

APPLICATION NOTE 801

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PC830 Servo Drive and Motors with a Comcoder (Hall/Encoder)

Note: This application note applies to PC830 firmware version 1.90 and higher.

Introduction

The PC830 Servo drive can commutate a motor containing the following feedback devices:

- Resolver
- Incremental Encoder
- Comcoder (Hall/Encoder)

This application note explains how to configure the PC830 to work with a motor containing a Comcoder (Hall/Encoder). It describes how to wire and configure the PC830 to work with Pacific Scientific's R, S and PMA motors as well as Non-Pacific Scientific motors.

Pacific Scientific Motor with a Comcoder (Hall/Encoder)

Pacific Scientific Cables

The following table lists the standard motor feedback cables available from Pacific Scientific.

	Regal (R) Series	Sentry (S) Series	PMA Series
Motor Feedback Cable	PFC-04-03-01-LLL* (MS Connector)	PFC-04-03-01-LLL* (MS Connector)	PFC-02-03-01-LLL* (Interconnectron Connector)

* LLL denotes the cable length in feet. These cable part numbers are based upon the standard (not flexible) cable option.



Building your own cable

The following table lists the pinout for motor power and feedback cables for the R, S, or PMA series motors from Pacific Scientific. Please build your cable accordingly.

PC830	R and S Motors	PMA Motors
TB1-10	GND	GND
TB1-11	Phase R	Phase U
TB1-12	Phase S	Phase V
TB1-13	Phase T	Phase W
J3-1	Sensor 1	Sensor W
J3-2	Sensor 2	Sensor U
J3-3	Sensor 3	Sensor V
J3-8	PTC	PTC
J3-9	PTC RTN	PTC RTN
J3-10	Encoder Power and/or Hall Power	Encoder Power and/or Hall Power
J3-11	Encoder Power RTN and/or Hall Power RTN	Encoder Power RTN and/or Hall Power RTN
J3-12	A-	A-
J3-13	A+	A+
J3-14	B+	B+
J3-15	B-	B-

Note: If connecting a PMA series motor with a Comcoder (Hall/Encoder), **DO NOT** connect Hall sensor leads \bar{U} , \bar{V} , and \bar{W} . Leave them floating and UNCONNECTED.

Procedure

Please follow the steps listed below to configure the PC830:

1. Connect motor and feedback cables to the motor and the PC830.
2. Configure the drive/motor combination using 830Tools.
3. Click on the **Feedback** tab and select **Comcoder (Hall/Encoder)** as the commutation source. Enter the correct incremental encoder line count.

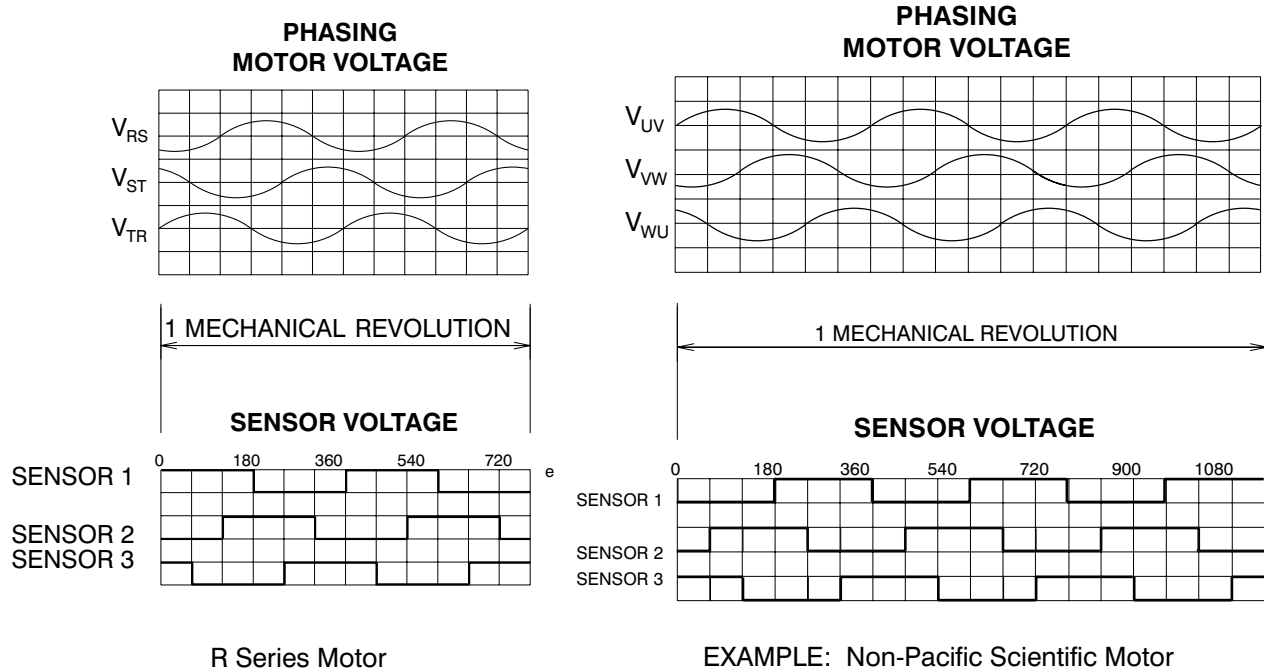
The screenshot shows a software window titled "<no name assigned yet>". The window displays configuration details for a drive and motor: Drive: 833, Motor: PMA22B, and Mode: Position Mode -- Predefined Moves. A series of tabs are visible at the top: Digital I/O, Analog I/O, Loop Gains, Position Controller, Predefined Moves, and Feedback. The Feedback tab is currently selected. In this tab, the "Commutation Source" is set to "Comcoder (Hall/Encoder)" via a dropdown menu. Below this, the "Feedback Mode" is described as "Closes position and velocity loops around the encoder". The "Encoder Line Count" is set to "1024" lines in a text input field. At the bottom of the window, there are three buttons: "<< Back", "Next >>", and "Help".

4. Download the configuration to the drive.
5. Save the configuration to Non-volatile (NV) memory.
6. The motor should now be ready to go.

Non-Pacific Scientific Motor with a Comcoder (Hall/Encoder)

The PC830 was designed to work with Hall sensors using the R, S, and PMA series motors' Hall configuration as the standard. A motor voltage phasing diagram and a Hall sensor phasing diagram for an R series motor and a non-Pacific Scientific motor are shown below. It is necessary to connect the motor power and Hall sensor feedback so that the Non-Pacific Scientific motor phasing diagrams (motor voltage phasing and Hall sensor phasing) exactly matches the R series motor phasing configuration. This section will describe in detail the necessary steps that **MUST** be performed in order to configure a Non-Pacific Scientific motor with a Comcoder (Hall/Encoder) and a PC830.

Motor Phasing Diagrams



Procedure

1. Obtain the motor voltage phasing diagram and Hall sensor phasing diagram for your specific motor.
2. Compare the motor voltage phasing sequence between the Non-Pacific Scientific motor and the R series motor voltage phasing diagram. It is necessary to have the motor voltage phasing consistent between the two motors so the proper phasing sequence can be achieved.

From the motor voltage phasing diagrams it can be seen that the following relationships will apply:

V_{RS} (R series motor) corresponds to V_{vw} (Non-PacSci motor)
 V_{ST} (R series motor) corresponds to V_{wu} (Non-PacSci motor)
 V_{TR} (R series motor) corresponds to V_{uv} (Non-PacSci motor)

**Procedure
(cont'd)**

3. Wire up the Non-Pacific Scientific motor power leads to the PC830 as follows:

R series motor	Non-Pacific Scientific motor	PC830 Wiring
V_{RS}	V_{vw}	Phase U (TB1-11)
V_{ST}	V_{wU}	Phase V (TB1-12)
V_{TR}	V_{uV}	Phase W (TB1-13)

4. Compare and match the Hall sensor phasing sequence for the Non-Pacific Scientific motor with the standard R series Hall sensor phasing sequence.

The following relationships can be seen by comparing the two Hall sensor phasing sequence diagrams:

Sensor 1 (R series motor) corresponds to Sensor 2 (Non-PacSci motor)

Sensor 2 (R series motor) corresponds to Sensor 1 (Non-PacSci motor)

Sensor 3 (R series motor) corresponds to Sensor 3 (Non-PacSci motor)

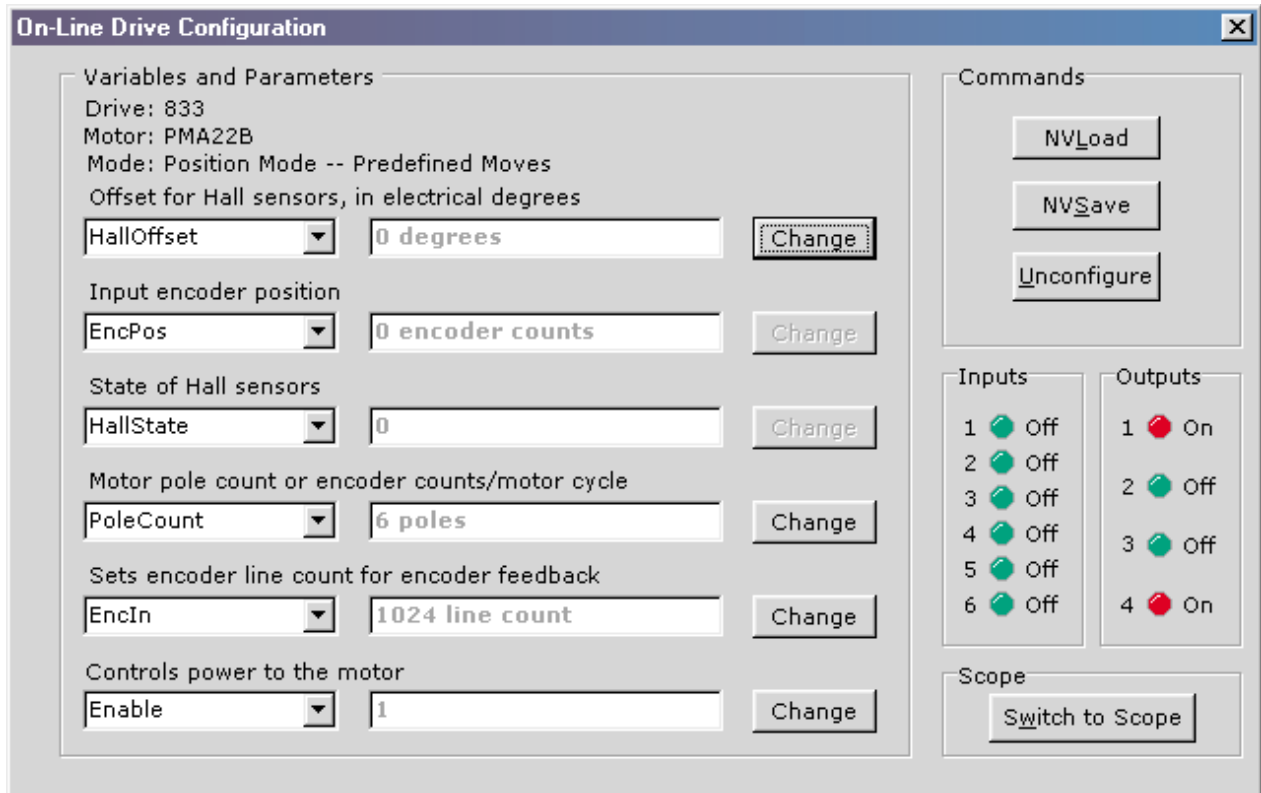
The only difference between the diagrams is the Non-Pacific Scientific motor Hall sensor phasing sequence is 60 degrees out of phase with respect to the standard R series Hall sensor phasing.

5. Wire up the Non-Pacific Scientific motor Hall sensor leads to the PC830 as follows:

R series motor	Non-Pacific Scientific motor	PC830 Wiring
Sensor 1	Sensor 2	Hall 1 (J3-1)
Sensor 2	Sensor 1	Hall 2 (J3-2)
Sensor 3	Sensor 3	Hall 3 (J3-3)

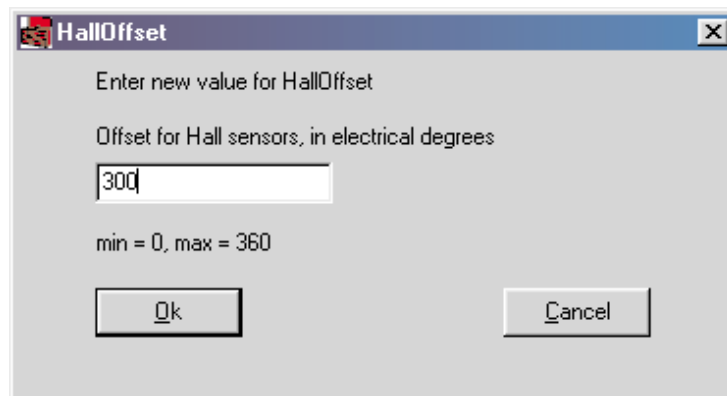
Procedure (cont'd)

- Based upon the Pacific Scientific motor that was selected in 830Tools, **HallOffset** is set to the default value of 0.



However, due to the 60 degrees phasing offset (phasing difference) between the standard R series motor Hall phasing sequence and the Non-Pacific Scientific motor Hall phasing sequence, the value of **HallOffset** must be changed.

A 60 degree phase lag (or -60 degrees phase offset) corresponds to 300 degrees. Therefore, set **HallOffset** = 300 degrees in the **Edit Drive Configuration Online** window using 830Tools.

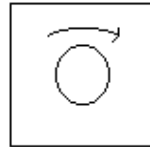


**Procedure
(cont'd)**

7. Connect the Comcoder's (Hall/Encoder's) incremental encoder leads to the PC830 as follows:

PC830	Non-Pacific Scientific Motor
J3-10	Encoder Power and/or Hall Power
J3-11	Encoder Power RTN and/or Hall Power RTN
J3-12	\bar{A}
J3-13	A
J3-14	B
J3-15	\bar{B}

8. In the **Edit Drive Configuration Online** window, poll the variables **EncPos** AND **HallState** as you rotate the motor shaft in the clockwise direction (see diagram below).



EncPos should increase as the motor is rotated in the clockwise direction. If it does not, swap incremental encoder leads A and \bar{A} and repeat the polling procedure.

HallState should repeat the following sequence (...6, 4, 5, 1, 3, 2, 6, 4, 5, ...) as the motor is rotated in the clockwise direction. If it does not, ensure that the motor power wiring AND Hall sensor wiring are correct. Restart this procedure starting from step three of this section.

9. Configure the drive/motor combination using 830Tools. Click on the **Feedback** tab and select **Comcoder (Hall/Encoder)** as the commutation source. Enter the correct incremental encoder line count.
10. Download the configuration to the drive. In the **Edit Drive Configuration Online** window enter the value determined for **HallOffset**.
11. Click on the **NVSave** button.

Note: Ensure that **PoleCount** (number of motor poles) has been properly set prior to "enabling" the motor. **PoleCount** is independent of the Comcoder (Hall/Encoder) configuration.

For additional assistance regarding Comcoder (Hall/Encoder) setup with a PC830, please contact the Applications Engineering department at Pacific Scientific.



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