

Version 1.0.0.0

Parker Automation Controller

P2M2HBVT Interface Function Blocks

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Preface

This document describes the P2M2HBVT function block library that provides an advanced level of access between the Parker Automation Control and the P2M2HBVT EtherCAT module. Each individual solenoid can be directly addressed from a PAM POU program, and basic control status information can be accessed directly as well. Many P2M2HBVT users will, therefore, not need to use these function blocks at all. Solenoid changes are made using the very fast EtherCAT PDO technology, so that as long as multiple solenoids are changed during the same scan cycle, their changes will effectively occur simultaneously.

The P2M2HBVT has several controls, status parameters, and counters providing an advanced level of control. These parameters and counters may only be accessed through the function block library. Also, some applications need to determine which solenoid valve or valves will be opened or closed programmatically, at run time. These functions will use the SetResetSolenoids or the SetResetSolenoidsEx function blocks in the library.

PAC_P2M2HBVT_SetResetSolenoids_R0

PAC_P2M2HBVT_SetResetSolenoids_R0 sets the solenoids identified in one list, resets the solenoids identified in another list, and performs this operation so that all the solenoids are set or cleared simultaneously. Solenoids not identified in either list remain in their previous state.

Inputs	Type	Description
Device	IoDrvEthercatLib.ETCSlave	Device object identifier for the function block.
Execute	BOOL	The function block executes on rising edge.
SolenoidSet	ARRAY[1..24] OF USINT	Indices of solenoids to set (1-24), zero-terminated.
SolenoidReset	ARRAY[1..24] OF USINT	Indices of solenoids to reset (1-24), zero-terminated.

Outputs	Type	Description
Done	BOOL	Indicates the function block has finished executing.
Busy	BOOL	Indicates the function block has not finished executing.
Error	BOOL	Indicates the function block has encountered an error.
ErrorID	DWORD	Indicates the error code of encountered error.
ErrorIDString	STRING	Indicates the function block error code string description.

PAC_P2M2HBVT_SetResetSolenoidsEx_R0

PAC_P2M2HBVT_SetResetSolenoidsEx_R0 extends the functionality of PAC_P2M2HBVT_SetResetSolenoids_R0 to up to 10 solenoid banks. The first device specified (nonzero) is assigned to solenoids 1-24; the second, 25-48; and so on, until up to 240 solenoids are mapped.

Inputs	Type	Description
Device1 . . . Device 10	IoDrvEthercatLib.ETCSlave	Device object identifier for the function block. From 1 to 10 devices may be specified. The top (lowest numbered) device supplies solenoids 1-24; the second lowest, 25-48; and so on.
Execute	BOOL	The function block executes on rising edge.
SolenoidSet	ARRAY[1..240] OF USINT	Indices of solenoids to set (1-240), zero-terminated.
SolenoidReset	ARRAY[1..240] OF USINT	Indices of solenoids to reset (1-240), zero-terminated.

Outputs	Type	Description
Done	BOOL	Indicates the function block has finished executing.
Busy	BOOL	Indicates the function block has not finished executing.
Error	BOOL	Indicates the function block has encountered an error.
ErrorID	DWORD	Indicates the error code of encountered error.
ErrorIDString	STRING	Indicates the function block error code string description.

PAC_P2M2HBVT_WriteSolenoids_R0

PAC_P2M2HBVT_WriteSolenoids_R0 sets or resets all solenoids simultaneously according to the values in SolenoidValues. Values must be supplied for every solenoid. Use PAC_P2M2HBVT_SetResetSolenoids_R0 to set or reset solenoids selectively.

Inputs	Type	Description
Device	IoDrvEthercatLib.ETCSlave	Device object identifier for the function block.
Execute	BOOL	The function block executes on rising edge.
SolenoidValues	UDINT	Mask of desired solenoid settings in low 24 bits. Bit 0 corresponds to solenoid 1; bit 23 corresponds to solenoid 24.

Outputs	Type	Description
Done	BOOL	Indicates the function block has finished executing.
Busy	BOOL	Indicates the function block has not finished executing.
Error	BOOL	Indicates the function block has encountered an error.
ErrorID	DWORD	Indicates the error code of encountered error.
ErrorIDString	STRING	Indicates the function block error code string description.

PAC_P2M2HBVT_WriteSolenoidsEx_R0

PAC_P2M2HBVT_WriteSolenoids_R0 sets or resets all solenoids in multiple modules simultaneously according to the values in SolenoidValues, an array of UDINT. Device objects are passed in the Devices array. Values must be supplied for every solenoid. All solenoids in all modules are set or reset simultaneous. Use PAC_P2M2HBVT_SetResetSolenoidsEx_R0 to set or reset solenoids selectively.

Inputs	Type	Description
Devices	ARRAY[1..10] OF IoDrvEthercatLib.ETCSlave	Device object identifier for the function block.
DeviceCount	USINT	Number of modules in Devices (and elements in SolenoidValues)
Execute	BOOL	The function block executes on rising edge.
SolenoidValues	ARRAY[1..10] OF UDINT	Array of masks with desired solenoid settings in low 24 bits. Bit 0 corresponds to solenoid 1; bit 23 corresponds to solenoid 24.

Outputs	Type	Description
Done	BOOL	Indicates the function block has finished executing.
Busy	BOOL	Indicates the function block has not finished executing.
Error	BOOL	Indicates the function block has encountered an error.
ErrorID	DWORD	Indicates the error code of encountered error.
ErrorIDString	STRING	Indicates the function block error code string description.

PAC_P2M2HBVT_WriteSolenoidsEna_R0

PAC_P2M2HBVT_WriteSolenoids sets a bank of solenoids to the SolenoidValues during the time that Enable is asserted. Use PAC_P2M2HBVT_SetResetSolenoids_R0 to set or reset solenoids selectively, and PAC_P2M2HBVT_SetResetSolenoidsEx_R0 to handle more than one bank of solenoids.

Inputs	Type	Description
Device	IoDrvEthercatLib.ETCSlave	Device object identifier for the function block.
Enable	BOOL	Solenoid settings will be set to <i>SolenoidValues</i> every cycle in which <i>Enable</i> is true.
SolenoidValues	UDINT	Mask of desired solenoid settings in low 24 bits. Bit 0 corresponds to solenoid 1; bit 23 corresponds to solenoid 24.

Outputs	Type	Description
Done	BOOL	Indicates the function block has finished executing.
Busy	BOOL	Indicates the function block has not finished executing.
Error	BOOL	Indicates the function block has encountered an error.
ErrorID	DWORD	Indicates the error code of encountered error.
ErrorIDString	STRING	Indicates the function block error code string description.

PAC_P2M2HBVT_ReadSolenoids_R0

PAC_P2M2HBVT_ReadSolenoids_R0 reads the current state of all solenoids into the low 24 bits of a DWORD mask.

Inputs	Type	Description
Device	IoDrvEthercatLib.ETCSlave	Device object identifier for the function block.
Execute	BOOL	The function block executes on rising edge.

Outputs	Type	Description
Done	BOOL	Indicates the function block has finished executing.
Busy	BOOL	Indicates the function block has not finished executing.
SolenoidValues	DWORD	Current setting of associated solenoid
Error	BOOL	Indicates the function block has encountered an error.
ErrorID	DWORD	Indicates the error code of encountered error.
ErrorIDString	STRING	Indicates the function block error code string description.

PAC_P2M2HBVT_ReadSolenoidEna_R0

PAC_P2M2HBVT_ReadSolenoidsEna_R0 continuously reads the current state of all solenoids into the low 24 bits of a DWORD mask.

Inputs	Type	Description
Device	IoDrvEthercatLib.ETCSlave	Device object identifier for the function block.
Enable	BOOL	Outputs will be updated with every cycle that Enable is TRUE.

Outputs	Type	Description
Done	BOOL	Indicates the function block has finished executing.
Busy	BOOL	Indicates the function block has not finished executing.
SolenoidValues	DWORD	Current setting of associated solenoid
Error	BOOL	Indicates the function block has encountered an error.
ErrorID	DWORD	Indicates the error code of encountered error.
ErrorIDString	STRING	Indicates the function block error code string description.

PAC_P2M2HBVT_ReadModuleErrors_R0

PAC_P2M2HBVT_ReadModuleError_R0s reads and reports the module-level error bits...

Inputs	Type	Description
Device	IoDrvEthercatLib.ETCSlave	Device object identifier for the function block.
Execute	BOOL	The function block executes on rising edge.

Outputs	Type	Description
Done	BOOL	Indicates the function block has finished executing.
Busy	BOOL	Indicates the function block has not finished executing.
AckRequired	BOOL	Set if either COM- μ C or Valve- μ C is in error state. Outputs are switched off, acknowledge is required.
AuxWarning	BOOL	Set if AUX voltage is out of range for warning
AuxError	BOOL	Set if AUX voltage is out of range for error. From Detection of this condition until indication in this bit a delay of 500ms is kept. Outputs are switched off, acknowledge is required.
TempWarning	BOOL	Set if a temperature warning (in one of the output driver chips) occurred. Outputs are switched off, acknowledge is required.
ModuleError	BOOL	Aggregation of the following errors: - SPI_COM_Error (requires acknowledge) - SPI_COM_lost (requires acknowledge) - Heartbeat_Valve_uC_Error (requires ack) - SPI_B40_Error (requires power-cycle) - B40_Version_Error (unrecoverable)
OutputStageNotAvail	BOOL	No Aux Power available (detected by missing heartbeat and level of heartbeat line is low). No acknowledge required.

ChannelError	DWORD	An element is TRUE if the corresponding channel reports an error.
Error	BOOL	Indicates the function block has encountered an error.
ErrorID	DWORD	Indicates the error code of encountered error.
ErrorIDString	STRING	Indicates the function block error code string description.

PAC_P2M2HBVT_ReadModuleErrorsEna_R0

PAC_P2M2HBVT_ReadModuleError_R0s reads and reports the module-level error bits, updating its outputs with every scan that Enable is TRUE.

Inputs	Type	Description
Device	IoDrvEthercatLib.ETCSlave	Device object identifier for the function block.
Enable	BOOL	Outputs will be updated with every cycle that Enable is TRUE.

Outputs	Type	Description
Done	BOOL	Indicates the function block has finished executing.
Busy	BOOL	Indicates the function block has not finished executing.
AckRequired	BOOL	Set if either COM- μ C or Valve- μ C is in error state. Outputs are switched off, acknowledge is required.
AuxWarning	BOOL	Set if AUX voltage is out of range for warning
AuxError	BOOL	Set if AUX voltage is out of range for error. From Detection of this condition until indication in this bit a delay of 500ms is kept. Outputs are switched off, acknowledge is required.
TempWarning	BOOL	Set if a temperature warning (in one of the output driver chips) occurred. Outputs are switched off, acknowledge is required.
ModuleError	BOOL	Aggregation of the following errors: <ul style="list-style-type: none">- SPI_COM_Error (requires acknowledge)- SPI_COM_lost (requires acknowledge)- Heartbeat_Valve_uC_Error (requires ack)- SPI_B40_Error (requires power-cycle)- B40_Version_Error (unrecoverable)

OutputStageNotAvail	BOOL	No Aux Power available (detected by missing heartbeat and level of heartbeat line is low). No acknowledge required.
ChannelError	DWORD	An element is TRUE if the corresponding channel reports an error.
Error	BOOL	Indicates the function block has encountered an error.
ErrorID	DWORD	Indicates the error code of encountered error.
ErrorIDString	STRING	Indicates the function block error code string description.

PAC_P2M2HBVT_ReadModuleInfo_R0

PAC_P2M2HBVT_ReadModuleInfo_R0 reads and reports the module-level information flag bits.

Inputs	Type	Description
Device	IoDrvEthercatLib.ETCSlave	Device object identifier for the function block.
Execute	BOOL	The function block executes on rising edge.

Outputs	Type	Description
Done	BOOL	Indicates the function block has finished executing.
Busy	BOOL	Indicates the function block has not finished executing.
WatchdogVuC	BOOL	Set if the prior reset of the Valve- μ C was caused by the independent watchdog
EEPROMError	BOOL	Set if none of the data sets in the EEPROM has been detected as valid on startup.
WatchdogCuC	BOOL	Set if the prior reset of the COM- μ C was caused by the independent watchdog
HeartbeatError	BOOL	Heartbeat is currently not toggling (during startup or error acknowledge this is not an error)
HeartbeatState	BOOL	Only served when Heartbeat_not_toggling is set: level of the Heartbeat input: 0: could be an evidence that AUX power is missing 1: could be an evidence that Valve- μ C is stuck in reset
Error	BOOL	Indicates the function block has encountered an error.
ErrorID	DWORD	Indicates the error code of encountered error.
ErrorIDString	STRING	Indicates the function block error code string description.

PAC_P2M2HBVT_ReadModuleInfoEna_R0

PAC_P2M2HBVT_ReadModuleInfo_R0 reads and reports the module-level information flag bits, updating its outputs with every scan that Enable is TRUE.

Inputs	Type	Description
Device	IoDrvEthercatLib.ETCSlave	Device object identifier for the function block.
Enable	BOOL	Outputs will be updated with every cycle that Enable is TRUE.

Outputs	Type	Description
Done	BOOL	Indicates the function block has finished executing.
Busy	BOOL	Indicates the function block has not finished executing.
WatchdogVuC	BOOL	Set if the prior reset of the Valve- μ C was caused by the independent watchdog
EEPROMError	BOOL	Set if none of the data sets in the EEPROM has been detected as valid on startup.
WatchdogCuC	BOOL	Set if the prior reset of the COM- μ C was caused by the independent watchdog
HeartbeatError	BOOL	Heartbeat is currently not toggling (during startup or error acknowledge this is not an error)
HeartbeatState	BOOL	Only served when Heartbeat_not_toggling is set: level of the Heartbeat input: 0: could be an evidence that AUX power is missing 1: could be an evidence that Valve- μ C is stuck in reset
Error	BOOL	Indicates the function block has encountered an error.
ErrorID	DWORD	Indicates the error code of encountered error.
ErrorIDString	STRING	Indicates the function block error code string description.

PAC_P2M2HBVT_ReadModuleParameters_R0

PAC_P2M2HBVT_ReadModuleParameters_R0 reads and reports detailed information not reported by PAC_P2M2HBVT_ReadModuleInfo_R0.

Inputs	Type	Description
Device	IoDrvEthercatLib.ETCSlave	Device object identifier for the function block.
Execute	BOOL	The function block executes on rising edge.

Outputs	Type	Description
Done	BOOL	Indicates the function block has finished executing.
Busy	BOOL	Indicates the function block has not finished executing.
CycleCount	ARRAY[1..24] OF UDINT	The switching cycle count for the associated channel
OutputBehavior	BOOL	TRUE: Hold output states constant when host communication lost; FALSE: Turn outputs off when communication lost.
AuxVoltage	UINT	Auxiliary (switching) voltage in mV.
AuxVoltLowWarning	UINT	If auxiliary voltage falls below this level (mV), a warning will be triggered.
AuxVoltHighWarning	UINT	If auxiliary voltage exceeds this level (mV), a warning will be triggered.
Error	BOOL	Indicates the function block has encountered an error.
ErrorID	DWORD	Indicates the error code of encountered error.
ErrorIDString	STRING	Indicates the function block error code string description.

PAC_P2M2HBVT_SetModuleParameters_R0

PAC_P2M2HBVT_SetModuleParameters_R0 is used to configure Moduflex parameters and clear selected cycle counters. If an input is left open (defaulted to 0), the parameter will be left unchanged.

Inputs	Type	Description
Device	IoDrvEthercatLib.ETCSlave	Device object identifier for the function block.
Execute	BOOL	The function block executes on rising edge.
ClearCycleCount	UDINT	For every element in mask set TRUE, the corresponding cycle count will be cleared.
OutputBehavior	BOOL	TRUE: Hold output states constant when host communication lost; FALSE: Turn outputs off when communication lost.
AuxVoltLowWarning	UINT	If auxiliary voltage falls below this level (mV), a warning will be triggered. If this input is not set, or set to 0, the voltage warning level will not be changed.
AuxVoltHighWarning	UINT	If auxiliary voltage exceeds this level (mV), a warning will be triggered. . If this input is not set, or set to 0, the voltage warning level will not be changed.

Outputs	Type	Description
Done	BOOL	Indicates the function block has finished executing.
Busy	BOOL	Indicates the function block has not finished executing.
Error	BOOL	Indicates the function block has encountered an error.
ErrorID	DWORD	Indicates the error code of encountered error.
ErrorIDString	STRING	Indicates the function block error code string description.

PAC_P2M2HBVT_SystemCommand_R0

PAC_P2M2HBVT_SetModuleParameters_R0 is called to clear module errors or to store the accumulated switching cycle counters by setting the System Command word and resetting it when the operation is done.

Inputs	Type	Description
Device	IoDrvEthercatLib.ETCSlave	Device object identifier for the function block.
Execute	BOOL	The function block executes on rising edge.
LeaveFailsafeState	BOOL	Set to clear module errors by executing a LeaveFailsafeState system command. Either LeaveFailsafeState or StoreSwitchingCycles must be set when Execute is set.
StoreSwitchingCycles	BOOL	Set to store the switching cycles counts by executing a StoreSwitchingCycles system command. Either LeaveFailsafeState or StoreSwitchingCycles must be set when Execute is set.

Outputs	Type	Description
Done	BOOL	Indicates the function block has finished executing.
Busy	BOOL	Indicates the function block has not finished executing.
Error	BOOL	Indicates the function block has encountered an error.
ErrorID	DWORD	Indicates the error code of encountered error.
ErrorIDString	STRING	Indicates the function block error code string description.