8902/RE and 8902/RR Resolver Speed Feedback Options

Technical Manual

HA469251U002 Issue 1

Compatible with Version 2.x and 3.x Software

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WARRANTY

Parker SSD Drives warrants the goods against defects in design, materials and workmanship for the period of 12 months from the date of delivery on the terms detailed in Parker SSD Drives Standard Conditions of Sale IA500504.

Parker SSD Drives reserves the right to change the content and product specification without notice.

Safety Information

WARNING!
During commissioning, remove the fuses (or trip the circuit breaker) on your 3-phase supply.
Make sure the power is OFF, and that it cannot be switched on accidentally whilst you are working.

REFER TO YOUR MAIN PRODUCT MANUAL FOR SPECIFIC SAFETY INFORMATION ABOUT THE DEVICE YOU ARE CONTROLLING

IMPORTANT: Please read this information BEFORE installing the equipment.

Intended Users

This manual 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 highlight safety issues, EMC considerations, and 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.

Safety

All control and signal terminals are SELV, i.e. protected by double insulation.

EMC

In a domestic environment this product may cause radio interference in which case the user may be required to take adequate counter-measures.

This equipment contains electrostatic discharge (ESD) sensitive parts. Observe static control precautions when handling, installing and servicing this product.

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Safety Information

CAUTION!

At any time, there may be a loss of motor control and separate/independent application measures should be taken to ensure that such loss of motor control cannot present a safety hazard.

RISK ASSESSMENT

Under fault conditions, power loss or unintended operating conditions, the drive may not operate as intended. In particular:

- Stored energy might not discharge to safe levels as quickly as suggested, and can still be present even though the drive appears to be switched off
- The motor's direction of rotation might not be controlled
- The motor speed might not be controlled
- The motor might be energised

A drive is a component within a drive system that may influence its operation or effects under a fault condition. Consideration must be given to:

- Stored energy
- Supply disconnects
- Sequencing logic
- Unintended operation

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RESOLVER SPEED FEEDBACK OPTION

Description

The 8902/RE and 8902/RR Resolver Speed Feedback Options allow resolvers to be connected directly to the motor controller to provide highly accurate speed feedback measurement.

In addition, the 8902/RR provides an emulated pulse encoder output.

Features

The Option has the following features:

- Contains two differential inputs on channels Sin and Cos
- Contains a carrier output signal to power the Resolver
- 8902/RR contains three differential outputs, emulating a pulse encoder.

Part Number

The part number for the Resolver Speed Feedback Option is :

8902/RE/00/00
8902/RE/00/FF (indicates a factory-fitted Option)

8902/RR/00/00
8902/RR/00/FF (indicates a factory-fitted Option)

Used On

This Option can be used on 890 drives with the following Product Codes:

890SD/..	890SD Standalone Drive
890CD/..	890CD Common Bus Drive

Refer to the 890 Engineering Reference Manual, Appendix E for Product Code details.

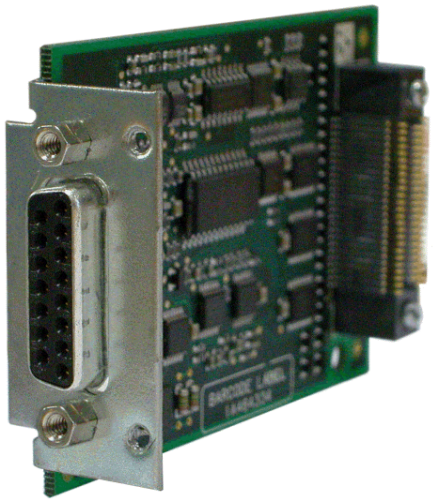


Figure 1 8902/RE Resolver Speed Feedback Option

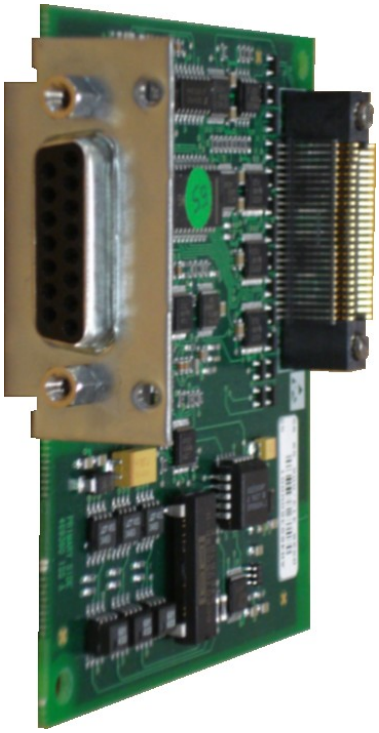


Figure 2 8902/RR Resolver Speed Feedback Option

Specifications – Resolver Interface (8902/RE and 8902/RR)

Maximum Speed	8902/RE: Up to 50,000RPM (with 2 pole resolver) 8902/RR: Up to 30,000RPM (with 2 pole resolver)
Carrier Output Signal	7Vrms, 8kHz
Maximum Carrier Supply	70mA rms
Maximum Input Voltage	±12V peak
Accuracy	< 5 minutes
Resolution	Equivalent to 16 bits per electrical revolution of resolver
Inputs	Differential inputs, Zin ~2 kΩ Maximum input voltage : 12Vpeak
Isolation	None

Specifications – Emulated Encoder (8902/RR only)

Signal amplitude	Compatible with RS422 and RS485
Outputs	3 Differential pairs
Signal nomenclature	A and B quadrature Z index pulse
Number of lines per revolution	1024
Isolation	Outputs are isolated from drive electronics

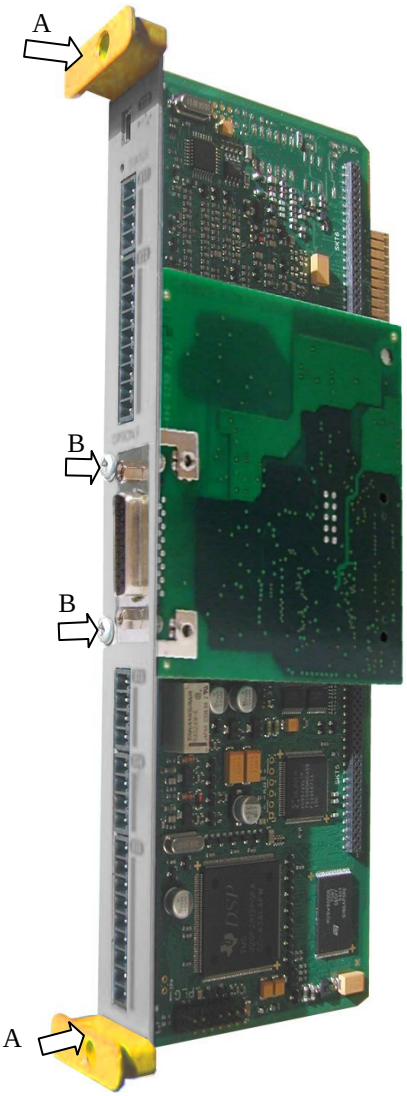
Recommended Spare Parts

We recommend that you keep one Option as a spare to reduce down-time.

Installation

Fitting the Option

If the Option is not factory-fitted, follow the procedure given below.



WARNING!
Disconnect all sources of power before attempting installation.

Caution
This Option contains ESD (Electrostatic Discharge) sensitive parts. Observe static control precautions when handling, installing and servicing this Option.

1. Undo the two screws securing Option A and Option B to the front of the drive. If Options are not fitted, completely remove the blank covers for the Option A and Option B slots.
2. Undo the screws (A) located in the top and bottom handles of the control board. Gently pull on the handles to withdraw the board from the drive, supporting any attached option boards. Note that the boards are sliding in top and bottom slots.
3. Remove any other Options that are fitted to the control board.
4. Offer up the Resolver Option through the "OPTION F" cut-out as shown opposite.
5. Fit the two locating pegs of the large connector on the rear edge of the option board into the locating holes on the control board, as shown below.
6. Fit the two screws and crinkle washers (C) at the rear edge of the Option.
   DO NOT OVERTIGHTEN.
   Tightening torque : 0.2Nm (28 oz-in).
7. Secure with the two screws (B) to the front of the control board.

   The front panel screws (B) are self-tapping and can be quite hard to turn. This turning torque must not be transferred through the option board to the control board connector. To avoid this hold the option board with one hand, while tightening the front panel screws with the other. DO NOT hold the control board while tightening these screws.
8. Refit any other Options that were removed from the control board.
9. Replace the control board (with attached Options) into the drive.
10. Tighten the Option A and Option B screws; or importantly, fit the blank covers and secure with the screws.

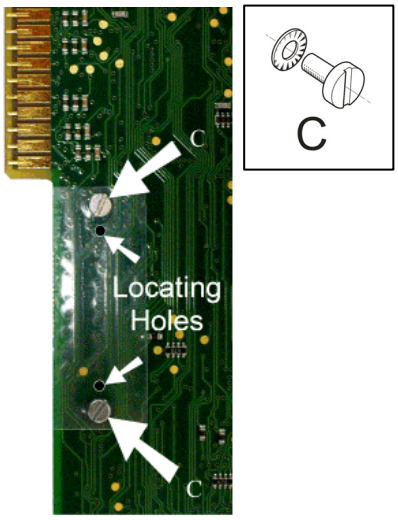


Figure 3 Rear of Control Board

Wiring the System

WARNING!
Disconnect all sources of power before attempting installation.

Caution
This Option contains ESD (Electrostatic Discharge) sensitive parts. Observe static control precautions when handling, installing and servicing this Option.

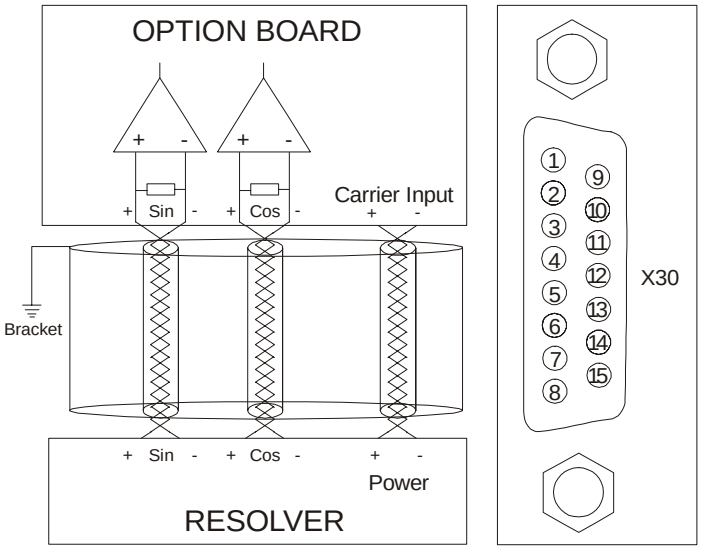
D-Type Connections

Note: *For correct operation, carrier, sine and cosine **must** be connected as specified. Poor performance/motor behaviour may occur if these signals are left unconnected or are connected incorrectly.*

Take special care wiring the resolvers to the Option due to the low level of the signals.

Ideally use twisted-pair, screened cable with an overall screen and a screen over each individual pair. It may be possible to use a cable with just a screen over each individual pair. The signal pairs should have characteristic impedance of 120Ω. To ensure compliance with the EMC Directive the overall cable screen should be connected to the connector body and to the cable clamp. Connect overall screen and individual screens together, on each side of the cable.

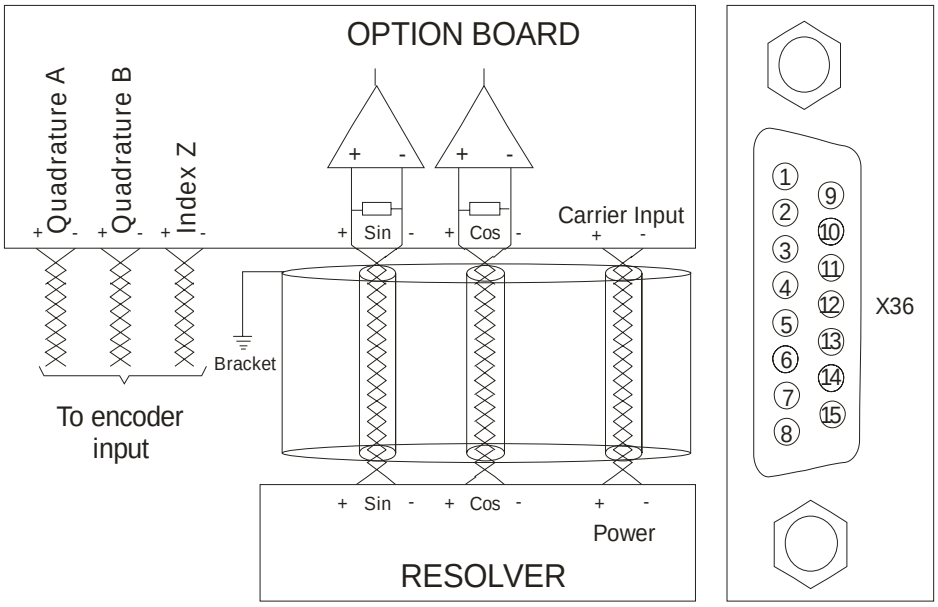
Use the resolver manufacturer's recommended cable.



X30 Terminal:

1 Sin+ input
2 not connected
3 Cos+ input
4 not connected
5 not connected
6 not connected
7 not connected
8 + carrier input, reference voltage
9 Sin- input
10 not connected
11 Cos- input
12 not connected
13 not connected
14 not connected
15 - carrier input, reference voltage

Figure 4 Wiring Diagram 8902/RE

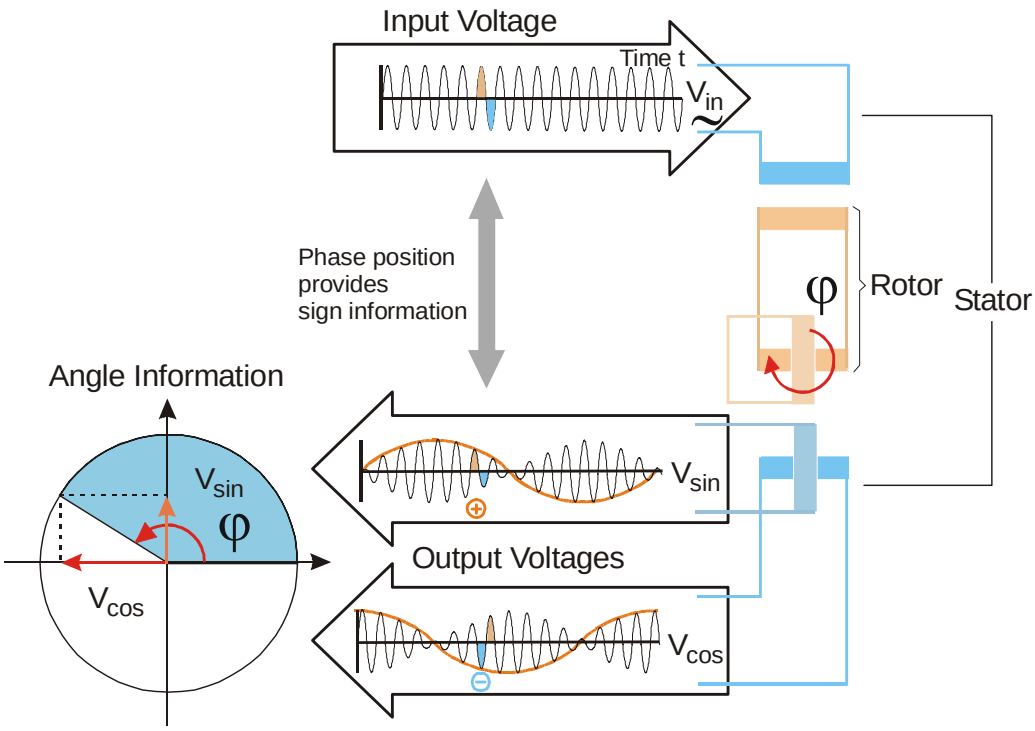


X36 Terminal:

1 Sin+ input
2 not connected
3 Cos+ input
4 Index Z+ output
5 Quadrature A+ output
6 Quadrature B+ output
7 not connected
8 + carrier input, reference voltage
9 Sin- input
10 not connected
11 Cos- input
12 Index Z- output
13 Quadrature A- output
14 Quadrature B- output
15 - carrier input, reference voltage

Figure 5 Wiring Diagram 8902/RR

Resolver Diagram



COSINE input : Vcos = V(S1-S3) = V(R1-R2) x TR x cosθ

SINE input : Vsin = V(S2-S4) = V(R1-R2) x TR x sinθ

With : Vin = V(R1-R2) : carrier signal (reference voltage)

TR = transformation ratio

φ = position

Approved Resolvers

Parker SSD Drives approve the following Resolvers for use with the 8902/RE Speed Feedback Option.

Tamagawa TS2610N71E64

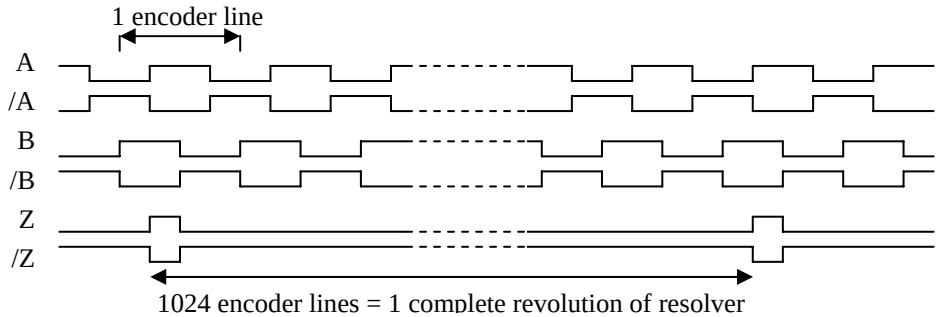
Tamagawa TS2620N701E11

Tamagawa TS2620N861E11

Tamagawa TS2640N821E64

Encoder Emulation

Encoder emulation creates three differential pairs, A, B and Z. These emulate a 1024 line encoder rotating at the same speed and direction as the resolver. Clockwise rotation of the encoder shaft normally causes channel A to lead channel B, but this could reverse depending on the resolver wiring.



Configuring the 890 Drive

Note: *The DSE 890 Configuration Tool is Parker SSD Drives' Windows-based block programming software and is supplied with each drive.*

Use the DSE 890 Configuration Tool to configure the RESOLVER function block, as detailed below.

You will require a PMAC (Permanent Magnet AC) Configuration when using DSE 890: create a "New Configuration" in DSE 890 and select "890 Permanent Magnet AC" in the dialog box. Double-click on the MOTOR CONTROL function block in the new configuration to display the RESOLVER function block.

DSE 890 offers a "Motor Wizard" to quickly enter parameter information into the RESOLVER function block: from the menu at the top of the screen select Edit → Motor Wizard. In the pop-up dialog box you can now select the motor and resolver from the drop-down lists.

Alternatively, you can enter parameter information directly into the RESOLVER function block. The parameters are described below.

RESOLVER Function Block

SETUP::MOTOR CONTROL::RESOLVER

This block allows Speed Feedback to be measured using a resolver.

Note: *Only parameters relevant to the Resolver are described below.*

Parameter Descriptions

NAME *Range:*

Resolver name/designation

POLES *Range: 2 to 20*

Number of resolver poles. In case of multi-pair poles resolver, the resolution of the resolver option is multiplied by the number of pair poles.

RATIO *Range: 0.2 to 1.0*

Transformation ratio of the resolver

SPEED MAX *Range: 0 to 2^{31} (user units)*

Mechanical maximum speed supported by the resolver.

ACCURACY *Range: 0 to 60.0 minutes*

This parameter represents the nominal accuracy of the resolver. (This information is only informative and could be left unspecified).

CARRIER VOLTAGE *Range: 5.0 to 10.0 Vrms*

This parameter represents the nominal carrier voltage for the resolver. (This information is only informative and could be left unspecified).

CURRENT *Range: 0.0 to 70mA rms*

This information represents the nominal current needed to run the resolver. (This information is only informative and could be left unspecified).

INERTIA *Range: 10.0 to 100000 Kgcm²*

This information represents the resolver rotor inertia. (This information is only informative and could be left unspecified).

Parameter Descriptions

TRIP

Range: FALSE-TRUE

This information gives the resolver processing state :

- TRUE : the drive has tripped. Verify the connection of the resolver.
- FALSE : the system is able to run. The position and speed information are available.

POSITION SET UP

Range : - 180° to 180°

Relative position between the position 0 degree from the resolver and the Parvex convention for the motor phasing.

Refer to "Motor Phasing" below.

INIT DONE

Range: FALSE-TRUE

This information gives the resolver processing init state :

- TRUE : the resolver processing is running, the init state is completed and the speed and position information are normally available
- FALSE : the initialisation phase is on-going. Position and speed information are not available.

The initialisation phase could be viewed :

- at power on,
- after a trip and reset action.

REVERSE CNT DIR

Range: FALSE-TRUE

This input allows you to reverse the counting direction of the resolver feedback.

FALSE : counting direction is positive when the motor spins in a clockwise direction, looking to the front shaft of the motor

TRUE : counting direction is negative when the motor spins in a clockwise direction, looking to the front shaft of the motor

SPEED FILTER

Range : 10.0 to 1000.0 Hz

This input allows you to select the cutting frequency of the first order low pass filter applied to the resolver speed output.

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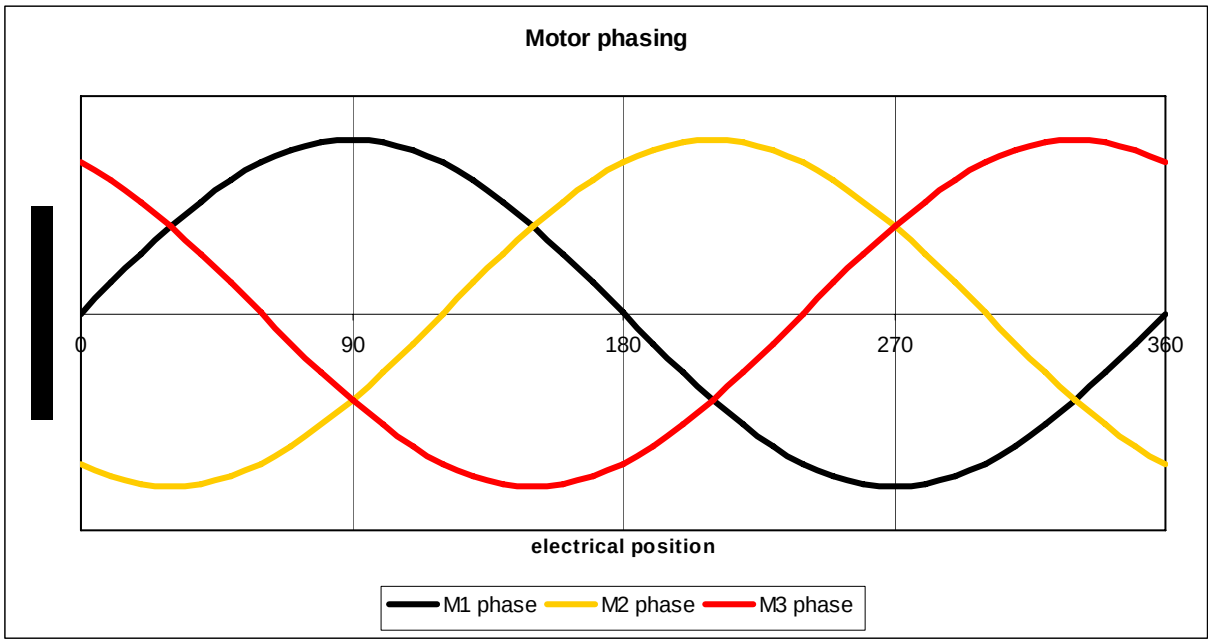
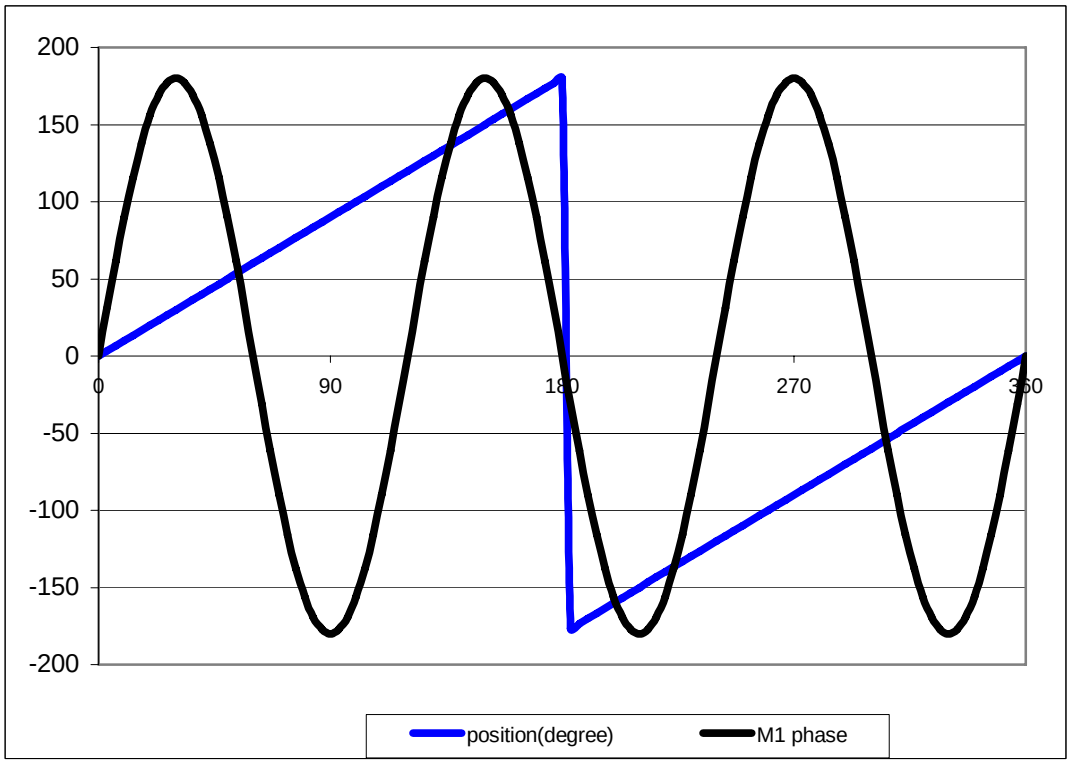
Motor Phasing

The control of PMAC brushless motors is allowed if the relative position between the stator and the rotor is well known. The resolver must be set up to define the relative position between the resolver and the 3 motor phases. For the 890 drive, the convention is as follows :

- when the motor runs in a clockwise direction, looking to the front shaft of the motor, the 3 successive phases are M1, M2 and M3 as shown below.



- The resolver must be adjusted in a way to give a position of 0 degrees when the M1 motor phase crosses the 0 Volt line in a rising variation. For example, a 6 pole motor associated with a 2 pole resolver will give the following curves:



ISS.	MODIFICATION	ECN No.	DATE	DRAWN	CHK'D
1	Add support for 8902/RR	17852	27/08/09	AFL	

FIRST USED ON	MODIFICATION RECORD 8902/RE and 8902/RR Resolver Speed Feedback Options	
Parker	DRAWING NUMBER ZZ469251C002	SHT. 1 OF 1