Motion Objects

Introduction

A **Motion** object manages a single axis or group of axes. Its primary function is to provide an interface to command movement on a coordinate system. It also provides status information about all the axes under its control, so motion can be either stopped or resumed in a controlled manner, especially in the event of error recovery. The Motion object is really a host-based object, with a corresponding Motion Supervisor object in the controller. The Motion Supervisor handles the real-time issues associated with axis data and status synchronization.

Some careful consideration should be given to Motion object (Motion Supervisor) to axis mapping. While it's possible to have multiple Motion objects share the same axes, only one Motion Supervisor can command motion to an axis at a time. Motion object to axis maps can be changed dynamically at any time, but Motion Supervisor to axis maps should NOT be changed when the axes are moving.

To learn more about using MPI Motion Attributes and MEI Motion Attributes, click here.

| Error Messages |

Methods

Create, Delete, Validate Methods

mpiMotion**Create**	Create Motion object
mpiMotion**Delete**	Delete Motion object
mpiMotion**Validate**	Validate Motion object

Configuration and Information Methods

mpiMotion**ConfigGet**	Get Motion configuration
mpiMotion**ConfigSet**	Set Motion configuration
mpiMotion**FlashConfigGet**	Get Motion flash config
mpiMotion**FlashConfigSet**	Set Motion flash config
meiMotion**FrameBufferStatus**	Get a Motion object (motion) frame buffer status.
meiMotion**LogClose**	Frees memory buffer for motion logging
meiMotion**LogOpen**	Allocates a memory buffer for motion logging.
meiMotion**LogPrint**	Writes motion log buffer data
mpiMotion**ParamsGet**	Get Motion parameters

mpiMotion**ParamsSet**	Set Motion parameters
meiMotion**ParamsValidate**	Validate Motion parameters
mpiMotion**PositionGet**	Get position parameters of all axes associated with Motion
mpiMotion**PositionSet**	Set position parameters of all axes associated with Motion
mpiMotion**Status**	Get Motion status
mpiMotion**Trajectory**	Get trajectories for all Axis associated with Motion

Event Methods

mpiMotion**EventNotifyGet**	Get event mask
mpiMotion**EventNotifySet**	Set event mask
mpiMotion**EventReset**	Reset events specified in event mask

Action Methods

mpiMotion**Action**	Perform an action on a Motion
meiMotion**ActionFunction**	
mpiMotion**Modify**	Modify parameters of Motion while it is executing
mpiMotion**Start**	Start Motion (idle state > moving state)

Memory Methods

mpiMotion**Memory**	Set address to be used to access Motion memory
mpiMotion**MemoryGet**	Get bytes of Motion memory and place it into application memory
mpiMotion**MemorySet**	Put (set) bytes of application memory into Motion memory

Relational Methods

mpiMotion**Control**	Return handle of Control object associated with Motion
mpiMotion**Number**	Get index of Motion
mpiMotion**Axis**	Return handle of axis by index number
mpiMotion**AxisAppend**	Append axis to list
mpiMotion**AxisCount**	Return number of axes in list
mpiMotion**AxisFirst**	Return handle to first axis in list
mpiMotion**AxisIndex**	Return index value of an axis in list
mpiMotion**AxisInsert**	Insert axis into list associated with Motion
mpiMotion**AxisLast**	Return handle to last axis in list
mpiMotion**AxisListGet**	Get list of axes associated with Motion
mpiMotion**AxisListSet**	Create a list of axes associated with Motion
mpiMotion**AxisNext**	Get handle to next axis in list
mpiMotion**AxisPrevious**	Get handle to previous axis in list
mpiMotion**AxisRemove**	Remove handle to axis in list

Data Types

*MEIMotion**ActionFunction**

MPIMotion**Attr** / MEIMotion**Attr**

MEIMotion**AttrHold**

MEIMotion**AttrHoldSource**

MEIMotion**AttrHoldType**

MPIMotion**AttrMask** / MEIMotion**AttrMask**

MEIMotion**AttrOutput**

MEIMotion**AttrOutputType**

MPIMotion**Attributes** / MEIMotion**Attributes**

MPIMotion**BESSEL**

MPIMotion**BSPLINE**

MPIMotion**Cam**

MPIMotion**Config** / MEIMotion**Config**

MPIMotion**DecelTime**

MEIMotion**Frame**

MEIMotion**FrameBufferStatus**

MPIMotion**Message** / MEIMotion**Message**

MPIMotion**Params** / MEIMotion**Params**

MPIMotion**Point**

MPIMotion**PT**

MPIMotion**PTF**

MPIMotion**PVT**

MPIMotion**PVTF**

MPIMotion**SCurve**

MPIMotion**SCurveJerk**

MPIMotion**SPLINE**

MEIMotion**Trace**

MPIMotion**Trapezoidal**

MPIMotion**Type** / MEIMotion**Type**

MPIMotion**Velocity**

Macros

mpiMotion**ATTR**

mpiMotion**AttrMaskBIT**

mpiMotion**TYPE**

mpiMotionCreate

Declaration

```
MPIMotion mpiMotionCreate(MPIControl control,
                          long       number,
                          MPIAxis    axis)
```

Required Header: stdmpi.h

Description

mpiMotionCreate creates a Motion object associated with the motion supervisor identified by ***number*** located on motion controller ***control***. *MotionCreate* is the equivalent of a C++ constructor.

If ***number*** is **-1**, MotionCreate selects the next unused motion supervisor. The ***axis*** parameter specifies the initial element in the list of Axis objects which determine the coordinate system (axis may be MPIHandleVOID).

Return Values	
handle	handle to a Motion object
MPIHandleVOID	if the object could not be created

See Also

mpiMotionDelete | mpiMotionValidate

mpiMotionDelete

Declaration

```
long mpiMotionDelete(MPIMotion motion)
```

Required Header: stdmpi.h

Description

mpiMotionDelete deletes a Motion object (***motion***) and invalidates its handle. *MotionDelete* is the equivalent of a C++ destructor.

Deleting a Motion object does not delete any of the Axis objects in the coordinate system.

Return Values	
MPIMessageOK	if *MotionDelete* successfully deletes a Motion object and invalidates its handle

See Also

mpiMotionCreate | mpiMotionValidate

mpiMotionValidate

Declaration

```
long mpiMotionValidate(MPIMotion  motion)
```

Required Header: stdmpi.h

Description

mpiMotionValidate validates the Motion object (***motion***) and its handle. Always call *mpiMotionValidate* after creating a new Motion object.

Return Values	
MPIMessageOK	if Motion is a handle to a valid object.

See Also

mpiMotionCreate | mpiMotionDelete

mpiMotionConfigGet

Declaration

```
long mpiMotionConfigGet(MPIMotion         motion,
                        MPIMotionConfig   *config,
                        void              *external)
```

Required Header: stdmpi.h

Description

mpiMotionConfigGet gets the configuration of a Motion object (***motion***) and puts (writes) it in the structure pointed to by ***config***, and also writes it into the implementation-specific structure pointed to by ***external*** (if ***external*** is not NULL).

The configuration information in ***external*** is in addition to the configuration information in ***config***, i.e, the configuration information in ***config*** and in ***external*** is not the same information. Note that ***config*** or ***external*** can be NULL (but not both NULL).

Remarks

external either points to a structure of type **MEIMotionConfig{}** or is NULL.

Return Values	
MPIMessageOK	if *MotionConfigGet* successfully gets the configuration of a Motion object and writes it into the structure(s)

See Also

mpiMotionConfigSet | MEIMotionConfig

mpiMotionConfigSet

Declaration

```
long mpiMotionConfigSet(MPIMotion       motion,
                        MPIMotionConfig *config,
                        void            *external)
```

Required Header: stdmpi.h

Description

mpiMotionConfigSet sets (writes) the configuration of a Motion object (***motion***) using data from the structure pointed to by ***config***, and also using data from the implementation-specific structure pointed to by ***external*** (if ***external*** is not NULL).

The configuration information in ***external*** is in *addition* to the configuration information in ***config***, i.e, the configuration information in ***config*** and in ***external*** is not the same information. Note that ***config*** or ***external*** can be NULL (but not both NULL).

Remarks

external either points to a structure of type **MEIMotionConfig{}** or is NULL.

Return Values	
MPIMessageOK	if *MotionConfigSet* successfully writes the configuration of a Motion object using data from the structure(s)

See Also

mpiMotionConfigGet | MEIMotionConfig

mpiMotionFlashConfigGet

Declaration

```
long mpiMotionFlashConfigGet(MPIMotion       motion,
                             void            *flash,
                             MPIMotionConfig *config,
                             void            *external)
```

Required Header: stdmpi.h

Description

mpiMotionFlashConfigGet gets the flash configuration for a Motion object (motion) and puts (writes) it into the structure pointed to by ***config***, and also writes it into the implementation-specific structure pointed to by ***external*** (if ***external*** is not NULL).

The Motion's flash configuration information in ***external*** is in addition to the Motion's flash configuration information in ***config***, i.e., the flash configuration information in ***config*** and in ***external*** is not the same information. Note that ***config*** or ***external*** can be NULL (but not both NULL). The implementation-specific ***flash*** argument is used to access flash memory.

Remarks

external either points to a structure of type **MEIMotionConfig{}** or is **NULL**. ***flash*** is either an MEIFlash handle or MPIHandleVOID. If ***flash*** is MPIHandleVOID, an MEIFlash object will be created and deleted internally.

Return Values	
MPIMessageOK	if *MotionFlashConfigGet* successfully gets the Motion's flash configuration and writes it into the structure(s).

See Also

mpiMotionFlashConfigSet

mpiMotionFlashConfigSet

Declaration

```
long mpiMotionFlashConfigSet(MPIMotion       motion,
                             void            *flash,
                             MPIMotionConfig *config,
                             void            *external)
```

Required Header: stdmpi.h

Description

mpiMotionFlashConfigSet sets (writes) the flash configuration of a Motion object (motion) using data from the structure pointed to by ***config***, and also using data from the implementation-specific structure pointed to by ***external*** (if ***external*** is not NULL).

The Motion's flash configuration information in ***external*** is in addition to the Motion's flash configuration information in config, i.e., the flash configuration information in ***config*** and in ***external*** is not the same information. Note that ***config*** or ***external*** can be NULL (but not both NULL). The implementation-specific ***flash*** argument is used to access flash memory.

Remarks

external either points to a structure of type MEIMotionConfig{} or is **NULL**. ***flash*** is either an MEIFlash handle or MPIHandleVOID. If ***flash*** is MPIHandleVOID, an MEIFlash object will be created and deleted internally.

Return Values	
MPIMessageOK	if *MotionFlashConfigSet* successfully sets (writes) the Motion's flash configuration using data from the structure(s)

See Also

MEIMotionConfig | MEIFlash | mpiMotionFlashConfigGet

mpiMotionFrameBufferStatus

Declaration

```
long meiMotionFrameBufferStatus(MPIMotion                    motion,
                                MEIMotionFrameBufferStatus   *status)
```

Required Header: stdmei.h

Description

mpiMotionFrameBufferStatus gets a Motion object (motion) frame buffer status and writes it to the structure pointed to by status.

motion	a handle to the Motion object
***status**	a pointer to the motion frame buffer status structure returned by the method

Return Values	
MPIMessageOK	if *MotionFrameBufferStatus* successfully gets the frame buffer status

See Also

MEIMotionFrameBufferStatus

meiMotionLogClose

Declaration

```
long meiMotionLogClose(MPIMotion    motion);
```

Required Header: stdmei.h

Description

meiMotionLogClose frees the memory buffer for motion logging.

motion	a handle to the Motion object

Return Values	
MPIMessageOK	if *MotionLogClose* successfully frees the memory buffer for motion logging.

See Also

meiMotionLogOpen | meiMotionLogPrint

meiMotionLogOpen

Declaration

```
long meiMotionLogOpen(MPIMotion    motion,
                      long         maxEntries);
```

Required Header: stdmei.h

Description

meiMotionLogOpen allocates a memory buffer for motion logging.

motion	a handle to the Motion object
maxEntries	The maximum number of log entries. This value determines the log buffer memory size.

Return Values	
MPIMessageOK	if *MotionLogOpen* successfully allocates a memory buffer for motion logging.

See Also

meiMotionLogClose | meiMotionLogPrint

meiMotionLogPrint

Declaration

```
long meiMotionLogPrint(MPIMotion    motion,
                       char        *filename);
```

Required Header: stdmei.h

Description

meiMotionLogPrint reads the motion log buffer entries and writes the data into a file specified by the ***fileName***.

motion	a handle to the Motion object
***filename**	a pointer to a file name string.

Return Values	
MPIMessageOK	if *MotionLogPrint* successfully writes the data into a file specified by the ***fileName***.

See Also

meiMotionLogOpen | meiMotionLogClose

mpiMotionParamsGet

Declaration

```
long mpiMotionParamsGet(MPIMotion       motion,
                        MPIMotionParams *params)
```

Required Header: stdmpi.h

Description

mpiMotionParamsGet reads the parameters of a Motion object (motion) and writes it to the structure pointed to by params. These motion parameters will be used if mpiMotionStart(.) is called with Null motion params.

motion	a handle to the Motion object
***params**	a pointer to the motion parameters structure returned by the method

Return Values	
MPIMessageOK	if *MotionParamsGet* successfully returns the parameters associated with a Motion object
motion parameters	that are associated with a Motion object (***motion***). To set these motion parameters, call either mpiMotionParamsSet(...) or mpiMotionStart(...)

See Also

mpiMotionParamsSet | mpiMotionStart | meiMotionParamsValidate

mpiMotionParamsSet

Declaration

```
long mpiMotionParamsSet(MPIMotion       motion,
                        MPIMotionParams *params)
```

Required Header: stdmpi.h

Description

mpiMotionParamsSet sets the parameters of a Motion object (***motion***). These motion parameters will be used if mpiMotionStart(...) is called with a Null motion parameter.

If Motion (***motion***) is active, *MotionParamsSet* will set motion parameters "on-the-fly," i.e., at the first opportunity.

Return Values	
MPIMessageOK	if *MotionParamsSet* successfully sets the parameters of a Motion object

See Also

mpiMotionStart | mpiMotionParamsGet

meiMotionParamsValidate

Declaration

```
long meiMotionParamsValidate(MPIMotion       motion,
                             MPIMotionType   type,
                             MPIMotionParams *params,
                             MEIXmpAction    action,
                             long            *points)
```

Required Header: stdmei.h

Description

meiMotionParamsValidate validates the type-specific motion parameters pointed to by ***params***, using the coordinate system of ***motion***.

If "point" is	Then
not Null	the number of points specified by ***params*** is written to the location (pointed to by ***points***)

Return Values	
MPIMessageOK	if *MotionParamsValidate* successfully validates the type-specific motion parameters using the coordinate system of ***motion***

See Also

mpiMotionPositionGet

Declaration

```
long mpiMotionPositionGet(MPIMotion  motion,
                          double     *actual,
                          double     *command)
```

Required Header: stdmpi.h

Description

mpiMotionPositionGet gets the actual and command position values for all axes associated with a Motion (***motion***). The ***actual*** and ***command*** arguments each point to an array with a size equal to the number of axes associated with ***motion***.

Return Values	
MPIMessageOK	if *MotionPositionGet* successfully gets the actual and command position values for all axes associated with a Motion object

See Also

mpiMotionPositionSet | Controller Positions

mpiMotionPositionSet

Declaration

```
long mpiMotionPositionSet(MPIMotion motion,
                          double    *actual,
                          double    *command)
```

Required Header: stdmpi.h

Description

mpiMotionPositionSet sets the actual and command position values for all axes associated with a Motion (***motion***). The ***actual*** and ***command*** arguments each point to an array with a size equal to the number of axes associated with ***motion***.

Return Values	
MPIMessageOK	if *MotionPositionSet* successfully sets the actual and command position values for all axes associated with a Motion object

See Also

mpiMotionPositionGet | Controller Positions

mpiMotionStatus

Declaration

```
long mpiMotionStatus(MPIMotion  motion,
                     MPIStatus  *status,
                     void       *external)
```

Required Header: stdmpi.h

Description

mpiMotionStatus gets a Motion's (***motion***) status and writes it to the structure pointed to by ***status***, and also writes it into the implementation-specific structure pointed to by ***external*** (if ***external*** is not NULL).

Remarks

external should always be set to NULL.

motion	a handle to a Motion object
***status**	a pointer to MPIStatus structure
***external**	a pointer to an implementation-specific structure

Return Values	
MPIMessageOK	if *MotionStatus* successfully writes the Motion's status to the structure(s).
MPIMessageARG_INVALID	if the *status* pointer is NULL.

See Also

mpiMotionTrajectory

Declaration

```
long mpiMotionTrajectory(MPIMotion      motion,
                         MPITrajectory *trajectory)
```

Required Header: stdmpi.h

Description

mpiMotionTrajectory reads the current velocity and acceleration for all axes associated with a Motion object (***motion***). The ***trajectory*** argument points to an array of MPITrajectory structures, with a size equal to the number of axes associated with the Motion object (***motion***).

NOTE: deceleration, jerkPercent, accelerationJerk, and decelerationJerk fields cannot be read from the controller and consequently are set to zero.

Remarks

external should always be set to NULL.

Return Values	
MPIMessageOK	if *MotionTrajectory* successfully gets the trajectories for all axes associated with a Motion object

Sample Code

```
MPITrajectory trajectory;

    mpiAxisTrajectory(axis, &trajectory);

    printf("Velocity %.3f\n"
           "Acceleration %.3f\n",
           trajectory.velocity,
           trajectory.acceleration);
```

See Also

MPITrajectory

mpiMotionEventNotifyGet

Declaration

```
long mpiMotionEventNotifyGet(MPIMotion     motion,
                             MPIEventMask  *eventmask,
                             void          *external)
```

Required Header: stdmpi.h

Description

mpiMotionEventNotifyGet writes the event mask (that specifies the event type(s) for which host notification has been requested) to the location pointed to by ***eventMask***, and also writes it into the implementation-specific location pointed to by ***external*** (if ***external*** is not NULL).

The event notification information in ***external*** is in addition to the event notification information in ***eventmask***, i.e, the event notification information in ***eventmask*** and in ***external*** is not the same information. Note that ***eventmask*** or ***external*** can be NULL (but not both NULL).

Event notification is enabled for event types specified in ***eventmask***, which is a bit mask generated **by the logical OR** of the MPIEventMask bits associated with the desired MPIEventType values.
Event notification is disabled for event types not specified in ***eventmask***.

Remarks

external either points to a structure of type **MEIEventNotifyData{}** or is NULL.
The **MEIEventNotifyData{}** structure is an array of firmware addresses, whose contents are placed into the **MEIEventStatusInfo{}** structure (of all events generated by this object).

Return Values	
MPIMessageOK	if *MotionEventNotifyGet* successfully writes the event mask to the location(s)

See Also

MPIEventType | MEIEventNotifyData | MEIEventStatusInfo | mpiMotionEventNotifySet

mpiMotionEventNotifySet

Declaration

```
long mpiMotionEventNotifySet(MPIMotion     motion,
                             MPIEventMask  eventmask,
                             void          *external)
```

Required Header: stdmpi.h

Description

mpiMotionEventNotifySet requests host notification of the event(s) that are generated by ***motion*** and specified by ***eventMask***, and also specified by the implementation-specific location pointed to by ***external*** (if ***external*** is not NULL).

The event notification information in ***external*** is in addition to the event notification information in ***eventmask***, i.e, the event notification information in ***eventmask*** and in ***external*** is not the same information. Note that ***eventmask*** or ***external*** can be NULL (but not both NULL).

Event notification is enabled for event types specified in ***eventMask***, a bit mask generated by the bitwise OR of the MPIEventMask bits *associated with* the desired MPIEventType values. Event notification is disabled for event types that are not specified in ***eventMask***.

The mask of event types generated by a Motion object consists of bits from MPIEventMaskMOTION and MPIEventMaskAXIS.

Remarks

external either points to a structure of type MEIEventNotifyData{} or is NULL. The MEIEventNotifyData{} structure is an array of firmware addresses, whose contents are placed into the MEIEventStatusInfo{} structure (of all events generated by this object).

To	Then
enable host notification of all events	set eventmask to MPIEventMaskALL
disable host notification of all events	set eventmask to MPIEventTypeNONE

Return Values	
MPIMessageOK	if *MotionEventNotifySet* successfully requests host notification of the event(s) that are specified by ***eventMask*** and generated by ***motion***

See Also

MPIEventType | MEIEventNotifyData | MEIEventStatusInfo | mpiEventMaskMOTION | mpiEventMaskAXIS | mpiMotionEventNotifyGet

mpiMotionEventReset

Declaration

```
long mpiMotionEventReset(MPIMotion     motion,
                         MPIEventMask  eventMask)
```

Required Header: stdmpi.h

Description

mpiMotionEventReset resets the event(s) that are specified in ***eventMask*** and generated by ***motion***. Your application must call *MotionEventReset* only after one or more latchable events have occurred.

Return Values	
MPIMessageOK	if *MotionEventReset* successfully resets the event(s) that are specified in ***eventMask*** and generated by ***motion***

See Also

mpiMotionAction

Declaration

```
long mpiMotionAction(MPIMotion   motion,
                     MPIAction   action)
```

Required Header: stdmpi.h

Description

mpiMotionAction performs the specified action on the Motion object (motion).

The deceleration stop and Estop times can be set with:

```
mpiMotionConfigSet(MPIMotion       motion,
                   MPIMotionConfig *config,
                   void            *external);
```

where the structure MPIMotionConfig, contains the elements:

```
MPIMotionConfig.decelTime.stop /* seconds */
MPIMotionConfig.decelTime.eStop /* seconds */
```

In the 20030818 and later releases, mpiMotionAction(...) was optimized for the MPIActionRESET action type. To make the execution as fast as possible, service commands to clear node status, CRCs, and the packet error counters were removed. Service commands to clear amp and encoder faults are only sent to the node when an amp fault or encoder fault is active.

The method, meiSqNodeStatusClear(...) was added to clear node faults. It sends service commands to the node in order to clear the node status, CRCs, packet error counters, and hardware latches for the nodeDisable and powerFault.

If "action" is	Then
MPIActionABORT *or* **MPIActionE_STOP** *or* **MPIActionE_STOP_ABORT**	the Motion will perform an emergency stop and/or abort on all axes, and then change to the error state (MPIStateSTOPPING_ERROR to MPIStateERROR). Before starting another Motion, you must first make a call to mpiMotionAction(motion, MPIActionRESET).
MPIActionABORT	MotionAction will disable the PID control (or other algorithm), set the DAC output to the offset value, and disable the amp enable outputs. After the abort completes, the Motion will be set to the ERROR state.

MPIActionE_STOP	MotionAction will decelerate the axis (or axes) to a stop in the time specified by the "eStop" time. After the Motion stops, the Motion will be set to the ERROR state.
MPIActionE_STOP_ABORT	MotionAction will decelerate the axis (or axes) to a stop in the time specified by the "eStop" time. Next, MotionAction will generate an MPIActionABORT. After the abort completes, the Motion is set to the ERROR state. The E_STOP_ABORT first performs an E_STOP, and then performs an ABORT. The E_STOP decelerates the axis to a stop, then the ABORT disables PID control and disables the amp enable output.
MPIActionRESET	If the motion supervisor (motion) is in the error state (MPIStateERROR), the motion supervisor will attempt to clear the error and change to the idle state (MPIStateIDLE), so that motion supervisor can be restarted. If the error state was caused by an Abort action, then the command position of associated axes will be set equal to the actual position during the Reset.
MPIActionRESUME	If the Motion is in the idle state (MPIStateIDLE), it will change to the moving state (MPIStateMOVING), and the Motion will resume if it was stopped by a prior call to mpiMotionAction(motion, MPIActionSTOP).
MPIActionSTOP	if the Motion is in the moving state (MPIStateMOVING), it will performing a stop on all axes and change to the idle state (MPIStateSTOPPING to MPIStateIDLE). MPIActionSTOP decelerates the axis (or axes) to a stop in the time specified by the "stop" time. After the motion stops, the Motion is set to the ERROR state.
MEIActionMAP	MotionAction will write the axis mapping relationship of the motion supervisor to the controller. This mapping is written automatically when mpiMotionStart() is called.

Return Values	
MPIMessageOK	if *MotionAction* successfully performs the specified action on the Motion object

See Also

meiMotionActionFunction

Declaration

```
MEIMotionActionFunction  meiMotionActionFunction(MPIMotion    motion,
                                                 MEIMotionActionFunction    function);
```

Required Header: stdmei.h

Description

meiMotionActionFunction

motion	a handle to the Motion object
function	

Return Values	
MPIMessageOK	if *MotionActionFunction* successfully

See Also

MEIFlashFiles | mpiControlReset

mpiMotionModify

Declaration

```
long mpiMotionModify(MPIMotion       motion,
                     MPIMotionType   type,
                     MPIMotionParams *params)
```

Required Header: stdmpi.h

Description

mpiMotionModify modifies the parameters of a Motion object (***motion***) if motion is in progress (MPIStateMOVING). The types of motion whose parameters can be modified while moving are MPIMotionTypeTRAPEZOIDAL, MPIMotionTypeS_CURVE, MPIMotionTypeVELOCITY, MPIMotionTypePT and MPIMotionTypePVT.

Use the MPIMotionAttrAUTO_START attribute to automatically start a motion profile if the MotionModify call is made too late (i.e., after the previous move has finished).

Each axis has a 128 frame buffer (FIFO). mpiMotionStart and mpiMotionModify calls will load up to 10 frames. No provision has been made to check if the new frames will overwrite the currently executing frames. This could happen after about 12 Start/Modify calls are made with the APPEND attribute.

The XMP firmware velocity frame execution time for point-to-point moves cannot exceed 16,384,000 samples. With the sample rate configured for 2000 (default), the maximum velocity time is 2.27 hours. If the commanded motion exceeds the maximum frame time, the axes will stop abruptly after 16,384,000 samples. The motors will still maintain servo control and no errors are reported.

Return Values	
MPIMessageOK	if *MotionModify* successfully modifies the parameters of a Motion object
MPIMotionMessageIDLE	if no Motion was in progress when *MotionModify* was called. In order for *MotionModify* to work, there must be a Motion in progress.
MPIMotionMessageAUTO_START	if *MotionModify* was called when no motion was in progress and the Auto-Start attribute was specified. In this case, the MotionModify is automatically converted into a MotionStart.

MPIMotionMessagePROFILE_ERROR	if the controller cannot generate the motion profile (based on the specified motion parameters and attributes).
For more Returns, click here	

See Also

mpiMotionStart

Declaration

```
long mpiMotionStart(MPIMotion       motion,
                    MPIMotionType   type,
                    MPIMotionParams *params)
```

Required Header: stdmpi.h

Description

mpiMotionStart changes a Motion object (***motion***) from the idle state (MPIStateIDLE) to the moving state (MPIStateMOVING), by initiating a motion of the given ***type*** using the specified parameters (***params***).If ***params*** is Null, then the motion parameters that were set by the most recent call to mpiMotionParamsSet(...) will be used to define the motion.

The coordinate system is defined by the ordered list of Axis object(s) that have been associated with the Motion object (***motion***). There must be at least one Axis in the coordinate system.

Each axis has a 128 frame buffer (FIFO). mpiMotionStart and mpiMotionModify calls will load up to 10 frames. No provision has been made to check if the new frames will overwrite the currently executing frames. This could happen after about 12 Start/Modify calls are made with the APPEND attribute.

If E-stop deceleration rates are not set high enough to stop within the number of frames specified by the empty frame limit, the axis jumps on a frame underflow. The axis will E-stop along the path of the last frames in the buffer, then continue onto the next frames (which are the frames from 128 frames ago). This can potentially cause a dangerous condition.

When successive non-integer length relative motions are commanded, the fractional portion is truncated and discarded. This may cause problems if the fractional value needs to be summed over multiple moves.

The XMP firmware velocity frame execution time for point-to-point moves cannot exceed 16,384,000 samples. With the sample rate configured for 2000 (default), the maximum velocity time is 2.27 hours. If the commanded motion exceeds the maximum frame time, the axes will stop abruptly after 16,384,000 samples. The motors will still maintain servo control and no errors are reported.

Return Values	
MPIMessageOK	*MotionStart* successfully changes a Motion object from the idle state to the moving state
MPIMotionMessageMOVING	if *MotionStart* was called when a Motion is in progress
For more Returns, click here	

See Also

mpiMotionParamsSet | MPIState | See diagram on how mpiMotionStart works

mpiMotionMemory

Declaration

```
long mpiMotionMemory(MPIMotion  motion,
                     void       **memory)
```

Required Header: stdmpi.h

Description

mpiMotionMemory sets (writes) the address [that is used to access a Motion's (***motion***) memory] to the contents of ***memory***. This address (or an address calculated from it) is passed as the ***src*** argument to mpiMotionMemoryGet(...), and also as the dst argument to mpiMotionMemorySet(...).

Return Values	
MPIMessageOK	if *MotionMemory* successfully writes the address (used to access a Motion's memory) to the contents of memory

See Also

mpiMotionMemoryGet | mpiMotionMemorySet

mpiMotionMemoryGet

Declaration

```
long mpiMotionMemoryGet(MPIMotion motion,
                        void      *dst,
                        void      *src,
                        long      count)
```

Required Header: stdmpi.h

Description

mpiMotionMemoryGet copies ***count*** bytes of a Motion's (***motion***) memory (starting at address ***src***) to application memory (starting at address ***dst***).

Return Values	
MPIMessageOK	if *MotionMemoryGet* successfully copies ***count*** bytes of a Motion's memory to application memory

See Also

mpiMotionMemorySet | mpiMotionMemory

mpiMotionMemorySet

Declaration

```
long mpiMotionMemorySet(MPIMotion motion,
                        void      *dst,
                        void      *src,
                        long      count)
```

Required Header: stdmpi.h

Description

mpiMotionMemorySet copies ***count*** bytes of application memory (starting at address src) to a Motion's (***motion***) memory (starting at address dst).

Return Values	
MPIMessageOK	if *MotionMemorySet* successfully copies ***count*** bytes of application memory to a Motion's memory

See Also

mpiMotionMemoryGet | mpiMotionMemory

mpiMotionControl

Declaration

```
MPIControl mpiMotionControl(MPIMotion  motion)
```

Required Header: stdmpi.h

Description

mpiMotionControl returns a handle to the Control object with which the motion is associated.

motion	a handle to the Motion object.

Return Values	
MPIControl	handle to a Control object
MPIHandleVOID	if ***motion*** is invalid

See Also

mpiMotionCreate | mpiControlCreate

mpiMotionNumber

Declaration

```
long mpiMotionNumber(MPIMotion  motion,
                     long       *number)
```

Required Header: stdmpi.h

Description

mpiMotionNumber writes the index of a Motion object (***motion***, on the motion controller that the Motion object is associated with) to the contents of ***number***.

Return Values	
MPIMessageOK	if *MotionNumber* successfully writes the index of a Motion object to the contents of ***number***

See Also

mpiMotionAxis

Declaration

```
MPIAxis mpiMotionAxis(MPIMotion motion,
                      long      index)
```

Required Header: stdmpi.h

Description

mpiMotionAxis returns the element at the position on the list indicated by ***index***.

motion	a handle to the Motion object.
index	a position in the list.

Return Values	
handle	to the ***index***th Axis of a Motion (***motion***)
MPIHandleVOID	if ***motion*** is invalid if ***index*** is less than 0 if ***index*** is greater than or equal to **mpiMotionAxisCount(motion)**
MPIMessageARG_INVALID	***index*** is a negative number.
MEIListMessageELEMENT_NOT_FOUND	***index*** is greater than or equal to the number of elements in the list.
MPIMessageHANDLE_INVALID	***motion*** is an invalid handle.

See Also

mpiMotionAxisAppend

Declaration

```
long mpiMotionAxisAppend(MPIMotion  motion,
                         MPIAxis    axis)
```

Required Header: stdmpi.h

Description

mpiMotionAxisAppend appends an Axis (***axis***) to a Motion (***motion***).

When using multiple Motion Supervisors that share axes, Motion events (Done, AtVelocity) are sent to both Motion objects, no matter which Motion Supervisor commanded the motion. This occurs, because the Motion events are derived from the Motion Supervisor status, which is derived from each axis' status.

motion	a handle to the Motion object.
axis	a handle to an Axis object.

Return Values	
MPIMessageOK	if *MotionAxisAppend* successfully appends an Axis to a Motion object
MPIMessageHANDLE_INVALID	Either ***motion*** or ***axis*** is an invalid handle.
MPIMessageUNSUPPORTED	The list already contains the maximum number of elements (MEIXmpMAX_COORD_AXES). **-or-** ***motion*** and axis are on different controllers.
MPIMessageOBJECT_NOT_ENABLED	***axis*** is not an enabled axis.
MPIMessageOBJECT_ON_LIST	***axis*** is already on the list.
MPIMessageNO_MEMORY	Not enough memory was available.

See Also

mpiMotionAxisCount

Declaration

```
long mpiMotionAxisCount(MPIMotion motion)
```

Required Header: stdmpi.h

Description

mpiMotionAxisCount returns the number of elements on the list.

motion	a handle to the Motion object.

Return Values	
number	of Axes in a Motion (***motion***)
-1	if ***motion*** is invalid
0	if ***motion*** is empty

See Also

mpiMotionAxis | mpiMotionAxisAppend

mpiMotionAxisFirst

Declaration

```
MPIAxis mpiMotionAxisFirst(MPIMotion  motion)
```

Required Header: stdmpi.h

Description

mpiMotionAxisFirst return the first element in the list. This function can be used in conjuntion with mpiMotionAxisNext() in order to iterate through the list.

motion	a handle to the Motion object.

Return Values	
handle	to the first Axis of a Motion (***motion***)
MPIHandleVOID	if ***motion*** is invalid if ***motion*** is empty
MPIMessageHANDLE_INVALID	***motion*** is an invalid handle.

See Also

mpiMotionAxisNext | mpiMotionAxisLast

mpiMotionAxisIndex

Declaration

```
long mpiMotionAxisIndex(MPIMotion motion,
                        MPIAxis   axis)
```

Required Header: stdmpi.h

Description

mpiMotionAxisIndex returns the position of "axis" on the list.

motion	a handle to the Motion object.
axis	a handle to an Axis object.

Return Values	
index	of an Axis (***axis***) in a Motion (***motion***)
-1	if ***motion*** is invalid if the Axis (axis) was not found in the Motion (***motion***)

See Also

mpiMotionAxis

mpiMotionAxisInsert

Declaration

```
long mpiMotionAxisInsert(MPIMotion motion,
                         MPIAxis   axis,
                         MPIAxis   insert)
```

Required Header: stdmpi.h

Description

mpiMotionAxisInsert inserts an Axis (***insert***) in a Motion (***motion***), just after the specified Axis (***axis***).

motion	a handle to the Motion object.

Return Values	
MPIMessageOK	if *MotionAxisInsert* successfully inserts an Axis (***insert***) in a Motion (***motion***) following a specified Axis (***axis***)

See Also

mpiMotionAxis

mpiMotionAxisLast

Declaration

```
MPIAxis mpiMotionAxisLast(MPIMotion motion)
```

Required Header: stdmpi.h

Description

mpiMotionAxisLast returns the last element in the list. This function can be used in conjuntion with mpiMotionAxisPrevious() in order to iterate through the list backwards.

motion	a handle to the Motion object.

Return Values	
handle	to the last Axis of a Motion (***motion***)
MPIHandleVOID	if ***motion*** is invalid if ***motion*** is empty
MPIMessageHANDLE_INVALID	Either ***motion*** or ***axis*** is an invalid handle.

See Also

mpiMotionAxisPrevious

mpiMotionAxisListGet

Declaration

```
long mpiMotionAxisListGet(MPIMotion  motion,
                          long       *axisCount,
                          MPIAxis    *axisList)
```

Required Header: stdmpi.h

Description

mpiMotionAxisListGet gets the coordinate system of a Motion object (***motion***).

MotionAxisListGet writes the number of axes (in the coordinate system) to a location (pointed to by ***axisCount***), and also writes an array (of ***axisCount*** Axis handles) to another location (pointed to by ***axisList***).

motion	a handle to the Motion object.

Return Values	
MPIMessageOK	if *MotionAxisListGet* successfully gets the coordinate system of a Motion object

See Also

mpiMotionAxisListSet | mpiMotionAxis

mpiMotionAxisListSet

Declaration

```
long mpiMotionAxisListSet(MPIMotion  motion,
                          long       axisCount,
                          MPIAxis    *axisList)
```

Required Header: stdmpi.h

Description

mpiMotionAxisListSet creates a coordinate system of ***axisCount*** dimensions, using the Axis handles specified by ***axisList***. Any existing coordinate system is completely replaced.

The ***axisList*** parameter is the address of an array of ***axisCount*** Axis handles, or is ***NULL*** (if ***axisCount*** is equal to zero).

A coordinate system may also be created incrementally (i.e. one Axis at a time) by using the append and/or insert methods described in this section. The initial Axis of a coordinate system may be specified using the ***axis*** parameter of mpiMotionCreate(...). The list methods in this section may be used to examine and manipulate a coordinate system (i.e. axis list) regardless of how it was created.

Return Values	
MPIMessageOK	if *MotionAxisListSet* successfully creates a coordinate system

Sample Code

```
/* Creates a 1:1 mapping between motion supervisor and axis */
MPIMotion motion;
MPIAxis axis;
long returnValue;

axis = mpiAxisCreate(control, axisNumber);
returnValue = mpiAxisValidate(axis);
msgCHECK(returnValue);

motion = mpiMotionCreate(control,
                         axisNumber,
                         NULL);
returnValue = mpiMotionValidate(motion);
msgCHECK(returnValue);
```

```
returnValue = mpiMotionAxisListSet(motion,
                                   1,
                                   &axis);
msgCHECK(returnValue);

returnValue = mpiMotionAction(motion, MEIActionMAP);
msgCHECK(returnValue);

/* Don't forget to delete your motion supervisor and axis objects */
```

See Also

mpiMotionCreate | mpiMotionAxisListGet | mpiMotionAxis

mpiMotionAxisNext

Declaration

```
MPIAxis mpiMotionAxisNext(MPIMotion motion,
                          MPIAxis   axis)
```

Required Header: stdmpi.h

Description

mpiMotionAxisNext returns the next element following "axis" on the list. This function can be used in conjuntion with mpiMotionAxisFirst() in order to iterate through the list.

motion	a handle to the Motion object.
axis	a handle to an Axis object.

Return Values	
handle	to the Axis just after the specified Axis (***axis***) in a Motion (***motion***)
MPIHandleVOID	if ***motion*** is invalid if the specified Axis (***axis***) is the last axis in a Motion (***motion***)
MPIMessageHANDLE_INVALID	Either ***motion*** or ***axis*** is an invalid handle.

See Also

mpiMotionAxisFirst | mpiMotionAxisPrevious

mpiMotionAxisPrevious

Declaration

```
MPIAxis mpiMotionAxisPrevious(MPIMotion motion,
                              MPIAxis   axis)
```

Required Header: stdmpi.h

Description

mpiMotionAxisPrevious returns the previous element prior to "axis" on the list. This function can be used in conjuntion with mpiMotionAxisLast() in order to iterate through the list backwards.

motion	a handle to the Motion object.
axis	a handle to an Axis object.

Return Values	
handle	to the Axis preceding the specified Axis (***axis***) in a Motion (***motion***)
MPIHandleVOID	if ***motion*** is invalid if the specfied Axis (***axis***) is the first Axis in a Motion (***motion***)
MPIMessageHANDLE_INVALID	Either ***motion*** or ***axis*** is an invalid handle.

See Also

mpiMotionAxisLast | mpiMotionAxisNext

mpiMotionAxisRemove

Declaration

```
long mpiMotionAxisRemove(MPIMotion  motion,
                         MPIAxis    axis)
```

Required Header: stdmpi.h

Description

mpiMotionAxisRemove removes an Axis (***axis***) from a Motion (***motion***).

Return Values	
MPIMessageOK	if *MotionAxisRemove* successfully removes the Axis from the Motion object

See Also

MEIMotionActionFunction

Definition

```
typedef long   /* Callback prototype */
    (*MEIMotionActionFunction)(MPIMotion        motion,
                               MPIMotionType    type,
                               MEIXmpAction     xmpAction);
```

Description

MEIMotionActionFunction is a function prototype definition. This is the prototype for a user defined callback function in the mpiMotionAction(...) method. If a callback function is set using meiMotionActionFunction(...), then every time the application calls mpiMotionAction(...), the callback function will be executed. Your motion action callback function must implement the exact interface of the above prototype.

Using a callback function can be useful to log details of mpiMotionAction(...) calls.

WARNING:
Defining a callback function will affect the execution time of the mpiMotionAction(...) method call. In order to preserve system performance, the callback function should be written to execute as fast as possible.

motion	The motion object handle used to call mpiMotionAction() will be passed to the callback function.
type	The type of motion that the action was called to act upon will be passed to the callback function.
xmpAction	The type of action that was requested will be passed to the callback function.

See Also

mpiMotionAction | meiMotionActionFunction

MPIMotionAttr / MEIMotionAttr

Definition: MPIMotionAttr

```
typedef enum {

    MPIMotionAttrAPPEND,
    MPIMotionAttrAUTO_START,
    MPIMotionAttrDELAY,
    MPIMotionAttrID,
    MPIMotionAttrELEMENT_ID,
    MPIMotionAttrRELATIVE,
    MPIMotionAttrSYNC_END,
    MPIMotionAttrSYNC_START,
    MPIMotionAttrREPEAT,
    MPIMotionAttrMASTER_START,
    MPIMotionAttrNO_BACKTRACK,
    MPIMotionAttrNO_BACKTRACK_HOLD,

    MPIMotionAttrCOUNT,
} MPIMotionAttr;
```

Description

The motion attributes are used to generate the motion attribute masks to enable features with mpiMotionStart(.) and mpiMotionModify(.). Please see MPIMotionAttrMask data type for more information.

MPIMotionAttrAPPEND	This bit enables the motion profile to be added to the end of a previous motion profile, in the controller's memory buffer. The APPENDed profile will begin execution after the previous profile has completed and the settling criteria has been met. The APPEND bit can be used with mpiMotionStart(.) or mpiMotionModify(.).
MPIMotionAttrAUTO_START	This bit converts a mpiMotionModify(.) call to a mpiMotionStart(.) if the modify occurs after the previous motion profile has completed. If the previous profile had completed, then mpiMotionModify(.) will return an error code, MPIMotionMessageAUTO_START.

MPIMotionAttrDELAY	This bit enables a time delay (seconds) before the motion profile begins. This mask can be used with mpiMotionStart(.). Motion with Modify is not supported with the DELAY attribute. Please see MPIMotionAttributes for more information.
MPIMotionAttrID	This bit enables an identification tag to be stored in the motion profile. Please see MPIMotionAttributes for more information. This bit can be used with mpiMotionStart(.) and mpiMotionModify(.).
MPIMotionAttrELEMENT_ID	This bit enables an identification tag to be stored in the path motion profiles. Please see MPIMotionAttributes for more information.
MPIMotionAttrRELATIVE	This bit changes the profile target position from absolute to relative coordinates. Currently only supports APPEND and ID attributes. Support for PT, PVT, SPLINE, BESSEL, or BSPLINE motion types will be added in the future.
MPIMotionAttrSYNC_END	This bit synchronizes the motion profiles for multiple axes so they will all end at the same time. Delays are inserted before the shorter profiles. When enabled, each axis will use its own MPITrajectory values.
MPIMotionAttrSYNC_START	This bit synchronizes the motion profiles for multiple axes so they will all start at the same time. Delays are inserted after the shorter profiles. When enabled, each axis will use its own MPITrajectory values.
MPIMotionAttrREPEAT	This attribute generates a repeating cam motion. If you use this attribute you need to fill in the repeatFrom field in the MPIMotionAttributes structure. See Repeating Cams.

MPIMotionAttrMASTER_START	This attribute specifics the position of the master that a cam will start.If you use this attribute you need to fill in the masterStart field in the MPIMotionAttributes structure. See Starting at Specific Master Positions.
MPIMotionAttrREPEAT_NO_BACKTRACK	This attribute modifies a cam motion so that when the slave axes will only progress if the master is moving in a positive direction, if the master changes direction and moves backwards the slave axes will hold that position until the master velocity returns to the original direction.This attribute cannot be specified with the MPIMotionAttrNO_BACKTRACK attribute. See Reversal of the Master - Backtracking.
MPIMotionAttrREPEAT_NO_BACKTRACK_HOLD	This attribute modifies a cam motion so that when the master changes direction the slave axes will hold that position until the master returns to the point where the direction changed.This attribute cannot be specified with the MPIMotionAttrFORWARD_ONLY attribute. See Reversal of the Master with NO_BACKTRACK_HOLD.

Definition: MEIMotionAttr

```
typedef enum {
    MEIMotionAttrEVENT,
    MEIMotionAttrFINAL_VEL,
    MEIMotionAttrNO_REVERSAL,
    MEIMotionAttrHOLD,
    MEIMotionAttrHOLD_LESS,
    MEIMotionAttrHOLD_GREATER,
    MEIMotionAttrOUTPUT,

    MEIMotionAttrCOUNT,
} MEIMotionAttr;
```

Description

The motion attributes are used to generate the motion attribute masks to enable features with mpiMotionStart(.) and mpiMotionModify(.). Please see MPIMotionAttrMask for more information.

MEIMotionAttrEVENT	This bit allows the user to specify an MPIEventMask during a motion.
MEIMotionAttrFINAL_VEL	This bit allows the user to specify a non-zero target velocity for point to point motion types.
MEIMotionAttrNO_REVERSAL	This bit prevents a motion profile from changing direction.
MEIMotionAttrHOLD	This bit prevents a motion profile from executing until the specified trigger conditions are met. MPIMotionMessageATTRIBUTE_INVALID will be returned if MEIMotionAttrHOLD is used with a mpiMotionModify(...) method.
MEIMotionAttrHOLD_LESS	Motion attribute bit for less than or equal hold logic. MPIMotionMessageATTRIBUTE_INVALID will be returned if MEIMotionAttrHOLD_LESS is used with a mpiMotionModify(...) method.
MEIMotionAttrHOLD_GREATER	Motion attribute bit for greater than or equal hold logic. MPIMotionMessageATTRIBUTE_INVALID will be returned if MEIMotionAttrHOLD_GREATER is used with a mpiMotionModify(...) method.
MEIMotionAttrOUTPUT	This bit allows the user to set or clear bits during a motion.

See Also

MPIMotionAttrMask | mpiMotionStart | mpiMotionModify

MEIMotionAttrHold

Definition

```
typedef struct MEIMotionAttrHold {
    MEIMotionAttrHoldType     type;
    MEIMotionAttrHoldSource   source;
    float                     timeout;
} MEIMotionAttrHold;
```

Description

type	This value specifies the motion hold type. Please see MEIMotionAttrHoldType for more information.
source	This value specifies the motion hold conditions. Please see MEIMotionAttrHoldSource for more information.
timeout	This value specifies the motion hold expiration time (samples). When the time exceeds the timeout value or the hold conditions are met, the motion profile will execute.

See Also

MEIMotionAttrHoldType | MEIMotionAttrHoldSource

MEIMotionAttrHoldSource

Definition

```
typedef union {
    long        gate;
    struct {
        long    *input;
        long    mask;
        long    pattern;
    } input;
    struct {
        long    number;
        long    mask;
        long    pattern;
    } motor;
    struct {
        long    number;
        long    position;
    } axis;
    struct {
        long    *address;
        long    mask;
        long    pattern;
    } user;
} MEIMotionAttrHoldSource;
```

Description

gate	This value specifies the control gate number when MEIMotionAttrHoldTypeGATE is used. Valid values are between 0 and 31. See meiControlGateGet/Set(.) for more information.
input.input	This value specifies the input address when MEIMotionAttrHoldTypeINPUT is used.
input.mask	This value specifies the AND mask when MEIMotionAttrHoldTypeINPUT is used.
input.pattern	This value specifies the comparison pattern when MEIMotionAttrHoldTypeINPUT is used. The value at input.input is bit-wise ANDed with the input.mask and compared to the input.pattern.
motor.number	This value specifies the motor number when MEIMotionAttrHoldTypeMOTOR is used.

motor.mask	This value specifies the AND mask when MEIMotionAttrHoldTypeMOTOR is used.
motor.pattern	This value specifies the comparison pattern when MEIMotionAttrHoldTypeMOTOR is used. The motor input word is bit-wise ANDed with the motor.mask and compared to the motor.pattern.
axis.number	An axis's number (0, 1, 2, etc.). Must be specified when the AXIS_POSITION_COMMAND or AXIS_POSITION_ACTUAL motion hold types are used.
axis.position	A position comparison value. Must be specified when the AXIS_POSITION_COMMAND or AXIS_POSITION_ACTUAL motion hold types are used.
user.address	A controller memory address. Must be specified when the USER_ADDRESS motion hold type is used.
user.mask	A bitwise AND mask for the user specified controller memory address. Must be specified when the USER_ADDRESS motion hold type is used.
user.pattern	A comparison value for the masked user.address. When the pattern matches the masked value, the motion will be triggered. Must be specified when the USER_ADDRESS motion hold type is used.

See Also

MEIMotionAttrHoldType | meiControlGateGet | meiControlGateSet

MEIMotionAttrHoldType

Definition

```
typedef enum {
   MEIMotionAttrHoldTypeINVALID,
   MEIMotionAttrHoldTypeNONE,
   MEIMotionAttrHoldTypeGATE,
   MEIMotionAttrHoldTypeINPUT,
   MEIMotionAttrHoldTypeMOTOR,
   MEIMotionAttrHoldTypeAXIS_POSITION_ACTUAL,
   MEIMotionAttrHoldTypeAXIS_POSITION_COMMAND,
   MEIMotionAttrHoldTypeUSER_ADDRESS,
} MEIMotionAttrHoldType;
```

Description

These types specify the motion profile trigger condition. The hold trigger value is specified with the MEIMotionAttrHoldSource data type.

MEIMotionAttrHoldTypeNONE	This type disables the hold trigger condition.
MEIMotionAttrHoldTypeGATE	This type configures a control gate for the hold trigger condition. See meiControlGateGet/Set(.) for more information.
MEIMotionAttrHoldTypeINPUT	This type configures a memory address for the hold trigger condition.
MEIMotionAttrHoldTypeMOTOR	This type configures a motor's input bit(s) for the hold trigger condition.
MEIMotionAttrHoldTypeAXIS_POSITION_ACTUAL	Motion hold input trigger from an axis's actual position.
MEIMotionAttrHoldTypeAXIS_POSITION_COMMAND	Motion hold input trigger from an axis's command position.
MEIMotionAttrHoldTypeUSER_ADDRESS	Motion hold input trigger from a user specifiable controller memory address.

See Also

MEIMotionAttrHoldSource | MEIMotionAttrHold

MPIMotionAttrMask / MEIMotionAttrMask

Definition: MPIMotionAttrMask

```
typedef enum {
    MPIMotionAttrMaskAPPEND,
    MPIMotionAttrMaskAUTO_START,
    MPIMotionAttrMaskDELAY,
    MPIMotionAttrMaskID,
    MPIMotionAttrMaskELEMENT_ID,
    MPIMotionAttrMaskRELATIVE,
    MPIMotionAttrMaskSYNC_END,
    MPIMotionAttrMaskSYNC_START,
    MPIMotionAttrMaskREPEAT,
    MPIMotionAttrMaskMASTER_START,
    MPIMotionAttrMaskNO_BACKTRACK,
    MPIMotionAttrMaskNO_BACKTRACK_HOLD,

    MPIMotionAttrMaskALL,
} MPIMotionAttrMask;
```

Description

MPIMotionAttrMaskAPPEND	This mask enables the motion profile to be added to the end of a previous motion profile, in the controller's memory buffer. The APPENDed profile will begin execution after the previous profile has completed and the settling criteria has been met. The APPEND mask can be used with mpiMotionStart(.) or mpiMotionModify(.).
MPIMotionAttrMaskAUTO_START	This mask converts a mpiMotionModify(.) call to a mpiMotionStart(.) if the modify occurs after the previous motion profile has completed. If the previous profile had completed, then mpiMotionModify(.) will return an error code, MPIMotionMessageAUTO_START.
MPIMotionAttrMaskDELAY	This mask enables a time delay (seconds) before the motion profile begins. This mask can be used with mpiMotionStart(.). Motion with Modify is not supported with the DELAY attribute. Please see MPIMotionAttributes for more information.

MPIMotionAttrMaskID	This mask enables an identification tag to be stored in the motion profile. Please see MPIMotionAttributes for more information. This mask can be used with mpiMotionStart(.) and mpiMotionModify(.).
MPIMotionAttrMaskELEMENT_ID	This mask enables an identification tag to be stored in the path motion profiles. Please see MPIMotionAttributes for more information.
MPIMotionAttrMaskRELATIVE	This mask changes the profile target position from absolute to relative coordinates. Currently only supports APPEND and ID attributes. Support for PT, PVT, SPLINE, BESSEL, or BSPLINE motion types will be added in the future.
MPIMotionAttrMaskSYNC_END	This mask synchronizes the motion profiles for multiple axes so they will all end at the same time. Delays are inserted before the shorter profiles. When enabled, each axis will use its own MPITrajectory values.
MPIMotionAttrMaskSYNC_START	This mask synchronizes the motion profiles for multiple axes so they will all start at the same time. Delays are inserted after the shorter profiles. When enabled, each axis will use its own MPITrajectory values.
MPIMotionAttrMaskREPEAT	This attribute generates a repeating cam motion. If you use this attribute you need to fill in the repeatFrom field in the MPIMotionAttributes structure. See Repeating Cams.
MPIMotionAttrMaskMASTER_START	This attribute specifics the position of the master that a cam will start.If you use this attribute you need to fill in the masterStart field in the MPIMotionAttributes structure. See Starting at Specific Master Positions.

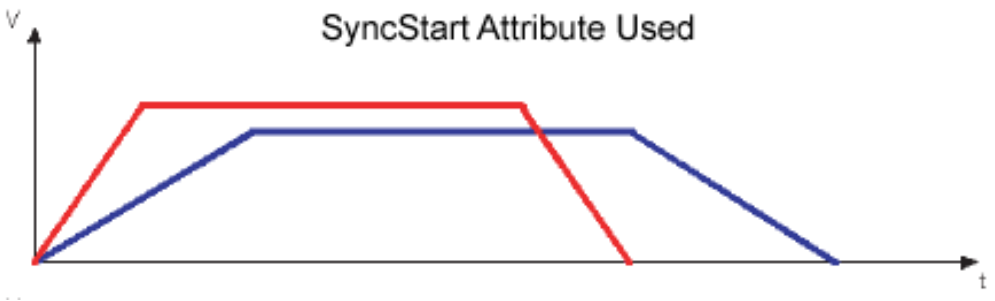
MPIMotionAttrMaskNO_BACKTRACK	This attribute modifies a cam motion so that when the slave axes will only progress if the master is moving in a positive direction, if the master changes direction and moves backwards the slave axes will hold that position until the master velocity returns to the original direction.This attribute cannot be specified with the MPIMotionAttrNO_BACKTRACK attribute. See Reversal of the Master - Backtracking.
MPIMotionAttrMaskNO_BACKTRACK_HOLD	This attribute modifies a cam motion so that when the master changes direction the slave axes will hold that position until the master returns to the point where the direction changed.This attribute cannot be specified with the MPIMotionAttrFORWARD_ONLY attribute. See Reversal of the Master with NO_BACKTRACK_HOLD.

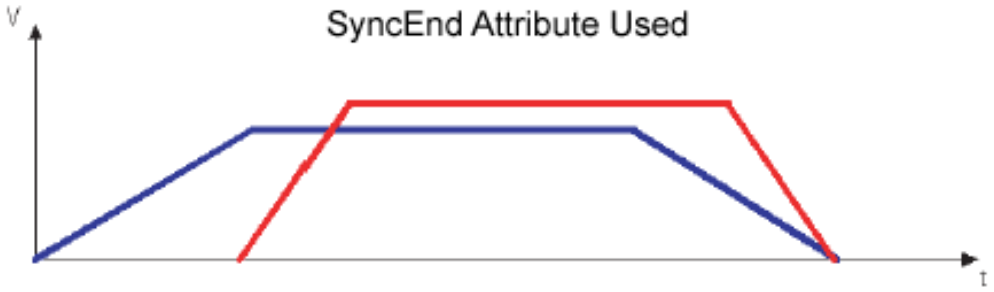
Remarks

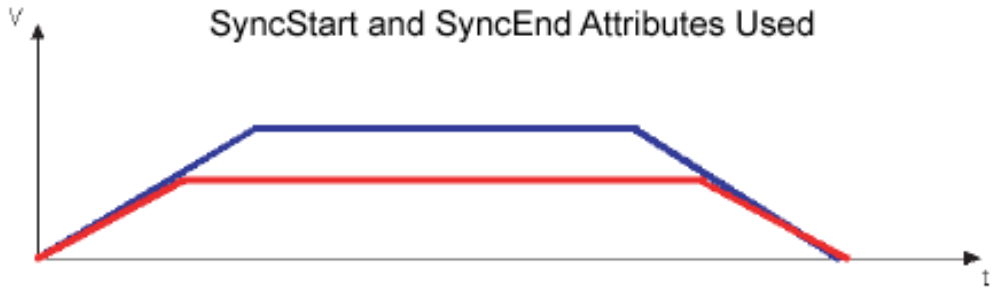
The motion attribute masks are used to enable features with mpiMotionStart(.) and mpiMotionModify(.). The masks are **OR**ed with the MPIMotionType to enable each feature.

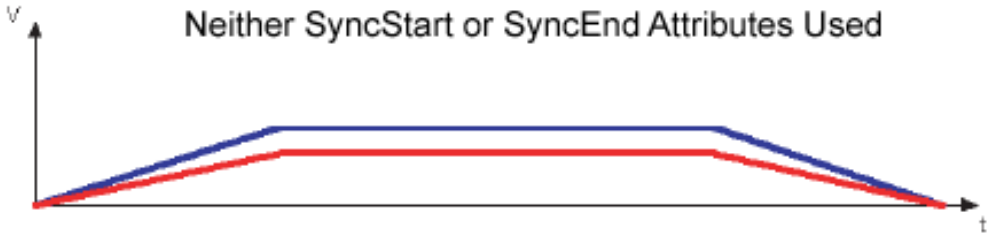
For the motion types MPIMotionTypeS_CURVE_JERK, MPIMotionTypeS_CURVE, MPIMotionTypeTRAPEZOIDAL, if neither MPIMotionAttrMaskSYNC_START nor MPIMotionAttrMaskSYNC_END are specified, then only one MPITrajectory structure will be used for by mpiMotionStart() and mpiMotionModify(). Please refer to MPIMotionAttr for more information.

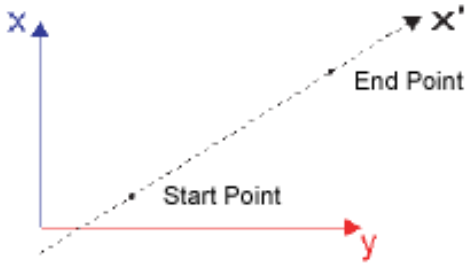
Trajectory











Definition: MEIMotionAttrMask

```
typedef enum {
    MEIMotionAttrMaskEVENT,
    MEIMotionAttrMaskFINAL_VEL,
    MEIMotionAttrMaskNO_REVERSAL,
    MEIMotionAttrMaskHOLD,
    MEIMotionAttrMaskHOLD_LESS,
    MEIMotionAttrMaskHOLD_GREATER,
    MEIMotionAttrMaskOUTPUT,
    MEIMotionAttrMaskALL,
} MEIMotionAttrMask;
```

Description

MEIMotionAttrMaskEVENT	This mask allows the user to specify an MPIEventMask during a motion.
MEIMotionAttrMaskFINAL_VEL	This mask allows the user to specify a non-zero target velocity for point to point motion types.
MEIMotionAttrMaskNO_REVERSAL	This mask prevents a motion profile from changing direction.
MEIMotionAttrMaskHOLD	This mask prevents a motion profile from executing until the specified trigger conditions are met.
MEIMotionAttrMaskHOLD_LESS	Motion attribute mask for less than or equal hold logic.
MEIMotionAttrMaskHOLD_GREATER	Motion attribute mask for greater than or equal hold logic.
MEIMotionAttrMaskOUTPUT	This mask allows the user to set or clear bits during a motion.
MEIMotionAttrOUTPUT	This bit allows the user to set or clear bits during a motion.

See Also

mpiMotionStart | mpiMotionModify | MPIMotionType | MPITrajectory | MPIEventMask

Description

MEIMotionAttrMaskEVENT	This mask allows the user to specify an MPIEventMask during a motion.
MEIMotionAttrMaskFINAL_VEL	This mask allows the user to specify a non-zero target velocity for point to point motion types.
MEIMotionAttrMaskNO_REVERSAL	This mask prevents a motion profile from changing direction.
MEIMotionAttrMaskHOLD	This mask prevents a motion profile from executing until the specified trigger conditions are met.
MEIMotionAttrMaskHOLD_LESS	Motion attribute mask for less than or equal hold logic.
MEIMotionAttrMaskHOLD_GREATER	Motion attribute mask for greater than or equal hold logic.
MEIMotionAttrMaskOUTPUT	This mask allows the user to set or clear bits during a motion.
MEIMotionAttrOUTPUT	This bit allows the user to set or clear bits during a motion.

See Also

mpiMotionStart | mpiMotionModify | MPIMotionType | MPITrajectory | MPIEventMask

MEIMotionAttrOutput

Definition

```
typedef struct MEIMotionAttrOutput {
    MEIMotionAttrOutputType     type;
    union {
        long  *output;
        long  motor;
    } as;
    long   offMask;
    long   onMask;
    long   pointIndex;  /* MEIMotionAttrMaskOUTPUT for path motion -
                           point index for turning on output -
                           used with point lists */
} MEIMotionAttrOutput;
```

Description

type	This value specifies the output type to determine the output bits to be set or cleared.
***output**	This value specifies the memory address when MEIMotionAttrOutputTypeOUTPUT is used.
motor	This value specifies the motor number when MEIMotionAttrOutputTypeMOTOR is used.
offMask	This value specifies the bits to be turned OFF when MEIMotionAttrOutputTypeOFFMASK is used.
onMask	This value specifies the bits to be turned ON when MEIMotionAttrOutputTypeONMASK is used.
pointIndex	This value specifies an index to a point, when multiple point motion is used.

See Also

MEIMotionAttrOutputType

MEIMotionAttrOutputType

Definition

```
typedef enum {
    MEIMotionAttrOutputTypeINVALID,
    MEIMotionAttrOutputTypeNONE,
    MEIMotionAttrOutputTypeMOTOR,
    MEIMotionAttrOutputTypeOUTPUT,
} MEIMotionAttrOutputType;
```

Description

MEIMotionAttrOutputTypeNONE	This type disables the setting/clearing of output bit(s) during motion.
MEIMotionAttrOutputTypeMOTOR	This type configures a motor's output bit(s) to be set or cleared during motion.
MEIMotionAttrOutputTypeOUTPUT	This type configures bit(s) at a memory address to be set or cleared during motion.

See Also

MEIMotionAttrOutput

MPIMotionAttributes / MEIMotionAttributes

Definition: MPIMotionAttributes

```
typedef struct MPIMotionAttributes {
    double  *delay;      /* MPIMotionAttrMaskDELAY */
    long    id;          /* MPIMotionAttrMaskID */
    long    *elementId;  /* MPIMotionAttrMaskELEMENT_ID */
    long    masterStart; /* MPIMotionAttrMaskMASTER_START */
    long    repeatFrom;  /* MPIMotionAttrMaskREPEAT */
} MPIMotionAttributes;
```

Description

delay	This array defines the delay time (seconds) before a motion profile begins execution.
id	This value defines the identity for a point to point motion. The id is limited to 16-bit resolution by the controller firmware.
elementId	This array defines the identity for each element of a path motion. The elementId is limited to 16-bit resolution by the controller firmware.
masterStart	This field is only used with the MASTER_START motion attribute and when commanding a cam motion. This field defines the position of the master at the start of the cam motion. See Starting at Specific Master Positions.
repeatFrom	This field is only used with the REPEAT motion attribute and when commanding a cam motion. This field defines the first frame that is repeated. Any frames before this frame will act as a run-in sequence. See Repeating Cams .

Definition: MEIMotionAttributes

```
typedef struct MEIMotionAttributes {
    MPIEventMask        eventMask;      /* MEIMotionAttrMaskEVENT */
    double              *finalVelocity; /* MEIMotionAttrMaskFINAL_VEL */
    MEIMotionAttrHold   *hold;          /* MEIMotionAttrMaskHOLD */
    long                *outputCount;   /* MEIMotionAttrMaskOUTPUT for path
                                           motion- number of outputs - per axis */
    MEIMotionAttrOutput *output;        /* MEIMotionAttrMaskOUTPUT for path and
                                           non path motion - outputs - per axis */
} MEIMotionAttributes;
```

Description

eventMask	This structure specifies the mask to enable event generation. See MPIEventMask for more information.
***finalVelocity**	This array specifies the target velocity for each axis when MEIMotionAttrMaskFINAL_VEL is used.
***hold**	This array specifies the hold configurations for each axis when MEIMotionAttrMaskHOLD is used.
***outputCount**	This array specifies the number of points per axis, to set/clear an output when MEIMotionAttrMaskOUTPUT is used.
***output**	This structure specifies the output configuration for each axis when MEIMotionAttrMaskOUTPUT is used.

See Also

MPIEventMask | MEIMotionAttrMask

MPIMotionBESSEL

Definition

```
typedef struct MPIMotionBESSEL {
    long     pointCount;
    double      *position;
    double      *time;

    MPIMotionPoint  point;
} MPIMotionBESSEL;
```

Description

positionCount	This value specifies the number of points.
***position**	This array stores the positions for the motion profile. There is one position value per point, per axis. The length of the array must be equal to pointCount multiplied by the number of axes. The positions are interleaved in the array by the axis index.
***time**	This array stores the times for the motion profile. There is one time value per point. The time specifies the number of seconds between the specified position, and the previous position (point). The length of the time array must be equal to pointCount.
point	This structure contains the point configuration. Please see MPIMotionPoint data type for more information.

See Also

MPIMotionPoint

MPIMotionBSPLINE

Definition

```
typedef struct MPIMotionBSPLINE {
    long                pointCount;
    double   *position;
    double   *time;

    MPIMotionPoint      point;
} MPIMotionBSPLINE;
```

Description

pointCount	This value specifies the number of points.
***position**	This array stores the positions for the motion profile. There is one position value per point, per axis. The length of the array must be equal to pointCount multiplied by the number of axes. The positions are interleaved in the array by the axis index.
***time**	This array stores the times for the motion profile. There is one time value per point. The time specifies the number of seconds between the specified position, and the previous position (point). The length of the time array must be equal to pointCount.
point	This structure contains the point configuration. Please see MPIMotionPoint data type for more information.

See Also

MPIMotionPoint

MPIMotionCam

Definition

```
typedef struct MPIMotionDecelTime {
    long     pointCount;
    long     **slavePosition;
    long     *masterDistance;
    double   **gearRatio;
             /* This field is only used with MPIMotionTypeCUBIC_CAM. */
} MPIMotionDecelTime;
```

Description

MPIMotionCam contains the cam segments for a linear or cubic interpolated cam move.

pointCount	This field defines the type of master position source is being used.
****slavePosition**	This field defines the distance that each slave axis will move during each segment of the cam.
***masterDistance**	An array containing pointCount number of elements. Each element is the distance the master axis will move during each segment of the cam.
****gearRatio**	This field is only used with cubic cams, with linear cams this field is completely ignored and can be either be set to zero or not initialised.This field defines the gear ratio (first derivative of the slave position with respect to the master position) to the cam at each of the transitions between cam segments. The initial gear ration is assumed to be zero.

See Also

MPIMotionConfig / MEIMotionConfig

Definition: MPIMotionConfig

```
typedef struct MPIMotionConfig {
   MPIMotionDecelTime   decelTime;
   float                normalFeedrate;
   float                pauseFeedrate;
}MPIMotionConfig;
```

Description

decelTime	This structure defines the deceleration time for Stop and E-Stop actions. Please see MPIMotionDecelTime data type documentation for more information.
normalFeedrate	This value defines the normal feed speed rate. The default value is 1.0 (100%).
pauseFeedrate	This value defines the feed speed rate for the Stop action. The default value is 0.0.

Definition: MEIMotionConfig

```
typedef struct  MEIMotionConfig {
    long    axisCount;
    long    axisNumber[MEIXmpMAX_COORD_AXES];
    double  blendLimit;
} MEIMotionConfig;
```

Description

axisCount	The current number of axes mapped to the Motion Supervisor on the controller.
axisNumber	This array specifies the axis numbers of the current Axis to Motion Supervisor mapping on the controller.
blendLimit	This value specifies the acceleration blending limit criteria. If the change direction is greater than 90 degrees (0 degrees = no change, 180 degrees = about face) the acceleration resulting from the blending can exceed the acceleration limit specified in the motion parameters (180 degrees = acceleration*2.0). The blendLimit allows the user to limit the sharpness of turns to be blended. If cosine (turn angle defined above) is greater than the blendLimit, the motion will be blended. A blend limit value of 0 exclude turns sharper than 90 degrees. 1.0 causes all moves to be blended. -1.0 allows no blending

See Also

MPIMotionDecelTime | mpiMotionModify

MPIMotionDecelTime

Definition

```
typedef struct MPIMotionDecelTime {
    float       stop;   /* seconds */
    float       eStop;  /* seconds */
} MPIMotionDecelTime;
```

Description

stop	This value defines the deceleration time (seconds) for a Stop action. The default value is .5 seconds.
eStop	This value defines the deceleration time (seconds) for an E-Stop action. The default value is .05 seconds.

See Also

MEIMotionFrame

Definition

```
typedef struct MEIMotionFrame {
    long             pointCount;
    MEIXmpFrame      *frame;
    MPIMotionPoint   point;
} MEIMotionFrame;
```

Description

pointCount	The value specifies the number of frames.
***frame**	This structure contains the frame data for each frame. See MEIXmpFrame for more information.
point	This structure specifies the points configuration. See MPIMotionPoint for more information.

See Also

MPIMotionPoint

MEIMotionFrameBufferStatus

Definition

```
typedef struct MEIMotionFrameBufferStatus {
    long  size;
    long  frameCount;
} MEIMotionFrameBufferStatus;
```

Description

size	This value specifies the size of the controller's frame buffer.
frameCount	This value specifies the number of frames in the controller's frame buffer.

See Also

MPIMotionMessage / MEIMotionMessage

Definition: MPIMotionMessage

```
typedef enum {
    MPIMotionMessageMOTION_INVALID,
    MPIMotionMessageAXIS_NOT_FOUND,
    MPIMotionMessageAXIS_COUNT,
    MPIMotionMessageAXIS_FRAME_COUNT,
    MPIMotionMessageTYPE_INVALID,
    MPIMotionMessageATTRIBUTE_INVALID,
    MPIMotionMessageIDLE,
    MPIMotionMessageMOVING,
    MPIMotionMessageSTOPPING,
    MPIMotionMessageSTOPPED,
    MPIMotionMessageSTOPPING_ERROR,
    MPIMotionMessageERROR,
    MPIMotionMessageAUTO_START,
    MPIMotionMessagePROFILE_ERROR,
    MPIMotionMessagePROFILE_NOT_SUPPORTED,
    MPIMotionMessagePATH_ERROR,
    MPIMotionMessageFRAMES_LOW,
    MPIMotionMessageFRAMES_EMPTY,
    MPIMotionMessageFRAME_BUFFER_TOO_SMALL,
} MPIMotionMessage;
```

Required Header: stdmpi.h
Change History: Modified in the 03.02.00

Description

MPIMotionMessage is an enumeration of Motion error messages that can be returned by the MPI library.

MPIMotionMessageMOTION_INVALID

The motion supervisor number is out of range. This message code is returned by mpiMotionCreate(.) if the motion supervisor number is less than zero or greater than or equal to MEIXmpMAX_MSs.

MPIMotionMessageAXIS_NOT_FOUND

The specified axis object is not available. This message is returned from mpiMotionAxisRemove(.) if the axis that is being removed is not a member of the motion object.

MPIMotionMessageAXIS_COUNT

The number of axes is out of range. This message is returned from mpiMotionConfigSet(.), mpiMotionStart(.), or mpiMotionModify(.) if there are no axes associated with the motion object or if the axis count exceeds MEIXmpMAX_COORD_AXES.

MPIMotionMessageAXIS_FRAME_COUNT

The axis frame count invalid on this Motion object. All axes appended to a Motion object must have the same frame buffer size. The axis frame buffer sizes are configured with the low-level controller configuration routine mpiControlConfigSet(.).

MPIMotionMessageTYPE_INVALID

The motion type or motion attribute is not valid. This message code is returned from mpiMotionStart(.) or mpiMotionModify(.) if the motion type or motion attribute mask is not recognized by the library. To correct the problem, select a motion type/attribute from the MPI and/or MEI enumerations.

MPIMotionMessageATTRIBUTE_INVALID

The motion attribute is not valid. This message code is returned from mpiMotionStart(.) or mpiMotionModify(.) if the motion attribute mask is not compatible with the specified motion type. To correct the problem, do not use the motion attribute mask with the specified motion type or select a different motion type.

Please see possible causes for receiving this message.

MPIMotionMessageIDLE

All motion supervisor axes are not moving and are ready to move. This message code is returned from mpiMotionModify(.) when the motion supervisor is in the IDLE state. A motion cannot be modified if no motion is in progress. To correct the problem, use the AUTO_START attribute for mpiMotionModify(.) or use mpiMotionStart(.) instead. This message code is also returned from mpiMotionAction(.) when a STOP or RESUME is commanded when the motion supervisor is in the IDLE state. A motion cannot be stopped if there is no motion in progress and a motion cannot be resumed if there is no motion profile pending.

MPIMotionMessageMOVING

At least one motion supervisor axis is moving. This message code is returned from mpiMotionStart(.) when the motion supervisor is in the MOVING state. A motion cannot be started if a motion is in progress. To correct the problem, use mpiMotionModify(.) instead. This message code is also returned from mpiMotionAction(.) when a RESUME or RESET is commanded when the motion supervisor is in the MOVING state. A motion cannot be resumed or reset while a motion is in progress.

MPIMotionMessageSTOPPING

Motion supervisor axes are stopping due to a STOP action. This message code is returned from mpiMotionStart(.) or mpiMotionModify(.) when the motion supervisor is in the STOPPING state. A motion cannot be commanded when a stop is in progress. This message code is also returned from mpiMotionAction(.) when a RESUME or RESET is commanded when the motion supervisor is in the STOPPING state. A motion cannot be resumed or reset while a stop is in progress.

MPIMotionMessageSTOPPED

Motion supervisor axes are stopped due to a STOP action. This message code is returned from mpiMotionAction(.) when a STOP action is commanded while the motion supervisor is already in the STOPPED state.

MPIMotionMessageSTOPPING_ERROR

Motion supervisor axes are stopping due to an E_STOP or ABORT action. This message code is returned from mpiMotionStart(.) or mpiMotionModify(.) when the motion supervisor is in the STOPPING_ERROR state. A motion cannot be commanded when a stopping on error action is in progress. This message code is also returned from mpiMotionAction(.) when a RESUME or RESET is commanded when the motion supervisor is in the STOPPING state. A motion cannot be resumed or reset while a stopping on error action is in progress.

MPIMotionMessageERROR

Motion supervisor axes are in an error state due to an E_STOP or ABORT action. This message code is returned from mpiMotionStart(.) or mpiMotionModify(.) when the motion supervisor is in the ERROR state. A motion cannot be commanded when the motion supervisor is in an error state. This message code is also returned from mpiMotionAction(.) when a STOP or RESUME is commanded when the motion supervisor is in the ERROR state. To correct the problem, fix the condition that caused the E_STOP or ABORT action and then clear the ERROR state using mpiMotionAction(.) with a RESET.

MPIMotionMessageAUTO_START

The motion modify was automatically converted to a motion start. This message code is returned from mpiMotionModify(.) when the AUTO_START attribute mask was specified and the motion was commanded while the motion supervisor is in the IDLE state. This message code is useful for notifying an application of an auto-start, it is not an error condition.

MPIMotionMessagePROFILE_ERROR

The motion profile is not possible with the specified constraints. This message code is returned by mpiMotionModify(.) when the NO_REVERSAL attribute mask is specified, but the specified target position is in the reverse direction. To correct the problem, either remove the NO_REVERSAL constraint or specify a target position that is in the same direction as the motion profile in progress.

MPIMotionMessagePROFILE_NOT_SUPPORTED

The controller firmware does not support the specified motion profile type. This message code is returned by mpiMotionStart(.) or mpiMotionModify(.) when an S_CURVE_JERK or VELOCITY_JERK motion type is commanded, but not supported by the controller firmware. Due to programming memory space constraints, specific revisions of controller firmware may not support jerk motion types. To correct the problem, use the S_CURVE or VELOCITY motion instead.

MPIMotionMessagePATH_ERROR

The specified multi-point motion path is not valid. This message code is returned by mpiMotionStart(.) or mpiMotionModify(.) when the final point is not specified or the time slice is less than one controller sample.

MPIMotionMessageFRAMES_LOW

The controller's frame buffer is low. This message code is returned by the internal method, meiMotionFramesLow(.). This is an internal message code used by the library to manage the frame buffering.

MPIMotionMessageFRAMES_EMPTY

The controller's frame buffer is empty. This message code is returned by the internal method, meiMotionFramesLow(.). This is an internal message code used by the library to manage the frame buffering.

MPIMotionMessageFRAME_BUFFER_TOO_SMALL

When trying to start a cam, an insufficient amount of space was found on the controller. To remedy this problem, you can either reduce the number of points within the cam (See Caming) or increase the number of points in the frame buffer. See Increasing the Maximum Cam Table Size.

Definition: MEIMotionMessage

```
typedef enum {
    MEIMotionMessageRESERVED0,
    MEIMotionMessageRESERVED1,
    MEIMotionMessageRESERVED2,
    MEIMotionMessageNO_AXES_MAPPED,
} MEIMotionMessage;
```

Required Header: stdmei.h

Description

MEIMotionMessage is an enumeration of Motion error messages that can be returned by the MPI library.

MEIMotionMessageRESERVED0

Reserved for specialized use.

MEIMotionMessageRESERVED1

Reserved for specialized use.

MEIMotionMessageRESERVED2

Reserved for specialized use.

MEIMotionMessageNO_AXES_MAPPED

The motion object has no axes. This message code is returned by mpiMotionStart(.), mpiMotionModify(.) or mpiMotionAction(.) if there are no axes mapped to the motion object. To correct this problem, make sure there is at least one axis object associated with the motion object before commanding any motion or motion actions.

Possible Causes:
No axes are mapped to the motion supervisor that the move was commanded on.

See Also

MPIMotionType | MPIMotionAttrMask | mpiMotionModify | mpiMotionAction
mpiMotionStart

MPIMotionParams / MEIMotionParams

Definition: MPIMotionParams

```
typedef struct MPIMotionParams {

    MPIMotionPT         pt;
    MPIMotionPTF        ptf;
    MPIMotionPVT        pvt;
    MPIMotionPVTF       pvtf;
    MPIMotionSPLINE     spline;
    MPIMotionBESSEL     bessel;
    MPIMotionBSPLINE    bspline;

    MPIMotionSCurve         sCurve;
    MPIMotionSCurve         sCurveJerk;
    MPIMotionTrapezoidal    trapezoidal;

    MPIMotionVelocity    velocity;
    MPIMotionVelocity    velocityJerk;

    MPIMotionCam     cam;

    MPIMotionAttributes     attributes;

    void                *external;
} MPIMotionParams;
```

Description

MPIMotionParams contains the motion trajectory parameters for each motion type and the motion attributes.

pt	This structure contains the parameters for a PT motion type. Please see MPIMotionPT data type for more information.
ptf	This structure contains the parameters for a PTF (position, time, and feedforward) motion type. Please see MPIMotionPTF data type for more information.
pvt	This structure contains the parameters for a PVT motion type. Please see MPIMotionPVT data type for more information.
pvtf	This structure contains the parameters for a PTF (position, velocity, time, and feedforward) motion type. Please see MPIMotionPVTF data type for more information.

spline	This structure contains the parameters for a SPLINE motion type. Please see MPIMotionSPLINE data type for more information.
bessel	This structure contains the parameters for a BESSEL motion type. Please see MPIMotionBESSEL data type for more information.
bspline	This structure contains the parameters for a BSPLINE motion type. Please see MPIMotionBSPLINE data type for more information.
sCurve	This structure contains the parameters for a S_CURVE motion type. Please see MPIMotionSCurve data type for more information.
sCurveJerk	This structure contains the parameters for an S-Curve Jerk point to point motion type. Please see MPIMotionSCurveJerk data type for more information.
trapezoidal	This structure contains the parameters for a Trapezoidal point to point motion type. Please see MPIMotionTrapezoidal data type for more information.
velocity	This structure contains the parameters for a VELOCITY motion type. Please see MPIMotionVelocity data type for more information.
velocityJerk	This structure contains the parameters for a VELOCITY_JERK motion type. Please see MPIMotionVelocity data type for more information.
cam	This structure contains the parameters for a cam motion type. Please see MPIMotionCAM data type for more information.
attributes	This structure contains the parameters for motion attributes. Please see MPIMotionAttributes data type for more information.
***external**	This points to an external structure, containing controller specific parameters. Presently, this only supports MEIMotionAttributes. Please see MEIMotionAttributes data type for more information.

Definition: MEIMotionParams

```
typedef         struct MEIMotionParams {
    MEIMotionFrame        frame;
    MPIMotionAttributes   attributes;
    MEIMotionAttributes   attributesMEI;
} MEIMotionParams;
```

Description

frame	This structure contains the frame data and points configuration. See MEIMotionFrame for more information.
attributes	This structure contains the motion attributes data. See MPIMotionAttributes for more information.
attributesMEI	This structure contains the motion attributes data. See MEIMotionAttributes for more information.

See Also

MEIMotionFrame | MPIMotionAttributes | MEIMotionAttributes

For more information, please see the PT and PVT Path Motion for the XMP application note.

MPIMotionPoint

Definition

```
typedef struct MPIMotionPoint {
    long        retain;         /* FALSE => flush points after use */
    long        final;          /* FALSE => more points to come */
    long        emptyCount;     /* # of remaining points to trigger
                        empty event, -1 => disable */
} MPIMotionPoint;
```

Description

retain	This value specifies whether or not the points should be stored in a buffer after execution. If retain=0, the points will not be stored after execution. If retain=1, the points will be stored in a buffer. This feature is useful for backing up on path.
final	This value specifies if more points will be loaded. If final=1, no more points will be loaded. If final=0, more points can be loaded using mpiMotionModify(.) with the MPIMotionAttrMaskAPPEND attribute mask.
emptyCount	This value specifies the minimum number of points in the buffer. If the number of points in the buffer is below emptyCount, an E_STOP action will occur. When emptyCount is (-1), the buffer low trigger is disabled.

See Also

mpiMotionModify | MPIMotionAttrMaskAPPEND | MPIMotionPT

MPIMotionPT

Definition

```
typedef  struct MPIMotionPT {
    long             pointCount;
    double           *position;
    double           *time;
    MPIMotionPoint   point;
} MPIMotionPT;
```

Description

pointCount	This value specifies the number of points.
position	This array stores the positions for the motion profile. There is one position value per point, per axis. The length of the array must be equal to pointCount multiplied by the number of axes. The positions are interleaved in the array by the axis index.
time	This array stores the times for the motion profile. There is one time value per point. The time specifies the number of seconds between the specified position, and the previous position (point). The length of the time array must be equal to pointCount.
point	This structure contains the point configuration. Please see MPIMotionPoint data type for more information.

See Also

MPIMotionPoint | Streaming Point Motion Type Calculations

For more information, please see the PT and PVT Path Motion for the XMP application note.

MPIMotionPTF

Definition

```
typedef struct MPIMotionPTF {
    long            pointCount;
    double          *position;
    double          *feedforward;
    double          *time;
    MPIMotionPoint  point;
} MPIMotionPTF;
```

Description

MPIMotionPTF contains the motion parameters for the MPIMotionTypePTF.

The feedforward values are interpolated linearly over the PT or PVT time intervals. The feedfoward values correspond to the P or PV values. (i.e. When the motion reaches a specified position (PTF) or position and velocity (PVTF), the interpolated feedforward value will be equal to what is specified in the motion parameters.)

The feedforward values are not set to zero at the beginning of the move; they retain the last value that is specified in the PTF or PVTF motion parameters.

The feedforward values are not zeroed by non-PTF or PVTF moves (i.e. PT, PVT, Spline, S-Curve, etc.).

pointCount	This value specifies the number of points.
***position**	This array stores the positions for the motion profile. There is one position value per point, per axis. The length of the array must be equal to pointCount multiplied by the number of axes. The positions are interleaved in the array by the axis index.
***feedforward**	This array stores the feedforward values for the motion profile. There is one feedforward value per point, per axis. The length of the array must be equal to pointCount multiplied by the number of axes. The feedforward values are interleaved in the array by the axis index. The units are raw DAC counts (range -32768 to +32767).
***time**	This array stores the times for the motion profile. There is one time value per point. The time specifies the number of seconds between the specified position, and the previous position (point). The length of the time array must be equal to pointCount.

point	This structure contains the point configuration. Please see MPIMotionPoint data type for more information.

See Also

MPIMotionParams | MPIMotionType | MPIMotionPoint | mpiMotionStart | mpiMotionModify

MPIMotionPVT

Definition

```
typedef struct MPIMotionPVT {
    long         pointCount;
    double       *position;
    double       *velocity;
    double       *time;
    MPIMotionPoint  point;
} MPIMotionPVT;
```

Description

pointCount	This value specifies the number of points.
position	This array stores the positions for the motion profile. There is one position value per point, per axis. The length of the array must be equal to pointCount multiplied by the number of axes. The positions are interleaved in the array by the axis index.
velocity	This array stores the times for the motion profile. There is one time value per point. The time specifies the number of seconds between the specified position, and the next position (point). The length of the time array must be equal to pointCount.
time	This array stores the times for the motion profile. There is one time value per point. The time specifies the number of seconds between the specified position, and the previous position (point). The length of the time array must be equal to pointCount.
point	This structure contains the point configuration. Please see MPIMotionPoint data type for more information.

See Also

MPIMotionPoint | Streaming Point Motion Type Calculations

For more information, please see the PT and PVT Path Motion for the XMP application note.

MPIMotionPVTF

Definition

```
typedef struct MPIMotionPVTF {
    long            pointCount;
    double          *position;
    double          *velocity;
    double          *feedforward;
    double          *time;
    MPIMotionPoint  point;
} MPIMotionPVTF;
```

Description

MPIMotionPVTF contains the motion parameters for the MPIMotionTypePVTF.

The feedforward values are interpolated linearly over the PT or PVT time intervals. The feedfoward values correspond to the P or PV values. (i.e. When the motion reaches a specified position (PTF) or position and velocity (PVTF), the interpolated feedforward value will be equal to what is specified in the motion parameters.)

The feedforward values are not set to zero at the beginning of the move; they retain the last value that is specified in the PTF or PVTF motion parameters.

The feedforward values are not zeroed by non-PTF or PVTF moves (i.e. PT, PVT, Spline, S-Curve, etc.).

pointCount	This value specifies the number of points.
***position**	This array stores the positions for the motion profile. There is one position value per point, per axis. The length of the array must be equal to pointCount multiplied by the number of axes. The positions are interleaved in the array by the axis index.
***velocity**	This array stores the times for the motion profile. There is one time value per point. The time specifies the number of seconds between the specified position, and the next position (point). The length of the time array must be equal to pointCount.
***feedforward**	This array stores the feedforward values for the motion profile. There is one feedforward value per point, per axis. The length of the array must be equal to pointCount multiplied by the number of axes. The feedforward values are interleaved in the array by the axis index. The units are raw DAC counts (range -32768 to +32767).

***time**	This array stores the times for the motion profile. There is one time value per point. The time specifies the number of seconds between the specified position, and the previous position (point). The length of the time array must be equal to pointCount.
point	This structure contains the point configuration. Please see MPIMotionPoint data type for more information.

See Also

MPIMotionParams | MPIMotionType | MPIMotionPoint | mpiMotionStart | mpiMotionModify

MPIMotionSCurve

Definition

```
typedef struct MPIMotionSCurve {
    MPITrajectory   *trajectory;
    double          *position;
} MPIMotionSCurve;
```

Description

MPIMotionSCurve contains the motion trajectory parameters and final target positions that specify the point-to-point motion profile. Only the velocity, acceleration, deceleration, and jerkPercent trajectory parameters are applicable to S-Curve motion profiles.

***trajectory**	A pointer to an array of trajectory structures. Each trajectory structure contains the motion profile parameters for each axis associated with the motion object. If more than one axis is associated with the motion and neither the MPIMotionAttrMaskSYNC_START nor MPIMotionAttrMaskSYNC_END attributes are specified, then only the first trajectory structure will be applied as the vector trajectory for all the axes.
***position**	A pointer to an array of target positions. Each position value specifies the target for each axis associated with the motion object. Some motion types, like VELOCITY and VELOCITY_JERK do not require target positions and will ignore these values.

See Also

MPITrajectory | MPIMotionType | mpiMotionStart | mpiMotionModify

MPIMotionSCurveJerk

Definition

```
typedef MPIMotionSCurve MPIMotionSCurveJerk;
```

Description

MPIMotionSCurveJerk contains the motion trajectory parameters and final target positions that specify the point-to-point motion profile. Only the velocity, acceleration, deceleration, accelerationJerk, and decelerationJerk trajectory parameters are applicable to S-Curve Jerk motion profiles.

See Also

MPITrajectory | MPIMotionType | mpiMotionStart | mpiMotionModify

MPIMotionSPLINE

Definition

```
typedef   struct MPIMotionSPLINE {
    long     pointCount;
    double   *position;
    double   *time;

    MPIMotionPoint  point;
} MPIMotionSPLINE;
```

Description

pointCount	This value specifies the number of points.
***position**	This array stores the positions for the motion profile. There is one position value per point, per axis. The length of the array must be equal to pointCount multiplied by the number of axes. The positions are interleaved in the array by the axis index.
***time**	This array stores the times for the motion profile. There is one time value per point. The time specifies the number of seconds between the specified position, and the previous position (point). The length of the time array must be equal to pointCount.
point	This structure contains the point configuration. Please see MPIMotionPoint data type for more information.

See Also

MPIMotionPoint

MEIMotionTrace

Definition

```
typedef enum {

    MEIMotionTraceSTATUS,
    MEIMotionTracePARAMS,
} MEIMotionTrace;
```

Description

MEIMotionTraceSTATUS	This trace bit enables motion status tracing for mpiMotion calls.
MEIMotionTracePARAMS	This trace bit enables motion parameters tracing for mpiMotion calls.

See Also

MPIMotionTrapezoidal

Definition

```
typedef MPIMotionSCurve MPIMotionTrapezoidal;
```

Description

MPIMotionTrapezoidal structure contains the motion trajectory parameters and final target positions that specify the point-to-point motion profile. Only the velocity, acceleration, and deceleration trajectory parameters are applicable to Trapezoidal motion profiles.

See Also

MPITrajectory | MPIMotionType | mpiMotionStart | mpiMotionModify

MPIMotionType and MEIMotionType

Definition: MPIMotionType

```
typedef enum {
    MPIMotionTypeINVALID,

    MPIMotionTypePT,
    MPIMotionTypePTF,
    MPIMotionTypePVT,
    MPIMotionTypePVTF,
    MPIMotionTypeSPLINE,
    MPIMotionTypeBESSEL,
    MPIMotionTypeBSPLINE,
    MPIMotionTypeBSPLINE2,

    MPIMotionTypeS_CURVE,
    MPIMotionTypeTRAPEZOIDAL,
    MPIMotionTypeS_CURVE_JERK,

    MPIMotionTypeVELOCITY,
    MPIMotionTypeVELOCITY_JERK,
    MPIMotionTypeCAM_LINEAR,
    MPIMotionTypeCAM_CUBIC,

    MPIMotionTypeMASK  = 0xFF,
} MPIMotionType;
```

Description

MPIMotionType is an enumeration of motion profile types. It specifies the motion profile to be generated with mpiMotionStart(.) and mpiMotionModify(.). The motion type also defines the trajectory parameters that must be passed to mpiMotionStart(...) and mpiMotionModify(...). For each MPIMotionType and MEIMotionType there is a corresponding element in the MPIMotionParams{...} or MEIMotionParams{...} structure. For example, when MPIMotionTypeS_CURVE is specified, the MPIMotionSCurve{...} structure must be filled in to specify the trajectory for the S-Curve profile.

The motion profile characteristics can be specified by bitwise OR-ing the MPIMotionType with one or more motion attribute masks. The MPIMotionAttrMask and MEIMotionAttrMask enumerations contain the attribute masks. Attribute masks can be used to enable special features or configure the motion profile calculation and execution properties.

Internally, the motion profile is calculated and broken up into smaller trajectory

segments called frames. The frames contain position, time, velocity, acceleration, and jerk trajectory information. The controller buffers the frames in its memory and executes them by loading the values into its trajectory calculator. For simple MotionTypes, like VELOCITY, TRAPEZOIDAL, and S_CURVE, the frames are calculated by the controller. For complex, multi-point motions, like PT, PVT, SPLINE, etc. the frames are calculated in the MPI Library. MotionTypes that are calculated in the controller can be modified on-the-fly with mpiMotionModify(...).

The move types, MPIMotionTypeS_CURVE_JERK and MPIMotionTypeVELOCITY_JERK are only available with custom firmware (option 21). In the custom firmware, the Velocity/Trapezoidal/S-Curve algorithm is replaced with the S-Curve Jerk algorithm. In the standard firmware, the MPIMotionTypeS_CURVE_JERK and MPIMotionTypeVELOCITY_JERK motion types are not supported and if specified, the MPI will return a "profile not supported" error.

Fore details, see S-Curve Jerk Algorithm and Attributes.

Example
Current Position = 2147483638 (2^{31} - 10)
First Position in Point List = 2147483658 ((2^{31} + 10)
or First Position in Point List = -2147483638 ((2^{31} + 10) - 2^{32})

From the controller's point of view, both first positions are the same value, but from the MPI's point of view, they are 2^{32} apart. With the shortest path algorithm, -2147483638 is converted to 2147483658 so that the motion between the current position and the first position is smooth and does not cause excessive acceleration or velocity.

NOTE: The shortest path algorithm only applies to the delta between the current position and the first point in a points list (path motion). It DOES NOT apply to points within the points list.

MPIMotionTypePT	This type fits constant velocity profile segments through a list of position and time points. Not supported in motion sequences. Please see MPIMotionPT for more information.
MPIMotionTypePTF	PTF motion is identical to PT except host-calculated feedforward values can be specified for each PTF motion segment.
MPIMotionTypePVT	This type fits jerk profile segments through a list of position, velocity and time points. Not supported in motion sequences. Please see MPIMotionPVT for more information.

MPIMotionTypePVTF	PVTF motion is identical to PVT except host-calculated feedforward values can be specified for each PVTF motion segment.
MPIMotionTypeSPLINE	This type fits a Cubic spline through a specified list of position and time points. Please see MPIMotionSPLINE data type for more information.
MPIMotionTypeBESSEL	This type fits a Bessel spline through a specified list of position and time points. Please see MPIMotionBESSEL data type for more information.
MPIMotionTypeBSPLINE	This type fits a 3rd order B spline through a list of position and time points. Please see MPIMotionBSPLINE data type for more information.
MPIMotionTypeBSPLINE2	This type fits a 2nd order B spline through a list of position and time points. Please see MPIMotionBSPLINE data type for more information.
MPIMotionTypeS_CURVE	This type specifies point to point motion using a S-Curve velocity profile. The profile is specified by acceleration, velocity, deceleration, jerkPercent, and final position. Please see MPIMotionSCurve data type for more information.
MPIMotionTypeS_CURVE_JERK	This type specifies point to point motion using a S-Curve velocity profile. The profile is specified by acceleration, velocity, deceleration, accelerationJerk, decelerationJerk, and final position. Please see MPIMotionSCurve data type for more information.
MPIMotionTypeTRAPEZOIDAL	This type specifies simple point to point motion using a trapezoidal velocity profile. The profile trajectory is specified by acceleration, velocity, deceleration and final position. Please see MPIMotionTrapezoidal data type for more information.
MPIMotionTypeVELOCITY	This type specifies S-Curve acceleration to a constant velocity. The profile trajectory is specified by acceleration, velocity, and jerkPercent. Please see MPIMotionVelocity data type for more information.
MPIMotionTypeVELOCITY_JERK	This type specifies S-Curve acceleration to a constant velocity. The profile trajectory is specified by acceleration, velocity, accelerationJerk and decelerationJerk. Please see MPIMotionVelocity data type for more information.
MPIMotionTypeCAM_LINEAR	This type generates linear interpolated cam motion. See Camming.

MPIMotionTypeCAM_CUBIC	This type generates cubic interpolated cam motion. See Camming.

Definition: MEIMotionType

```
typedef enum {
    MEIMotionTypeFRAME,
} MEIMotionType;
```

Description

MEIMotionType is an enumeration of the controller specific motion profile types. See MPIMotionType for details.

MEIMotionTypeFRAME	This motion type is used to construct motion profiles at the frame level.

See Also

mpiMotionStart | mpiMotionModify | mpiMotionTYPE | MPIMotionParams | MEIMotionParams | MPIMotionAttr | MEIMotionAttr | Streaming Point Motion Type Calculations

MPIMotionVelocity

Definition

```
typedef struct MPIMotionVelocity {
    MPITrajectory       *trajectory;
} MPIMotionVelocity;
```

Description

MPIMotionVelocity contains the motion trajectory parameters that specify velocity motion profiles. Only the velocity, acceleration, jerkPercent, and accelerationJerk trajectory parameters are applicable to velocity and velocity-jerk motion profiles.

***trajectory**	This structure specifies the parameters for the motion profile, except deceleration is ignored. Please see MPITrajectory data type for more information.

See Also

MPITrajectory | MPIMotionType | mpiMotionStart | mpiMotionModify

mpiMotionATTR

Declaration

```
#define   mpiMotionATTR(type,attr)
((type) |= mpiMotionAttrMaskBIT(attr))
```

Required Header: stdmpi.h

Description

mpiMotionATTR turns on the specified motion attribute mask bits in the motion type.

See Also

MPIMotionAttr | MPIMotionAttrMask

mpiMotionAttrMaskBIT

Declaration

```
#define mpiMotionAttrMaskBIT(attr) (0x1 << (attr))
```

Required Header: stdmpi.h

Description

mpiMotionAttrMaskBIT converts the motion attribute into the motion attribute mask.

See Also

MPIMotionAttr | MPIMotionAttrMask

mpiMotionTYPE

Declaration

```
#define  mpiMotionTYPE(type)  ((type) & MPIMotionTypeMASK)
```

Required Header: stdmpi.h

Description

mpiMotionTYPE masks off all other bits in ***type***, leaving the motion type.

See Also

MPIMotionType

Motion Attributes

Introduction | MPI Motion Attributes | MEI Motion Attributes

Introduction

This section details the use of various Motion Attributes, which are listed individually below. To use Motion Attributes, OR the attribute mask with the MPIMotionType value.

MPI Motion Attributes

MPIMotionAttrAPPEND

The MPI has been extended to support mpiMotionStart(...) with the MPIMotionAttrMaskAPPEND attribute. This makes it possible to buffer several point-to-point motion profiles in the controller. Each successful call to mpiMotionStart(...) with the APPEND attribute will generate an MPIEventTypeMOTION_DONE from the controller when the motion is complete.

The MPIMotionAttrMaskID attribute is supported with MPIMotionAttrMaskAPPEND when calling mpiMotionStart(...). The XMP-Series controller firmware has been modified to buffer the ID values inside the axis' frames. Therefore, applications using the motion and axis event user data must be changed. Since the ID is stored in the controller's axis frames, the mpiMotionEventNotifySet(...) and mpiAxisEventNotifySet(...) must explicitly configure an appropriate axis memory location for the firmware to retrieve the ID. The sample programs motionID1.c and motionID2.c demonstrate this feature.

The MEIMotionAttrHOLD attribute is supported with MPIMotionAttrMaskAPPEND when calling mpiMotionStart(...).

Move Types: **PT, PVT, Bessel, Bspline, Bspline2, S-Curve, Trapezoidal, Velocity, Frame**

MPIMotionAttrAUTO_START

The MPI has been extended to support mpiMotionStart(...) with the MPIMotionAttrMaskAUTO_START attribute. When AUTO_START is enabled, calls to mpiMotionModify(.) will automatically start a new motion if the previous motion is done. If AUTO_START is not enabled, and mpiMotionModify(...) is commanded after the initial motion has completed, the method will return an MPIMotionStateIDLE error.

Move Types: **S-Curve, Trapezoidal, Velocity**

MPIMotionAttrDELAY

The MPI has been extended to support mpiMotionStart(...) with the MPIMotionAttrMaskDELAY attribute. This motion attribute will delay the move for a given number of seconds. MPIMotionParams.attributes.delay is a pointer to an array of doubles that assign delay times for each Axis.

Move Types: **S-Curve, Trapezoidal, Velocity**

MPIMotionAttrELEMENT_ID

The MPI has been extended to support mpiMotionStart(...) with the MPIMotionAttrMaskELEMENT_ID attribute. Similar to the MPIMotionAttrMaskID, the ELEMENT_ID allows the application to set an identification value for each element of a path motion. The ID values are long values configured in the MPIMotionParams.attributes.elementId array. Each element in the array will be the ID value for that sequential portion of the motion.

In order to retrieve the ElementID, a pointer to the element ID is placed into the MEIEventNotifyData structure. This will cause the XMP to send the ElementID up to the MEIEventStatusInfo structure when an event occurs that causes an interrupt.

Move Types: PT, PVT, Bessel, Bspline, Bspline2, S-Curve, Trapezoidal, Velocity

MPIMotionAttrMaskID

The MPI has been extended to support mpiMotionStart(...) with the MPIMotionAttrMaskID attribute. The ID attributes allows the application to assign an identification number to each motion. This number can be returned in the MPIEventStatus structure so the application will know which move has ended. This is particularly useful when multiple moves are buffered and the application needs to know which move is executing or has returned an event.

The MPIMotionParams.attributes.id value is a long that identifies the Motion. This ID value is passed to each Axis associated with the MS. In order to retrieve the MoveID, a pointer to the move ID is placed in the MEIEventNotifyData structure. This will cause the XMP to send the MoveID up to the MEIEventStatusInfo structure when an event occurs that causes an interrupt.

Move Types: **PT, PVT, Spline, Bessel, Bspline, Bspline2, S-Curve, Trapezoidal, Velocity, Frame**

MPIMotionAttrRELATIVE

The MPI has been extended to support mpiMotionStart(...) with the MPIMotionAttrMaskRELATIVE attribute. When this mask is ANDed into the attribute mask, all position values will be used as relative motion distances instead of final absolute positions. For example, without the RELATIVE motion attribute, a move beginning at position 1000 with a position parameter value of 2000 will move to position 2000. If the RELATIVE attribute is turned on, the final move position will be 3000, a relative distance of 2000 counts from the starting value of 1000.

Move Types: **PT, PVT, Spline, Bessel, Bspline, Bspline2, S-Curve, Trapezoidal, Velocity**

MPIMotionAttrSYNC_END

The MPI has been extended to support mpiMotionStart(...) with the MPIMotionAttrMaskSYNC_END attribute. SYNC_END is used for motions that include more than one axis. The SYNC_END attribute will generate trajectories for all axes appended to an MS that will end simultaneously. For all but the longest motion profile, wait frames will be added to the beginning of the moves. This will ensure that all axes end simultaneously.

TOP

Move Types: **S-Curve, Trapezoidal**

MPIMotionAttrSYNC_START

The MPI has been extended to support mpiMotionStart(...) with the MPIMotionAttrMaskSYNC_START attribute. SYNC_START is used for Motions that include more than one Axis. All Axes will begin simultaneously. For those axes that finish first, a delay frame will be added to the end of the move.

Move Types: **S-Curve, Trapezoidal**

MEI Motion Attributes

MEIMotionAttrEVENT

The MPI has been extended to support mpiMotionStart(...) with the MEIMotionAttrMaskEVENT attribute. This mask allows the user to specify an MPIEventMask during a motion.

MEIMotionAttrFINAL_VEL

The MPI has been extended to support mpiMotionStart(...) with the MEIMotionAttrMaskFINAL_VEL attribute. This mask allows the user to specify a non-zero target velocity for point to point motion types.

MEIMotionAttrNO_REVERSAL

The MPI has been extended to support mpiMotionStart(...) with the MEIMotionAttrMaskNO_REVERSAL attribute. This mask prevents a motion profile from changing direction.

MEIMotionAttrHOLD

The MPI has been extended to support mpiMotionStart(...) with the MEIMotionAttrMaskHOLD attribute. The HOLD attribute prevents execution of a Motion. The HOLD attribute is applied at the beginning of the motion (one HOLD frame) before the execution of the point list. This prevents execution of the Motion until the HOLD frame is disabled.

The HOLD attribute is used to synchronize the start of motion with a host function call, XMP internal variable, or Motor Input state change. More than one Motion Supervisor may be synchronized. The type field of the MEIMotionAttrHold{} structure determines whether the synchronization comes from a host call (meiControlGateSet(), see below), internal variable (Axis Status, Position, etc.) or a Motor Input signal (transceiver, home input, user input, etc.).

Gated Moves: If the value of type is MEIMotionAttrHoldTypeGATE, the motion will be held until a call to mpiControlGateSet() is made with the closed parameter set to FALSE. When a MEIMotionAttrHoldTypeGATE is used, the source.gate field of MEIMotionAttrHold{} must be set to the gate number (0-31). The same gate number must be used for the gate parameter of meiControlGateSet().

Input Hold Moves: If the value of type is MEIMotionAttrHoldTypeINPUT, the motion will be held until then value of the internal Xmp variable specified (pointed to) by source.input bitwise anded with source.mask matches source.pattern.

Motor Input Hold Moves: If the value of type is MEIMotionAttrHoldTypeMOTOR, the motion will be held until the value of the internal dedicated input word (Motor[n].IO. DedicatedIN.IO) for the motor specified by source.motorNumber bitwise anded with source.mask matches source.pattern.

The timeout field of MEIMotionAttrHold{} will cause the motion to start after the specified timeout period (in seconds), even if the other hold criteria have not been satisfied. A value of zero for timeout causes the timeout feature to be disabled and forces the motion to wait for the hold criteria (gate open, or pattern match).

The MPI expects an array of hold attributes specifying separate attributes form each axis of a motion supervisor. All axes holding with the same hold attributes (same gate, same input, mask, and pattern) will start motion in the same sample even if the moves are specified using different motion supervisors.

MEIMotionAttrOUTPUT

The MPI has been extended to support mpiMotionStart(...) with the MPIMotionAttrMaskAPPEND attribute. This mask allows the user to set or clear bits during a motion. This motion attribute allows a Motion to change the state of a register in the controller memory. This configures a frame to toggle an output bit as a move begins.

Table of Error Messages / Return Values

The table below provides an exhaustive list of the error messages / return values that are returned by the message.exe utility. For a complete description of the error message and tips on troubleshooting, click on the links under the Define column.

String	Define
OK	MPIMessageOK
Argument invalid	MPIMessageARG_INVALID
Parameter invalid	MPIMessagePARAM_INVALID
Handle invalid	MPIMessageHANDLE_INVALID
Out of memory	MPIMessageNO_MEMORY
Object freed	MPIMessageOBJECT_FREED
Object not enabled	MPIMessageOBJECT_NOT_ENABLED
Object not found	MPIMessageOBJECT_NOT_FOUND
Object on list	MPIMessageOBJECT_ON_LIST
Object in use	MPIMessageOBJECT_IN_USE-------
Timeout	MPIMessageTIMEOUT
Unsupported	MPIMessageUNSUPPORTED
Fatal error	MPIMessageFATAL_ERROR
File close error	MPIMessageFILE_CLOSE_ERROR
File open error	MPIMessageFILE_OPEN_ERROR
File read error	MPIMessageFILE_READ_ERROR
File write error	MPIMessageFILE_WRITE_ERROR
Firmware File Mismatch	MPIMessageFILE_MISMATCH
Adc	MPIAdcMessageFIRST
Adc: ADC invalid	MPIAdcMessageADC_INVALID
Axis	MPIAxisMessageFIRST
Axis: axis invalid	MPIAxisMessageAXIS_INVALID
Axis: unable to set command position	MPIAxisMessageCOMMAND_NOT_SET
Axis: not mapped to motion supervisor	MPIAxisMessageNOT_MAPPED_TO_MS
Can	MEICanMessageFIRST
Can: can invalid	MPICanMessageCAN_INVALID
Can: firmware invalid	MPICanMessageFIRMWARE_INVALID
Can: firmware version mismatch	MPICanMessageFIRMWARE_VERSION

Can: firmware not initialized	MPICanMessageNOT_INITIALIZED
Can: IO not supported by node	MPICanMessageIO_NOT_SUPPORTED
Can: file format incorrect	MPICanMessageFILE_FORMAT_ERROR
Can: user aborted operation	MPICanMessageUSER_ABORT
Can: DPR Command protocol	MPICanMessageCOMMAND_PROTOCOL
Can: interface not found	MPICanMessageINTERFACE_NOT_FOUND
Can: node dead	MPICanMessageNODE_DEAD
Can: SDO Timeout	MPICanMessageSDO_TIMEOUT
Can: SDO abort	MPICanMessageSDO_ABORT
Can: SDO protocol	MPICanMessageSDO_PROTOCOL
Can: transmit buffer overflow	MPICanMessageTX_OVERFLOW
Can: RTR transmit buffer overflow	MPICanMessageRTR_TX_OVERFLOW
Can: Receive buffer empty	MPICanMessageRX_BUFFER_EMPTY
Can: Bus off	MPICanMessageBUS_OFF
Can: Signature invalid	MPICanMessageSIGNATURE_INVALID
Capture	MEICaptureMessageFIRST
Capture: invalid motor number	MPICaptureMessageMOTOR_INVALID
Capture: invalid capture type	MPICaptureMessageCAPTURE_TYPE_INVALID
Capture: invalid capture number	MPICaptureMessageCAPTURE_INVALID
Capture: invalid encoder index parameter	MPICaptureMessageENCODER_INVALID
Capture: vaild capture edge required	MEICaptureMessageINVALID_EDGE
Capture: global capture cannot be enabled and be a trigger source at the same time	MEICaptureMessageGLOBAL_CONFIG_ERR
Capture: global config already enabled on another capture on this block	MEICaptureMessageGLOBAL_ALREADY_ENABLED
Capture: capture not enabled	MEICaptureMessageCAPTURE_NOT_ENABLED
Capture: capture is in an invalid state	MEICaptureMessageCAPTURE_STATE_INVALID
Capture: capture does not map to existing hardware	MEICaptureMessageNOT_MAPPED
Capture: capture not supported on primary encoder	MEICaptureMessageUNSUPPORTED_PRIMARY
Capture: capture not supported on secondary encoder	MEICaptureMessageUNSUPPORTED_SECONDARY
Capture: secondary index can not be used for multiple source capturing	MEICaptureMessageSECONDARY_INDEX_INVALID
Client	MEIClientMessageFIRST
Client: client invalid	MEIClientMessageCLIENT_INVALID

Client: method invalid	MEIClientMessageMETHOD_INVALID
Client: header invalid	MEIClientMessageHEADER_INVALID
Command	MPICommandMessageFIRST
Command: command invalid	MEICommandMessageCOMMAND_INVALID
Command: type invalid	MPICommandMessageTYPE_INVALID
Command: param invalid	MPICommandMessagePARAM_INVALID
Compensator	MPICompensatorMessageFIRST
Compensator: compensator object invalid	MPICompensatorMessageCOMPENSATOR_INVALID
Compensator: compensator object not configured	MPICompensatorMessageNOT_CONFIGURED
Compensator: object not enabled	MPICompensatorMessageNOT_ENABLED
Compensator: axis not enabled	MPICompensatorMessageAXIS_NOT_ENABLED
Compensator: table size is too small. adjust MPIControlConfig.compensatorPostionCount	MPICompensatorMessageTABLE_SIZE_ERROR
Compensator: position delta invalid	MPICompensatorMessagePOSITION_DELTA_INVALID
Compensator: table dimension not supported	MPICompensatorMessageDIMENSION_NOT_SUPPORTED
Control	MPIControlMessageFIRST
Control: application is not compatible with MPI DLL	MPIControlMessageLIBRARY_VERSION
Control: address invalid	MPIControlMessageADDRESS_INVALID
Control: control invalid	MPIControlMessageCONTROL_INVALID
Control: control number exceeds maximum limit	MPIControlMessageCONTROL_NUMBER_INVALID
Control: type invalid	MPIControlMessageTYPE_INVALID
Control: interrupts disabled	MPIControlMessageINTERRUPTS_DISABLED
Control: out of external memory	MPIControlMessageEXTERNAL_MEMORY_OVERFLOW
Control: adcCount exceeds configuration limit	MPIControlMessageADC_COUNT_INVALID
Control: axisCount exceeds configuration limit	MPIControlMessageAXIS_COUNT_INVALID
Control: invalid axisFrameCount	MPIControlMessageAXIS_FRAME_COUNT_INVALID
Control: captureCount exceeds configuration limit	MPIControlMessageCAPTURE_COUNT_INVALID
Control: compareCount exceeds configuration limit	MPIControlMessageCOMPARE_COUNT_INVALID
Control: cmdDacCount exceeds configuration limit	MPIControlMessageCMDDAC_COUNT_INVALID

Control: auxDacCount exceeds configuration limit	MPIControlMessageAUXDAC_COUNT_INVALID
Control: filterCount exceeds configuration limit	MPIControlMessageFILTER_COUNT_INVALID
Control: motionCount exceeds configuration limit	MPIControlMessageMOTION_COUNT_INVALID
Control: motorCount exceeds configuration limit	MPIControlMessageMOTOR_COUNT_INVALID
Control: sample rate value must be greater than or equal to 1000	MPIControlMessageSAMPLE_RATE_TO_LOW
Control: recorderCount exceeds configuration limit	MPIControlMessageRECORDER_COUNT_INVALID
Control: compensatorCount exceeds configuration limit	MPIControlMessageCOMPENSATOR_COUNT_INVALID
Control: cannot configure while axes are running	MPIControlMessageAXIS_RUNNING
Control: cannot configure while recorders are running	MPIControlMessageRECORDER_RUNNING
Control: firmware invalid	MEIControlMessageFIRMWARE_INVALID
Control: No firmware found (factory default)	MEIControlMessageFIRMWARE_VERSION_NONE
Control: firmware version mismatch	MEIControlMessageFIRMWARE_VERSION
Control: Too many FPGA hardware socket types	MEIControlMessageFPGA_SOCKETS
Control: Bad FPGA hardware socket data	MEIControlMessageBAD_FPGA_SOCKET_DATA
Control: FPGA hardware socket does not exist	MEIControlMessageNO_FPGA_SOCKET
Control: Invalid Motion Block count	MEIControlMessageINVALID_BLOCK_COUNT
Control: Too many SynqNet objects	MEIControlMessageSYNQNET_OBJECTS
Control: SynqNet state is invalid	MEIControlMessageSYNQNET_STATE
Control: I/O bit selected is unavailable	MEIControlMessageIO_BIT_INVALID
driveMap	MEIDriveMapMessageFIRST
driveMap: Could not open drive map file	MEIDriveMapMessageMAP_FILE_OPEN_ERROR
driveMap: Format error in drive map file	MEIDriveMapMessageMAP_FILE_FORMAT_INVALID
driveMap: Node type not found in drives map file	MEIDriveMapMessageNODE_NOT_FOUND_IN_MAP
driveMap: Drive firmware version not found in drives map file	MEIDriveMapMessageVERSION_NOT_FOUND_IN_MAP
driveMap: Drive parameter is read-only	MEIDriveMapMessageDRIVE_PARAM_READ_ONLY
Element	MEIElementMessageFIRST
Element: element invalid	MEIElementMessageELEMENT_INVALID

Element: Velocity must be positive	MPIPathMessageILLEGAL_VELOCITY
Element: Acceleration must be positive	MPIPathMessageILLEGAL_ACCELERATION
Element: timeSlice must be positive	MPIPathMessageILLEGAL_TIMESLICE
Element: blending cannot be used with path interpolation method	MPIPathMessageINVALID_BLENDING
Event	MPIEventMessageFIRST
Event: event invalid	MPIEventMessageEVENT_INVALID
EventMgr	MPIEventMgrMessageFIRST
EventMgr: eventMgr invalid	MPIEventMgrMessageEVENTMGR_INVALID
Filter	MPIFilterMessageFIRST
Filter: filter invalid	MPIFilterMessageFILTER_INVALID
Filter: filter algorithm invalid	MPIFilterMessageINVALID_ALGORITHM
Filter: DRate value out of range (0-7)	MPIFilterMessageINVALID_DRATE
Filter: Divide by zero in conversion	MPIFilterMessageCONVERSION_DIV_BY_0
Filter: Specified postfilter section not enabled	MPIFilterMessageSECTION_NOT_ENABLED
Filter: Invalid filter form	MPIFilterMessageINVALID_FILTER_FORM
Flash	MEIFlashMessageFIRST
Flash: flash invalid	MEIFlashMessageFLASH_INVALID
Flash: flash verify error	MEIFlashMessageFLASH_VERIFY_ERROR
Flash: flash write error	MEIFlashMessageFLASH_WRITE_ERROR
Flash: flash file path is too long	MEIFlashMessagePATH
Flash: write to flash failed. Network topology has not been saved to flash - use meiSynqNetTopologySave()	MEIFlashMessageNETWORK_TOPOLOGY_ERROR
List	MEIListMessageFIRST
List: list invalid	MEIListMessageLIST_INVALID
List: element not found	MEIFlashMessageELEMENT_NOT_FOUND
List: element invalid	MEIFlashMessageELEMENT_INVALID
Map	MEIMapMessageFIRST
Map: name invalid	MEIMapMessageNAME_INVALID
Map: name not found	MEIMapMessageNAME_NOT_FOUND
Map: index invalid	MEIMapMessageINDEX_INVALID
Map: file invalid	MEIMapMessageFILE_INVALID
Motion	MPIMotionMessageFIRST
Motion: motion invalid	MPIMotionMessageMOTION_INVALID

Motion: axis not found	MPIMotionMessageAXIS_NOT_FOUND
Motion: axis count invalid	MPIMotionMessageAXIS_COUNT
Motion: type invalid	MPIMotionMessageTYPE_INVALID
Motion: attribute invalid	MPIMotionMessageATTRIBUTE_INVALID
Motion: MPIStateIDLE	MPIMotionMessageIDLE
Motion: MPIStateMOVING	MPIMotionMessageMOVING
Motion: MPIStateSTOPPING	MPIMotionMessageSTOPPING
Motion: MPIStateSTOPPED	MPIMotionMessageSTOPPED
Motion: MPIStateSTOPPING_ERROR	MPIMotionMessageSTOPPING_ERROR
Motion: MPIStateERROR	MPIMotionMessageERROR
Motion: auto-start	MPIMotionMessageAUTO_START
Motion: profile error	MPIMotionMessagePROFILE_ERROR
Motion: profile not supported	MPIMotionMessagePROFILE_ERROR_NOT_SUPPORTED
Motion: path error	MPIMotionMessagePATH_ERROR
Motion: frame buffer low	MPIMotionMessageFRAMES_LOW
Motion: frame buffer empty	MPIMotionMessageFRAMES_EMPTY
Motion: frame buffer too small	MPIMotionMessageFRAME_BUFFER_TOO_SMALL
Motion: RESERVED0	MEIMotionMessageRESERVED0
Motion: RESERVED1	MEIMotionMessageRESERVED1
Motion: RESERVED2	MEIMotionMessageRESERVED2
Motion: No Axis mapped	MEIMotionMessageNO_AXES_MAPPED
Motor	MPIMotorMessageFIRST
Motor: motor invalid	MPIMotorMessageMOTOR_INVALID
Motor: motor type invalid	MPIMotorMessageMOTOR_TYPE_INVALID
Motor: motor not enabled	MEIMotorMessageMOTOR_NOT_ENABLED
Motor: secondary encoder not available	MEIMotorMessageSECONDARY_ENCODER_NA
Motor: hardware not found	MEIMotorMessageHARDWARE_NOT_FOUND
Motor: cannot set disable action to CMD_EQ_ACT when motor type is STEPPER	MEIMotorMessageSTEPPER_INVALID
Motor: cannot set motor type to STEPPER when disable action is CMD_EQ_ACT	MEIMotorMessageDISABLE_ACTION_INVALID
Motor: stepper Pulse Width out of range (10^(-7) < pulseWidth < 10^(-3)	MEIMotorMessagePULSE_WIDTH_INVALID
Motor: unable to invert feedback for specified encoder type	MEIMotorMessageFEEDBACK_REVERSAL_NA

Motor: unable to disable the filter for specified encoder type	MEIMotorMessageFILTER_DISABLE_NA
Notify	MPINotifyMessageFIRST
Notify: notify invalid	MPINotifyMessageNOTIFY_INVALID
Notify: wait in progress	MPINotifyMessageWAIT_IN_PROGRESS
Packet	MEIPacketMessageFIRST
Packet: packet invalid	MEIPacketMessagePACKET_INVALID
Packet: address invalid	MEIPacketMessageADDRESS_INVALID
Packet: communication error	MEIPacketMessageCOMM_ERROR
Packet: connection closed	MEIPacketMessageCONNECTION_CLOSED
Packet: receive error	MEIPacketMessageRECV_ERROR
Packet: send error	MEIPacketMessageSEND_ERROR
Path	MPIPathMessageFIRST
Path: Path invalid	MPIPathMessagePATH_INVALID
Path: Dimension Out of Range	MPIPathMessageILLEGAL_DIMENSION
Path: Illegal Element	MPIPathMessageILLEGAL_ELEMENT
Path: Arc Dimension Out of Range	MPIPathMessageARC_ILLEGAL_DIMENSION
Path: Helix Dimension Out of Range	MPIPathMessageHELIX_ILLEGAL_DIMENSION
Path: Illegal Radius	MPIPathMessageILLEGAL_RADIUS
Path: Path too long	MPIPathMessagePATH_TOO_LONG
Probe	MPIProbeMessageFIRST
Probe: invalid node number	MPIProbeMessageNODE_INVALID
Probe: invalid probe type	MPIProbeMessagePROBE_TYPE_INVALID
Probe: invalid probe number	MPIProbeMessagePROBE_INVALID
Recorder	MPIRecorderMessageFIRST
Recorder: recorder invalid	MPIRecorderMessageRECORDER_INVALID
Recorder: already started	MPIRecorderMessageSTARTED
Recorder: already stopped	MPIRecorderMessageSTOPPED
Recorder: not configured	MPIRecorderMessageNOT_CONFIGURED
Recorder: no recorders available	MPIRecorderMessageNO_RECORDERS_AVAIL
Recorder: not enabled	MPIRecorderMessageNOT_ENABLED
Recorder: cannot configure while running	MPIRecorderMessageRUNNING
Sequence	MPISequenceMessageFIRST
Sequence: sequence invalid	MPISequenceMessageSEQUENCE_INVALID

Sequence: command count invalid	MPISequenceMessageCOMMAND_COUNT
Sequence: command not found	MPISequenceMessageCOMMAND_NOT_FOUND
Sequence: MPISequenceStateSTARTED	MPISequenceMessageSTARTED
Sequence: MPISequenceStateSTOPPED	MPISequenceMessageSTOPPED
Server	MEIServerMessageFIRST
Server: server invalid	MEIServerMessageSERVER_INVALID
Server: method invalid	MEIServerMessageMETHOD_INVALID
Server: header invalid	MEIServerMessageHEADER_INVALID
SqNode	MEISqNodeMessageFIRST
SqNode: invalid	MEISqNodeMessageINVALID
SqNode: Node invalid	MEISqNodeMessageNODE_INVALID
SqNode: Config file and network are different	MEISqNodeMessageCONFIG_NETWORK_MISMATCH
SqNode: Not in Config File	MEISqNodeMessageNOT_IN_CONFIG_FILE
SqNode: Config file format invalid	MEISqNodeMessageCONFIG_FILE_FORMAT_INVALID
SqNode: service cmd response timeout	MEISqNodeMessageRESPONSE_TIMEOUT
SqNode: node busy : service cmd ready timeout	MEISqNodeMessageREADY_TIMEOUT
SqNode: service cmd error	MEISqNodeMessageSRVC_ERROR
SqNode: service cmd unsupported	MEISqNodeMessageSRVC_UNSUPPORTED
SqNode: invalid service channel specified	MEISqNodeMessageSRVC_CHANNEL_INVALID
SqNode: node module did not complete the specified operation	MEISqNodeMessageCMD_NOT_SUPPORTED
SqNode: node specific discovery failure	MEISqNodeMessageDISCOVERY_FAILURE
SqNode: node specific command dispatch error	MEISqNodeMessageDISPATCH_ERROR
SqNode: node specific initialization failure	MEISqNodeMessageINIT_FAILURE
SqNode: node module doesn't support discovery	MEISqNodeMessageINTERFACE_ERROR1
SqNode: node type does not match the file provided for download	MEISqNodeMessageFILE_NODE_MISMATCH
SqNode: the file provided for download was not found	MEISqNodeMessageFILE_INVALID
SqNode: the header information in the download image is invalid	MEISqNodeMessageINVALID_HEADER
SqNode: node firmware download failed	MEISqNodeMessageDOWNLOAD_FAIL
SqNode: node firmware verify failed	MEISqNodeMessageVERIFY_FAIL
SqNode: firmware download not supported	MEISqNodeMessageDOWNLOAD_NOT_SUPPORTED

SqNode: firmware verify not supported	MEISqNodeMessageVERIFY_NOT_SUPPORTED
SqNode: boot rom not recognized	MEISqNodeMessageBOOT_ROM_INVALID
SqNode : invalid resource table in node module	MEISqNodeMessageINVALID_TABLE
SqNode : invalid string length	MEISqNodeMessageINVALID_STR_LEN
SqNode: invalid feedback map attempt	MEISqNodeMessageFEEDBACK_MAP_INVAILD
SqNode: node failure	MEISqNodeMessageNODE_FAILURE
SqNode: I/O Module Incompatibility	MEISqNodeMessageIO_MODULE_INCOMPATIBILITY
SqNode: I/O Module EEPROM not programmed	MEISqNodeMessageIO_MODULE_EEPROM_NOT_PROGRAMMED
SqNode: I/O Module Count Exceeded	MEISqNodeMessageIO_MODULE_COUNT_EXCEEDED
SqNode: I/O Module length check failed	MEISqNodeMessageIO_MODULE_LENGTH_CHECK_FAILED
SqNode: I/O Module 3.3V bus current exceeded	MEISqNodeMessageIO_MODULE_3_3V_BUS_CURRENT_EXCEEDED
SqNode: I/O Module 24V bus current exceeded	MEISqNodeMessageIO_MODULE_24V_BUS_CURRENT_EXCEEDED
SqNode: I/O Slice initalization error	MEISqNodeMessageIO_SLICE_INITIALIZATION_ERROR
SqNode: I/O Slice initalization timeout	MEISqNodeMessageIO_SLICE_INITIALIZATION_TIMEOUT
SqNode: I/O Slice topology mismatch	MEISqNodeMessageIO_SLICE_TOPOLOGY_MISMATCH
SqNode: Boot file not found or corrupt, kollmorgen_ember.a00 must be in path	MEISqNodeMessageBOOT_FILE_NOT_FOUND
SqNode: Parameter is read only	MEISqNodeMessagePARAM_READ_ONLY
SqNode: SFD motor selected, parameter is locked	MEISqNodeMessagePARAM_LOCKED
SqNode: Monitor config invalid, index not supported	MEISqNodeMessageMONITOR_INDEX
SqNode: Monitor config invalid, address not supported	MEISqNodeMessageMONITOR_ADDRESS
SynqNet	MEISynqNetMessageFIRST
SynqNet: synqNet invalid	MEISynqNetMessageSYNQNET_INVALID
SynqNet: maximum blocks exceeded	MEISynqNetMessageMAX_NODE_ERROR
SynqNet: unexpected network state	MEISynqNetMessageSTATE_ERROR
SynqNet: network communication is down	MEISynqNetMessageCOMM_ERROR
SynqNet: network down due to CRC errors	MEISynqNetMessageCOMM_ERROR_CRC
SynqNet: network down due to Rx errors	MEISynqNetMessageCOMM_ERROR_RX
SynqNet: network down due to Rx packet length errors	MEISynqNetMessageCOMM_ERROR_RX_LEN
SynqNet: network down due to Rx pack errors	MEISynqNetMessageCOMM_ERROR_RX_FIFO

SynqNet: network down due to Rx dribble	MEISynqNetMessageCOMM_ERROR_RX_DRIBBLE
SynqNet: network down due to Rx CRC errors	MEISynqNetMessageCOMM_ERROR_RX_CRC
SynqNet: interface not available	MEISynqNetMessageINTERFACE_NOT_FOUND
SynqNet: network topology mismatch in dynamic memory - network in asynq mode	MEISynqNetMessageTOPOLOGY_MISMATCH
SynqNet: network topology mismatch in flash memory - network in asynq mode	MEISynqNetMessageTOPOLOGY_MISMATCH_FLASH
SynqNet: timeout : reset request packet	MEISynqNetMessageRESET_REQ_TIMEOUT
SynqNet: timeout : reset complete packet	MEISynqNetMessageRESET_ACK_TIMEOUT
SynqNet: timeout : discovery problem	MEISynqNetMessageDISCOVERY_TIMEOUT
SynqNet: no nodes found on network	MEISynqNetMessageNO_NODES_FOUND
SynqNet: no timing data available in module	MEISynqNetMessageNO_TIMING_DATA_AVAIL
SynqNet: internal buffer size overflow: reduce network payload	MEISynqNetMessageINTERNAL_BUFFER_OVERFLOW
SynqNet: too many motors configured for this node	MEISynqNetMessageINVALID_MOTOR_COUNT
SynqNet: invalid auxiliary encoder count	MEISynqNetMessageINVALID_AUX_ENC_COUNT
SynqNet: incomplete motor : fulfill motor packet requirements or remove all packet fields for motor	MEISynqNetMessageINCOMPLETE_MOTOR
SynqNet: invalid command configuration	MEISynqNetMessageINVALID_COMMAND_CFG
SynqNet: invalid feedback count	MEISynqNetMessageINVALID_ENCODER_COUNT
SynqNet: invalid capture count	MEISynqNetMessageINVALID_CAPTURE_COUNT
SynqNet: invalid compare count	MEISynqNetMessageINVALID_COMPARE_COUNT
SynqNet: invalid ioInput count	MEISynqNetMessageINVALID_INPUT_COUNT
SynqNet: invalid ioOutput count	MEISynqNetMessageINVALID_OUTPUT_COUNT
SynqNet: invalid monitor field configuration	MEISynqNetMessageINVALID_MONITOR_CFG
SynqNet: invalid analogIn count	MEISynqNetMessageINVALID_ANALOG_IN_COUNT
SynqNet: invalid digitalIn count	MEISynqNetMessageINVALID_DIGITAL_IN_COUNT
SynqNet: invalid digitalOut count	MEISynqNetMessageINVALID_DIGITAL_OUT_COUNT
SynqNet: invalid analogOut count	MEISynqNetMessageINVALID_ANALOG_OUT_COUNT
SynqNet: cable number is not idle, status is unknown	MEISynqNetMessageLINK_NOT_IDLE
SynqNet: idle cable number unknown due to failed node(s)	MEISynqNetMessageIDLE_LINK_UNKNOWN
SynqNet: only supported with ring topologies	MEISynqNetMessageRING_ONLY

SynqNet: network is currently recovering from a fault	MEISynqNetMessageRECOVERING
SynqNet: detected an unsupported cable length	MEISynqNetMessageCABLE_LENGTH_UNSUPPORTED
SynqNet: cable length mismatch - network in asynq mode	MEISynqNetMessageCABLE_LENGTH_MISMATCH
SynqNet: nominal cable length out of range	MEISynqNetMessageCABLE_LENGTH_INVALID_NOMINAL
SynqNet: minimum cable length out of range	MEISynqNetMessageCABLE_LENGTH_INVALID_MIN
SynqNet: maximum cable length out of range	MEISynqNetMessageCABLE_LENGTH_INVALID_MAX
SynqNet: node FPGA version mismatch warning	MEISynqNetMessageNODE_FPGA_VERSION
SynqNet: maximum motor count exceeded	MEISynqNetMessageMAX_MOTOR_ERROR
SynqNet: node PLL unable to lock with drive	MEISynqNetMessagePLL_ERROR
SynqNet: node specific initialization failed	MEISynqNetMessageNODE_INIT_FAIL
SynqNet: network topology is already clear	MEISynqNetMessageTOPOLOGY_CLEAR
SynqNet: network topology is already saved to flash. Use meiSynqNetFlashTopologyClear(...) first	MEISynqNetMessageTOPOLOGY_SAVED
SynqNet: network topology cannot be saved or cleared while amplifiers are enabled	MEISynqNetMessageTOPOLOGY_AMPS_ENABLED
SynqNet: node MAC version mismatch - network in asynq mode	MEISynqNetMessageNODE_MAC_VERSION
SynqNet: controller sample rate exceeds required analog input sample time	MEISynqNetMessageADC_SAMPLE_FAILURE
SynqNet: unrecoverable network scheduling error	MEISynqNetMessageSCHEDULING_ERROR
SynqNet: invalid probe count	MEISynqNetMessageINVALID_PROBE_CFG
SynqNet: invalid probe depth	MEISynqNetMessageINVALID_PROBE_DEPTH
WinNT	MEIPlatformMessageFIRST
WinNT: platform invalid	MEIPlatformMessagePLATFORM_INVALID
WinNT: device invalid	MEIPlatformMessageDEVICE_INVALID
WinNT: device error	MEIPlatformMessageDEVICE_ERROR
WinNT: device map error	MEIPlatformMessageDEVICE_MAP_ERROR