

INSTALLATION TEST GUIDE

FOR

ITEC EMS-1 SWITCHING EQUIPMENT

I-3014

Issue 1 1/15/82

EMS-1 INSTALLATION TEST GUIDE

A. GENERAL

This test guide for ITEC EMS-1 equipment is intended to be a general guide for testing to be performed during installation. It can also be used as a check list of the tests that have been performed for equipment acceptance records. Each applicable item in this guide should be initialled by the Installer in charge, attesting that the equipment item covered has been fully tested as specified.

EMS-1 equipment can be tested using the same procedures commonly used to test any SXS type switching equipment. The Technician has a distinct advantage, however, of having many Light Emitting Diodes (LED's) and digital displays to show the progress of the call being processed.

This guide includes all basic items in a complete new EMS-1 exchange, however, it can also be used for equipment additions as applicable. It is organized in the sequence in which testing should be performed. It is desirable to test the equipment in reverse sequence to normal call progress so that tests are always being conducted into equipment that has been tested.

1. Power System - The power system should be completely tested before any switching equipment (EMS-1) circuit cards are being installed. This applies to all power wiring on additions also.
 - a. Check all wiring for proper polarity and tight connections.
 - b. Ring generator operation and transfer function.
 - c. Interrupter operation and transfer function.
 - d. Tone outputs and transfer operation.
2. Alarms - Check all alarms (power and equipment) for proper indications and the proper input to the Alarm Aisle Pilots and Central alarm status panel.

B. TESTING PROCEDURES FOR CONNECTOR MODULE 800030

1. Refer to I-2130 for drawings and equipment details. Verify power wiring to be correct and free of foreign ground or EMF potential and verify fuse alarm operation, prior to fusing the module.

2. Dial all connectors with and without loop resistance to verify ability to register pulsing. Observe the connector test card for proper number display.
3. Make up a movable test plug to allow connector number to be terminated to a telephone connected through 750 ohms resistance in each side of the line and 3 MF capacitor and 20,000 ohms across the line. Terminate 2 calls from each connector, verify proper LED indications, answer and talk. Observe ring trip function (CONN LED) for fast trip action during silent and ringing periods.

Connector LED functions are:

- OS - Out of Service - Indicates OS switch is operated.
- SZ - Seize - Same as dialing or A relay. Follows dial pulses.
- BY - Busy - Same as hold or B relay.
- CT - Cut through - Indicates matrix is connected.
- RING - Ringing - Indicates ringing is enabled.
- ANS - ANSWER - Follows supervision of called party.
- CONN - Connect - Same as ring trip relay operation.
- BT - Busy Tone - Indicates call went to busy.
- RC - Revertive Call - Indicates call went to revertive call (only used when revertive call by directory number option is equipped). Not used outside North America.
- PBX - PBX Hunt - Indicates that the connector terminated to a subscriber number other than the one dialed due to the PBX rotary hunt function operating.
- FA - Fuse Alarm - Indicates a fuse on the circuit card is blown.

4. Dial a number from each connector to an unused 97, 98, 99 or 00 terminal when only 96 numbers are equipped, (3 Matrix Cards). Busy tone should be returned. Note that when a working number is called, the line LED on the associated line card will illuminate. This test not required if 100 working numbers are equipped (4 Matrix Cards).
5. Operate all OS switches, observe that OS LED illuminates and check sleeves on DTA or OGT block for presence of ground.
6. Dial all numbers from each connector, answer and talk.
7. In all PBX number groups, program a PBX group into the 600138 control card. Test, using the connector test circuit, and ring all phones (use minimum of 3). Check each connector for PBX operation. See I-2130 for detailed instructions.
8. Access the Test Connector via the test distributor and/or operator verification access and ensure that it cuts the +, -, p test leads through the proper terminal and makes connector #10 busy. (The test connector shares the #10 connector matrix).
9. Go to the Selector DTA (assuming all grading and outlet jumpers are in place) and short the T & R to each connector, test that ground appears on the sleeve. This test will verify jumpers and cabling from the DTA to the connectors.
10. Traffic Meter operation must be verified.

The Meter outputs provided are:

Peg Count - A ground pulse (50 or 150 ms. as strapped) appears each time a call is attempted.

A traffic scanner can be connected to the connector sleeve at DTA OGT block.

PBX Group Busy - 97, 98, & 99 - A ground pulse of 150 ms. for up to three PBX groups to be observed. Program 97, 98, or 99 to the group to be observed as an alternate. See PBX instruction in I-2130 for greater detail.

NOTE: This function cannot be used when PBX groups have 97, 98, & 99 used as working numbers.

11. All grading cards completed with information about access from selectors and the associated line circuit.

C. TESTING PROCEDURES FOR SELECTOR MODULES 800020 & 800220 Refer to I-2120 and I-2122 for drawing and equipment details.

1. The test procedure for Selectors is similar for local 1st, incoming or intermediate Selectors. As such, all are treated as a group in this instruction. The Installer shall delete any test on incoming or intermediate selectors that apply only to local 1st.

Verify power wiring to be correct and free of foreign potentials, and fuse alarm operation, prior to fusing the Module.

2. It is good practice to check the correctness of cabling and jumpering from the Selector DTA by shorting the T & R of each outlet (trunk) on the DTA and observing ground return on the sleeve with a test lamp. This test can detect wiring problems prior to testing the outlet (trunk) - choices from the selectors and basic equipment malfunctions.
3. Seize and dial each selector, with and without loop resistance to verify ability to register dial pulses. Observe LED's for proper indication.

Check all 1st Selectors for Dial Tone.

Selector-LED functions are:

OS - Out of Service - Indicates the OS switch is operated.

SZ - Seize - Same as dialing or A relay. Follows dial pulses.

BY - Busy - Same as hold or B relay.

CT - Cut through - Indicates the selector is cut through to an outlet.

BT - Busy Tone - Indicates all outlets are busy in the level dialed.

FA - Fuse alarm - Indicates the fuse on the circuit card is blown.

General Operation:

a. Seizure - SZ & BY LED's illuminated

A standard hand test telephone (Butt in) with a plug can be plugged into the jack on the face plate to seize the Selector.

Verify that the SZ & BY LED's light and dial tone can be heard if a 1st Selector.

b. Dialing - SZ & BY LED's

Before dialing, the Selector Test Card should be set on the Selector being tested by operating the STEP switch until the number of the Selector being tested is displayed on the test card face plate.

During the dialing, the SZ LED will follow pulsing and the BY LED will remain lighted. If an "A" or "AR" digit is dialed, no other LED's will light nor will the Selector Test Card indicate outlet selected.

c. Cut Through - CT LED lights, SZ & BY LED's extinguish

When a digit is dialed that is strapped for cut through to a level, the CT LED will light indicating an outlet has been found, and the test card will display the number of the selected outlet. The SZ and BY LED's will extinguish.

If the CT LED only flashes and the test card outlet display drops back to 000, it indicates an open Tip, Ring, or Sleeve to the succeeding equipment. Check that the outlet momentarily indicated on the test card is in fact connected to a succeeding circuit. If it is, verify that the TR & S are good to the DTA connections of the Matrix Card connectorized cable. If good at that point, verify that the flat cable connecting the Selector to the Matrix Card is plugged on correctly at all points. Dial all codes in the office to verify digit treatment strapping.

d. Busy - SZ, BY & BT LED's illuminated

Dial a digit connected to block or a level with all outlets busy. The BT LED should light and busy tone should be returned.

4. Dial all working number codes in each Selector. Observe that each working code cuts through and holds the succeeding equipment. Verify that the selector test card displays the proper outlet for the code dialed.
5. Operate all OS switches, observe that all OS LEDs illuminate and check sleeves on backplane for ground. (Pin A30).
6. Test each Selector for ability to be "forced" to an outlet by the Selector Test Card "force feature". See I-2120 for operating details.
7. In systems that use absence of ground on the sleeve to indicate an idle circuit, check that all unused outlets have ground strapped to the sleeve at the DTA.
8. Busy all outlets of one level and dial that level to check for presence of 120 IPM busy tone.
9. Test all outlets of all levels from all Selectors. Use force feature on Selector Test Card. See I-2120 for more detail.
10. Selectors - Traffic Meter Outputs

Traffic recording outputs from the Selector are provided with two outputs that can provide selector cut-through information and/or level selective recording. (Such as separating two levels using a common trunk).

Scanners can be attached to the selector sleeve for total circuit busy time. Each Selector has separate outputs on the backplane to allow individual scanner connections or be wired in multiple to a meter by the installer.

Straps are provided on the Selector to allow field selection of the outputs on PC/TM1 and TM2 pins. See I-2120 for detailed information.

An ATB output is provided for each level to peg a meter when all outlets of the level are busy. If this feature is used verify meter operation. Important, all Peg Count meters must have a diode or resistor capacitor arc suppressor across the coil.

D. TESTING PROCEDURES FOR LINE MODULE 800010 Refer to I-2110 for drawings and equipment details. -

1. Verify power wiring to be correct and free of foreign potentials and fuse alarm operation prior to fusing the Module.
2. Verify that all Finders are properly cross-connected to 1st Selectors. Plug a hand test telephone into the jack on each Finder. Dial Tone should be received from the associated 1st Selector. The only action in the Finder will be that the NEXT LED will extinguish when the Selector is seized and ground is returned on the sleeve. By plugging into the Finder with the Next LED illuminated and observing that it goes out when Dial Tone is heard verifies the T, R, & S wiring from the Finder to Meter Control and to the Selector is good. Seize line 96 from the test jack in the line test card (Test Jack must be jumpered to line 96 on backplanes). Rotate through all Finders and check operation of allotter monitor display and LEDS.

The explanation below will explain the functions of LED's. Note that the digital display on the Allotter times out in 30 minutes and must be reset by operating the STEP/MONITOR switch if more time is needed.

3. Function of LED's by circuit are as follows:

(a) Line Card

1. L1 thru L8 - Illuminated indicate line busy from either an originating or terminating call. Also, line LED flash at 240 IPM to show delayed dial tone or flash at 60 IPM to show a line in lockout if lockout is equipped.
2. REO (Request) - Indicates a line is requesting the Allotter to connect a Finder. (Flashes during normal operation, stays on if block condition exists).
3. PS (Permanent Signal) - On lockout line circuits, shows a line has been in lockout for 40 minutes or more.
4. FA (Fuse Alarm) - Indicates a blown fuse on the card. (Line card has 2 fuses).

(b) Finder

1. OS (Out of Service) - Shows that the busy switch has been operated to remove the Finder from service.

2. BY (Busy) - Shows the Finder is in use.
3. NEXT - Indicates that the Allotter has preselected this Finder to be used by the next line to request service.
4. FA (Fuse Alarm) - Indicates a blown fuse on the Finder card.

(c) Allotter

1. AFB (All Finders Busy) - Indicates that all Finders are busy, either from use or manually busied out.
2. MIN (Minor) - Indicates that a Finder is selected, but the Allotter was unable to establish a connection in 1 second.
3. MAJ (Major) - Indicates that idle Finders are available but the Allotter is unable to select one for use in 50 seconds.
4. FA (Fuse Alarm) - Indicates a blown fuse on the Allotter card.
5. DIGITAL DISPLAY - Controlled by the Allotter Monitor plug on.

(a) FIND - Indicates 1 thru 0 to correspond to Finder 1 thru 10. Operate STEP key to select the Finder desired to be observed.

(b) LINE NUMBER - Indicates the Line number that the selected Finder served during the present or last time to be used. The monitor stores in memory the last line served by each Finder, even if the display is not on. To recall this information, operate the STEP key until the Line in question is displayed. The Finder that handled the call will be indicated by the FIND display.

When the MONITOR switch is left operated, each call being processed will be displayed.

4. GENERAL OPERATING INDICATIONS OF LED's

(A) All Lines Idle

The only LED that should be illuminated is the NEXT LED on the Finder that is next in line to service a request. The digital display on the Allotter will function if the STEP/MONITOR switch is operated.

(B) Terminating Call

The L1-L8 LED for the line called will light. No other action will occur.

(C) Originating Call, Finders Available

The L1-L8 LED for the line requesting service will light. The REQ LED will flash. The Finder that had its next LED illuminated will now go to busy and the Finder next in sequence will then have its NEXT LED illuminated to indicate it is available for the next request. The Allotter Monitor (if on) will display the number of the line served.

(D) Originating Call, All Finders Busy

The AFB LED on the Allotter will be on. The L1-L8 LED indicating the line requesting service will flash at 240 IPM and the REQ LED will light. When a Finder becomes available, the request will be served in the normal manner.

5. TEST OPERATIONS

Plug a hand test telephone (Butt-in) with a 310 plug into the line jack on the Test Line Access Card in position 12 of the Finder Cage. Assuming line 96 is equipped, it should be able to be seized from the line test jack. Rotate through all equipped Finders. If trouble is encountered, check for proper fusing and check that the flat cables are properly installed. (A Finder that falls off is usually caused by a flat cable connector that is not plugged on properly, or jumpers not properly connected to the 1st Selector).

- (A) If all Finders can be accessed and held from the test line, seize each line from the MDF. Check line cables on any lines that do not operate properly.

(B) When all lines are able to be accessed, seize all lines again with a 2000 ohm resistance to assure their operation on long lines.

(C) While it is good practice to seize all lines into every Finder, it is not necessary on EMS-1 to check all matrix operations. All relays and apparatus operation can be verified by seizing the following lines:

1,2,3,4,8,12,16,20,24,28,32,36,40,44,48,52,56,
60,64,68,72,76,80,84,88,92 & 96

Operate these lines into every Finder.

(D) Traffic Meter Operation - Busy all Finders and seize a line. Observe that all OS LED's are illuminated as well as the AFB LED on the Allotter. Observe that the line LED flashes at 240 IPM and the REQ LED is on. Remove the busy from a finder and a connection should be made. Make all Finders busy again and check the ATB meter for operation when all Finders were made busy. Seize a line while all Finders are busy and check the REQ PEG and DEL. Call PEG (OF) Meters for operation when the line is seized. The DEL Call lead should have ground present while the call is blocked. The PEG count meter should operate when the call is processed by removing the busy from a Finder.

(E) Alarms - Check that the Allotter alarms are connected properly by applying a 120 ohm ground to the Major and Minor alarm posts in turn on the Finder Backplane. (It is not practical to cause these alarms to function during testing).

E. TRUNKS - Trunks are treated herein as a category rather than by individual groups. Test all trunk groups for all functions that apply.

1. Seize and dial outgoing - with and without resistance in loop.
2. Seize and dial incoming from loop or E lead.
3. Proper answer supervision recognition and signalling to distant office.
4. Trouble time out on outgoing trunks.
5. Proper operation with identifier.
6. Check out of service switches to ensure sleeve is grounded to DTA.

7. Verify MACH START operation if used.
 8. Verify ATB operation if used.
 9. Coin operation or coin tone on toll trunks.
 10. Peg count meters.
- F. ANI 500 SYSTEM - The testing of the identifier system should be dealt with as a separate entity. The items listed below are to be regarded as a test checkoff list only and do not fully represent a proper test of an ANI unit. Refer to I-2500 (Standard) or I-2501 (Programmable) for detailed instructions.
1. All trunks will dial, identify, supervise, etc.
 2. All ANI Matrix terminals will identify.
 3. ONI function.
 4. Block function.
 5. Coin - function.
 6. PBX (if required) cancels ID and transfers request to identified PBX.
 7. Party test operation.
 8. Test Panel and display operation.
 9. Portable Test Panel operation.
 10. Meters and Traffic information storage.
 11. Duplicate tests of A & B identifiers.
- G. PRESELECTOR - Test prior to jumpering into grading or connecting to trunks. Refer to I-2127 for details.
1. Test that each preselector display and step function operates. Note that the display times out after approximately 30 minutes.
 2. Monitoring the display on one preselector at a time, apply ground on each outgoing sleeve as displayed. Observe that each preselector will select all available outlets. This will test the ability to search and find and to move off a busy outlet.

3. Ground ATB lead - Make all outlets busy. Observe that all preselectors run. Remove ground from the ATB lead and they should stop searching. If ATB circuits are equipped, unplug for this test. With ATB circuit all sleeves (including unused ones) must be grounded to generate the ATB function.

H. MISC. ITEMS

1. Test Distributor (600152 & 600154) - Must be tested to verify that each test connector can be reached by dialing the proper 2 digit access. Also, that the last 2 digits will connect to the number dialed and extend a metallic T, R & S to the test desk from the line.

Test for all control functions:

- a. Stepping to next line
 - b. Releasing CO relay
 - c. Dialing into central
2. Operator Number Verification (600152 & 600154) - Test that each incoming Selector or dedicated Verification Selector can verify a busy number by dialing the proper code. NOTE: Verification distributor may be shared with test distributor or be a dedicated circuit.
 3. Intercept (600155) - (Where equipped) - Jumper a subscriber number to each intercept control circuit and place a call to that number to verify that each intercept control can access either of the 2 operator trunks.
 4. Subscriber Metering - Using a test lamp connected to +48Vdc place voltage on each connector sleeve at the LIDF and verify that the proper meter operates.

Test each metering control circuit for operation on reverse battery signal at answer and for successive meter pulses from timed pulses from the master clock.

5. Trunk Rotation - Verify that each level that has trunk rotation will rotate successive calls over the 1st three outlets of the selector level.

6. Alarm Sending & Check Unit - Note that in EMS-1 exchanges, this circuit also serves as the office alarm circuit and control audible and centralized visual indications.
 - a. Verify that all alarm indications appear on face plate of the alarm sender and on the Wire Chief test unit.
 - b. Verify that bell (audible) in Wire Chief test unit operates. Audible alarm is to be silenced on ALCO or Alarm Send settings key operation.
 - c. When ALM SEND key on WC test panel is operated, an alarm condition seizes the alarm trunk to the operator (Or 1 of 3 as required). When the operator answers the Alarm, the trunk releases.
 - d. Alarm check number can be dialed from any incoming trunk or regular line. Verify that alarms give proper indication when alarm checking # is dialed.

Major Alarm - No tones

Minor Alarm - 60 IPM Busy

Carrier Alarms - 120 IPM Busy

Perm Signal - 1 ring code

No trouble - 2 ring code

7. Inspectors Ringback/Revertive Call - This circuit is accessed by an access digit(s) and receives the called and calling parties party number. Check for the following:
 - a. Pulse 1 to 10 for 1st and 2nd digits to verify pulse receiving circuit.
 - b. Check proper frequency or polarity for each digit. (As wired)
 - c. Check for proper tones or Recording to calling party thence to be called party.
8. The Installer must verify that all equipment designation and call tracing cards are properly filled in.
9. The Installer must mark 2 sets of all job drawings to show any changes made during installation. One set shall be returned to Engineering in order to correct job records.

The Installer in charge should sign and submit this form to the Installation Manager attesting to having performed all tests listed.

I certify that all applicable tests herein have been performed and all deficiencies corrected.

Installer in Charge DATE

I verify that all tests herein have been performed by the Installer in charge.

Acceptance Test Engineer DATE