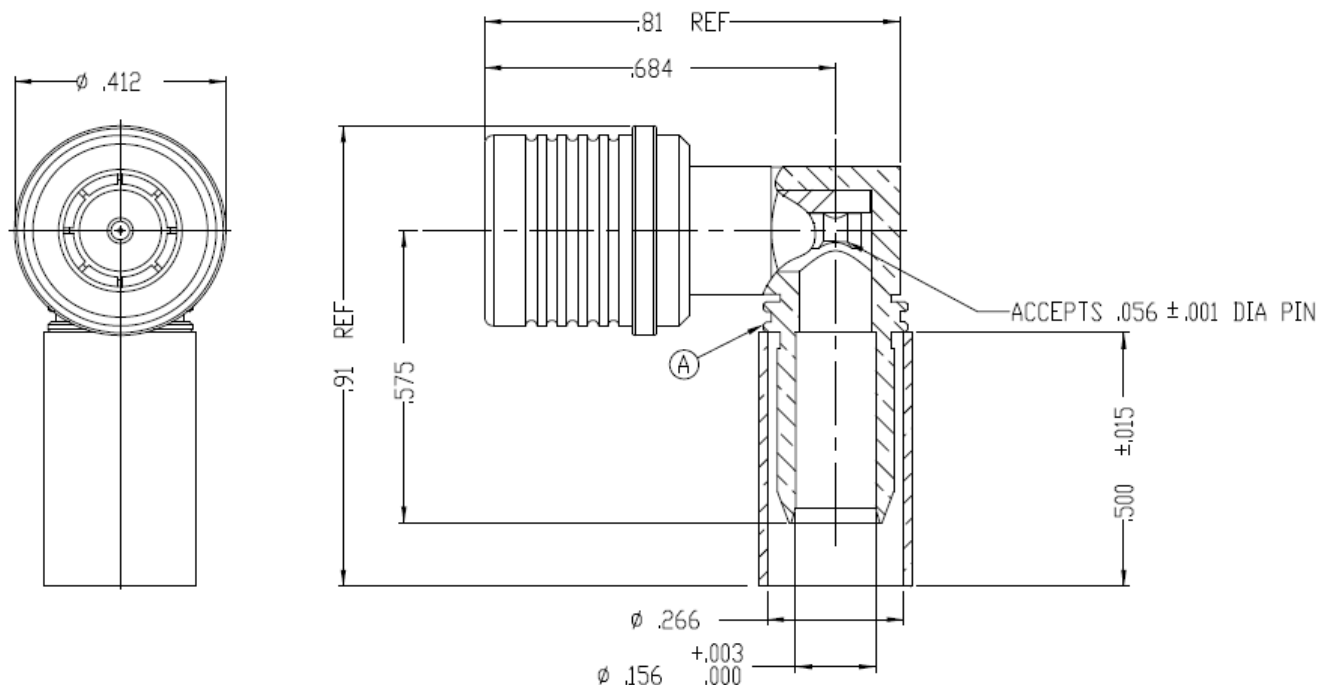


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| SYM | REVISION DESCRIPTION    | DFTM  | DATE   | APPD   | DATE    |
|-----|-------------------------|-------|--------|--------|---------|
| A   | RELEASED FOR PRODUCTION | N.N.N | 9/4/13 | J.D.B. | 9/10/13 |



#### NOTES:

1. ASSEMBLED CONNECTOR INTERFACE IS DESIGNED TO MATE WITH STANDARD QMA JACK.

2. 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

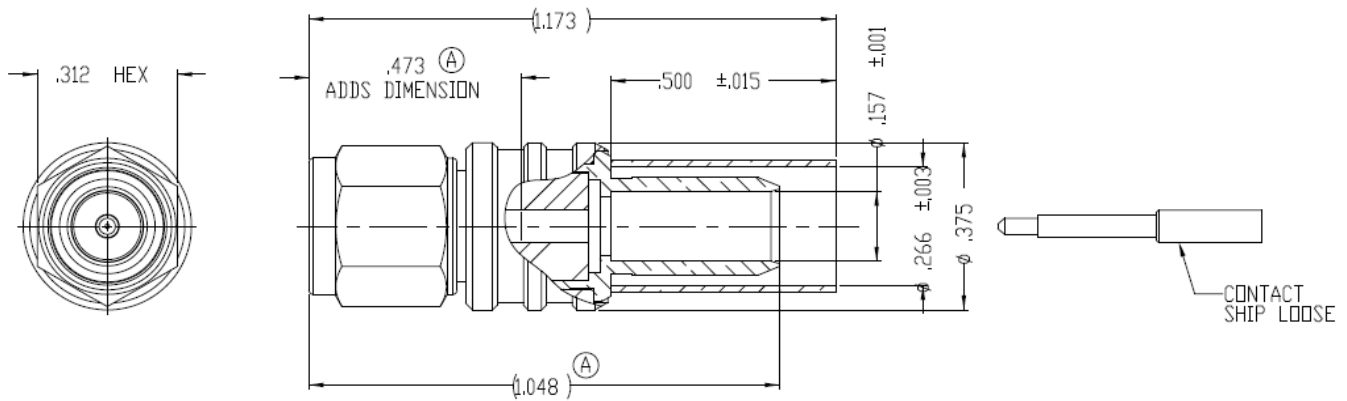
3. FINISH:

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

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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:

1. ASSEMBLED CONNECTOR INTERFACE IS DESIGNED IN ACCORDANCE WITH MIL-STD-348

#### 2. MATERIAL:

CLAMP & CONTACT - BRASS PER ASTM B16, C36000 ALLOY, TEMPER H02  
 BODY, CNUT - STAINLESS STEEL PER ASTM 582, S30300 ALLOY, COND. A  
 INSULATOR - TEFLON PER ASTM D1710, TYPE 1, GRADE 1, CLASS A  
 GASKET - SILICONE RUBBER PER A-A-59588, 50-75 DUROMETER  
 SHRINK SLEEVE - HEAT SHRINKABLE ATUM PER MIL-I-23053/4 (NOT SHOWN)  
 CRIMP SLEEVE - D.H.P. COPPER CDA, ALLOY #122, TEMPER HARD  
 CONTACT & LOCKING RING - BERYLLIUM COPPER PER ASTM B196, C17300 ALLOY, CONDITION HT

#### 3. FINISH:

CONTACT - GOLD PLATE PER ASTM B488  
 CRIMP SLEEVE - SULFAMATE NICKEL PER MIL-P-27418  
 CLAMP - NICKEL PLATE PER AMS-QQ-N-290  
 C'NUT & BODY - PASSIVATE PER SAE-AMS-2700

|             |             |                                                                                                                                                                                                                                    |                  |                |              |                                                          |       |  |  |
|-------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------|--------------|----------------------------------------------------------|-------|--|--|
| MATL:       |             | UNLESS OTHERWISE SPECIFIED                                                                                                                                                                                                         |                  | DFTM. N. N. N  |              | TIMES MICROWAVE SYSTEMS                                  |       |  |  |
|             |             | ALL DIMENSIONS ARE IN INCHES<br>MACHINED SURFACES FINISH 63 RMS MAX.<br>REMOVE ALL BURRS .004 MAX. BREAK<br>MACHINE CORNERS .005 MAX. FILLET R.<br>TOLERANCES ON DECIMALS<br>.XX ± .01 .XXX ± .005<br>ANGLES ± 1° FRACTIONS ± 1/64 |                  | DATE 9/4/13    |              |                                                          |       |  |  |
| USED ON: A  |             |                                                                                                                                                                                                                                    |                  | CHKD. J. D. B. |              | TC-240-SM-SS-X<br>CONNECTOR ASSEMBLY<br>SMAM for LMR-240 |       |  |  |
|             |             |                                                                                                                                                                                                                                    |                  | DATE 9/10/13   |              |                                                          |       |  |  |
|             |             |                                                                                                                                                                                                                                    |                  | APPD. J. D. B. |              |                                                          |       |  |  |
| SCALE: NONE | DWG. SIZE A | DO NOT SCALE DRAWING                                                                                                                                                                                                               | CODE IDENT 68999 | DATE 9/10/13   | SHEET 1 of 1 | SD3190-2898                                              | REV A |  |  |

## LMR®-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®** 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®-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®-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®-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®-PVC** is designed for low loss general-purpose applications and is somewhat more flexible than the standard polyethylene jacketed LMR.
- **LMR®-PVC-W** is a white-jacketed version of LMR-PVC for marine and other applications where color compatibility is desired.
- **LMR®-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) |

### Mechanical Specifications

| 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)   |

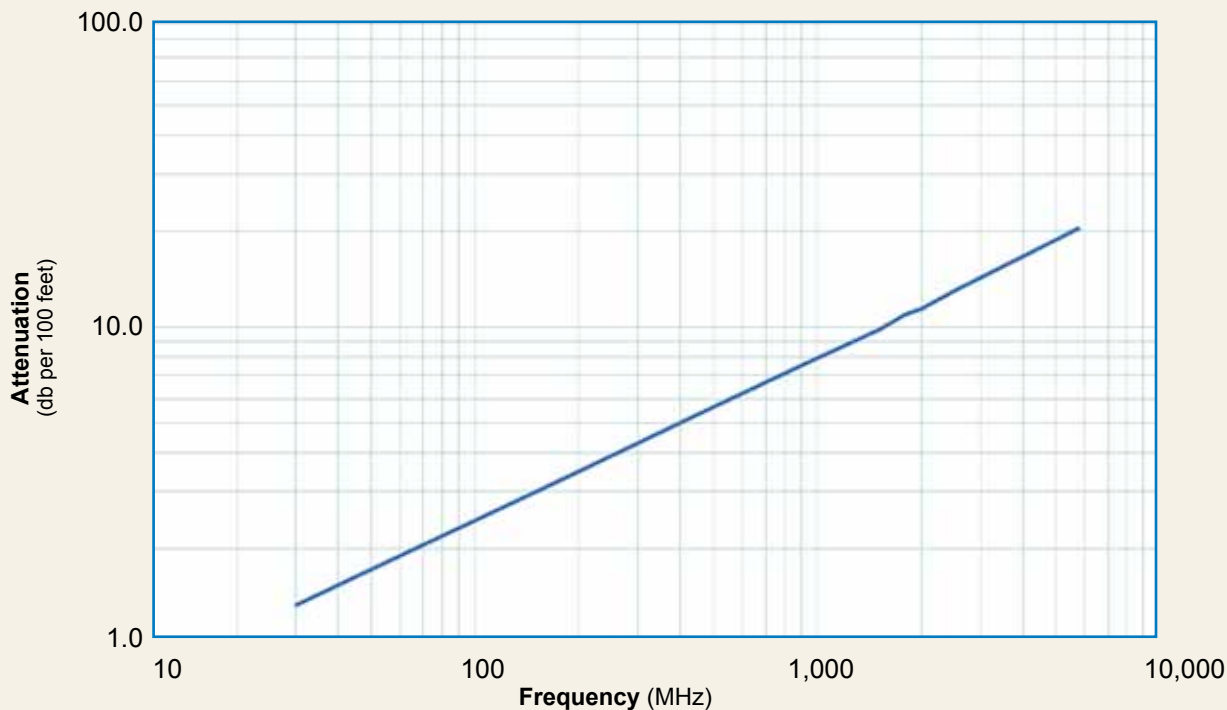
### Environmental Specifications

| 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 |

### Electrical Specifications

| 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   |          |
| DC Resistance           |                   |       |          |
| 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®-240

## Flexible Low Loss Communications Coax



### Connectors

| Interface         | Description      | Part Number       | Stock Code | VSWR**<br>Freq. (GHz) | Coupling<br>Nut | Inner<br>Contact<br>Attach | Outer<br>Contact<br>Attach | Finish*<br>Body /Pin | Length<br>in (mm) | Width<br>in (mm) | Weight<br>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                    |
| Debur 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       |