

## 1) Application Equipment

Glenair recommends the use of a Bak Rion Model 5100726 1600W hot-air-gun with a 34mm sieve spoon reflector (or equivalent system). Clamp the hot-air-gun in a bench mounted vice or comparable fixture to stabilize, with the reflector nozzle pointed upwards.



### Hot air gun settings

With the air-gun vent open and appropriate reflector nozzle installed, set the hot air gun as follows:

#### For installation of protective sleeves:

Use setting of 4-5 or 450° - 520°F (230° - 270°C)

#### For installation of the heat shrinkable terminator (HST):

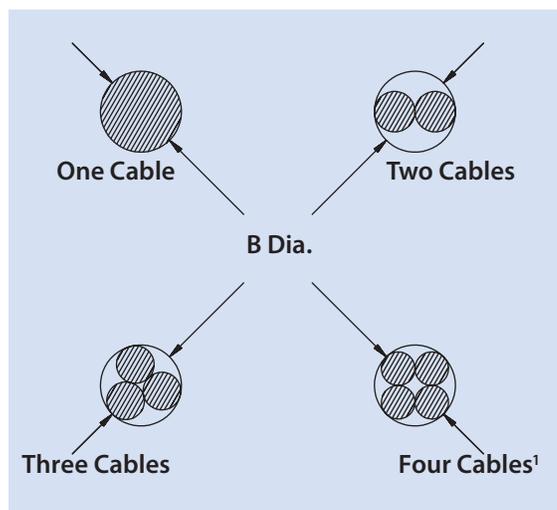
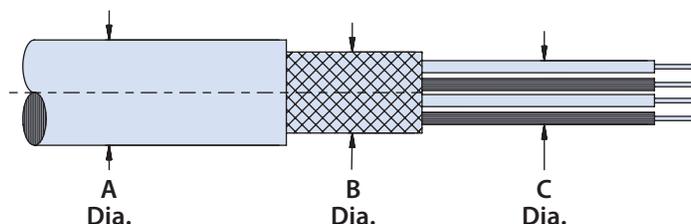
Use setting of 8-9 or 720° - 790°F (380° - 420°C)

While the hot air gun is warming, take a moment to check that all necessary StarShield™ assembly equipment is ready to terminate, and that extra components are on hand in case of a mis-termination.

## 2) Cable Preparation

Single or multi-conductor shielded cables meeting the envelope dimensions below may be used in any combination not to exceed 4 braids per ferrule.

Figure 1



1) Refer to Figure 3 for Special Instructions

Envelope Diameters

Size	Ø A		Ø B		Ø C	
	Min.	Max.	Min.	Max.	Min.	Max.
687-764-02*	.122 (3.1)	.271 (6.9)	.094 (2.4)	.208 (5.3)	N/A	.165 (4.2)
687-764-04*	.169 (4.3)	.350 (8.9)	.094 (2.4)	.244 (6.2)	N/A	.165 (4.2)
687-809-03*	.110 (2.79)	.189 (4.80)	N/A	N/A	.110 (2.79)	.189 (4.80)

\* Finish Code

Please see section D of this Catalog for tool ordering information

Dimensions in inches (millimeters) and are subject to change without notice.

# Glenair StarShield™ Assembly Procedure



The filling factors listed below may be used as a guideline in determining the number of wires per ferrule. Actual fit-checks should be performed to ensure feasibility.

## Circular Connectors

Connector	
Size	AWG 22 Contact Qty
9-35	6
11-35	13
13-35	22
15-35	37
17-35	55
19-35	66
21-35	79
23-35	100
25-35	128

StarShield™					
Size	Ferrule Qty	AWG 22 Shielded Wire Maximum Qty	Filling Factor	AWG 20 Shielded Wire Maximum Qty	Filling Factor
9	1	8	100%	6	100%
11	2	16	100%	12	92%
13	3	24	100%	18	82%
15	5	40	100%	24	37%
17	6	48	87%	36	55%
19	7	56	85%	42	64%
21	9	72	91%	54	68%
23	10	80	80%	60	60%
25	12	96	75%	72	56%

## ARINC 600 Connectors

Connector	
ARINC 600 Size	AWG 22 Contact Qty
2	300
3	600

StarShield™					
Size	Ferrule Qty	AWG 22 Shielded Wire Maximum Qty	Filling Factor	AWG 20 Shielded Wire Maximum Qty	Filling Factor
21	18	144	48%	108	36%
21	36	288	48%	216	36%

- With an AWG 22 (wire OD .039"/1.0mm), a ferrule can accept up to 4 screened twisted pairs (8 wires total)
- With an AWG 20 (wire OD .051"/1.3mm), a ferrule can accept up to 3 screened twisted pairs (6 wires)
- Filling factors can be increased if unshielded wires are used by routing them through a drilled star.

## StarShield™ Cable Length Preparation

Table I	
Angular Function and Connector Size	Length Constant
45° & 90° Circular 9	1.60
45° & 90° Circular 11 & 13	1.74
45° & 90° Circular 15 & 17	2.03
45° & 90° Circular 19	2.13
45° & 90° Circular 21	2.48
45° & 90° Circular 23	2.61
45° & 90° Circular 25	2.76
Straight Circular All Sizes	1.82

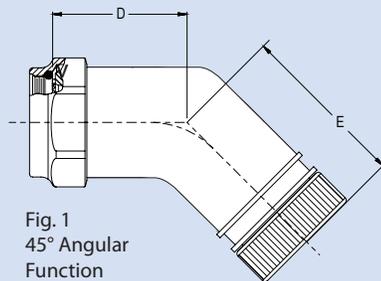


Fig. 1  
45° Angular Function

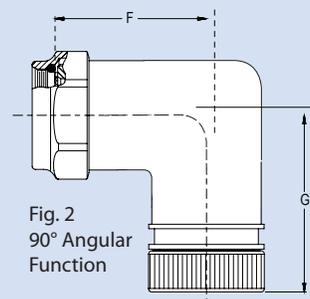


Fig. 2  
90° Angular Function

To calculate the cable length, see Table I (at left) to establish the *length constant* according to the connector designator's size and angular function. Then use the formula below to calculate the total length

$$45^\circ L = \text{Length constant} + D + E$$

Example:  
470HT017XM176G  
 $L = 2.03 + 0.81 + 1.20 = 4.04$  in.

$$\text{Straight } L = \text{Length constant} + \text{Straight length}$$

Example:  
470HS017XM176G  
 $L = 1.82 + 1.11 = 2.93$  in.

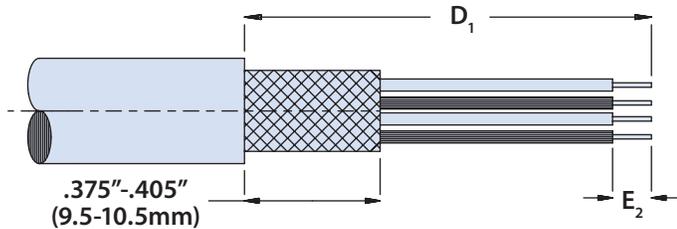
Dimensions in inches (millimeters) and are subject to change without notice.

Figure 2

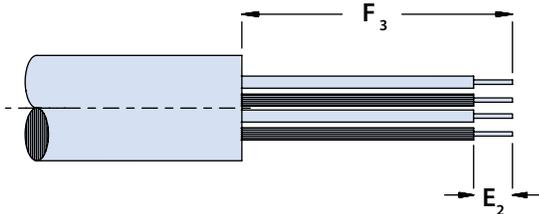
.375"-.405"  
(9.5-10.5mm)



HST preparation dimension

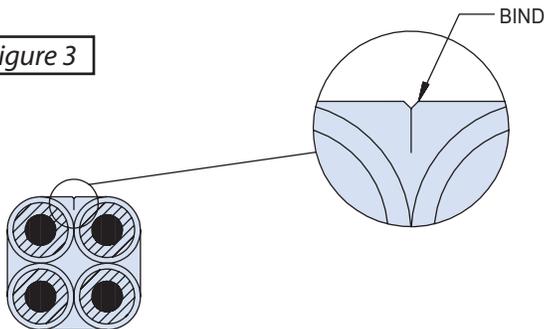


Adhesive sleeve preparation dimension

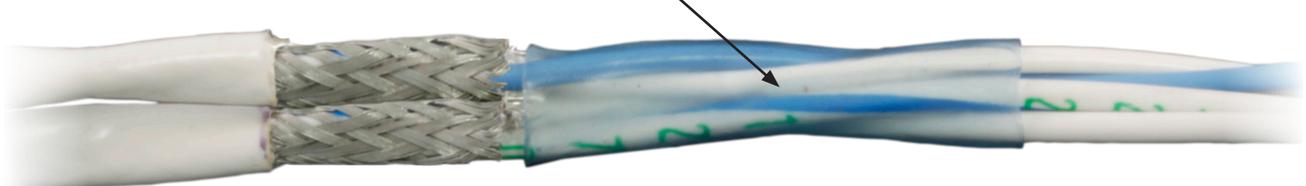


1.  $D_1$  dimension allows for at least one repair of the crimp contact.
2.  $E_2$  dimension determined by crimp contact mfr instructions.
3.  $F_3$  dimension for adhesive sleeve allows for at least one repair to the crimp contact

Figure 3



Heat Shrinkable Protective Sleeve



Strip the cables according to the following dimensions.

Backshell Style	Size	D Dim ±.02" (0.5mm)	F Dim ±.02 (0.5mm)
Straight ARINC 600	All	3.23 (82)	2.83 (71.88)
Straight Circular	All	3.07 (78)	2.67 (67.82)
45° & 90° Circular	9	3.35 (85)	2.95 (74.93)
45° & 90° Circular	11 & 13	3.54 (90)	3.14 (79.76)
45° & 90° Circular	15 & 17	3.94 (100)	3.54 (89.92)
45° & 90° Circular	19	4.13 (105)	3.73 (94.74)
45° & 90° Circular	21	4.53 (115)	4.13 (104.90)
45° & 90° Circular	23	4.72 (120)	4.32 (109.73)
45° & 90° Circular	25	4.92 (125)	4.52 (114.81)

Make sure not to fray braided shielding ends. Contacts may be installed at this time if desired, provided their size is not so great as to prevent the leads to pass through the ferrule.

### 3) Assembly

Arrange prepared cables into bundles in accordance with plan. (See figure 1 in step 2)

For applications with 4 braids, we recommend the use of a solid tin plated copper wire  $\varnothing$ .008-.016" (0.2-0.4mm) to bind the shields securely during the installation. Secure them together as shown in figure 3. Trim ends to .20" (5mm) long and fold flat along length of cable.

Using the hot air gun (see step 1), install provided .75" (19mm) protective sleeve directly adjacent the stripped braid. This will prevent the wire conductors from getting pinched in the ferrule slot as well as keeping the wire bundle well managed throughout the rest of the assembly process.

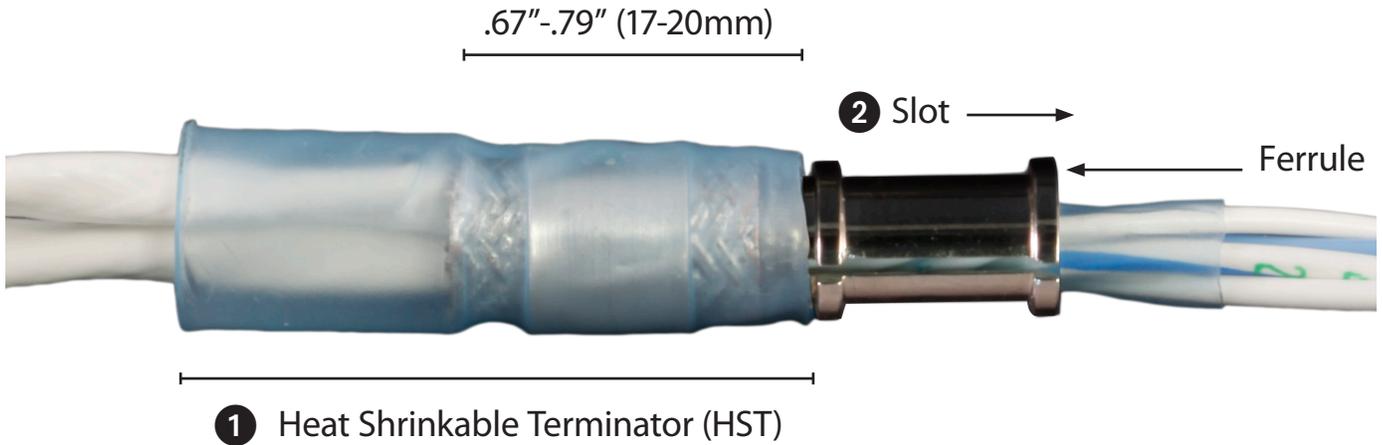
Please see section D of this Catalog for tool ordering information

Dimensions in inches (millimeters) and are subject to change without notice.

# Glenair StarShield™ Assembly Procedure



1 Stage the StarShield™ HST over the cable bundle, positioning the solder preform directly over the stripped section of braided shielding.

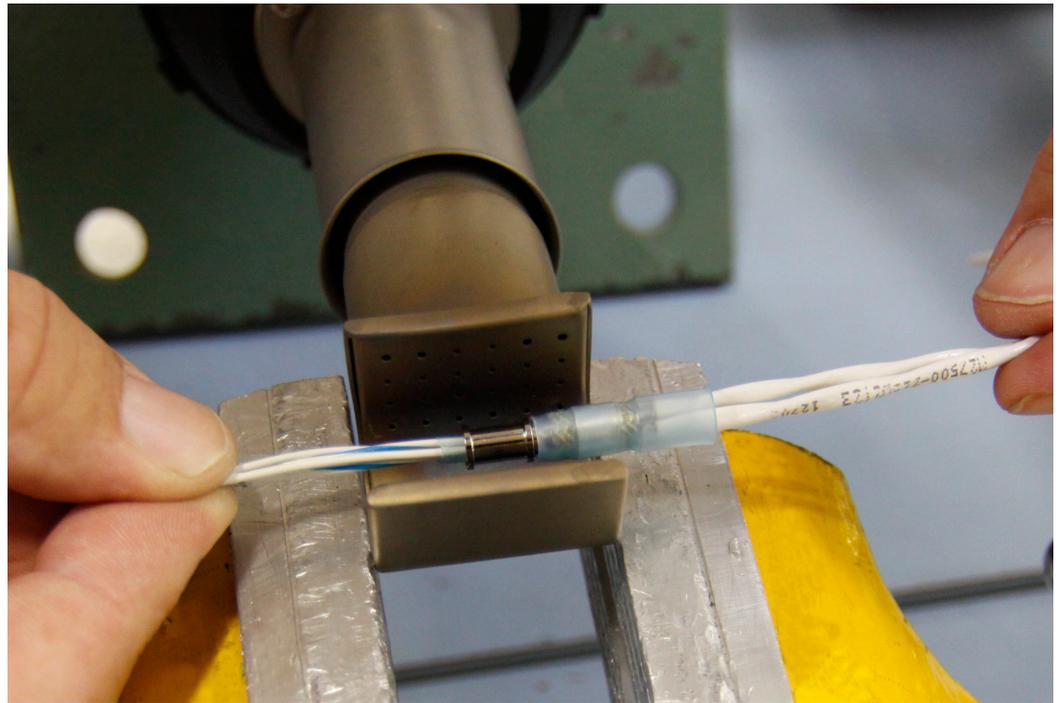


2 Next, carefully slide the StarShield™ ferrule (with slotted side oriented towards contacts) over the leads until the non-lipped end slides under the HST braid. Cable jacketing should be positioned on the ferrule as shown above.

## 4) Termination Procedure

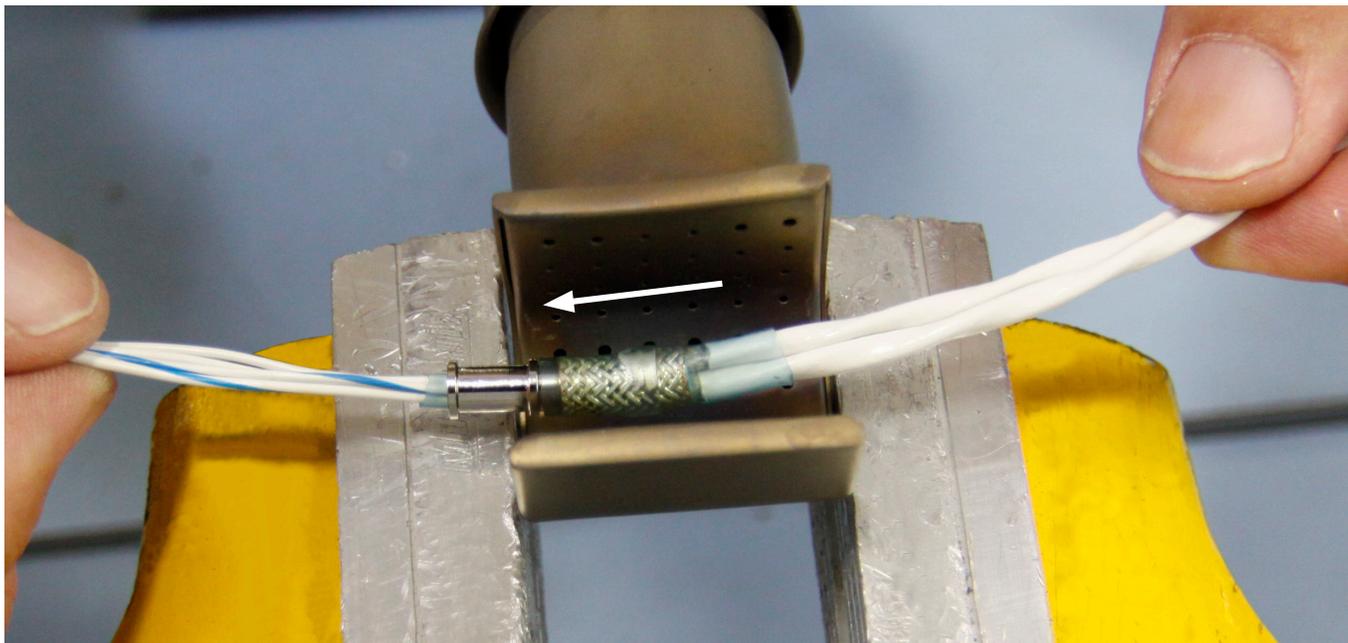
Check that the hot-air-gun is set to the recommended setting and has been allowed to warm up for 1 minute.

Position cable and staged ferrule/HST in the center of the hot-air-gun reflector, being careful not to touch the outer heat shrink material to the reflector.



Dimensions in inches (millimeters) and are subject to change without notice.

A



Focus heat on ferrule for a few seconds and begin moving towards the solder preform. Solder should melt and begin to flow freely. Continue to move the preform towards the center of the heat reflector as solder completely melts and flows along preform braid.

Heat until shrink sleeve has fully recovered around preform assembly and solder has completely melted and flowed through copper braid (approximately 15-45 seconds). Some solder flowing over the stripped cable braids should be seen. The solder will take on a lustrous appearance when properly melted. (Note: luster will subside as preform assembly cools to ambient temperature).



Be careful not to overheat preform assembly and scorch outer shrink sleeve. Slight browning of outer shrink sleeve is acceptable, but severe discoloration is indicative of improper termination.

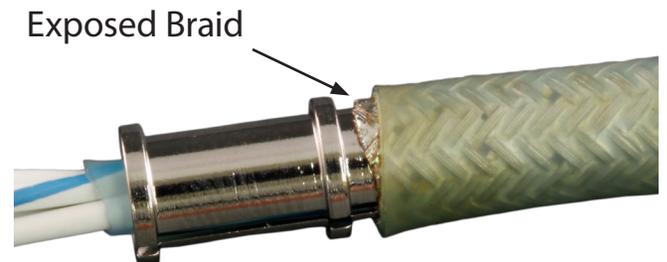
*Please see section D of this Catalog for tool ordering information*

## 5) Inspection

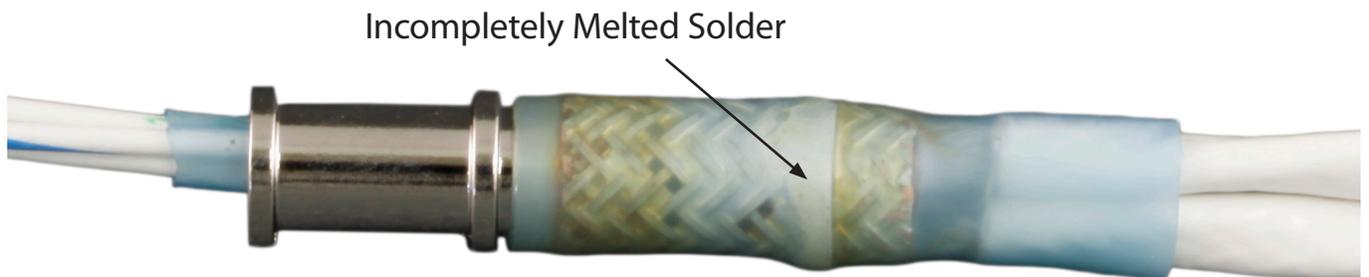
Allow the ferrule and HST assembly to cool completely before touching with bare hands.

Check for cuts, splits or charred spots in the outer heat shrink sleeve. A complete discolored dark brown sleeve indicates an overheated termination. A slight browning of the sleeve is acceptable.

Make sure that no braid strands are exposed from under the sleeve. If any such damage is evident, remove damaged sleeve and replace with new heat shrinkable sleeve Glenair part number 687-808-02 or 687-808-04.



If solder has not completely melted and flowed within the preform assembly and/or outer heat shrink sleeve has not fully recovered, reheating may be necessary.



## 6) Repair

Reheat incompletely melted terminations to obtain proper solder flow and/or fully recovered sleeve onto the cable jacket. If the outer shrink sleeve has split during the assembly process, it must be replaced. To do so, cut away existing (damaged) shrink sleeve with snips and carefully remove from solder preform. Slide replacement heat-shrinkable sleeve (Glenair P/N 687-808-\*\*) over terminated solder preform, leaving roughly .06" (1.5mm) of overlap on the braid/ferrule transition point. Heat new shrink sleeve until it recovers fully around preform and wires, making sure to constantly move it within the hot air gun reflector to ensure even heating and recovery. Once the new shrink sleeve is fully recovered, remove assembly from the hot air gun and allow the assembly to cool before proceeding with subsequent steps. Repeat inspections per step 5.

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StarShield™ Zero Length Shield Termination Catalog

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## 7) Replacement

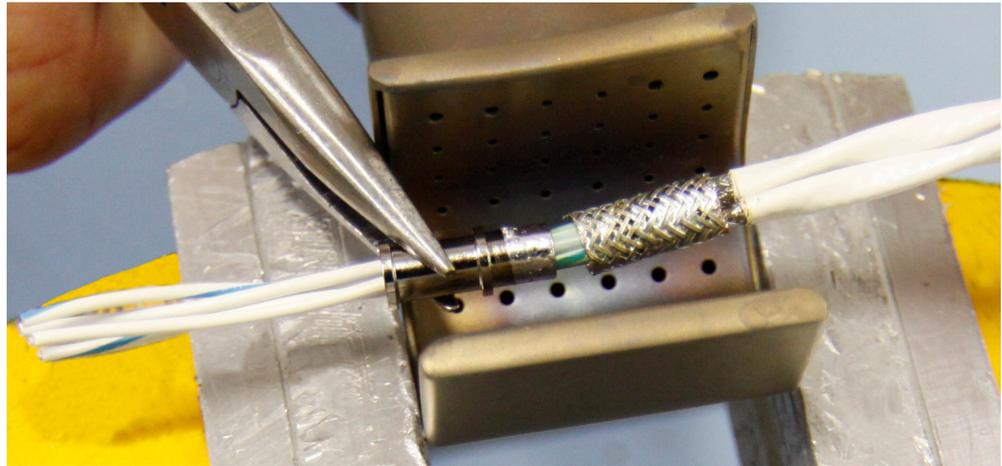
### A

In the case of severely damaged StarShield™ HST assemblies, complete removal and re-termination may be necessary. Users will need a hot air gun fixed in a bench mount (see step 1), needle nose pliers and an unused StarShield™ HST kit (Glenair part number 687-764-\*\*\*)

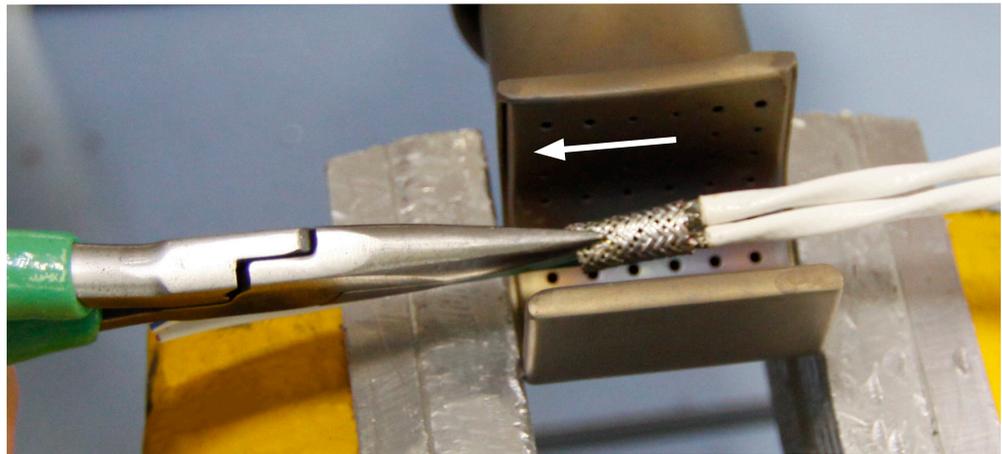
*Set hot-air-gun to recommended setting (see step 1) and allow to warm up for one minute.*

*Remove outer heat shrink sleeve completely, being careful not to cut or damage wire jacketing.*

With needle nose pliers firmly planted on end of ferrule, place StarShield™ ferrule/HST in hot air gun and allow solder to melt and flow. Once solder is molten, gently pull ferrule away from braided preform and slide off wires. Remove assembly from heat and set aside.



Next, grasp preform braid with needle nose pliers and return assembly to hot air gun reflector. When solder begins to melt, gently pull preform braid away from cable. Remove from heat and allow to cool.



Once assembly cools to ambient temperature, use fingers to gently scrape residual solder off cable jacketing and protective sleeve.

Re-terminate with a new StarShield™ HST (Glenair part number 687-764-\*\*\*) and inspect for damage per previous instructions.

*Please see section D of this Catalog for tool ordering information*

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## 8) Assembly of StarShield™ Backshells

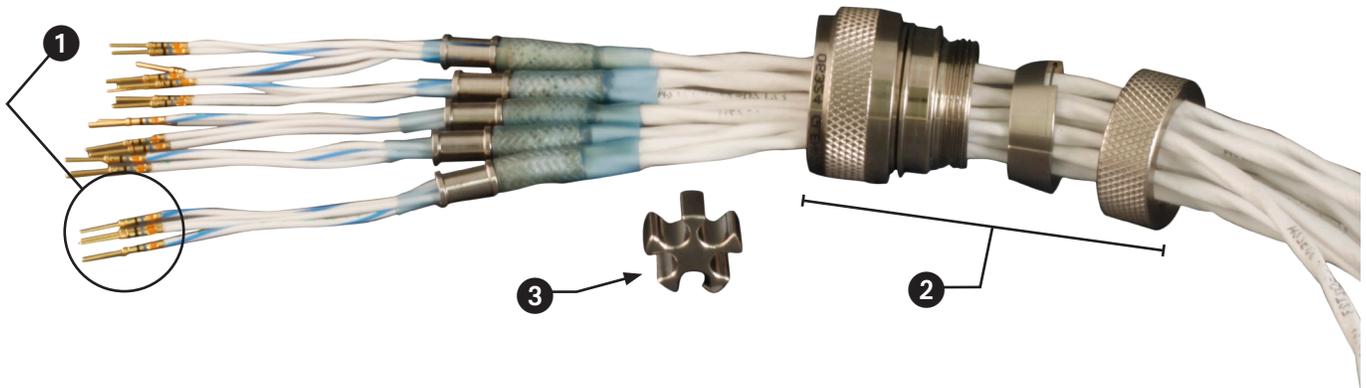
Install HST/ferrules onto cables per steps 1 through 4.

❶ Terminate crimp contacts onto leads per Glenair crimping instructions, or follow appropriate connector manufacturer's contact procedure.

❷ Slide the gland nut, compression ring and backshell body/coupling nut assembly over the cable bundle—paying special attention to the order and orientation of each component.

❸ For backshells with drilled stars, route the wires that pass through the center hole of the star before inserting the contacts into the connector. See split star configurations in step 9 for further instruction.

A



Using appropriate insertion tools, insert terminated contacts into the connector per Glenair insertion instructions, or per connector manufacturer's procedure.

*Please see section D of this Catalog for tool ordering information*

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A

Hand tighten the backshell body/ coupling nut assembly onto the connector accessory threads until anti-rotation teeth engage. Once threads have engaged and anti-rotation teeth are sitting peak-to-valley, begin tightening with assembly tool to specified torque value. We suggest the connector be mated to an appropriate holding tool (see Glenair tools catalog) before final tightening takes place. Continue to tighten the coupling nut until specified torque value has been reached (see chart below for values). Effective EMI grounding is dependent upon proper tightening of backshell to connector body. Snap ferrules into place on the StarShield™ “star.”



### Installation Torque Values for Circular Electrical Connector Accessories

Accessory Thread Torque: ± inch pounds

Shell Sizes	Group 1 Light & Medium Duty	Group 2 Heavy Duty	Group 2
	MIL-C-5015 (MS3100 Series) MIL-C-26482 Series I MIL-C-26500 MIL-C-27599 MIL-C-38999 Series I, II MIL-C-81511 Series I, II, III, IV MIL-C-81703 Series I	MIL-C-5015 (MS3400 Series) MIL-C-22992 MIL-C-26482 Series II MIL-C-28840 MIL-C-38999 Series III, IV MIL-C-81703 Series III MIL-C-83723 Series I, II, III	Values for Hand Held Tool Applications Field Repair Torque
8, 9, A	35	56	40 - 50
3, 10, 10SL, 11, B	35	76	40 - 50
7, 12, 12S, 13, C	40	108	40 - 50
14, 14S, 15, D	40	116	50 - 60
16, 16S, 17, E	40	116	50 - 60
18, 19, 27, F	40	116	50 - 60
20, 21, 37, G	80	136	80 - 90
22, 23, H	80	136	80 - 90
24, 25, 61, J	80	136	80 - 90

#### Notes:

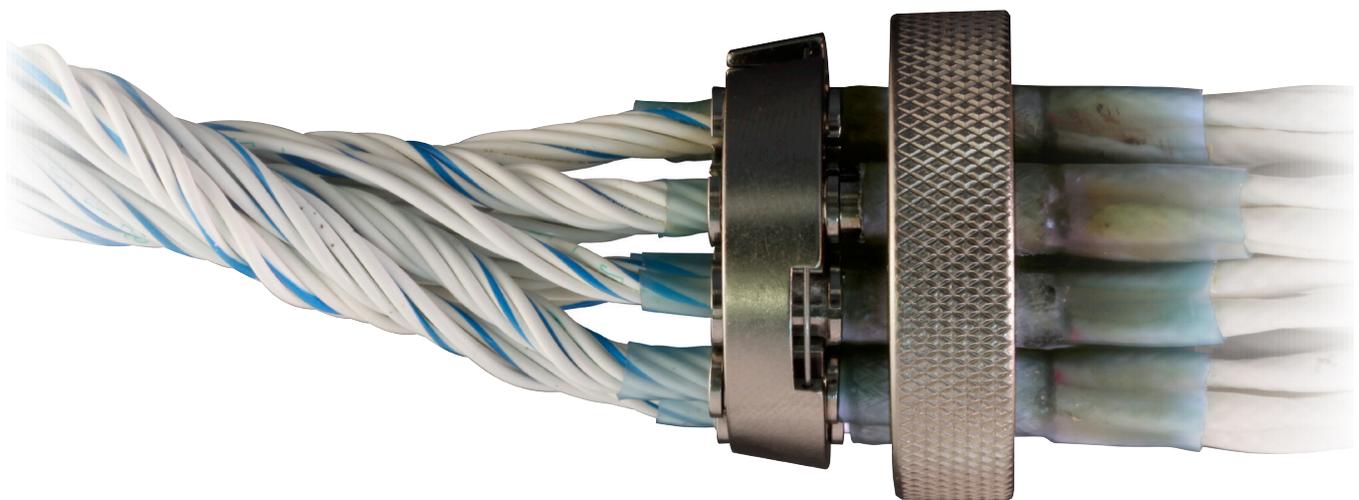
Values based on 80% of MIL-C-85049 thread strength.  
Use group 1 values for all composite connector accessories.  
When tightened with Glenair  
600-091 And 600-007 torque tools. Consult factory.

Dimensions in inches (millimeters) and are subject to change without notice.

### 9) Split Star Configurations

For star-in-star or split star configurations, install ferrules starting from the inner star or ferrule slot. Position conical ring on the star.

Position the sub-assemblies (stars, compression ring and ferrules) into the body by carefully twisting to “birdcage” the individual wire pairs first and then the entire wire bundle in a counter clockwise motion. If necessary, heat may be applied to the wires to make them more pliable and easier to fit into backshell body (Hot air gun setting 4–5 or 450°–520°F/230°–270°C with reducer nozzle).



Dimensions in inches (millimeters) and are subject to change without notice.

Apply heat, then push and twist the wires until the gland nut threads engage the threads on the body.

**A**



Tighten the gland nut on the body to the appropriate torque value.



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Glenair recommends the use of an appropriately sized Series 600 backshell holding wrench, TG70 strap wrench, or TG69 soft jaw pliers. (These tools are used to grip the self-locking coupling nut. Any one of the three will do the job.) Connector plug or receptacle holder: These tools take the form of a socket device used in conjunction with a torque wrench, either hand held (600-161) or bench mounted (600-162). These tools are used to hold the inner body of the connector in place while the StarShield™ Backshell coupling nut and clamping nut are torqued onto the back. Note: most holder series tools provide “universal polarization”, but a few connector series require specific polarization for each alternate keying arrangement. Please see section D of this Catalog for tool ordering information

## 10) Dismantling StarShield™ Backshells:

Dismantling is the reverse of the assembly. To remove a ferrule from a star, grip the ferrule assembly as close to the star as possible. Carefully twist and lift the ferrule straight up from the ferrule slot in the star. Do not remove the ferrule by lifting or pulling on the cable or wires only, or damage to the termination may result. For maximum contact extraction tool access, unclip all ferrules from the star, remove the star from the cable bundle before pushing the backshell body towards the cable.

