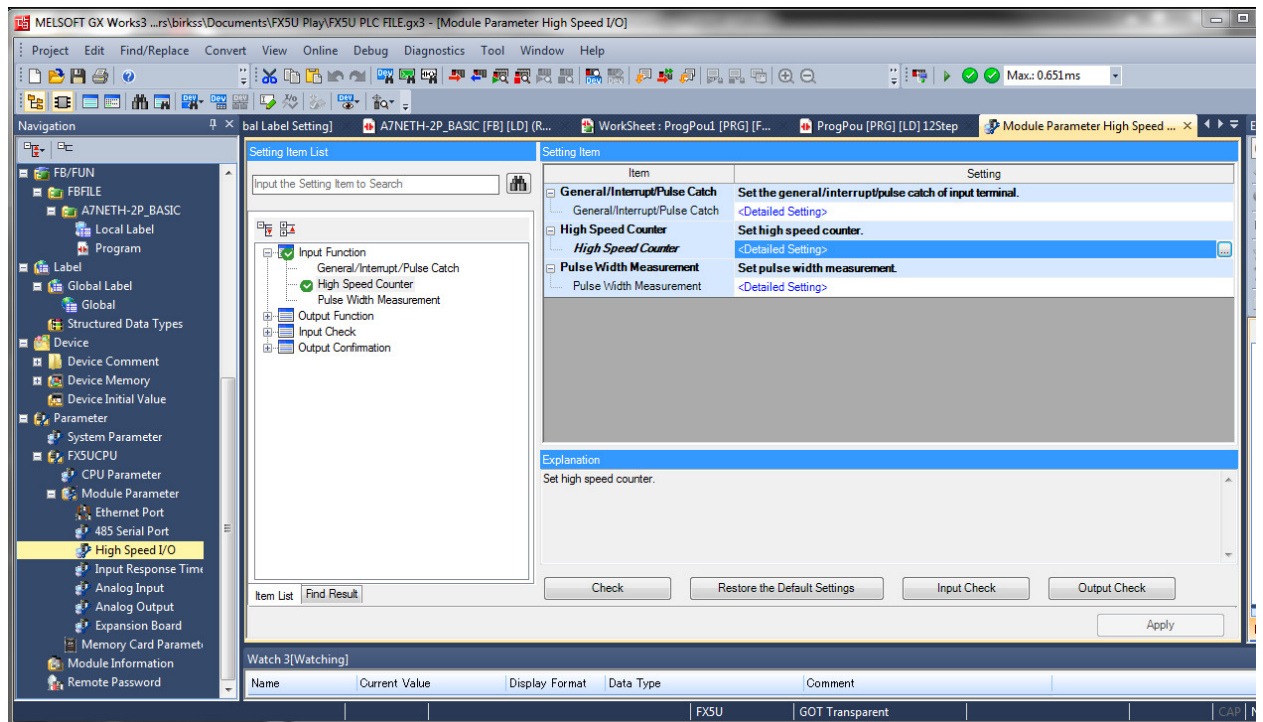
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### Method

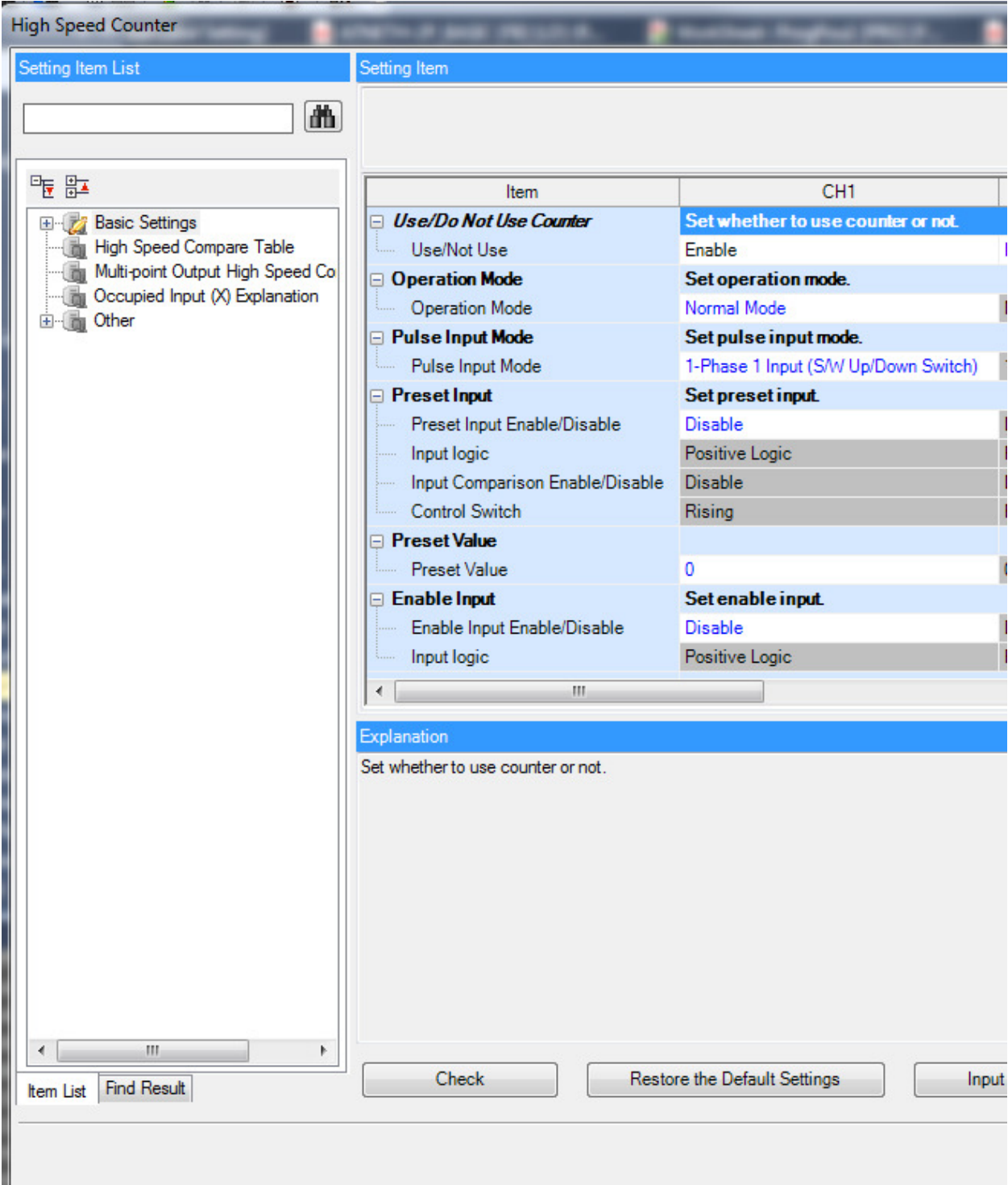
Before using the HIOEN instruction the PLC parameters must be set to enable the channel:

In the Navigation Window of GX Works 3 select Parameter, Module Parameter, High Speed I/O and from the Setting Item window select High Speed Counter , Detailed Settings.



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From there enable Channel 1 in Normal Mode to use as a high speed counter.



Item	CH1
<b>Use/Do Not Use Counter</b>	<b>Set whether to use counter or not.</b>
Use/Not Use	Enable
<b>Operation Mode</b>	<b>Set operation mode.</b>
Operation Mode	Normal Mode
<b>Pulse Input Mode</b>	<b>Set pulse input mode.</b>
Pulse Input Mode	1-Phase 1 Input (S/W Up/Down Switch)
<b>Preset Input</b>	<b>Set preset input.</b>
Preset Input Enable/Disable	Disable
Input logic	Positive Logic
Input Comparison Enable/Disable	Disable
Control Switch	Rising
<b>Preset Value</b>	
Preset Value	0
<b>Enable Input</b>	<b>Set enable input.</b>
Enable Input Enable/Disable	Disable
Input logic	Positive Logic

**Explanation**  
Set whether to use counter or not.

Item List Find Result Check Restore the Default Settings Input

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In the program write a line similar to the following:



In this line the first K0 refers to the operation mode, K0 is Normal mode, K10 is rotation speed mode, etc. The second parameter is the channel to be turned on, in this case K1 is channel 1. The third parameter is the channel to be turned off.

Each time X0 is turned on the value of SD4500 and SD4501 will increase ( or decrease). SM4500 is a Special relay which reports the on/off status of the CH1 enable. SM4532 will report ch1 overflow, and SM4548 will report underflow. SM 4564 is a read only bit reporting the count direction for Channel 1. SM 4580 is a read/ write bit controlling the direction of counting.

### Other Modes

The selection above puts channel 1, which is driven by X0, into normal mode. It is also possible to put The channel into pulse density or rotation speed modes, the HIOEN instruction would then be HIOEN K10 K1 K0. There are further modes, which can be selected from the parameter settings, and enabled by values K30 ( High Speed Comparison), K40 (pulse width measurement) and K50 ( PWM Output on a high speed output ).

The FX5U User's Manual (Application) gives details of these.

For each of these modes, the parameter setting and HIOEN setting have to match, and the result is stored in a different Special Register. In general results can be double integer in size as two Special Registers are allocated.

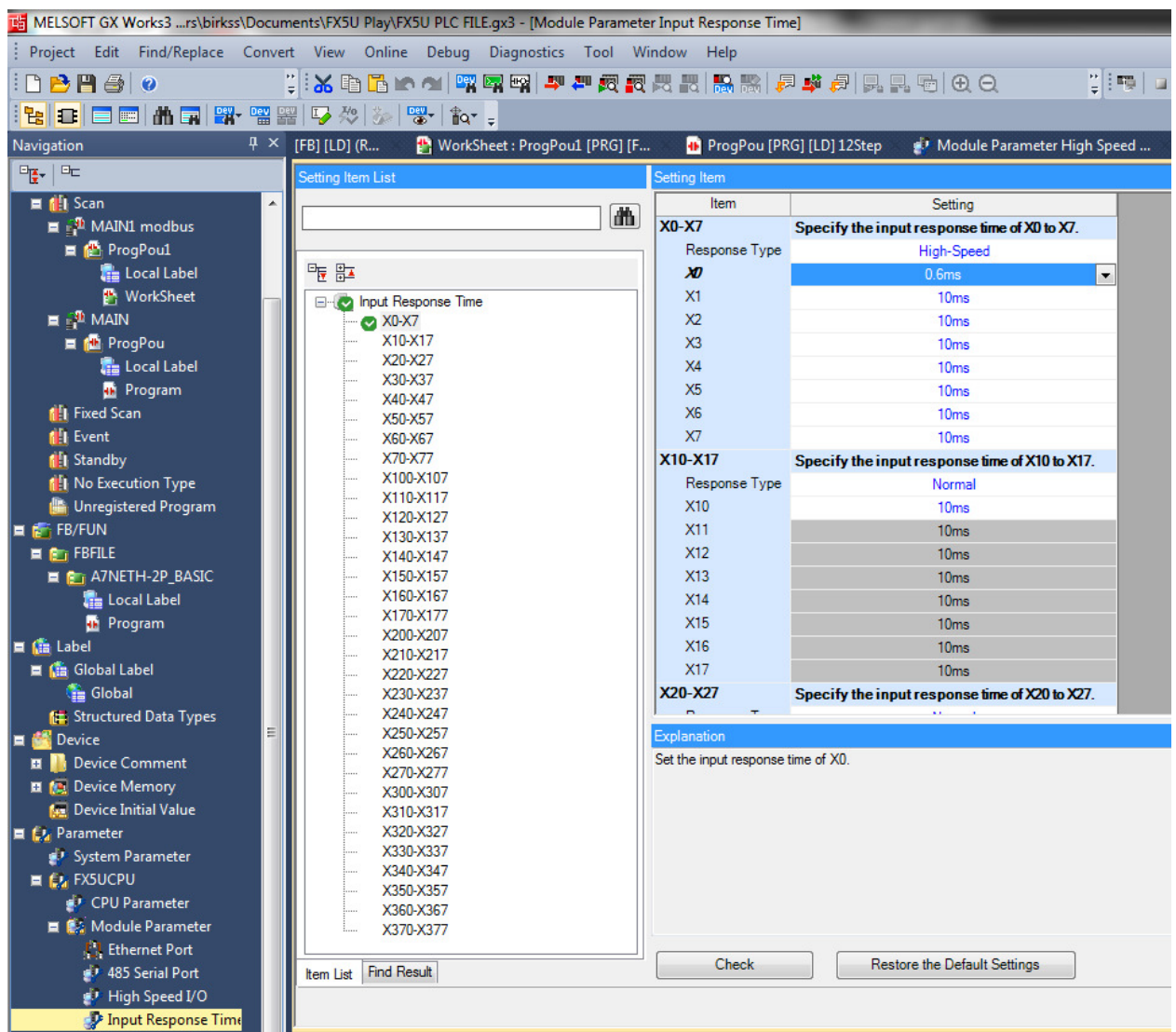
No.	Name
SD4500	High-speed counter current value [Low-order] (CH1)
SD4501	High-speed counter current value [High-order] (CH1)
SD4502	High-speed counter maximum value [Low-order] (CH1)
SD4503	High-speed counter maximum value [High-order] (CH1)
SD4504	High-speed counter minimum value [Low-order] (CH1)
SD4505	High-speed counter minimum value [High-order] (CH1)
SD4506	High-speed counter pulse density [Low-order] (CH1)
SD4507	High-speed counter pulse density [High-order] (CH1)
SD4508	High-speed counter rotation speed [Low-order] (CH1)
SD4509	High-speed counter rotation speed [High-order] (CH1)
SD4510	High-speed counter preset control switch (CH1)
SD4512	High-speed counter preset value [Low-order] (CH1)
SD4513	High-speed counter preset value [High-order] (CH1)
SD4514	High-speed counter ring length [Low-order] (CH1)
SD4515	High-speed counter ring length [High-order] (CH1)
SD4516	High-speed counter measurement-unit time [Low-order] (CH1)
SD4517	High-speed counter measurement-unit time [High-order] (CH1)
SD4518	High-speed counter number of pulses per rotation [Low-order] (CH1)

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### Input Filter

Note again that X0 is never referred to the program. Use of X0 in the program causes the input filter circuit to be connected.

In FX5U and GX Works 3 the input filter can be controlled from the parameters. If you select Parameter, Module Parameter, Input Response Time: This gives a list of the inputs and their response times, and a faster response time can be selected from here.



The screenshot shows the 'Setting Item List' and 'Setting Item' windows in MELSOFT GX Works 3. The 'Setting Item List' shows a tree view with 'Input Response Time' expanded, listing various input ranges from X0-X7 to X370-X377. The 'Setting Item' window shows the configuration for three groups of inputs:

Item	Setting
<b>X0-X7</b> Specify the input response time of X0 to X7.	
Response Type	High-Speed
X0	0.6ms
X1	10ms
X2	10ms
X3	10ms
X4	10ms
X5	10ms
X6	10ms
X7	10ms
<b>X10-X17</b> Specify the input response time of X10 to X17.	
Response Type	Normal
X10	10ms
X11	10ms
X12	10ms
X13	10ms
X14	10ms
X15	10ms
X16	10ms
X17	10ms
<b>X20-X27</b> Specify the input response time of X20 to X27.	

Below the settings, an 'Explanation' section states: 'Set the input response time of X0.'

### Resetting a High Speed Counter.

This has to be done by moving a '0' into the special device number of the relevant counter - please see below:

