
Application Note

C003 Phase Locking Set up with Retransmit Encoder Output

HA502487C003 Issue C

AC30P/D/A V2. 17 onwards

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Requirements

Intended Users

This Application Note is to be made available to all persons who are required to install, configure or service equipment described herein, or any other associated operation.

The information given is intended to enable the user to obtain maximum benefit from the equipment.

Application Area

The equipment described is intended for industrial motor speed control utilising AC induction or AC synchronous machines.

Personnel

Installation, operation and maintenance of the equipment should be carried out by qualified personnel. A qualified person is someone who is technically competent and familiar with all safety information and established safety practices; with the installation process, operation and maintenance of this equipment; and with all the hazards involved.

Hazards

Refer to the Safety Information given at the front of the Product Manual supplied with every Parker SSD Drives product.

C003 PHASE LOCKING SET UP WITH RETRANSMIT ENCODER

Abstract

This application note gives an example of setting up a phase locking application with the 690Like Phase locking application described in HA503284U007_005 onwards

Pre-Requisite

The pre-requisites are :

- a AC30D/A drive used as the master drive (needs of a retransmit output)
- a AC30P/D/A drive used as the slave drive

Introduction

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

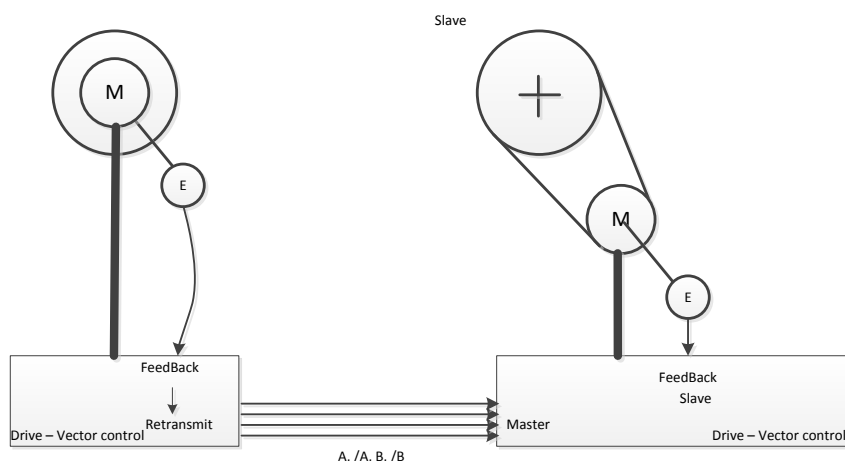
The speed/phase following capability of the 690 range is recreated within the AC30P/D/A.

The option board allows the product to accept a master encoder input, with or without marker, and for the drive to follow the input, with or without speed gearing. The second encoder input may be from the drive's own motor, and in that case provides the speed/position feedback for its closed-loop.

The AC30D allows for the repetition of one of the encoder input available on the board through a programmable voltage encoder output, including mark. This is known as the RETRANSMIT feature.

Some others phase blocks are also available:

- Phase inch – progressive phase advance or retard on demand
- Phase move – pre-defined phase change, at set speed and acceleration, on demand
- Phase offset – adjustment of the relative phase.
- Phase tuning – facility for the injection of square speed or phase offsets to assist loop tuning.



Phase Loop operation

The phase loop is a position loop.

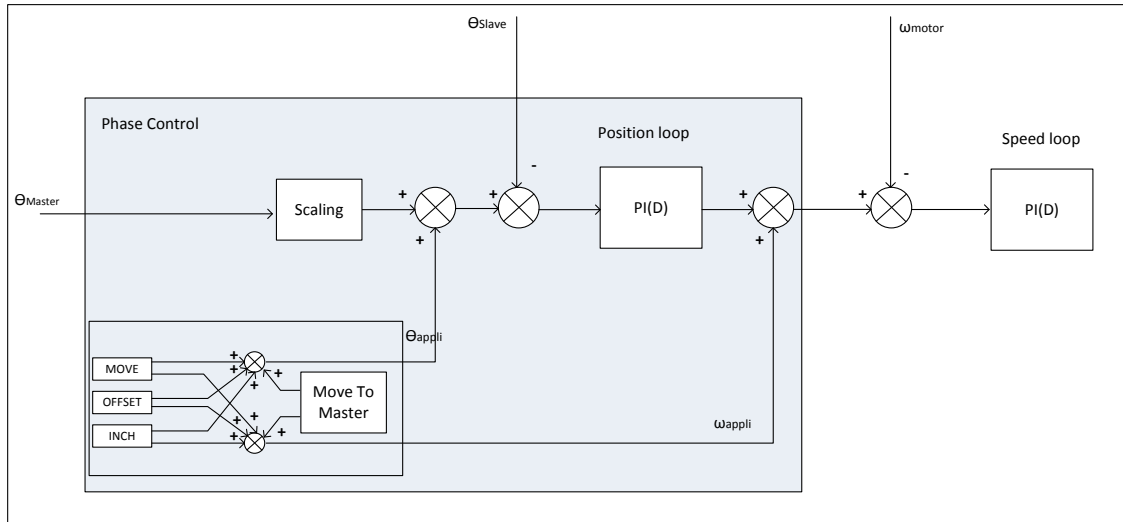
The position demand is the sum of the reference position plus the offsets generated by the phase blocks belonging to the application layer.

The position feedback is the position from the encoder defined as the slave encoder.

It contains a PI corrector (no derivative action), a feed forward term and an output saturation.

The feed forward term is the sum of the reference speed plus the speeds generated by the phase blocks.

The output feeds the speed loop.



Phase Control Default application

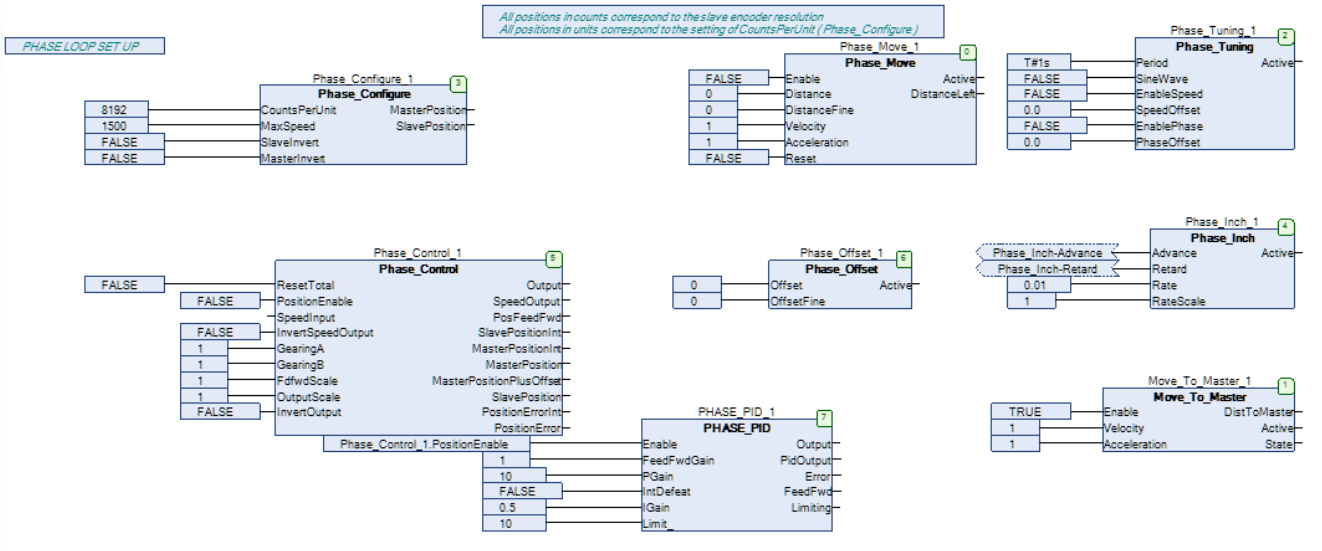
Default application is available as RA503284U007_001.prj

Default configuration is separated in 2 parts :

- first is dedicated to the phase control :
 - o phase blocks
 - o phase configure and phase control
 - o phase loop phase PID
- second is dedicated to the I/Os and sequencing of the drive
 - o Digital I/Os
 - o Encoder(s) setting
 - o Master/slave selection

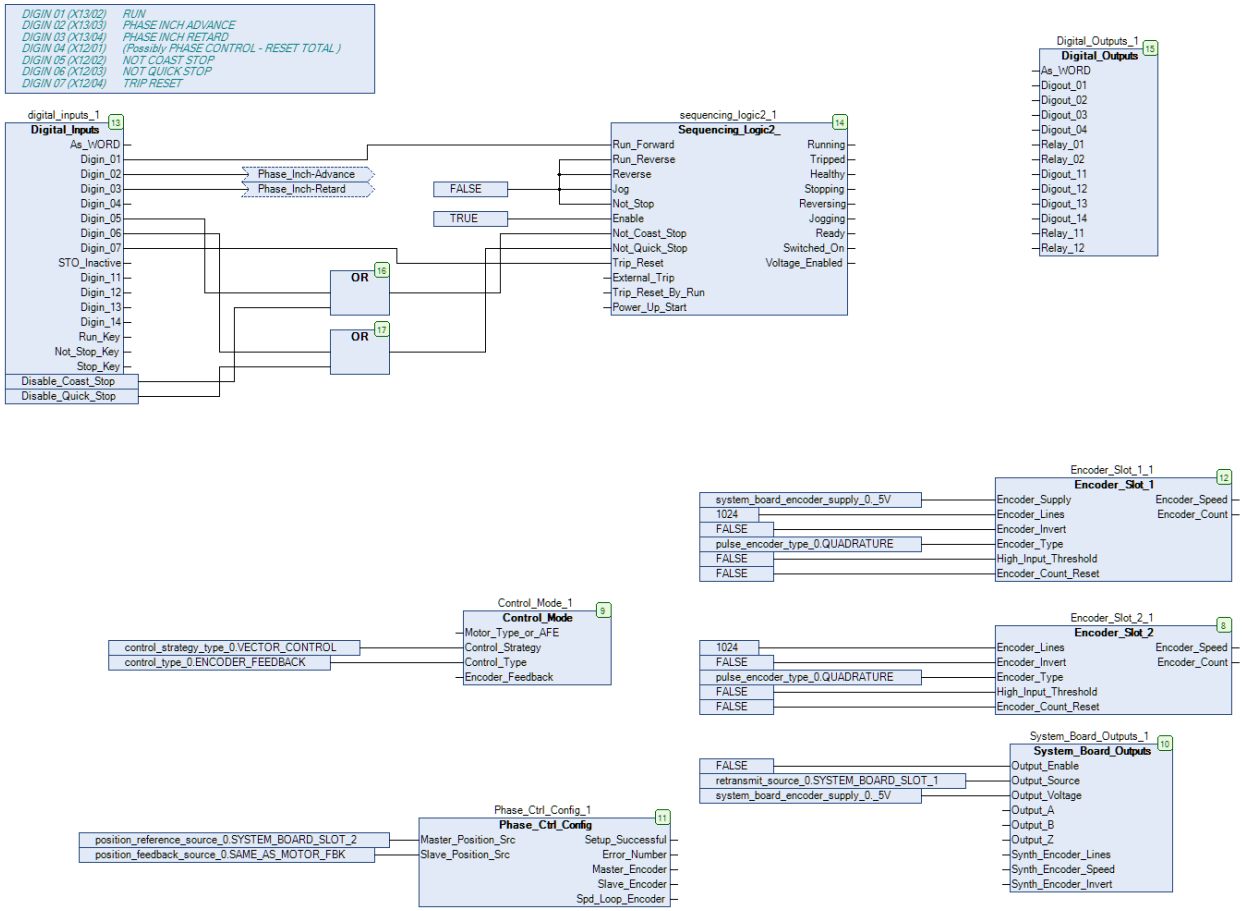
Phase Control :

PHASE CONFIGURATION

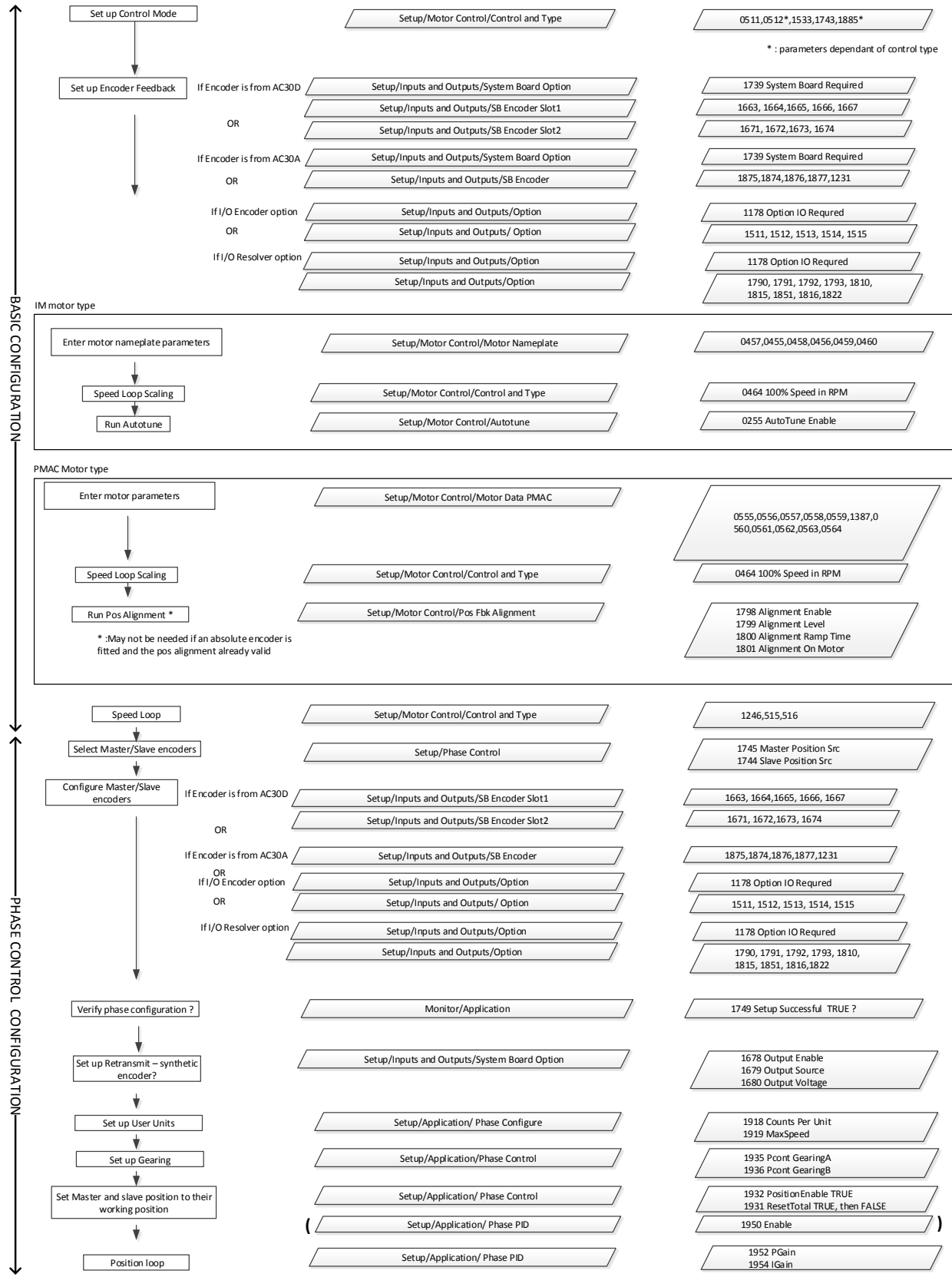


I/Os and sequencing :

DRIVE CONFIGURATION



Step to Configure Both drives



Setup Control Mode:

Selection of the control mode (Vector control) and selection of the encoder feedback for the speed loop control.

Setup Encoder Feedback :

Depending of the encoder feedback selected :

- if MAIN SPD FEEDBACK Selected, an IO option pulse encoder is required and the settings of the encoder are done in **Setup::Inputs and Outputs::Option**
- if MAIN SPD FEEDBACK Selected, an IO Resolver option is required and the settings of the Resolver are done in **Setup::Inputs and Outputs::Option**
- if AC30D and if SYSTEM BOARD SLOT 1 or SLOT 2 is selected, a system board is required and the settings of the encoder are done in **Setup::Inputs and Outputs::SB Encoder Slot1** or **Setup::Inputs and Outputs::SB Encoder Slot2**
- if AC30, the settings of the encoder are done in **Setup::Inputs and Outputs::SB Encoder**

Motor Nameplate parameters :

Enter the motor parameters

Speed Loop Scaling:

Enter the scaling for the speed loop control. This value represents 100% speed

Autotune :

Run Autotune.

Pos Alignment :

Only required for PMAC motors, if the alignment has not been done mechanically in factory.
Run Pos Alignment.

Speed Loop :

By default, speed loop settings gives a safe control of the motor. For a better dynamic and behaviour, it may be better to try to optimize the speed loop settings.

Master/Slave Encoders:

Selection of the Master/Slave encoders used by the drive.
Diagnostic given in the block allows to verify if there is no issue with this setting.

Retransmit encoder :

If this feature in use, for exemple in the Master drive, setup the parameters **Setup::Inputs and Outputs::System Board Option**

User units:

Please refer to the Manual HA503284U007 to find an explanation on how to set it up.

Phase control:

Setup Gearing A and Gearing B input to their values

Enable Phase control:

Insure your drive is torque OFF.

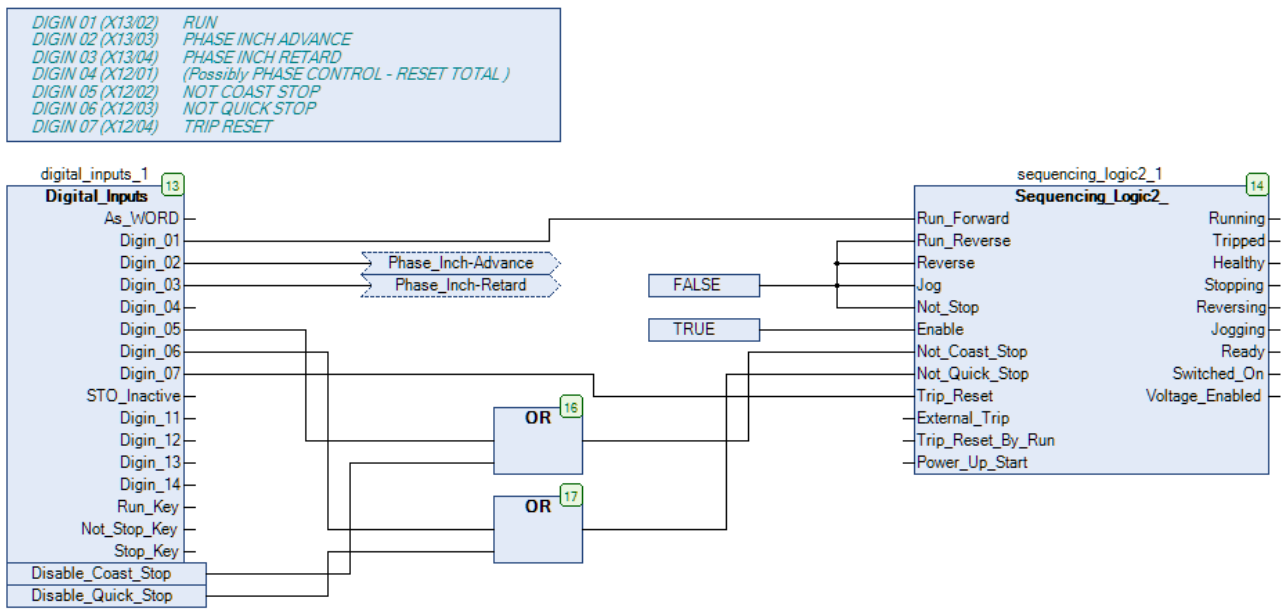
Enable Phase Control : **Setup::Application::Phase Control::PositionEnable** = TRUE and **Setup::Application::Phase PID::Enable** = TRUE (by default the application set this input to TRUE if Phase Control is Enabled)

To reset the phase control to the actual motor position, set **Setup::Application::Phase Control::ResetTotal** to TRUE, then to FALSE.

By default, position loop settings gives a safe control of the motor. For a better dynamic and behaviour, it may be better to try to optimize the settings.

Inputs and Outputs

In default application, Inputs are connected as below :



2 inputs Digin_02 and Digin_03 are connected to the Phase Inch Blocks to synchronize the Slave to the Master position. Rate and Rate scale parameters allows to control the change in position when the inputs are TRUE.

Master Drive

The Master drive may be run in speed mode. The retransmit output is set up to retransmit the encoder used for the speed loop control.

Slave Drive

The Slave drive is in phase control mode. It follows the position defined as the Master position.

Resetting position to the actual motor position

- Move your motor to the position you would like it to be the Zero position (in speed control, for ex)
- Insure your drive is torque OFF.
- Enable Phase Control : **Phase Control::PositionEnable** = TRUE and **Phase PID::Enable** = TRUE (by default the application set this input to TRUE if Phase Control is Enabled)
- Insure all phase offsets are at zeros :
 - **Phase Control::MasterPosition** = **Phase Control::MasterPositionPlusOffset**
- To reset the phase control to the actual motor position, set **Phase Control::ResetTotal** to TRUE, then to FALSE.