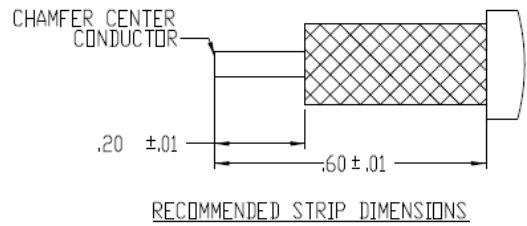
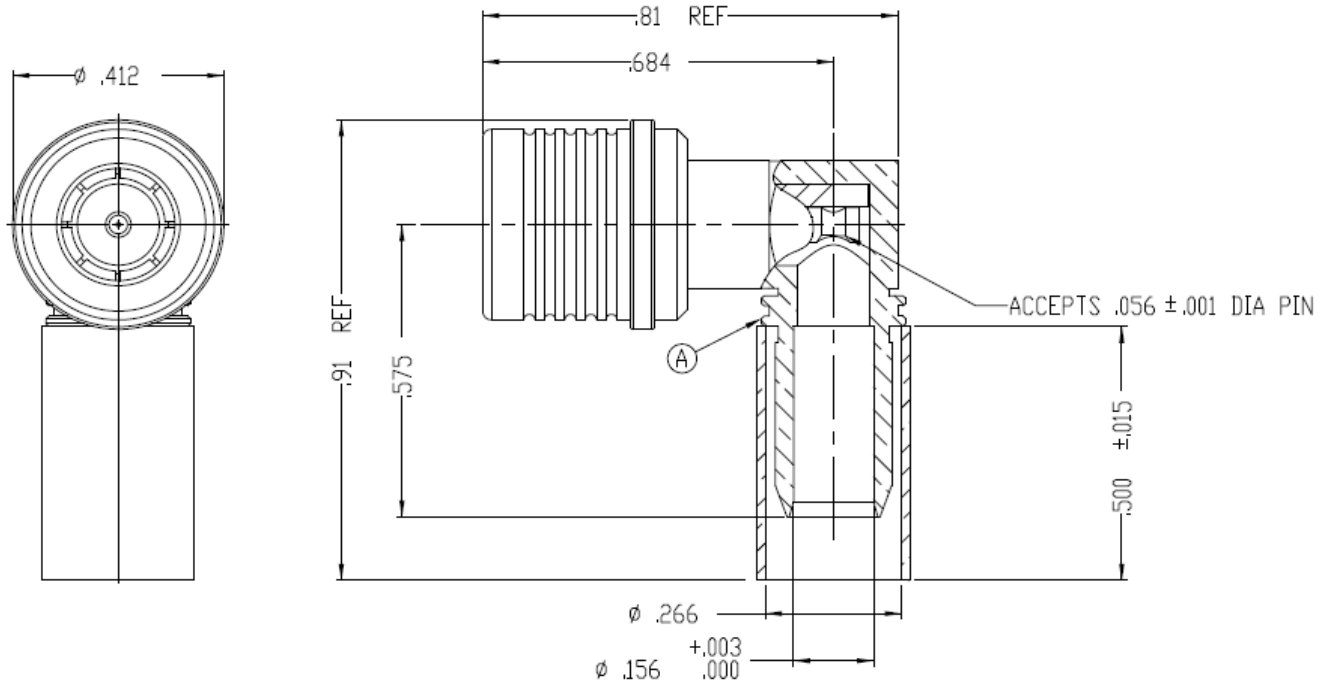


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SYM	REVISION DESCRIPTION	DFTM	DATE	APPD	DATE
A	RELEASED FOR PRODUCTION	N. N. N	9/4/13	J. D. B.	9/10/13



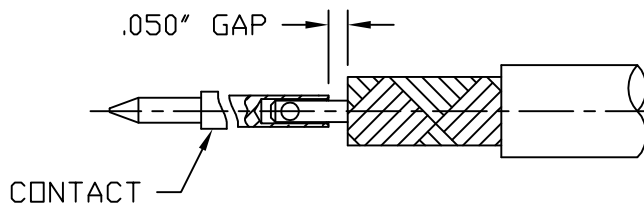
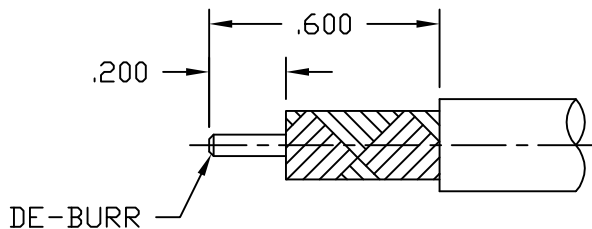
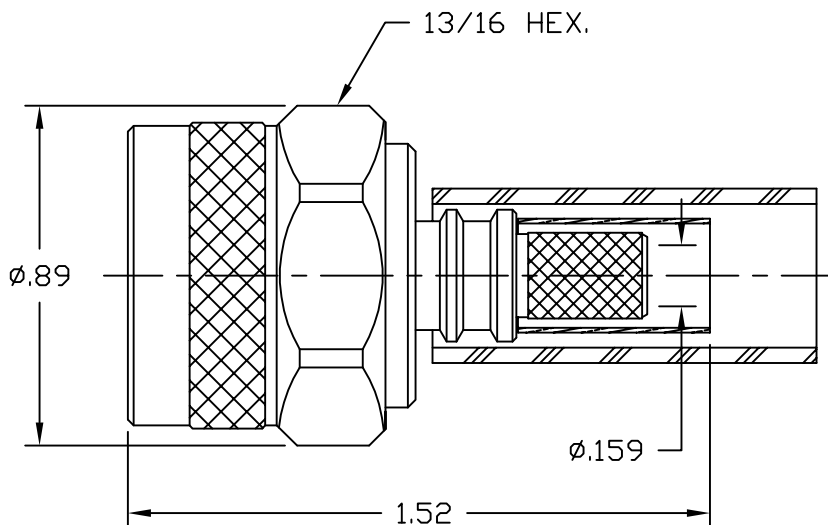
**NOTES:**

- ASSEMBLED CONNECTOR INTERFACE IS DESIGNED TO MATE WITH STANDARD QMA JACK.
- MATERIAL:**  
 BODY, COUPLING SLEEVE - BRASS PER ASTM B16, C36000 ALLOY, TEMPER H02  
 INSULATOR - TEFLON PER ASTM D1710, TYPE 1, GRADE 1, CLASS A  
 SHRINK SLEEVE - HEAT SHRINKABLE ATUM PER MIL-I-23053/4 (NOT SHOWN)  
 CRIMP SLEEVE - D.H.P. COPPER CDA, ALLOY #122, TEMPER HARD  
 CONTACT - BERYLLIUM COPPER PER ASTM B196, C17300 ALLOY, CONDITION HT  
 CONTACT FINGER - PHOSPHOR BRONZE PER ASTM B139, C54400 ALLOY, TEMPER HD
- FINISH:**  
 CONTACT & FINGER - GOLD PLATE PER ASTM B488  
 CRIMP SLEEVE - SULFAMATE NICKEL PER MIL-P-27418  
 ALL OTHER METAL PARTS - ALBALOY PLATE PER DELTA SPEC. 111197

MATL:	UNLESS OTHERWISE SPECIFIED		DFTM. N. N. N	TIMES MICROWAVE SYSTEMS	
	ALL DIMENSIONS ARE IN INCHES MACHINED SURFACES FINISH 63 RMS MAX. REMOVE ALL BURRS .004 MAX. BREAK MACHINE CORNERS .005 MAX. FILLET R. TOLERANCES ON DECIMALS .XX ± .01 .XXX ± .005 ANGLES ± 1° FRACTIONS ± 1/64		DATE 9/4/13		
USED ON: B	DO NOT SCALE DRAWING		CHKD. J. D. B.	EZ-240-QM-RA-X CONNECTOR ASSEMBLY 90° QMAM for LMR-240	
			DATE 9/10/13		
SCALE: NONE	DWG. SIZE A	CODE IDENT 68999	APPD. J. D. B.	DATE 9/10/13	1 of 1
				SD3190-2895	A

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SYM	REVISION DESCRIPTION	DFTM	DATE	APPD	DATE
A	RELEASED FOR PRODUCTION	D. J. H.	10/17/13	J. D. B.	10/21/13



**CABLE PREPARATION**  
 USE CST-240A (3192-152)  
 STRAIGHT SETTING.  
 CRIMP .255" HEX.

- |  |  |                               |
|--|--|-------------------------------|
| 1.0 PERFORMANCE                        | 2.0 MATERIALS                          | 3.0 FINISHES                  |
| 1.1 FREQUENCY RANGE: DC-6 GHz          | 2.1 DIELECTRIC: PTFE                   | 3.1 CONTACT: GOLD/NI          |
| 1.2 NOMINAL IMPEDANCE: 50 OHMS         | 2.2 CONTACT: BRASS                     | 3.2 BODY: ALBALOY             |
| 1.3 DWV: 750 VRMS @ 60 Hz (SEA LEVEL)  | 2.3 LOCKING RING: PHOSPHOR BRONZE      | 4.0 MECHANICAL                |
| 1.4 TEMPERATURE RANGE: -65°C TO +165°C | 2.4 CRIMP FERRULE: SOFT COPPER         | 4.1 INTERFACE PER MIL-STD-348 |
|  | 2.5 OTHER METAL PARTS: BRASS           |                               |
|  | 2.6 GASKET: SILICONE RUBBER            |                               |
|  | 2.7 HEAT SHRINK: POLYOLEFIN THICK WALL |                               |

MATERIAL:	UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES MACHINED SURFACES FINISH N/A RMS MAX. REMOVE ALL BURRS .005 MAX. BREAK MACHINE CORNERS .005 MAX. FILLET R. TOLERANCES ON DECIMALS .XX ± .03 .XXX ± .005 ANGLES ± 1° FRACTIONS ± 1/32	DFTM. D. J. H.	TIMES MICROWAVE SYSTEMS
		DATE 10/17/13	
USED ON: A		CHKD. J. D. B.	<b>TC-240-NMH-X</b> N MALE FOR LMR-240 CABLE SOLDER/CRIMP/NO BRAID TRIM
		DATE 10/21/13	
SCALE: N/A	DWG. SIZE A	APPD. J. D. B.	SHEET 1 of 1   SD3190-2887   REV A
		DATE 10/21/13	
DO NOT SCALE DRAWING		CODE IDENT 68999	

## LMR<sup>®</sup>-240

# Flexible Low Loss Communications Coax

### Ideal for...

- Jumper Assemblies in Wireless Communications Systems
- Short Antenna Feeder runs (e.g. WLL, GPS, LMR, Mobile Antennas)
- Any application (e.g. WLL, GPS, LMR, WLAN, WISP, WiMax, SCADA, Mobile Antennas) requiring an easily routed, low loss RF cable



• **LMR<sup>®</sup>** standard is a UV Resistant Polyethylene jacketed cable designed for 20-year service outdoor use. The bending and handling characteristics are significantly better than air-dielectric and corrugated hard-line cables.

• **LMR<sup>®</sup>-DB** is identical to standard LMR plus has the advantage of being watertight. The addition of waterproofing compound in and around the foil/braid insures continuous reliable service should the jacket be inadvertently damaged during installation or in the future.

• **LMR<sup>®</sup>-FR** is a non-halogen (non-toxic), low smoke, fire retardant cable designed for in-building runs that can be routed anywhere except air handling plenums. LMR-FR is UL/NEC & CSA rated 'CMR' and 'FT4' respectively, meets FAA FAR25 requirements and is MSHA-P for mining applications.

• **LMR<sup>®</sup>-FR-PVC** is a general-purpose indoor cable and has a UL/NEC & CSA rating of 'CMR' and 'FT4' respectively. It is less expensive than LMR-FR, however it emits toxic fumes (HCL) and greater smoke density when burned.

• **LMR<sup>®</sup>-PVC** is designed for low loss general-purpose applications and is somewhat more flexible than the standard polyethylene jacketed LMR.

• **LMR<sup>®</sup>-PVC-W** is a white-jacketed version of LMR-PVC for marine and other applications where color compatibility is desired.

• **LMR<sup>®</sup>-MA** is a flexible cable designed specifically for mobile antenna applications. It has a PVC jacket and un-bonded aluminum tape to facilitate end stripping with automated equipment.

• **Flexibility** and bendability are hallmarks of the LMR-240 cable design. The flexible outer conductor enables the tightest bend radius available for any cable of similar size and performance.

• **Low Loss** is another hallmark feature of LMR-240. Size for size LMR has the lowest loss of any flexible cable and comparable loss to semirigid hard-line cables.

• **RF Shielding** is 50 dB greater than typical single shielded coax (40 dB). The multi-ply bonded foil outer conductor is rated conservatively at > 90 dB (i.e. >180 dB between two adjacent cables).

• **Weatherability:** LMR-240 cables designed for outdoor exposure incorporate the best materials for UV resistance and have life expectancy in excess of 20 years.

• **Connectors:** A wide variety of connectors are available for LMR-240 cable, including all common interface types, reverse polarity, and a choice of solder or non-solder center pins. Most LMR connectors employ crimp outer attachment using standard hex crimp sizes.

• **Cable Assemblies:** All LMR-240 cable types are available as pre-terminated cable assemblies. Refer to the section on FlexTech for further details.

Part Description					Stock
Part Number	Application	Jacket	Color	Code	
LMR-240	Outdoor	PE	Black	54021	
LMR-240-DB	Outdoor/Watertight	PE	Black	54090	
LMR-240-FR	Indoor/Outdoor Riser	CMR FRPE	Black	54029	
LMR-240-FR-PVC	Indoor/Outdoor Riser	CMR FRPVC	Black	54214	
LMR-240-PVC	General Purpose	PVC	Black	54140	
LMR-240-PVC-W	General Purpose	PVC	White	54202	
LMR-240-MA	Indoor & Mobile Antenna	PVC	Black	54046	

Construction Specifications			
Description	Material	In.	(mm)
Inner Conductor	Solid BC	0.056	(1.42)
Dielectric	Foam PE	0.150	(3.81)
Outer Conductor	Aluminum Tape	0.155	(3.94)
Overall Braid	Tinned Copper	0.178	(4.52)
Jacket	(see table above)	0.240	(6.10)

<b>Mechanical Specifications</b>			
Performance Property	Units	US	(metric)
Bend Radius: installation	in. (mm)	0.75	(19.1)
Bend Radius: repeated	in. (mm)	2.5	(63.5)
Bending Moment	ft-lb (N-m)	0.25	(0.34)
Weight	lb/ft (kg/m)	0.034	(0.05)
Tensile Strength	lb (kg)	80	(36.3)
Flat Plate Crush	lb/in. (kg/mm)	20	(0.36)

<b>Environmental Specifications</b>		
Performance Property	°F	°C
Installation Temperature Range	-40/+185	-40/+85
Storage Temperature Range	-94/+185	-70/+85
Operating Temperature Range	-40/+185	-40/+85

<b>Electrical Specifications</b>			
Performance Property	Units	US	(metric)
Velocity of Propagation	%	84	
Dielectric Constant	NA	1.42	
Time Delay	nS/ft (nS/m)	1.21	(3.97)
Impedance	ohms	50	
Capacitance	pF/ft (pF/m)	24.2	(79.4)
Inductance	uH/ft (uH/m)	0.060	(0.20)
Shielding Effectiveness	dB	>90	
<b>DC Resistance</b>			
Inner Conductor	ohms/1000ft (/km)	3.2	(10.5)
Outer Conductor	ohms/1000ft (/km)	3.89	(12.8)
Voltage Withstand	Volts DC		1500
Jacket Spark	Volts RMS		5000
Peak Power	kW		5.6

**Attenuation vs. Frequency (typical)**



Frequency (MHz)	30	50	150	220	450	900	1500	1800	2000	2500	5800
<b>Attenuation dB/100 ft</b>	1.3	1.7	3.0	3.7	5.3	7.6	9.9	10.9	11.5	12.9	20.4
<b>Attenuation dB/100 m</b>	4.4	5.7	9.9	12.0	17.3	24.8	32.4	35.6	37.7	42.4	66.8
<b>Avg. Power kW</b>	1.49	1.15	0.66	0.54	0.38	0.26	0.20	0.18	0.17	0.15	0.10

**Calculate Attenuation =**

$(0.242080) \cdot \sqrt{\text{FMHz}} + (0.000330) \cdot \text{FMHz}$  (interactive calculator available at [http://www.timesmicrowave.com/cable\\_calculators](http://www.timesmicrowave.com/cable_calculators))

**Attenuation:**

VSWR=1.0 ; Ambient = +25°C (77°F)

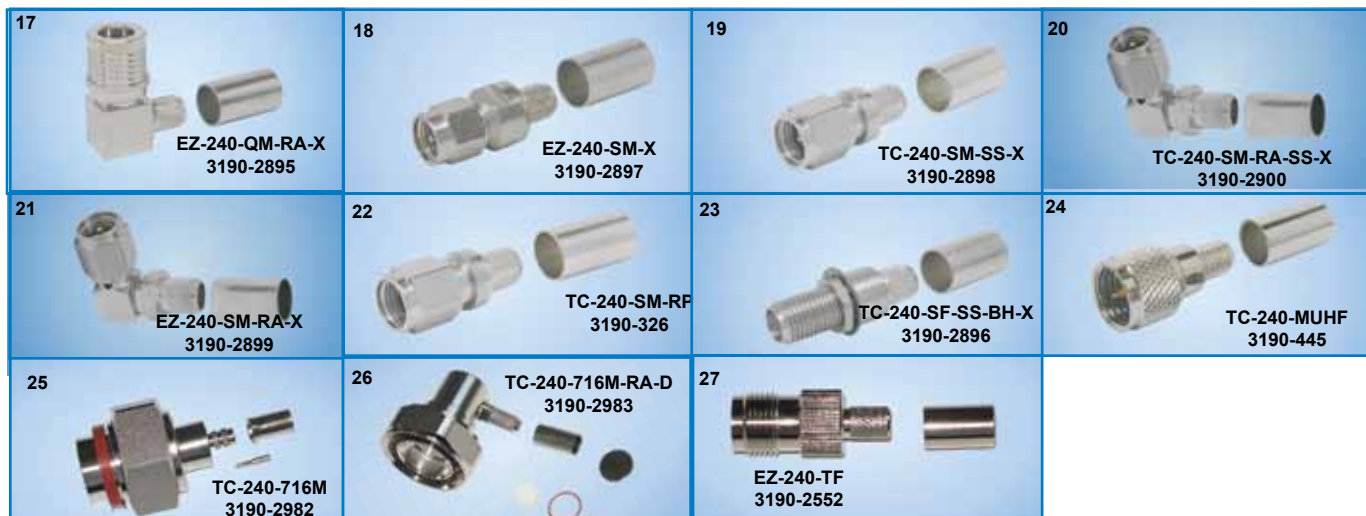
**Power:** VSWR=1.0; Ambient = +40°C; Inner Conductor = 100°C (212°F); Sea Level; dry air; atmospheric pressure; no solar loading

# LMR<sup>®</sup>-240 Flexible Low Loss Communications Coax



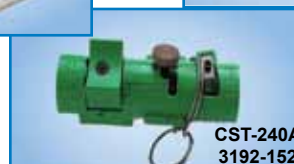
## Connectors

Interface	Description	Part Number	Stock Code	VSWR** Freq. (GHz)	Coupling Nut	Inner Contact Attach	Outer Contact Attach	Finish* Body /Pin	Length in (mm)	Width in (mm)	Weight lb (g)
1. F Male	Straight Plug	TC-240-FM-X	3190-2891	<1.25:1 (2.5)	Knurl	Solder	Crimp	N/G	1.1 (28)	0.45 (11.4)	0.014 (6.4)
2. N Male	Straight Plug	EZ-240-NMH-X	3190-2893	<1.25:1 (2.5)	Hex/Knurl	Spring Finger	Crimp	A/G	1.5 (38.1)	0.78 (19.8)	0.086 (39.0)
3. N Male	Right Angle	TC-240-NMH-RA-D	3190-2426	<1.35:1 (6)	Hex/Knurl	Solder	Crimp	A/G	1.2 (32.4)	1.22 (31.0)	0.091 (41.7)
4. N Male	Straight Plug	TC-240-NMH-X	3190-2887	<1.25:1 (2.5)	Hex/Knurl	Solder	Crimp	N/S	1.5 (38)	0.75 (19.1)	0.086 (39.0)
5. N Male	Straight Plug	TC-240-NMC	3190-244	<1.25:1 (2.5)	Knurl	Solder	Clamp	S/G	1.5 (38)	0.75 (19.1)	0.082 (37.2)
6. 1.0/2.3 DIN	Straight Plug	EZ-240-1023M	3190-2512	<1.35:1 (2.5)	knurl	Spring Finger	Crimp	N/G	1.1 (228.5)	0.33 (8.5)	0.014 (6.63)
7. N Female	Bulkhead Jack	TC-240-NF-BH-X	3190-2888	<1.25:1 (2.5)	NA	Solder	Crimp	A/G	1.7 (44)	0.88 (22.2)	0.115 (52.2)
8. N Female	Panel Mount	TC-240-NF-PM-X	3190-2889*	<1.25:1 (6)	NA	Solder	Crimp	A/G	1.7 (44)	0.88 (22.2)	0.115 (52.2)
9. BNC Male	Straight Plug	TC-240-BMC	3190-242	<1.25:1 (2.5)	Knurl	Solder	Clamp	S/G	1.7 (43)	0.56 (14.2)	0.040 (18.1)
10. BNC Male	Straight Plug	TC-240-BM-X	3190-2890	<1.25:1 (2.5)	Knurl	Solder	Crimp	A/G	1.3 (34)	0.58 (14.7)	0.043 (19.5)
11. BNC Male	Straight Plug	TC-240-BM-RA-D	3190-2869	<1.25:1 (2)	Knurl	Solder	Crimp	A/G	1.0 (25.1)	0.57 (14.5)	0.115 (52.0)
12. TNC Male	Straight Plug	EZ-240-TM-X	3190-2725	<1.25:1 (2.5)	Knurl	Spring Finger	Crimp	N/G	1.4 (34.3)	0.59 (15.0)	0.043 (19.5)
13. TNC Male	Straight Plug	TC-240-TM-X	3190-2797	<1.25:1 (2.5)	Knurl	Solder	Crimp	N/G	1.7 (43)	0.59 (15.0)	0.043 (19.5)
14. TNC Male	Reverse Polarity	EZ-240-TM-RP-X	3190-2892	<1.25:1 (6)	Knurl	Spring Finger	Crimp	A/G	1.4 (36)	0.59 (15.0)	0.043 (19.5)
15. TNC Male	Right Angle	TC-240-TM-RA-D	3190-2798	<1.25:1 (6)	Hex	Solder	Crimp	A/G	1.0 (25.1)	0.62 (15.7)	0.115 (52.0)
16. QMA Male	Straight Plug	EZ-240-QM-X	3190-2894	<1.25:1 (6)	Knurl	Spring Finger	Crimp	N/G	1.2 (30.0)	0.41 (10.5)	0.014 (6.35)
17. QMA Male	Right Angle	EZ-240-QM-RA-X	3190-2895	<1.25:1 (<6)	Knurl	Spring Finger	Crimp	N/G	0.8 (20.3)	0.65 (16.5)	0.019 (8.62)
18. SMA Male	Straight Plug	EZ-240-SM-X	3190-2897	<1.25:1 (6)	Hex	Spring Finger	Crimp	N/G	1.0 (25.4)	0.32 (8.1)	0.016 (7.26)
19. SMA Male	Straight Plug	TC-240-SM-SS-X	3190-2898*	<1.25:1 (10)	Hex	Solder	Crimp	SS/G	1.0 (25)	0.32 (8.1)	0.016 (7.3)
20. SMA Male	Right Angle	TC-240-SM-RA-SS-X	3190-2900*	<1.35:1 (6)	Hex	Solder	Crimp	SS/G	0.8 (20)	0.65 (16.5)	0.019 (8.6)
21. SMA Male	Right Angle	EZ-240-SM-RA-X	3190-2899	<1.25:1 (6)	Hex	Spring Finger	Crimp	A/G	0.9 (22.8)	0.31 (7.9)	0.019 (8.6)
22. SMA Male	Reverse Polarity	TC-240-SM-RP	3190-326	<1.25:1 (2.5)	Hex	Solder	Crimp	SS/G	1.0 (25)	0.32 (8.1)	0.016 (7.3)
23. SMA Female	Bulkhead Jack	TC-240-SF-SS-BH-X	3190-2896*	<1.25:1 (2.5)	NA	Solder	Crimp	SS/G	1.1 (29)	0.31 (7.9)	0.019 (8.6)
24. Mini-UHF	Straight Plug	TC-240-MUHF	3190-445	<1.25:1 (2.5)	Knurl	Solder	Crimp	N/G	1.1 (28)	0.45 (11.4)	0.014 (6.4)
25. 7/16 Din Male	Straight Plug	TC-240-716M	3190-2982	<1.35:1 (3)	Hex	Spring Finger	Crimp	A/S	2.0 (50.5)	1.26 (32.0)	0.186 (84.4)
26. 7/16 Din Male	Right Angle	TC-240-716M-RA-D	3190-2983	<1.35:1 (3)	Hex	Solder	Crimp	A/S	1.4 (34.3)	1.60 (40.6)	0.239 (108.5)
27. TNC Female	Straight Jack	EZ-240-TF	3190-2552	<1.35:1 (6)	NA	Spring Finger	Crimp	N/G	1.1 (27.0)	0.45 (11.4)	0.035 (15.9)



## Hardware Accessories

Type	Part Number	Stock Code	Description
Ground Kit	GK-S240TT	GK-S240TT	Standard Ground Kit (each)



## Install Tools

Type	Part Number	Stock Code	Description
Crimp Tool	CT-240/200/195/100	3190-667	Crimp tool for LMR-100, 195, 200 and 240 connectors
Strip Tool	CST-240A	3192-152	Prep tool for LMR-240 connectors
Deburr Tool	DBT-U	3192-001	Removes center conductor rough edges
Cutting Tool	CCT-01	3190-1544	Cable end flush cut tool
Replacement Blade	RB-01	3190-1609	Replacement blade for cutting tool
Replacement Blade Kit	RB-CST	3192-086	Replacement blade kit for all CST strip tools