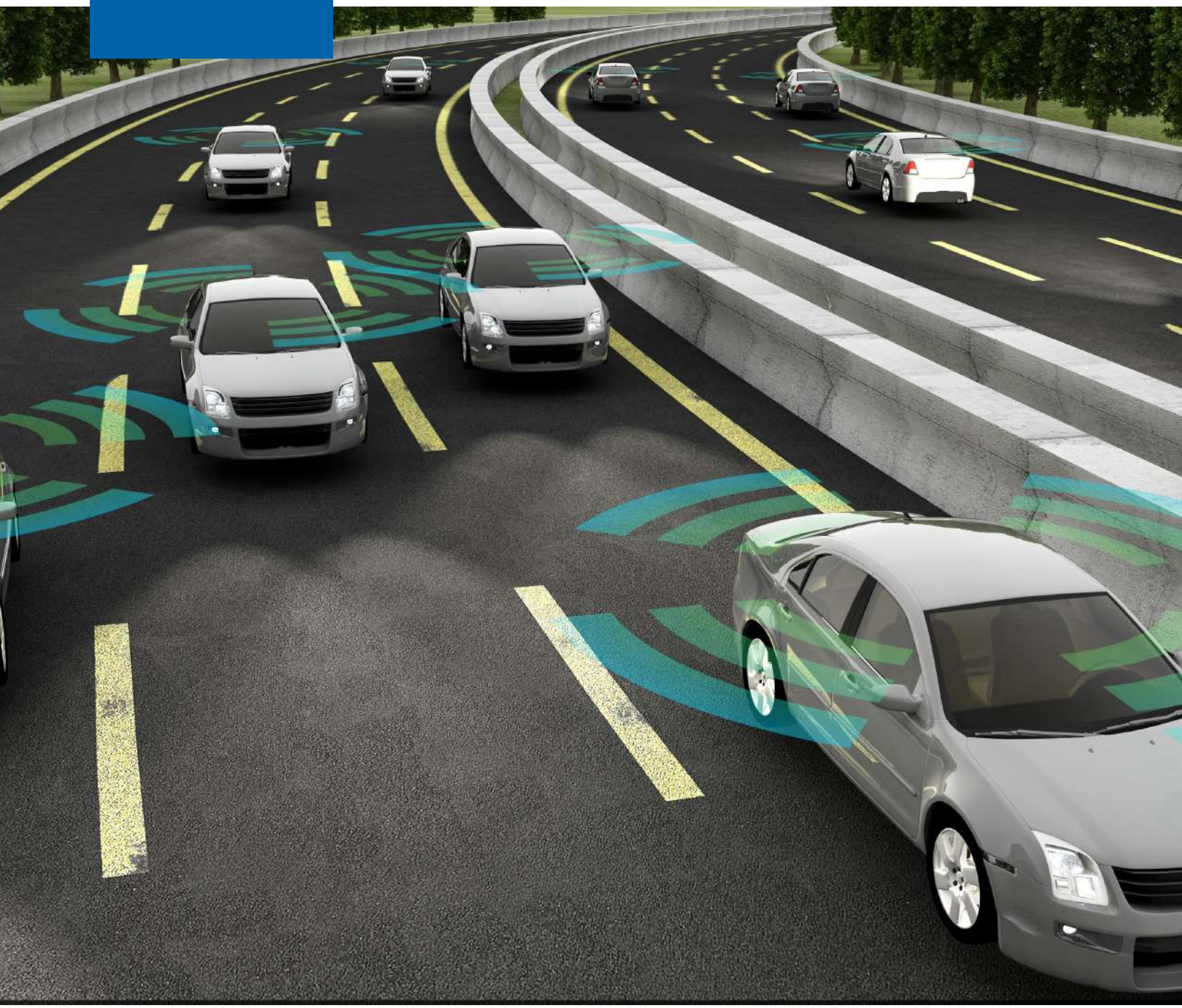
Automotive
Interconnect

FAKRA CONNECTOR SERIES

Amphenol® RF



TECHNICAL RESOURCE GUIDE

WWW.AMPHENOLRF.COM/AUTOMOTIVE

FAKRA CONNECTOR SERIES

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OVERVIEW

The automotive industry has been revolutionized with the increased adoption of telematics in vehicles including GPS, Cellular, Bluetooth Wi-Fi, and Satellite Radio. Amphenol RFs industry leading product line meets both FAKRA and USCAR standards with such features as 12 different mechanical and color codes, plastic housing with locking feature and audible clicking noise, minimum of 100 mating cycles and a frequency range of DC to 6 GHz. These connectors are available in numerous configurations with straight, and right angle solutions for cable applications, as well as edge-launch and PCB designs.

With the introduction of autonomous and connected cars into the market, there has been an overwhelming demand for a space conscious, high-performance interface that can support data transmission rates up to 20 Gbps. Amphenol RF's next generation line of automotive interconnect technology, AUTOMATE® (mini-FAKRA), is able to meet this evolving trend in automotive innovation. Designed with the same popular features traditional FAKRA, AUTOMATE offers improved performance operating up to an impressive 15 GHz with industry leading mating forces in a reduced package size.

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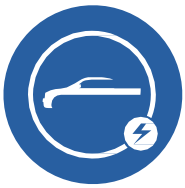
APPLICATIONS

FAKRA Connectors are versatile RF interconnect and are ideal for a number of critical applications, primarily winthin the automotive space.



AUTONOMOUS VEHICLES

Self-driving vehicles operate without human control, using sensors and advanced processing to safely drive and navigate.

ADVANCED DRIVER ASSISTANCE SYSTEMS (ADAS)

ADAS systems use sensors to monitor vehicle surroundings, alert drivers of unsafe conditions, and take corrective actions such as automatically braking.

CAMERAS

Vehicle cameras have evolved beyond simple backup functions to providing 360 degree surround-vehicle views, driver monitoring, and object recognition for autonomous navigation.

GPS NAVIGATION

GPS is a satellite navigation system that continuously provides location and time information up to centimeter-level accuracy.

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APPLICATIONS

HIGH-BANDWIDTH INFOTAINMENT

Advanced infotainment systems utilize high resolution displays and instrument clusters to deliver video feeds, safety alerts, GPS navigation, interfaces to Internet applications and Bluetooth-connected devices, and other services.

REMOTE START AND VEHICLE CONTROL

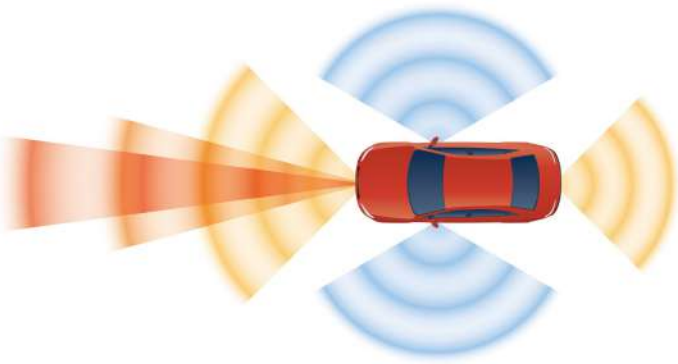
Wireless key fobs and smartphone applications enable remote start, climate control, door/window controls, and keyless entry.

ANTENNA CONNECTIONS

Automotive antennas support Wi-Fi, 4G/5G cellular connectivity, Bluetooth, remote start and control, AM/FM/XM and satellite radio, and DSRC/V2X communication.

DSRC/V2X COMMUNICATION

Wireless data sharing protocols between vehicles and external objects facilitate safety systems, autonomous navigation, and intelligent transportation systems.



FAKRA CONNECTOR SERIES

TECHNICAL SPECIFICATIONS

Electrical

Impedance	50 Ohm
Frequency Range	DC - 6 GHz
Voltage Rating	335 Volts RMS Continuous
Dielectric Withstanding Voltage	800 VRMS Max
VSWR (Return Loss)	
DC - 200 MHz	1.2 (-21 dB) Max
200 - 500 MHz	1.35 (-16 dB) Max
500 MHz - 2 GHz	1.4 (-15 dB) Max
2 GHz - 3 GHz	1.5 (-14dB) Max
3 - 6 GHz	1.6 (-13dB) Max
Insulation Resistance	1000 MΩ Min
Center Contact Resistance	24 mΩ Max
Outer Contact Resistance	5 mΩ Max (6 mΩ after Environmental Testing)
Contact Current (dependent on cable size)	≤1 A DC
Insertion Loss	
DC - 200 MHz	0.15 dB
200 - 500 MHz	0.25 dB
500 MHz - 2 GHz	0.3 dB
2 - 3 GHz	0.3 dB
3 - 6 GHz	0.45 dB
Power Handling	95 W Max @ 1 GHz @ 25ºC

FAKRA CONNECTOR SERIES

TECHNICAL SPECIFICATIONS

Environmental

Temperature Range	−40°C to +105°C
Thermal Shock	USCAR-2, para 5.6.1
Vibration	USCAR-2, para 5.4.6
Mechanical Shock	USCAR-2, para 5.4.6
Temperature/Humidity Cycling	USCAR-2, para 5.6.2
High Temperature Exposure	USCAR-2, para 5.6.3

Mechanical

Mating Cycles	100 Min
Coupling Mechanism	Push-On
Interface Specification	USCAR-18
Engagement Force, per USCAR-25, Table 3.1	5.6 - 10.1 lbs (25 - 45 N)
Disengagement Force, per USCAR-17 5.4.2.4	16.9 lbs (<75N)

Note:
These characteristics are typical and may not apply to all connectors. Connector configurations may affect performance.

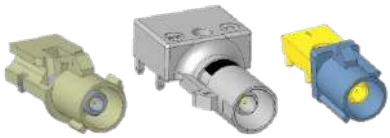
FAKRA connectors are shipped in bulk (tray or reels, as applicable) for efficient use in high volume applications. Connectors should be stored in original packaging at room temperature of 25°C.

FAKRA CONNECTOR SERIES

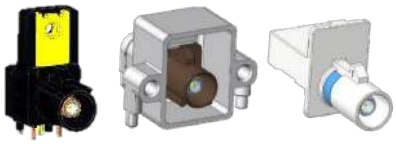
PRINTED CIRCUIT BOARD CONNECTOR GUIDE

Vertical	
Part Number	**Description**
FA1-NXSP-PCB-2	Gold Plated Body
FA1-NXSP-PCBD6	Gold Plated Body, Thin Profile
2FA1-NXSP-PCBB6	Tin Plated Body, Thin Profile

Right Angle	
Part Number	**Description**
FA1-NXRP-PCB-6	Removable Housing, Gold Plated Body
FA1-NXRP-PCB-8	Removable Housing, Tin Plated Body
2FA1-NXRP-PCBB2	Tin Plated Body
2FA1-NXRP-PCB-5	All Metal Body
2FA1-NXRP-PCB-6	Extended PCB Legs
4FA1-NXRP-PCB-3	End Launch



Surface Mount	
Part Number	**Description**
2FA1-NXSP-PCBA9	Tin Plated Body
2FA1-WXSP-1000	All Metal Body, Tin Plated, West Orientation
2FA1-WXSP-PCBA3	Gold Plated Body, West Orientation



Custom Mounting	
Part Number	**Description**
FA1-NXRP-PCB-12	Recessed Interface
2FA1-NXSP-PCB-3	Mounting Flange, Surface Mount Contact
4FA1-NXRP-PCB-2	Mounting Flange with Tapped Hole

ADDITIONAL CONFIGURATIONS AVAILABLE- PLEASE CONSULT FACTORY

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SOLDER REFLOW PROCESS – SMT PRODUCTS

Notes:

1. This is a general specification to be used a reference only

2. It is not possible to recommend a solder profile for all applications as it is highly dependent on the total thermal mass of the board and the components

3. The recommended solder profile has five zones:
   A. Preheat - 2-3°C/sec to 150°C (leaded) 170°C (lead-free)
   B. Soak - 60 sec at 150°C (leaded) 170°C (lead-free)
   C. Reflow - 30 sec at 225°C (leaded) 250°C (lead-free)
   D. Cooling - 30 sec at 225°C (leaded) 250°C (lead-free)

4. Peak temperatures should not exceed: recommended solder reflow temperature profile
   A. 235°C for leaded solder

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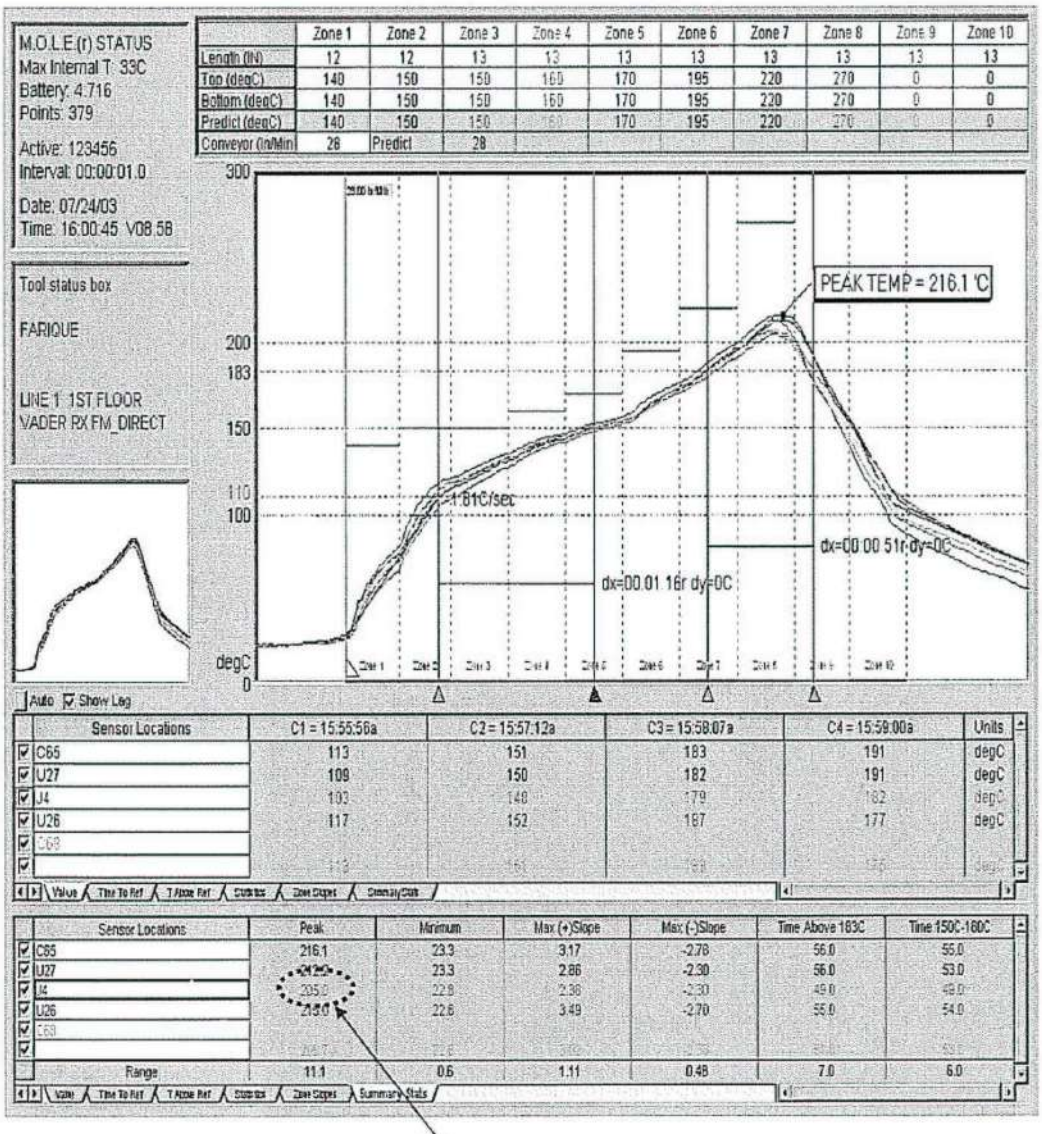
PIN AND PASTE PROCESS – SMT PRODUCTS

Notes:

1. This is a general specification to be used for reference only.
2. The recommended solder reflow profile is as depicted below. The peak temperature is 205°C.

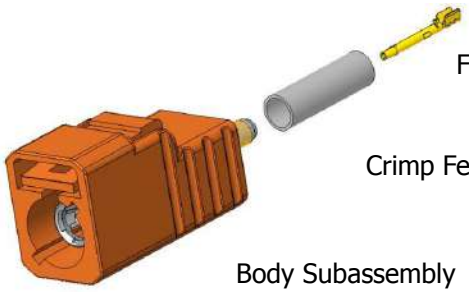


FAKRA CONNECTOR SERIES

CABLE MOUNT CONSTRUCTION

UNSEALED CONNECTORS

Straight Jack

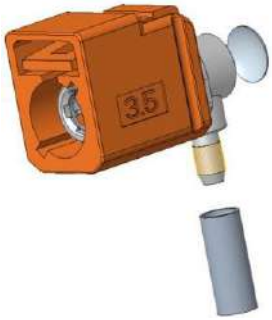


Female Contact

Crimp Ferrule

Body Subassembly

Right Angle Jack

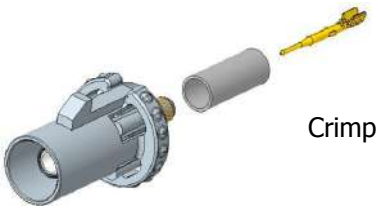


Cap

Body Subassembly

Crimp Ferrule

Straight Plug



Male Contact

Crimp Ferrule

Body Subassembly

CONSTRUCTION MAY VARY BASED ON SPECIFIC CONNECTOR DESIGN

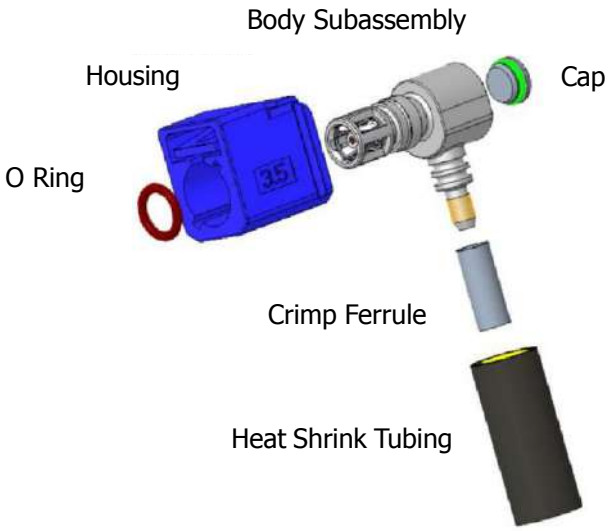
FAKRA CONNECTOR SERIES

CABLE MOUNT CONSTRUCTION

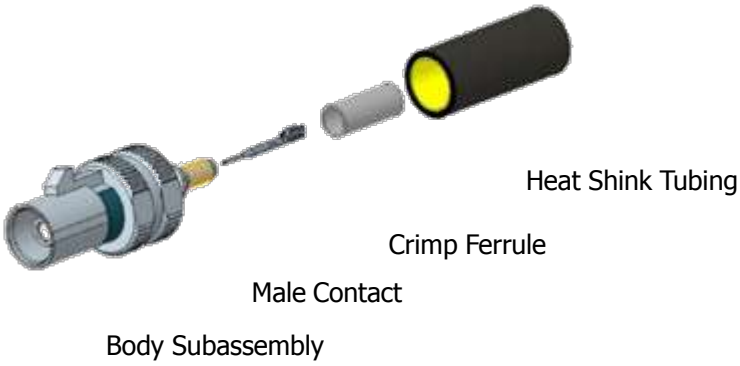
SEALED CONNECTORS

Straight Jack

Right Angle Jack



Straight Plug



CONSTRUCTION MAY VARY BASED ON SPECIFIC CONNECTOR DESIGN

FAKRA CONNECTOR SERIES

CABLE CONNECTOR GUIDE

Single Straight Jacks - Sealed

Part Number	Cable Type	Assembly Procedure	Contact Tooling Specification	Notes
3FA1MXSJ-C01E0	RG-174/DACAR 462	349-50832	349-50750	
3FA1-NXSJ-C01E0	RG-174/DACAR 462	349-50832	349-50750	
3FA1-NXSJ-C01E6	RG-174/DACAR 462	349-50832	349-50750	With Mounting Clip Provision
3FA1ENXSJ-C01ES	RG-174/DACAR 462	349-50910	349-50750	
3FA1ENXSJ-C04E0	RG-58	349-50910	349-50748	
3FA1ENXSJ-C04ES	RG-58	349-50910	349-50748	

Single Right-Angle Jacks - Sealed

Part Number	Cable Type	Assembly Procedure	Contact Tooling Specification	Notes
3FA1ENXRJ-C01ER	RG-174/DACAR 463	349-50883	N/A	
3FA1ENXRJ-C04E3	RG-58	349-50883	N/A	

Single Straight Plugs - Sealed

Part Number	Cable Type	Assembly Procedure	Contact Tooling Specification	Notes
2FA1-NXSP-C01E1	RG-174/DACAR 462	349-50832	349-50750	
2FA1-NXSP-C01E6	RG-174/DACAR 462	349-50832	349-50750	With Mounting Provision
2FA1-NXSP-C04E1	RG-58	349-50832	349-50748	

Single Straight Jacks - Unsealed

Part Number	Cable Type	Assembly Procedure	Contact Tooling Specification	Notes
3FA1-NXSJ-C01W0	RG-174	349-50801	349-50750	
3FA1-NXSJ-C01W6	RG-174	349-50801	349-50750	With Mounting Clip Provision
3FA1-NXSJ-C65W0	RG-59	349-50801	349-50750	
3FA1-NXSJ-C65W6	RG-59	349-50801	349-50750	With Mounting Clip Provision
3FA1-NXSJ-M59W0	RTK 031	349-50801	349-50750	
3FA1-NXSJ-M56W6	RTK 031	349-50801	349-50750	With Mounting Clip Provision
3FA1-NXSJ-D46W0	DACAR 462	349-50801	349-50750	
3FA1-NXSJ-D46W6	DACAR 462	349-50801	349-50750	With Mounting Clip Provision
3FA1-NXSJ-C04W0	RG-174	349-50801	349-50748	
3FA1-NXSJ-C04W6	RG-58	349-50801	349-50748	With Mounting Clip Provision
3FA16NXSJ-C04-0	RG-58	349-50801	349-50915	6 GHz
3FA16NXSJ-C04-6	RG-58	349-50801	349-50915	With Mounting Clip Provision/6 GHz

ADDITIONAL CONFIGURATIONS AVAILABLE- PLEASE CONSULT FACTORY

FAKRA CONNECTOR SERIES

CABLE CONNECTOR GUIDE

Single Right-Angle Jacks - Unsealed

Part Number	Cable Type	Assembly Procedure	Contact Tooling Specification	Notes
3FA1ENXRJ-C01-3	RG-174	349-50785	N/A	
3FA1ENXRJ-C04-3	RG-58	349-50785	N/A	
3FA1ENXRJ-C65-3	RG-59	349-50785	N/A	
3FA1ENXRJ-M59-3	RTK 031	349-50785	N/A	
3FA1MNXRJ-C01F6	RG-174	349-50785	N/A	With Mounting Clip Provision

Single Straight Plugs - Unsealed

Part Number	Cable Type	Assembly Procedure	Contact Tooling Specification	Notes
2FA1-NXSP-C01W1	RG-174	349-50914	349-50750	
2FA1-NXSPTC01W6	RG-174		349-50750	With Mounting Clip Provision
2FA1-NXSP-C04W1	RG-58	349-50914	349-50748	
2FA1-NXSPTC04W6	RG-58	349-50837	349-50748	With Mounting Clip Provision
2FA1-NXSP-D46W1	DACAR 462	349-50914	349-50750	
2FA1-NXSP-C65W1	RG-59	349-50914	349-50750	
2FA16NXSP-C01-1	RG-174	349-50915	349-50915	6 GHz

Dual Straight Jacks - Unsealed

Part Number	Cable Type	Assembly Procedure	Contact Tooling Specification	Notes
3FAH-NXSJ-C00W6	RG-174 & RG-58	349-50767	349-50748 & 349-50750	With Mounting Clip Provision
3FAH-NXSJ-C01W6	RG-174 (2)	349-50767	349-50750	With Mounting Clip Provision
3FAH-NXSJ-C04W6	RG-58 (2)	349-50767	349-50748	With Mounting Clip Provision
3FAH-NXSJ-C64W6	DACAR 462 & RG-59	349-50767	349-50748 & 349-50750	With Mounting Clip Provision
3FAH-NXSJ-C88W6	RG-174 & RG-74	349-50767	349-50750	With Mounting Clip Provision
3FAH-NXSJ-C99W6	RG-174 & RG-59	349-50767	349-50748 & 349-50750	With Mounting Clip Provision, RG-59 in Port 2 Position
3FAHRNXSJ-C99W6	RG-174 & RG-59	349-50767	349-50748 & 349-50750	With Mounting Clip Provision, RG-59 in Port 1 Position
3FAH-NXSJ-D46W6	DACAR 462 (2)	349-50767	349-50750	With Mounting Clip Provision

Dual Straight Plugs - Unsealed

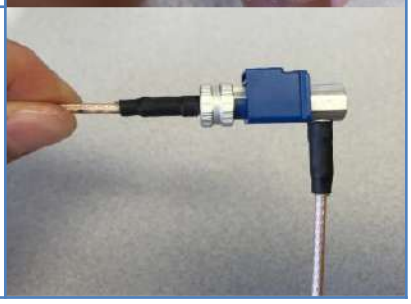
Part Number	Cable Type	Assembly Procedure	Contact Tooling Specification	Notes
2FAH-NXSP-C00W9	RG-174 & RG-58	349-50767	349-50748 & 349-50750	
2FAH-NXSP-C01W9	RG-174 (2)	349-50767	349-50750	
2FAH-NXSP-C04W9	RG-58 (2)	349-50767	349-50748	
2FAH-NXSP-C00W6	RG-174 & RG-58	349-50767	349-50748 & 349-50750	With Mounting Clip Provision
2FAH-NXSP-D46W9	DACAR 462 (2)	349-50767	349-50750	
2FAH-NXSP-C64W9	DACAR 462 & RG-58	349-50767	349-50748 & 349-50750	
2FAH-NXSP-C88W9	RG-174 & RG-71	349-50767	349-50750	
2FAH-NXSP-C99W9	RG-174 & RG-59	349-50767	349-50748 & 349-50750	RG-59 in Port 2 Position
2FAHRNXSP-C99W9	RG-174 & RG-59	349-50767	349-50748 & 349-50750	RG-59 in Port 1 Position

ADDITIONAL CONFIGURATIONS AVAILABLE- PLEASE CONSULT FACTORY

FAKRA CONNECTOR SERIES

MATING & UN-MATING

Best practices for mating single in-line cable connectors are as follows:

STEP 1	ALIGN	ALIGN AND ORIENT THE FAKRA CONNECTOR TO THE MATING CONNECTOR	
STEP 2	PUSH	SLIDE CONNECTOR FULLY FORWARD, ALIGNED AXIALLY TO THE MATING CONNECTOR, DO NOT MATE THE CONNECTOR AT AN ANGLE	
STEP 3	CLICK	RELEASE THE CONNECTOR AFTER THE LATCH BECOMES ENGAGED ONTO THE MATING CONNECTOR. A 'CLICK' WILL BE FELT/HEARD.	
STEP 4	INSPECT	DO NOT ALLOW CONNECTOR TO BECOME COCKED OR BENT (I.E. AXIALLY ANGLED) ONCE MATED	

FAKRA CONNECTOR SERIES

MATING & UN-MATING

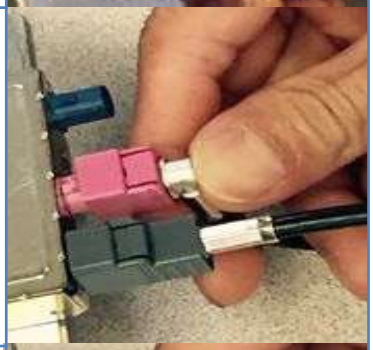
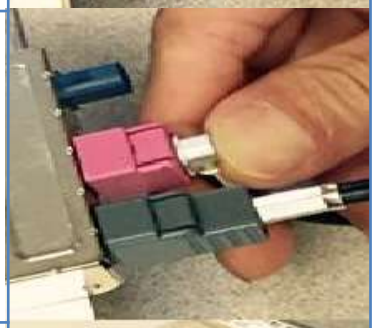
Best practices for unmating single in-line cable connectors are as follows:

STEP 1	ROTATE	ROTATE CABLE TO PERMIT IMPROVED FINGERGRIP ON BOTTOM AND TOP OF CONNECTOR	
STEP 2	DEPRESS	DEPRESS LATCH FULLY, WHEREBY LATCH IS LIFTED OVER THE SHARKFIN ON THE MATING CONNECTOR	
STEP 3	ALIGN	MAINTAIN AXIAL ALIGNMENT WITH MATING CONNECTOR	
STEP 4	PULL	PULL CONNECTOR AWAY FROM THE MATING CONNECTOR. MAINTAIN AXIAL ALIGNMENT WITH MATING CONNECTOR.	
STEP 5	SEPARATE	COMPLETE UNMATING PROCESS	

FAKRA CONNECTOR SERIES

MATING & UN-MATING

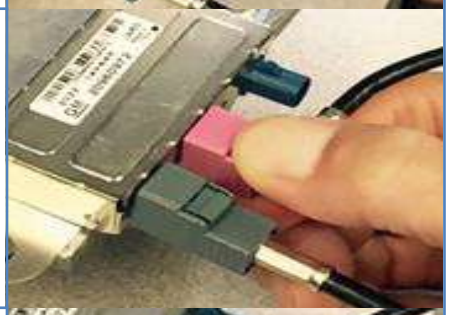
Best practices for mating right-angle in-line cable connectors are as follows:

STEP 1	ALIGN	ALIGN AND ORIENT THE FAKRA CONNECTOR TO THE MATING CONNECTOR	
STEP 2	PUSH	SLIDE CONNECTOR FULLY FORWARD, ALIGNED AXIALLY TO THE MATING CONNECTOR, DO NOT MATE THE CONNECTOR AT AN ANGLE	
STEP 3	CLICK	RELEASE THE CONNECTOR AFTER THE LATCH BECOMES ENGAGED ONTO THE MATING CONNECTOR. A 'CLICK' WILL BE FELT/HEARD.	
STEP 4	INSPECT	DO NOT ALLOW CONNECTOR TO BECOME COCKED OR BENT (I.E. AXIALLY ANGLED) ONCE MATED	

FAKRA CONNECTOR SERIES

MATING & UN-MATING

Best practices for unmating right-angle in-line cable connectors are as follows:

STEP 1	ROTATE	ROTATE CABLE TO PERMIT IMPROVED FINGERGRIP ON BOTTOM AND TOP OF CONNECTOR	
STEP 2	DEPRESS	DEPRESS LATCH FULLY, WHEREBY LATCH IS LIFTED OVER THE SHARKFIN ON THE MATING CONNECTOR	
STEP 3	ALIGN	MAINTAIN AXIAL ALIGNMENT WITH MATING CONNECTOR	
STEP 4	PULL	PULL CONNECTOR AWAY FROM THE MATING CONNECTOR. MAINTAIN AXIAL ALIGNMENT WITH MATING CONNECTOR.	
STEP 5	SEPARATE	COMPLETE UNMATING PROCESS	

FAKRA CONNECTOR SERIES

MATING & UN-MATING

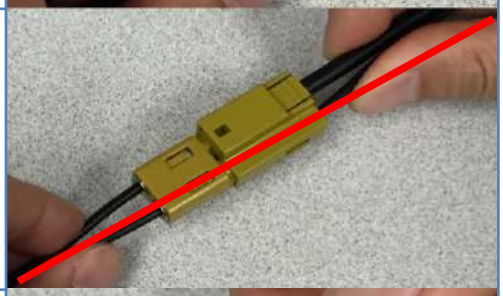
Best practices for mating right dual in-line cable connectors are as follows:

STEP 1	GRASP	GRASP THE CONNECTOR BY THE HOUSING ONLY	
		DO NOT GRAB THE CABLES OR SQUEEZE THE CABLES TOGETHER	
STEP 2	ALIGN	ALIGN AND ORIENT THE FAKRA CONNECTOR TO THE MATING CONNECTOR	
STEP 3	PUSH	SLIDE CONNECTOR FULLY FORWARD, ALIGNED AXIALLY TO THE MATING CONNECTOR. DO NOT MATE THE CONNECTOR AT AN ANGLE.	
STEP 4	CLICK	RELEASE THE CONNECTOR AFTER THE SHARKFIN BECOMES ENGAGED INTO THE THE MATING CONNECTOR. A 'CLICK' WILL BE FELT/HEARD.	
STEP 5	INSPECT	DO NOT ALLOW CONNECTOR TO BECOME COCKED OR BENT (I.E. AXIALLY ANGLED) ONCE MATED	

FAKRA CONNECTOR SERIES

MATING & UN-MATING

Best practices for unmating right dual in-line cable connectors are as follows:

STEP 1	GRASP	GRASP THE CONNECTOR BY THE HOUSING ONLY	
		DO NOT GRAB THE CABLES OR SQUEEZE THE CABLES TOGETHER	
STEP 2	DEPRESS	DEPRESS LATCH ON THE MATING CONNECTOR FULLY, WHEREBY LATCH IS LIFTED OVER THE SHARKFIN.	
STEP 3	ALIGN	MAINTAIN AXIAL ALIGNMENT WITH THE MATING CONNECTOR	
STEP 4	PULL	PULL CONNECTOR AWAY FROM THE MATING CONNECTOR. MAINTAIN AXIAL ALIGNMENT WITH MATING CONNECTOR.	
STEP 5	SEPARATE	COMPLETE UNMATING PROCESS	

FAKRA CONNECTOR SERIES

AMPHENOL CORPORATE OVERVIEW

Amphenol Corporation

Amphenol Corporation (NYSE ticker: APH) is one of the largest manufacturers of interconnect products in the world. The Company designs, manufactures and markets electrical, electronic and fiber optic connectors, coaxial and flat-ribbon cable, and interconnect systems. Amphenol has a diversified presence as a leader in high growth segments of the interconnect market including: Military and Commercial Aerospace, Automotive, Broadband Communication, Industrial, Information Technology and Data Communications Equipment, Mobile Devices and Wireless Infrastructure.

Amphenol RF Division

Amphenol RF is the world's largest manufacturer of coaxial connectors for use in radio frequency, microwave, and data transmission system applications. Amphenol RF offers a complete range of RF connectors, cable assemblies and components used in the Automotive, Broadband, Wireless LAN/RFID, Wireless Infrastructure, Military Aerospace and Instrumentation markets.

Commitment to Quality

For over 80 years, leading manufacturers of communications, consumer, industrial, automotive, military and aerospace products have relied on Amphenol to provide total interconnect solutions. Maintaining this high level of customer trust requires a total concern for complete customer satisfaction at all levels – from engineering to manufacturing to quality assurance. Since many products are custom designed to individual customer specifications, often for the harshest environments, it's critical that a teamwork approach be taken, involving the customer at all levels. Amphenol RF's commitment to quality remains exceptionally uniform and internationally standardized, from raw materials testing, through design engineering, to automated manufacturing and sub-assembly, to fully documented and traceable test procedures developed in accordance with customer specifications.

Environmental Compliance

Amphenol RF is proud to be a continued world leader in improving environmental issues in the global marketplace. We are committed to meeting and exceeding the ever changing expanse of environmental compliance requirements. Amphenol works diligently with our customers on a variety of environmental protocols. As a global supplier we are committed to supporting RoHS/202/95/EC, PFOS 2006/12/EC and REACH requirements.

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ACKNOWLEDGEMENTS

All the information provided in this guide are considered best practices by all available industry standards but may vary depending on specific part number or design. Please refer to individual component drawings or contact factory for additional information.

Amphenol RF is proud to enable the next generation of automotive interconnect technology.

Contact

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