

# **GTD-5<sup>®</sup> EAX**

**Solid State Line Cards  
Handling, Testing, Grounding,  
and Maintenance Procedures**



**AG Communication Systems**

A Joint Venture of AT&T and GTE

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1. GENERAL

1.01 This practice provides the procedures for proper handling, off-line testing, grounding, and maintenance of AG Communication Systems Corporation (AGCS) solid state line cards.

1.02 Throughout this document, AGCS and GTE Practices are referenced to provide additional information. All of these practices are contained in CH-110, Central Office Equipment Installation Handbook.

2. EQUIPMENT INSTALLATION

2.01 All installation personnel must wear wrist straps that are connected to the unpainted card guide side brackets or the banana-type grounding receptacle on the frame fuse panel when performing the following tasks:

- (a) Moving/positioning grounded or ungrounded frames (if frames are equipped with Printed Circuit Board Assemblies (PCBA's) or other equipment).
- (b) Leveling/junctioning grounded or ungrounded frames (if frames are equipped with PCBA's or other equipment).
- (c) Mounting rear cable management brackets.
- (d) Inserting pin alignment strips.
- (e) Checking/torquing backplane bus bar screws.
- (f) Running and plugging cables when contact with cards or backplanes is possible.
- (g) Tapping power feeders.

(h) Buzzing cables that are connected on the equipment side.

(i) Performing ground isolation verification activities.

(j) Performing medications on backplanes.

NOTE: Do not connect wrist straps to painted surfaces. Paint insulates the clip from ground.

2.02 Before the T&R (Tip and Ring) cables are attached to backplanes, ensure that the shorting cards (FB-16228-A) have been unseated.

2.03 For additional information on electrostatic discharge, refer to Installation Procedure (IP) 2000 in Section 2 of CH-224-001, GTD-5' EAX Installation Handbook.

3. POWER AND GROUNDING

3.01 The GTD-5 EAX equipment frame power and grounding should be tapped prior to any activity dealing with any circuitry within the frames.

3.02 The GTD-5 EAX system uses a number of ground paths within the switch. The Line Protection Ground (LPG) system is the main focus of this practice since it is used in conjunction with the FB-16248-A SLIC Line Circuit Card (SLCC). An LPG system provides a low-impedance ground for anticipated lightning strikes on line circuits associated with outside cables. GTE Practice 795-805-071, Central Office Grounding Systems - Engineering Applications, provides complete information on central office grounding systems, including the LPG. Additional grounding information can also be found in JD-XXXXX-EPDG.

3.03 It is essential that the LPG system be connected in its entirety from the line frame card files to the Master Ground Bar (MGB) and/or the Floor Ground Bar (FGB) prior to applying power to the GTD-5 EAX

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solid state line cards. This ground provides a path for all damaging potentials on the T&R connections that might otherwise damage the line card components.

3.04 The LPG system cabling is divided into the following three leads:

- (a) Lead 61, which comes from the FGB down the end aisle, is a 2/0 cable.
- (b) Lead 62, which taps off lead 61 and runs down each lineup, is a 1/0 cable.
- (c) Leads 63 (two per frame), which come out of each lineup frame and tap onto lead 62, are two green No. 10 or 12 AWG cables. These two leads are identified by factory-attached tags labeled PGA and PGB.

3.05 For additional information on the LPG system, refer to AGCS Practice 224-100-100, GTD-5 EAX Power and Alarm Equipment, and Practice 237-224-214, GTD-5 EAX Engineering and Installation Ground Isolation.

3.06 For information on cabling the LPG system, including ground zone requirements and LPG frame feeders, refer to AGCS Practice 256-224-216, GTD-5 EAX Cabling Methods.

3.07 Prior to testing the FB-16248-A card, the following items should be checked:

- (a) The Frame Ground (FG) and LPG cables terminate on the FGB and are connected to the proper zone of the FGB. Also, all other grounds within the GTD-5 EAX complex should be terminated at their respective assigned locations. Refer to JD-XXXXX-EPDG.
- (b) The Ground Return (+MG), Low Voltage Ground (LVG), Filter Ground (MGF), Facility Test (FT)/FG, and LPG cabling systems must be

kept physically and electrically separate within the GTD-5 EAX area.

- (c) Lead 62 (LPG) cables are run in their own zone on the upper level of the front row of goal posts.
- (d) Lead 63 (LPG) feeders are run, secured, and terminated within the frames at the factory.
- (e) Bending radii constraints apply to all cables run as grounding conductors including LPG. Refer to IP 6050 (Table 2) in CH-224-001, GTD-5 EAX Installation Handbook.
- (f) The LPG leads may be tapped with an "H" or a "C" tap.
- (g) Lead 63 (LPG), LVG, battery, and ground leads within a line frame should not be bundled with any other wiring in the frame.

3.08 For additional information on ground isolation and power and grounding, refer to IP's 5010, 6050, and 6060 in Sections 5 and 6 of CH-224-001, GTD-5 EAX Installation Handbook, or Practices 256-224-2 16 and 795-805-071.

3.09 If the FB-16248-A card is to be installed in an existing queen-size line frame that does not contain LPG wiring, the frame must first be upgraded for LPG using modification kit EC-19080-A, the applicable Circuit Conversion (CC) document, and the appropriate On-Line Implementation Procedure (OLIP). Table 1 lists queen-size line frame part numbers with and without LPG.

#### 4. HANDLING CARDS

##### Static Discharge Control

4.01 Installation and maintenance personnel must wear wrist straps that are properly grounded when performing the following tasks:

Table 1. Queen-Size Line Frame Part Numbers With and Without LPG Wiring.

FRAME	PART NO. WITHOUT LPG	PART NO. WITH LPG	CIRCUIT CONVERSION (CC) DOCUMENT
Analog Line Unit Frame (ALUF)	EC-I 6230-A EC-I 6230-B EC- 16378-A EC-I 6378-B	EC-I 6230-C EC-I 6230-D EC-I 6378-C EC-I 6378-D	CC-16230-CVC CC-I 6230-DVC CC- 16378-CVC CC-I 6378-DVC
Expanded Line Master Frame (ELMF)	EC- I 6468-A EC-I 6468-C EC- 16468-B EC-I 6468-D EC-I 6900-A EC-I 6900-C EC-I 6900-B EC-I 6900-D	EC- I 6468-E EC-I 6468-F EC- 16468-G EC-I 6468-H EC-I 6900-E EC-I 6900-F EC-I 6900-G EC-I 6900-H	CC- 16468-VC 1 CC- 16468-VC2 CC- I 6468-VC3 CC- 16468-VC4 CC- I 6900-VC 1 CC- I 6900-VC2 CC- 16900-VC3 CC-I 6900-VC4
Expanded Line Slave Frame 8: 1 (ESEF)	EC-I 6470-A EC-I 6470-B EC- 16909-A EC-I 6909-B	EC- I 6470-C EC- 16470-D EC- 16909-C EC- 16909-D	CC- 16470-VC 1 CC- 16470-VC2 CC- 16909-VC 1 CC- I 6909-VC2
Expanded Line Slave Frame 6: 1 (ESSF)	EC- I 6469-A EC-I 6469-B EC- 16469-D EC-I 6469-E EC-16914-A EC-16914-B EC-16914-D EC-16914-E	EC- 16469-F EC- I 6469-G EC- I 6469-J EC- 16469-K EC-16914-F EC-16914-G EC-16914-J EC-16914-K	CC- 16469-VC 1 CC-I 6469-VC2 CC- 16469-VC3 CC- I 6469-VC4 CC- 169 14-VC 1 CC-16914-VC2 CC-I 69 14-VC3 CC- 169 14-VC4

- |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>(a) Removing PCBA's from equipment frames and inserting them in antistatic bags.</p> <p>(b) Removing PCBA's from antistatic bags and inserting them in equipment frames.</p> <p>(c) Running or plugging cables when contact with PCBA's is possible.</p> <p>(d) Performing modification activities.</p> | <p>(b) PCBA's must not be placed component side down except when supported by the edges in an approved fixture.</p> <p>(c) PCBA's that are not in boxes must not be stacked on top of each other even if they are in antistatic bags.</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

4.02 The following guidelines must also be followed when handling PCBA's:

- (a) All PCBA's must be placed in antistatic bags when they are not in

4.03 For additional information on controlling static discharge, refer to IP 2000 in Section 2 of CH-224-001, GTD-5 EAX Installation Handbook.

Repair and Modification of PCBA's

4.04 For information on the repair and modification of PCBA's, refer to the following documents:

- (a) IP 2000 in Section 2 of CH-224-001, GTD-5 EAX Installation Handbook.
- (b) Section 10, Modification and Wire Wrapping Procedures, of CH-224-001.
- (c) GTE Practice 200-9 1 O-200, Printed Circuit Cards - Maintenance and Modifications, which also includes information on handling, storing, transporting, repairing, and troubleshooting electrostatic sensitive cards.

5. POWERING-UP LINE EQUIPMENT FRAMES

5.01 To power-up the line equipment frames, perform the following Installation Test Procedures (ITP's) found in Section 1 of CH-224-002, GTD-5 EAX Installation Test Handbook:

- (a) ITP 0591, Analog Line Unit Frame (ALUF).
- (b) ITP 0608, Expanded Line Slave Frame (ESEF).
- (c) ITP 0609, Expanded Line Unit Master Frame (ELMF).
- (d) ITP 0610, Expanded Line Slave Frame (ESSF).
- (e) ITP 0613, Standard Width Line Unit Master Frame 4: 1 (SLMF), EC-191 24.
- (f) ITP 0614, Standard Width Line Unit Frame 6: 1 (SSSF), EC-191 25.
- (g) ITP 0615, Standard Width Line Unit Frame 8: 1 (SSEF), EC-19126.

(h) ITP 0617, Standard Width Line Unit Master Frame 4: 1 (SLMF), EC-26324.

(i) ITP 0618, Standard Width Line Unit Frame 6: 1 (SSSF), EC-26325.

(j) ITP 0619, Standard Width Line Unit Frame 8: 1 (SSEF), EC-26326.

5.02 Figures 1 through 3 show ITP's 0617, 0618, and 0619, respectively.

6. DIAGNOSING LINE CIRCUITS

6.01 To diagnose GTD-5 EAX line circuits, perform ITP 7128 found in Section 3 of CH-224-002, GTD-5 EAX Installation Test Handbook. For additional information on diagnosing line circuits, refer to Part 6, FZ-7XXXXX-UTL, Line and Trunk Testing, of the GTD-5 EAX User's Guide. To schedule and define maintenance routines, refer to Part 14, FZ-7XXXXX-USA, Miscellaneous, and Part 15, FZ-7XXXXX-URP, Repair Manual, of the GTD-5 EAX User's Guide.

6.02 If several line card failures occur, check test apparatus to ensure that it is working properly.

6.03 If Outside Plant (OSP) is not attached, Compensation Network Verify Test (CNVT) failures may occur. These should be ignored.

6.04 The FB-16248-A SLCC line card is a replacement for the FB-1622 1 Standard Service Line Card (STLC). The Standard Width Line Frame (SWLF) is identified as a Standard Sized Line - Facility Interface Unit (SL-FIU). It is equivalent to the Analog Line - Facility Interface Unit (AL-FIU) and Expanded Line - Facility Line Unit (EL-FIU) concepts used on previous line frame designs. Prior to System Version Release (SVR) 1.6.3.2, system software does not support FIU type SLF. Therefore, the FIU type must be set to ELF for new SWLF's. Also, when an SLCC card is used in a switch that is below SVR 1.6.2.1, EB-2, DTF-3A, the make card command must use STLC as the

card type. This will allow all circuits to be correctly assigned.

## System Verification Test Plan

### 7. OTHER TESTS

#### Call Processing Tests

7.01 To verify the proper functioning of the various types of calls, perform the ITP's found in Section 9 of CH-224-002, Installation Test Handbook.

#### Multiple Call Turnover Criteria Tests

7.02 To verify the application of any Traffic Load Simulator (TLS), perform the ITP's found in Section 10 of CH-224-002, GTD-5 EAX Installation Test Handbook.

7.03 To verify that the GTD-5 EAX system is ready to be turned over to the customer, perform the ITP's found in Section 11 of CH-224-002, GTD-5 EAX Installation Test Handbook.

7.04 The overall performance of the solid state line card protection is based upon an office that meets the grounding objectives set forth in GTE Practice 795-805-071. A grounding audit using that practice as well as local company procedures should be conducted prior to the powering-up of new line frames.

### 8. REFERENCES

8.01 The following documents supplement or complement the information provided in this practice:

DOCUMENT	NUMBER	DESCRIPTION
AGCS Practices:	224-100-100	GTD-5 EAX Power and Alarm Equipment
	237-224-214	GTD-5 EAX Engineering and Installation Ground Isolation
	256-224-216	GTD-5 EAX Cabling Methods
GTE Practices:	795-805-071	Central Office Grounding Systems - Engineering Applications
AGCS Handbooks:	CH-224-001	GTD.5 EAX Installation Handbook
	CH-224-002	GTD-5 EAX Installation Test Handbook
GTE Handbooks:	CH-110	Central Office Equipment Installation Handbook
User's Guide:	FZ-7XXXXX-UTL	Part 6, Line and Trunk Testing
	FZ-7XXXXX-USA	Part 14, Miscellaneous
	FZ-7XXXXX-URP	Part 15, Repair Manual

PRELIMINARY TEST/POWER-UP EQUIPMENT

ITP 0617 - ISSUE 1, JANUARY 1991

FRAME: SLMF Power-Up Test Procedure  
REFERENCE: EL-16086-KB, EL-16189-KA, EL-16061-KA

APPLICABILITY: EC-26324-A/B/C/D

STEP	ACTION	EXPECTED RESULT
1	Connect anti-static grounding device to ground and to body.	<p>OOS &amp; FAILURE LED's light on power supply in slot 023 of files T/B/E/C.</p> <p>POWER ON LED lights on all power supplies. All others extinguish.</p> <p>POWER ON LED lights on all power supplies. All others extinguish.</p>
2	Unseat all PCBA's in all files of the frame to be powered up.	
3	Connect digital multimeter common lead to ground.	
4	Verify all battery inputs at fuses FF1 through FF10 are at Office Battery Voltage.	
5	Verify there is no continuity between ground and output side of fuses FF1 through FF10.	
6	Trip circuit breakers and seat power supplies in slot 23 of files T/B/E/G (and files AK/F/H if equipped).	
7	Insert a 5-amp fuse in fuse position FF1 through FF8.	
8	Reset circuit breakers on all power supplies in SLMF.	
9	Depress rocker switch to ON for all power supplies in SLMF.	
10	Trip circuit breakers on all power supplies in SLMF.	
11	Seat all cards in SLMF into their respective backplane connectors.	
12	Reset circuit breakers on all power supplies in SLMF.	
13	Depress rocker switch to ON for all power supplies in SLMF.	
14	Insert a 1 -amp fuse in fuse position FA9.	
15	Insert a 20-amp barrel fuse in fuse position FF9. Wait 5 seconds to charge filter capacitor.	
16	Insert a 1-amp fuse in fuse position FA10.	
18	Insert a 1 S-amp barrel fuse in fuse position FF10.	
19	Insert remaining grasshopper fuses in SLMF fuse panel.	
20	Verify voltage level appearances as shown below - right.	
END		

Office Battery Voltage			Cross Reference					Voltage Level** Appearances						
# CELLS	BATTERY	FLOAT RANGE	FF	MB	FILE	SLOT	COPY	+ 5V	-5V	+ 12V	- 12v	+ 15V	- 15v	LPG
24	Antimony	51.08 to 52.08 VDC	1-4	1	T/A/B/C			Files T thru H slot 038, pin 1	Files T thru H slot 038, pin 2	Files T thru H slot 038, pin 3				TX22 TX26 Line card slots pins 88/89
24	Calcium	51.80 to 52.80 VDC	5-8	2	E/F/G/H									
24	Absolyte/VR	53.00 to 54.96 VDC	9	MBF1	FILT BATT									
23	Absolyte/VR	50.75 to 51.75 VDC	10	-	FILT BATT									

If fans are equipped: ITP 0611  
 For power distribution fusing: ITP 0576  
 For common power supply info: SDA 0576  
 For misc. equipment power up: ITP0616

F51-F54	MBFP1	Fan packs*
F56-F59	MBFP2	Fan packs*

\*\* +/-4%

\* Fan packs may not be equipped.

Figure 1. ITP 0617, SLMF (EC-26324) Power-Up Test Procedure.

SECTION 224-000-802

ISSUE 1

PRELIMINARY TEST/POWER-UP EQUIPMENT

ITP 0618 - ISSUE 1, JANUARY 1991

FRAME: SSSF Power-Up Test Procedure  
 REFERENCE: EL-16087-KB, **EL-16189-KA**, EL-16061-KA

APPLICABILITY: EC-26325-A/B/C/D/E  
 For add-on modules or partially equipped frames, use only appropriate sections

STEP	ACTION	EXPECTED RESULT
1	Connect anti-static grounding device to ground and to body.	<p>OOS &amp; FAILURE LED's light on power supply in slot 023 of files T/B/E/G.</p> <p>POWER ON LED lights on all power supplies. All others extinguish.</p> <p>POWER ON LED lights on all power supplies. All others extinguish.</p>
2	Unseat all PCBA's in all files of the frame to be powered up.	
3	Connect digital multimeter common lead to ground.	
4	Verify all battery inputs at fuses FF1 through FF10 are at Office Battery Voltage.	
5	Verify there is no continuity between ground and output side of fuses FF1 thru h FF10.	
6	Trip circuit breakers and seat power supplies in slot 23 of files T/B/E/G (and files A/C/F/H if equipped).	
7	Insert a 5-amp fuse in fuse position FF1 through FF8.	
8	Reset circuit breakers on all power supplies in SSSF.	
9	Depress rocker switch to ON for all power supplies in SSSF.	
10	Trip circuit breakers on all power supplies in SSSF.	
11	Seat all cards in SSSF into their respective backplane connectors.	
12	Reset circuit breakers on all power supplies in SSSF.	
13	Depress rocker switch to ON for all power supplies in SSSF.	
14	Insert a 1 -amp fuse in fuse position FA9.	
15	Insert a 20-amp barrel fuse in fuse position FF9.	
16	Wait 5 seconds to charge filter capacitor.	
17	Insert a 1-amp fuse in fuse position FA10.	
18	Insert a 1 S-amp barrel fuse in fuse positron FF10.	
19	Insert remaining grasshopper fuses in SSSF fuse panel.	
20	Verify voltage level appearances as shown below -right.	
END		

Office Battery Voltage			Cross Reference					Voltage Level** Appearances								
# CELLS	BATTERY	FLOAT RANGE	FF	MB	FILE	SLOT	COPY	+ 5V	-5v	+ 12V	-12V	+ 15V	-15v	LPG		
24	Antimony	51.08 to 52.08 VDC	1-4	1	T/A/E/F			Files T thru H slot 038, pin 1	Files T thru H slot 038, pin 2	Files T thru H slot 038, pin 3				TX22 TX26 Line card slots pins 88/89		
24	Calcium	51.80 to 52.80 VDC	5-8	2	B/C/G/H											
24	Absolyte/VR	53.00 to 54.96 VDC	9	MBF1	FILT BATT											
23	Absolyte/VR	50.75 to 51.75 VDC	10	-	FILT BATT											
If fans are equipped:			ITP 0611	F51- MBFP1	Fan packs*			** +/- 4%								
For power distribution fusing:			ITP0576	F54- MBFP1	Fan packs*											
For common power supply info:			SDA 0576	F56- MBFP2	Fan packs*											
For misc. equipment power up:			ITP0616	F59- MBFP2	Fan packs*											

\* Fan packs may not be equipped.

Figure 2. ITP 0618, SSSF (EC-26325) Power-Up Test Procedure.

PRELIMINARY TEST/POWER-UP EQUIPMENT

ITP 0619 - ISSUE 1, JANUARY 1991

FRAME: SSEF Power-Up Test Procedure  
REFERENCE: EL-16088-KB, EL-16189-KA, EL-16061-KA

APPLICABILITY: EC-26326-A/B

STEP	ACTION	EXPECTED RESULT
1	Connect anti-static grounding device to ground and to body.	<p>OOS &amp; FAILURE LED's light on power supply in slot 023 of files T/B/E/G.</p> <p>POWER ON LED lights on all power supplies. All others extinguish.</p> <p>POWER ON LED lights on all power supplies. All others extinguish.</p>
2	Unseat all PCBA's in all files of the frame to be powered up.	
3	Connect digital multimeter common lead to ground.	
4	Verify all battery inputs at fuses FF1 through FF10 are at Office Battery Voltage.	
5	Verify there is no continuity between ground and output side of fuses FF1 through FF10.	
6	Trip circuit breakers and seat power supplies in slot 23 of files T/B/E/G (and files A/C/F/H if equipped).	
7	Insert a 5-amp fuse in fuse position FF1 through FF8.	
8	Reset circuit breakers on all power supplies in SSEF.	
9	Depress rocker switch to ON for all power supplies in SSEF.	
10	Trip circuit breakers on all power supplies in SSEF.	
11	Seat all cards in SSEF into their respective backplane connectors.	
12	Reset circuit breakers on all power supplies in SSEF.	
13	Depress rocker switch to ON for all power supplies in SSEF.	
14	Insert a 1-amp fuse in fuse position FA9.	
15	Insert a 20-amp barrel fuse in fuse position FF9.	
16	Wait 5 seconds to charge filter capacitor.	
17	Insert a 1-amp fuse in fuse position FA10.	
18	Insert a 1 S-amp barrel fuse in fuse position FF10.	
19	Insert remaining grasshopper fuses in SSEF fuse panel.	
20	Verify voltage level appearances as shown below - right.	
END		

Office Battery Voltage			Cross Reference				Voltage Level** Appearances									
#CELLS	BATTERY	FLOAT RANGE	FF	MB	FILE	SLOT	COPY	+5V	-5v	+12V	-12V	+15V	-15v	LPG		
24	Antimony	51.08 to 52.08 VDC	1-4	1	T/A/E/F			Files T thru H slot 038, pin 1	Files T thru H slot 038, pin 2	Files T thru H slot 038, pin 3				TX22		
24	Calcium	51.80 to 52.80 VDC	5-8	2	B/C/G/H											TX26
24	Absolyte/VR	53.00 to 54.96 VDC	9	MBF1	FILT BATT											Line card slots
23	Absolyte/VR	50.75 to 51.75 VDC	10	-	FILT BATT											pins 88/89
If fans are equipped:		ITP 0611	F51-F54	MBFP1	Fan packs*											
For power distribution fusing:		ITP 0576	F56-F59	MBFP2	Fan packs*											
For common power supply info:		SDA 0576														
For misc. equipment power up:		ITP0616														

\*\* +/- 4%

• Fan packs may not be equipped.

Figure 3. ITP 0619, SSEF (EC-26326) Power-Up Test Procedure.

