Phase Locking Application

HA503284U008 Issue 2

Phase Locking Application Manual

Description

Phase Control or Phase Lock, sometimes referred to as electronic gearbox, is a position trim of a slave drive to a speed to maintain the relative position between a master and a slave shaft or a precision ratio between the two shafts. The slave speed demand is composed of the master speed demand and a position trim from a counter of the accumulated differences between the Master and Slave Encoders

Drive : AC30P or AC30D

AC30D :

Contains 2 encoders inputs that could be set up as Master Encoder input or Slave Encoder input.

Contains a Retransmit output to duplicate one of the 2 encoder inputs or a synthetic encoder to another drive.

Contains a PTP (Precision Time Protocol)connection to synchronize drives in time

AC30P :

Contains a PTP (Precision Time Protocol)connection to synchronize drives in time

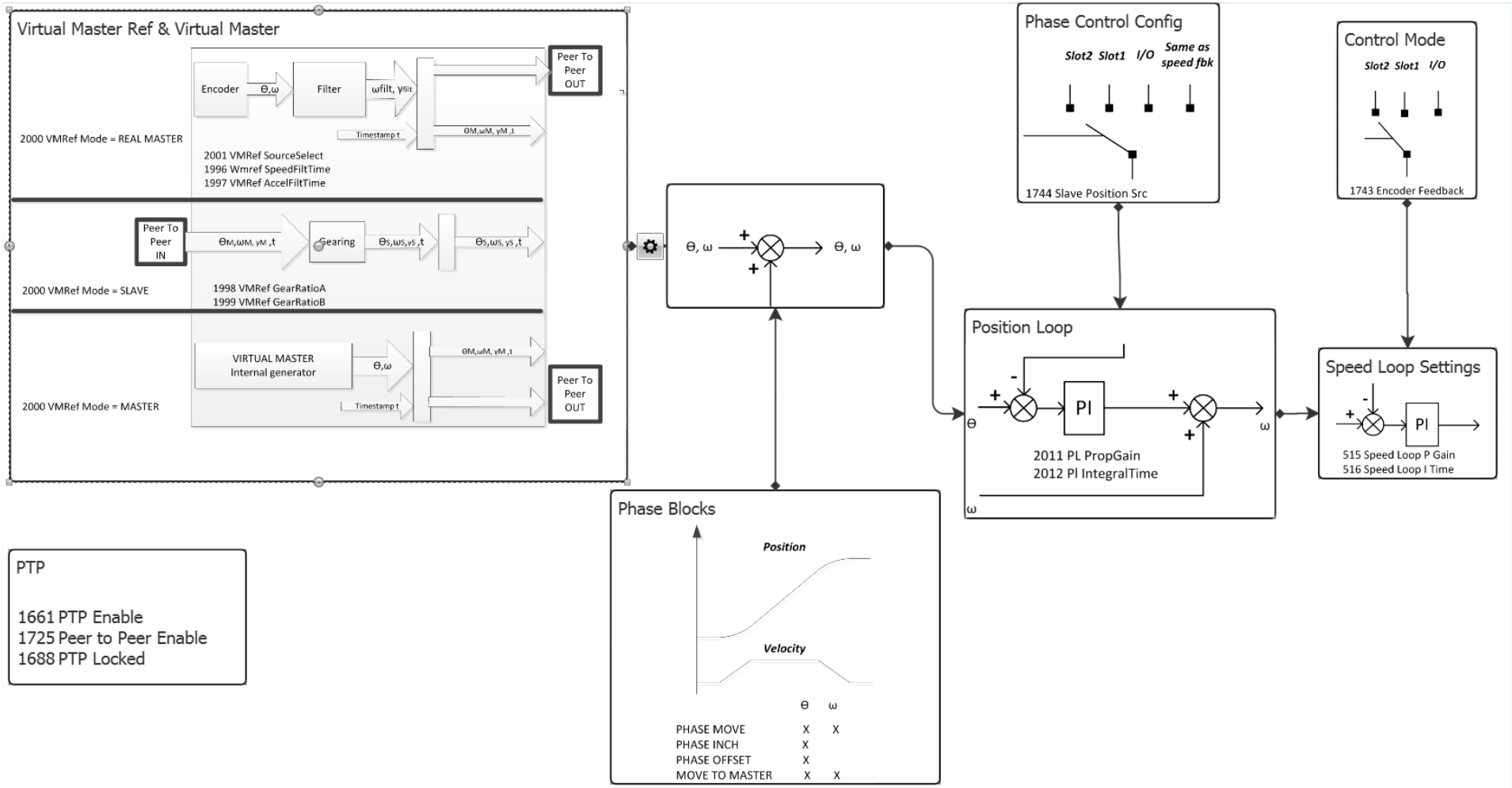
Features

- 690Like Phase Control application specific menus and parameters
- Phase Control

Requirements

To use the AC30P/D for phase control as described in this manual, the application RA503284U008_03 (or newer) must be loaded into an AC30P/D series drive with firmware 2.13. or newer.

690Like Phase Locking



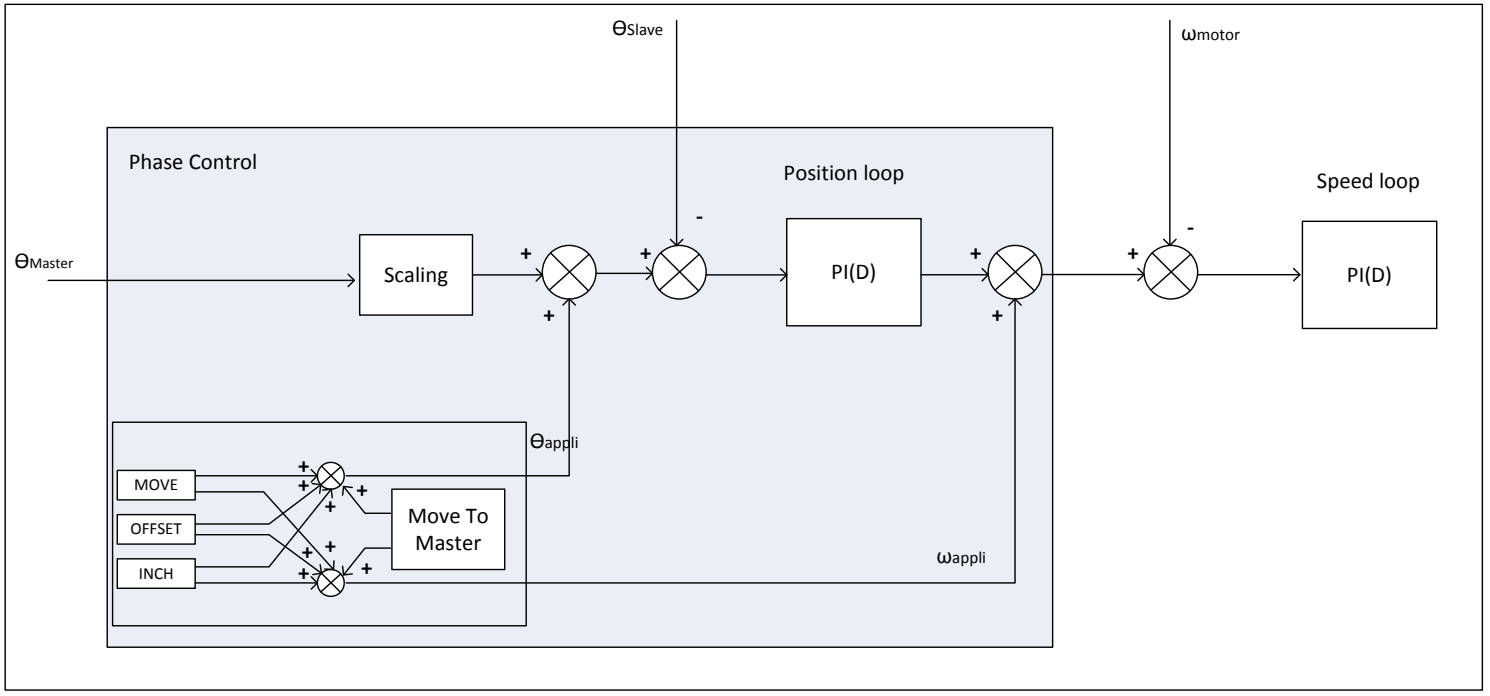
Description

The Slave drive is to follow a Master drive.

Phase control adds a position loop over the speed control to synchronize in position Master and Slave drive. Adding a factor between Master and Slave allows to synchronize drives in various situation.

Drives are linked by using a peer to peer connection. The Master (Real or Virtual) provides position, speed, acceleration and time to the Slave drives. Slave Drives are synchronized to the Master position, with the possibility of adding a Gearing between the Master and each of the Slave.

Principle



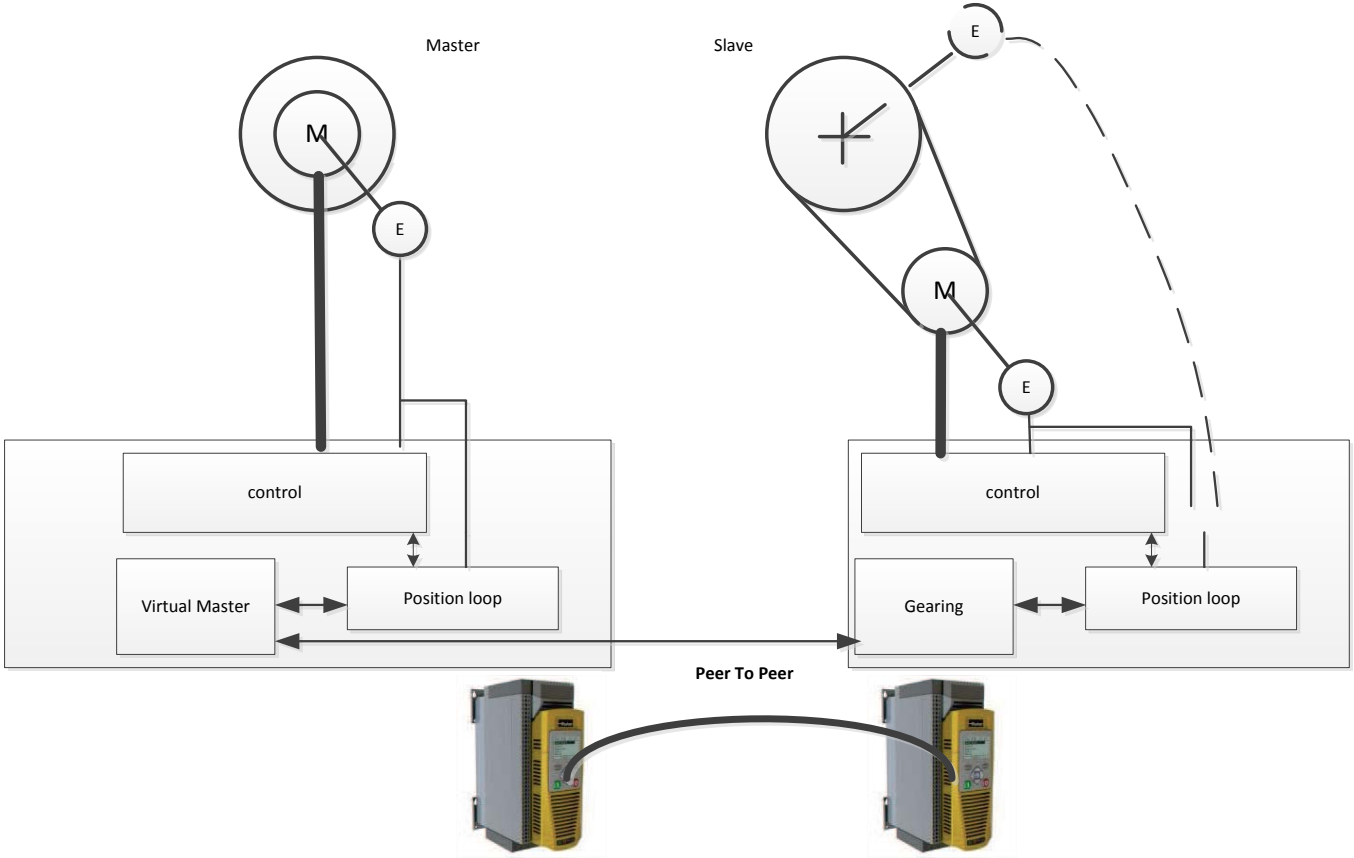
VIRTUAL MASTER CONFIGURATION

In Virtual Master mode, the Virtual Master generates a speed profile with position, speed ,acceleration and time information, based on an user input.

These information feed the position loop of the drive containing the virtual Master.

They are transferred to the Slave drives by using the Peer To Peer feature.

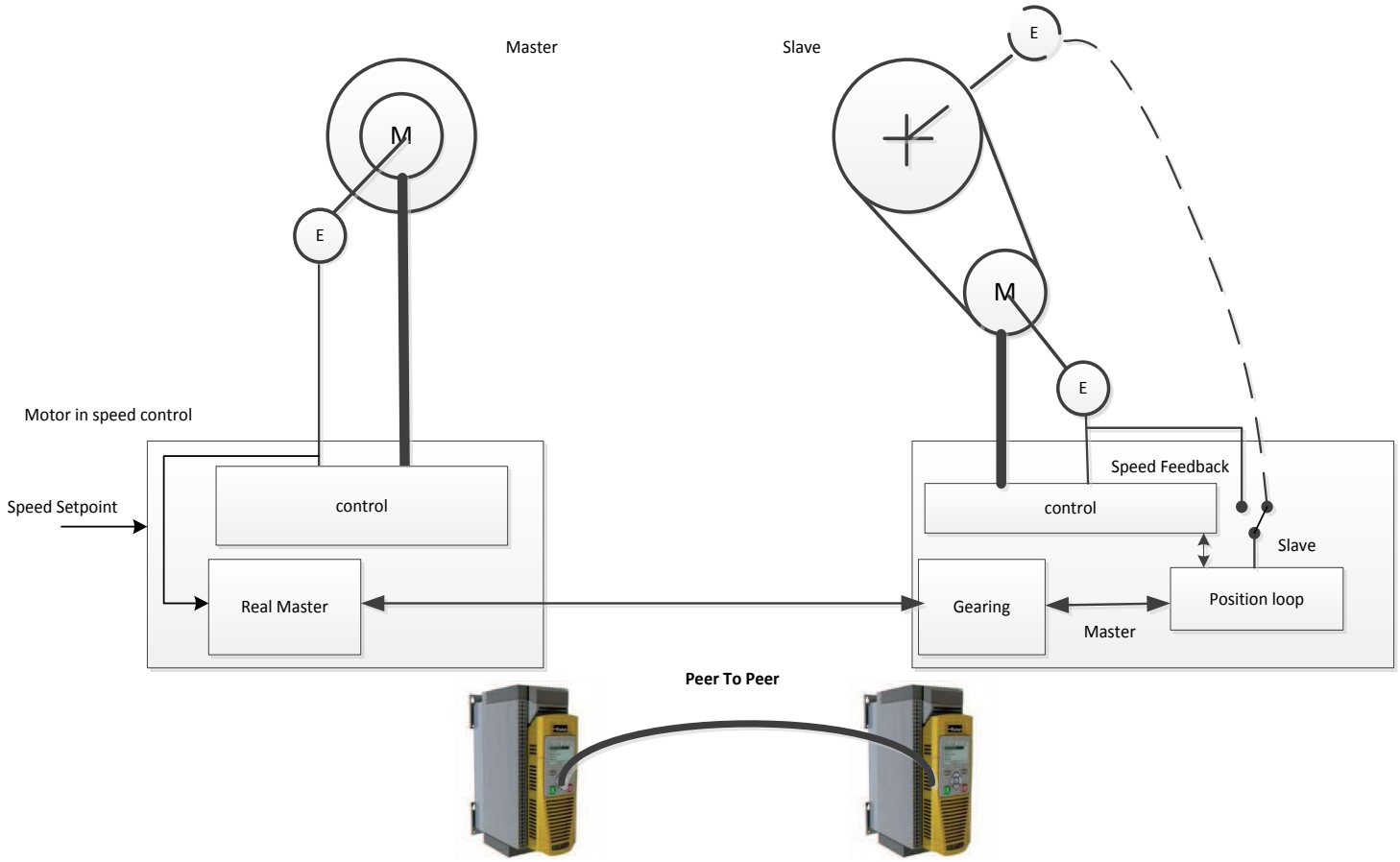
All drives are synchronized to the Virtual Master.



REAL MASTER CONFIGURATION

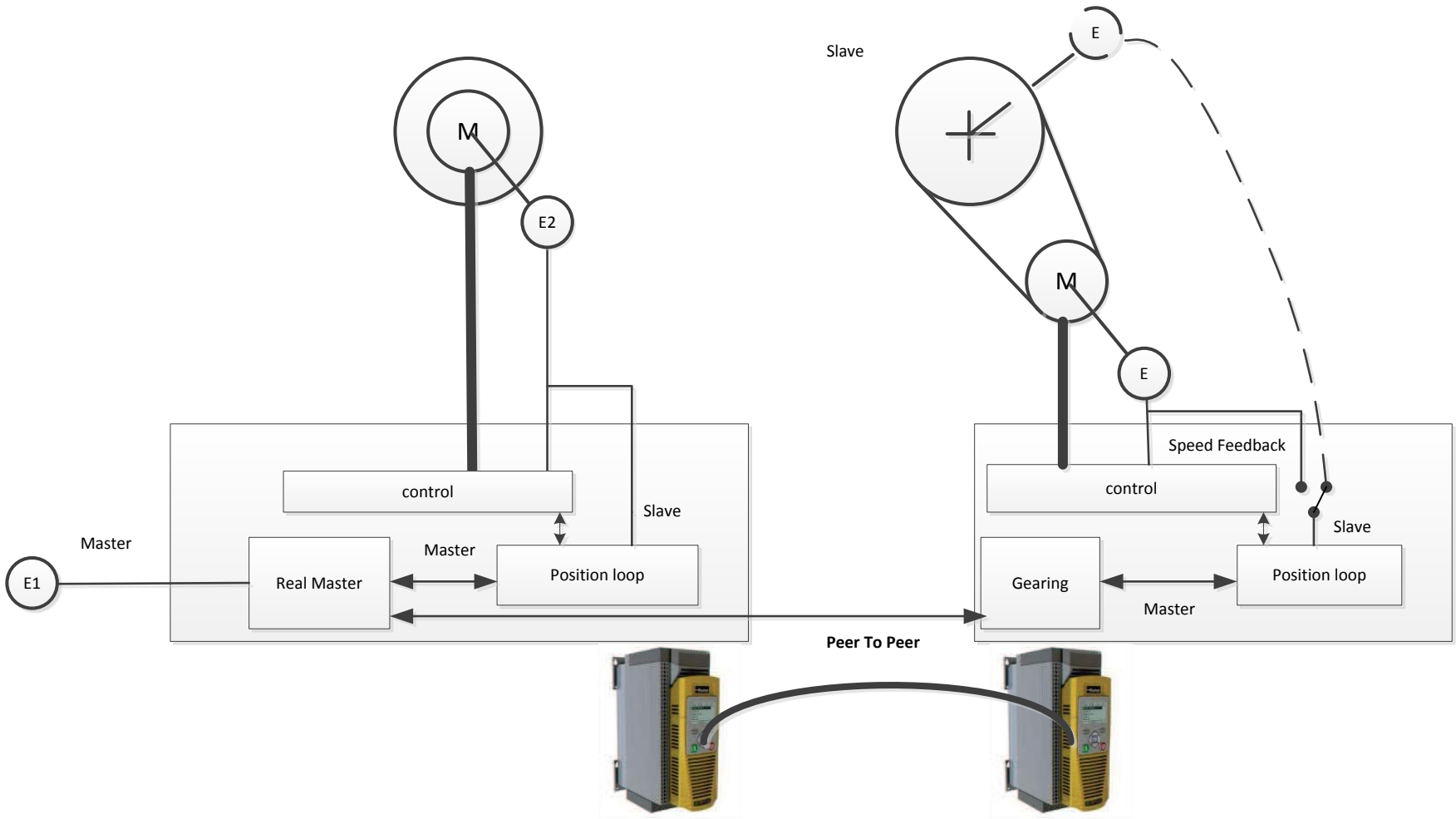
In Real Master mode, the drive on the left generates position, speed, acceleration and time obtained from a Real encoder.

If the drive is in speed mode, and the Real Master is the encoder used for the speed control, then Slave drives will follow the drive in speed mode.



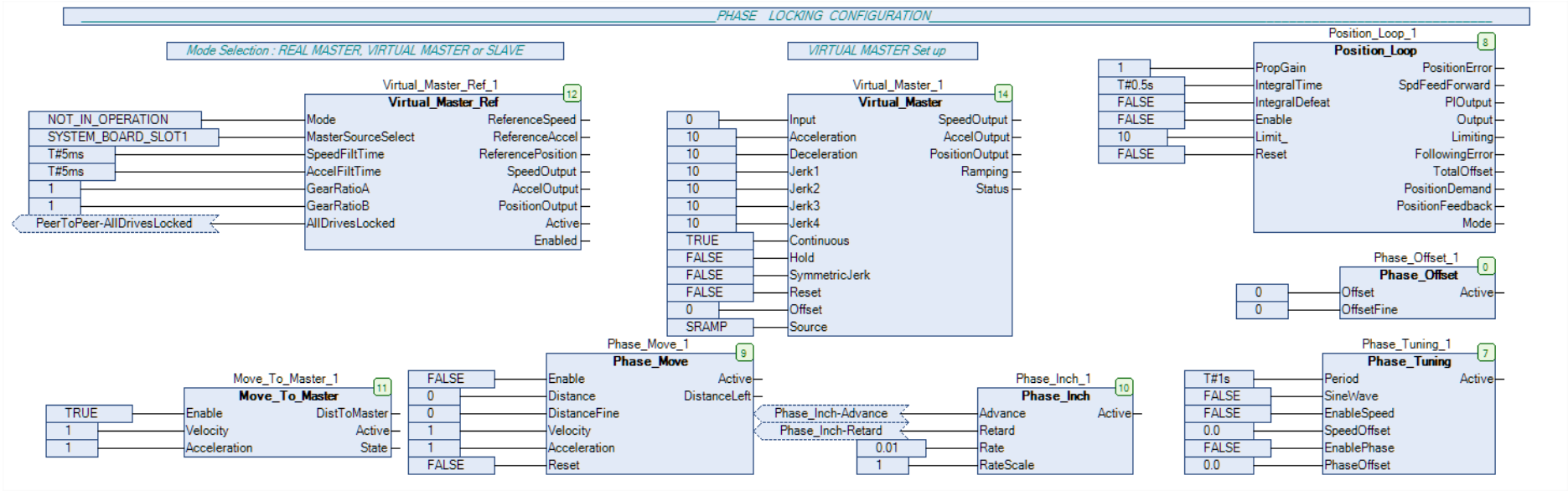
If the Real Master is an external encoder, then the drive configured to be the Real Master can be set up in position loop and it will follow the Real Master.

All Slave drives will follow the Real Master.


Slave
E
M
E2
M
E
control
Speed Feedback
control
Slave
Slave
Master
Master
E1
Real Master
Position loop
Gearing
Position loop
Master
Peer To Peer

Main Block Diagram

In default application, all Blocks inputs are initialized with safe values.



Virtual Master, ***Virtual Master Ref***, ***Position loop*** need to operate together. They are internally linked and cannot be used separately.

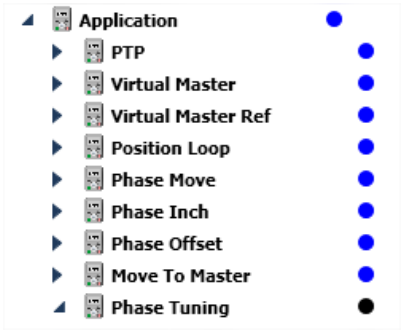
PTP and ***Peer To Peer*** also need to be set up and used.

Drives need to be configured to use the correct control mode.

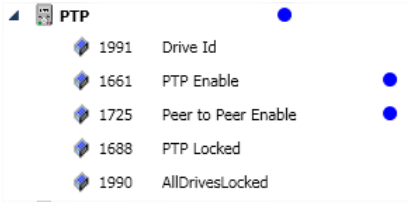
Where Encoder inputs are needed, they should be set up in their respective blocks.

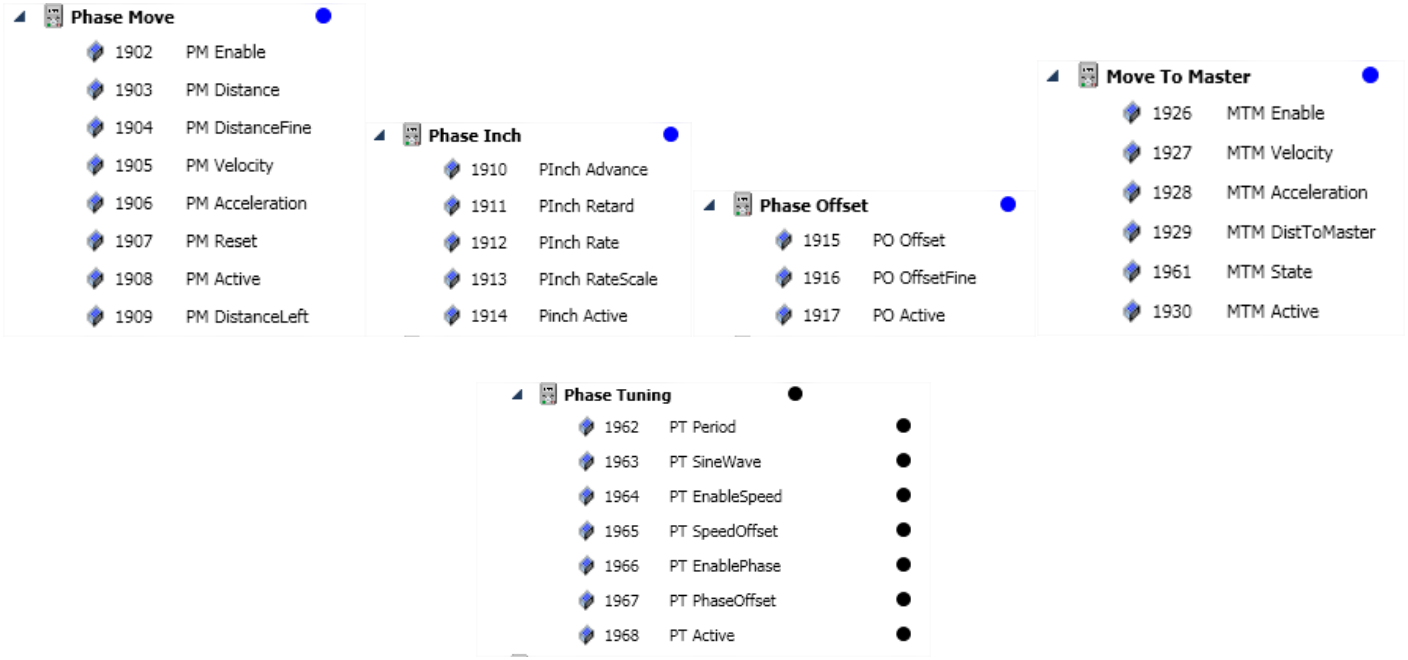
Graphical Keypad (GKP) Application Customisation

The application **AC30P Phase Locking** adds menus and parameters to the GKP. It also modifies the behaviour of the Control Screen and set-up wizard.



Below is the list of added parameters :



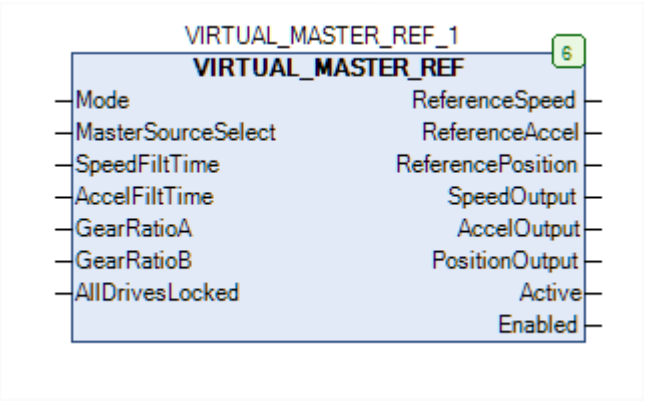


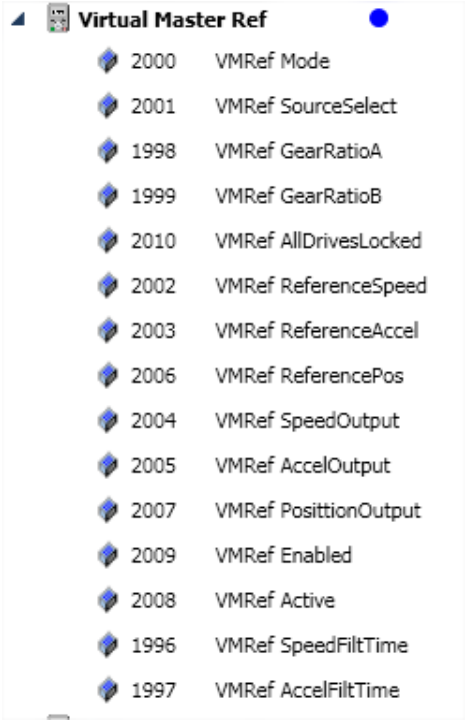
Function Blocks

(*) : unit : 1.0 represents 1 mechanical turn of the slave encoder.
(**) : unit/s : 1.0 represents a speed of 1unit/s of the slave encoder
(***) : unit/s² : 1.0 represents an acceleration/deceleration of 1 unit/s per second of the slave encoder

VIRTUAL MASTER REF

Application::Virtual Master Ref





This block defines how the Virtual Master will be used.

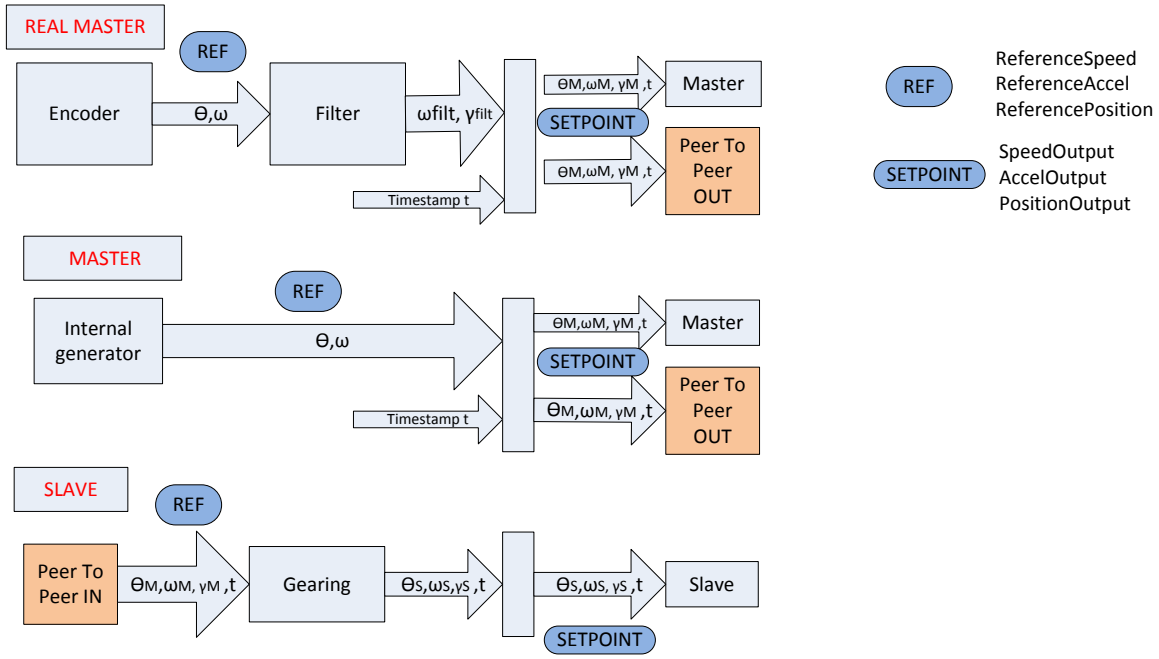
Mode of operation, source of the Real Master (if Real Master mode selected), and Gearing factor are accessible.

The mode of operation is linked to the use of the Peer To Peer features. To operate correctly, Peer To Peer must be used and locked .

To operate the Virtual Master (Real Master, Master or Slave modes), ***AllDriveLocked*** input must be set to TRUE.

In default configuration, this input is connected to the Peer To Peer system control available at the bottom of the application.

The virtual Master is in action if ***Enabled*** output is TRUE **and** the Position Loop is enabled. If the Position Loop is not enabled, the drive will be run in speed loop mode even if Virtual Master is selected.



Parameter Name	*No.*	*WEB/GKP*	*Default*	*Range*	*Units*	*Writable*
Mode	2000	Application::Virtual Master Ref::VMRef Mode	0	0 NOT IN OPERATION 1: MASTER 2: SLAVE 3: REAL MASTER		

Selection of the mode :

NOT IN OPERATION : neither REAL MASTER nor VIRTUAL MASTER are used.

MASTER : the drive is in virtual Master mode and the drive is the Master. The position/speed/acceleration are generated internally. All parameters related to the movement are set up in ***Virtual Master*** Block

SLAVE : the drive is in virtual Master mode and the drive is the Slave. It will follow the Master.

REAL MASTER : The drive is used as a Master and the position/speed are taken from an external encoder. The encoder is selected by ***MasterSourceSelect***

MasteSourceSelect	2001	Application::Virtual Master Ref::VMRef SourceSelect	0	0 : MAIN SPEED FEEDBACK 1: SYSTEM BOARD SLOT 1 2: SYSTEM BOARD SLOT 2		

Parameter Name	No.	WEB/GKP	Default	Range	Units	Writable

Selection of the encoder used when ***Mode*** is set to REAL MASTER :
MAIN SPEED FEEDBACK : use the I/O option encoder input as the Master encoder
SYSTEM BOARD SLOT1 (AC30D only) : use the encoder connected to the SLOT1 of the system board as the Master
SYSTEM BOARD SLOT2 (AC30D only) : use the encoder connected to the SLOT2 of the system board as the Master

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SpeedFiltTime 1996 Application::Virtual Master Ref::VMRef SpeedFiltTime 5 0 to 100 ms

When ***Mode*** is set to REAL MASTER, the speed is filtered by the value set in this parameter.

AccelFiltTime 1997 Application::Virtual Master Ref::VMRef AccelFiltTime 5 0 to 100 ms

When ***Mode*** is set to REAL MASTER, the acceleration is filtered by the value set in this parameter.

GearRatioA 1998 Application::Virtual Master Ref::VMRef GearRatioA 1.000 -2000000 to 2000000

This parameter provides a Gear Ratio A/B inserted between Master reference and Slave output.
Ouptut = Master Reference * ***GearRatioA/GearRatioB***.

GearRatioB 1999 Application::Virtual Master Ref::VMRef GearRatioB 1.000 -2000000 to 2000000

This parameter provides a Gear Ratio A/B inserted between Master reference and Slave output.
Ouptut = Master Reference * ***GearRatioA/GearRatioB***.

AllDrivesLocked 2010 Application::Virtual Master Ref::VMRef AllDrivesLocked FALSE

Must be TRUE to allow the REAL MASTER or VIRTUAL MASTER to be run.
FALSE locks the Master reference to Zero. If the drive is enabled, it runs and stays in speed loop mode and cannot be run in REAL MASTER or VIRTUAL MASTER mode.
Default configuration provides a way to control the Peer To Peer connection of all drives in the chain. AllDrivesLocked input can be connected to the output of this feature, allowing to switch back all drives in speed mode in case of problem on the Peer To Peer Connection.
When the drive is switch back to speed mode, then settings of classical speed control mode are in operation (ramp, stop mode, etc….). The motor is controlled through the speed setpoint.

Parameter Name	No.	WEB/GKP	Default	Range	Units	Writable
ReferenceSpeed	2002	Application::Virtual Master Ref::VMRef ReferenceSpeed	FALSE		u/s (unit/s)	NEVER

Speed Output of the Reference in unit/s
REAL MASTER or MASTER mode :Master speed sent to Slaves through the Peer To Peer connection
SLAVE Mode : Master speed received by Slaves through the Peer To Peer connection. Gearing not applied.

ReferenceAccel	2003	Application::Virtual Master Ref::VMRef ReferenceAccel			u/s² (unit/s²)	NEVER

Acceleration Output of the Reference in unit/s².
REAL MASTER or MASTER mode :Master acceleration sent to Slaves through the Peer To Peer connection
SLAVE Mode : Master acceleration received by Slaves through the Peer To Peer connection. Gearing not applied

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ReferencePosition	2003	Application::Virtual Master Ref::VMRef ReferencePos				NEVER

Position Output of the Reference. 65536 corresponds to 1 unit
REAL MASTER or MASTER mode :Master position sent to Slaves through the Peer To Peer connection
SLAVE Mode : Master position received by Slaves through the Peer To Peer connection. Gearing not applied

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SpeedOutput	2004	Application::Virtual Master Ref::VMRef SpeedOutput			u/s (unit/s)	NEVER

Speed Output in unit/s
Speed feeding the position loop feedforward term, associated with the time
Gearing applied.

AccelOutput	2005	Application::Virtual Master Ref::VMRef AccelOutput			u/s² (unit/s²)	NEVER

Acceleration Output in unit/s²
Acceleration associated with the timestamp
Gearing applied

PositionOutput	2007	Application::Virtual Master Ref::VMRef PositionOutput			u (unit)	NEVER

Parameter Name	No.	WEB/GKP	Default	Range	Units	Writable

Position Output in unit. 65536 corresponds to 1 unit.
Position applied to the position loop as a reference, associated with the time.
Gearing applied

Active 2009 Application::Virtual Master Ref::VMRef Active NEVER

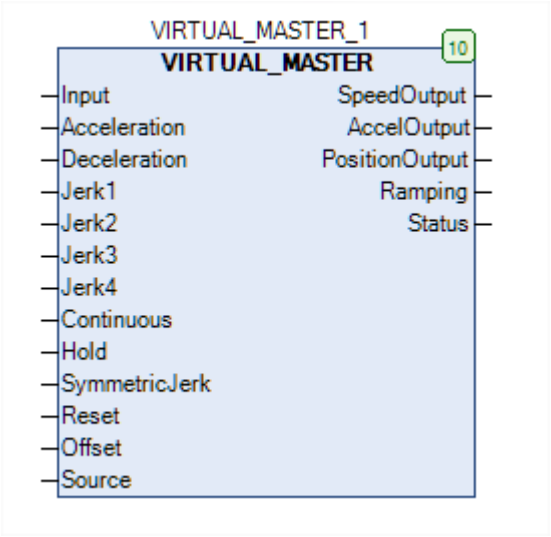
TRUE if ***mode*** is set to **REAL MASTER** or **MASTER** or **SLAVE**
FALSE if ***mode*** set to **NOT IN OPERATION**

Enabled 2008 Application::Virtual Master Ref::VMRef Enabled NEVER

TRUE if ***Active*** = TRUE and ***AlldrivesLocked*** = TRUE

VIRTUAL MASTER

Application::Virtual Master

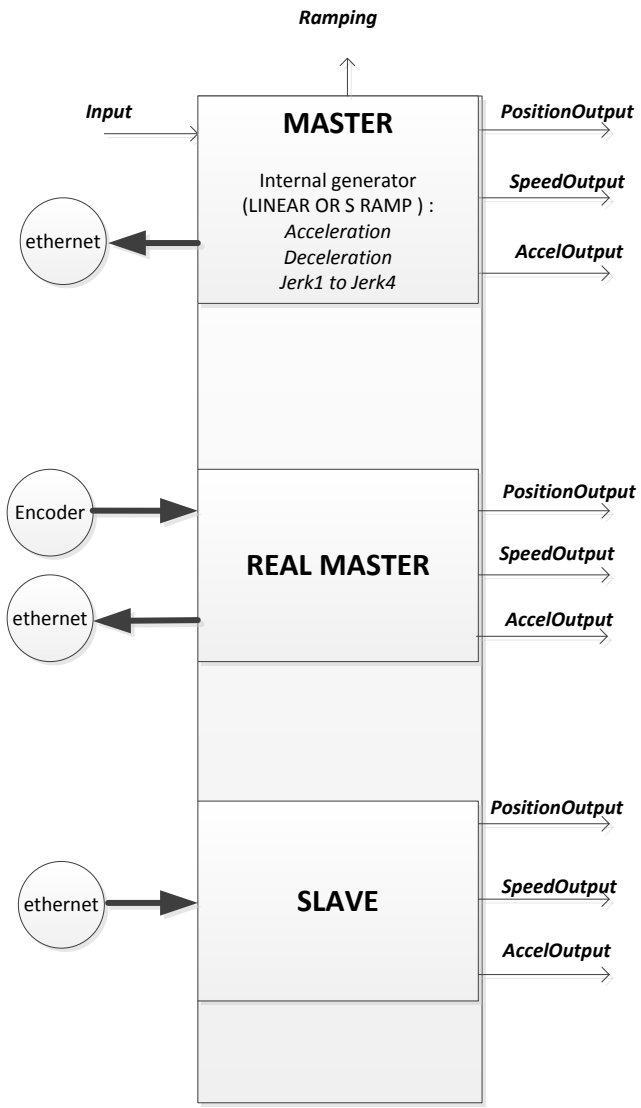


In MASTER mode or REAL MASTER mode, the block generates a regular update of the position, speed and acceleration transmitted by using the Peer To Peer features.

In MASTER Mode, the Input is processed to generate a well-defined profile (LINEAR or S RAMP) by the ***Acceleration***, ***Deceleration***, ***Jerk1*** to ***Jerk4*** parameters. Outputs are the information generated. The drive needs to be Torque On to generate a profile.

In REAL MASTER Mode, the outputs are the information coming from an external encoder and processed to generate the regular updated information transmitted by using the Peer To Peer.

In SLAVE Mode, the outputs of the block are the information received by using the Peer To Peer connection.



Parameter Name	No.	WEB/GKP	Default	Range	Units	Writable
Input	1981	Application::Virtual Master::VM Input	0	-100 to 100	%	

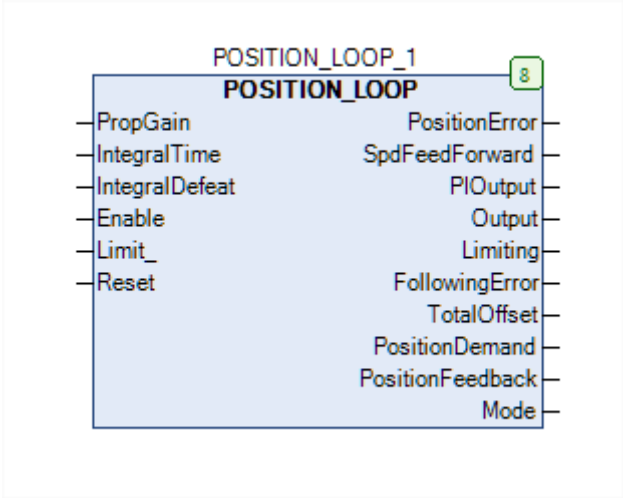
Parameter Name	No.	WEB/GKP	Default	Range	Units	Writable
When internal generator selected (***Virtual Master Ref::Mode* = MASTER**) , user speed setpoint input in % % refers to the speed loop scaling (0464) corresponding to the 100% motor speed in RPM.						
Acceleration	1982	Application::Virtual Master::VM Acceleration	0	0 to 100	%/s	
Set the acceleration rate in %/s % refers to the speed loop scaling (0464) corresponding to the 100% motor speed in RPM.						
Deceleration	1983	Application::Virtual Master::VM Deceleration	10	0 to 100	%/s	
Set the deceleration rate in %/s % refers to the speed loop scaling (0464) corresponding to the 100% motor speed in RPM.						
Jerk1	1976	Application::Virtual Master::VM Jerk1	10	0 to 100	%/s²	
Rate of change of acceleration in %/s² when S RAMP is selected, first segment. % refers to the speed loop scaling (0464) corresponding to the 100% motor speed in RPM.						
Jerk2	1977	Application::Virtual Master::VM Jerk2	10	0 to 100	%/s²	
Rate of change of acceleration in %/s² when S RAMP is selected, second segment. % refers to the speed loop scaling (0464) corresponding to the 100% motor speed in RPM.						
Jerk3	1978	Application::Virtual Master::VM Jerk3	10	0 to 100	%/s²	
Rate of change of acceleration in %/s² when S RAMP is selected, third segment. % refers to the speed loop scaling (0464) corresponding to the 100% motor speed in RPM.						
Jerk4	1979	Application::Virtual Master::VM Jerk4	10	0 to 100	%/s²	
Rate of change of acceleration in %/s² when S RAMP is selected, fourth segment. % refers to the speed loop scaling (0464) corresponding to the 100% motor speed in RPM.						

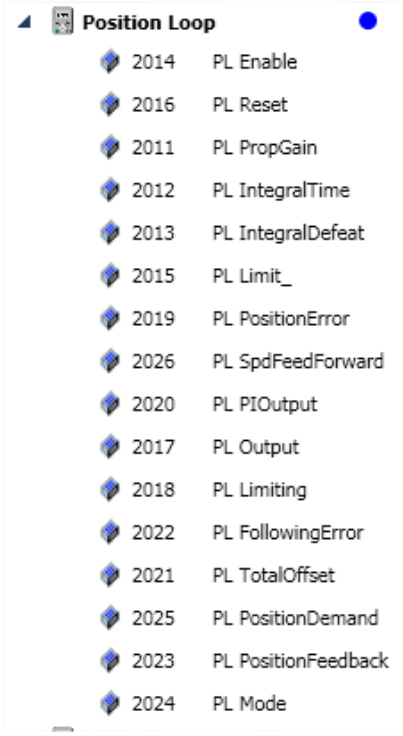
Parameter Name	No.	WEB/GKP	Default	Range	Units	Writable
Jerk4	1979	Application::Virtual Master::VM Jerk4	10	0 to 100	%/s²	
Rate of change of acceleration in %/s² when S RAMP is selected, fourth segment. % refers to the speed loop scaling (0464) corresponding to the 100% motor speed in RPM.						
Continuous	1980	Application::Virtual Master::VM Continuous	FALSE			
When TRUE, it forces a smooth transition if the speed setpoint is changed when Ramping. The curve is controlled by the ***Acceleration*** and ***Jerk1*** to ***Jerk4*** parameters. When FALSE, there is an immediate transition from the old curve to the new curve.						
Hold	1975	Application::Virtual Master::VM Hold	FALSE			
When TRUE, the output of the ramp is hold at its last value.						
Symmetric Jerk	1975	Application::Virtual Master::VM SymmetricJerk	FALSE			
When TRUE, Jerk1 is used for all segments of the curve. Jerk2, Jerk3 and Jerk4 are ignored.						
Reset	1985	Application::Virtual Master::VM Reset	FALSE			
If TRUE, the position output is set to Zero if MASTER mode selected.						
Offset	1986	Application::Virtual Master::VM Offset	0.0	0 to 360	degree	
Additional Offset applied to PositionOutput, in degrees						
Source	1901	Application::Virtual Master::VM Source	0	0 : LINEAR RAMP 1 : SRAMP		
Ramp type selection : LINEAR RAMP or SRAMP						
SpeedOutput	1973	Application::Virtual Master::VM SpeedOutput			u/s (unit/s)	NEVER

Parameter Name	No.	WEB/GKP	Default	Range	Units	Writable
Speed Output in unit/s **MASTER** mode :speed output of the generator sent to Slaves through the Peer To Peer connection **SLAVE** mode : Master speed received by Slaves through the Peer To Peer connection. Gearing not applied. **REAL MASTER** mode: speed output sent to Slaves through the Peer To Peer connection						
AccelOutput	1971	Application::Virtual Master::VM AccelOutput			u/s ²(unit/s²)	NEVER
Acceleration Output in unit/s² **MASTER** mode :acceleration output of the generator sent to Slaves through the Peer To Peer connection **SLAVE** mode : Master acceleration received by Slaves through the Peer To Peer connection. Gearing not applied. **REAL MASTER** mode: acceleration output sent to Slaves through the Peer To Peer connection						
PositionOutput	1972	Application::Virtual Master::VM PositionOutput				NEVER
Position Output. 65536 corresponds to 1 unit **MASTER** mode : position output of the generator sent to Slaves through the Peer To Peer connection **SLAVE** mode : Master position received by Slaves through the Peer To Peer connection. Gearing not applied. **REAL MASTER** mode : position output sent to Slaves through the Peer To Peer connection						
Ramping	1974	Application::Virtual Master::VM Ramping				NEVER
TRUE when ramping						
Status	1988	Application::Virtual Master::VM Status		0 : READY 1 : RESET		NEVER
Status of the Virtual Master : READY : Ready to run RESET : ***Reset*** is action						

POSITION LOOP

Application::Position Loop



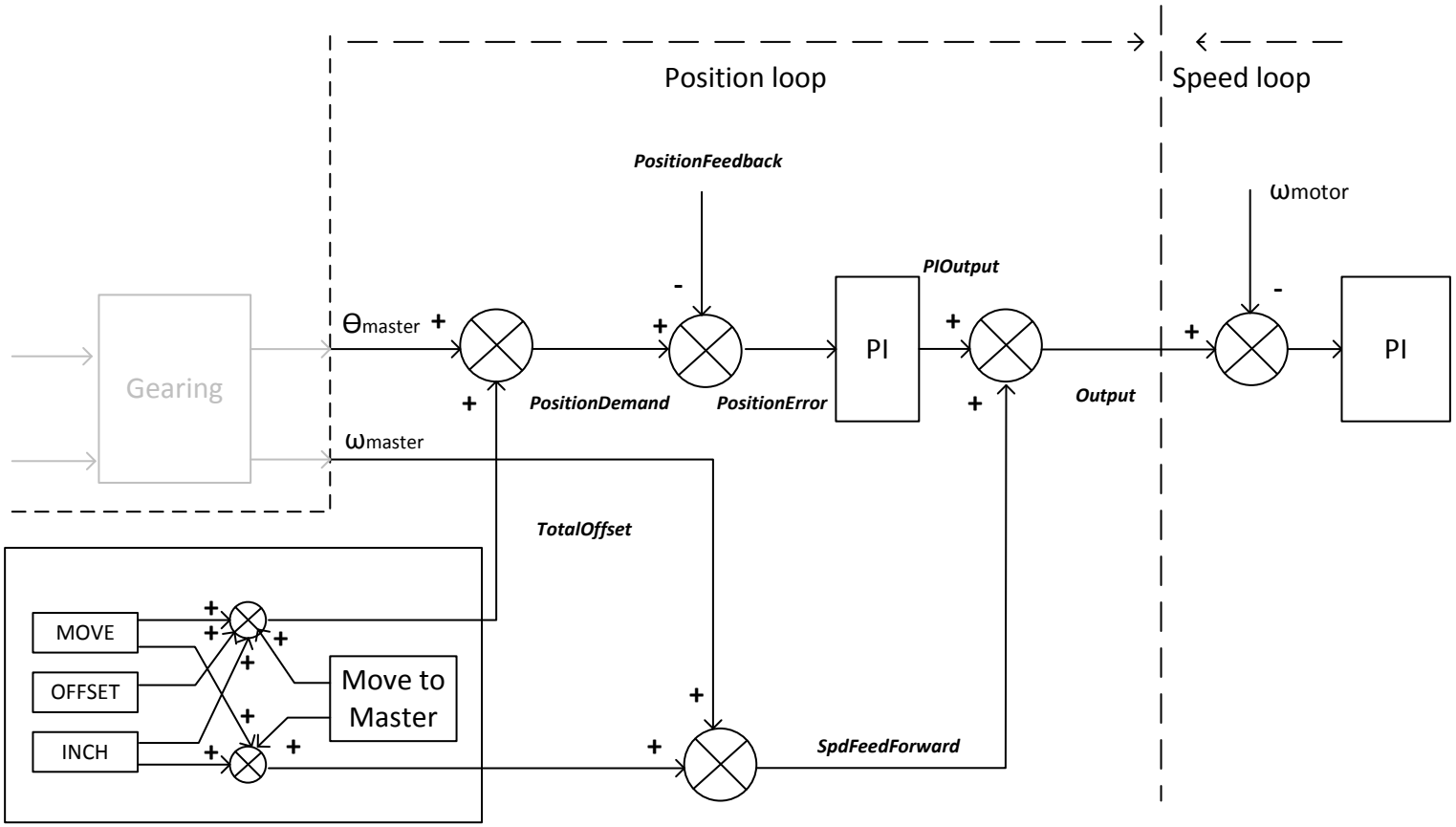


This block controls the position of the motor. It compares a reference position to a feedback position, and generates a speed demand dependent of the difference.

The Position Loop works on a multi turn position. The error between the Master and the slave can be a multi turn error.

Please Note that all the Phase blocks (including the Move To Master) will not work if this block has not been enabled by ***Enable*** = TRUE

Note that this block will operate if Virtual Master in operation (REAL MASTER, MASTER or SLAVE mode selected). If not, then the system will be run in speed loop mode.


Position loop
Speed loop
PositionFeedback
ωmotor
PIOutput
Gearing
Θmaster
PI
PI
PositionDemand
PositionError
Output
ωmaster
TotalOffset
MOVE
OFFSET
INCH
Move to Master
SpdFeedForward

Parameter Name	No.	WEB/GKP	Default	Range	Units	Writable
PropGain	2011	Application::Position Loop::PL PropGain	10.0	0 to 3000.0		
Position loop proportional gain						
IntegralTime	2012	Application::Position Loop::PL IntegralTime	500ms	1ms to 30s	TIME	
Position loop integral time constant						
IntegralTime	2012	Application::Position Loop::PL IntegralTime	500ms	1ms to 30s	TIME	
Position loop integral time constant						
IntegralDefeat	2013	Application::Position Loop::PL IntegralDefeat	FALSE			
When TRUE disables the operation of the integral term of the position loop						
Enable	2014	Application::Position Loop::PL Enable	FALSE		%	
TRUE to operate the position loop						
Limit_	2015	Application::Position Loop::PL Limit	10.0	0 to 300	%	
Sets a symmetric clamp as a percentage of the maxspeed, to limit the maximum position loop output (***PIOutput***)						
Reset	2016	Application::Position Loop::PL Reset	FALSE			
To reset position to the actual position, when position loop is enabled. Following a cycle FALSE TRUE FALSE on this input on all drives, Master and Slaves are synchronized without motion. If at TRUE, and if the drive is enable, all outputs of the position loop are kept at zero.						

Parameter Name	No.	WEB/GKP	Default	Range	Units	Writable
PositionError	2019	Application::Position Loop::PL PositionError			unit	NEVER
Show the instantaneous position error in unit						
SpdFeedForward	2026	Application::Position Loop::PL SpdFeedForward			unit/s	NEVER
Shows the speed feed forward term from the Master speed + other speeds from phase blocks in unit/s						
PIOutput	2020	Application::PositionLoop::PL PIOutput			unit/s	NEVER
Shows the output of the position loop only in unit/s						
Output	2017	Application::Position Loop::PL Ouput			unit/s	NEVER
Shows the total output of the position loop (***PIOutput*** + ***SpdFeedForward***) in unit/s						
Limiting	2018	Application::Position Loop::PL Limiting				NEVER
Diagnostics TRUE when the ***PIOutput*** has reached the ***Limit***_ value						
FollowingError	2022	Application::PositionLoop::PL FollowingError			unit	NEVER
Shows the maximum absolute position loop error over a 1 second period in unit						
TotalOffset	2021	Application::Position Loop::PL TotalOffset			unit	NEVER
Shows the Offset added to the reference (Master position), from phase blocks in unit						
PositionDemand	2025	Application::Position Loop::PL PositionDemand			unit	NEVER
Shows the actual position reference feeding the position loop in unit						

Parameter Name	No.	WEB/GKP	Default	Range	Units	Writable
PositionFeedback	2023	Application::Position Loop::PL PositionFeedback			unit	NEVER
Shows the actual Slave position feeding the position lop in unit						
Mode	2024	Application::Position Loop::PL Mode	0	0 : BLOCK DIAGRAM SPEED 1 : MASTER SPEED 2 : MASTER RELATIVE POSITION 3 : MASTER ABSOLUTE POSITION		NEVER

Diagnostics giving the status of the loops :
BLOCK DIAGRAM SPEED : The drive is in speed loop. The speed setpoint is the usual speed setpoint input (as described in ***Parameters::Motor Control::Sequencing*** and ***Parameters::Motor Control::Ramp)***
MASTER SPEED : The drive is still in speed loop, trying to catch up the speed setpoint from the reference (Master)
MASTER RELATIVE POSITION: the drive is still in speed loop. Speeds are synchronized, position are not synchronised. The drive moves to MASTER ABSOLUTE POSITION when position loop is enabled.
MASTER ABSOLUTE POSITION : the drive is in position loop, speed and position are synchronised.

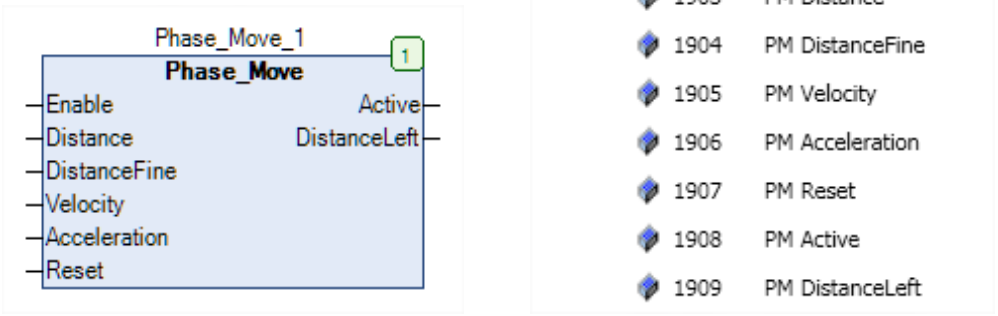
When the Torque is switched ON, the system goes through this state machine to sit at the end in MASTER ABSOLUTE POSITION when the drive is synchronized to the master position (position loop enabled).
When the Torque is switched OFF, the system go back to BLOCK DIAGRAM SPEED and is controlled by speed loop usual settings

PHASE MOVE

Application::Phase Move

This block moves the motor a set distance. The distance is in Slave encoder revolutions and is added to movement of other phase blocks and the position demand.

This is a simple trapezoidal speed shape, which acts on each rising edge of the Enable Input.



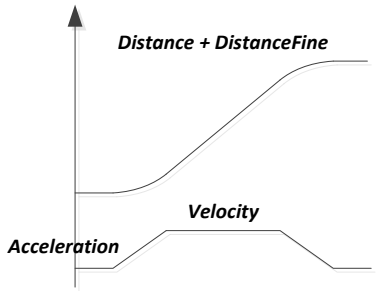
A move must be complete before a new move will be run.

The move operation is aborted by the Reset Input.

The Total Distance is the sum of ***Distance*** and ***DistanceFine***. The direction of the move is given by the sign of the Total Distance.

DistanceLeft Output provides an information of remaining distance to be done while the move is active.

Active Output is TRUE while the move is active.



Parameter Name	No.	WEB/GKP	Default	Range	Units	Writable
Enable	1902	Application::Phase Move::PM Enable	FALSE			
Enable starts the Move operation when going from FALSE TO TRUE (if block is not already ***Active***) Setting ***Enable*** to FALSE will not abort the operation while the Move is ***Active***						
Distance	1903	Application:: Phase Move::PM Distance	1.0	-3000.0 to 3000.0	unit	
The distance that the Move command will add to the Master position in unit. Total Distance = ***Distance*** + ***DistanceFine***						
DistanceFine	1904	Application:: Phase Move::PM DistanceFine	1.0	-1.0 to 1.0	unit	
The distance that the Move command will add to the Master position in unit. Total Distance = ***Distance*** + ***DistanceFine***						
Velocity	1905	Application:: Phase Move::PM Velocity	1.0	0.1 to 300.0	unit/s	
Maximum speed in unit/s at which the distance will be added to the position loop						
Acceleration	1906	Application:: Phase Move::PM Acceleration	1.0	0.1 to 3000.0	unit/s²	

Parameter Name	No.	WEB/GKP	Default	Range	Units	Writable

Acceleration in unit/s² at which the distance will be added to the position loop

---

Reset 1907 Application: Phase Move::PM Reset FALSE

When TRUE stops the actual Move operation with a controlled deceleration

---

Active 1908 Application:: Phase Move::PM Active 1.0 NEVER

TRUE when a Move command is on going

DistanceLeft 1909 Application:: Phase Move::PM DistanceLeft 1.0 Unit NEVER

Remaining distance in unit of the Move when active.
0 when move is inactive

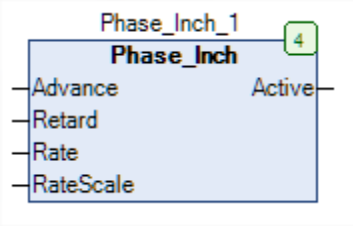
PHASE INCH

Application::Phase Inch

The block may be used to advance or retard the relative position on the Slave relative to the Master.

This is achieved by feeding extra counts into the position loop at a rate given by the combination of ***Rate*** and ***RateScale***. The actual Rate is the product of ***Rate*** and ***RateScale*** and is in Slave encoder turn per second.

Active output is active while ***Advance*** or ***Retard*** are set to TRUE.



Parameter Name	*No.*	*WEB/GKP*	*Default*	*Range*	*Units*	*Writable*
Advance	1910	Application::Phase Inch:PInch Advance	FALSE			

While is TRUE, counts are added to the Master position at a rate given by ***Rate***
If Both ***Advance*** and ***Retard*** are TRUE, then no action is taken.

Retard	1911	Application::Phase Inch:: PInch Retard	FALSE			

While is TRUE, counts are substracted to the Master position at a rate given by ***Rate***
If Both ***Advance*** and ***Retard*** are TRUE, then no action is taken

---

Rate	1912	Application::Phase Inch:: PInch Rate	0.01	0.0001 to 30	unit/s	

The rate at which the counts are added/substracted to the Master position. A rate of 1.0 would cause the Slave to move at a rate of 1 unit per second

---

RateScale	1913	Application::Phase Inch:: PInch RasteScale	1.0	0.0001 to 30		

Allows fine control of actual rate = ***Rate*** * ***RateScale***

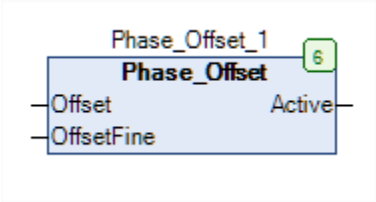
Parameter Name	No.	WEB/GKP	Default	Range	Units	Writable
Active	1914	Application::Phase Inch:: PInch Active				NEVER
TRUE when ***Advance*** or ***Retard*** actions are active						

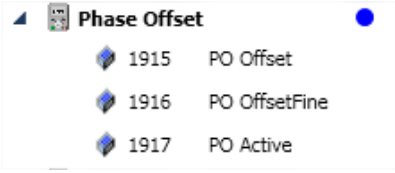
PHASE OFFSET

Application::Phase Offset

The block adds an offset to the Master position

This is an unramped position Offset.





Parameter Name	*No.*	*WEB/GKP*	*Default*	*Range*	*Units*	*Writable*
Offset	1915	Application::Phase Offset:PO Offset	0	-3000.0 to 3000.0	unit	

Positon added to the Master position in unit.
Will cause the Slave to move to the new Master position with an unramped motion

OffsetFine	1916	Application::Phase Offset::PO OffsetFine	FALSE	-1.0 to 1.0	unit	

Additional position added to the Master position in unit.
Will cause the Slave to move to the new Master position with an unramped motion.

Active	1917	Application::Phase Offset::PO Active				NEVER

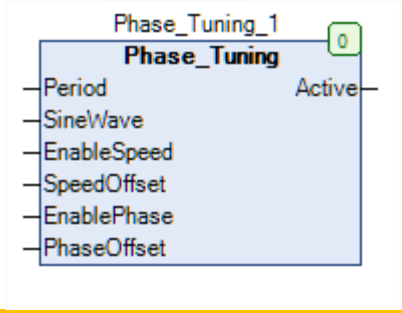
TRUE when ***Offset*** and ***OffsetFine*** are applied

PHASE TUNING

Application::Phase Tuning

The block adds either a periodic speed signal or an offset of position.

This is mainly used to set up loops of the system and must not be used as position/speed setpoint generator in the application.



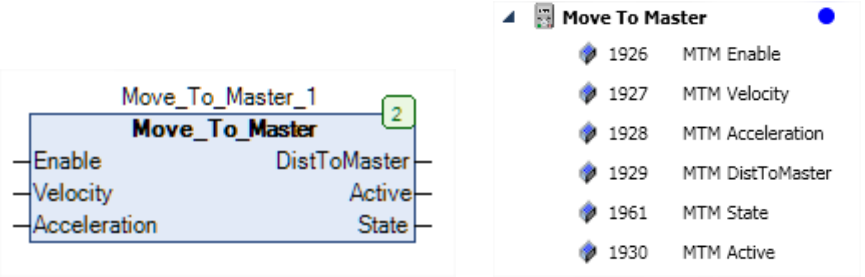
Parameter Name	*No.*	*WEB/GKP*	*Default*	*Range*	*Units*	*Writable*
Period Define the period in s of the stimulus	1962	Application::Phase Tuning::PT Period	T#5s	T#0.1S to T#30s		
SineWave TRUE will generate a sinusoidal stimulus FALSE will generate a square stimulus.	1963	Application:: Phase Tuning::PT SineWave	FALSE			
EnableSpeed Enable speed offset to be added to the speed feed forward term	1964	Application:: Phase Tuning::PT EnableSpeed	0.0	-300 to 300		
SpeedOffset Speed offset value	1965	Application:: Phase Tuning::PT SpeedOffset	FALSE			
EnablePhase	1966	Application:: Phase Tuning::PT EnablePhase	FALSE			

Parameter Name	No.	WEB/GKP	Default	Range	Units	Writable
Enable position offset to be added .						
PhaseOffset Position offset value	1967	Application:: Phase Tuning::PT PhaseOffset	0.0	-300 to 300	unit	
Active When either ***EnableSpeed*** or ***EnablePhase*** are active	1968	Application:: Phase Tuning::PT Active				NEVER

MOVE TO MASTER

Application::Move To Master

This block allows to align the position demand from the Master + offsets from phase blocks to the Slave position in a controlled manner. A trapezoidal move is added to align the Master+offsets to the Slave by using ***Velocity*** and ***Acceleration***.



When ***Enable***, if an offset exists when the Slave drive is enabled, the Slave will move to the Master position in a controlled movement.

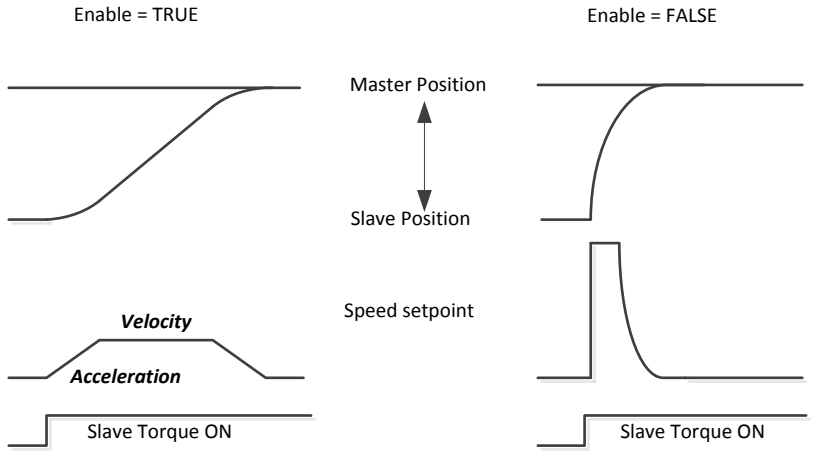
If disabled, in the same condition, the system moves to the Master position with a crude movement.

Velocity and Acceleration define the shape of the motion.

DistToMaster output is the remaining distance to be done while the ***Move to Master*** is ***Active***

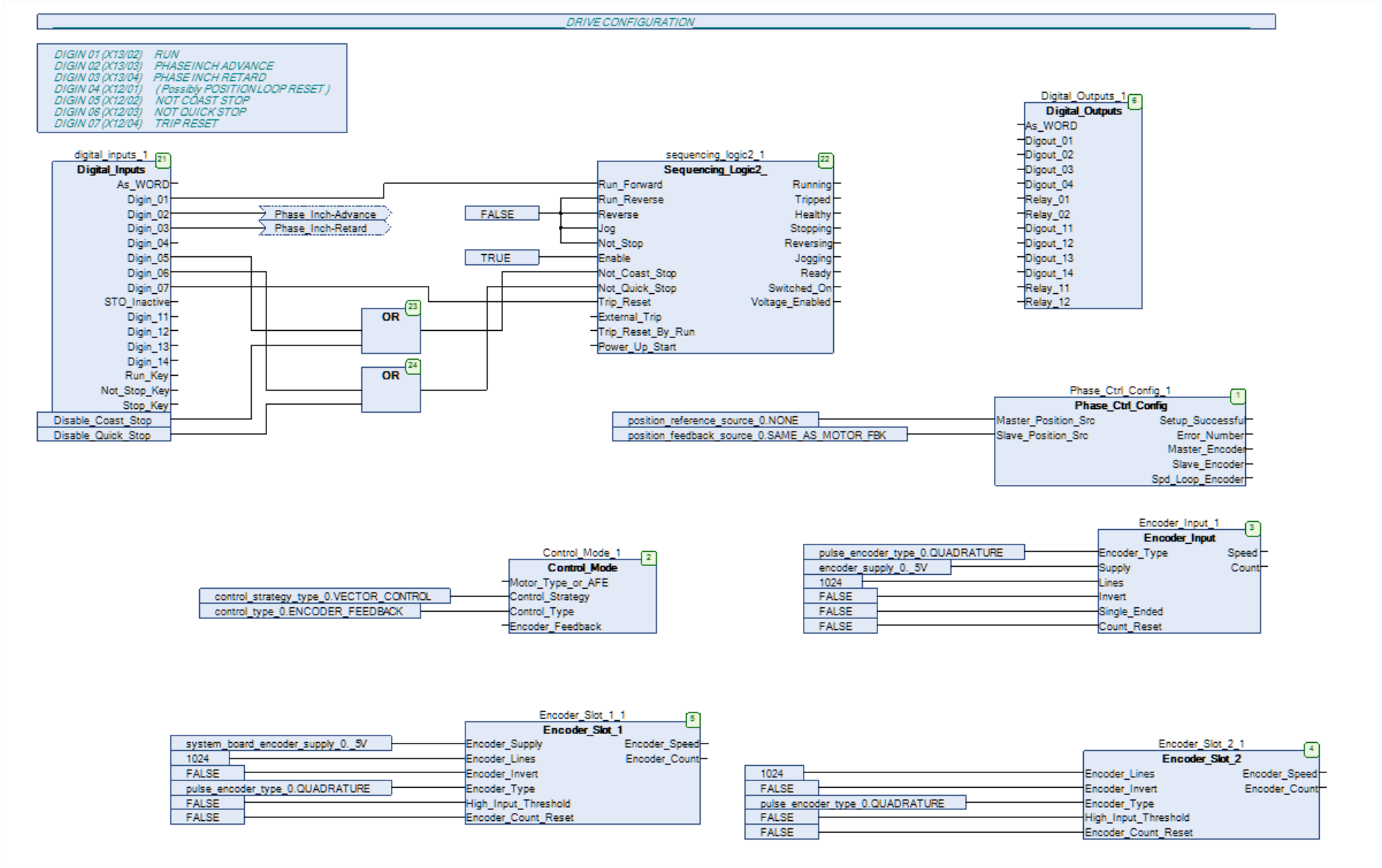
Active is TRUE is the ***Move to Master*** is in action.

State gives the state of the actual ***Move To Master*** block



Parameter Name	No.	WEB/GKP	Default	Range	Units	Writable
Enable	1926	Application::Move To Master::MTM Enable	FALSE			
To validate any controlled alignment of the Master and Slave due to offsets						
Velocity	1927	Application:: Move To Master::MTM Velocity	1.0	0.1 to 300	unit/s	
Maximum velocity of the Move, set in unit/s.						
Acceleration	1928	Application:: Move To Master::MTM Acceleration	1.0	0.1 to 3000	unit/s²	
Acceleration/deceleration of the Move in unit/s²						
DistToMaster	1929	Application:: Move To Master::MTM DistToMaster			unit	NEVER
Remaining distance between the Master and the Slave in unit. 0 when ***Move To Master*** inactive						
Active	1930	Application:: Move To Master::MTM Active				NEVER
TRUE to indicate that the ***Move To Master*** is Active						
State	1961	Application:: Move To Master::MTM State		0 : RESET 1 : POS AQUIRE 2 : ALIGN 3 : DONE		NEVER
Gives the state of the actual Move To Master : RESET : When ***Enable*** is FALSE POS_AQUIRE : While the Slave is OFF and ***Enable*** is TRUE. ALIGN : When a Move To Master is in progress to align a Slave to Master DONE : When Move To Master is completed						

Drive Configuration Block Diagram



Functional Description

Disable Coast Stop:
This feature disables the use of the COAST STOP input.

Caution The Drive will not stop when the coast stop input is disconnected.

Power Up Start:
This feature removes the requirement of a transition from FALSE to TRUE on the run command. This allows an immediate start of the motor when power is applied to the Drive.

Caution The Drive may run without warning.

Control mode to select the encoder used as the speed feedback

Phase_Ctrl_Config to select the slave encoder connected. If the slave and the speed feedback encoder are the same, then setup Slave_Position_Src to SAME_AS_MOTOR_FBK

Phase _Ctrl_Config to select the master encoder

Encoder_Slot_1 and/or **Encoder_Slot_2** to set up encoder connected to system board Slot1 and/or Slot2

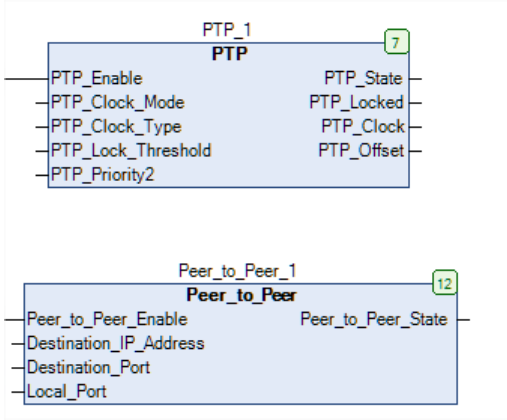
User Input :

REAL MASTER mode : Encoder lines A and B connected to one of the Encpder inputs

MASTER mode : Virtual Master::Input : user speed setpoint

SLAVE mode : Peer to Peer Information

Peer To Peer Setup



PTP and ***Peer_To_Peer*** should be set up and Enabled (for more details please refer to Drive Manual)

PTP :

The PTP will synchronize the internal clocks over the Ethernet to better than 1 microsecond. No external master is required for the PTP network; any of the inverters may become a PTP master.

The initial use of the PTP is for shaft locking applications using the Virtual Master or Real Master control.

Note: Currently up to 9 inverters are supported on a PTP network.

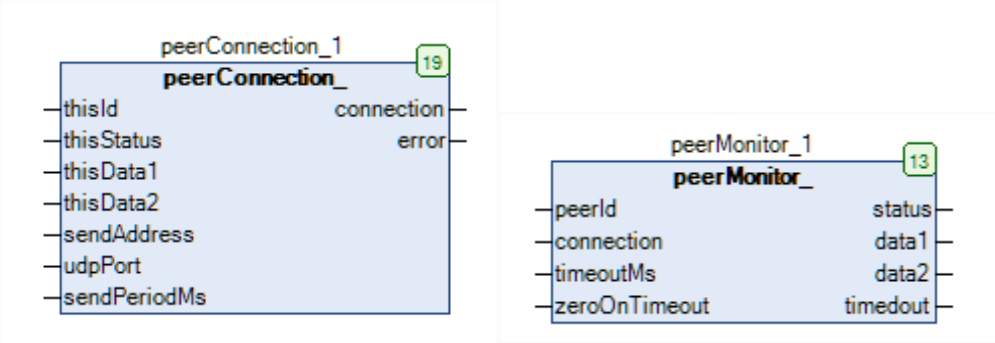
Peer To Peer :

The Peer to Peer module is implemented in the AC30P and AC30D inverters and provides Ethernet communications between inverters.

The data sent is not accessible to the user. The initial use of the Peer to Peer module is for shaft locking applications using the Virtual Master or Real Master control and used in conjunction with the Precision Time Protocol (PTP).

Note: The Peer to Peer module broadcasts data at a high rate, as such, when the Peer to Peer module is enabled it is recommended not to connect the inverters to a corporate or other sensitive network.

In default configuration appears some others blocks used to control and give diagnostics about the Peer To Peer connection.



peerConnection_ : ThisData1 ThisData2 could be used to transfer information through the peer to peer from one drive to the others.

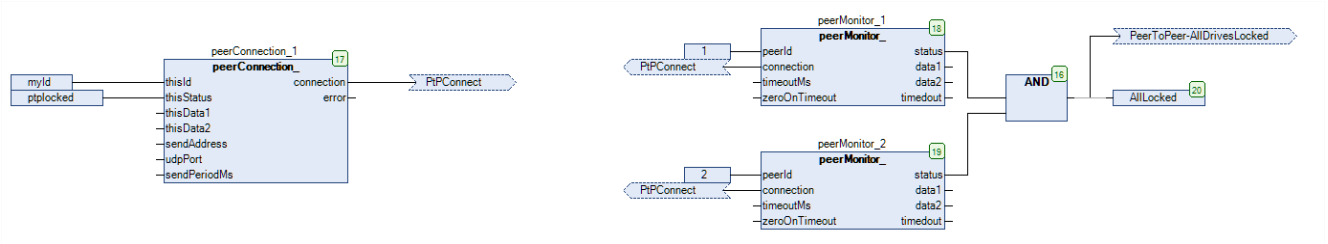
peerMonitor_ : data1 data2 are used to read this information transferred from this drive.

ThisData1, ThisData2, data1 and data2 are 32 bits type. BIT_AS_DWORD and DWORD_AS_BIT Conversion Functions may be used to pass binary information.

In default configuration is given the possible connection od two drives with Ids 1 and 2. This is to detect a disconnection or a lost of Peer To Peer connection in the chain between drives.

The output information '***AllLocked'*** is TRUE when all drives are connected and the Peer To Peer connection is Safe.

'***AllLocked'*** is FALSE when the drives are not connected. This output can feed ***AllDrivesLocked*** input of ***Virtual Master Ref.***



The default configuration is designed for 2 drives connected together.

Each drive should contain this control feature.

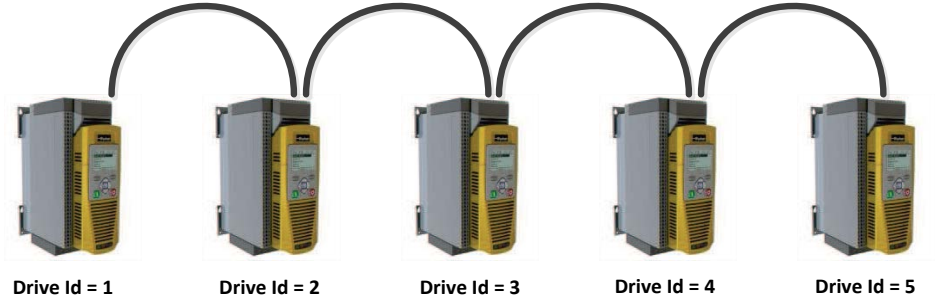
Each drive is identified by an unique Id accessible by the GKP under ***Application::PTP::Drive Id***. In the default application, Drive Ids are 1 and 2.

If the Peer To Peer connection is lost between drive 1 and drive 2, then the diagnostic ***AllLocked*** becomes FALSE. If connected to ***Virtual Master Ref::AllDriveLocked***, then drives are informed that the peer to peer connection has been lost and can take on their side the correct decision to stop safely the motor.

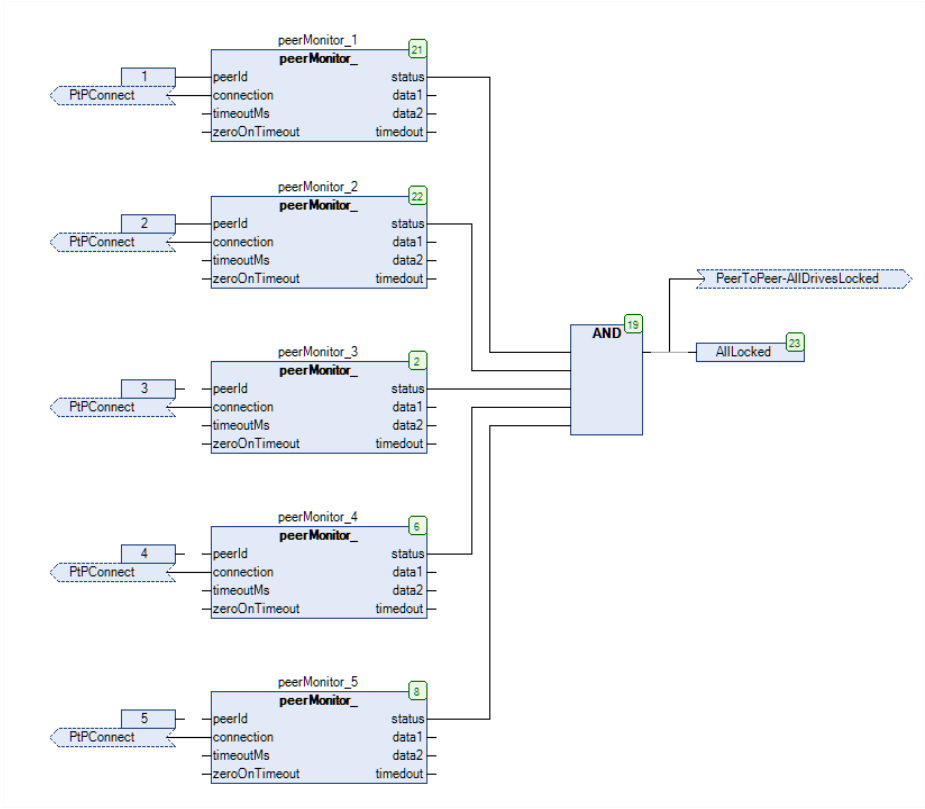
If nothing else is added to the configuration, the drive will return in speed control mode and move back the motor to the user speed setpoint (values of the speed setpoint feeding the speed loop in speed control mode, usual settings of a speed setpoint in ***Parameters::Motor Control::Sequencing***) by using the system ramp acceleration/deceleration set up in the Ramp block (***Parameters::Motor Control::Ramp***).

When and if the Connection is recovered, than the motor will move back in position loop. All drives will then resynchronize themselves to the master position.

Example of 5 drives connected together, with Drive Id from 1 to 5.

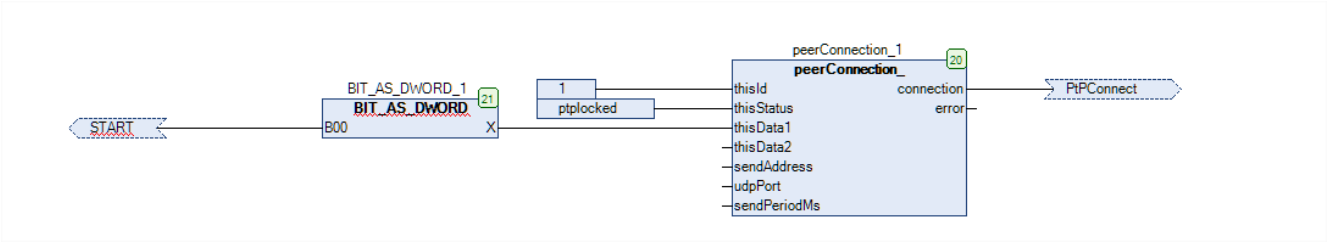


Each drive owns its own Id (1 to 5 , Application::PTP::Drive Id), and should contain this control diagram in its application.

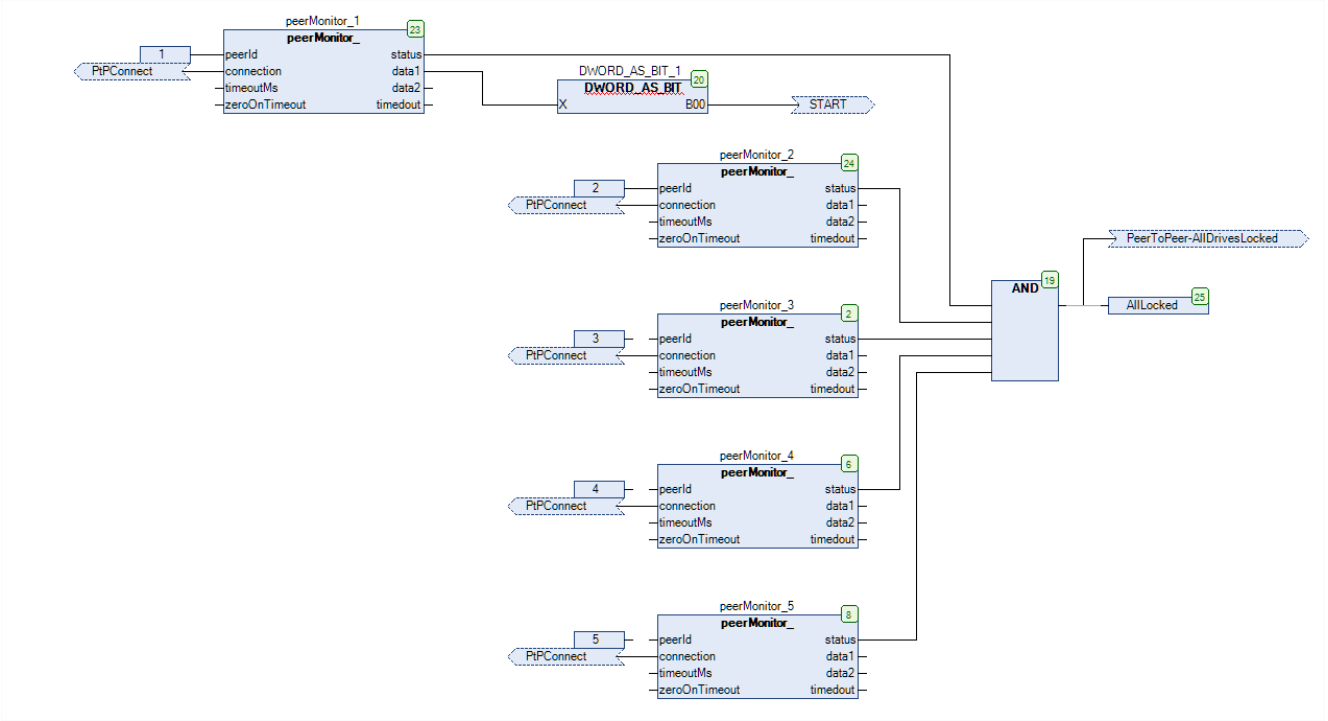

peerMonitor_1
peerMonitor_
21
1
PtPConnect
peerId
connection
timeoutMs
zeroOnTimeout
status
data1
data2
timedout
peerMonitor_2
peerMonitor_
22
2
PtPConnect
peerId
connection
timeoutMs
zeroOnTimeout
status
data1
data2
timedout
peerMonitor_3
peerMonitor_
2
3
PtPConnect
peerId
connection
timeoutMs
zeroOnTimeout
status
data1
data2
timedout
peerMonitor_4
peerMonitor_
6
4
PtPConnect
peerId
connection
timeoutMs
zeroOnTimeout
status
data1
data2
timedout
peerMonitor_5
peerMonitor_
8
5
PtPConnect
peerId
connection
timeoutMs
zeroOnTimeout
status
data1
data2
timedout
AND
19
PeerToPeer-AllDrivesLocked
AllLocked
23

Example of info transferred from drive 1 to others drive 2 to 5

Drive Id=1 sends the start command



All others drives receive the start command from the drive Id = 1



Basic Steps for a simple phase locking configuration