Power 775 L-Link Optical Cables Service Procedure
11/30/2011
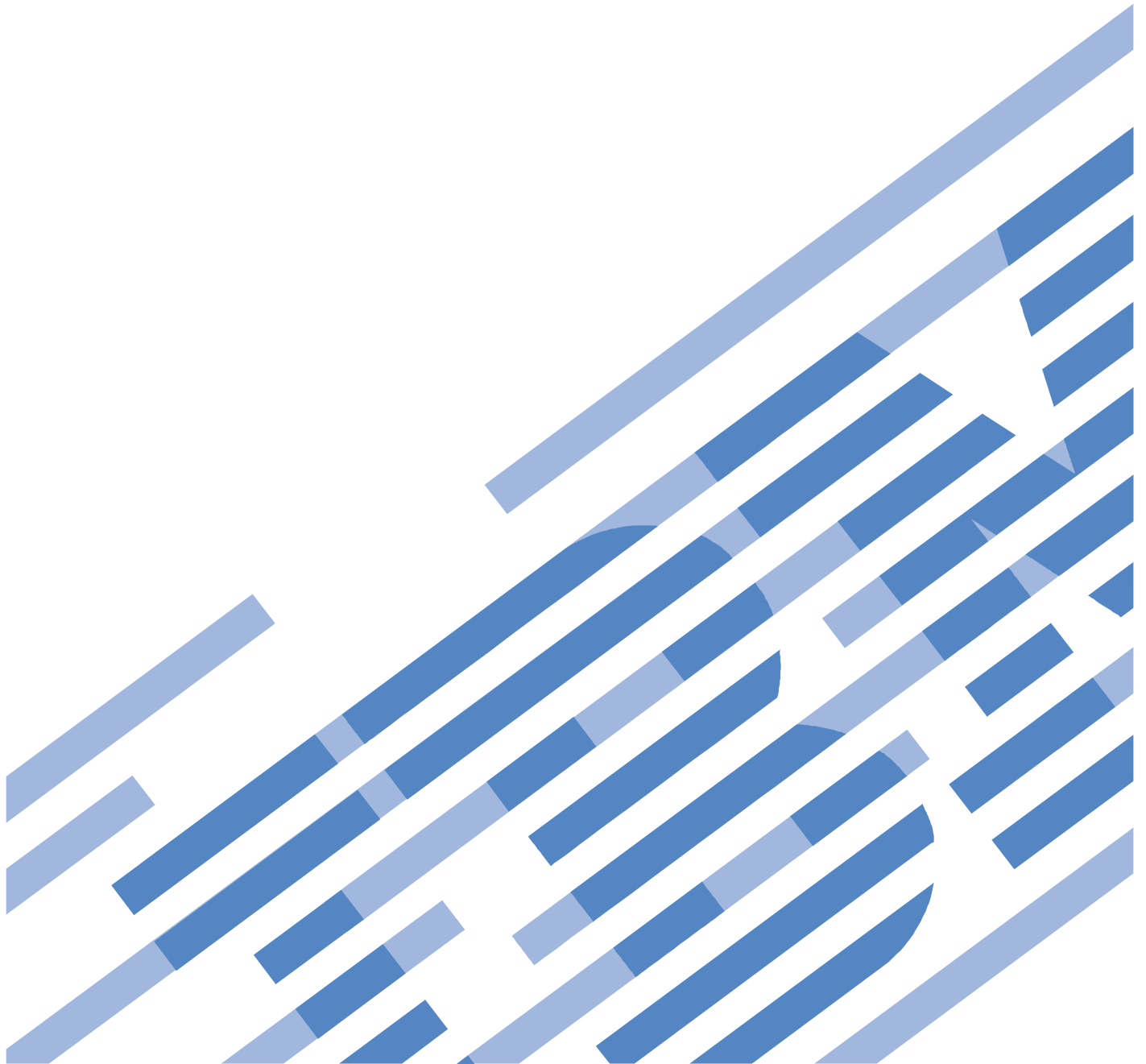
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1 GENERAL

1.1 Release / Revision History

File Name	Date	Description
"p775_l_link_cables.pdf"	11/30/2011	Initial Release

Table 1 Release / Revision History

1.2 Where to find this document

The current Power 775 L-Link Optical Cables Service Procedure document is "p775_l_link_cables.pdf" which is to be downloaded from:

InfoCenter Website: http://publib.boulder.ibm.com/infocenter/powersys/v3r1m5/topic/p7ee2/p7ee2kickoff.htm
Click "PDF files for the IBM Power 775 (9125-F2C) removing and replacing parts"

Under "System enclosure", click "L-Link Optical cables" to download PDF "p775_l_link_cables.pdf"

This is the only valid source for the latest Power 775 L-Link Optical Cables Service Procedure.

1.3 Required Documents

Document	P/N	Location
Safety Notices http://publib.boulder.ibm.com/infocenter/powersys/v3r1m5/topic/p7hdx/G229-9054.pdf	Document # G229-9054	Infocenter*

Table 2 Required Documents

*InfoCenter Website: http://publib.boulder.ibm.com/infocenter/powersys/v3r1m5/topic/p7ee2/p7ee2kickoff.htm

1.4 Related Documents

Document	Doc #	Location
"p775_l_link_cables.pdf"		InfoCenter *

Table 3 Related Documents

*InfoCenter Website: http://publib.boulder.ibm.com/infocenter/powersys/v3r1m5/topic/p7ee2/p7ee2kickoff.htm

1.5 Abbreviations

Abbreviation	Definition	Details
CEC	Central Electronic Complex	Also referred to as the node.
		The CEC enclosure is referred to as a Drawer in this procedure.
DCCA	Distributed Conversion and Control Assembly	The power supplies for the CEC and DE are called the CEC DCCA and DE DCCA respectively.
DE	Disk Enclosure	
D-Link	Distant Link	Optical Cables that connect supernodes to other supernodes.
FRU	Field Replaceable Unit	
L-Link	Local Link	L-Links are optical (fiber) or electrical (copper) links connect all Hub modules to all other Hub modules within the same supernode.
		L-Links are distinguished as being either "LL-Links", which are electrical links that interconnect all Hubs within a CEC, or "LR-Links", which are optical links, enclosed within an OBE, that interconnect each Hub with all 24 Hubs in the other 3 drawers of the supernode.
MPO	Multi-Fiber Push-on/Pull-off	Type of multi-fiber optical connector
MTP		Branded version of the MPO optical fiber connector
OBE	Optical Backplane Enclosure	This is the enclosure that holds and manages the L-Link Cables.
SN	SuperNode	Array of 32 Octants or Nodes, in 4 CEC Drawers, that are interconnected in an all-to-all full mesh topology using LL-Links or LR-Links.
SSR	Systems Services Representative	IBM Service personnel
VCSEL	Vertical Cavity Surface Emitting Laser	

2 OVERVIEW

This section is an overview only. Do not start the service procedure until Section 3 which contains the detailed steps.

2.1   Safety Notices

Read   "Safety_Notices " available from InfoCenter – see Section 1.3.
http://publib.boulder.ibm.com/infocenter/powersys/v3r1m5/topic/p7hdx/G229-9054.pdf

The following cautions apply to all Power775 service procedures:

CAUTION:
Energy hazard present. Shorting might result in system outage and possible physical injury. Remove all metallic jewelry before servicing. (C001)

CAUTION:
The doors and covers to the product are to be closed at all times except for service by trained service personnel. All covers must be replaced and doors locked at the conclusion of the service operation. (C013)

CAUTION:
Servicing of this product or unit is to be performed by trained service personnel only. (C032)

The following caution specifically pertains to this Power775 service procedure.

CAUTION:
This product contains Class 1M lasers. Do not view directly with optical instruments. (C028)

DANGER: Hazardous voltage present. Voltages present constitute a shock hazard, which can cause severe injury or death. (L004)

CAUTION: Sharp edges, corners, or joints nearby. (L006)

2.2   Confirm how you got to this Power 775 L-Link Optical Cables Service Procedure

You should be performing this procedure if you have determined an L-Link has poor signal quality or has failed. This procedure instructs how to remove, clean and reinstall the Optical Backplane Enclosure (OBE) which holds and manages the L-Links.   If cleaning does not work and replacement is required, the same procedure is used with the exception of using a new OBE, as opposed to reinstalling.

You should have downloaded this procedure from:

InfoCenter Website: http://publib.boulder.ibm.com/infocenter/powersys/v3r1m5/topic/p7ee2/p7ee2kickoff.htm

 This is the only valid source for the latest Power775 L-Link Optical cables Service Procedure document.

2.3   L-Link Optical Backplane Enclosure Description

Figure 1 describes the mapping between L-Ports that is implemented through the L-Link Optical Backplane.

Each of the 32 Hubs in the SuperNode is connected to the 24 Hubs in the other 3 CEC drawers of the SuperNode through a (6+6) fiber bidirectional L-Link. The full L-Link Optical Backplane therefore contains 32 * 24 * (6+6) = 4,608 optical fibers. There are 32*24 = 768 individual (6+6) fiber links within the L-Link Optical Backplane Enclosure.

Each Drawer has 48 of the 48-fiber L-Port optical connectors. The organization of these 48 connectors is shown in the figure below. Each 48-fiber connector carries signals for 4 of the (6+6)-fiber L-Ports.
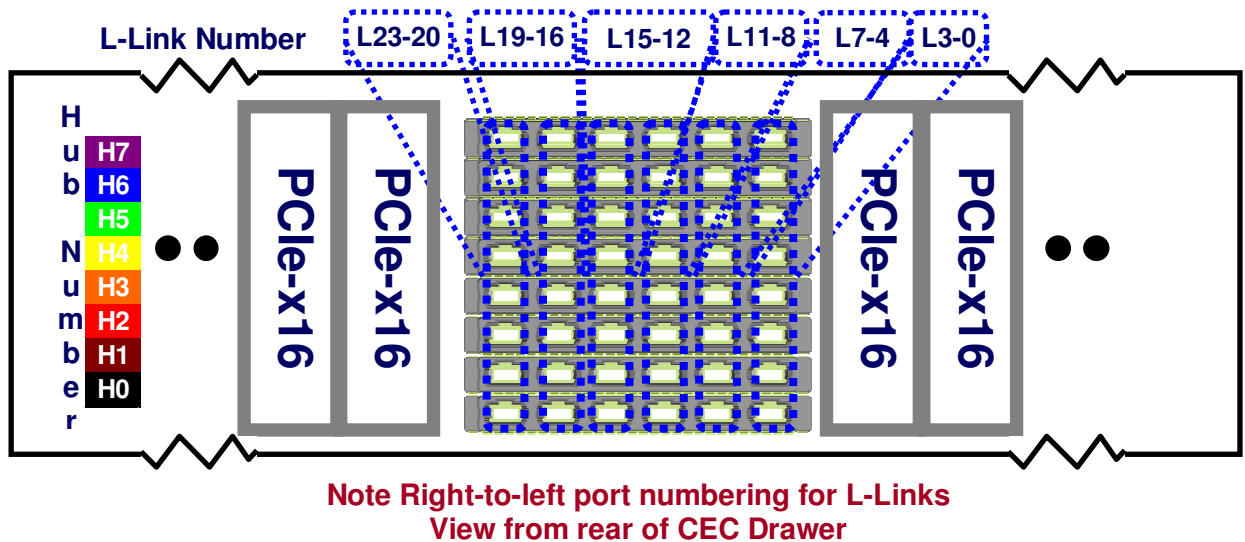
Figure 1 L-Link Port Numbering

The full L-Link Optical Backplane Enclosure holds and manages 4*48= 192 optical connectors.

Figure2 on the following page shows the connectivity mapping between L-Ports

Power 775 L-Link Optical Cables Service Procedure

This table shows the connectivity for the 192 L-Links that connect Drawer 0 with Drawers 1, 2, and 3

Shuffle Cable 2: 0⇔3

Shuffle Cable 1: 0⇔2
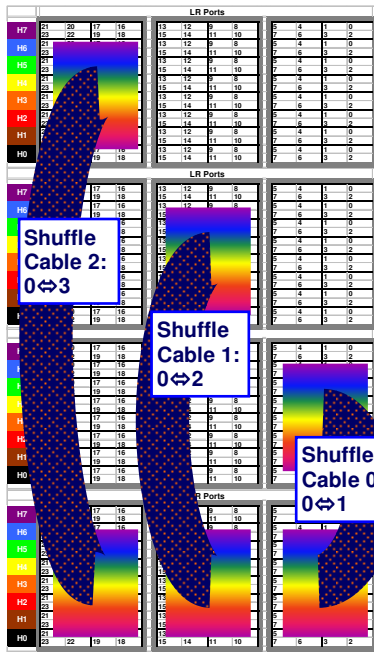
Shuffle Cable 0: 0⇔1

Shuffle Cable 0						Shuffle Cable 1						Shuffle Cable 2					
Link		Drawer 0		Drawer 1		Link		Drawer 0		Drawer 2		Link		Drawer 0		Drawer 3	
#	Octal	Hub	Port	Hub	Port	#	Octal	Hub	Port	Hub	Port	#	Octal	Hub	Port	Hub	Port
0	000	0	0	0	0	64	100	0	8	0	8	128	200	0	16	0	16
1	001	0	1	1	0	65	101	0	9	1	8	129	201	0	17	1	16
2	002	0	2	2	0	66	102	0	10	2	8	130	202	0	18	2	16
3	003	0	3	3	0	67	103	0	11	3	8	131	203	0	19	3	16
4	004	0	4	4	0	68	104	0	12	4	8	132	204	0	20	4	16
5	005	0	5	5	0	69	105	0	13	5	8	133	205	0	21	5	16
6	006	0	6	6	0	70	106	0	14	6	8	134	206	0	22	6	16
7	007	0	7	7	0	71	107	0	15	7	8	135	207	0	23	7	16
8	010	1	0	0	1	72	110	1	8	0	9	136	210	1	16	0	17
9	011	1	1	1	1	73	111	1	9	1	9	137	211	1	17	1	17
10	012	1	2	2	1	74	112	1	10	2	9	138	212	1	18	2	17
11	013	1	3	3	1	75	113	1	11	3	9	139	213	1	19	3	17
12	014	1	4	4	1	76	114	1	12	4	9	140	214	1	20	4	17
13	015	1	5	5	1	77	115	1	13	5	9	141	215	1	21	5	17
14	016	1	6	6	1	78	116	1	14	6	9	142	216	1	22	6	17
15	017	1	7	7	1	79	117	1	15	7	9	143	217	1	23	7	17
16	020	2	0	0	2	80	120	2	8	0	10	144	220	2	16	0	18
17	021	2	1	1	2	81	121	2	9	1	10	145	221	2	17	1	18
18	022	2	2	2	2	82	122	2	10	2	10	146	222	2	18	2	18
19	023	2	3	3	2	83	123	2	11	3	10	147	223	2	19	3	18
20	024	2	4	4	2	84	124	2	12	4	10	148	224	2	20	4	18
21	025	2	5	5	2	85	125	2	13	5	10	149	225	2	21	5	18
22	026	2	6	6	2	86	126	2	14	6	10	150	226	2	22	6	18
23	027	2	7	7	2	87	127	2	15	7	10	151	227	2	23	7	18
24	030	3	0	0	3	88	130	3	8	0	11	152	230	3	16	0	19
25	031	3	1	1	3	89	131	3	9	1	11	153	231	3	17	1	19
26	032	3	2	2	3	90	132	3	10	2	11	154	232	3	18	2	19
27	033	3	3	3	3	91	133	3	11	3	11	155	233	3	19	3	19
28	034	3	4	4	3	92	134	3	12	4	11	156	234	3	20	4	19
29	035	3	5	5	3	93	135	3	13	5	11	157	235	3	21	5	19
30	036	3	6	6	3	94	136	3	14	6	11	158	236	3	22	6	19
31	037	3	7	7	3	95	137	3	15	7	11	159	237	3	23	7	19
32	040	4	0	0	4	96	140	4	8	0	12	160	240	4	16	0	20
33	041	4	1	1	4	97	141	4	9	1	12	161	241	4	17	1	20
34	042	4	2	2	4	98	142	4	10	2	12	162	242	4	18	2	20
35	043	4	3	3	4	99	143	4	11	3	12	163	243	4	19	3	20
36	044	4	4	4	4	100	144	4	12	4	12	164	244	4	20	4	20
37	045	4	5	5	4	101	145	4	13	5	12	165	245	4	21	5	20
38	046	4	6	6	4	102	146	4	14	6	12	166	246	4	22	6	20
39	047	4	7	7	4	103	147	4	15	7	12	167	247	4	23	7	20
40	050	5	0	0	5	104	150	5	8	0	13	168	250	5	16	0	21
41	051	5	1	1	5	105	151	5	9	1	13	169	251	5	17	1	21
42	052	5	2	2	5	106	152	5	10	2	13	170	252	5	18	2	21
43	053	5	3	3	5	107	153	5	11	3	13	171	253	5	19	3	21
44	054	5	4	4	5	108	154	5	12	4	13	172	254	5	20	4	21
45	055	5	5	5	5	109	155	5	13	5	13	173	255	5	21	5	21
46	056	5	6	6	5	110	156	5	14	6	13	174	256	5	22	6	21
47	057	5	7	7	5	111	157	5	15	7	13	175	257	5	23	7	21
48	060	6	0	0	6	112	160	6	8	0	14	176	260	6	16	0	22
49	061	6	1	1	6	113	161	6	9	1	14	177	261	6	17	1	22
50	062	6	2	2	6	114	162	6	10	2	14	178	262	6	18	2	22
51	063	6	3	3	6	115	163	6	11	3	14	179	263	6	19	3	22
52	064	6	4	4	6	116	164	6	12	4	14	180	264	6	20	4	22
53	065	6	5	5	6	117	165	6	13	5	14	181	265	6	21	5	22
54	066	6	6	6	6	118	166	6	14	6	14	182	266	6	22	6	22
55	067	6	7	7	6	119	167	6	15	7	14	183	267	6	23	7	22
56	070	7	0	0	7	120	170	7	8	0	15	184	270	7	16	0	23
57	071	7	1	1	7	121	171	7	9	1	15	185	271	7	17	1	23
58	072	7	2	2	7	122	172	7	10	2	15	186	272	7	18	2	23
59	073	7	3	3	7	123	173	7	11	3	15	187	273	7	19	3	23
60	074	7	4	4	7	124	174	7	12	4	15	188	274	7	20	4	23
61	075	7	5	5	7	125	175	7	13	5	15	189	275	7	21	5	23
62	076	7	6	6	7	126	176	7	14	6	15	190	276	7	22	6	23
63	077	7	7	7	7	127	177	7	15	7	15	191	277	7	23	7	23

This table shows the connectivity for the 192 L-Links that connect Drawer 1 with Drawers 2 & 3, and Drawer 2 with Drawer 3.

Shuffle Cable 4: 1⇔3

Shuffle Cable 5: 2⇔3
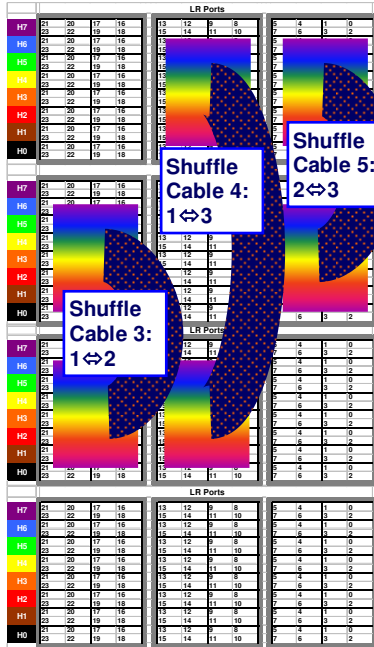
Shuffle Cable 3: 1⇔2

Shuffle Cable 3						Shuffle Cable 4						Shuffle Cable 5					
Link		Drawer 1		Drawer 2		Link		Drawer 1		Drawer 3		Link		Drawer 2		Drawer 3	
#	Octal	Hub	Port	Hub	Port	#	Octal	Hub	Port	Hub	Port	#	Octal	Hub	Port	Hub	Port
192	300	0	16	0	16	256	400	0	8	0	8	320	500	0	0	0	0
193	301	0	17	1	16	257	401	0	9	1	8	321	501	0	1	1	0
194	302	0	18	2	16	258	402	0	10	2	8	322	502	0	2	2	0
195	303	0	19	3	16	259	403	0	11	3	8	323	503	0	3	3	0
196	304	0	20	4	16	260	404	0	12	4	8	324	504	0	4	4	0
197	305	0	21	5	16	261	405	0	13	5	8	325	505	0	5	5	0
198	306	0	22	6	16	262	406	0	14	6	8	326	506	0	6	6	0
199	307	0	23	7	16	263	407	0	15	7	8	327	507	0	7	7	0
200	310	1	16	0	17	264	410	1	8	0	9	328	510	1	0	0	1
201	311	1	17	1	17	265	411	1	9	1	9	329	511	1	1	1	1
202	312	1	18	2	17	266	412	1	10	2	9	330	512	1	2	2	1
203	313	1	19	3	17	267	413	1	11	3	9	331	513	1	3	3	1
204	314	1	20	4	17	268	414	1	12	4	9	332	514	1	4	4	1
205	315	1	21	5	17	269	415	1	13	5	9	333	515	1	5	5	1
206	316	1	22	6	17	270	416	1	14	6	9	334	516	1	6	6	1
207	317	1	23	7	17	271	417	1	15	7	9	335	517	1	7	7	1
208	320	2	16	0	18	272	420	2	8	0	10	336	520	2	0	0	2
209	321	2	17	1	18	273	421	2	9	1	10	337	521	2	1	1	2
210	322	2	18	2	18	274	422	2	10	2	10	338	522	2	2	2	2
211	323	2	19	3	18	275	423	2	11	3	10	339	523	2	3	3	2
212	324	2	20	4	18	276	424	2	12	4	10	340	524	2	4	4	2
213	325	2	21	5	18	277	425	2	13	5	10	341	525	2	5	5	2
214	326	2	22	6	18	278	426	2	14	6	10	342	526	2	6	6	2
215	327	2	23	7	18	279	427	2	15	7	10	343	527	2	7	7	2
216	330	3	16	0	19	280	430	3	8	0	11	344	530	3	0	0	3
217	331	3	17	1	19	281	431	3	9	1	11	345	531	3	1	1	3
218	332	3	18	2	19	282	432	3	10	2	11	346	532	3	2	2	3
219	333	3	19	3	19	283	433	3	11	3	11	347	533	3	3	3	3
220	334	3	20	4	19	284	434	3	12	4	11	348	534	3	4	4	3
221	335	3	21	5	19	285	435	3	13	5	11	349	535	3	5	5	3
222	336	3	22	6	19	286	436	3	14	6	11	350	536	3	6	6	3
223	337	3	23	7	19	287	437	3	15	7	11	351	537	3	7	7	3
224	340	4	16	0	20	288	440	4	8	0	12	352	540	4	0	0	4
225	341	4	17	1	20	289	441	4	9	1	12	353	541	4	1	1	4
226	342	4	18	2	20	290	442	4	10	2	12	354	542	4	2	2	4
227	343	4	19	3	20	291	443	4	11	3	12	355	543	4	3	3	4
228	344	4	20	4	20	292	444	4	12	4	12	356	544	4	4	4	4
229	345	4	21	5	20	293	445	4	13	5	12	357	545	4	5	5	4
230	346	4	22	6	20	294	446	4	14	6	12	358	546	4	6	6	4
231	347	4	23	7	20	295	447	4	15	7	12	359	547	4	7	7	4
232	350	5	16	0	21	296	450	5	8	0	13	360	550	5	0	0	5
233	351	5	17	1	21	297	451	5	9	1	13	361	551	5	1	1	5
234	352	5	18	2	21	298	452	5	10	2	13	362	552	5	2	2	5
235	353	5	19	3	21	299	453	5	11	3	13	363	553	5	3	3	5
236	354	5	20	4	21	300	454	5	12	4	13	364	554	5	4	4	5
237	355	5	21	5	21	301	455	5	13	5	13	365	555	5	5	5	5
238	356	5	22	6	21	302	456	5	14	6	13	366	556	5	6	6	5
239	357	5	23	7	21	303	457	5	15	7	13	367	557	5	7	7	5
240	360	6	16	0	22	304	460	6	8	0	14	368	560	6	0	0	6
241	361	6	17	1	22	305	461	6	9	1	14	369	561	6	1	1	6
242	362	6	18	2	22	306	462	6	10	2	14	370	562	6	2	2	6
243	363	6	19	3	22	307	463	6	11	3	14	371	563	6	3	3	6
244	364	6	20	4	22	308	464	6	12	4	14	372	564	6	4	4	6
245	365	6	21	5	22	309	465	6	13	5	14	373	565	6	5	5	6
246	366	6	22	6	22	310	466	6	14	6	14	374	566	6	6	6	6
247	367	6	23	7	22	311	467	6	15	7	14	375	567	6	7	7	6
248	370	7	16	0	23	312	470	7	8	0	15	376	570	7	0	0	7
249	371	7	17	1	23	313	471	7	9	1	15	377	571	7	1	1	7
250	372	7	18	2	23	314	472	7	10	2	15	378	572	7	2	2	7
251	373	7	19	3	23	315	473	7	11	3	15	379	573	7	3	3	7
252	374	7	20	4	23	316	474	7	12	4	15	380	574	7	4	4	7
253	375	7	21	5	23	317	475	7	13	5	15	381	575	7	5	5	7
254	376	7	22	6	23	318	476	7	14	6	15	382	576	7	6	6	7
255	377	7	23	7	23	319	477	7	15	7	15	383	577	7	7	7	7

Figure 2 L-Link Port Mapping

2.3.1 General Discussion of MTP Optical Connector Handling

The MTP implementation of the MPO (Multi-Fiber Push-on/Pull-off) optical connector is a robust, rugged optical connector with a long worldwide record of service worldwide over nearly two decades. However, there are several factors that will greatly improve the effectiveness in using this optical connector.

CLEANLINESS IS CRITICAL. Operation of an optical connector required butt-coupling alignment of the two ends of the optical fibers, with little or no air gap in between. Fiber ends are pushed together with force of about 2 pounds, to minimize likelihood of air gaps. If dust or hair gets on the ends of the connectors, where the optical fibers exit, it may block the light passing between fibers, or may push ferrules apart, causing larger gaps between fibers. Therefore, it is important that the ends of the connectors are either kept clean, or are actively cleaned before each mating. The following steps will help assure cleanliness, and will help ensure proper signal integrity on all fiber lanes.

- Leave dust caps and dust covers on connectors and ports as much as possible,

- Ensure to never touch the end surfaces of the connectors, and

- Regularly use approved cleaning tools, such as the Fiber Optic Cleaning Tool shown below, preferably before each and every connector mating.
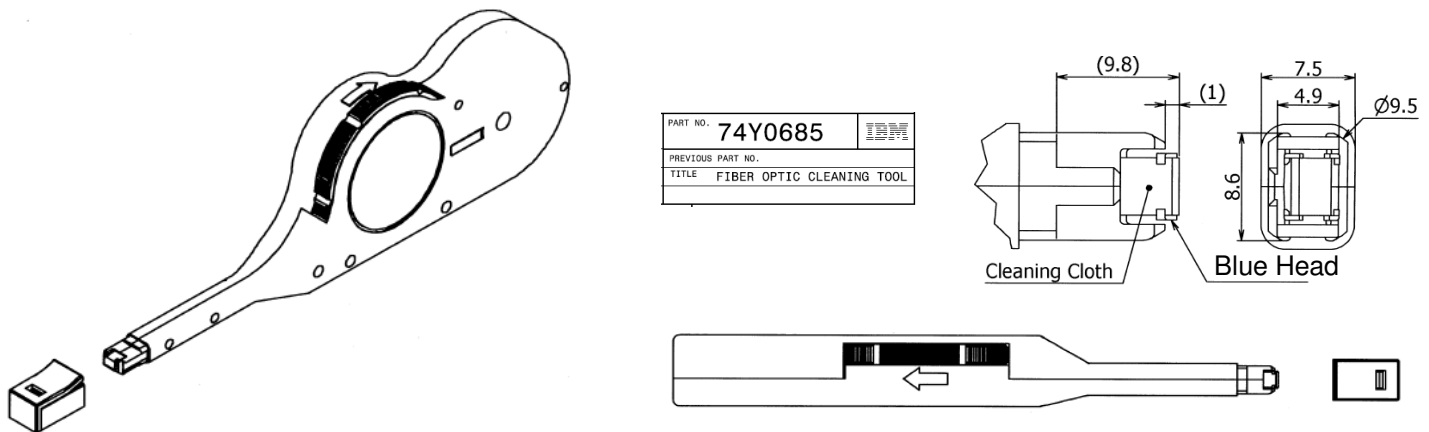
SOME FORCE IS REQUIRED. A relatively large amount of force – 20 to 28 lbs (9 to 13kg)– is required for each handle, to fully seat the connectors behind each handle, since each connector requires approximately 1.5 to 2.0 lbs of seating force. There is little danger of damaging any OBE pieces, if the initial insertion of each connector that will be described in STEP 24 has been properly executed.

LISTEN/FEEL FOR THE CLICKS. MTP optical connectors operate in two steps: 1. Initial actuation, where the connector is aligned with the L-Port receptacle and pushed partway in, and 2. Final actuation, where the latching fingers push the spring-loaded latching sleeve back, then ride over two latching nubs, and, when past the latching nubs, release the spring-loaded latching sleeve so that it can slide over the latching fingers. When this happens, there is an audible "click" as the latching sleeve hits its end of travel. If there is not a "click", the connector is not mated, the fiber ends are not pressed together, and the connector will not pass light well. Similarly, on removal, there is another "click", as the spring-loaded latching sleeve is pulled back, releasing the latching fingers, and they snap over the latching nubs.   When actuating all 6 connectors at once with an OBE handle, you should hear the "click"s as they mate correctly.

2.4 Concurrency

This procedure requires removal of all of the L-Link connectors in an Optical Backplane Enclosure, which will disable all L-Links within a SuperNode. This procedure will not affect the copper links that interconnect the hubs within a CEC drawer, and will not affect the D-Links.

L-Link Optical Backplane Removal may have significant impact on system performance, depending on network traffic patterns

2.5 L-Link Optical Backplane Weight

The weight of the L-Link Optical Backplane is 8 lbs (3.6kg).

2.6 Required SSRs and Roles

This service procedure contains steps to be performed by a customer system administrator and an IBM Systems Services Representative (SSR)
- The customer system administrator and SSR tasks are separately called out in the procedure.

2.7 Estimated Service Time

Removal of an OBE requires 2 to 5 minutes.

Installation of an OBE requires 10 to 15 minutes for cleaning the optical connectors on the OBE and the node, 10 minutes for inserting and actuating the handles and 5-15 minutes for assuring that all individual MTP optical connectors are fully seated and all links are up and operational.

2.8 P7IH Hand Tool Kit Required Tools

Installation of optical connectors requires a cleaning tool (IBM PN: 74Y0685, FIBER OPTICAL CLEANING TOOL), to clean the front surface of the optical connectors before mating.

Testing of L-Ports requires an L-Link Wrap Plug (IBM PN: 74Y0793, WRAP PLUG, 48 POS STRAIGHT, WITH SLEEVE, WITH BACK), to wrap an L-Port transmitter back to its own receiver. Testing of both end-ports of a link will be faster if 2 wrap plugs are used.

Optionally, a bright flashlight (6-LED or 9-LED or equivalent) may be useful to inspect adapter ports for debris or contamination. Also, optionally, a 5x eye loupe-style magnifier is useful for inspecting the OBE connector front surfaces for dust contamination. For eye safety, this is absolutely not to be used for inspecting the adapter ports in the CEC drawers while the system is turned on – the system's laser transmitters are rated Class 1M, Eye safe *without* magnifying optics.

2.9 Prerequisites for this Procedure

In order to perform this procedure, you will need the following information:
1) The location code of the FRU to be serviced
2) The cage location of the FRU to be serviced
3) The frame number and frame serial number of the FRU to be serviced

2.10   Overview of Procedure

This is an overview of the tasks to be performed. Read this overview but do not perform any of the tasks yet.

3 SERVICE PROCEDURE

STOP – Do not proceed unless you have read "Safety_Notices_G229-9054.pdf" which is available from InfoCenter; see Section 1.3

3.1 Assess Impact on Cluster Performance <= CUSTOMER TASK

STEP 1   The customer must assess whether the expected performance impact due to removing an Optical Backplane Enclosure (OBE) can be tolerated at this time.

This procedure requires removal of all of the L-Link connectors in an Optical Backplane Enclosure, which will disable all L-Links within a SuperNode. This procedure will not affect the copper links that interconnect the hubs within a CEC drawer, and will not affect the D-Links.
L-Link Optical Backplane Removal may have significant impact on system performance, depending on network traffic patterns

If the customer determines the procedure can be tolerated at this time, proceed to STEP 2.

If the customer determines the procedure cannot be tolerated at this time, the system will continue to operate on the indirect paths until the single link failure can be repaired.

3.2 Identify the frame, CEC, and L-Port<= SSR Task

For both L-Ports that are part of the problem link within the OBE, do the steps in section 3.2.

STEP 2   Access the HMC via the keyboard/display that resides in the management rack.

STEP 3   Place a checkmark in the Select column of the CEC Drawer connected to the L-Link Cable needing service.

STEP 4   *Click* the Tasks Menu button (right-arrow) and *select* **Operations -> LED Status -> Identify LED**. See Figure 3.
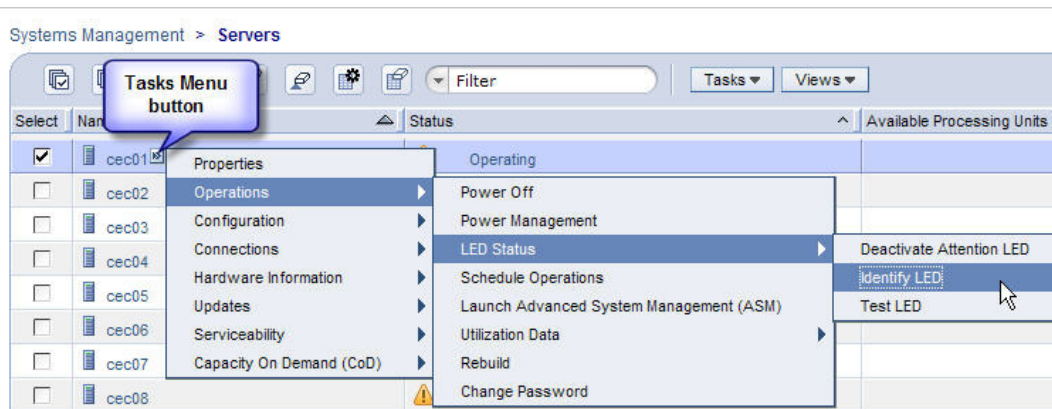
Figure 3 Identify LED Selection

STEP 5   In the window titled **Identify LED, Select Enclosure** *select* **System Unit, Model F2C** then *click* the **Activate LED** button (see Figure 4). This will cause the CEC ID LED to flash, as well as the UEPO Panel of the frame.
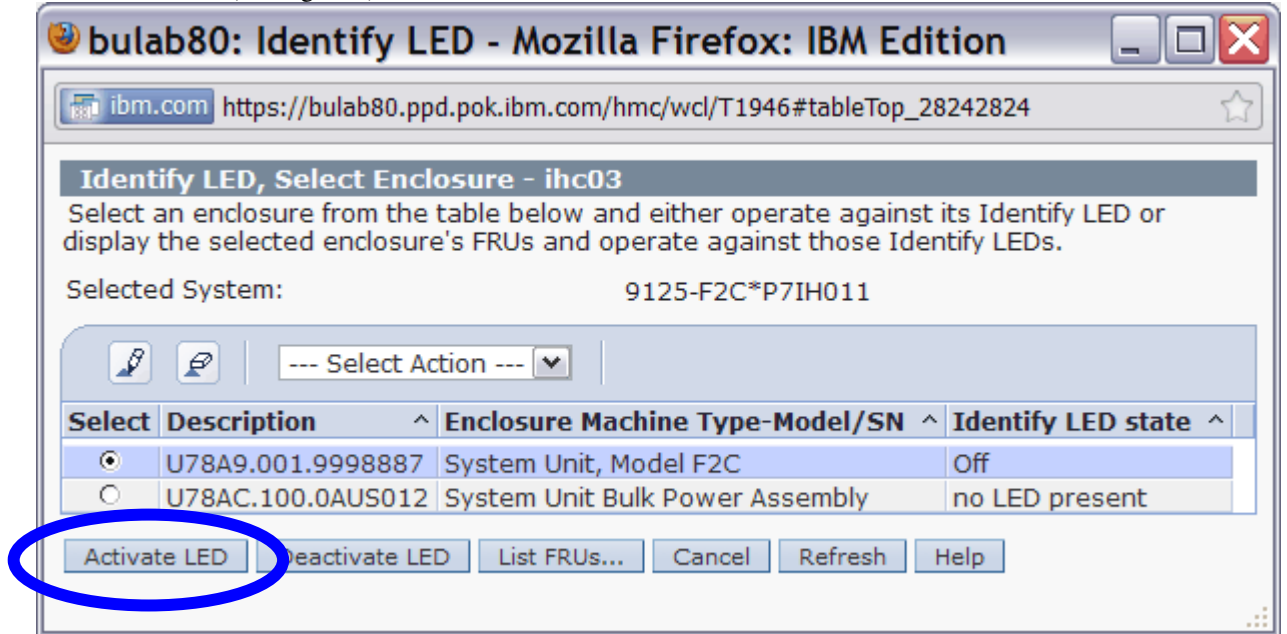
Figure 4 System Unit, Model F2C Selection – Activate LED

STEP 6   Locate the frame. The UEPO Identify Amber Led (see Figure 5) should be flashing. If the LEDs are not flashing, verify th e FRU via MTMS (machine type model serial number). The rack level MTMS is located on the face of the UEPO (see Figure 5). Open the front and rear door of the frame.
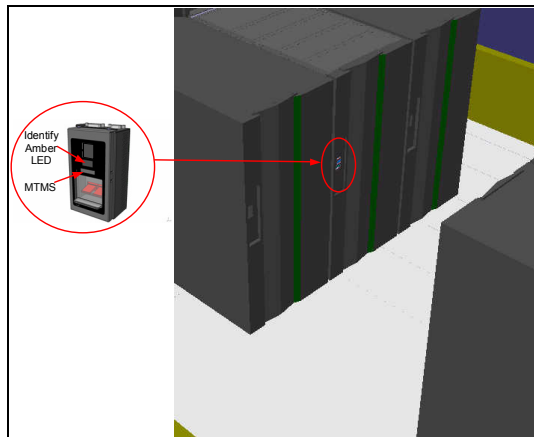
Figure 5 UEPO Identify LED location

STEP 7   Locate the CEC with the L-Link Cable requiring service. The CEC Drawer Identify LEDs (see Figure 6 and Figure 7) will be flashing. If the LEDs are not flashing, verify the FRU via MTMS (machine type model serial number).
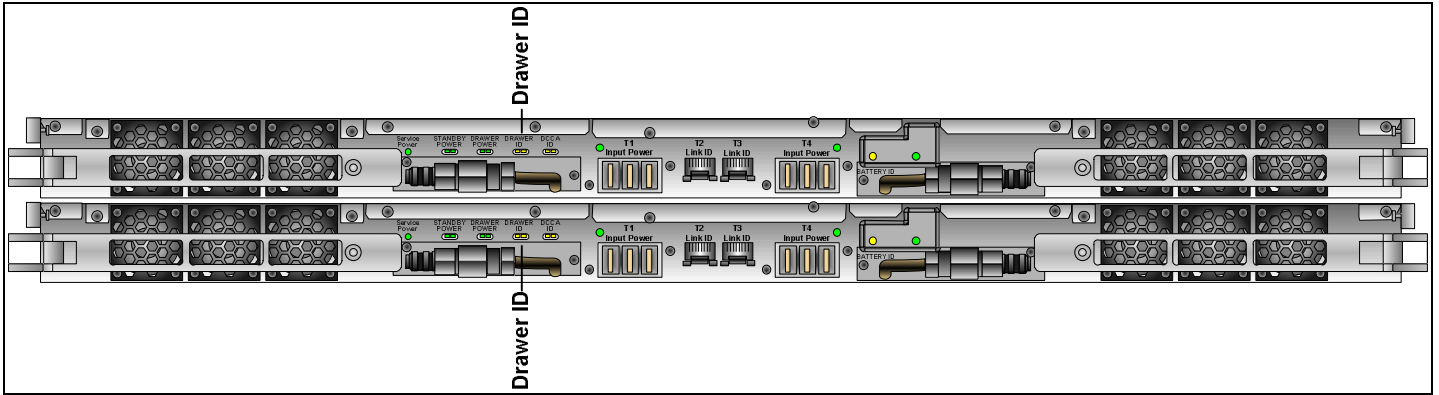
Figure 6 CEC Drawer ID – Front
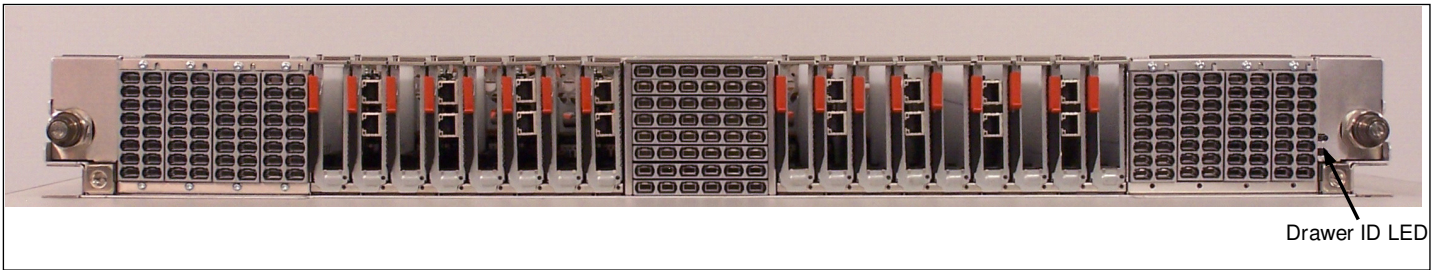
Figure 7 CEC Drawer ID - Rear

STEP 8   Verify that the serial number on the CEC Enclosure VPD label (CEC Node serial # label) matches the location code of the L-Link OBE / L-Link Port requiring service (see Figure 8). This is the 7 digit serial number in the location code, show in bold below for example:
U78A9.001.**312N003**-P1-C15-T1-L3
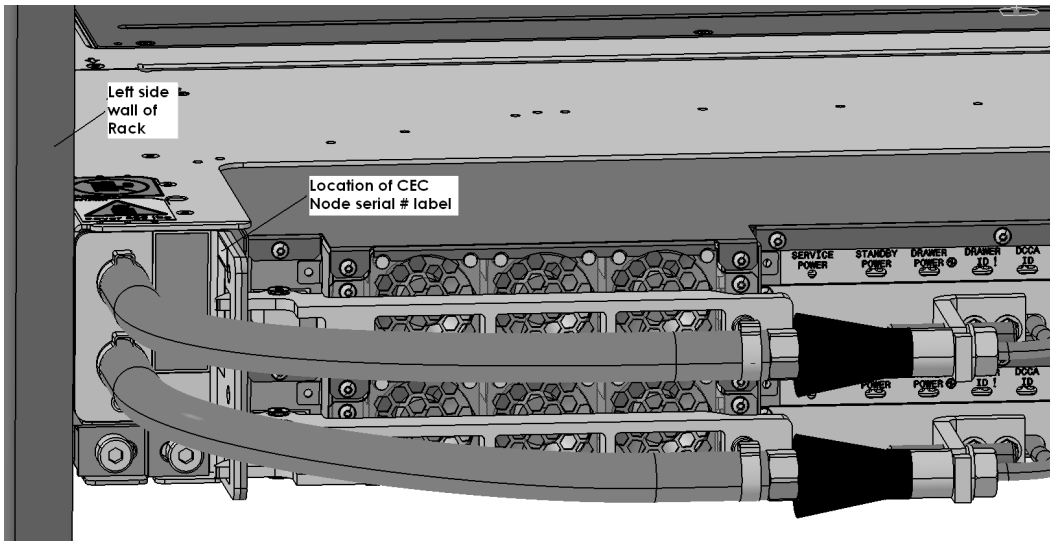
Figure 8 FRU Serial number location

3.3   Remove L-Link Optical Backplane Enclosure (OBE) <= SSR TASK

CAUTION: Sharp edges, corners, or joints nearby. (L006)

STEP 9   Ensure that all 8 spring clips holding the OBE to the CEC drawer are properly latched.

This is a correctly latched spring clip.
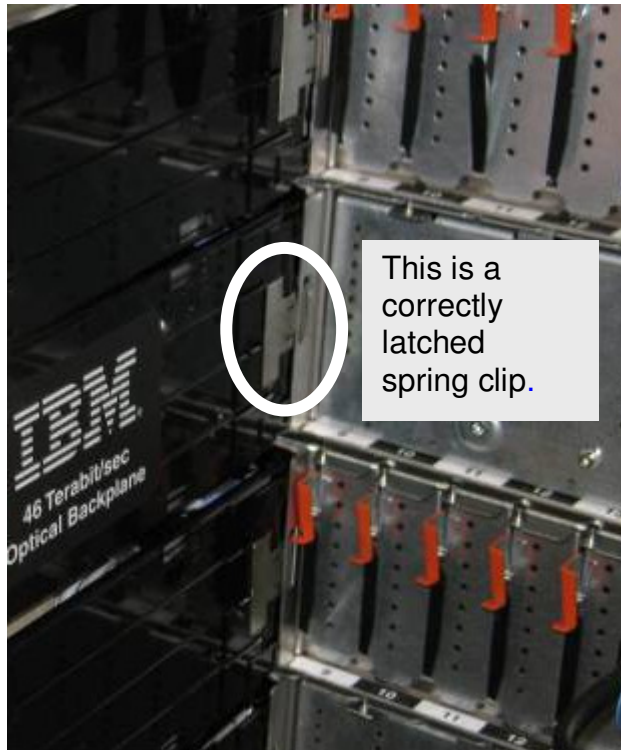
Figure 9 Correctly Latched Spring Clip

STEP 10   Pull out each of the 16 handles by ~10 mm to "unclick" each of the 12 MPO connectors per handle (see Figure 10 for how to hold the handles while pulling them out.).

CAUTION: Do not pull the handles more than 10 mm outward, to prevent over-bending of fibers.
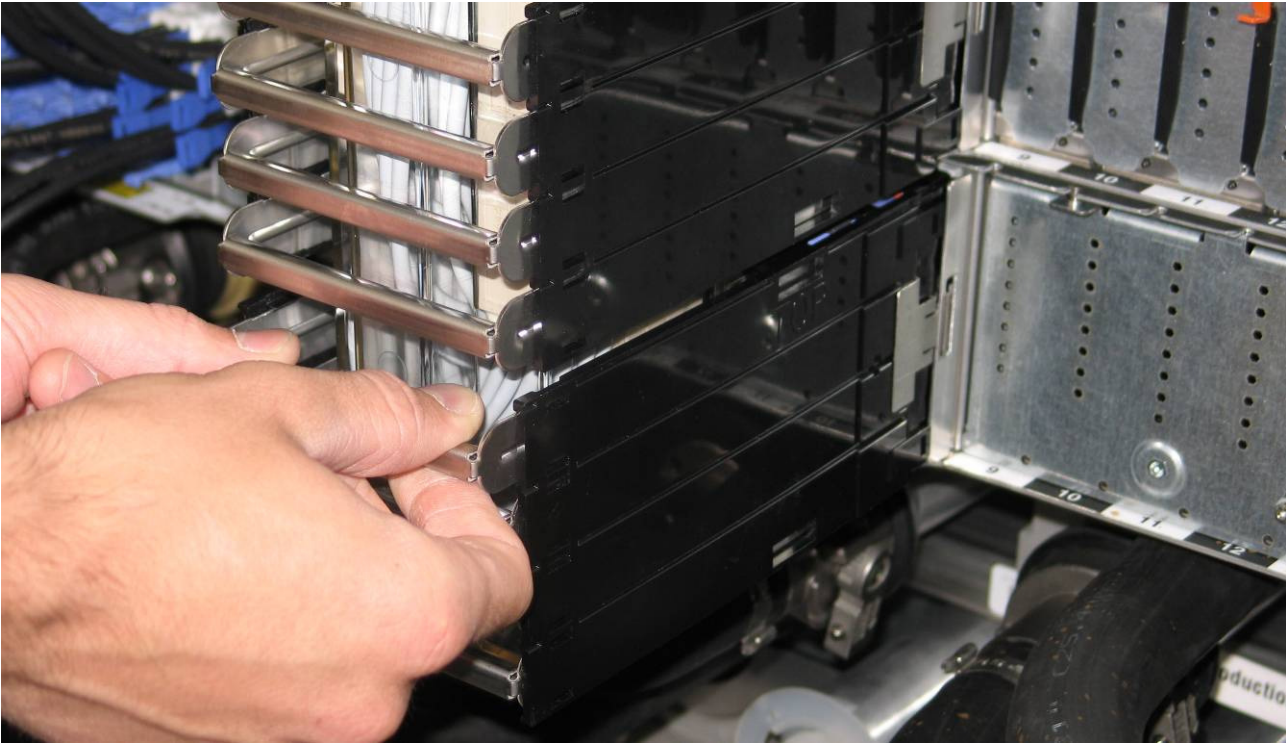
Figure 10 Pulling out handles

STEP 11   Working from the bottom Drawer of the SuperNode and moving upward, press in the 2 spring clips on either side of the optical backplane enclosures, to de-latch the OBE from the drawers, and pull the handle/sidewall assembly slightly outward to separate it from the CEC drawer (see **Figure 11**). Be sure to support the full OBE as the last two clips are removed (see **Figure 12**).
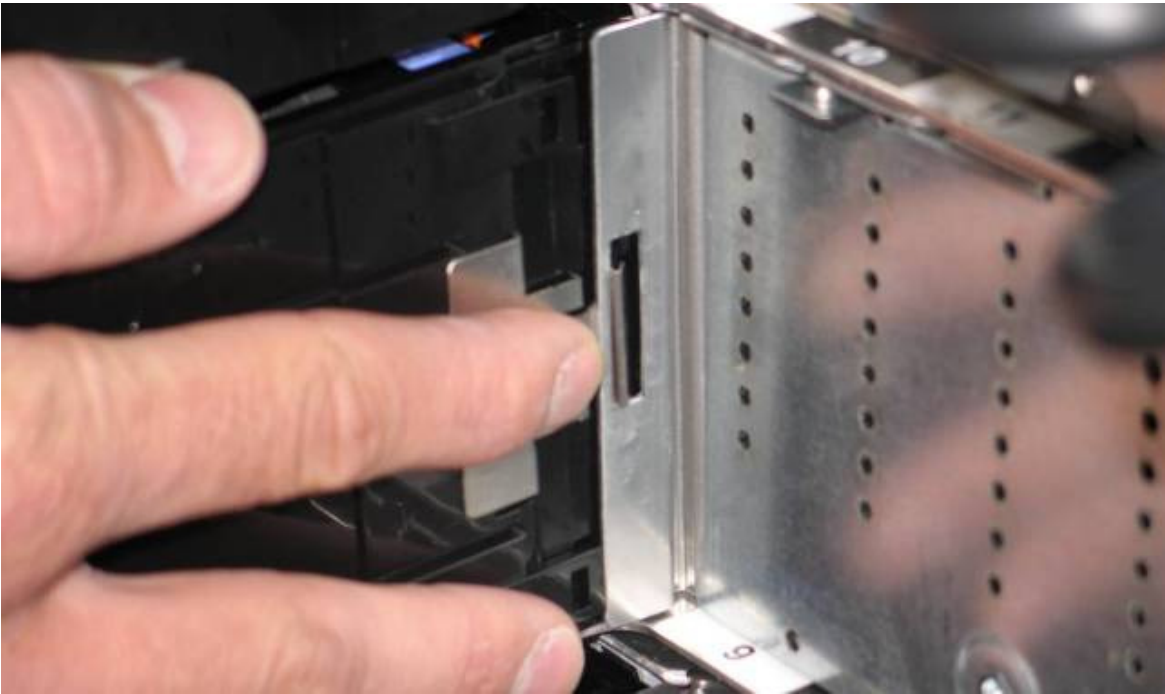
Figure 11 De-latch the OBE
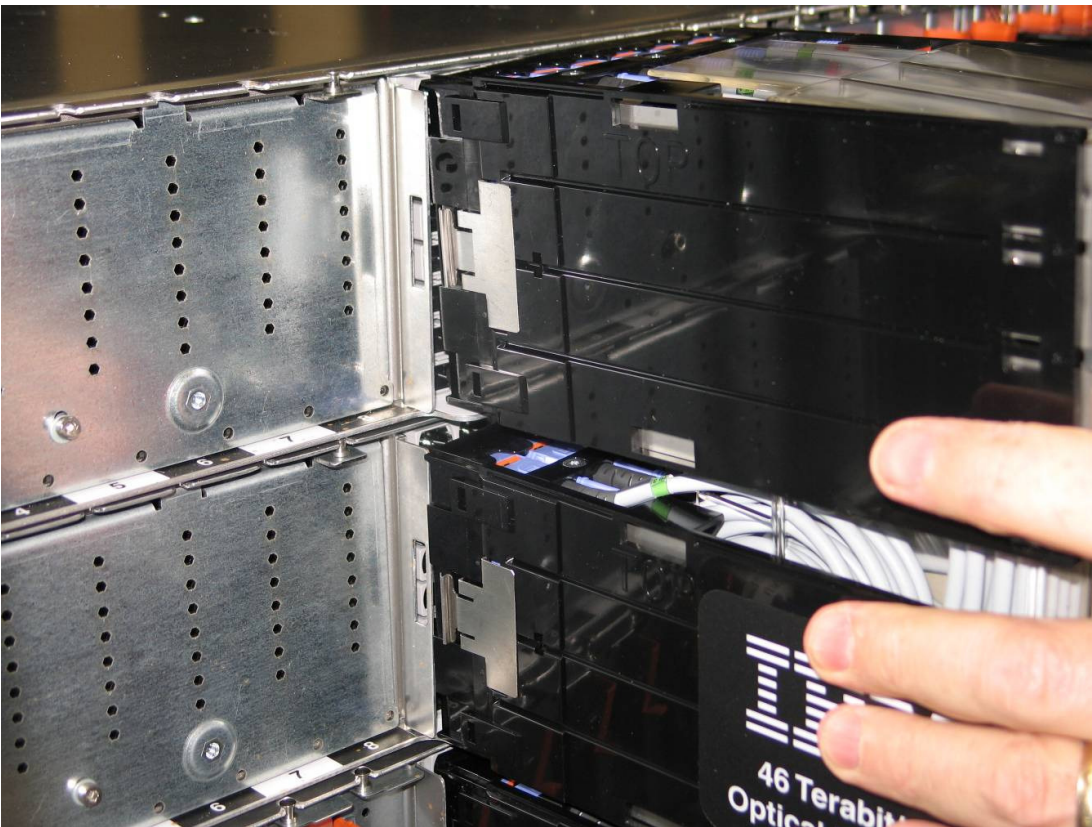
Figure 12 Support the OBE as the last two spring clips are removed.

STEP 12 Being sure to support the OBE from below, remove the optical backplane enclosure from the CEC drawers (see **Figure 13**).
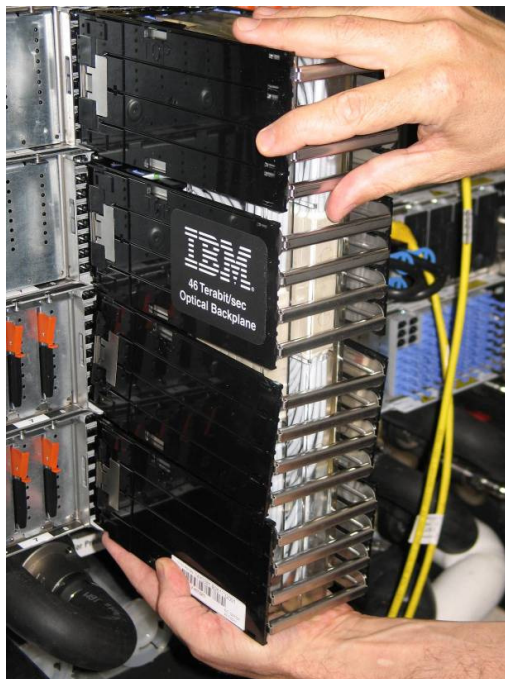
Figure 13 Support and remove OBE

STEP 13 Set the OBE down on a sturdy surface with the connector front surfaces facing upward,

CAUTION: Be sure not to touch the front surface of the connectors, to prevent contamination of the optical surfaces.

STEP 14 Put dust caps on all the connectors, to prevent contamination by dust or debris.

STEP 15 If a new OBE will not be installed immediately, insert a Removable dust plug (IBM PN: 74Y0628, Optical "D" Link Single Plug, Removable) on each of the 192 L-Link ports of the 4 CEC drawers to protect the front faces of the L-Port optical connectors (see Figure 14). Alternately, insert 32 1x6 Gang Dust covers (IBM PN: 45D9902) on the ports.
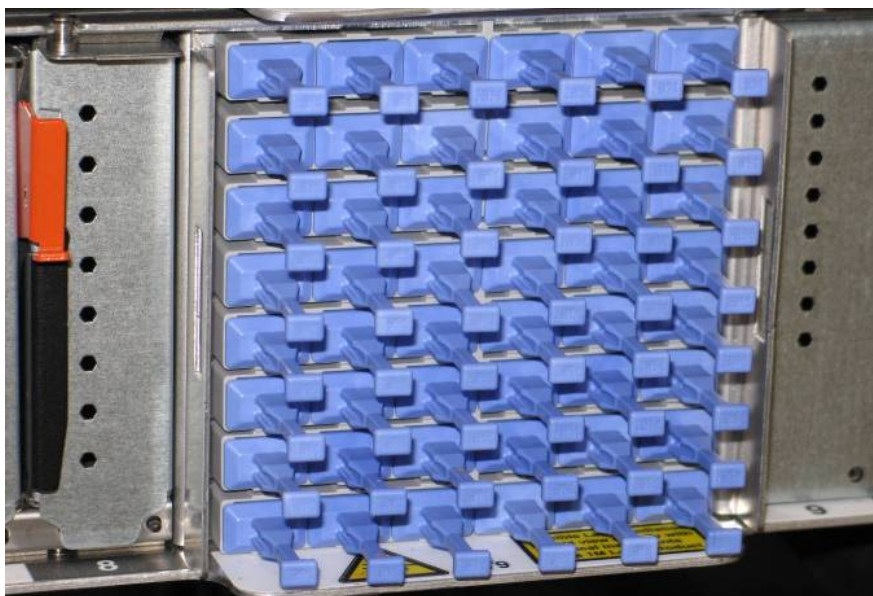
Figure 14 Removable Dust Plugs Inserted in L-Link Ports

3.4　　　**Run Wrap Plug Test (nwlinkdiag) <= Customer Task**

STEP 16　　Run the nwlinkdiag command on each of the two ports to determine if the ports can come up when wrapped back on themselves. The nwlinkdiag command is documented in the "p775_management_guide.pdf", in Section 3.1.17. Note that the syntax of the nwlinkdiag command is:

　　　　　　nwlinkdiag { -f <frame-id> -c cage-id -m <hub-module –l <link-id> } [-h]
　　　　　　nwlinkdiag { -s <supernode-id> -d <drawer-id> -m <hub-module –l <link-id> } [-h]

where the CEC drawer can be identified either by frame-id and cage-id, or by supernode-id and drawer-id (in the range 0-3). The module-id specifies the hub module within the CEC drawer (in the range 0-7). The link-id specifies the link to diagnose.

　　　　　　Link-id values 7-31 map to L-Links LR0-LR23
　　　　　　Link-id values 32-47 map to D-Links D0—D15.

Sample command, with successful output, of the nwlinkdiag command for
L-Link LR0 supernode 3 drawer 1 hub 4:
　　　　　　$ nwlinkdiag –s 3 –d 1 –m 4 –l 7

　　　　　　This link is operational.

Sample command, with failing output, for L-Link LR0, in supernode 49, drawer 0, hub 3:
　　　　　　$ nwlinkdiag –s 49 –d 0 –m 3 -l 7

　　　　　　FR007-CG12-SN049-DR0-HB3-LD15 LOCATION_CODE=U78A9.001.1122333-P1-T9
　　　　　　This link is not operational. If a cable is installed in the optical port,
　　　　　　remove the cable and install an optical wrap device instead, then re-issue
　　　　　　the nwlinkdiag command. If a wrap device is already installed, then the
　　　　　　problem lies behind the optical port.

3.5　　　**Evaluate Wrap Plug Test Results <= SSR Task**

STEP 17　　If the nwlinkdiag test fails on either of the L-Ports, notify next-level support that the L-Port in the CEC has failed, and the procedure is complete – no further steps are necessary (replacing the OBE will not help if the L-Port has failed).

If the nwlinkdiag test succeeds on both L-Ports, and if all 4 connector surfaces on the link (2 on the OBE, plus 2 in the L-Ports at either end) have all been verified to be clean, then the problem has been isolated to be in the OBE. Proceed to the next step

3.6   Clean and Install L-Link Optical Backplane Enclosure <= SSR TASK

It is important that connectors on both sides of a connection be cleaned well before they are plugged together. Even a few particles of dust can block light and cause poor signal integrity.

Note that the procedures below do not explicitly describe procedures for cleaning the optical connectors in the OBE, or the optical connector ports in the tailstock of the CEC drawers. Follow the cleaning procedures that are included in the case of the Fiber Optical Cleaning Tool.

If you are using this procedure to clean the existing backplane as opposed to replacing it, proceed to STEP 10. Otherwise, if you are replacing it, go to STEP 9:

STEP 18   Unpack the Optical Backplane Enclosure from the packaging (see Figure 15).

Figure 15   Unpacked OBE

STEP 19   Remove all of the 192 dust plugs from the fronts of the connectors (see Figure 16)

Optionally, use a white LED flashlight, shining into the fiber ends, and viewed at the opposite end of the connector, to verify that no optical fibers within the OBE are routed incorrectly, and that no fibers are broken. (Both of these errors are very rare.).

Inspect the fronts of the connectors to make sure that they are clean, dust-free, and undamaged. Clean any dust or debris from the front of the connectors using the optical connector cleaning tool (IBM PN: 74Y0685, Fiber Optic Cleaning Tool).
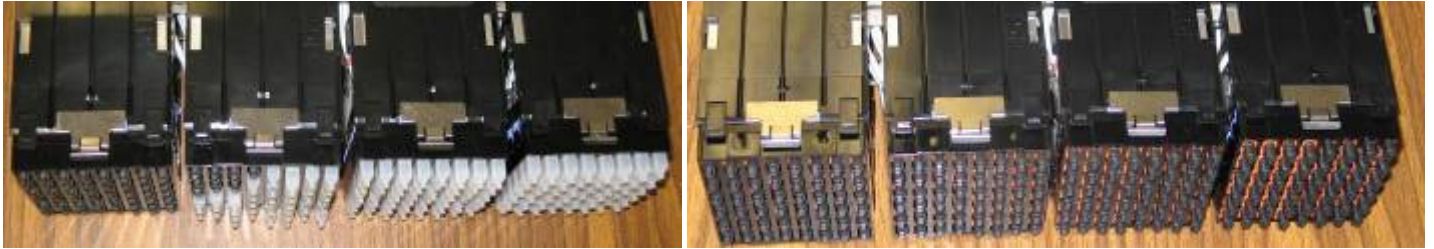
Figure 16   Remove Dust Covers

STEP 20   Clean all the optical connector ports on the tailstock of the 4 CEC drawers of the Supernode, using the same Fiber Optical Cleaning Tool.

STEP 21   Ensure that all of the MTP optical connectors are retracted within the 4 connector alignment blocks, by pulling the handles backward.

Figure 17 shows incorrect configuration – connector surfaces are susceptible to damage during plugging.

Figure 18 below shows correct configuration -- the connectors are all retracted and protected.
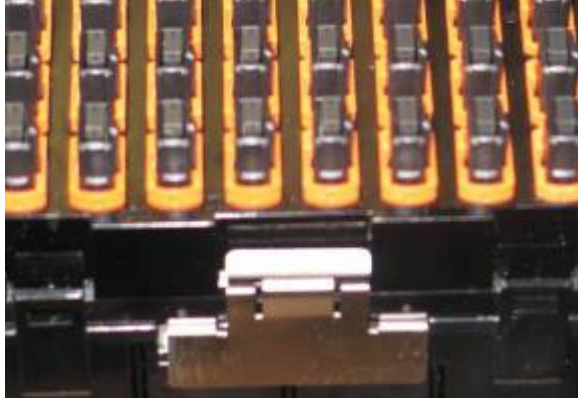

Figure 17 INCORRECT – MTP Connectors extended forward

Figure 18 CORRECT - MTP Connectors all retracted

STEP 22   Orient the OBE near the 4 CEC drawers, with the "TOP" label at the top (see Figure 19).

- NOTE: While orienting, assure that the front surfaces of the optical connectors don't come into contact with the protruding sheet metal ribs on the CEC drawers.

Figure 19 Orienting OBE

STEP 23   Latch the 8 spring clips to the 4 CEC drawers by pressing the sidewalls of the OBE in towards the CEC drawers. Repeat for the other 3 CEC drawers of the SuperNode, working from top to bottom (see Figure 20 and 21).

- During this step, the OBE must be supported manually. While not required, it may be easier to have a second person support the OBE while connectors are being inserted into the L-Ports.

- It may be helpful to push inward on the two spring clips, to help ensure that they latch properly into the protruding sidewalls of the CEC drawers.
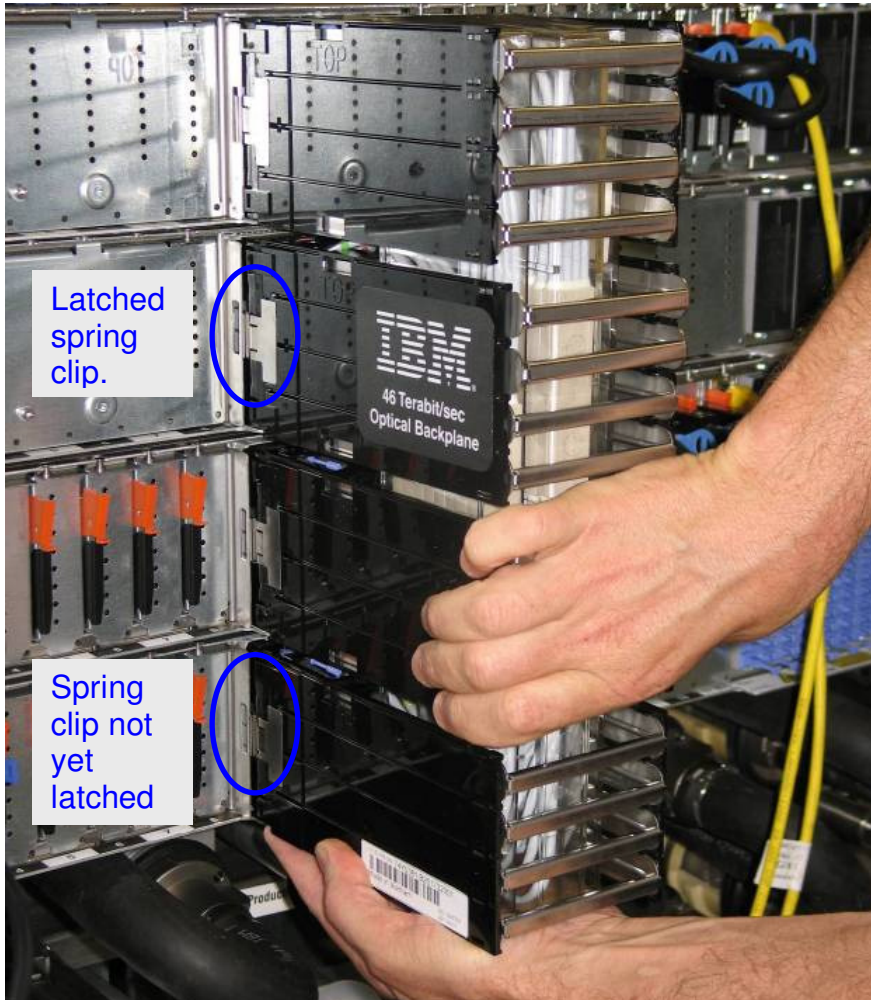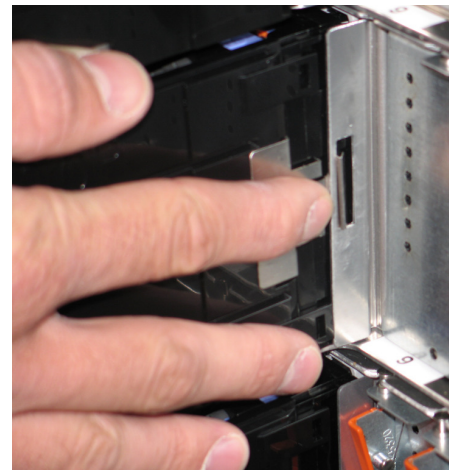

Figure 20   Spring clips latched and unlatched

Figure 21   Latching spring clip zoomed

STEP 24   Partially insert the top two rows of connectors in the top handle into the top two rows of L-Link ports in the top CEC drawer of the Supernode. Follow with the next two rows of connectors in the next handle, and the remaining handles (16 pairs of rows), so that all connectors are partially inserted into the L-Link Ports in the 4 CEC drawers.

STEP 25   Using the top handle, press in the connectors in the top two rows to fully seat them. This final seating is marked by an audible 'click' for each of the 12 MTP connectors. Each of the 16 handles is used to insert or extract 12 connectors, in 2 rows. Approximately 20 lbs of force will be required for each of the handles to fully actuate all 12 connectors during insertion (see Figure 22).

Figure 22 Final Seating of Connectors

STEP 26   Working from top to bottom, using the handles, press each connector row to fully seat them. As each is fully seated, it will 'click' into place (see Figure 17)

Note: A relatively large amount of force – between 20 and 28 lbs – is required for each handle, to fully seat the connectors behind each handle, since each connector requires approximately 1.5 to 2.0 lbs of seating force. There is little danger of damaging any OBE pieces, if the initial insertion of each connector describing in STEP 24 has been properly executed.
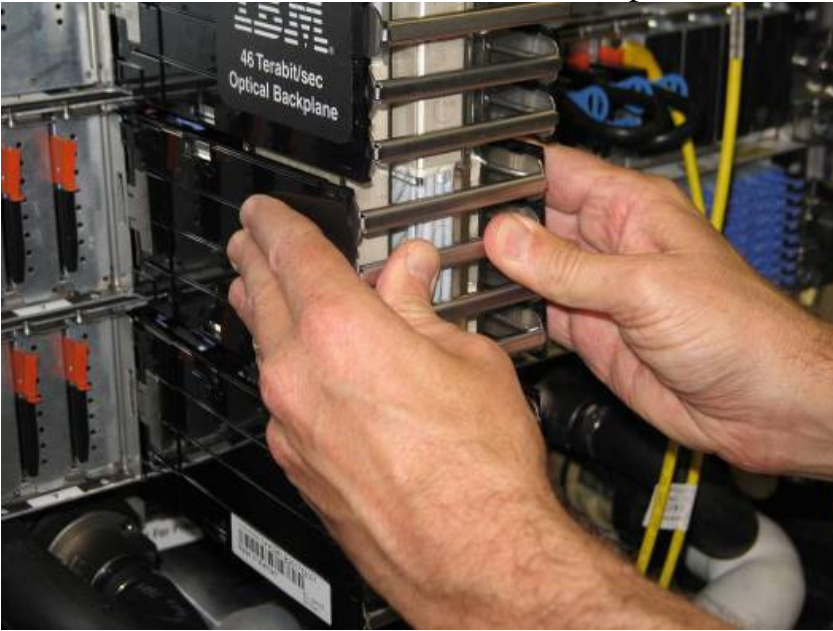
Figure 23 Pressing a handle in

STEP 27 Repeat the previous step – again press in each of the 16 handles with roughly 25 lbs. of force while rocking the handle upward and downward until no more clicks can be heard on any of the handles, to assure that all 12 MTP connectors per handle are fully actuated.

STEP 28 Run the lsnwlinkinfo command to ensure that all L-Links in the SuperNode are in the UP_OPERATIONAL status.

- • Note: It is necessary to run the lsnwlinkinfo on all 4 CEC drawers, to ensure that all links are operational.
- • Two possible calling formats are possible, either
  lsnwlinkinfo –f <frame> -c <cage> // <frame> as numbered, <cage> in frame, range 3 – 14
    or
  lsnwlinkinfo –s <supernode> -d <drawer> // <drawer> in SuperNode, range 0-3
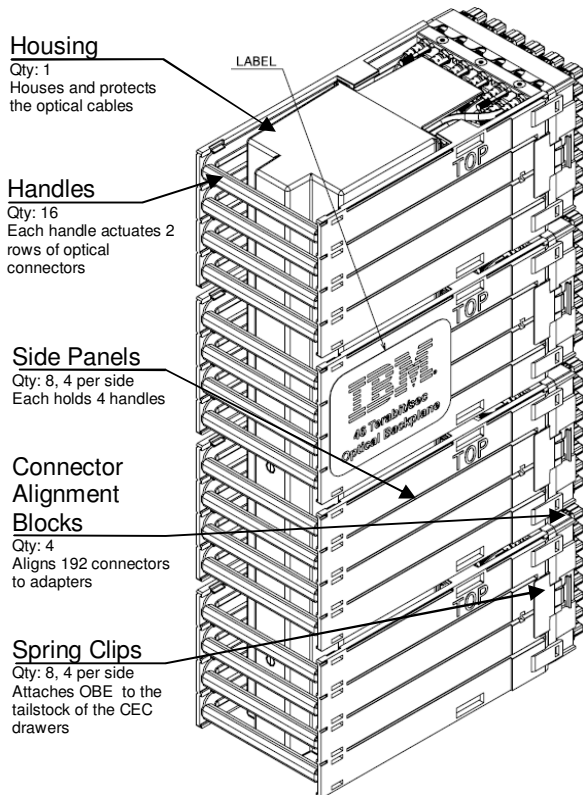- • Calling syntax for the lsnwlinkinfo command is described in Section 2.11

If any are not operational, try STEP 19 one more time and listen for any clicks indicating a connector was not seated, and repeat STEP 20. If any are still not operational, contact the next level of support.

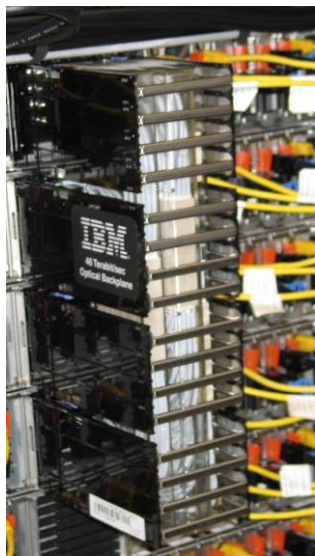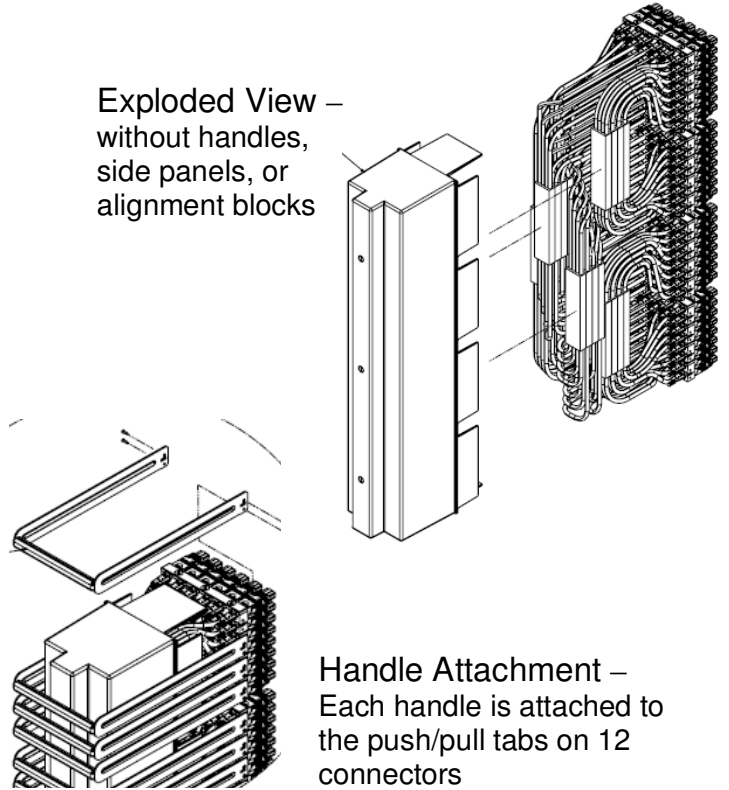## 3.7   End of Power 775 L-Link Optical Cables Service Procedure

4 APPENDIX A: BACKGROUND INFORMATION ON FAILURE ISOLATION OF L-LINKS

The L-Links that interconnect the 4 CEC drawers of a SuperNode are all enclosed within an enclosure, termed the Optical Backplane Enclosure (OBE). This OBE organizes and protects the L-Link optical shuffle cables that interconnect the 32 Hubs of the SuperNode.

Optical Backplane Enclosure (OBE)

Housing
Qty: 1
Houses and protects
the optical cables

LABEL

Handles
Qty: 16
Each handle actuates 2
rows of optical
connectors

Side Panels
Qty: 8, 4 per side
Each holds 4 handles

Connector
Alignment
Blocks
Qty: 4
Aligns 192 connectors
to adapters

Spring Clips
Qty: 8, 4 per side
Attaches OBE to the
tailstock of the CEC
drawers

Exploded View –
without handles,
side panels, or
alignment blocks

Handle Attachment –
Each handle is attached to
the push/pull tabs on 12
connectors

4.1   Notes on Diagnosis of L-Links

The information in Section 2.11 is useful for diagnosing a link failure.   This document, however, is written with the assumption that you have already diagnosed the failure and have determined that there is an L-Link cable needing cleaning or replacement. Section 3 describes how to clean or replace the cable.

The following procedure is used for isolating failures in L-Links, and for repairing them, if possible

4.1.1   Likely Root Causes for Failure in L-Links

If an L-Link is found to be nonfunctional, there are several potential root causes. If, for example, the L-Link from L-Port A (e.g., Hub 0, LR3 in CEC drawer 0 of the SN) to L-Port B (e.g., Hub 3, LR0, in CEC drawer 1 of SN 2) is found to be non-functional, then the possible root causes are:

1. Failure in some part of the transmitting L-Port (e.g., connector, optical fiber ribbon, internal lenses, optical transmitters, electrical wiring in the Hub module, or circuitry on the L-Port A Hub chip)

2. Dirt, dust, or other contamination between the cable's optical connector and the L-Port A internal optical connector

3. Breakage or failure of optical fibers or optical connectors within in the Optical Backplane Enclosure (OBE) or the OBE optical connectors (this is unlikely)

4. Dirt, dust, or other contamination between the cable's optical connector and the L-Port B internal optical connector

5. Failure in some part of transmitter L-Port B (e.g., connector, optical fiber ribbon, internal lenses, optical receivers, electrical wiring in the module, or receiver circuitry on the L-Port B Hub chip)

A failure in either the transmitting L-Port (root cause 1 above) or the receiving L-Port (root cause 5) is not field repairable – the full CEC drawer is the Field Replaceable Unit. The procedure below is designed to isolate whether the root cause of an L-Link failure results from failure in the transmitting or receiving CEC drawer (1 or 5), from contamination of the connector face(s) (2 or 4), or from breakage or failure of a fiber or a connector in the OBE (3).

In the case of OBE failure, the OBE must be replaced – the failed OBE must be factory re-worked. In the case of contaminated connector(s), the link can generally be repaired by cleaning the connector(s).

4.1.2   Failure Isolation and Repair for L-Links

The following procedure is used for isolating failures in L-Links, and for repairing them, if possible

1. Note which receiving port (L-Port B) is not receiving good signals, and which transmitting port (L-Port A) is connected to it through the OBE, using the mapping described in the following section. Use the following steps to determine which L-Ports are affected.

    a. Record the System Reference Code (SRC) or refcode or alert_id of the failure notification.

    b. Record the problem description or reason

    c. Record the FRU list – particularly the HFI_CAB (cable connector location code) and CBLCONT (location code for the other end of the cable) FRUs.

    d. Before proceeding, follow the Fail-in-place (FIP) procedures to determine if action is required, since no action is required if FIP resources are still available.

    e. If action is required, Log onto the EMS and run /usr/bin/nwlinkdiag on the affected L-Link to specifically diagnose any problems with the link before proceeding further.

2. Before proceeding further, ensure that the L-Link optical connectors are fully seated.

   a. Pull out on the actuator handle then press in hard on the actuator handle (with between 20 and 30 lbs force), while rocking the handle left-and-right and up-and-down, to see if the connectors can be fully 'clicked' into place.

   b. Repeat on the other end of the L-Link.

   c. Repeat the diagnostic procedure in Step 1 above, to ensure that the problem has not been remedied, before proceeding further.

      • Note: Since each handle must simultaneously actuate 12 MTP connectors inside the OBE, it is possible, if an L-Link is not functioning, that one or more of the L-Link connectors inside the OBE is not fully clicked into place. Many L-Link problems can be remedied by assuring correct seating of all the connectors.

Note that the following procedures require removing the entire L-Link optical backplane, which will take down all of the L-Links in the SuperNode. It is not possible to remove the connectors for one L-Link without affecting the rest of the SuperNode. Verify that the remaining L-Links in the SuperNode are not in use before proceeding further.

3. Remove the OBE.

4. On the L-Port A and L-Port B ports, install 48-position Straight Wrap Plugs (IBM PN: 74Y0793; WRAP PLUG, 48 POSITION, STRAIGHT, WITH SLEEVE, WITH BACK). If only one 48-position Straight Wrap Plug is available, Steps 4-5 can be executed sequentially on each L-Port.

5. Run the lsnwlinkinfo command on both ports to determine if the ports can come up when wrapped back on themselves.

      • Note: Following is an overview of the lsnwlinkinfo command. The lsnwlinkinfo command is more fully documented in the specification "High performance clustering using the 9125-F2C",

      • The command syntax is:
        lsnwlinkinfo [{ -f <frame> | --frame <frame> } [{ -c <cage> | --cage <cage> } [{ -m <hubmodule> | -hub_module <hubmodule> }]] | { -s <supernode> | --supernode <supernode> } [{ -d <drawer> | -drawer <drawer> } [{ -m <hubmodule> | -hub_module <hubmodule> }]]] [-p | --page] [-h | -help]

      • Sample output of 'lsnwlinkinfo' command for supernode '0', drawer'0' and hub'0'

```
$ ./lsnwlinkinfo –supernode 0 –drawer 0 –hub_module 0
FR001-CG03-SN000-DR0-HB0-LL0 Status: UP_OPERATIONAL
   ExpNbr: FR001-CG03-SN000-DR0-HB3-LL0 ActualNbr: FR001-CG01-SN000-DR0-HB3-LL0
FR001-CG03-SN000-DR0-HB0-LL1 Status: UP_OPERATIONAL
   ExpNbr: FR001-CG03-SN000-DR0-HB5-LL0 ActualNbr: FR001-CG01-SN000-DR0-HB5-LL
:
:
FR001-CG03-SN000-DR0-HB0-LR0 Status: DOWN_NBRPOWEROFF
   ExpNbr: : FR001-CG02-SN000-DR1-HB1-LR0 ActualNbr: FR001-CG02-SN000-DR1-HB1-Lxx
FR001-CG03-SN000-DR0-HB0-LR1 Status: DOWN_MISWIRED
   ExpNbr: : FR001-CG02-SN000-DR1-HB1-LR0 ActualNbr: FR001-CG03-SN000-DR0-HB0-LR1
FR001-CG03-SN000-DR0-HB0-LR2 Status: DOWN_NBRPOWEROFF
   ExpNbr: : FR001-CG03-SN000-DR2-HB1-LR0 ActualNbr: FR001-CG03-SN000-DR2-HB1-LR0
:
FR001-CG03-SN000-DR0-HB0-D0 Status: DOWN_NBRNOTINSTALLED
   ExpNbr: : FR001-CG07-SN001-DR0-HB0-D0 ActualNbr: FR001-CG03-SN000-DR0-HB0-Lxx
:
FR001-CG03-SN000-DR0-HB0-D15 Status: UP_OPERATIONAL
   ExpNbr: : FR001-CG07-SN001-DR0-HB3-D0 ActualNbr: FR001-CG03-SN000-DR2-HB3-D0
```

      • A successful test will return either of the following status indications:
        DOWN_MISWIRED, UP_OPERATIONAL, UP_9, or UP_8.

- Other status indications, such as DOWN_FAULTY or DOWN_NBRNOTINSTALLED indicate an unsuccessful test.

- In the sample output above, the L-Port under test, LR1, has a passing status. The DOWN_MISWIRED status indicates that the receiver for the port is successfully connected to a transmitter for a part that is different than the port configured in the system topology file, which is what would be expected for a wrap test. The other L-Ports indicate status of DOWN_NBRPOWEROFF, since there is no optical power coming from their NBR neighbor ports, since the other L-Link connections in the OBE are removed. The LL electrical ports inside the CEC drawer, and the active D-Ports between SuperNodes, indicate status of UP_OPERATIONAL. D-Links that aren't in use, and don't have Neighbor ports in the cluster's topology, indicate status of DOWN_NBRNOTINSTALLED.

6. If the lsnwlinkinfo command indicates L-Port failure on either L-Port A or L-Port B (i.e., L-Port status of either DOWN_FAULTY or DOWN_NBRPOWEROFF) , then the link cannot be repaired without replacing the corresponding CEC drawer. If the link initialization tests succeed on both L-Ports, then the L-Ports in both CEC drawers are working -- proceed to the following step.

7. Clean all OBE connectors and L-Port receptacle connectors using the Fiber Optic Cleaning Tool (PN: 74Y0685).

8. Perform Wrap test – see STEP9 of Section 3.3.

9. Run the lsnwlinkinfo link initialization test to determine if the ports can correctly come up with the OBE installed.

10. If the lsnwlinkinfo link initialization test fails, remove the OBE, install a replacement OBE and repeat from Step 9. If the test succeeds, the link is repaired.

Summary: If the error is determined to be due to a failure in the L-Port A or L-Port B of the CEC drawers, and the failure can not be handled using Fail-in-Place resources, the CEC drawer must be either replaced or repaired. Otherwise, cleaning of the connectors or replacement of the OBE should repair the failure.

5 END OF DOCUMENT