REV J
SHT 1
NAVSEA DRAWING NO. 6877804
ESWBS 499

APPLICATION	
NEXT ASSY	USED ON

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	RELEASED AS REVISION A.	10/5/94	[redacted]
B	UPDATE OF REVISION A.	4/11/95	
C	UPDATE OF REVISION B.	9/30/99	
D	UPDATE OF REVISION C.	1/09/06	
E	UPDATE OF REVISION D.	2/04/08	
F	UPDATE OF REVISION E.	5/1/18	
G	UPDATE OF REVISION F.	8/28/18	
H	UPDATE TO PARA 2.15.	12/15/20	
J	ADD PARA 2.17.	3/23/22	GOOD.CHRISTOPHER A.1280374500 Digitally signed by GOOD.CHRISTOPHER.A.1280374500 Date: 2022.03.24 08:54:46 -04'00'

LIST OF REFERENCES

REF NO.	DOCUMENT NUMBER	DOCUMENT TITLE
1	MIL-STD-2042-6	FIBER OPTIC TOPOLOGY INSTALLATION STANDARD METHODS FOR NAVAL SHIPS (TEST)
2	S9086-PF-STM-010/CH-435	FIBER OPTIC TOPOLOGY OPERATION MAINTENANCE AND REPAIR
3	MIL-STD-1678-5	FIBER OPTIC CABLING SYSTEMS REQUIREMENTS AND MEASUREMENTS. PART 5: DESIGN PHASE, SUPPLEMENTAL AND LEGACY MEASUREMENTS
4	MIL-STD-1678-2	FIBER OPTIC CABLING SYSTEMS REQUIREMENTS AND MEASUREMENTS. PART 2: OPTICAL MEASURMENTS
5	A-A-59940/1	CONNECTORS, FIBER OPTIC, SINGLE FIBER SMALL FORM FACTOR, LC TYPE
6	A-A-59940/3	CONNECTORS, FIBER OPTIC, SINGLE FIBER ST TYPE
7	MIL-PRF-85045	CABLES, FIBER OPTIC
8	MIL-PRF-28876	CONNECTORS, FIBER OPTIC
9	MIL-PRF-29504	TERMINI, FIBER OPTIC CONNECTOR

REV STATUS OF SHEETS																					
	REV	J	G	G	J	J	J	G	G	G	G	G	G	G	G	G	G	G	G	G	G
	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	REV	G																			
	SHEET	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40

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VENDOR ITEM DRAWING

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:

FRACTIONS +/-
DECIMALS .xx+/- 0.01 .xxx+/- 0.005
ANGLES
P DO NOT SCALE DRAWING

MATERIAL:

FINISHES:

CAGE CODE
CONTRACT NO.

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DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
WASHINGTON, D.C. 20362-5101

JUMPERS, TEST EQUIPMENT FIBER OPTIC

SIZE	CAGE	ESWBS	DRAWING NO.	REV
A	53711	499	6877804	J

SCALE: NONE | UCI | WT GRP | SHEET 1 OF 21

1. NOTES

1.1 NAVAL SURFACE WARFARE CENTER DAHLGREN DIVISION, FIBER OPTICS SECTION IS THE TECHNICAL DIRECTION AGENT (TDA) FOR FIBER OPTICS FOR NAVSEA AND THE APPROVING ACTIVITY FOR MEASUREMENT QUALITY JUMPERS (MQJs).

1.2 ORGANIZATIONS ARE ALLOWED TO MANUFACTURE MQJs FOR THEIR OWN INTERNAL USE AS LONG AS THE MQJs MEET THE REQUIREMENTS (SECTION 2.0), SPECIFIED CONFIGURATIONS (SECTION 3.0) AND PASS THE MQJ SELECTION CRITERIA DETAILED IN MIL-STD-2042 PART 6, METHOD 6F1. ORGANIZATIONS MANUFACTURING MQJs FOR EXTERNAL USE (eg. DISTIBRUTION/SALE) SHALL MEET THE REQUIREMENTS, CONFIGURATIONS, VERIFICATIONS AND APROVAL PROCESS DEFINED IN THIS DRAWING.

1.3 SUGGESTED SOURCE OF SUPPLY

FOR A COMPLETE LIST OF VENDORS APPROVED TO MANUFACTURE AND SELL MEASUREMENT QUALITY JUMPER CABLES, PLEASE SEE THE RECOMMENDED TEST EQUIPMENT LIST ON THE NAVY SHIPBOARD FIBER OPTIC WEBSITE LOCATED AT www.navsea.navy.mil/Home/WarfareCenters/NSWCDahlgren/WhatWeDo/NavyShipboardFiberOptics.aspx . VENDOR PART NUMBERS ARE ALSO LOCATED ON THE WEBSITE. DUE TO THE DYNAMIC NATURE OF WEB ADDRESSES THE CURRENT WEBSITE URL CAN BE OBTAINED BY E-MAILING DLGR_NSWC_FOWEB@NAVY.MIL WITH THE SUBJECT LINE "WEBSITE URL REQUEST". AN AUTOMATED REPLY WILL CONTAIN THE CURRENT WEB ADDRESS.

1.4 SUBSTITUTION OF PIECES OR ITEMS IS NOT AUTHORIZED WITHOUT APPROVAL OF THE APPROVING ACTIVITY, NAVAL SURFACE WARFARE CENTER, DAHLGREN DIVISION, FIBER OPTICS SECTION.

1.5 THESE ITEMS ARE TO BE USED IN THE PERFORMANCE OF FIBER OPTIC TESTING AS SPECIFIED IN THE CURRENT REVISIONS OF REFERENCES 1 AND 2.

1.6 ITEMS NO. 1 THROUGH 4 AND 14 (SEE TABLE I) AND ITEMS 1SME THROUGH 4SME AND 14SME (SEE TABLE II) ARE FOR USE WITH AN OPTICAL TIME DOMAIN REFLECTOMETER (OTDR).

1.6 ITEMS NO. 5 THROUGH 13 AND 15 THROUGH 16 (SEE TABLE I), AND ITEMS 5SME THROUGH 13SME AND 15SME THORUGH 16SME (SEE TABLE II) ARE FOR USE WITH AN OPTICAL LOSS TEST SET (OLTS) AND OPTICAL RETURN LOSS (ORL) METERS.

1.7 INDIVIDUAL ITEMS SHALL BE PROCURED USING THE BASIC DRAWING NUMBER FOLLOWED BY A DASH AND THE ITEM NUMBER FROM TABLE I-II. TABLE III & IV ARE ADDED FOR QUICK REFERENCE ONLY, USING COMMON LANGUAGE EQUIVALENTS.

1.8 ALL PIECES IDENTIFIED BY THE MILITARY PART NUMBER SHALL BE FROM AN APPROVED SOURCE OF SUPPLY LISTED ON THE QUALIFIED PRODUCTS LIST (QPL) (http://www.navsea.navy.mil/Home/Warfare-Centers/NSWC-Dahlgren/What-We-Do/Navy-Shipboard-Fiberoptics/Status-QPLs/) UNLESS OTHERWISE APPROVED BY THE APPROVING ACTIVITY.

2. REQUIREMENTS

2.1 THE SHIPBOARD FIBER OPTIC MQJs SHALL MEET THE REQUIREMENTS SPECIFIED HEREIN.

2.2 THE END FACE OF ALL LIGHT DUTY (ST, LC) CONNECTORS, TERMINI PINS AND SOCKETS ON MQJs, WHEN INSPECTED USING A 400X VIDEO SCOPE, SHALL HAVE NO VISIBLE SCRATCHES.

2.3 THE SHIPBOARD FIBER OPTIC MQJs SHALL BE TESTED FOR OPTICAL LOSS AND RETURN LOSS (IF SINGLE MODE) IN ACCORDANCE WITH THE CURRENT REVISION OF REFERENCE 1 AND THIS DOCUMENT.

2.4 SHIPBOARD FIBER OPTIC MQJs WITH MIL-C-28876 PLUGS OR RECEPTACLES KEYED WITH ONLY THE MASTER KEY SHALL BE VISIBLY MARKED WITH THE FOLLOWING:

WARNING
SPECIAL MEASUREMENT QUALITY JUMPER
VISUALLY VERIFY PROPER KEY ALIGNMENT
BEFORE ENGAGING WITH MATING CONNECTORS.

2.5 ALL SHIPBOARD FIBER OPTIC MQJs SHALL BE VISIBLY MARKED WITH THE FOLLOWING:

FIBER OPTIC MEASUREMENT QUALITY
JUMPER CABLE

2.6 FOR ITEMS TERMINATED WITH MIL-S-24623/4-01 SPLICES, THE CABLE SHALL BE STRAIN RELIEVED TO THE SPLICE USING ADHESIVE LINED HEAT SHRINK TUBING. CABLE STRENGTH MEMBERS SHALL BE PLACED AROUND THE REAR OF THE SPLICE BEFORE THE HEAT SHRINK TUBING IS APPLIED.

2.7 CONNECTORS ASSEMBLED USING COLOR CODED SINGLE FIBER CABLING SHALL ASSIGN THE SINGLE FIBER CABLES TO TERMINI AS FOLLOWS: 1 – BLUE, 2 – ORANGE, 3 – GREEN, 4 – BROWN, 5 – GRAY, 6 – WHITE, 7 – RED, 8 – BLACK. FOR CONNECTORS ASSEMBLED USING SAME COLOR SINGLE FIBER CABLING, THE SINGLE FIBER CABLING SHALL BE MARKED WITH THE CORRESPONDING TERMINUS NUMBER.

2.8 MULTIFIBER MQJ CABLES SHALL HAVE 18 +/- 1 INCHES OF SINGLE FIBER CABLE EXPOSED AT THE END OF THE JUMPER CABLE TERMINATED WITH SINGLE FIBER CONNECTORS.

2.9 MULTIFIBER MQJ CABLES CONSTRUCTED USING M85045/16 SINGLE FIBER CABLE SHALL INCLUDE A STRAIN RELIEF MECHANISM AT THE POINT OF TRANSITION FROM THE PROTECTIVE TUBING TO THE UNPROTECTED M85045/16 SINGLE FIBER CABLE.

2.10 CONNECTOR PARTS IDENTIFIED FOR SINGLE MODE MQJ CABLES MAY BE UTILIZED IN THE CONSTRUCTION OF MULTIMODE JUMPER CABLES.

2.11 END CONNECTIONS ON MULTIMODE MQJ CABLES SHALL MEET THE FOLLOWING LOSS REQUIREMENTS:

EACH M29504/14 or M29504/15 TERMINUS SHALL HAVE A MEAN OPTICAL LOSS OF $\leq$ 0.70 dB AND A MAXIMUM STANDARD DEVIATION OF 0.05 dB. EACH LIGHT DUTY TYPE CONNECTOR SHALL HAVE A MEAN OPTICAL LOSS OF $\leq$ 0.35 dB AND A MAXIMUM STANDARD DEVIATION: OF 0.05 dB. EACH M24623/4-01 SHALL HAVE A MEAN OPTICAL LOSS OF $\leq$ 0.30 dB AND A MAXIMUM STANDARD DEVIATION OF 0.05 dB.

2.12 END CONNECTIONS ON SINGLE MODE MEASUREMENT QUALITY JUMPER CABLES SHALL MEET THE FOLLOWING LOSS REQUIREMENTS:

EACH M29504/14 or M29504/15 TERMINUS SHALL HAVE A MEAN OPTICAL LOSS OF $\leq$ 0.70 dB AND A MAXIMUM STANDARD DEVIATION OF 0.10 dB. EACH LIGHT DUTY TYPE CONNECTOR SHALL HAVE A MEAN OPTICAL LOSS OF $\leq$ 0.35 dB AND A MAXIMUM STANDARD DEVIATION: OF 0.10 dB. EACH M24623/4-01 SHALL HAVE A MEAN OPTICAL LOSS OF $\leq$ 0.30 dB AND A MAXIMUM STANDARD DEVIATION OF 0.05 dB.

2.13 END CONNECTIONS ON SINGLE MODE MQJ CABLES SHALL BE OF ENHANCED PERFORMANCE AND MEET REFLECTANCE REQUIREMENTS of -43.0 dB OR GREATER

2.14 CONNECTOR AND TERMINUS RETURN LOSS SHALL BE MEASURED IN ACCORDANCE WITH MIL-STD-1678-2 MEASUREMENT 2105

2.15 END FACE GEOMETRY SHALL BE IN ACCORDANCE WITH MIL-STD-1678-5; MEASUREMENT 5201 DOMED/SPHERICAL END FACE SURFACE, PC POLISH, SHIPBOARD APPLICATION UNLESS OTHERWISE SPECIFIED.

2.16 MARKING SHALL BE IN ACCORDANCE WITH MIL-STD-130

2.17 MQJ ASSEMBLY LENGTH: UNLESS OTHERWISE SPECIFIED FOR A PARTICULAR MQJ CONSTRUCTION, THE MQJ LENGTH SPECIFIED SHALL BE THE LENGTH MEASURED FROM THE FERRULE END FACE (TIP) ON EACH CONNECTOR END (TIP-TO-TIP LENGTH). IF A ONE METER (3.3 FOOT) LENGTH IS SPECIFIED THE TOLERANCE SHALL BE +0.13M/0.0M. IF A 50 METER (164 FOOT) LENGTH IS SPECIFIED, THE TOLERANCE SHALL BE +2.0M/0.0M.

3. MQJ CONFIGURATIONS

3.1 MQJs SHALL BE PROVIDED IN ONE OR MORE OF THE FOLLOWING CONFIGURATIONS SPECIFIED IN TABLE I/III FOR MULTIMODE MQJs AND TABLE II/IV FOR SINGLE MODE MQJs.

3.2 SPECIAL CONFIGURATIONS, NOT SPECIFIED IN TABLES I – IV, MAY BE USED WITH AUTHORIZED APPROVAL (SEE 1.1) BUT WILL NOT BE CONSIDERED STANDARD. SPECIAL CONFIGURATIONS WILL NOT BE ADDED TO THE RECOMMENDED TEST EQUIPMENT LIST.

TABLE I
MULTIMODE FIBER OPTIC MQJ CABLES

ITEM NO.	LENGTH (M)	CONNECTOR MILITARY OR VENDOR PART NO.	CABLE MILITARY OR VENDOR PART NO.	CONNECTOR ADAPTER VENDOR PART NO.	CONNECTOR MILITARY OR VENDOR PART NO.	TERMINI MILITARY OR VENDOR PART NO.
1	50	A-A-59940/3-111SN	M85045/16-01	NA	A-A-59940/3-111SN	NA
2	50	A-A-59940/3-111SN	M85045/16-01	NA	M24623/4-01	NA
3	50	A-A-59940/3-111SN	M85045/16-01	NA	NA	M29504/14-4131C
4	50	A-A-59940/3-111SN	M85045/16-01	NA	NA	M29504/15-4171C
5	1	A-A-59940/3-111SN	M85045/16-01	NA	A-A-59940/3-111SN	NA
6	1	A-A-59940/3-111SN	M85045/16-01	NA	M24623/4-01	NA
7	1	A-A-59940/3-111SN	M85045/18-01	NA	1145846-B042P0S	M29504/14-4131C
			M85045/16-01 127-021-1-1-16CKHE	189-014NF13-07	4565143-B04P0S	
8	1	A-A-59940/3-111SN	M85045/18-01	NA	1145840-B042S0S	M29504/15-4171C
			M85045/16-01 127-021-1-1-16CKHE	189-014NF13-07	4565141-B04S0S	
9	1	A-A-59940/3-111SN	M85045/17-01	NA	1145846-C081P0S	M29504/14-4131C
			M85045/16-01 127-021-1-1-16CKHE	189-014NF15-07	4565143-C08P0S	
10	1	A-A-59940/3-111SN	M85045/17-01	NA	1145840-C081S0S	M29504/15-4171C
			M85045/16-01 127-021-1-1-16CKHE	189-014NF15-07	4565141-C08S0S	
12	1	A-A-59940/3-111SN	M85045/16-01 127-021-1-1-32CKHE	189-014NF23-07	4565143-F31P0S	M29504/14-4131C
13	1	A-A-59940/3-111SN	M85045/16-01 127-021-1-1-32CKHE	189-014NF23-07	4565141-F31S0S	M29504/15-4171C
14	50	A-A-59940/3-111SN	M85045/16-01	NA	A-A-59940/1-111SN	NA
15	1	A-A-59940/3-111SN	M85045/16-01	NA	A-A-59940/1-111SN	NA
16	1	A-A-59940/3-111SN	M85045/16-01	189-014NF11	4565141-A021S0S	M29504/15-4171C

TABLE II
SINGLE MODE ENHANCED PERFORMANCE FIBER OPTIC MQJ CABLES

ITEM NO.	LENGTH (M)	CONNECTOR MILITARY OR VENDOR PART NO.	CABLE MILITARY OR VENDOR PART NO.	CONNECTOR ADAPTER VENDOR PART NO.	CONNECTOR MILITARY OR VENDOR PART NO.	TERMINI MILITARY OR VENDOR PART NO.
1SME	50	A-A-59940/3-121SN	M85045/16-02	NA	A-A-59940/3-121SN	NA
3SME	50	A-A-59940/3-121SN	M85045/16-02	NA	NA	M29504/14-4141C
4SME	50	A-A-59940/3-121SN	M85045/16-02	NA	NA	M29504/15-4181C
5SME	1	A-A-59940/3-121SN	M85045/16-02	NA	A-A-59940/3-121SN	NA
7SME	1	A-A-59940/3-121SN	M85045/18-02	NA	1145846-B042P0S	M29504/14-4141C
			M85045/16-02 127-021-1-1-16CKHE	189-014NF13-07	4565143-B04P0S	
8SME	1	A-A-59940/3-121SN	M85045/18-02	NA	1145840-B042S0S	M29504/15-4181C
			M85045/16-02 127-021-1-1-16CKHE	189-014NF13-07	4565141-B04S0S	
9SME	1	A-A-59940/3-121SN	M85045/17-02	NA	1145846-C081P0S	M29504/14-4141C
			M85045/16-02 127-021-1-1-16CKHE	189-014NF15-07	4565143-C08P0S	
10SME	1	A-A-59940/3-121SN	M85045/17-02	NA	1145840-C081S0S	M29504/15-4181C
			M85045/16-02 127-021-1-1-16CKHE	189-014NF15-07	4565141-C08S0S	
12SME	1	A-A-59940/3-121SN	M85045/16-02 127-021-1-1-32CKHE	189-014NF23-07	4565143-F31P0S	M29504/14-4141C
13SME	1	A-A-59940/3-121SN	M85045/16-02 127-021-1-1-32CKHE	189-014NF23-07	4565141-F31S0S	M29504/15-4181C
14SME	50	A-A-59940/3-121SN	M85045/16-02	NA	A-A-59940/1-121SN	NA
15SME	1	A-A-59940/3-121SN	M85045/16-02	NA	A-A-59940/1-121SN	NA
16SME	1	A-A-59940/3-121SN	M85045/16-02	189-014F11	4565141-A021S0S	M29504/15-4181C

TABLE III
MM MQJ QUICK REFERENCE

ITEM NO.	LENGTH (M)	CONNECTOR .	CABLE MILITARY OR VENDOR PART NO.	CONNECTOR ADAPTER VENDOR PART NO.	CONNECTOR	TERMINI MILITARY OR VENDOR PART NO.
1	50	ST	SINGLE FIBER TIGHT BUFFER MM	NA	ST	NA
2	50	ST	SINGLE FIBER TIGHT BUFFER MM	NA	ROTARY MECHANICAL SPLICE	NA
3	50	ST	SINGLE FIBER TIGHT BUFFER MM	NA	NA	PIN*
4	50	ST	SINGLE FIBER TIGHT BUFFER MM	NA	NA	SOCKET*
5	1	ST	SINGLE FIBER TIGHT BUFFER MM	NA	ST	NA
6	1	ST	SINGLE FIBER TIGHT BUFFER MM	NA	ROTARY MECHANICAL SPLICE	NA
7	1	ST	FOUR FIBERS SHIPBOARD MM	NA	UNIVERSAL SHELL SIZE 13 PLUG CONNECTOR - CONVENTIONAL	PIN*
			SINGLE FIBER TIGHT BUFFER MM (4 EA)	SHELL SIZE 13 ADAPTER	UNIVERSAL SHELL SIZE 13 PLUG CONNECTOR - CONDUIT	
8	1	ST	FOUR FIBERS SHIPBOARD MM	NA	UNIVERSAL SHELL SIZE 13 RECEPTACLE CONNECTOR - CONVENTIONAL	SOCKET*
			SINGLE FIBER TIGHT BUFFER MM (4 EA)	SHELL SIZE 13 ADAPTER	UNIVERSAL SHELL SIZE 13 RECEPTACLE CONNECTOR - CONDUIT	
9	1	ST	EIGHT FIBERS SHIPBOARD MM	NA	UNIVERSAL SHELL SIZE 15 PLUG CONNECTOR - CONVENTIONAL	PIN*
			SINGLE FIBER TIGHT BUFFER MM (8 EA)	SHELL SIZE 15 ADAPTER	UNIVERSAL SHELL SIZE 15 PLUG CONNECTOR - CONDUIT	
10	1	ST	EIGHT FIBERS SHIPBOARD MM	NA	UNIVERSAL SHELL SIZE 15 RECEPTACLE CONNECTOR - CONVENTIONAL	SOCKET*
			SINGLE FIBER TIGHT BUFFER MM (8 EA)	SHELL SIZE 15 ADAPTER	UNIVERSAL SHELL SIZE 15 RECEPTACLE CONNECTOR - CONDUIT	
12	1	ST	SINGLE FIBER TIGHT BUFFER MM (31 EA)	SHELL SIZE 23 ADAPTER	UNIVERSAL SHELL SIZE 23 PLUG CONNECTOR - CONVENTIONAL	PIN*
13	1	ST	SINGLE FIBER TIGHT BUFFER MM (31 EA)	SHELL SIZE 23 ADAPTER	UNIVERSAL SHELL SIZE 23 RECEPTACLE CONNECTOR - CONVENTIONAL	SOCKET*
14	50	ST	SINGLE FIBER TIGHT BUFFER MM	NA	LC	NA
15	1	ST	SINGLE FIBER TIGHT BUFFER MM	NA	LC	NA
16	1	ST	SINGLE FIBER TIGHT BUFFER MM (2 EA)	SHELL SIZE 11 ADAPTER	UNIVERSAL SHELL SIZE 11 PLUG CONNECTOR - CONVENTIONAL	SOCKET*

* LONG LENGTH, CERAMIC GUIDE BUSHING, MM, W/ CRIMP SLEEVE, FOR MIL-PRF-28876 CONNECTORS

TABLE IV
SME MQJ QUICK REFERENCE

ITEM NO.	LENGTH (M)	CONNECTOR	CABLE	CONNECTOR ADAPTER .	CONNECTOR .	TERMINI MILITARY OR VENDOR PART NO.
1SME	50	ST	SINGLE FIBER TIGHT BUFFER SM	NA	ST	NA
3SME	50	ST	SINGLE FIBER TIGHT BUFFER SM	NA	NA	PIN*
4SME	50	ST	SINGLE FIBER TIGHT BUFFER SM	NA	NA	SOCKET*
5SME	1	ST	SINGLE FIBER TIGHT BUFFER SM	NA	ST	NA
7SME	1	ST	FOUR FIBERS SHIPBOARD SM	NA	UNIVERSAL SHELL SIZE 13 PLUG CONNECTOR - CONVENTIONAL	PIN*
			SINGLE FIBER TIGHT BUFFER SM (4 EA)	SHELL SIZE 13 ADAPTER	UNIVERSAL SHELL SIZE 13 PLUG CONNECTOR - CONDUIT	
8SME	1	ST	FOUR FIBERS SHIPBOARD SM	NA	UNIVERSAL SHELL SIZE 13 RECEPTACLE CONNECTOR - CONVENTIONAL	SOCKET*
			SINGLE FIBER TIGHT BUFFER SM (4 EA)	SHELL SIZE 13 ADAPTER	UNIVERSAL SHELL SIZE 13 RECEPTACLE CONNECTOR - CONDUIT	
9SME	1	ST	EIGHT FIBERS SHIPBOARD SM	NA	UNIVERSAL SHELL SIZE 15 PLUG CONNECTOR - CONVENTIONAL	PIN*
			SINGLE FIBER TIGHT BUFFER SM (8 EA)	SHELL SIZE 15 ADAPTER	UNIVERSAL SHELL SIZE 15 PLUG CONNECTOR - CONDUIT	
10SME	1	ST	EIGHT FIBERS SHIPBOARD SM	NA	UNIVERSAL SHELL SIZE 15 RECEPTACLE CONNECTOR - CONVENTIONAL	SOCKET*
			SINGLE FIBER TIGHT BUFFER SM (8 EA)	SHELL SIZE 15 ADAPTER	UNIVERSAL SHELL SIZE 15 RECEPTACLE CONNECTOR - CONDUIT	
12SME	1	ST	SINGLE FIBER TIGHT BUFFER SM (31 EA)	SHELL SIZE 23 ADAPTER	UNIVERSAL SHELL SIZE 23 PLUG CONNECTOR - CONVENTIONAL	PIN*
13SME	1	ST	SINGLE FIBER TIGHT BUFFER SM (31 EA)	SHELL SIZE 23 ADAPTER	UNIVERSAL SHELL SIZE 23 RECEPTACLE CONNECTOR - CONVENTIONAL	SOCKET*
14SME	50	ST	SINGLE FIBER TIGHT BUFFER SM	NA	LC	NA
15SME	1	ST	SINGLE FIBER TIGHT BUFFER SM	NA	LC	NA
16SME	1	ST	SINGLE FIBER TIGHT BUFFER SM (2 EA)	SHELL SIZE 11 ADAPTER	UNIVERSAL SHELL SIZE 11 PLUG CONNECTOR CONVENTIONAL	SOCKET*

* LONG LENGTH, CERAMIC GUIDE BUSHING, SM, W/ CRIMP SLEEVE, FOR MIL-PRF-28876 CONNECTORS

4. VERIFICATION OF REQUIREMENTS

4.1 UNLESS OTHERWISE SPECIFIED BY THE PROCURING ACTIVITY THE SUPPLIER IS RESPONSIBLE FOR THE PERFORMANCE OF ALL ITEMS CONTAINED HEREIN WITH REGARD TO THE ABOVE REQUIREMENTS. TEST DATA MAY BE PROVIDED TO DEMONSTRATE PERFORMANCE, HOWEVER THE PROCURING ACTIVITY RESERVES THE RIGHT TO PERFORM ANY OF THE INSPECTIONS SPECIFIED. TEST SAMPLES SHALL BE SUBMITTED TO THE APPROVING ACTIVITY.

4.2 END FACE GEOMETRY DATA WILL ONLY BE PROVIDED IF REQUESTED WHEN ORDERING.

5. EVALUATION PROCESS FOR APPROVAL OF MEASUREMENT QUALITY JUMPERS (MQJs)

5.1 THE PROCESS FOR EVALUATION AND APPROVAL OF MQJs DEVELOPED IN ACCORDANCE WITH NAVSEA DRAWING 6877804 IS DESCRIBED HEREIN.

5.2 PREFERRED PROCESS

5.2.1 ORGANIZATIONS SEEKING APPROVAL FOR THEIR MQJs MUST CONTACT, IN WRITING, NSWCDD, AT DLGR_NSWC_FO_ENG@NAVY.MIL REQUESTING THE APPROVAL OF THEIR MQJs. NSWCDD WILL CONTACT THE ORGANIZATION SEEKING APPROVAL AND PROVIDE GUIDANCE ON HOW TO PROCEED THROUGH THE PROCESS.
5.2.2 ORGANIZATION SEEKING APPROVAL PROVIDES MQJ CANDIDATES (SEE 5.3 FOR REQUIRED SUBMISSIONS) OR AS DIRECTED BY NSWCDD.

5.2.3 NSWCDD VERIFIES THAT THE PRODUCTS PASS THE REQUIREMENTS HEREIN (SEE SECTION 2 AND APPENDIX A).

5.2.4 UPON SUCCESSFULLY COMPLETING THE PROCESS, NSWCDD WILL CONTACT THE ORGANIZATION SEEKING APPROVAL AND NOTIFY THEM OF THE RESULTS VIA EMAIL. THE PARTS THAT HAVE OBTAINED FULL APPROVAL (SEE TABLE V OR TABLE VI) WILL BE ADDED TO THE RECOMMENDED TEST EQUIPMENT LIST WHICH IS PUBLISHED ON THE NSWCDD FIBER OPTIC WEBSITE.

5.2.5 INTERIM APPROVED MQJs (SEE TABLE V OR TABLE VI) WILL NOT APPEAR ON THE RECOMMENDED TEST EQUIPMENT LIST. TO OBTAIN FULL APPROVAL FOR AN INTERIM APPROVED MQJ THE ORGANIZATION SHALL, UPON FIRST SALE OF AN INTERIM APPROVED MQJ, SEND A COPY OF THE FOLLOWING DATA FOR THE MQJ TO THE APPROVING ACTIVITY: INSERTION LOSS, RETURN LOSS (IF SINGLE MODE), INTERFEROMETER MEASUREMENTS, AND THE CUSTOMER'S POC INFORMATION. IF THE DATA INDICATES PASSING RESULTS AND THE CUSTOMER IS SATISFIED WITH THE PRODUCT, THE ORGANIZATION WILL THEN RECEIVE FULL APPROVAL FOR THAT PRODUCT AND THE PRODUCT WILL BE ADDED TO THE RECOMMENDED TEST EQUIPMENT LIST.

5.2.6 FOR CHANGES IN MQJ PRODUCT OR MANUACTURING PROCESS AFTER APPROVAL CONTACT NSWCDD (SEE 5.4)

5.3. REQUIRED SAMPLE MQJ SUBMISSIONS

5.3.1 REQUIRED SAMPLES FOR ST TO LC MQJs. THE REQUESTING ORGANIZATION SHALL SUPPLY NAVSEA DRAWING 6877804 ITEM NUMBERS 15 AND 15SME FOR EVALUATION. OPTICAL LOSS AND OPTICAL RETURN LOSS DATA (SM ONLY) ALONG WITH INTERFEROMETER DATA SHALL BE PROVIDED FOR EACH OF THE SAMPLES SUBMITTED. NSWCDD WILL THEN VERIFY THAT THE PRODUCTS PASS THE REQUIREMENTS WITHIN NAVSEA DRAWING 6877804. UPON PASSING REQUIREMENTS, THE ORGANIZATION WILL BE GRANTED THE MANUFACTURING AND SALE APPROVALS AS SHOWN IN TABLE VI.

5.3.2 REQUIRED SAMPLES FOR ALL OTHER MQJ TYPES. THE REQUESTING ORGANIZATION SHALL PROVIDE NAVSEA DRAWING 6877804 ITEM NUMBERS: 7, 8, 12SME, AND 13SME ALONG WITH TWO 1 METER MM LEADS WITH M29504/14 ON ONE END AND M29504/15 ON THE OTHER END, AND TWO 1 METER SM LEADS WITH SME POLISHED M29504/14 ON ONE END AND SME POLISHED M29504/15 ON THE OTHER END TO NSWCDD FOR EVALUATION. OPTICAL LOSS AND OPTICAL RETURN LOSS DATA (SM ONLY) ALONG WITH INTERFEROMETER DATA SHALL BE PROVIDED FOR EACH OF THE SAMPLES SUBMITTED. NSWCDD WILL THEN VERIFY THAT THE PRODUCTS PASS THE REQUIREMENTS WITHIN NAVSEA DRAWING 6877804. UPON PASSING REQUIREMENTS, THE REQUESTING ORGANIZATION WILL BE GRANTED THE MANUFACTURING AND SALE APPROVALS AS SHOWN IN TABLE VI.

TABLE V - FULL AND INTERIM APPROVAL (ST, M29504/14, M29504/15, M28876 PLUG AND RECEPTACLE)

ITEM NUMBER	APPROVAL STATUS /1 /2
12SME	FULL APPROVAL
13SME	FULL APPROVAL
7	FULL APPROVAL
8	FULL APPROVAL
1	INTERIM APPROVAL
3	INTERIM APPROVAL
4	INTERIM APPROVAL
5	INTERIM APPROVAL
9	INTERIM APPROVAL
10	INTERIM APPROVAL
12	INTERIM APPROVAL
13	INTERIM APPROVAL
16	INTERIM APPROVAL
1SME	INTERIM APPROVAL
3SME	INTERIM APPROVAL
4SME	INTERIM APPROVAL
5SME	INTERIM APPROVAL
7SME	INTERIM APPROVAL
8SME	INTERIM APPROVAL
9SME	INTERIM APPROVAL
10SME	INTERIM APPROVAL
16SME	INTERIM APPROVAL

/1 TABLE V PROVIDES DIRECTION FOR ORGANIZATIONS LOOKING TO OBTAIN APPROVAL TO MANUFACTURE AND SELL SM AND MM MQJs IN ACCORDANCE WITH NAVSEA DRAWING 6877804.

/2 IF THE REQUESTING ORGANIZATION ONLY WANTS APPROVAL TO MANUFACTURE AND SELL SPECIFIC ITEMS IN TABLE V, THE ORGANIZATION MUST CONTACT THE FIBER OPTIC TECHNOLOGY SECTION (DLGR_NSWC_FO_ENG@NAVY.MIL) TO DISCUSS OTHER OPTIONS FOR THE APPROVAL TO MANUFACTURE AND SELL THOSE ITEMS.

TABLE VI - FULL AND INTERIM APPROVAL (ST to LC MQJs)

NAVSEA DRAWING 6877804 ITEM NUMBER	QUANTITY	APPROVAL STATUS /1 /2
15SME	15	FULL APPROVAL
15	5	FULL APPROVAL
14SME	N/A	INTERIM APPROVAL
14	N/A	INTERIM APPROVAL

/1 TABLE VI PROVIDES DIRECTION FOR ORGANIZATIONS LOOKING TO OBTAIN APPROVAL TO MANUFACTURE AND SELL ST TO LC SM AND MM MQJs IN ACCORDANCE WITH NAVSEA DRAWING 6877804.

/2 IF THE REQUESTING ORGANIZATION ONLY WANTS APPROVAL TO MANUFACTURE AND SELL SPECIFIC ITEMS IN TABLE VI, THE ORGANIZATION MUST CONTACT THE FIBER OPTIC TECHNOLOGY SECTION (DLGR_NSWC_FO_ENG@NAVY.MIL) TO DISCUSS OTHER OPTIONS FOR THE APPROVAL TO MANUFACTURE AND SELL THOSE ITEMS.

5.4 ALTERNATE APPROVAL PROCESS. REQUESTING ORGANIZATIONS THAT DO NOT WISH TO FOLLOW THE PREFERRED PROCESS MUST CONTACT NSWCDD AT DLGR_NSWC_FO_ENG@NAVY.MIL WITH A REQUEST ON WHAT SUBSET OF MQJs FOR WHICH THEY ARE SEEKING APPROVAL. NSWCDD WILL THEN WORK WITH THE REQUESTING ORGANIZATION TO DEFINE THE REQUIRED SAMPLE SET FOR EVALUATION.

5.5 CHANGES IN MANUFACTURING PROCESSES. IF THE ORGANIZATION MAKES ANY CHANGES TO ITS MANUFACTURING PROCESS (E.G. CHANGE FACILITIES, CONTRACTORS, ETC.) THEY SHALL NOTIFY NSWCDD, AT DLGR_NSWC_FO_ENG@NAVY.MILOF THE CHANGE. NSWCDD RESERVES THE RIGHT TO CANCEL THE ORGANIZATION'S APPROVAL IF THEY BELIEVE THE CHANGE CAN BE DETRIMENTAL TO THE QUALITY OF THE MQJ OR TO REQUEST RE-EVALUATION OF THE MQJs.

APPENDIX A

EVALUATION OF MEASUREMENT QUALITY JUMPERS

A.1 VISUAL INSPECTION AND ENDFACE GEOMETRY

a. TAKE SEVERAL PICTURES OF THE MQJs UNDER TEST AT DIFFERENT ANGLES.

b. COMPARE MQJs UNDER TEST WITH NAVSEA DRAWING 6877804 AND NOTE ANY DIFFERENCES.

c. INSPECT PHYSICAL CONSTRUCTION OF MQJs FOR QUALITY OF WORKMANSHIP AND COMMENT.

d. VISUALLY INSPECT ALL LIGHT DUTY CONNECTORS, TERMINI PINS AND SOCKETS ON MQJs AND COMMENT ON WORKMANSHIP. THE FIBER OPTIC SECTION USES A 400X VIDEO SCOPE WITH A BLUE LIGHT TO VIEW CONNECTOR AND TERMINI END FACES. IN ORDER TO PASS THE INSPECTION, THERE SHALL BE NO VISIBLE SCRATCHES OBSERVED WHEN USING THE VIDEO SCOPE.

e. CHECK ALL LIGHT DUTY CONNECTOR ENDFACES OF MQJs USING THE INTERFEROMETER AND PRINT COPIES OF THE MEASUREMENTS. THE REQUESTING ORGANIZATION SHALL SUPPLY COPIES OF THE INTERFEROMETER MEASUREMENTS OF ALL SAMPLES SUBMITTED. CONNECTORS SHALL MEET GR-326 CRITERIA FOR DOMED PHYSICAL CONTACT CONNECTORS. THE FOLLOWING IS THE CRITERIA:
   i. RADIUS OF CURVATURE (ROC) SHALL BE BETWEEN 7MM AND 25 MM
   ii. APEX OFFSET OF THE SPHERICAL ENDFACE TO THE AXIS OF THE FERRULE SHALL BE LESS THAN 50 MICROMETERS
   iii. FIBER PROTRUSION SHALL NOT EXCEED 50 NM; WHEN ROC IS 25 MM, FIBER UNDERCUT SHALL BE NO MORE THAN 50 NM. FOR ALL OTHER ROC VALUES THE MAXIMUM UNDERCUT IS GIVEN IN TABLE A-I.

TABLE A-I – MAXIMUM UNDERCUT ALLOWANCE

ROC (mm)	7	8	9	10	11	12
Undercut(nm)	125	125	125	125	115	106
ROC (mm)	13	14	15	16	17	18
Undercut(nm)	98	91	85	80	75	72
ROC (mm)	19	20	21	22	23	24
Undercut(nm)	68	65	62	59	56	53

A.2 OPTICAL INSERTION LOSS MEASUREMENTS

NOTE: FOR SINGLE MODE FIBER MEASUREMENTS, THE REFERENCE CABLE MAY INCLUDE A SINGLE LOOP WITH A DIAMETER OF 30 MILLIMETERS (1 INCH) TO ELIMINATE HIGHER ORDER MODE POWER.

NOTE: THE TIME DELAY BETWEEN THE MEASUREMENT OF P1 AND P2 SHALL BE KEPT TO A MINIMUM TO PREVENT INACCURATE READINGS.

NOTE: THE REFERENCE CABLE TO LIGHT SOURCE CONNECTION SHALL NOT BE DISTURBED BETWEEN THE MEASUREMENT OF P1 AND P2 TO PREVENT INACCURATE READINGS.

NOTE: A WIPE DAMPENED WITH ALCOHOL MAY BE USED TO CLEAN THE ADAPTERS AND CONNECTORS AND THEY MAY BE BLOWN DRY WITH AIR BEFORE MAKING EACH CONNECTION.

NOTE: THIS PROCEDURE INVOLVES THE USE OF REFERENCE MQJs. DEFECTIVE OR DIRTY MQJs WILL LEAD TO UNACCEPTABLE LOSS VALUES. THE REFERENCE MQJ SHOULD BE CLEAN AND OF KNOWN QUALITY.

TABLE A-II – SUMMARY OF PASS/FAIL CRITERIA

Test performed	Pass/Fail criteria
Evaluate workmanship	See evaluation process for details
Visual exam	See evaluation process for details
Interferometer measurements	GR-326 criteria for multimode and single mode
Insertion loss of ST and LC connectors	Mean: 0.35 dB Standard deviation multimode: 0.05 max Standard deviation single mode: 0.10 max
Insertion loss of termini (M29504/14 or M29504/15)	Mean: 0.7 dB Standard Deviation multimode: 0.05 max Standard Deviation single mode: 0.10 max
Return loss (Single Mode Only)	43 dB or better

A.2.1 ST-TO-LIGHT DUTY CONNECTOR (ST OR LC) MQJs:

A.2.1.1 MEASURE THE OPTICAL LOSS OF THE ST CONNECTOR ENDS AS FOLLOWS (SEE FIGURES A-1 AND A-2 BELOW)

a. REFERENCE MEASUREMENT (P_1)

i. SELECT AN MQJ REFERENCE CABLE
NOTE: SELECT AN MQJ THAT COMPLIES WITH MIL-STD-2042-6C METHOD 6F1: MQJ CABLE SELECTION TEST
ii. CONNECT END “A” (ST) OF THE ST TO LIGHT DUTY CONNECTOR (ST/LC) REFERENCE MQJ TO THE LIGHT SOURCE
iii. CONNECT END “B” (ST OR LC) OF THE ST TO LIGHT DUTY CONNECTOR (ST/LC) REFERENCE MQJ TO THE POWER METER
iv. RECORD THE OPTICAL POWER AT THE METER AS P1 (SEE FIGURE A-1)

b. TEST MEASUREMENT (P_2)

i. DISCONNECT END “B” OF THE REFERENCE MQJ FROM THE POWER METER
ii. CONNECT END “B” OF THE REFERENCE MQJ TO A ST-TO-ST OR LC-TO-LC ADAPTER
iii. CONNECT END “A” OF THE MQJ UNDER TEST TO THE ST-TO-ST OR LC–TO-LC ADAPTER
iv. CONNECT END “B” OF THE MQJ UNDER TEST TO THE OPPOSITE END OF THE MQJ UNDER TEST TO THE POWER METER
v. RECORD THE OPTICAL POWER AS P_2 (SEE FIGURE A-2)

c. CALCULATE THE LIGHT DUTY CONNECTOR (ST/LC) CONNECTOR, OF THE MQJ UNDER TEST, END “A” OPTICAL LOSS AS P_1- P_2

d. RECORD THE OPTICAL LOSS VALUE

e. MEASURE THE OPTICAL LOSS OF THE LIGHT DUTY CONNECTOR (ST/LC) CONNECTOR A MINIMUM OF TWO ADDITIONAL TIMES (MAXIMUM OF 10 TOTAL TIMES). DE-MATE AND MATE THE ST CONNECTORS (REFERENCE MQJ LIGHT DUTY CONNECTOR (ST/LC) AND MQJ UNDER TEST LIGHT DUTY CONNECTOR (ST/LC)) BETWEEN EACH MEASUREMENT.

NOTE: DE-MATED CONNECTORS SHALL BE CLEANED PRIOR TO RE-MATING.

f. THE LIGHT DUTY CONNECTOR (ST/LC) OF THE MQJ UNDER TEST IS ACCEPTABLE IF THE AVERAGE OF THE OPTICAL LOSS MEASUREMENTS IS $\leq$ 0.35 DB AND THE STANDARD DEVIATION IS 0.05 OR BETTER FOR MULTIMODE AND 0.1 FOR SINGLE MODE. NOTE: NO INDIVIDUAL MEASUREMENT SHALL BE GREATER THAN 0.35 DB.

g. REPEAT PROCEDURE TO MEASURE THE CONNECTOR LOSS ON THE OTHER END OF THE MQJ UNDER TEST

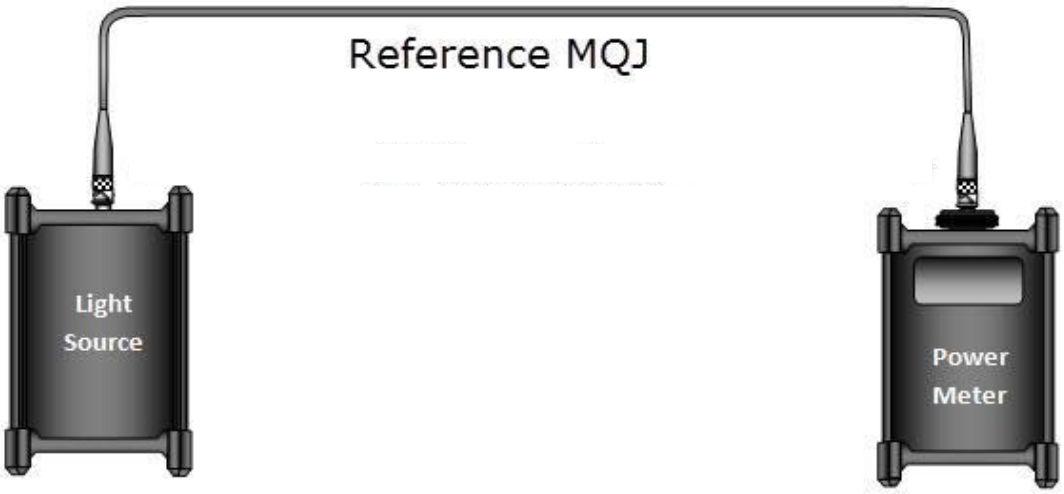

FIGURE A-1 - REFERENCE MEASUREMENT (P1)

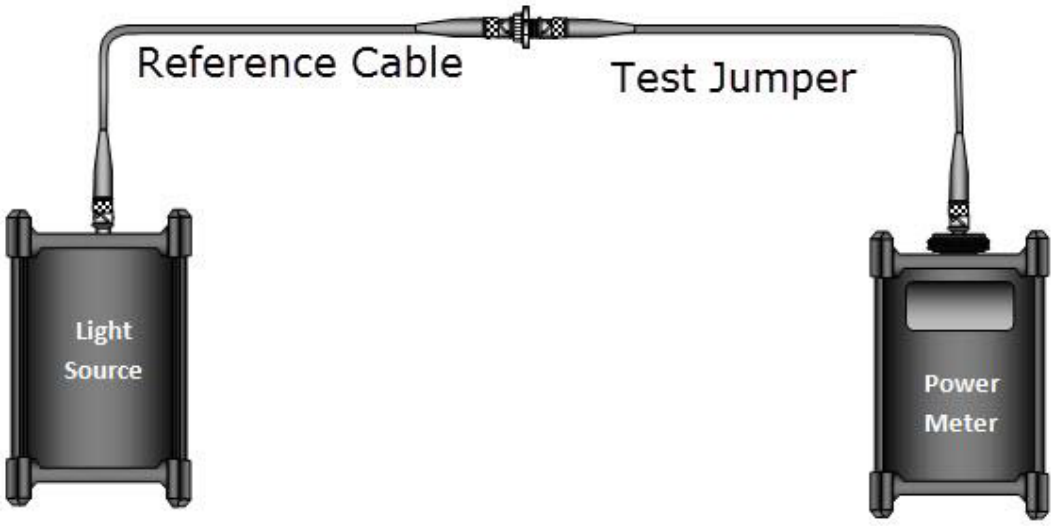

FIGURE A-2 - TEST MEASUREMENT (P2)

A.2.2 ST-TO-MULTI-TERMINUS CONNECTOR MQJs

A.2.2.1 MEASURE THE OPTICAL LOSS OF THE ST CONNECTOR ENDS AS FOLLOWS

a. REFERENCE MEASUREMENT (P_1)

i. CONNECT END “A” (ST CONNECTOR END) OF THE REFERENCE MQJ (DESIGNATED MQJ 2) TO THE OPTICAL SOURCE.

NOTE: METHOD IS WRITTEN FOR MQJ UNDER TEST BEING A PLUG MQJ. IF MQJ UNDER TEST IS A RECEPTACLE MQJ THEN THE REFERENCE MQJ WILL NEED TO SWITCH TO A PLUG MQJ.

ii. CONNECT END “B” OF MQJ 2, THE END OPPOSITE THE LIGHT SOURCE, TO END “B” (MULTI-TERMINUS END) OF THE MQJ UNDER TEST
iii. CONNECT END “A” (ST END) OF THE MQJ UNDER TEST TO THE POWER METER
iv. RECORD THE OPTICAL POWER AS P_1 (SEE FIGURE A-3)

b. TEST MEASUREMENT (P_2)

i. DISCONNECT END “A” OF THE MQJ UNDER TEST FROM THE POWER METER
ii. CONNECT END “A” (ST CONNECTOR END) OF THE MQJ UNDER TEST TO A ST-TO-ST ADAPTER
iii. CONNECT END “A” OF MQJ 1 (REFERENCE ST-TO-ST MQJ) TO THE ST-TO-ST ADAPTER
iv. CONNECT THE OPPOSITE END OF MQJ 1 TO THE POWER METER
v. RECORD THE OPTICAL POWER AS P_2 (SEE FIGURE A-4)

c. CALCULATE THE ST CONNECTOR OPTICAL LOSS AS $P_1 - P_2$

d. RECORD THE OPTICAL LOSS VALUE

e. MEASURE THE OPTICAL LOSS OF THE ST CONNECTOR A MINIMUM OF TWO ADDITIONAL TIMES (MAXIMUM OF 10 TOTAL TIMES). DE-MATE AND MATE THE ST CONNECTORS (MQJ 1 ST AND MQJ UNDER TEST ST) BETWEEN EACH MEASUREMENT.

NOTE: DE-MATED CONNECTORS SHALL BE CLEANED PRIOR TO RE-MATING

f. THE ST CONNECTOR OF THE MQJ UNDER TEST IS ACCEPTABLE IF THE AVERAGE OF THE OPTICAL LOSS MEASUREMENTS IS $\leq$ 0.35 DB AND THE STANDARD DEVIATION IS 0.05 OR BETTER FOR MULTIMODE AND 0.1 FOR SINGLE MODE.

NOTE: NO INDIVIDUAL MEASUREMENT SHALL BE GREATER THAN 0.35 DB

g. REPEAT STEPS ‘A’ THROUGH ‘F’ FOR EACH CHANNEL OF THE MQJ

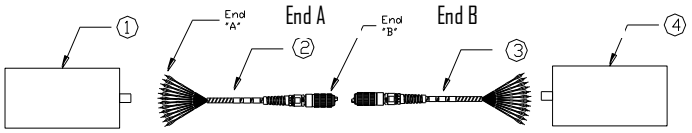

FIGURE A-3 - REFERENCE MEASUREMENT (P1)

1. LIGHT SOURCE (MM – USE LED SOURCE, SM – USE LASER)
2. MQJ 2 = ST TO CONNECTOR WITH TERMINI REFERENCE MQJ (MM – USE MM, SM – USE SME MQJ)
3. MQJ UNDER TEST (ST TO CONNECTOR WITH TERMINI)
4. POWER METER

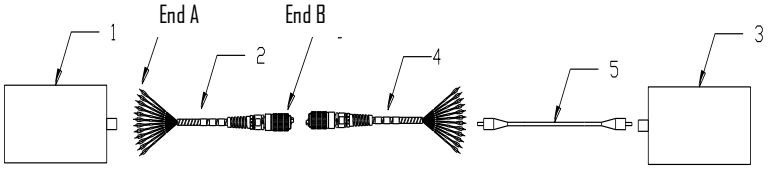

FIGURE A-4 - TEST MEASUREMENT (P2)

1. LIGHT SOURCE (MM- USE LED SOURCE, SM – USE LASER)
2. MQJ 2 = ST TO CONNECTOR WITH TERMINI REFERENCE MQJ (MM – USE MM, SM – USE SME MQJ)
3. POWER METER
4. MQJ UNDER TEST (ST TO CONNECTOR WITH TERMINI)
5. MQJ 1 = ST TO ST REFERENCE MQJ (MM-USE MM, SM- USE SME MQJ)

A.2.3 MEASURE THE OPTICAL LOSS OF THE TERMINI

NOTE: THIS MEASUREMENT IS DONE OVER THE TERMINUS INTERFACE AT END “B” OF THE MQJ UNDER TEST

NOTE: THIS MEASUREMENT INVOLVES A SUBSTITUTION OF THE MQJ FROM THE REFERENCE MEASUREMENT TO THE TEST MEASUREMENT

NOTE: THIS METHOD IS WRITTEN FOR THE MQJ UNDER TEST BEING A PLUG MQJ. IF THE MQJ UNDER TEST IS A RECEPTACLE MQJ THEN THE REFERENCE MQJ WILL NEED TO SWITCH TO A PLUG MQJ.

a. REFERENCE MEASUREMENT (P_1)
   i. CONNECT TWO REFERENCE ST-TO-ST MQJs (DESIGNATED MQJ 1 AND MQJ 2) BETWEEN THE LIGHT SOURCE AND POWER METER. (SEE FIGURE A-5)
   ii. RECORD THE OPTICAL POWER AS P_1

b. TEST MEASUREMENT (P_2)
   i. DISCONNECT MQJ 2 FROM MQJ 1 AND THE POWER METER
   ii. CONNECT END “A” (ST CONNECTOR END) OF A REFERENCE MQJ (DESIGNATED MQJ 3) TO MQJ 1, THE END OPPOSITE THE LIGHT SOURCE. (SEE FIGURE A-6)

iii. CONNECT END “B” OF MQJ 3, THE END OPPOSITE THE LIGHT SOURCE, TO END “B” OF THE MQJ UNDER TEST. (SEE FIGURE A-6)
iv. CONNECT END “A” (ST END) OF THE MQJ UNDER TEST TO THE POWER METER (SEE FIGURE A-6)
v. RECORD THE OPTICAL POWER AS P_2

c. CALCULATE THE OPTICAL LOSS AS P_1- P_2

d. RECORD THE OPTICAL LOSS VALUE

e. MEASURE THE OPTICAL LOSS OF THE TERMINI A MINIMUM OF TWO ADDITIONAL TIMES (MAXIMUM OF 10 TOTAL TIMES). DE-MATE AND MATE THE TERMINI (ASSEMBLY) (MQJ 3 AND MQJ UNDER TEST ST) BETWEEN EACH MEASUREMENT.

NOTE: DE-MATED CONNECTORS SHALL BE CLEANED PRIOR TO RE-MATING

f. THE TERMINI OF THE MQJ UNDER TEST IS ACCEPTABLE IF THE AVERAGE OF THE OPTICAL LOSS MEASUREMENTS IS $\leq$ 0.70 DB AND THE STANDARD DEVIATION IS 0.05 OR BETTER FOR MULTIMODE AND 0.1 FOR SINGLE MODE

NOTE: NO INDIVIDUAL MEASUREMENT SHALL BE GREATER THAN 0.70 DB

g. REPEAT STEPS A THROUGH F FOR EACH CHANNEL OF THE MQJ

h. REPEAT PROCEDURE WITH THE RECEPTACLE AS THE MQJ UNDER TEST AND MQJ PLUG AS MQJ 3

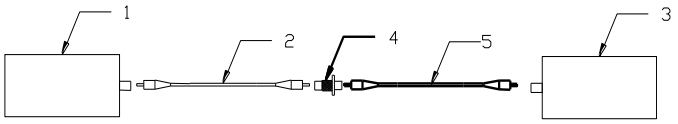

FIGURE A-5 - REFERENCE MEASUREMENT (P1)

1. LIGHT SOURCE (MM-USE LED, SM – USE LASER)
2. MQJ 1 = ST TO ST REFERENCE MQJ (MM – USE MM MQJ, SM – USE SME MQJ)
3. POWER METER
4. ST TO ST ADAPTER
5. MQJ 2 = ST TO ST REFERENCE MQJ (MM – USE MM MQJ, SM – USE SME MQJ)

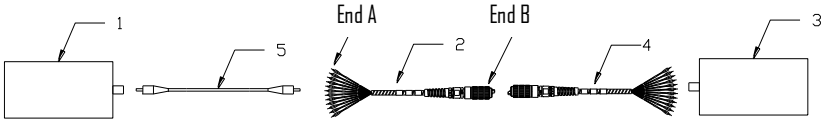

FIGURE A-6 - TEST MEASUREMENT (P2)

1. LIGHT SOURCE (MM-USE LED, SM – USE LASER)
2. MQJ 3 = ST TO CONNECTOR WITH TERMINI REFERENCE MQJ (MM – USE MM MQJ, SM – USE SME MQJ)
3. POWER METER
4. MQJ UNDER TEST (ST TO CONNECTOR WITH TERMINI)
5. MQJ 1 = ST TO ST REFERENCE MQJ (MM – USE MM MQJ, SM – USE SME MQJ)

TABLE A-4 - MQJ OPTICAL LOSS ACCEPTANCE CRITERIA

END CONNECTION	ACCEPTABLE LOSS (DB) 1/	STANDARD DEVIATION (DB)
ST	$0.00 \leq M_C \leq 0.35$	0.05 MAX. (MULTIMODE) 0.10 MAX. (SINGLE MODE)
LC	$0.00 \leq M_C \leq 0.35$	0.05 MAX. (MULTIMODE) 0.10 MAX. (SINGLE MODE)
M29504/14 PIN TERMINUS	$0.00 \leq M_C \leq 0.70$	0.05 MAX. (MULTIMODE) 0.10 MAX. (SINGLE MODE)
M29504/15 SOCKET TERMINUS	$0.00 \leq M_C \leq 0.70$	0.05 MAX. (MULTIMODE) 0.10 MAX. (SINGLE MODE)

1/ WHERE M_C IS THE MEAN CONNECTION LOSS

A.3 OPTICAL RETURN LOSS MEASURING

NOTE: OPTICAL RETURN LOSS TESTING IS ONLY PERFORMED ON SINGLE MODE MQJs

NOTE: USE ENHANCED DOME POLISH REFERENCE MQJs WITH RETURN LOSS REQUIREMENTS NOT LESS THAN 43 DB

A.3.1 ST-TO-LIGHT DUTY (ST OR LC) CONNECTOR MQJs

NOTE: SELECT THE 1310 NANOMETER WAVELENGTH IF THE ORLM CAN PERFORM RETURN LOSS MEASUREMENTS AT MULTIPLE WAVELENGTHS

a. REFERENCE THE ORLM
b. WHEN THE REFERENCING PROCESS IS COMPLETE, UNWRAP THE REFERENCE MQJ FROM THE MANDREL
c. VERIFY THAT THE ORLM IS DISPLAYING A VALUE BETWEEN 14.3 AND 15.9
d. CONNECT END “B”, END OPPOSITE ORLM, OF THE REFERENCE MQJ TO A ST-ST OR LC-TO-LC ADAPTER
e. CONNECT END “A” OF THE MQJ UNDER TEST TO THE ST-ST OR LC-TO-LC ADAPTER
f. WRAP THE MQJ UNDER TEST AROUND A 6 MM MANDREL, BEHIND THE ST MATED PAIR, AND RECORD THE DATA

NOTE: THE MQJ UNDER TEST SHOULD BE WRAPPED AROUND THE MANDREL UNTIL A STABLE VALUE IS INDICATED ON THE ORLM DISPLAY. TEN MANDREL WRAPS ARE USUALLY SUFFICIENT TO OBTAIN A STABLE VALUE.

g. THE RETURN LOSS VALUE FOR SME MQJs SHALL BE GREATER THAN 43 DB
h. REPEAT STEPS ‘E’ THRU ‘F’ WITH END “B” OF THE MQJ UNDER TEST CONNECTED TO THE ST END OF THE REFERENCE MQJ

A.3.2 ST-TO-MULTI-TERMINUS CONNECTOR MQJs

NOTE: SELECT THE 1310 NANOMETER WAVELENGTH IF THE ORLM CAN PERFORM RETURN LOSS MEASUREMENTS AT MULTIPLE WAVELENGTHS

A.3.2.1 MEASURE THE OPTICAL RETURN LOSS OF THE ST CONNECTOR ENDS

a. REFERENCE THE ORLM
b. WHEN THE REFERENCING PROCESS IS COMPLETE, UNWRAP THE REFERENCE MQJ FROM THE MANDREL
c. VERIFY THAT THE ORLM IS DISPLAYING A VALUE BETWEEN 14.3 AND 15.9
d. CONNECT END “B”, END OPPOSITE ORLM, OF THE REFERENCE MQJ TO A ST-ST ADAPTER

e. CONNECT END “A” OF THE MQJ UNDER TEST TO THE ST-ST ADAPTER
f. WRAP THE MQJ UNDER TEST AROUND A 6 MM MANDREL, BEHIND THE ST MATED PAIR, AND RECORD THE DATA

NOTE: THE MQJ UNDER TEST SHOULD BE WRAPPED AROUND THE MANDREL UNTIL A STABLE VALUE IS INDICATED ON THE ORLM DISPLAY. TEN MANDREL WRAPS ARE USUALLY SUFFICIENT TO OBTAIN A STABLE VALUE. REPEAT STEPS “E” THROUGH “F” FOR THE REMAINING CHANNELS OF THE MQJ UNDER TEST.

g. THE RETURN LOSS VALUE FOR SME MQJs SHALL BE GREATER THAN 43 DB
h. REPEAT STEPS ‘E’ THROUGH ‘G’ FOR ALL CHANNELS

A.3.2.2 MEASURE THE OPTICAL RETURN LOSS OF THE TERMINI ENDS

a. CONNECT ST-ST REFERENCE MQJ TO ORLM, AND THEN CONNECT ST OF ST- M28876 REFERENCE MQJ TO THE ST-ST REFERENCE MQJ AND REFERENCE ORLM BY MANDREL WRAPPING ST-M28876 REFERENCE MQJ
b. WHEN THE REFERENCING PROCESS IS COMPLETE, UNWRAP THE REFERENCE MQJ FROM THE MANDREL
c. VERIFY THAT THE ORLM IS DISPLAYING A VALUE BETWEEN 14.3 AND 15.9
d. CONNECT THE TERMINI END OF THE MQJ UNDER TEST TO THE TERMINI END OF ST-M28876 REFERENCE MQJ
e. WRAP THE MQJ UNDER TEST AROUND A 6 MM MANDREL, NEAR THE ST END, AND RECORD THE DATA (SEE FIGURE A-8)

NOTE: THE MQJ UNDER TEST SHOULD BE WRAPPED AROUND THE MANDREL UNTIL A STABLE VALUE IS INDICATED ON THE ORLM DISPLAY. TEN MANDREL WRAPS ARE USUALLY SUFFICIENT TO OBTAIN A STABLE VALUE.
f. THE RETURN LOSS VALUE FOR SME MQJs SHALL BE GREATER THAN 43 DB
g. REPEAT STEPS ‘M’ THROUGH ‘N’ FOR ALL CHANNELS

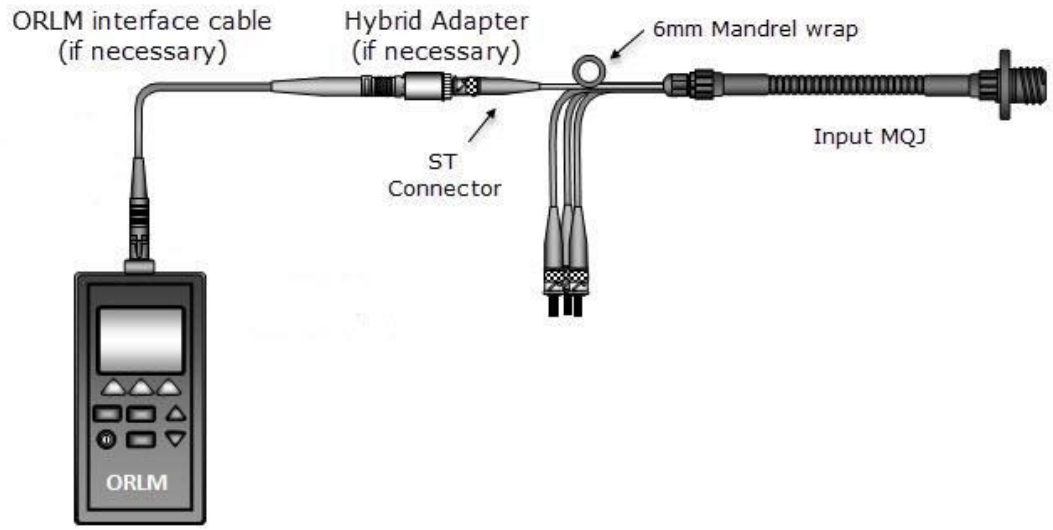

FIGURE A-7 - ORLM REFERENCE SETUP

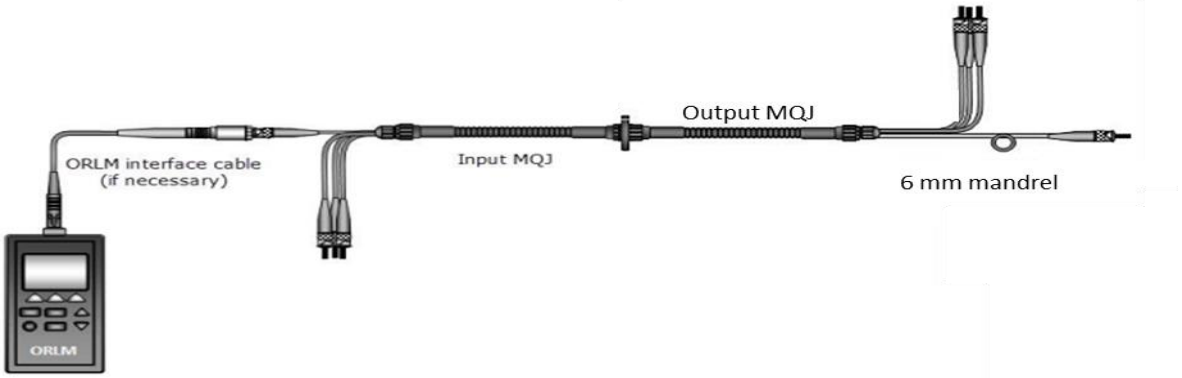

FIGURE A-8 - ORLM TEST SETUP