

## Chapter 2. Operation

### 2.1. Limit Inputs

There are two types of limit inputs: end of travel and home. End of travel limits must be normally low to allow motor motion. Should a limit go high while the motor is moving in the direction of that limit, the IFX will stop motor motion instantly. The end of travel limit inputs may be defeated using the LD command. The home input is used for establishing a home reference position. Giving the GH command causes the motor to search for a transition on its home input. After successfully finding the home position it sets its absolute position to zero.

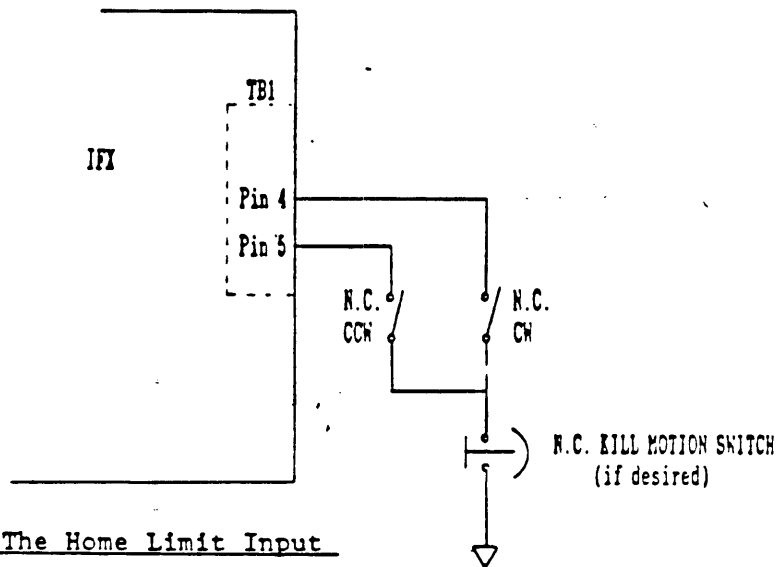
Pins 5 through 7 on connector TB1 are the Clockwise, Counterclockwise, and Home limit switch inputs. The CW and CCW limit inputs are activated in the high state and require a normally closed load activated switch to Isolated GND. The Home limit input requires a normally open load and is activated by a switch to Isolated GND. The Ground Pin for the limit inputs is Pin 8 of TB1 (Isolated Ground). If limit switches are not needed in the application, they may be disabled over RS232 with the LD command.

When either the CW or CCW Limit switch inputs (TB1 pins 5 and 6) go active the motor is brought to an immediate halt (no deceleration) if it is traveling in the direction of the active limit and will not be able to move in the direction of the active limit until the limit input goes inactive. If the motor is not moving in the direction of the active limit, motion will not be affected. Travel in the direction of the active limit will be prohibited however, until the limit input goes inactive.

2.1.1. CW and CCW End of Travel Limit Inputs

The IFX is equipped with CW and CCW end of travel limit inputs. These inputs are optically isolated<sup>1</sup> and require a normally closed, load activated switch to Isolated GND. If either input goes high, motor motion in the corresponding direction will not be possible until the input goes low again. These inputs are used to prevent the load from crashing into a mechanical stop and hurting or damaging equipment and personnel.

Figure 2-1: Limit Switch Connections



2.1.2. The Home Limit Input

The GO HOME function of the IFX is initiated by issuing the GO HOME (GH) command. When the GO HOME command is issued, the direction and velocity in which it should search for home must be included. The home limit input on the IFX is optically isolated, and is normally high. A normally open, load activated switch to Isolated GND is the most common way for determining the home position in both motor step and encoder step mode. In encoder step mode the Z channel pulse from the encoder is used in conjunction with the home limit switch to determine the home position. When the IFX is commanded to GO HOME, it will begin to move in the direction and at the velocity specified, at the last defined acceleration rate, and look for the home limit input to go active (motor step mode), or for the home limit input and

<sup>1</sup> Optical isolation is provided on the CW, CCW, and Home limit inputs to increase the IFX's noise immunity.

the encoder Z channel to go active (encoder step mode). If the motor encounters an end of travel limit while searching for home, it will reverse direction and look for the home limit input to go active in the opposite direction. If the other limit is encountered before the home signal is detected, the GO HOME move will be aborted and the motor will stop.

**NOTE**

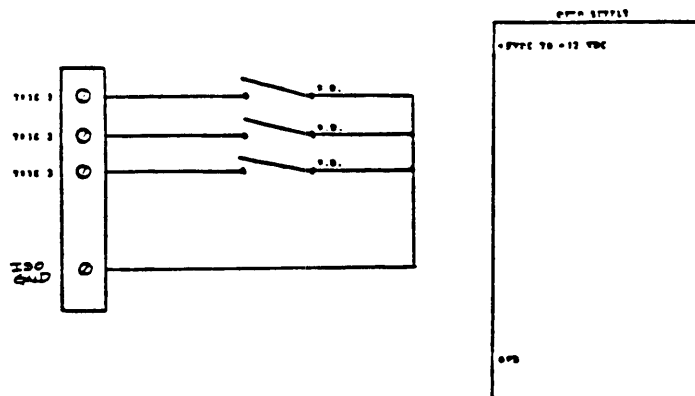
We cannot guarantee performance with Home and End of Travel limits tied together.

**2.2. Trigger Inputs**

The IFX has three trigger inputs. They are normally high and optically isolated. Trigger inputs are connected to TB1 pin 9 (Trigger input 1), TB1 pin 10 (Trigger input 2), and TB1 pin 11 (Trigger input 3). The return line for the Trigger inputs is Isolated Ground (TB1 Pin 8). See Command description for the TR command in Chapter 5 for functional description of these inputs.

<u>Trigger</u>	<u>Pin #(TB1)</u>
1	9
2	10
3	11

**Figure 2-2: Trigger Input Connections**



### 2.3. Using Sequences

The IFX allows the user to predefine a string of commands and store that string in nonvolatile memory for later execution. When such a string is stored in nonvolatile memory it is referred to as a "sequence". Each defined sequence will have a number assigned to it to identify that particular command string. The IFX allows the user to define up to 7 sequences that will be identified by the numbers 1 through 7. The sequence is assigned an identifying number when the XDn (define sequence) command is issued, where n is the identifying number for that sequence.

There are several ways that a sequence may be executed after it is defined. The first and most straight forward method is done by issuing the XRn (run sequence) command, where n is the sequence number to be executed. This command must be issued over the RS232C interface. Sequence execution will begin as soon as the delimiter, (space or carriage return) following the sequence identifier or number, is issued.

Another method for executing sequences is done by issuing the XP9 command. The XP9 command will not cause any sequence to be immediately executed. Once the XP9 command is issued the IFX will read the sequence select inputs (Pins 12-14 on TB1) every time it is powered up, or every time the Z (software reset) command is issued. The status of the sequence select inputs will be interpreted by the IFX as a sequence number (see table 1-7). If, at the time of power up<sup>2</sup>, the number represented by the sequence select inputs is a valid predefined sequence, the IFX will automatically execute that sequence. When this first sequence is finished executing, the IFX will once again read the sequence select inputs and execute the first valid sequence number present on these inputs. The IFX will continue to execute sequences in this fashion until an S (stop) or a K (kill) command is issued. If the IFX reads the number 8, or any number that has no sequence defined, it will wait until the state of the inputs change to a valid, defined sequence.

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<sup>2</sup> Issuing the Z command will cause the IFX to respond the same as if it were just powered up.

Table 1-7: Sequence Select Inputs

<u>Sequence</u>	<u>Seq 1</u>	<u>Seq 2</u>	<u>Seq 3</u>
*8	off	off	off
7	on	off	off
6	off	on	off
5	on	on	off
4	off	off	on
3	on	off	on
2	off	on	on
1	on	on	on

\* 8 is not a valid sequence number.

off = Open switch (not pulled to ground)

on = Closed switch (pulled to ground)

It is possible to cause the IFX to pause between sequence execution in the XP9 mode. This is done with the XQ1 command. When the XQ1 command is present within a sequence definition, the IFX will pause after the execution of the sequence and will wait for the sequence select inputs to go to a value of 8 before it will execute the next valid sequence whose number appears on them. The XQ1 command may be placed anywhere within the sequence.

The IFX may also be programmed to read the sequence select lines on power up with the XP8 command. This command will cause the IFX to execute the first valid sequence number it reads on the sequence select inputs after power up exactly like the XP9 command. It differs from the XP9 command in that it turns control back over to the RS232C communications port after it is done executing the first sequence, rather than reading the sequence select lines and executing another sequence.

A single, predetermined sequence may be executed on power up with the XPn command, where n is the sequence number 1-7. For example, if an XP1 command were entered, the next time the IFX was powered up, sequence #1 would be executed. Sequence #1 would continue to execute on each subsequent power up until a new XP(0-9), or an XZ command was entered. Once the predetermined sequence is finished executing, the IFX turns control back over to the RS232C communications port. If no sequence had been defined as "Sequence #1", control would automatically go to the RS232C communications port.

The XP command may be issued at any time. Typically, it will not be issued during sequence definition, although there are no restrictions against doing so. Once an XP command is entered, it is automatically saved in nonvolatile memory by the IFX.

#### 2.4. Output #1 & Output #2

The IFX is equipped with 2 programmable output bits. They are normally high (not conducting current) and optically isolated. Pins 15 and 16 of connector TB1 are Outputs #1 and #2. Both of these outputs are programmable and may be used to signal a peripheral device that some event in the IFX has just been completed by the IFX. e.g. Move is complete, or that a Trigger configuration has been met on the IFXs' Trigger inputs, etc. These Outputs are capable of delivering up to 12 mA of current each. These outputs are controlled with the "O" command.

#### 2.5. Opto +

This output provides +12VDC. It is not intended to power external peripheral devices. It is an internal supply that powers all of the IFX's I/O. An LED may be connected between OPTO + and a Programmable output for visual verification of the output. When using Compumotor drives, it is necessary to connect Dir- input of the drive to Dir output of the IFX, and the Dir + input of the drive to OPTO +. Reference for this supply is Isolated Gnd.