

Programmable Hoist Controller Plus

Operation Quick Guide



IMPORTANT SAFETY INFORMATION

The Programmable Hoist Controller Plus is a highly sophisticated motion controller and has been designed with safety as a primary concern. However, as with all motion control systems that involve the movement of equipment and loads that can pose a danger to persons or property, it is the end users responsibility to carry out a full risk assessment of their application. They must ensure that the controller / control system used is suitable for their application and is used in the correct manner.

The Programmable Hoist Controller Plus (PHC+) is designed to be an operator aid, allowing complex and impressive movements to be easily created and played back with precision. The PHC+ is not, however, designed to be a substitute for operator supervision, or safety approved monitoring systems. Where the PHC+ is used to control equipment or loads that can present a danger to persons or property, it is the end users responsibility to ensure that ALL equipment and loads under the control of the PHC+ are directly monitored by trained persons when running any move. Only suitably trained and competent persons should operate the PHC+.

If the PHC+ is to control loads that can pose a danger to persons or property, as with all control systems in this situation, an emergency stop system, compliant with local regulations, must be used. This emergency stop system should include an emergency stop 'plunger' installed next to the PHC+ and must be designed in such a way as to remove motion power from all equipment under the control of the PHC+ when activated, assuming it is safe to do so.

- Always carry out a full risk assessment of your application.
- Always ensure that all relevant sections of the full operation manual have been read and fully understood before operating the PHC+.
- Always check that equipment under the control of the PHC+ is safe to operate and properly maintained.
- Only allow suitably trained persons to operate the PHC+.
- Ensure that an emergency stop system, compliant with local regulations and your risk assessment, is installed and tested regularly.
- Never use the PHC+ to control equipment that moves persons or poses danger to persons in the vicinity.
- Always monitor ALL pieces of equipment controlled by the PHC+ when running any move.
- The PHC + is for use by professionals only.

**Safety should be your prime concern.
If in any doubt seek professional advice.**

BASIC OPERATION

There are 3 modes of operation, selected by the 3 blue mode buttons next to the go button. Selecting between the 3 modes is instant - simply press the relevant button at any time and jump straight into that mode of operation.

Manual Mode - Press The Go Button And The Hosts Will Move

The controller behaves just like a standard manual hoist controller. Select the direction for each hoist to move using the toggle switches. Press the Go Button to move the hoists. Release the Go button to stop movement.

Computer tracking still operates, so hoists that have been correctly setup will still track their correct position. However all of the controller protection functions are disabled. The controller will always output the move signal to the hoist, regardless of any errors it detects.

This mode is useful in several situations:-

- Loading In - when the hoists have not yet been properly setup and their positions 'referenced'.

- Loading Out – allows limits etc that have been set for the show to be ignored.

- During A Show – allows the operator to immediately take overriding control in the event of the controller halting movement due to it detecting an error. Errors can sometimes be caused by faulty encoders, faulty cabling etc – in this situation the operator is able to immediately bypass the protection functions.

Manual Monitor Mode – Manual Control With Monitoring For Errors

The controller behaves just like a standard manual hoist controller. Controller protection functions are enabled. Once the hoists have been setup this mode can be used to allow manual control, but with all movement being automatically halted should the controller detect an error.

This mode is primarily designed for use when lifting rigs with several hoists – all of the channels become one complete group and any error causes all movement to stop. The difference between this and computer mode is that in computer mode individual groups may be setup, which cause only specified hoists to halt should a hoist error, instead of all movement as in this mode.

Computer Mode – All The Bells And Whistles

In this mode all of the functions of the controller are available. Manual moves may still be carried out at any time.

The following sections show some of the functions that may be carried out in this mode...

SETTING UP YOUR HOISTS

Press the 'Menu' button to enter the Main Menu

```
          M A I N   M E N U
<W e i g h t s                R u n >
<U t i l l i t i e s   P r e v i e w >
<S e t u p           P r o g r a m m e >
```

Go into the 'Setup' Menu and then select 'Channels'.

The next screen is common to many of the functions of the controller. You have the option to either select individual channels, or groups of channels, as shown on the screen (the greyed in arrow shows the currently selected function):

```
          S E T U P   C H A N N E L S
◀ S e l e c t   C h a n n e l s
◁ S e l e c t   G r o u p s
```

No groups have been setup yet, so we can only select channels. Use the channel select buttons (under each toggle switch) to select each channel you want to setup. Press the button again to remove a channel from the selection. Then press 'Next'.

If the controller already contains a library entry for the type of hoist the selected channels are using then this may be selected now by pressing 'Use A Library Setup'. If not then press 'Set Values Manually'. If a library setup is selected the following screens are then exactly the same as if 'Set Values Manually' was pressed, except that the default values offered by the controller will have been set by the library entry.

Note that if you are adjusting the values of hoists you have already setup do not select use library, use set values manually so that the current setup values in use will be shown to you which you may then edit as required.

The next thing to do is to select the channel / hoist type. There are 4 options:

1 Phase Encoder - The hoist being used contains a single phase encoder

2 Phase Encoder - The hoist being used contains a dual phase encoder.

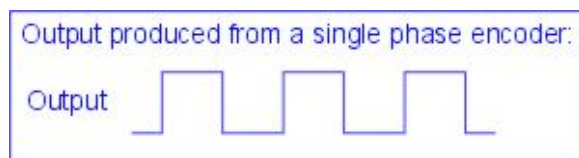
2 Phase Reversed - Same as the 2 Phase encoder option, but used to correct for encoders that are counting in the wrong direction.

Timed positioning - The hoist being used does not have an encoder. Movement of the hoist will be simulated by the controller, keeping track of its real world position. This setup provides no feedback from the hoist for movement error detection.

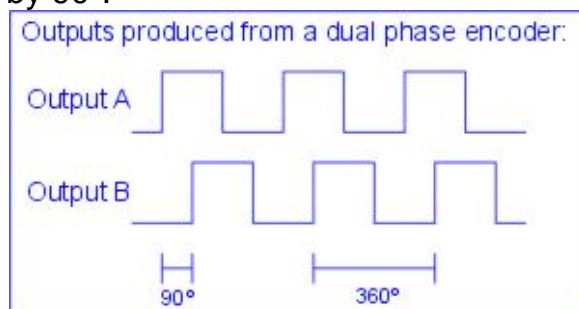
Tracking Off - The hoist is not required to track its position and will only be operated manually.

How Single And Dual Phase Encoders Work

Two types of technology are commonly used to achieve the counting in an encoder – The most common is optical. This is usually based on passing an infra red beam through a slotted disk. As the disk rotates the infra red beam 'reads' the slots, producing a square wave pulse signal. Alternatively magnetic 'hall effect' encoders are also used. These work on the same principle but use a magnetic receiving device positioned next to a 'cog' shaped wheel which has each of its outer 'cogs' magnetised with 'north' or 'south'. As one of the outer parts of the cog passes, the magnetic receiver detects the 'north' or 'south' magnetism and goes high or low respectively. Both of these types of encoder produce a pulse train of highs and lows and are called 'incremental' encoders. With just one of these detection methods you have a single phase encoder which when rotated produces an output as shown below:



This type of encoder allows accurate positioning, but the controller is unable to tell in which direction the device is moving. The controller will rely on knowing in which direction it is telling the hoist to move and assume that the hoist is moving in this direction. To achieve direction detection a dual phase encoder is used. A dual phase encoder simply contains 2 single phase encoders, but with the 2 encoders offset from each other by 90°:



The offsetting of the two outputs allows the direction of the device to be calculated. This can be seen by running a ruler across the diagram above, from left to right and then right to left. In one direction the outputs read as follows: A goes high, B goes high, A goes low, B goes low... and in the other direction: B goes high, A goes high, B goes low, A goes low...

Therefore the use of a dual phase encoder provides a more reliable counting method. The use of a single phase encoder works satisfactorily in many applications, but some amount of count error tends to be produced over time, without the directional information of a dual phase encoder being available.

The Parameters Required To Set Up Your Hoists

In order for the controller to accurately track each channel's position, it must be setup with the relevant operating information of each channel / hoist. Whilst the operation of the Controller is designed to be as simple as possible, the setting up of new hoists does require some knowledge of motion control systems. However, once setup the parameters can be noted for next time, or better still added as a new library entry, and the hoist can then be quickly and simply setup each time it is used.

The Controller user manual contains detailed information on each of the parameters required and simple methods of finding out these values if they are not known.

Below is a brief description of the parameters required for each type of hoist setup:-

Single Phase Encoder

Pulses per metre - The controller needs to know how many encoder pulses received relate to the actual distance moved by the hoist.

Minimum pulses per second - One of the protective features provided by the controller is to halt a channel should it not move correctly. A hoist that doesn't move when it should, or is being obstructed, causing it to move at a slower speed, won't give any encoder pulses, or will give a reduced number of encoder pulses. The value set in this parameter is compared, every second, to the actual number of pulses detected. If too few pulses are received, a move error is triggered.

Up and Down Coast Times - When a hoist is stopped by the controller it will actually continue to move for a short period of time, due to the operation time of the hoists control contactors and brake etc. A channel that uses a single phase encoder cannot tell which direction the hoist is moving in. Therefore the controller ignores any encoder pulses received while the channel isn't being moved by the controller. This is to avoid counting the false pulses produced by some inferior quality encoders when they come to rest on the 'edge' of a pulse. As the hoist continues to move for a short time after the controller stops it, the controller needs to continue counting the pulses during this time.

Dual Phase Encoder

Pulses per metre - As for the single phase encoder.

Minimum pulses per second - As for the single phase encoder

Timed Positioning

Up and Down Speeds - To achieve accurate positioning of timed channels the Controller needs to know the actual speed of the hoist, for both up and down moves. The two directions are separated, as often hoists will travel slightly slower up than down, due to the weight of the load they are

moving. With these speeds set, the controller is able to simulate the movement of the hoist, keeping track of its real world position.

Up and Down Coast Times - When a hoist is stopped by the controller it will actually continue to move for a short period of time, due to the operation time of the hoists control contactors and brake etc. Up and downtimes are separated, as their values will sometimes be different. As timed positioning simulates the movement of the hoist, this time delay needs to be known by the controller in order to keep the position of the hoist accurate.

Once the channel type is selected, the menu will ask you for each of the required parameters for the selected channel type.

Referencing The Position of Your Hoists

Once the hoists have been setup the main status screen will look as follows:-

```
0 1 :  ? ? . ? ? ? m      I d l e
0 2 :  ? ? . ? ? ? m      I d l e
0 3 :  ? ? . ? ? ? m      I d l e
< D i s p l a y   C h a n n e l   >
```

The question marks are shown for each channel as, although the channels have been setup, the controller has not been told the current position of each channel. Switch to 'Manual' mode to move the hoists to a known position (using say a tape measure or a pole of known length). This will be the 'reference' position, and you will need to be able to return the hoists back to this known position to re 'reference' them when required.

Change back to Computer Mode and then use the menu to select 'Setup Position' 'Menu' > 'Setup' > 'Position'

As before, select the channels you wish to set the position of, using the channel select buttons. Press next and then enter the position:

```
SET CHAN POSITION
New Position :
          1 0 . 0 0 0 m
                               S t o r e >
```

When you return to the main status screen you will see that the current position you have set is shown. Now move the hoists using the toggle switches and the go button and you will see the position change as each hoist moves.

The controller is now setup! It will track the position of hoists and halt movement should it detect move errors. You may now use as many or as few of the additional features of the controller as you wish.

PROGRAMMING CUES

The controller allows up to 250 cues to be programmed. As an example, using 4 hoists we will programme 5 cues. The first cue will move the first hoist to a high position. The second cue will move the next hoist to a high position and so on. The 5th cue will move all of the hoists to a low position.

First manually move all 4 hoists to a high position, using the toggle switches and the go button. Use the menu to select 'Programme Cue'

'Menu' > 'Programme' > 'Edit Cue'

```
PROGRAMME CUE
◀ Cue No : 001
  Name :
( Empty )           Edit >
```

Select cue number 1 using the cursor keys and press edit. The cue may then be given a name if desired, using the channel select buttons and cursor keys to enter characters. Meaningful names greatly help when using cues.

Then select the channels to edit for this cue. For the first cue just select the first hoist and press next.

```
PROGRAMME CUE : 001
◀ Target : Idle
< Use Current pos n
< Store Cue       Next >
```

The target for the selected hoist may then be set. A position in mm may be entered or press 'Use Current Position' to set the target to the selected hoists current position. Alternatively 'Clear' may be pressed to set the selected channels to Idle, effectively removing them from a cue if they were previously set to move.

Select 'Use Current Position'. If we had more channels to select for this cue with different numeric positions to enter we could press next, but as we are only moving the 1 channel press 'Store Cue'

Now repeat this for cues 2 – 4, selecting the 2nd, 3rd and 4th hoists for each cue.

Now exit the Programme menu and manually move the 4 hoists down to a low position.

Then programme cue 5 to include all 4 hoists to move to this position (i.e. select 'Use Current Position')

That's is, you've successfully programmed some cues!

Preview Your Cues

Before running any cues you should use the preview function to check what each cue will do when run. Use the menu to select Preview Cue
'Menu' > 'Preview' > 'Preview Cue'

```
          P R E V I E W   C U E
◀ C u e   N o : 0 0 1
   N a m e : 1   U P
( S t o r e d )           P r e v i e w >
```

Select the first cue and press 'Preview'

```
          P R E V I E W   C U E :   0 0 1
0 1 :   0 1 . 0 1 5 m   > 0 2 . 4 3 0 m
0 2 :   0 1 . 0 1 5 m       I d l e
0 3 :   0 1 . 0 1 5 m       I d l e
```

The controller then shows what would happen if the cue is run now. The channel LEDs light up for each channel that will move. The screen shows the target for each channel included in the cue. Repeat this for each cue you have programmed.

Running Your Cues

Use the Menu to Select Run Cue
'Menu' > 'Run' > 'Run Cue'

```
          R U N   C U E
◀ C u e   N o : 0 0 1
   N a m e : 1   U P
< P r e v i e w           A r m >
```

Select the first cue, press 'Arm' then press and hold the go button. The cue will run, sending the 1st hoist to the upper position you programmed.

The controller will allow more than 1 cue to be run at once. All programmed moves operate on the principal of giving a channel a target position, set in metres. When a programmed move is run, i.e. a cue, each channel that has been set a target in the cue will start to move in the direction required to reach its target.

The controller operates on the principal of 'last takes precedence'. This means that if a channel is being moved to a target, i.e. running a programmed move, and a new cue is triggered which moves the channel to a new target, the channel will respond to the new cue and change its target. If the new target requires the channel to change direction the channel will stop and then move in the opposite direction to reach the new target.

This approach allows multiple cues to be run simultaneously. As each new cue is triggered, all the channels set with a target in the new cue will respond and move to their new set target. Any channels that are moving and are not addressed by the new cue will continue to move to their current target.

To show this we will now run the next 4 cues (2 to 5) in quick succession. Select Run Cue and then select Cue 2. Press and hold the GO button to run the cue and then use the menu to select Run Cue 3. Instead of 'Arm' the Run Cue screen now says 'Go'. When the button is pressed the cue will then immediately run. Runs cues 3 and 4 in the same way. Finally run cue 5 and you will see that all of the hoists will run back down to the low position you programmed, including any of the hoists that we're already moving up from their previous cues.

Manual Moves While Running Cues

The toggle switches may also be used at any time during playback, providing instant manual control over any channel. The toggle switches override a channels operation and take priority over any programmed move. Should a toggle switch be used on a channel that is currently running a programmed move to a target, the target move will be cancelled and the channel will move in the direction set by the toggle switch. When the toggle switch is returned to off the channel will stop and will only move to a target when next addressed by the triggering of a cue or sequence step.

Other Functions Available From The Controllers

Programme and run sequences

Setup groups

Halt and release individual channels and groups of channels

Setup high and low end of travel limits

Setup load cells for integrated weight monitoring with overload and underload protection

Setup security to password protect controller functions

Ensure that you read the full PHC+ user manual before using the controllers to move equipment that can pose a danger to persons or property.



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