4.1. PROBE / ENCODER CALIBRATION

The probe / encoder will be calibrated when the setworks is commissioned.

A 'probe' generally refers to a type of measuring transducer that uses a rod style (for fitting internally to cylinders), or profile style (external/stand alone mounting) and has a magnet that slides along the device for purposes of measurement.   These devices give approximately 22-23 raw counts/mm travel, and raw counts increase as the magnet moves away from the end with the electrical connector (usually as cylinders extend or machines move forward). Where a setworks has been configured for using a transducer the 'Probe Type' parameter (P120/220) will be set to '1' for a start/stop pulse type (most common), '2' for a PWM or L type, and '3' for an SSI type.

An 'encoder' refers to a rotary encoder fitted to a wire rope spring return mechanism.   These devices usually give 20.48 raw counts/mm travel (but encoders can be programmed at the factory for different resolution).   Where a setworks has been configured for using an encoder the 'Probe Type' parameter (P120/220) will be set to '3' for an SSI type.

Important: Additional steps are required when calibrating a machine that uses a rotary encoder with spring return wire rope mechanism. Please refer to the additional details in 'Note2' later in this section.

If for some reason the calibration needs repeating the easiest method is via the "Auto Calibrate" function as outlined in the "Functions" section.

Auto calibrate is not suitable for some systems where damage may occur if a drive signal is applied when the knees are at full extension (for example a chain-driven system). For a system such as this the recalibration must be done manually as outlined in the following steps:

Calibration Steps

1)   Run the knees to their full extension. This may have to be done manually, to prevent the forward limits from restricting the movement. When at full extension note the value of Parameter 199 (Loop1 Probe Counts), also note the actual measurement of the knees as this will be required when calculating the Stroke of the system.

2)   Retract the knees as far back as they will travel, again this may have to be done manually. Note the value of Parameter 199 (Loop1 Probe Counts) and again note the actual position measurement of the knees.

3)   Calculate the distance between full extension and full retraction (measurements recorded in steps 1 and 2). This value will be the stroke of the probe (Parameter 123).

4)   Enter the Probe Count values obtained from the above steps into the appropriate parameters, with the larger count value entered into "Probe Max Counts" (P124), and the lesser value entered as the "Probe Minimum Counts" (P125).

5)   If the raw probe counts from parameter 199 were largest when the knees were extended, then the probe invert paramater (P121) should be set to '0'.
      If the raw probe counts from parameter 199 were largest when the knees were retracted, then the probe invert paramater (P121) should be set to '1'.

5)   Enter the actual measurement from step 1 (full extension) into offset parameter (P122)   This will complete the calibration operation.

Note1:   **The method shown above is specific to the calibration of Loop1. Loop2 can be calibrated in the same manner, but will involve different parameter numbers as outlined in the parameter list.**
      ie -   Loop1 parameters = 100 to 199
             Loop2 parameters = 200 to 299

Note2:   **Additional steps are required when calibrating a machine that uses a rotary encoder with spring return wire rope mechanism. Please refer to the following explanation.**

Encoders may be programmed at the factory in different configurations, and this may affect the calibration steps above. These differences can include the resolution, the count direction as the wire rope extends, and the reference count when the button on the encoder is pressed. It should also be noted that as the encoder counts go down towards '0' they will not stop counting at '0'. Instead the count will 'roll over' and start counting down from 65535.

1)   Resolution

Normally encoders are configured for 20.48 raw counts/mm (4096 counts/200mm). This may be configured differently if the encoder is installed in a different wire rope mechanism or on another type of connection to the machine (ball screw for example). As long as the probe min and max counts fall within an allowable range and the resolution is enough to provide accurate control this should not present any problem.

2)   Count direction

Encoders can be configured to count up or down as the wire rope extends. Before attempting to calibrate a machine it will be necessary to check what direction the encoder is currently counting. This will be necessary to know for step 3. To work this out it is recommended to check the raw counts (P199) at the current position, then get an assistant to pull the wire rope out a small amount (eg 50mm), and check P199 again to see if counts have increased or decreased.

3)   Encoder reference

Encoders also do not have a fixed reference (0 raw count) position like 'probe' style transducers. Instead they have a button built into the encoder which, if pressed while power is on will immediately set the raw encoder count to a pre-defined number (usually '0', but could be configured for another set value, like '10,000' for example). Once the count direction has been determined in step 2 above, the encoder reference can be set. The

example below will assume the encoder references to '0' when the internal button is pressed.

Firstly, ensure the setworks electronics are powered on and the setworks hydraulics or electric motor drive are **off/stopped**.

Next remove the slotted coin sized cap with a screwdriver to give access to the button inside.

If the encoder count direction from step 2 proved counts increase as the wire rope extends then:

> Disconnect the wire rope from the
> machine and carefully let the rope feed back into the encoder housing.
> With the rope fully retracted press the button in the encoder, then
> reconnect the wire rope to the machine.
> (If this method results in a too large of a probe minimum counts value
> in parameter P125 during later stages of calibration, then this step
> may need to be repeated but do not let the wire rope return
> completely to housing). Ideally the encoder would be 'zeroed' with the
> wire rope at a position approx 100mm beyond the back limit position.

If the encoder count direction from step 2 proved counts decrease as the wire rope extends then:

> Pull the wire rope out from the return mechanism by approx 100mm
> more than the machines current distance to its forward limit (ie, if the
> machines actual position is currently at 400mm, then pull out 500mm
> of wire rope). With the rope held in this position press the button in
> the encoder, then carefully let the wire rope feed back into the return
> mechanism.

Replace the slotted cap that covers the button inside the encoder.

Once the encoder reference has been done, the normal calibration steps can be followed. It should be noted that the count direction found in step 2 will govern the setting of the 'probe invert' parameter (P121).