Copley Serial Resolver CSR

RESOLVER TO DIGITAL CONVERTER

Features

- Small Form Factor
- Easy Integration
- High Speed
- High Resolution
- Loss Detection
- Absolute Single-turn Resolver Cycle
- Conforms to Ruggedized Standards

Inputs

- Resolver
- Motor Temperature Sensor
- Halls for Pass-through
- Shield

Outputs

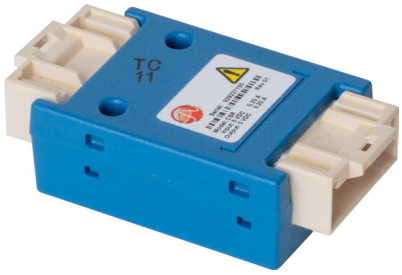
- Clock and Data
- Motor Temp
- Halls
- Shield

Compatible Drives

- Any Copley Controls drive that supports serial encoders
- Xenus XTL, XSJ, and Rugged Xenus R10, R11
- Accelnet® ADP, ACJ, and Rugged Accelnet R20, R21
- 1-Axis Plus Drives (B*L, X*L)

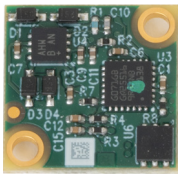
Dimensions:

- CSR: 1.93 x 1.0 x 0.54 in [49.1 x 25.5 x 13.7 mm]
- CSR-MOD: 0.59 x 0.59 x 0.16 in [15 x 15 x 4.12 mm]



CSR

Model	Application
CSR	Panel Drives



CSR-MOD

Model	Application
CSR-MOD	Module Drives

Description

The Copley Serial Resolver (CSR) is an adapter that uses Clock and Data signals to enable non-resolver drives to interface with resolver feedback. The CSR is available for use with ARM and FPGA-based drives that provide support for serial encoders like BiSS and SSI. The adapter comes in two small easy to integrate form factors. The CSR features connectors that simplify the component connections to the Copley Drives and Resolver feedback.

Optional cable assemblies enable quick and easy migration from legacy Copley Resolver Drives. The CSR includes fully conformally coated PCB's to enable operation in even the harshest environments. Similarly, the CSR-MOD is a conformally coated module. It is designed to be mounted on the OEM mounting boards where the Copley modules are used.

GENERAL SPECIFICATIONS

MODEL	CSR	CSR-MOD	Units
INPUT POWER			
5 V	+/- 5%	+/- 5%	Tolerance
No load Current	<50 mArms	<50 mArms	Quiescent
Input Current	250 mArms	250 mArms	Maximum
Input Power	< 1 W	< 1 W	Watts
OUTPUTS			
Serial Position	Clock & Data		
Pass-Through	Halls and Motor Temp		
RESOLVER			
Type	Brushless, single-speed, 1:1 to 2:1 transformation ratio		
Resolution	Resolution to 16 bits (65,536 counts/rev or another count/rev for example, 16384, 8192, 4096)		
Excitation Frequency	8.0 kHz		
Reference Voltage	2.8 Vrms		
Reference	Maximum current 100 mArms, Maximum RPM 25 krpm		
MECHANICAL & ENVIRONMENTAL			
Size	CSR:	1.93 x 1.0 x 0.54 in [49.1 x 25.5 x 13.7 mm]	
	CSR-MOD:	0.59 x 0.59 x 0.16 in [15 x 15 x 4.12 mm]	
Weight	CSR:	0.55 oz [15.6 gm], CSR-MOD: 0.12 oz [3.4 gm]	
Ambient Temperature	Non-Operating:	-50ºC to 85ºC	
	Operating:	-40ºC to 70ºC	
Thermal Shock	Operating:	-40ºC to 70ºC in 1 minute	
Relative Humidity	Non-Operating:	95% non-condensing at 70ºC	
	Operating:	95% non-condensing at 70ºC	
Vibration	Operating:	5 Hz to 500 Hz, up to 3.85 *g*rms	
Altitude	Non-Operating:	-400 m to 12,200 m	
	Operating:	-400 m to 5,000 m	
Shock	Crash Safety:	75 *g* peak acceleration	
	Operating:	40 *g* peak acceleration	
MIL-STD Specifications	MIL-STD-	810	
Contaminants	Pollution Degree 2 per IEC 60664-1		

*Note: For shock and vibration testing, the CSR unit was fastened to the test apparatus with M2 screws and secured into its mounting holes. For harsh environments, use the appropriate hardware to secure the unit.

AGENCY STANDARDS CONFORMANCE

Standards and Directives

Product Safety

Directive 2014/35/EU (Low Voltage)

IEC 61800-5-1

EMC

Directive 2014/30/EU (EMC)

IEC 61800-3

Approvals

UL and cUL recognized components to:

UL 61800-5-1, E522139

IEC 61800-5-1

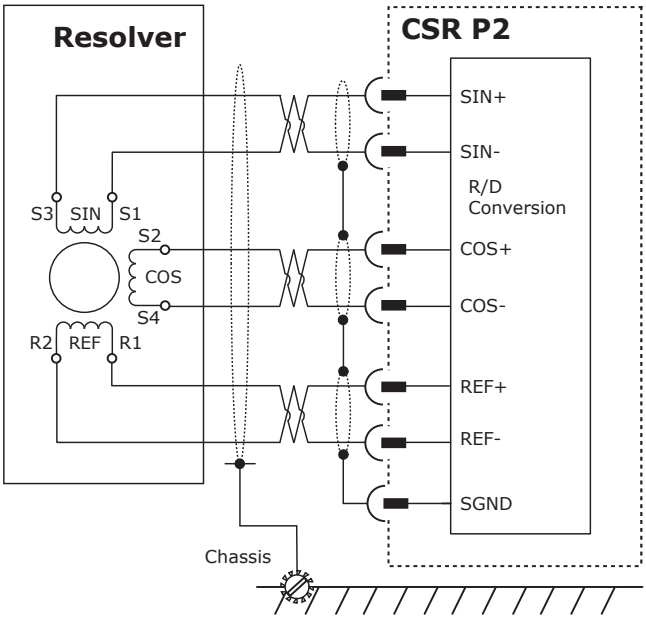
RoHS Directive 2011/65/EU and amendment 2015/863 is now part of the CE marking procedure.

RESOLVER CONNECTIONS

RESOLVER

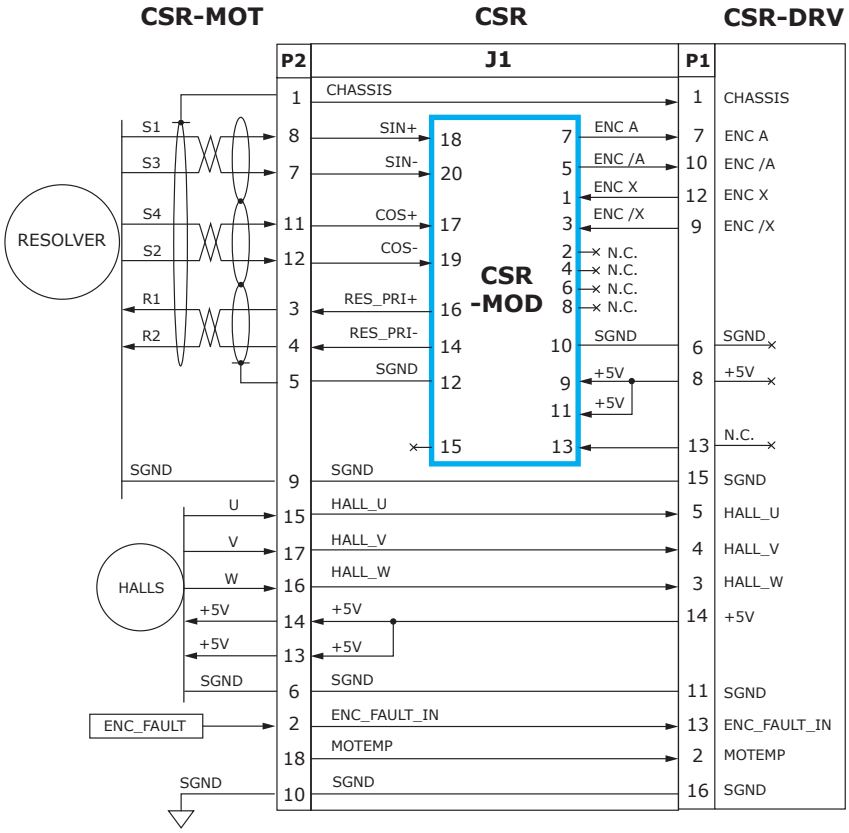
The connections to the resolver are assembled with shielded cable that use three twisted-pair wires. Once the resolver is connected to the CSR, use the CME software to configure the resolver set up, motor phasing, and other commissioning adjustments.

There are no hardware adjustments. The following diagram shows the resolver motor connections to the CSR.



Resolver Connections Diagram

The following diagram shows all the connections from the motor resolver to the drive using the cables shown on pages 7~10.

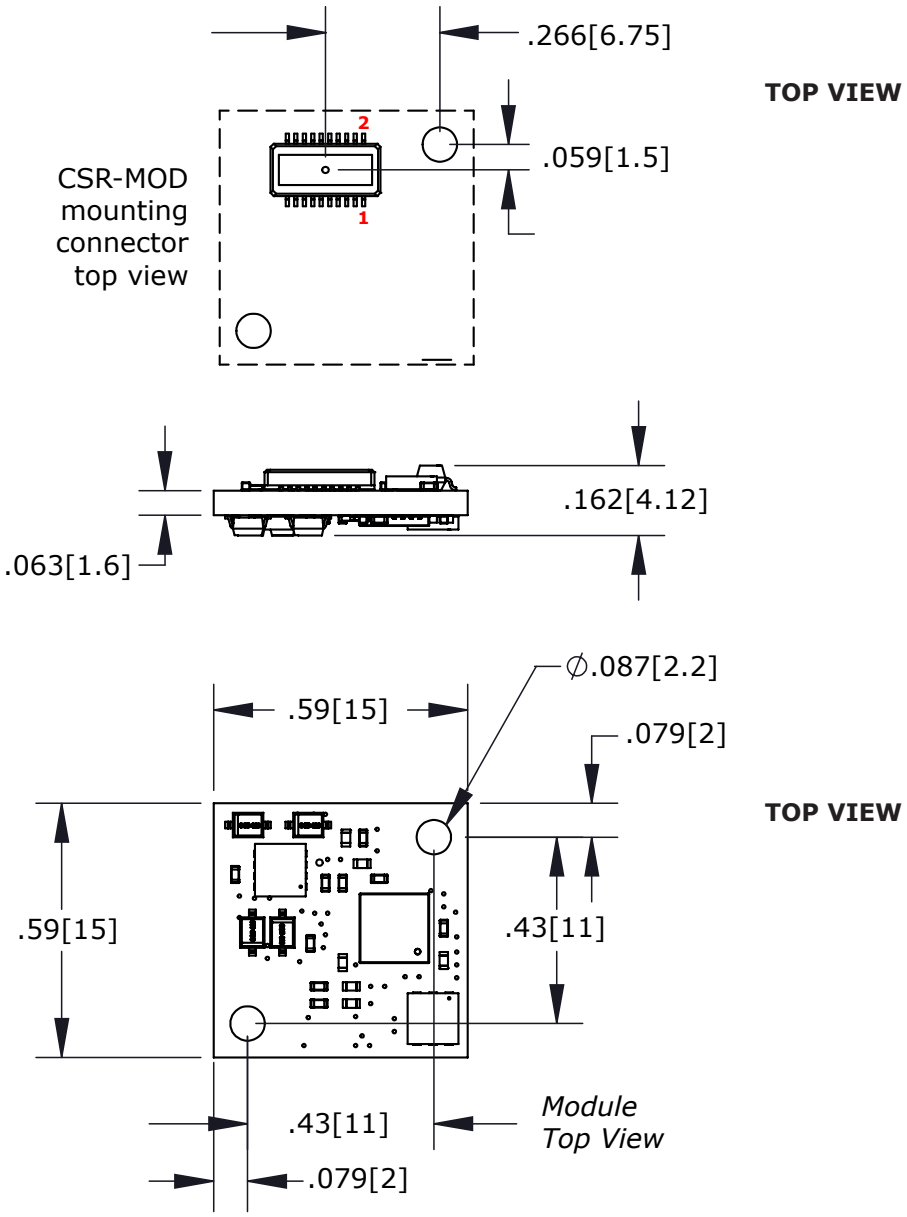


Motor Resolver to Drive Connections Diagram

CSR-MOD DIMENSION IN [MM]

The following diagram shows the CSR-MOD top, side views and the dimensions.

The dashed lines show the outlined position of the connector placed on the user's mounting board.

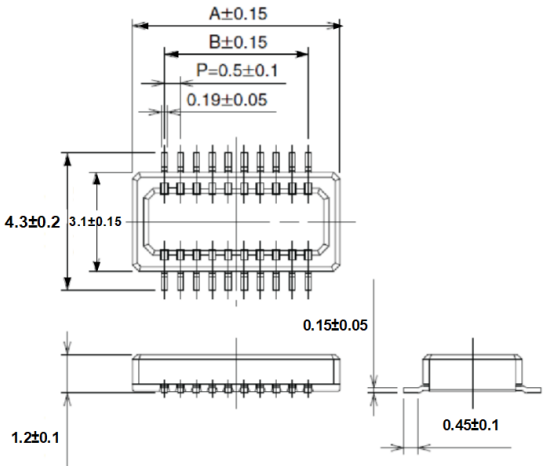


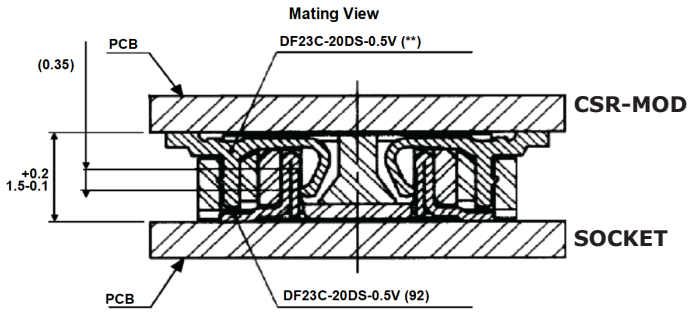
CSR-MOD Top/Side Views and Dimensions Diagram

CSR-MOD (DIMENSIONS & CONNECTIONS) [MM]

The following diagram shows the dimensions of the socket that supports the CSR-MOD mounting connector (see previous page (4) for the top and the side view dimensions).

The mounting connector used is a Hirose DF23C-20DP-0.5V(92) and it is soldered to the mounting board.

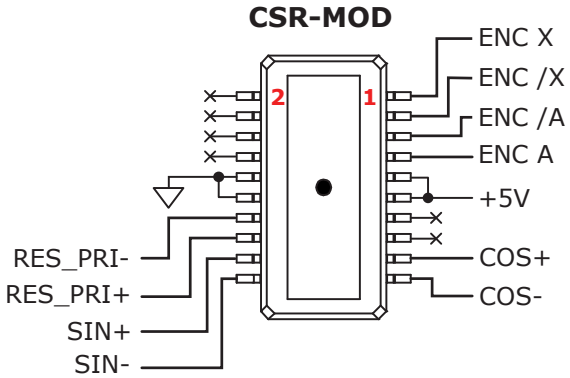




NOTE: Dimensions are measured in inches and millimeters.

Socket Dimensions Diagram

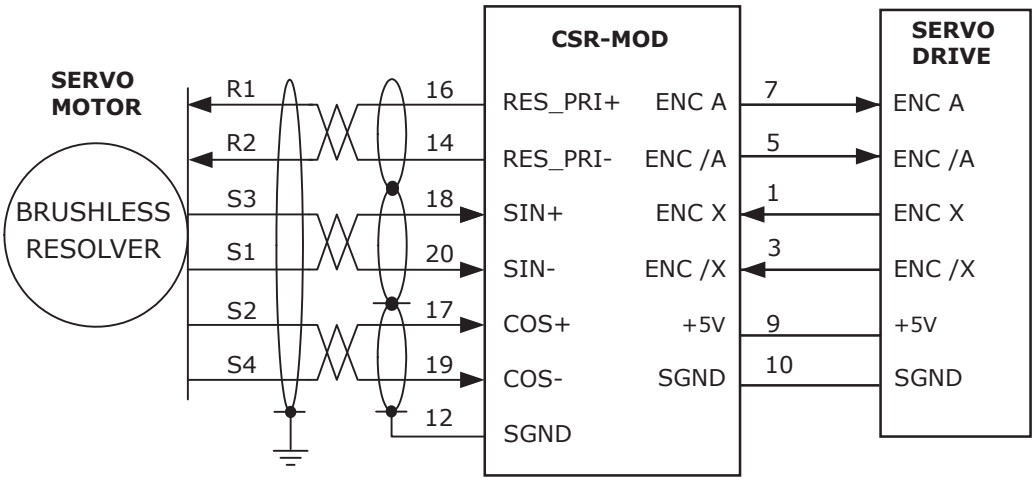
The following diagram shows the connections setup when the CSR-MOD is inserted into the socket.



CSR-MOD Connections Diagram

The following diagram shows the circuit layout when the CSR-MOD is connected to a resolver and a servo drive.

The encoder interface is the type used for absolute encoders.



CSR-MOD Connected to Resolver and Servo Drive Diagram

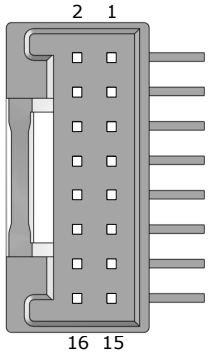
CSR CONNECTIONS & PARTS

The following diagram shows the two P1 and P2 adapter connectors that connect the CSR to a servo drive and to a resolver. The P1, 16-Pin connector links a servo drive to the CSR module.

The P2, 18-Pin connector links the CSR to a resolver. The CSR-CK Connector Kit includes the plugs and the terminals for both of the adapter connectors.

CSR Connections Diagram

P1

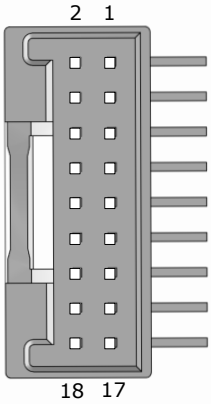


16 Pin, Molex Connector

Drive Feedback Connector CSR-DRV

Pin	Signal	Pin	Signal
2	MOTEMP	1	CHASSIS
4	HALL_V	3	HALL_W
6	SGND	5	HALL_U
8	+5V	7	ENC A
10	ENC /A	9	ENC /X
12	ENC X	11	SGND
14	+5V	13	ENC_FAULT_IN
16	SGND	15	SGND

P2



18 Pin, Molex Connector

Motor Resolver Connector CSR-MOT

Pin	Signal	Pin	Signal
2	ENC_FAULT_IN	1	CHASSIS
4	R2 RES_PRI-	3	R1 RES_PRI+
6	SGND	5	SGND
8	S3 SIN+	7	S1 SIN-
10	SGND	9	SGND
12	S4 COS-	11	S2 COS+
14	+5V	13	+5V
16	HALL_W	15	HALL_U
18	MOTEMP	17	HALL_V

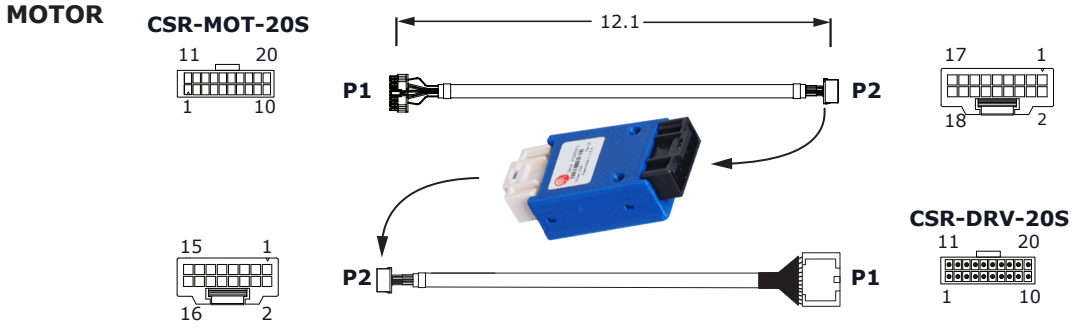
CSR-CK Connector Kit Parts

Item	Description	Part Number
16-Pin Connector	Molex, Mating Connector, 2mm pitch, 16-Pin, iGrid dual-row wire-to-board connectors with positive lock	501646-1600
18-Pin Connector	Molex, Mating Connector, 2 mm pitch, 18-PIN, iGrid dual-row wire-to-board connectors with positive lock	501646-1800
Crimp Terminal	Molex, Female Crimp Terminal pins Tin (Sn) plating, 22-26 AWG, 2mm pitch	501647-1000
Crimp Tool	Hand Crimp Tool used for iGrid female terminals, 22-26 AWG and 0.30-0.20mm² wire	0638192300

CONNECTIONS TO XSJ & R11

The following diagram shows the two P1 and P2 adapter connectors. The diagram illustrates the cable connections to setup the XSJ and R11 drives.

The tables include the wiring and component information.



XSJ & R11 Connections Diagram

CSR-MOT-20S Connector

Wiring Table Motor: 105-132256-02 or 21-136153-01			
Wire Pairs	**SAMTEC 20M (P1)**	**Description**	**MOLEX-18 (P2)**
Black/Red	1/4/7/10/11/14/17	CHASSIS	1
Red	N.C.	N.C.	N.C.
Black/White	N.C.	N.C.	N.C.
White	N.C.	N.C.	N.C.
Black/Green	3/6	SGND	5
Green	N.C.	N.C.	N.C.
Black/Blue	20	MOTEMP	18
Blue	N.C.	N.C.	N.C.
Black/Brown	15	S1 SIN-	7
Brown	5	S3 SIN+	8
Black/Yellow	18	COS-	12
Yellow	8	COS+	11
Black/Orange	12	REF-	4
Orange	2	REF+	3
Red/Green	9/13	SGND	9
Green	16/19	SGND	10

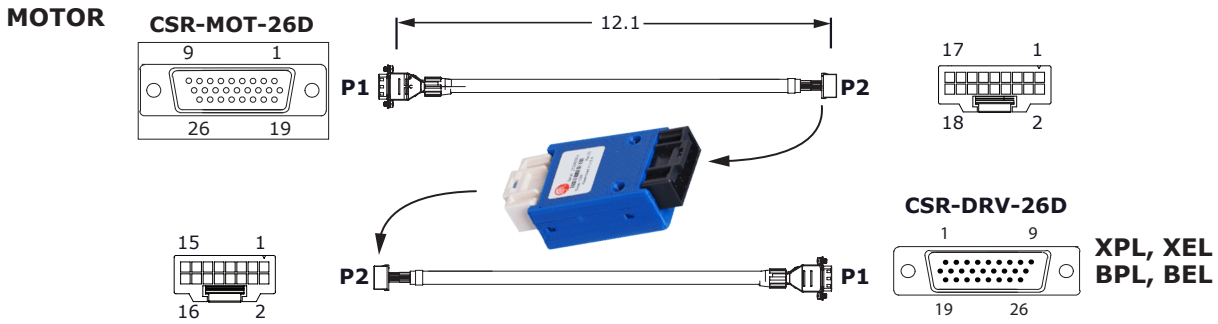
CSR-DRV-20S Connector

Wiring Table Drive: 105-132256-01 or 21-136150-01			
Wire Pairs	**SAMTEC 20F (P1)**	**Description**	**MOLEX-16 (P2)**
Black/Red	10	CHASSIS	1
Red	18	HALL_U	5
Black/White	8	HALL_V	4
White	9	HALL_W	3
Black/Green	3	SGND	6
Green	13	+5V OUTPUT	8
Black/Blue	20	MOTEMP	2
Blue	N.C.	N.C.	N.C.
Black/Brown	16	ENC /X	9
Brown	6	ENC X	12
Black/Yellow	14	ENC /A	10
Yellow	4	ENC A	7
Black/Orange	N.C.	N.C.	N.C.
Orange	17	+5V OUTPUT	14
Red/Green	7	SGND	15
Green	19	SGND	16

CONNECTIONS TO XPL, XEL, BPL & BEL

The following diagram shows the two P1 and P2 adapter connectors. The diagram illustrates the cable connections to setup the XPL, XEL, BPL and BEL drives.

The tables include the wiring and component information.



XPL, XEL, BPL & BEL Connections Diagram

CSR-MOT-26D Connector

Wiring Table Motor: 105-132260-02 or 21-136186-01			
Wire Pairs	**DB26F (P1)**	**Description**	**MOLEX-18 (P2)**
Black/Red	1	CHASSIS	1
Red	2	HALL_U	15
Black/White	3	HALL_V	17
White	4	HALL_W	16
Black/Green	5/16	GND	5
Green	6/17	+5	13
Black/Blue	7	MOTEMP	18
Blue	24	MOTEMP	2
Black/Brown	18	SIN-	7
Brown	19	SIN+	8
Black/Yellow	20	COS-	12
Yellow	21	COS+	11
Black/Orange	22	REF-	4
Orange	23	REF+	3
Red/Green	25	GND	9
Green	26	GND	10

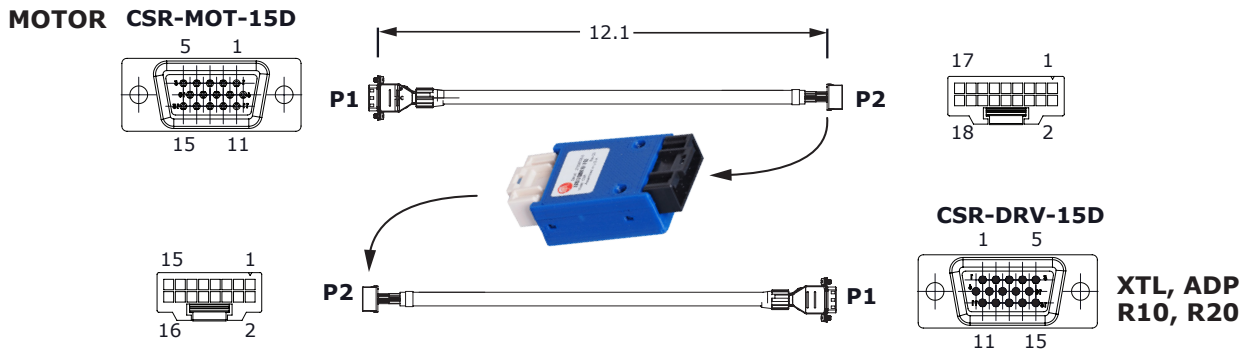
CSR-DRV-26D Connector

Wiring Table Drive: 105-132260-01 or 21-136185-01			
Wire Pairs	**DB26M (P1)**	**Description**	**MOLEX-16 (P2)**
Black/Red	1	CHASSIS	1
Red	2	HALL_U	5
Black/White	3	HALL_V	4
White	4	HALL_W	3
Black/Green	5	GND	6
Green	6	+5	8
Black/Blue	7	MOTEMP	2
Blue	24	+5 OUTPUT	13
Black/Brown	8	ENC /X	9
Brown	9	ENC X	12
Black/Yellow	14	ENC /S	10
Yellow	15	ENC S	7
Black/Orange	16	GND	11
Orange	17	+5	14
Red/Green	25	GND	15
Green	26	GND	16

CONNECTIONS TO XTL, ADP, R10 & R20

The following diagram shows the two P1 and P2 adapter connectors. The diagram illustrates the cable connections to setup the XTL, ADP, R10 and R20 drives.

The tables include the wiring and component information.



XTL, ADP, R10 & R20 Connections Diagram

CSR-MOT-15D Connector

Wiring Table Motor: 105-132259-02 or 21-136178-01			
Wire Pairs	**DB15F (P1)**	**Description**	**MOLEX-18 (P2)**
Black/Red	1/6/11	CHASSIS	1
Red	N.C.	N.C.	N.C.
Black/White	N.C.	N.C.	N.C.
White	N.C.	N.C.	N.C.
Black/Green	5	SGND	5
Green	N.C.	N.C.	N.C.
Black/Blue	10	MOTEMP	18
Blue	N.C.	N.C.	N.C.
Black/Brown	7	SIN-	7
Brown	8	SIN+	8
Black/Yellow	12	COS-	12
Yellow	13	COS+	11
Black/Orange	2	REF-	4
Orange	3	REF+	3
Red/Green	15	GND	9
Green	N.C.	N.C.	N.C.

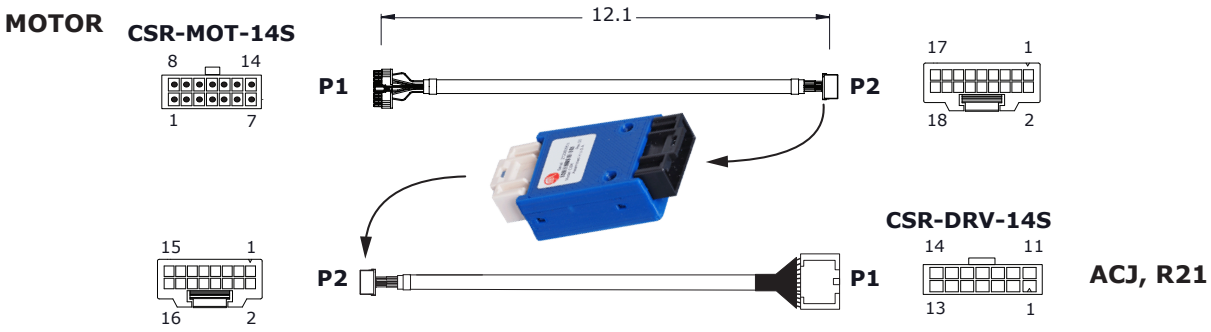
CSR-DRV-15D Connector

Wiring Table Drive: 105-132259-01 or 21-136177-01			
Wire Pairs	**DB15M (P1)**	**Description**	**MOLEX-16 (P2)**
Black/Red	1	CHASSIS	1
Red	3	HALL_U	5
Black/White	6	HALL_V	4
White	9	HALL_W	3
Black/Green	5	CHASSIS	6
Green	2	+5 OUTPUT	8
Black/Blue	10	MOTEMP	2
Blue	N.C.	N.C.	N.C.
Black/Brown	7	ENC /X	9
Brown	8	ENC X	12
Black/Yellow	13	ENC /A	10
Yellow	14	ENC A	7
Black/Orange	N.C.	N.C.	N.C.
Orange	4	+5 OUTPUT	14
Red/Green	15	SGND	15
Green	N.C.	N.C.	N.C.

CONNECTIONS TO ACJ & R21

The following diagram shows the two P1 and P2 adapter connectors. The diagram illustrates the cable connections to setup the ACJ and R21 drives.

The tables include the wiring and component information.



ACJ & R21 Connections Diagram

CSR-MOT-14S Connector

Wiring Table Motor: 105-133744-02 or 21-136212-01			
Wire Pairs	**SAMTEC 14**	**Description**	**MOLEX-18**
Black/Red	14	CHASSIS	1
Red	5	HALL_U	15
Black/White	12	HALL_V	17
White	13	HALL_W	16
Black/Green	11	GND	5
Green	4	+5V	13
Black/Blue	7	MOTEMP	18
Blue	N.C.	N.C.	N.C.
Black/Brown	1	SIN-	7
Brown	8	SIN+	8
Black/Yellow	2	COS-	12
Yellow	9	COS+	11
Black/Orange	3	REF-	4
Orange	10	REF+	3
Red/Green	6	GND	9
Green	N.C.	N.C.	N.C.

CSR-DRV-14S Connector

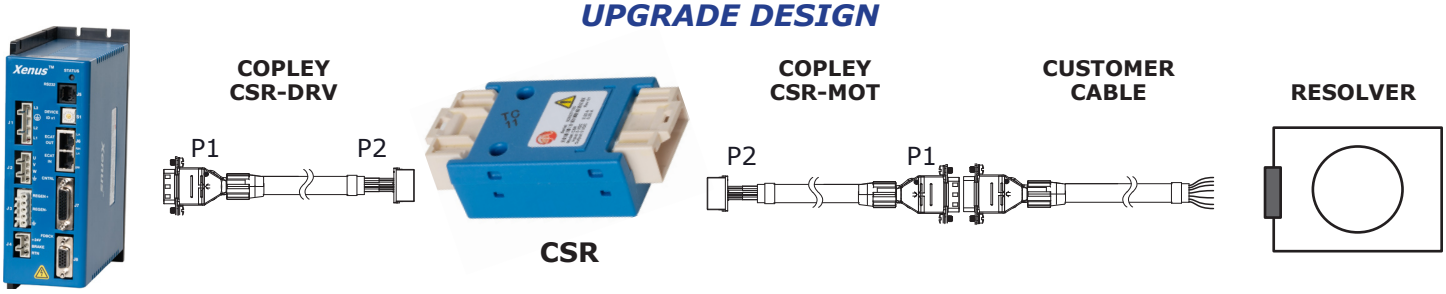
Wiring Table Drive: 105-133744-01 or 21-136210-01			
Wire Pairs	**SAMTEC 14**	**Description**	**MOLEX-16**
Black/Red	14	CHASSIS	1
Red	5	HALL_U	5
Black/White	12	HALL_V	4
White	13	HALL_W	3
Black/Green	6	GND	6
Green	4	+5V	8
Black/Blue	7	MOTEMP	2
Blue	N.C.	N.C.	N.C.
Black/Brown	3	ENC /X	9
Brown	10	ENC X	12
Black/Yellow	1	ENC /A	10
Yellow	8	ENC A	7
Black/Orange	11	GND	11
Orange	N.C.	N.C.	N.C.
Red/Green	N.C.	N.C.	N.C.
Green	N.C.	N.C.	N.C.

CSR CONFIGURATIONS

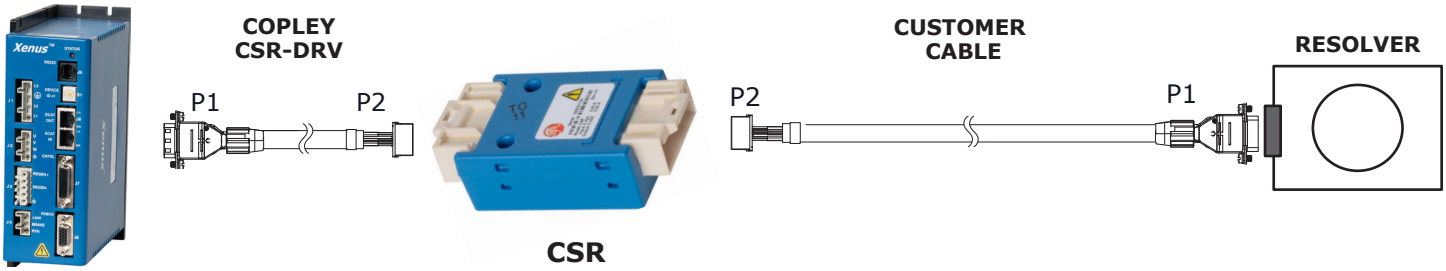
The following diagrams show the components required and the cable setup for each of the configurations listed below.

- Upgrade
- Retrofit
- OEM Cable Design
- OEM Module Design

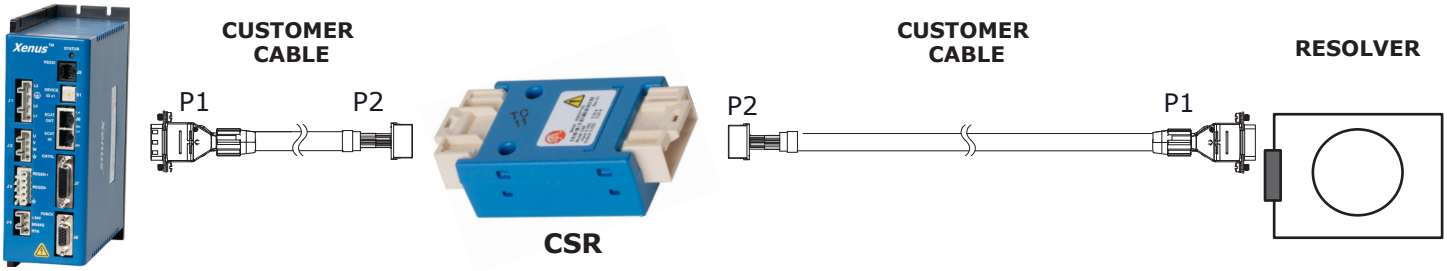
UPGRADE DESIGN



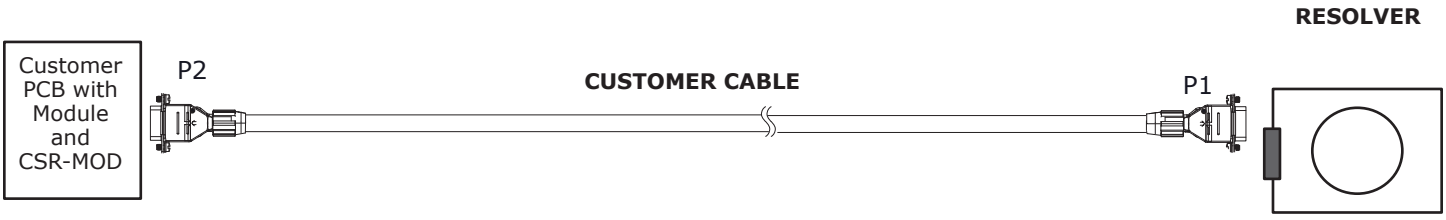
RETROFIT DESIGN



OEM CABLE DESIGN

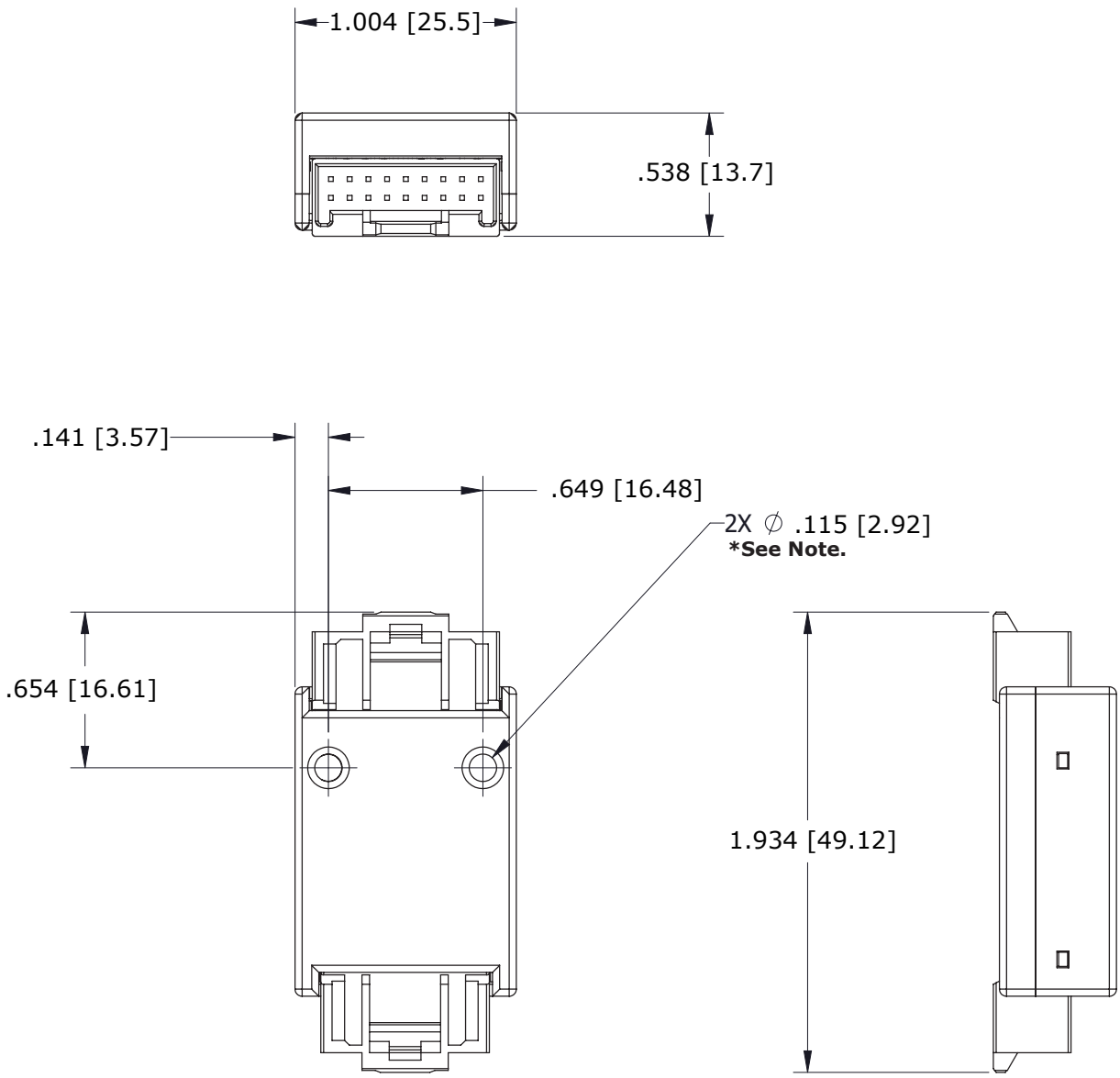


OEM MODULE DESIGN



CSR DIMENSIONS IN [MM]

The following diagram shows the CSR dimensions in inches and mm.



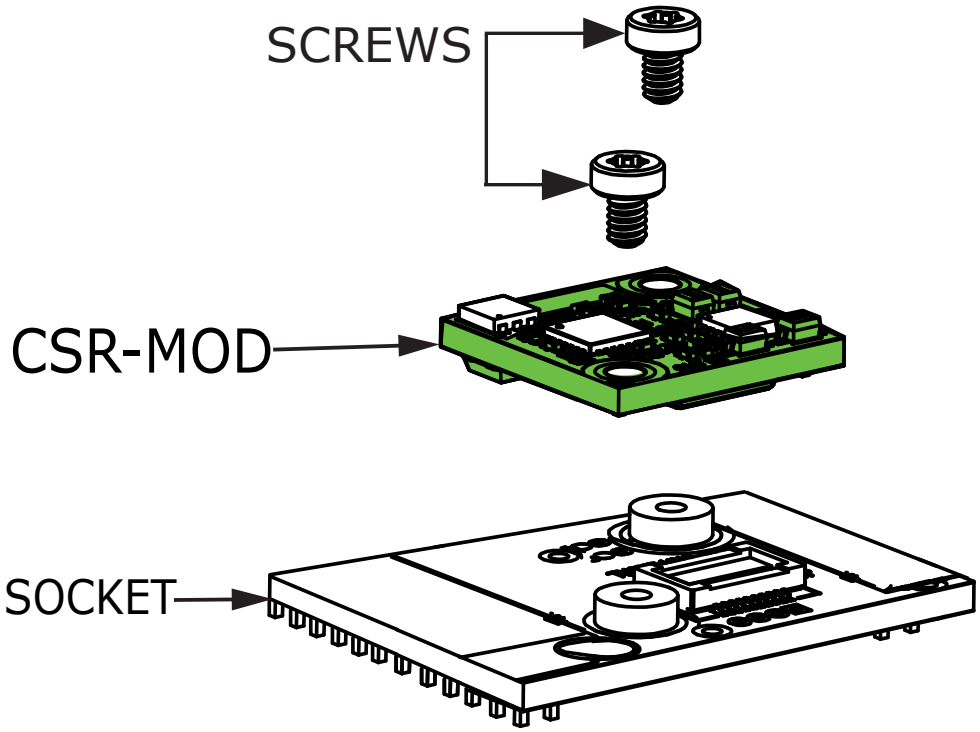
*Note: The term, 2X, indicates two mounting holes not shown.

CSR Dimensions Diagram

CSR-MOD INSTALLATION

To assemble the CSR-MOD to the socket, do the following steps.

1. Place the CSR-MOD into the socket.
2. Insert the two screws into the CSR-MOD. (The screws are not supplied with the assembly).
3. Secure the screws to the socket as shown in the diagram below.



CSR-MOD Assembly Diagram

ORDERING GUIDE

Converter

Model Number	Description
CSR	Copley Serial Resolver Adapter for Drives
CSR-MOD	Copley Serial Resolver Module for Mounting Boards

Connector Kit for CSR

Model	Qty	Name	Description	MFGR: Part Number
CSR-CK Connector Kit	1	Connector	CONN WIRE-MT HSG RCPT 2X9P 2X2MM LKG NYL NAT	Molex: 501646-1800
	1	Connector	CONN TH HDR R/A 2X8P SHRD LKG NYL-GF NAT SN	Molex: 501646-1600
	40	Pins	Crimp Terminal, 2.00 mm pitch, tin, 22~26 AWG	Molex: 501647-1000

NOTE: This kit includes the connectors and contacts that enable the user to make their own cables that plug into the CSR.

Compatible Drives

Model	Description	Rev	Model	Description	Rev
ACJ	Accelnet Micro Panel ACJ Servo Drive	Rev 01	XSJ	Xenus Micro Panel XSJ Servo Drive	Rev 02
ADP	Accelnet ADP Servo Drive	Rev 02	XTL	Xenus XTL Servo Drive	Rev 02
BEL	Accelnet^{Plus} Panel EtherCAT BEL Servo Drive	Rev 01	XEL	Xenus^{Plus} EtherCAT XEL Servo Drive	Rev 02
BPL	Accelnet^{Plus} Panel CANopen BPL Servo Drive	Rev 01	XPL	Xenus^{Plus} CANopen XPL Servo Drive	Rev 02
BML	Accelnet^{Plus} Panel MACRO BML Servo Drive	Rev 00	XML	Xenus^{Plus} MACRO XML Servo Drive	Rev 02
R20	Accelnet R20 Servo Drive	Rev 02	R10	Xenus R10 Servo Drive	Rev 02
R21	Accelent R21 Servo Drive	Rev 01	R11	Xenus R11 Servo Drive	Rev 02

Adapter Cables

Model Number	Description	Drive Connections
CSR-DRV-15D	Cable Assembly for CSR to Standard 15P D-Sub Drive, 12in	XTL, ADP, R10, R20
CSR-MOT-15D	Cable Assembly for CSR to Resolver for Standard 15P D-Sub motor, 12in	
CSR-DRV-20S	Cable Assembly for CSR to Standard 20P Samtec Drive, 12in	XSJ, R11
CSR-MOT-20S	Cable Assembly for CSR to Resolver for Standard 20P Samtec Motor, 12in	
CSR-DRV-26D	Cable Assembly for CSR to Standard 26P D-Sub Drive, 12in	XEL, XPL, BEL, BPL
CSR-MOT-26D	Cable Assembly for CSR to Resolver for Standard 26P D-Sub Motor, 12in	
CSR-DRV-14S	Cable Assembly for CSR to Resolver for Standard 14P Samtec Drive, 12in	ACJ, R21
CSR-MOT-14S	Cable Assembly for CSR to Resolver for Standard 14P Samtec Motor, 12in	

NOTE: Specifications subject to change without notice.

16-131524 Document Revision History

Revision	Date	Remarks
00	January 16, 2024	Initial release to production.
01	May 13, 2024	Update and change CSR-MOD to conformally coated.
02	August 20, 2025	Update XSJ, XPL, ZTL & ACJ pin diagrams on pages 7,8,9 & 10. Add the following new cable part #s on pages 7,8,9 & 10: CSR-MOT-20S Cable: 21-136153-01 and CSR-DRV-20S: 21-136150-01 CSR-MOT-26D Cable: 21-136186-01 and CSR-DRV-26D: 21-136185-01 CSR-MOT-15D Cable: 21-136178-01 and CSR-DRV-15D: 21-136177-01 CSR-MOT-14S Cable: 21-136212-01 and CSR-DRV-14S: 21-136210-01

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