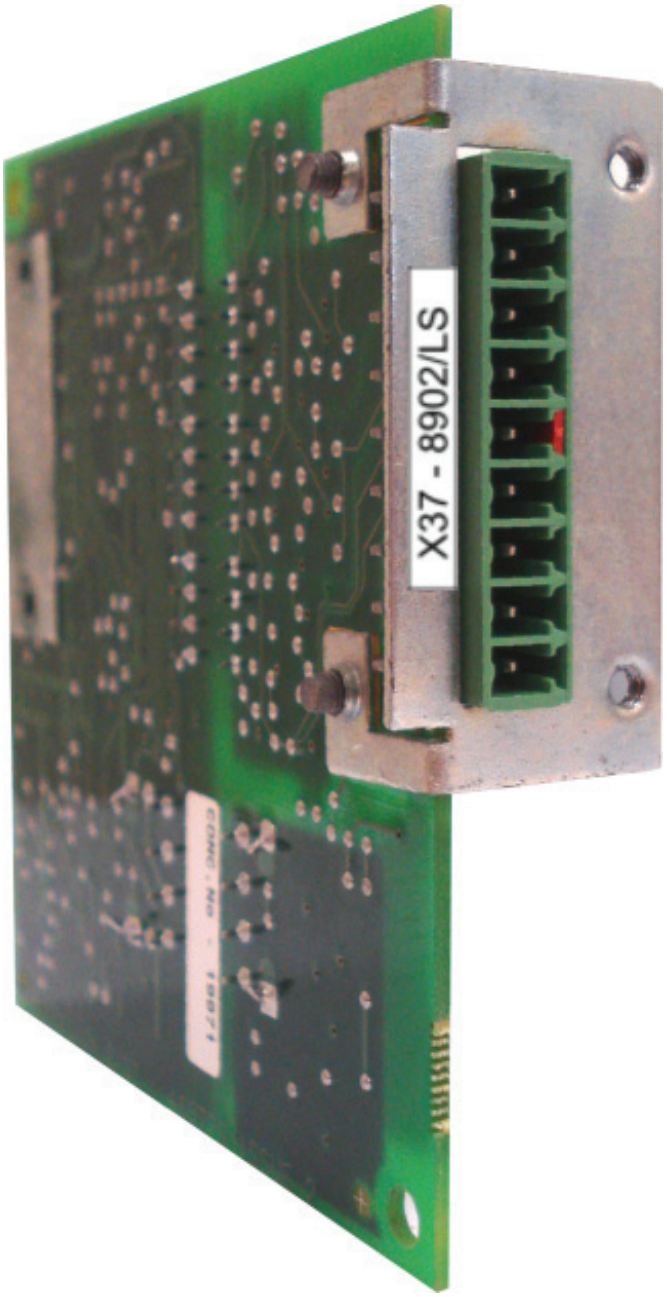

8902/LS

Line Synchronization Option

HA471892U001 Issue 3
Technical Manual

aerospace
climate control
electromechanical
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ENGINEERING YOUR SUCCESS.

8902/LS
Line Synchronization Option

Technical Manual

HA471892U001 Issue 3

Compatible with 890 Version 3.3 + Firmware

WARRANTY

Parker Hannifin Ltd., Automation Group, SSD Drives Europe, warrants the goods against defects in design, materials and workmanship for the period of 24 months from the date of manufacture, or 12 months from the date of delivery (whichever is the longer period) on the terms detailed in Parker SSD Drives Standard Conditions of Sale IA500504.

Parker Hannifin Ltd., Automation Group, SSD Drives Europe reserves the right to change the content and product specification without notice.

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker-Hannifin Corporation, its subsidiaries and authorized distributors provide product or system options for further investigation by users having technical expertise.

The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.

To the extent that Parker or its subsidiaries or authorized distributors provide component or system options based upon data or specifications provided by the user, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the components or systems.

Cont.2

Safety Information

Requirements

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.

Complete the following table for future reference detailing how the unit is to be installed and used.

INSTALLATION DETAILS	
Model Number *(see product label)*	
Where installed *(for your own information)*	
Unit used as a: *(refer to Certification for the Inverter)*	☐ Component ☐ Relevant Apparatus
Unit fitted:	☐ Wall-mounted ☐ Enclosure

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.

Product Warnings

 **Caution** Risk of electric shock	 **Caution** Refer to documentation	 **Earth/Ground** Protective Conductor Terminal

Cont.3

Safety Information

Hazards

DANGER! - Ignoring the following may result in injury

1. This equipment can endanger life by exposure to rotating machinery and high voltages.
2. The equipment must be permanently earthed due to the high earth leakage current, and the drive motor must be connected to an appropriate safety earth.
3. Ensure all incoming supplies are isolated before working on the equipment. Be aware that there may be more than one supply connection to the drive.
4. There may still be dangerous voltages present at power terminals (motor output, supply input phases, DC bus and the brake, where fitted) when the motor is at standstill or is stopped.
5. For measurements use only a meter to IEC 61010 (CAT III or higher). Always begin using the highest range.
   CAT I and CAT II meters must not be used on this product.
6. Allow at least 5 minutes for the drive's capacitors to discharge to safe voltage levels (<50V). Use the specified meter capable of measuring up to 1000V dc & ac rms to confirm that less than 50V is present between all power terminals and earth.
7. Unless otherwise stated, this product must NOT be dismantled. In the event of a fault the drive must be returned. Refer to "Routine Maintenance and Repair".

WARNING! - Ignoring the following may result in injury or damage to equipment

SAFETY

Where there is conflict between EMC and Safety requirements, personnel safety shall always take precedence.

- Never perform high voltage resistance checks on the wiring without first disconnecting the drive from the circuit being tested.
- Whilst ensuring ventilation is sufficient, provide guarding and /or additional safety systems to prevent injury or damage to equipment.
- When replacing a drive in an application and before returning to use, it is essential that all user defined parameters for the product's operation are correctly installed.
- All control and signal terminals are SELV, i.e. protected by double insulation. Ensure all external wiring is rated for the highest system voltage.
- Thermal sensors contained within the motor must have at least basic insulation.
- All exposed metalwork in the Inverter is protected by basic insulation and bonded to a safety earth.
- RCDs are not recommended for use with this product but, where their use is mandatory, only Type B RCDs should be used.

EMC

- In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.
- This equipment contains electrostatic discharge (ESD) sensitive parts. Observe static control precautions when handling, installing and servicing this product.
- This is a product of the restricted sales distribution class according to IEC 61800-3. It is designated as "professional equipment" as defined in EN61000-3-2. Permission of the supply authority shall be obtained before connection to the low voltage supply.

CAUTION!

APPLICATION RISK

- The specifications, processes and circuitry described herein are for guidance only and may need to be adapted to the user's specific application. We can not guarantee the suitability of the equipment described in this Manual for individual applications.

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

Cont.4

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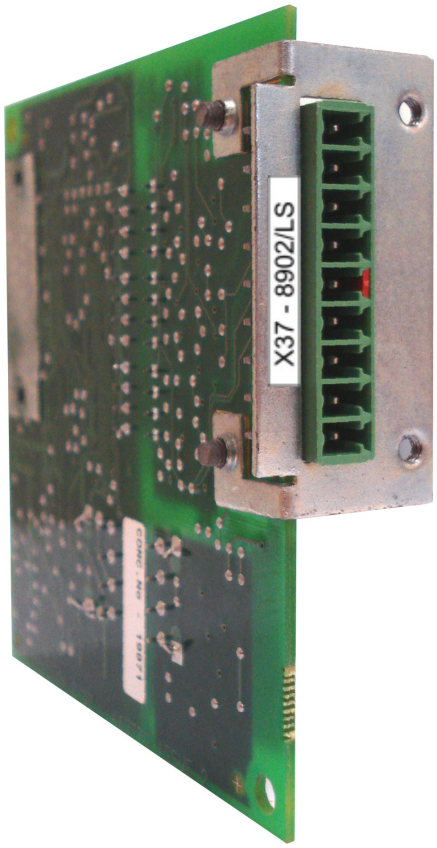
LINE SYNCHRONIZATION OPTION

Description

The Line Synchronization Option allows the 890 Active Front-End (AFE) to monitor the three-phase supply voltage waveform and synchronize the IGBT firing to supply grid frequency and phase rotation. Once synchronized, the AFE acts as a four-quadrant, sinusoidal, power factor controlled power supply.



Features

- The attenuator module provides a means to drop the line voltage to SELV levels.
- Its output has two components, coding (supply phase zero crossing) and rotation (supply phase rotation), which are sent to the 8902-LS-00 feedback card
- Enables the 890 AFE to execute power factor and VAR control.

Part Number

The part number for the Line Synchronization Option 8902-LS-00 attenuator module part number is LA471892U001.

Used On

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

890SD/..	890SD Standalone Drive
890CD/..	890CD Common Bus Drive
890PX/..	890PX high power drive

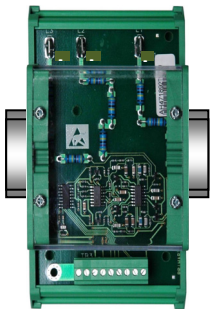
Refer to the 890 Engineering Reference Manual, Appendix E for Product Code details.

Recommended Spare Parts

We recommend that you keep one option as a spare to reduce downtime.

2
Installation

Fitting the LA471892U001 Attenuator module



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.

Snap the attenuator module on to a DIN rail near the 890 drive, to be used as the AFE.

DIP Switch Settings on 8902-LS-00

The switch settings control the following inputs:

Input Threshold				
Switch Number	1	2	3	4
Input Controlled	A	B	M	not used
3V±1	On	On	On	On
8V±1	Off	Off	Off	Off

Set all switches to the ON position (3V).

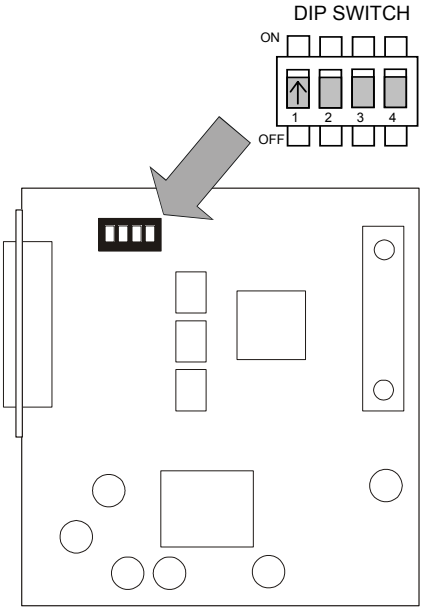


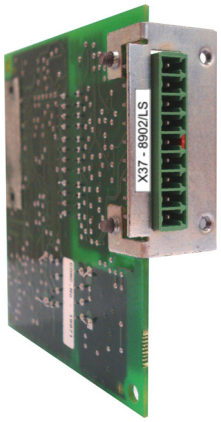
Figure 1 Option board showing DIP Switch location

Fitting the 8902-LS-00

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. Set DIP switches to ON position before fitting the board. See previous section for details.
2. 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.
3. Undo the captive 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.
4. If fitted, remove Option A and/or B boards that are mounted on the control board by separating the connector at the rear of the option board from the control board.
5. Offer up the 8902-LS-00 through the "OPTION F" cutout as shown opposite. 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 opposite.

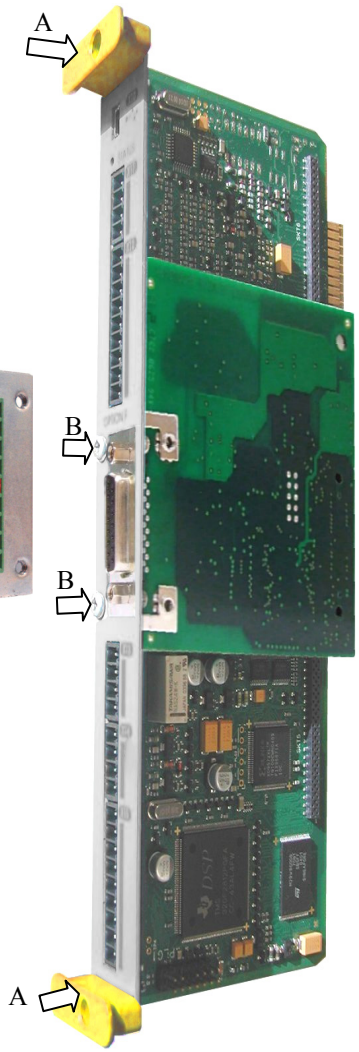


Figure 2 Control board showing Option correctly

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 Options A and B: Press the assembly into the connector on the Control Board. Ensure that the front panel of the TechCard overlaps the front of the Control Board. Ease the connector at the TechCard so that the two PCB's are parallel when viewed on edge.
9. Replace the control board (with attached options) into the drive. Tighten screws (A).
10. Tighten the Option A and Option B screws; or importantly, fit the blank covers and secure with the screws.

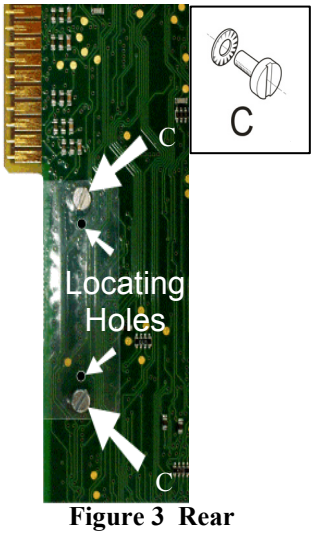


Figure 3 Rear of Control

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.

Connections

1. Connect L1 (U) of power phase to tab L1 (U) on the attenuator board, and repeat for L2 (V) and L3 (W). It is imperative that the phases are not swapped while wiring this portion.

   If an LCL filter is present, tap the power from the line side of the filter.

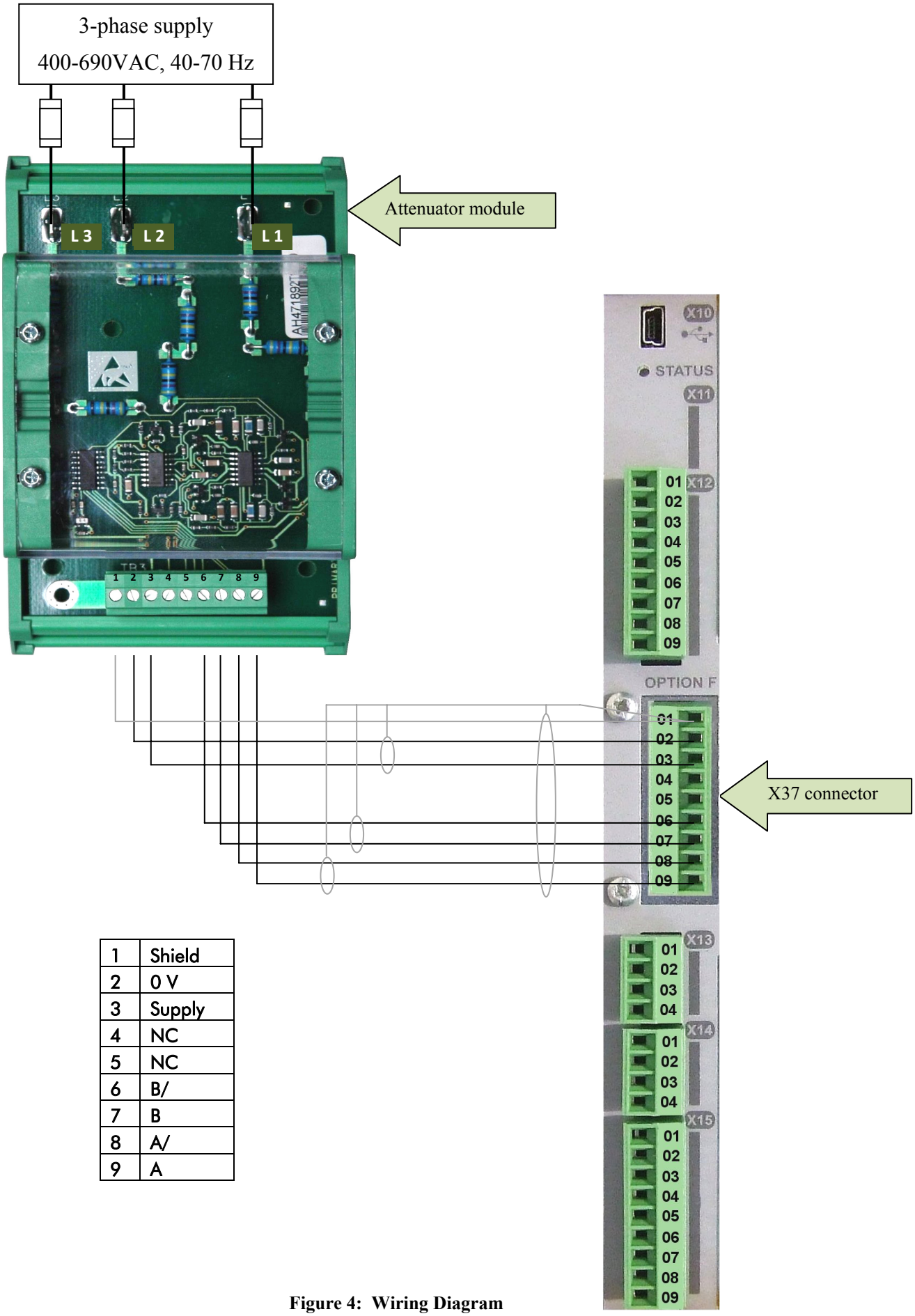
   Use the thinnest gauge power wiring allowed by local code, to bring 3-phase power into the attenuator module. Ensure that the voltage rating of the insulation exceeds the voltage of the supply. The input of the attenuator board needs to be protected by some fuses

2. Run a 3 twisted pair screened cable (such as an encoder cable) between the attenuator module and the 8902-LS-00 card fitted in the drive. See figure 4 on the next page.

   Use twisted-pair, screened cable, preferably with an overall screen and a screen over each individual pair.

   Recommended cable:

   Three pairs individually screened, plus overall screen, characteristic impedance 100 to 120Ω, e.g. Belden 8163



1	Shield
2	0 V
3	Supply
4	NC
5	NC
6	B/
7	B
8	A/
9	A

Figure 4: Wiring Diagram

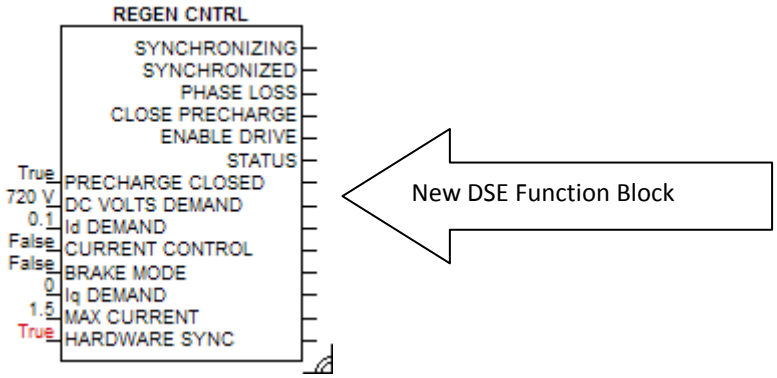
Configuring the 890 AFE

Use the DSE (Lite) Configuration Tool to configure the drive.

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

Under **File/New/890/v3**, select the **v3_AFE.890** template. Install it in the drive. For detailed instructions on operating DSE Lite, please see its product manual.

In **SETUP::MOTOR CONTROL::REGEN CONTROL,** set "**Hardware Sync**" to TRUE



The drive should now be set up to operate a standard 890AFE. Consult the 890 Engineering Reference Manual, Chapter 8 for details.

You need to set the control mode to 4Q Regen, set up the motor data block with the correct voltage, current and leakage inductance and disable the EMC Y capacitor (frame B to D). However, all this is covered in the 890 Engineering Reference Manual.

Using the keypad:
Regen Control Function Block

SETUP::MOTOR CONTROL::REGEN CONTROL

This block sets up the drive in the AFE mode.

Please refer to the 890 Engineering Reference Manual, Appendix D Programming.

Save the Application

Remember to save your new configuration in DSE 890 and install it in the drive. In DSE 890, select "Command→Install At Selected" to install the currently opened configuration into a drive.

Specifications

Input Voltage (Attenuator)	400 to 690VAC ± 10%
Input Frequency	40 to 70 Hz
Input Voltage Range (8902-LS)	±30V (differential)
Terminal Wire Size (maximum)	16 AWG
Terminal Tightening Torque	0.22 - 0.25Nm (1.9 - 2.2 pound-inches)

Environmental Details		
Operating Temperature	Operating temperature is defined as the ambient temperature to the immediate surround of the drive and line synchronization attenuator. 0°C to 45°C	
Storage Temperature	-25°C to +55°C	
Shipping Temperature	-25°C to +70 °C	
Product Enclosure Rating	Line synchronization attenuator	IP20 UL (c-UL) Open Type (North America/Canada)
Humidity	Maximum 85% relative humidity at 40°C non-condensing	
Atmosphere	Non flammable, non corrosive and dust free	
Climatic Conditions	Class 3k3, as defined by EN61800-5-1 (2007)	
Vibration	Test Fc of EN60068-2-6 10Hz<=f<=57Hz sinusoidal 0.075mm amplitude 57Hz<=f<=150Hz sinusoidal 1g 10 sweep cycles per axis on each of three mutually perpendicular axis	
Safety Overvoltage Category	Overvoltage Category III (numeral defining an impulse withstand level)	
Pollution Degree	Pollution Degree II (non-conductive pollution, except for temporary condensation) Pollution Degree III (dirty air rating for through-panel mounted parts)	

Cabling Requirements		
	Supply Cable	Signal/Control Cable
Cable Type (for EMC Compliance)	Unscreened	Screened
Segregation	From all other wiring (clean)	From all other wiring (sensitive)
Length Limitations	?	25 metres
Screen to Earth Connection		Drive end only

8
Disposal

This product contains materials which are consignable waste under the Special Waste Regulations 1996 which complies with the EC Hazardous Waste Directive - Directive 91/689/EEC.

We recommend you dispose of the appropriate materials in accordance with the valid environmental control laws. The following table shows which materials can be recycled and which have to be disposed of in a special way.

Material	Recycle	Disposal
metal	yes	No
plastics material	yes	No
printed circuit board	no	yes

The printed circuit board should be disposed of in one of two ways:

1. High temperature incineration (minimum temperature 1200°C) by an incinerator authorised under parts A or B of the Environmental Protection Act
2. Disposal in an engineered land fill site that is licensed to take aluminium electrolytic capacitors. Do not dispose of in a land fill site set aside for domestic waste.

Packaging

During transport our products are protected by suitable packaging. This is entirely environmentally compatible and should be taken for central disposal as secondary raw material.

Requirements for UL Compliance

Recommended Branch Circuit Protection

It is recommended that UL Listed (JDDZ) non-renewable cartridge fuses, Class K5 or H; or UL Listed (JDRX) renewable cartridge fuses, Class H, are installed upstream of the drive.

Field Wiring Temperature Rating

Use 75°C Copper conductors only.

Field Wiring Terminal Markings

For correct field wiring connections that are to be made to each terminal refer to page 4.

Terminal Tightening Torques

For correct terminal tightening torques refer to page 3 for the Line Synchronization Attenuator and page 2 for the 8902-LS-00 installation.

Recommended Wire Sizes

North American wire sizes (AWG) are based on NEC/NFPA-70 for ampacities of thermoplastic-insulated (75ºC) copper conductors assuming not more than three current-carrying conductors in raceway or cable, based on ambient temperature of 30ºC.
The wire sizes allow for an ampacity of 125% of the rated input and output amperes for motor branch-circuit conductors as specified in NEC/NFPA-70.

European Directives and the CE Mark

The following information is supplied to provide a basic understanding of the EMC and low voltage directives CE marking requirements. The following literature is recommended for further information:

- *Recommendations for Application of Power Drive Systems (PDS), European Council Directives - CE Marking and Technical Standardisation* - (CEMEP)

  Available from your local trade association or Parker SSD Drives office

The European machines and drives manufacturers via their national trade associations have formed the European Committee of Manufacturers of Electrical Machines and Power Electronics (CEMEP). Parker SSD Drives and other major European drives manufacturers are working to the CEMEP recommendations on CE marking. The CE mark shows that a product complies with the relevant EU directives, in our case the Low Voltage Directive and, in some instances, the EMC Directive.

CE Marking for Low Voltage Directive

When installed in accordance with this manual, the Line Synchronization Attenuator is CE marked by Parker SSD Drives in accordance with the low voltage directive (S.I. No. 3260 implements this LVD directive into UK law). An EC Declaration of Conformity (low voltage directive) is included at the end of this chapter.

CE Marking for EMC - Who is Responsible?

Note: *The specified EMC emission and immunity performance of this unit can only be achieved when the unit is installed to the EMC Installation Instructions given in this manual.*

According to S.I. No. 2373 which implements the EMC directive into UK law, the requirement for CE marking this unit falls into two categories:

1. Where the supplied unit has an intrinsic/direct function to the end user, then the unit is classed as ***relevant apparatus***.
2. Where the supplied unit is incorporated into a higher system/apparatus or machine which includes (at least) the motor, cable and a driven load but is unable to function without this unit, then the unit is classed as a ***component***.

Legal Requirements for CE Marking

IMPORTANT: Before installation, clearly understand who is responsible for conformance with the EMC directive. Misappropriation of the CE mark is a criminal offence.

It is important that you have now defined who is responsible for conforming to the EMC directive, either:

Parker SSD Drives Responsibility
You intend to use the unit as *relevant apparatus.*

When this option is correctly fitted to the VSD following EMC installation instructions, it complies with the relevant standards indicated in the following tables.

The relevant declarations are to be found at the end of this chapter. The CE mark is displayed on the EC Declaration of Conformity (EMC Directive) provided at the end of this chapter.

Customer Responsibility
You intend to use the unit as a *component,* therefore you have a choice:

To fit this option as specified following EMC installation instructions to gain EMC compliance for the final machine/system.

Note: *When two or more EMC compliant components are combined to form the final machine/system, the resulting machine/system may no longer be compliant, (emissions tend to be additive, immunity is determined by the least immune component). Understand the EMC environment and applicable standards to keep additional compliance costs to a minimum.*

Applying for CE Marking for EMC

We have supplied a Manufacturer's EMC Declaration at the end of this chapter that you can use as a basis for your own justification of overall compliance with the EMC directive. There are three methods of demonstrating conformity:

1. Self-certification to a relevant standard
2. Third party testing to a relevant standard
3. Writing a technical construction file stating the technical rationale as to why your final machine/system is compliant. An EMC "competent body" must then assess this and issue a technical report or certificate to demonstrate compliance.
   Refer to EMC Directive 2004/108/EC.

With EMC compliance, an EC Declaration of Conformity and the CE mark will be issued for your final machine/system.

IMPORTANT: Professional end users with EMC expertise who are using drive modules and cubicle systems defined as components who supply, place on the market or install the relevant apparatus must take responsibility for demonstrating EMC conformance and applying the CE mark and issuing an EC Declaration of Conformity.

Which Standards Apply?

Power Drive Product Specific

The standards that may apply to this unit come under two broad categories:

1. Emission - these standards limit the interference caused by operating (this) drive module.
2. Immunity - these standards limit the effect of interference (on this unit) from other electrical and electronic apparatus.

Conformance can be demonstrated using the Product Specific Standard.

Certificates

LINE SYNCHRONIZATION ATTENUATOR

EC DECLARATIONS OF CONFORMITY

Date CE marked first applied: 01.04.2000

Issued for compliance with the EMC Directive when the unit is used as *relevant apparatus*.

EMC Directive

In accordance with the EEC Directive

2004/108/EC

We Parker SSD Drives, address as below, declare under our sole responsibility that the above Electronic Products when installed and operated with reference to the instructions in the Product Manual (provided with each piece of equipment) is in accordance with the relevant clauses from the following standard:-

* BSEN61800-3 (2004)

Low Voltage Directive

In accordance with the EEC Directive

2006/95/EC

We Parker SSD Drives, address as below, declare under our sole responsibility that the above Electronic Products when installed and operated with reference to the instructions in the Product Manual (provided with each piece of equipment), is in accordance with the relevant clauses from the following standard :-

EN61800-5-1:2007

The drive is CE marked in accordance with the low voltage directive for electrical equipment and appliances in the voltage range when installed correctly.

MANUFACTURERS DECLARATIONS

This is provided to aid your justification for EMC compliance when the unit is used as a *component.*

EMC Declaration

We Parker SSD Drives, address as below, declare under our sole responsibility that the above Electronic Products when installed and operated with reference to the instructions in the Product Manual (provided with each piece of equipment) is in accordance with the relevant clauses from the following standard:-

* BSEN61800-3 (2004)

Machinery Directive

The above Electronic Products are components to be incorporated into machinery and may not be operated alone. The complete machinery or installation using this equipment may only be put into service when the safety considerations of the Directive 2006/42/EC are fully adhered to. Particular reference should be made to EN60204-1 (Safety of Machinery - Electrical Equipment of Machines). All instructions, warnings and safety information of the Product Manual must be adhered to.

Since the potential hazards are mainly electrical rather than mechanical, the drive does not fall under the machinery directive. However, we do supply a manufacturer's declaration for when the drive is used (as a *component*) in machinery.

Dr Martin Payn (Conformance Officer)

* *Compliant with the immunity requirements of the Standard without specified EMC filters.*

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HA471892U001 03

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05/03/09

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