

Quick Start Motion Application Software – QS_FLT_1

Quick Start Motion Application Software allows commissioning of 1 to 32 axes motion applications in a matter of hours. Basic motion control is transformed from a programming effort to an application exercise.

The foundation of the Quick Start package is the basic motion control application specific function block (ASFB). Two ASFB's address basic motion control, these are:

- QS_AIS_1 – Basic servo motion control ASFB
- QS_DIG_1 – Master axis feedback interface ASFB

One ASFB provides fault control and fault history, this is:

- QS_FLT_1 – Fault control and fault history ASFB

One ASFB provides integration with a Cimrex Operator Interface, this is:

- QS_C69_1 – Integration with Cimrex C69 HMI operating in portrait mode

These functions may be used with PiC, MMC or MMC for PC controls.

This document covers the functionality provided by QS_FLT_1.

Overview

QS_FLT_1 provides a single-network solution to providing fault control and fault history. Functions provide by QS_FLT_1 include:

Fault Control

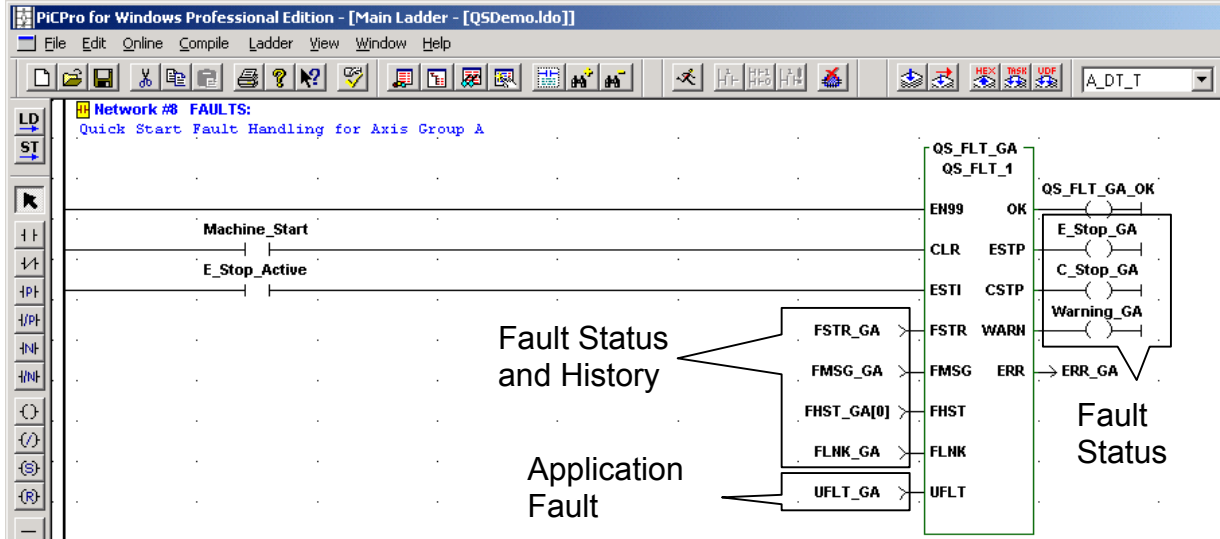
- E Stop Monitor
- C Stop Monitor
- Warning Monitor

Fault History:

- Time stamped history of last ten faults

Multi-axis application fault coordination

- Coordination of fault status among all axes in application
- Monitor and report application specific User Faults



Use QS_FLT_1 to coordinate fault control for a group of axes. FMSG provides a time stamped text description of the current fault status for the system. FHST provides a history of the last ten faults. FLNK is input into each of the servo control function blocks so QS_FLT_1 can monitor and coordinate their fault status. Overall Fault Status for the group is indicated by the ESTP, CSTP and WARN outputs in addition to the FSTR status message.

Three priorities of faults are provided:

- E Stop – Emergency Stop
- C Stop – Controlled Stop
- Warning – Warning Condition Present

Warning, warning condition present, is the lowest priority fault. In the event of a Warning QS_FLT_1 will time stamp the warning message and present it in FSTR. No other action is taken.

C Stop, controlled stop, is the next highest priority fault. C Stop takes precedence over Warning. In the event of a C Stop fault all other axes in the group will be placed in the C Stop condition and QS_FLT_1 will time stamp the fault message and present it in FSTR. When a C Stop condition occurs the servo system aborts the currently active move and decelerates the axis to zero velocity at the C Stop decel rate specified in Servo Setup.

E Stop, emergency stop, is the highest priority fault. E Stop takes precedence over both C Stop and Warning. In the event of an E Stop fault all other axes in the group will be placed in the E Stop condition and QS_FLT_1 will time stamp the fault message and present it in FSTR. When an E Stop fault occurs the servo system opens the servo loop and begins setting the commanded position equal to the feedback position.

Applications that have multiple groups of axes that need independent fault coordination can be accommodated by QS_FLT_1. Simply create unique variables for all of the inputs and outputs to QS_FLT_1, e.g. FLNK_GB for group two, and declare and insert another instance of QS_FLT_1 as the fault manager for the second group of axes. Input FLNK_GB into the FLNK input of each servo control function block and both groups will function with completely independent fault control.

QS_FLT_1 Inputs

Name	Type	Description
EN	BOOL	Enable, must always be ON
CLR	BOOL	One-shot to move current fault into the fault history and to clear the fault status.
ESTI	BOOL	Emergency Stop Input – Turn ON when the control emergency stop input indicates an E Stop condition
FSTR	STRING[64]	Text message indicating current status or fault if fault present
FMSG	STRUCT	Fault message structure for use by the HMI
FHST	STRUCT	History of last ten fault conditions and resets that occurred
FLNK	STRUCT	Fault link table coordinates fault control in multiple axis applications
UFLT	STRUCT	User Application Fault indications and messages

QS_FLT_1 Outputs

Use the QS_FLT_1 ASFB outputs to see the status of this group of axes at a glance.

Name	Type	Description
OK	BOOL	ON when all data structure size checks passed
ESTP	BOOL	ON when an E Stop fault is present in this group of axes
CSTP	BOOL	ON when an C Stop fault is present in this group of axes
WARN	BOOL	ON when an Warning condition is present in this group of axes
PERR	UINT	Programming error, set to: 0 – All data structure sizes correct 1001 – FMSG structure size incorrect 1002 – FHST structure size incorrect 1003 – FLNK structure size incorrect 1004 – UFLT structure size incorrect

FMSG Fault Message Structure for use by the HMI

FMSG is used to present the current fault status. When CLR is pulsed to reset faults the present content of FMSG is transferred to the fault history, FHST and FMSG indicates Faults Cleared.

Name	Type	Description
FMSG	STRUCT	Fault Message Data Structure
.AMSG	String[22]	O - Axis description
.AMSGn	USINT	O - Axis number
.FMSG	String[32]	O - Fault description
.FMSGn	INT	O - Fault message number
.FTIM	String[32]	O - Time when fault occurred
.Structure_Check_Constant	DINT	I – Verify structure is correct size - 662214
END_STRUCT		

FHST Fault History Data Structure

Use the Fault History Data Structure to view time stamped text messages describing the last ten faults and fault resets that occurred.

Name	Type	Description
FHST	Struct(0..9)	Fault History Data Structure
.AMSG	String[22]	O - Axis description
.AMSGn	USINT	O - Axis number
.FMSG	String[32]	O - Fault description
.FMSGn	INT	O - Fault message number
.FTIM	String[32]	O - Time when fault occurred
.Structure_Check_Constant	DINT	I – Verify structure is correct size - 4321987
END_STRUCT		

FAULT LINK Data Structure

The Fault Link Data Structure is used in multi-axis applications to automatically link the fault status of a group of axes together. No user programming of any variables in the FLNK structure is required. Simply place the same structure, e.g. FLNK_GA, at the input to every axis' QS_AIS_1 ASFB and also into the FLNK input of the QS_FLT_1, fault manager ASFB.

When linked, if any axis in the group enters a C_Stop condition then all axes in the group will be placed in a C_Stop condition. Likewise, if any axis in the group enters an E_Stop condition then all axes in the group will be placed in an E_Stop condition. QS_FLT_1, the fault manager, will time stamp and log the first fault that occurred so it can be reported and corrected.

Multiple groups of axes can be programmed with independent fault control by using a separate fault link data structure. For example, create a new fault link structure, FLNK_GB, and use a separate instance of the fault control manager, QS_FLT_1. See the documentation for QS_FLT_1 for more information.

Name	Type	Description
FLNK	Struct	Coordinate fault control in multiple axis applications
.Axis	USINT	I/O – Axis number of first axis to fault
.E_Stop	BOOL	I/O – E Stop Fault present
.C_Stop	BOOL	I/O – C Stop Fault present
.Warning	BOOL	I/O – Warning condition present
.AMSG	STRING[22]	O – fault axis for first fault
.FMSG	STRING[32]	O – fault message for first fault
.FMSGn	INT	O – fault message number for first fault
.Structure_Check_Constant	DINT	I – Verify structure is correct size - set to 67891
END_STRUCT		

FLNK.variables

- Used by QS_AIS_1, QS_DIG_1 and QS_FLT_1 to coordinate faults. Must not be used by the application.

FLNK.Structure_Check_Constant – Input

- Must be set to an initial value of 67891. Checked by QS_FLT_1 on first scan, if not 67891 then ERR will be set to 1003, ESTP will be energized, and QS_FLT_1 will exit without executing.

UFLT User Application Fault Indicator and Message Structure

UFLT provides a method for the application program to generate application specific Emergency Stop, Controlled Stop and Warning Condition faults using the QS_FLT_1 fault manager.

Name	Type	Description
UFLT	Struct	User Application Fault Structure
.User_E_Stop_1	BOOL	Set to indicate User E Stop 1 Condition
.User_E_Stop_1_Description	String[28]	Text Description of User E Stop 1
.User_E_Stop_2	BOOL	Set to indicate User E Stop 2 Condition
.User_E_Stop_2_Description	String[28]	Text Description of User E Stop 2
.User_E_Stop_3	BOOL	Set to indicate User E Stop 3 ondition
.User_E_Stop_3_Description	String[28]	Text Description of User E Stop 3
.User_E_Stop_4	BOOL	Set to indicate User E Stop 4 Condition
.User_E_Stop_4_Description	String[28]	Text Description of User E Stop 4
.User_E_Stop_5	BOOL	Set to indicate User E Stop 5 Condition
.User_E_Stop_5_Description	String[28]	Text Description of User E Stop 5
.User_C_Stop_1	BOOL	Set to indicate User C Stop 1 Condition
.User_C_Stop_1_Description	String[28]	Text Description of User C Stop 1
.User_C_Stop_2	BOOL	Set to indicate User C Stop 2 Condition
.User_C_Stop_2_Description	String[28]	Text Description of User C Stop 2
.User_C_Stop_3	BOOL	Set to indicate User C Stop 3 ondition
.User_C_Stop_3_Description	String[28]	Text Description of User C Stop 3
.User_C_Stop_4	BOOL	Set to indicate User C Stop 4 Condition
.User_C_Stop_4_Description	String[28]	Text Description of User C Stop 4
.User_C_Stop_5	BOOL	Set to indicate User C Stop 5 Condition
.User_C_Stop_5_Description	String[28]	Text Description of User C Stop 5
.User_Warning_1	BOOL	Set to indicate User Warning 1 Condition
.User_Warning_1_Description	String[28]	Text Description of User Warning 1
.User_Warning_2	BOOL	Set to indicate User Warning 2 Condition
.User_Warning_2_Description	String[28]	Text Description of User Warning 2
.User_Warning_3	BOOL	Set to indicate User Warning 3 Condition
.User_Warning_3_Description	String[28]	Text Description of User Warning 3
.User_Warning_4	BOOL	Set to indicate User C Warning 4 Condition
.User_Warning_4_Description	String[28]	Text Description of User Warning 4
.User_Warning_5	BOOL	Set to indicate User C Warning 5 Condition
.User_Warning_5_Description	String[28]	Text Description of User Warning 5
.Structure_Check_Constant	DINT	l – Verify structure is correct size - set to 22334455
END_STRUCT		

Troubleshooting QS_FLT_1

In case of difficulties use PiCPro's animation and view capability to observe the operation of QS_FLT_1.

If the OK output of QS_FLT_1 is OFF there is a programming error. Check for:

Problem	QS_FLT_1 not operating properly
QS_FLT_1 Output Conditions	OK = OFF ERR <> 0
<p>1 - Check ERR:</p> <ul style="list-style-type: none"> ERR = 1001 – FMSG structure size incorrect ERR = 1002 – FHST structure size incorrect ERR = 1003 – FLNK structure size incorrect ERR = 1004 – UFLT structure size incorrect <p>If an incorrect structure size error occurred make sure that the correct structure is programmed as the input to QS_FLT_1, that the structures array index is not greater than its array size in software declarations and that a revision changing the number of members in the structure has not occurred.</p>	

If the OK output of QS_FLT_1 is ON but ESTP is ON. Check for:

Problem	QS_FLT_1 reporting fault
QS_FLT_1 Output Conditions	OK = OFF ERR <> 0 FSTR = <i>First Scan E Stop</i>
<p>This is the normal state of FSTR after control power on or restart of the scan. FSTR never indicates <i>First Scan E Stop</i> after the first time CLR is pulsed to reset faults.</p> <p>1 - To clear faults CLR must make an OFF to ON transition. If CLR is permanently ON after the first fault occurs it will not be able to be cleared with out restarting the control scan.</p> <p>3 - Check the C69 fault history for First Scan E Stop faults - each one indicates that the control power has been powered on or the control scan has been stopped and restarted.</p>	
Problem	QS_FLT_1 reporting fault
QS_FLT_1 Output Conditions	OK = OFF ERR <> 0 FSTR = <i>E Stop Request</i>
<p>1 - Check the logic driving ESTI to determine why it is energizing</p>	
Problem	QS_FLT_1 reporting fault
QS_FLT_1 Output Conditions	OK = OFF ERR <> 0 FSTR = <i>axis name followed by other fault message</i>
<p>1 - FSTR will indicate which axis was the first to detect a fault by presenting the axis name, Axis 1 to Axis 32 or Digitized 1 to Digitized 32 are the default names, followed by the fault description. For a detailed list of fault descriptions and troubleshooting see QS_AIS_1 and QS_DIG_1.</p>	