[SimplIQ Line](http://www.elmomc.com/members/NetHelp/simpliqline.htm" \o "SimplIQ Line) / [SimplIQ Command Reference](http://www.elmomc.com/members/NetHelp/simpliqcommandrefere.htm) / [Alphabetical Listing](http://www.elmomc.com/members/NetHelp/alphabeticallisting.htm) / [IL[N] – Input Logic](http://www.elmomc.com/members/NetHelp/ilninputlogic.htm)

**IL[N] – Input Logic**

**Purpose:**  
Defines the logic level and functional behavior of the digital inputs. The drive has several non-committed digital inputs. Each of these inputs can be programmed to a specific function and logic level. In addition, the IL[N] function enables the simulation of a digital input. This option is convenient for testing and debugging user programs.

A digital input serves only one dedicated function, which can be reflected in the following commands/features:

•User program auto routine (#@AUTO\_##)

•Homing procedure (HM[N], HY[N])

•IP command

•IB[N] command

**Notes:**

•The response to a digital input is made only according to the definition of IL[N]. For example, if digital input #2 is defined by IL[2] as RLS (Reverse Limit switch), changes in the connector pin of digital input #1 will not be reflected in IB[1] commands. IB[1] will read continuously zero. In this case, IB[11] will reflect this input status.

•When a digital input is activated, the relevant bit in IP/IB[N] is set. Refer to the IP and IB[N] commands for more details.

•Inputs 5 and 6 also serve as high-speed home/capture inputs, used independently by the HM[N] and HY[N] commands. The logic level for the home inputs is also defined by the IL[N] command.

•If inputs 5 or 6 are used as home inputs, the corresponding parameters IF[5] and IF[6] do not apply. The parameters EF[1] and EF[2] are used instead.

The following table summarizes the functions that may be attached to each digital input pin. The function details are given in the next table. The prefix “Hard” indicates that the function applies to the stop manager, not to the motion reference generator. The term “Soft” indicates that the function applies to the motion reference generator. The term “Hard and Soft” indicates that the function applies both to the stop manager and to the position reference generator.

| **IL[N] Bits** | **Meaning** | **Values** |
| --- | --- | --- |
| 0 | Logic levels | 0:            Low level active. The function attached to this switch is activated when*no* current flows through the input opto-coupler. |
| 1:            High level active. The function attached to this switch is activated when current flows through the input opto-coupler. |
| 1 to 4 | Function behaviors (next table) | 0:            Inhibit (INH); shut servo driver, freewheel. For RM=1 and UM=1, the SimplIQ drive will retry starting the motor automatically when the inhibit function is released. |
|  | 1:            Stop immediately under control; hard stop only. |
|  | 2:            Ignore. |
|  | 3:            General purpose. |
|  | 4:            Hard-enable forward direction only (RLS). |
|  | 5:            Hard-enable reverse direction only (FLS). |
|  | 6:            Begin. |
|  | 7:            Stop immediately under control; soft stop only. |
|  | 8:            Home switch for IL[5] only. |
|  | 9:            Auxiliary Home switch for IL[6] only. |
|  | 10:          Simultaneous activation of the hard and soft stop functions (functions 1 and 7). |
|  | 11 - Abort. |
|  | 12 to 15:               Reserved. |
| 5 | Simulation mode | 0:            Read value from digital input pin. 1:            Read value from bit 6, regardless of pin state. |
| 6 | Simulation value | Value to set for pin if bit 5 is on. |
| 7 to 15 | Reserved |  |

**Table 18: IL[N] Functions**

| **Command Value** | **Active Level** | **When Active . . .** |
| --- | --- | --- |
| IL[N]=0 | Low | Shut servo drive, freewheel. |
| IL[N]=1 | High | Shut servo drive, freewheel **Note:** It is high recommended *not* to use this state. The motor may spin when the input wire is cut or disconnected. |
| IL[N]=2 | Low | Stop immediately under control: soft and auxiliary stop. |
| IL[N]=3 | High | Stop immediately under control: soft and auxiliary stop. |
| IL[N]=4 | Low | No function is attached. Ignore the switch. |
| IL[N]=5 | High | No function is attached. Ignore the switch. |
| IL[N]=6 | Low | General purpose. |
| IL[N]=7 | High | General purpose. |
| IL[N]=8 | Low | Hard-enable forward direction only (RLS). |
| IL[N]=9 | High | Hard-enable forward direction only (RLS). |
| IL[N]=10 | Low | Hard-enable reverse direction only (FLS). |
| IL[N]=11 | High | Hard-enable reverse direction only (FLS). |
| IL[N]=12 | Low | Begin: activates BG command. |
| IL[N]=13 | High | Begin: activates BG command. |
| IL[N]=14 | Low | Stop immediately under control: soft stop only. Activates the ST command. |
| IL[N]=15 | High | Stop immediately under control: soft stop only. Activates the ST command. |
| IL[5]=16 | Low | Enable the Main Home sequence. |
| IL[5]=17 | High | Enable the Main Home sequence. |
| IL[6]=18 | Low | Enable the Auxiliary Home sequence. |
| IL[6]=19 | High | Enable the Auxiliary Home sequence. |
| IL[N]=20 | Low | Stop immediately under control: stop both software trajectory and auxiliary reference. |
| IL[N]=21 | High | Stop immediately under control: stop both software trajectory and auxiliary reference. |
| IL[N]=22 | Low | Abort motion. Shut servo drive, freewheel. |
| IL[N]=23 | High | Abort motion. Shut servo drive, freewheel. |

**Table 19: Possible Values for IL[N]**

**Function 0: Inhibit (freewheel)**   
Servo is off (MO=0). The motor is *not* under control. No current is applied through the motor phases. If the motor was previously running, it will continue to coast on its own inertia. The motor fault code (see the MF command) is 0x10. If the unit mode is UM=1 (torque control) or UM=2 (velocity control) and an external command is active (RM=1), a motor restart will be attempted when the switch is “not active.” This attempt is made within a few (no less than 10) milliseconds. In addition, when restarting the motor the #@AUTO\_ENA automatic routine can be activated.

**Function 1: Hard stop immediately under control**  
The function behavior depends on the unit mode:

| **UM** | **Action** |
| --- | --- |
| Torque (UM=1) | Set torque command to zero. |
| Speed (UM=2) | Set speed command to zero immediately at the deceleration of the SD parameter. |
| Position (UM=3, 4, 5) | Slow down to complete stop using the deceleration of the SD parameter. |

**Table 20: UM Values for Hard Stop**

**Function 2: Input is ignored**  
This serves no function in the system and always reads zero in the IP/IB[N] indications.

**Function 3: General purpose (GPI)**   
No special function. Serves as an uncommitted input. The input may be used in the user program and homing sequences as simple digital input. In addition, general purpose inputs can activate ##AUTO\_DIN automatic routines in the user program.

**Function 4: Hard-reverse limit switch**  
The function activates the ##AUTO\_RLS routine in the user program. In addition, it has the following unit mode dependent actions:

| **UM** | **Action** |
| --- | --- |
| Torque (UM=1) | Allow only positive torque commands. Negative torque demands yield zero motor current. |
| Speed (UM=2) | Allow only positive speed command (external or internal). If, at the time of switch sensing, the speed command was negative, the speed command will converge to zero using the stop deceleration (SD). |
| Position (UM=3, 4, 5) | Allow only positive position command increments (external and internal). If, at the time of switch sensing, the speed was negative, the position command will decelerate to complete stop using the deceleration of the SD parameter. |

**Table 21: UM Values for Hard Reverse**

**Function 5: Hard-forward limit switch**  
The function activates the ##AUTO\_FLS routine in the user program. In addition, it has the following unit mode dependent actions.

| **UM** | **Action** |
| --- | --- |
| Torque (UM=1) | Allow only negative torque commands. Positive torque demands yield zero motor current. |
| Speed (UM=2) | Allow only negative speed command (internal or external). If, at the time of switch sensing, the total speed command was positive, the speed command will converge to zero using the stop deceleration (SD). |
| Position (UM=3, 4, 5) | Allow only negative position command increments (external and internal). If, at the time of switch sensing, the speed was positive, the position command will decelerate to a complete stop using the deceleration of the SD parameter. |

**Table 22: UM Values for Hard Forward**

**Function 6: Begin**The function behaves like a software BG command, activating the ##AUTO\_BG routine in the user program. In addition, it has the following unit mode dependent actions:

| **UM** | **Action** |
| --- | --- |
| Torque (UM=1) | Nothing. |
| Speed (UM=2) | Set software speed command to JV. |
| Position (UM=3, 4, 5) | Set software position command to the activated motion mode (PA, JV, PT, PV). |

**Table 23: UM Values for Begin**

**Function 7: Software Stop**  
The function behaves like a software ST command, activating the ##AUTO\_ST routine in the user program. In addition, it has the following unit mode dependent actions:

| **UM** | **Action** |
| --- | --- |
| Torque (UM=1) | Nothing. |
| Speed (UM=2) | Reduce the software speed command to zero, using the deceleration SD. |
| Position (UM=3, 4, 5) | Set software position command to complete stop, using the deceleration SD. |

**Table 24: UM Values for Software Stop**

**Function 8: Main Home switch**  
This function activates the ##AUTO\_HM routine in the user program. When the function is selected, digital input connector pin #5 serves as the Home/Capture switch for the feedback defined as main. Only IL[5] can be programmed to this function. Refer to the HM[N] command for more information.

**Function 9: Auxiliary Home switch**This function activates the ##AUTO\_HY routine in the user program. When the function is selected, digital input connector pin #6 serves as the Home/Capture switch for the feedback defined as auxiliary. Only IL[6] can be programmed to this function. Refer to the HY[N] command for more information.

**Function 10: Hard and Soft stop**  
The function activates the ##AUTO\_ST routine in the user program. It stops the motor under control, stopping the response to external reference and applying the software ST command simultaneously. This function actually activates function 1 and function 7 simultaneously.

| **UM** | **Action** |
| --- | --- |
| Torque (UM=1) | Set the torque command to zero. |
| Speed (UM=2) | Reduce the software speed command to zero, using the stop deceleration SD. Reduce the controller speed command to zero, using the deceleration SD. |
| Position (UM=3, 4, 5) | Set the software position command to a complete stop, using the stop deceleration SD. Bring the controller reference command to a complete stop, using the deceleration SD. |

**Table 25: UM Values for Hard and Soft Stop**

**Function 11: Abort motion**  
The behavior is similar to the Inhibit function with the exception that the “Abort” input release will not start the motor automatically. After the Abort is activated, MO=1 must be set either by communication or by the internal User Program.

The function activates the #@AUTO\_ER routine, if it exists, in the user program.

**Notes:**

•Make sure that the drive you use has the actual digital input that is programmed. Failing to do so will not generate an error. Not all drives have the same digital input entries. Nevertheless no error indication would be given in case a “none existing” digital input is programmed. For example the Harmonica drive has 6 physical digital inputs. An attempt to set IL[10]=8 would not generate an error but the RLS function would be programmed to the drive

•Use the Inhibit freewheel function with care. When the drive is shut, the motor applies no torque. Turning off a drive might leave the motor spinning until it stops by friction. In some situations, this may be dangerous.

•When a switch is released, the attached function terminates. Functions 2, 3 and 4 (Full Stop, RLS and FLS) do not change the drive reference command. When the switch is released, the reference command (speed or position) is recovered. In order to ensure that reference recoveries do not generate discontinuities, the SD, VL[2] and VH[2] limits are used.

•IP and IB[N] can be used to detect a logically active switch of all defined functions, excluding function 2 (“No function is attached”).

**Attributes:**                   **Type**:                                          Parameter, Bit-field**Assignment:**                            Yes**Source:**                                      Program, RS-232, CANopen**Restrictions:**                            None**Default value:**                         IL[1]=0                                                      IL[2…10]=7 (RS), Non-volatile**Range:**                                        According to previous description**Index range:**                            [1…10]**Unit modes:**                            All**Activation:**                               Immediate

**Reference chapter in the *SimplIQ* *Software Manual:***  
Chapter 12, ” The Position Reference Generator”

**See also:**  
UM, RM, JV, PX, BG, IP, IB[N], HM[N], HY[N]

Links:

[IP – Input Port](http://www.elmomc.com/members/NetHelp/ipinputport1.htm)