

Circuit Description

CD-5D008-01
ISSUE 3A
APPENDIX 6B
DWG. ISSUE 9B

5ESS® ELECTRONIC SWITCHING EQUIPMENT
OFFICE ALARM UNIT
CIRCUIT

CHANGES

REASONS FOR REISSUE

Added information for the New TN137B OFFICE ALARM UNIT CIRCUIT WITH DEAD SYSTEM ALARM. (FS3A)

DESCRIPTION OF CHANGES

Added FS3A and updated App. Fig 4 for TN137B

Revised FS3 to show scan point information for 3B20D and 3B21D.

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DEPT NA5350000-OW-FNG

CIRCUIT DESCRIPTION

CD-5D008-01
ISSUE 4A
APPENDIX 1A
DWG ISSUE 8A
DISTN CODE AT13

5ESS® SWITCHING EQUIPMENT
OFFICE ALARM UNIT
CIRCUIT

CHANGES

D. DESCRIPTION OF CHANGES

D.1 Revised FS4 to show the addition of a TN867 circuit pack and input alarm wiring at EQL 04-150, which adds 24 alarms, and the wiring from this circuit pack to a terminal field at EQL 04-134 to allow connectorized cabling access to the 24 scan point outputs of this pack.

D.2 CHD 1, APP. FIG. 3, and FS1 revised to reflect changes noted in D.1.

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SESS™ SWITCHING EQUIPMENT
OFFICE ALARM UNIT
CIRCUIT

CHANGES

D. Description of Changes

- D.1 Add V Wiring Option to FS 3. This allows for connectorized cabling to be used when connecting the OAU to an RAUR.

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CIRCUIT DESCRIPTION

CD-5D008-01
ISSUE 3A
APPENDIX 3A
DWG ISSUE 6A
DISTN CODE 7T13

**5ESS™ SWITCHING EQUIPMENT
OFFICE ALARM UNIT
CIRCUIT**

CHANGES

D. Description of Changes

D.1 Revised FS 3 to provide inputs on the office alarm circuit that are required to sense a 3B20D Duplex Power Failure and provide a Critical Alarm Indication.

D.2 CAD1 has been revised to reflect changes noted in D.1.

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CIRCUIT DESCRIPTION

CD-5D008-01
ISSUE 3A
APPENDIX 2B
DWG ISSUE 5B
DISTN CODE 7T13

SESS™ SWITCHING EQUIPMENT
OFFICE ALARM UNIT
CIRCUIT

CHANGES

D. Description of Changes

- D.1 Revised FS 3 to show the addition of "W" option. This option adds wiring from the office alarm circuit to the terminal field at 04-102 to allow connectorized cabling access to the second set of alarm contacts.
- D.2 Information notes 302 and 303 have been modified.
- D.3 CAD1 has been revised to reflect changes noted in D.1.

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CIRCUIT DESCRIPTION

CD-5D008-01
ISSUE 3A
APPENDIX 1D
DRAWING ISSUE 4D
DISTR CODE 7T13

5ESS™ SWITCHING EQUIPMENT
OFFICE ALARM UNIT
CIRCUIT

CHANGES

D. Description of Changes

- D.1 For description of operation, see CD-5D008-01, Issue 3A.
- D.2 FSs have been reorganized to reflect their functionality better.
- D.3 CAD figure has been removed.
- D.4 Other general documentation changes have been made for better clarity.

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5ESS™ SWITCHING EQUIPMENT

OFFICE ALARM UNIT

CIRCUIT

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alarm devices and alarm lights within the local area.

2.03 The remote alarm unit circuit pack responds to alarm signals from the metallic service unit and drives audible and visual alarms in the local area.

SECTION II - DETAILED DESCRIPTION

1. SCAN APPLIQUE CIRCUIT

CIRCUIT DESCRIPTION

FUNCTION

1.01 The TN867 Scan Applique Circuit (SAC) provides an interface from 24 central office building alarms to the 3B central processor of the 5ESS. The SAC provides optically isolated duplex outputs to drive scan points of both side 0 and side 1 of the 3B IOP from a single office alarm input. An alarm input must be a hard contact closure or open that does not apply any potential (except ground) to the SAC input. A strapping option allows an input signal to be inverted to provide a closure to the 3B IOP scan points from either a normally open or normally closed building alarm. Twenty-four (24) identical interface circuits are included on each circuit pack, along with circuitry to switch to the alternate -48V power bus if a primary power bus fails.

DETAILED DESCRIPTION

1.02 Each scan interface circuit consists of a transistor output 2C dual opto-isolator, a 51-B npn transistor, an 808B zener diode, a 458A diode and two resistors. Input to each scan circuit is provided by three leads labeled SCXXCM, SCXXNO, and SCXXNC, where XX is a number from 0 to 23. The manner in which these leads

are connected determines whether the signal is inverted before it reaches the 3B IOP. A normally open alarm point does not necessitate inversion by the SAC, but a normally closed alarm point must be wired for inversion to provide a closure to the 3B IOP when the alarm point opens.

Normally Open Operation

1.03 Normally open alarm contacts are connected between the SCXXNO and the SCXXCM inputs of the SAC. The SCXXNC lead must be left unconnected. When the alarm contacts are open, current does not flow through the LEDs of the opto-isolator and the output transistor of the opto-isolator is cut off. When the alarm contacts close, SCXXNO is connected to SCXXCM and -48RET is applied to the cathode of CR1. Current then flows through the circuit, turns on the LEDs in the opto-isolator, and saturates both output transistors. Zener diode CR1 provides a 6V noise margin before the circuit operates. Q1 saturates because SCXXNC is left open and base current flows through R2 to Q1. Current flow through the opto-isolator LED circuit is limited by R1.

Normally Closed Operation

1.04 Normally closed alarm contacts are connected between the SCXXNC and the SCXXCM inputs of the SAC and the SCXXNO lead must be strapped to the SCXXCM. When the alarm contacts are in their normally closed state, base current required to turn on Q1 is shunted through the contacts to -48RET (SCXXCM), keeping Q1 cut off. No current flows through the opto-isolator LEDs and the opto-isolator outputs are off. When the normally closed contacts open, base current flows into Q1 driving it into saturation. Current flows through the opto-isolator LEDs, and the outputs turn on providing a closure to the 3B IOP scan point.

Power Bus Switch

1.05 K1, K2, R3, and R4 comprise a circuit that allows the SAC to switch between two power buses that provide -48V supply to the circuit pack. K1 and K2 provide break-before-make transfer contacts to switch both -48V and -48RET. K1 and K2 are energized by current from bus A limited by R3 and R4. When K1 and K2 are energized, the circuit pack draws power from bus A. If bus A fails, the relays de-energize and the circuit pack receives -48V power from bus B.

Symbol/Lead Mnemonics

- OSCXXP - Side 0 scan point No. XX positive terminal
- OSCXXN - Side 0 scan point No. XX negative terminal
- 1SCXXP - Side 1 scan point No. XX positive terminal
- 1SCXXN - Side 1 scan point No. XX negative terminal
- SCXXN0 - Scan point No. XX normally open input terminal
- SCXXNC - Scan point No. XX normally closed input terminal
- SCXXCM - Scan point No. XX common input terminal

2. AUDIBLE ALARM CIRCUIT

FUNCTION

2.01 The audible alarm circuit has four inputs from the 3B IOP that are converted into signals used to drive their respective audible and visual alarm outputs. These alarms are the critical (CR), major (MJ), and minor (MN) alarms. To produce an input signal to the AAC, the 3B IOP must make current flow through an LED across the

input terminals of the AAC. When an input signal is present from the 3B IOP on one of the alarm inputs, its respective output lead is energized. When an output is energized, it is connected between -48V and -48RET through a 10 ohm resistor.

The number of output devices that the AAC is capable of driving is limited so the driving voltage does not become too low. The AAC is capable of driving six sets of alarm lights and one audible alarm panel.

Inputs and Outputs

- (A) CR - a current mode signal of 5 to 10 mA magnitude lasting approximately 8 seconds. When CR starts, relays K1 and K7 operate. K1 lights the critical alarm lamps and keeps them lit. K7 operates the tone bar in a syncopated fashion. When the signal current stops, relay K7 releases. Drive to the tone bar stops; the lights remain on.
- (B) MJ - a current mode signal of 5 to 10 mA magnitude lasting approximately 8 seconds. When MJ starts, relays K2 and K7 operate. K2 lights the major alarm lamps and keeps them lit. K7 operates the tone bar in a syncopated fashion. When the signal current stops, relay K7 releases. Drive to the tone bar stops; the lights remain on.
- (C) MN - a current mode signal of 5 to 10 mA magnitude lasting approximately 8 seconds. When MN starts, relays K3 and K6 operate. K3 lights the minor alarm lamps. K6 operates the SIB audible

alarm with a steady tone. When this signal current stops, K6 is released. Drive to the SIB stops; the lights remain on.

- (D) RET - a current mode signal of 5 to 10 mA magnitude and short duration. When this signal is received, any engaged relay (K1, K2, or K3) releases and, its associated lights turn off.

As long as this circuit pack has -48V power, relay K5 is energized. If power is lost, a break contact on K5 closes the path from an external power source to the "alarm battery alarm".

Timing

2.02 The regular tone bar operation consists of one stroke every 1.5 seconds; the syncopated operation consists of cycles repeated every 1.5 seconds. Each cycle has two strokes of the bar separated by approximately 0.44 seconds.

Fuse Alarms (FA0 and FA1)

2.03 Opto-isolators U7 and U8 are included on the AAC to detect fuse failures on the miscellaneous frame. Inputs FA0 and FA1 should be connected such that when a fuse blows, -48V is applied to its FA terminal. When -48V is applied to either FA0 or FA1, current conducts through the LEDs in either U7 or U8 respectively, and lights the corresponding LEDs. The opto-isolator output transistors saturate and provide the equivalent of a contact closure to sides 0 and 1 of the 3B IOP.

Symbol/Lead Mnemonics

BA1	Alarm battery alarm contact side 1
BA2	Alarm battery alarm contact side 2
CR	Critical alarm from 3B Processor
CRR	Critical alarm signal return path
CRL1	Critical light No. 1 drive
CRL2	Critical light No. 2 drive
FA0	Fuse alarm No. 0 input
FA1	Fuse alarm No. 1 input
MJ	Major alarm from 3B Processor
MJR	Major alarm signal return path
MJL1	Major light No. 1 drive
MJL2	Major light No. 2 drive
MJL3	Major light No. 3 drive
MN	Minor alarm from 3B Processor
MNR	Minor alarm signal return path
MNL1	Minor light No. 1 drive
MNL2	Minor light No. 2 drive
MNL3	Minor light No. 3 drive
RET	Retire visual alarms signal from 3B Processor
RETR	Retire signal return path

SC40N	Scan point terminal	No. 40	negative
SC40P	Scan point terminal	No. 40	positive
SC41N	Scan point terminal	No. 41	negative
SC41P	Scan point terminal	No. 41	positive
SIB	Minor audible alarm drive		
TB	Tone bar drive		

Timing

3.02 The critical or stand alone audible alarm is signaled by a double stroke of the tone bar. The first stroke is separated from the second by 0.5 seconds or less and the following double stroke about 1.5 seconds later. The major audible alarm is signaled by a single stroke of the tone bar about every 1.5 seconds, and the minor audible alarm is signaled by a continuous tone of the ringer. These audible alarms are retired in approximately 5 seconds.

Fuse Alarms

3.03 Should power to this circuit fail by either the removal of -48V or by the failure of the 5V power converter, power failure signals are sent to the 3B IOP and the metallic service unit scanner.

Test and Maintenance

3.04 This circuit may be tested by either operating the alarm test button on the circuit pack or by sending an order from the maintenance control center through the software and metallic service unit signal distributor to the remote alarm circuit. Outputs from the alarm circuit indicate that the test order was received and that the pack is operational.

Symbol/Lead Mnemonics

Inputs

XCR	Critical alarm
XCRR	Critical alarm return
XST	Stand alone alarm
XSTR	Stand alone alarm return
XMJ	Major alarm
XMJR	Major alarm return

3. REMOTE ALARM UNIT CIRCUIT

FUNCTION

3.01 The remote alarm circuit controls the audible and visual 5ESS system alarms. The four visual alarm outputs are the critical (CR), major (MJ), minor (MN), and stand alone lamp outputs. The two audible alarm outputs are the tone bar and the ringer (sounder).

A critical alarm causes the software to send an order to the metallic service unit or modular metallic service unit signal distributor that closes a relay contact causing the remote alarm circuit to supply power (-48V) to the tone bar and critical alarm lamps. Similarly, a major alarm sounds the tone bar and lights major alarm lamps. A stand alone alarm sounds the tone bar and lights the stand alone lamps, and a minor alarm sounds the ringer and lights the minor alarm lamps. For all alarms, a signal is sent to the 3B IOP indicating that the alarm order was received by this circuit.

XMN Minor alarm
 XMNR Minor alarm return
 XATST Alarm test
 XATSTR Alarm test return

Outputs

TB Tone bar
 TBR Tone bar return
 MNAUD Minor audible alarm
 MNAUDR Minor audible alarm return
 LMPCR Critical alarm lamp
 LMPCCR Critical alarm lamp return
 LMPMJ Major alarm lamp
 LMPMJR Major alarm lamp return
 LMPMN Minor alarm lamp
 LMPMNR Minor alarm lamp return
 LMPST Stand alone lamp
 LMPSTR Stand alone lamp return
 PWRALM1 Power alarm -48V
 PWRALM Power alarm
 PWRALMR Power alarm return
 XTSTP Test output - positive
 XTSTN Test output - negative
 XALMPWRP Power alarm - positive
 XALMPWRN Power alarm - negative
 XALMACTP Input active - positive
 XALMACTN Input active - negative

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 None.

2. FUNCTIONAL DESIGNATIONS

ALM APLQ Alarm Applique Circuit - TN867
 A/V ALM Audible/Visual Alarms - IN137

3. FUNCTIONS

3.01 Converts alarm output signals from the 3B IOP to signal levels capable of driving the audible and visual alarms.

3.02 Generates the timing for the output signals required to drive the tone bar when either a critical or major alarm occurs. The timing of the tone bar is different for critical and major alarms so that they may be distinguished.

3.03 Provides up to 96 scan points capable of driving both sides 0 and 1 of the 3B IOP.

3.04 Provides two fuse alarm scan points, each capable of driving both sides 0 and 1 of the 3B IOP.

4. CONNECTING CIRCUITS

4.01 When this circuit is listed on a keysheet, the connection information thereon is to be followed.

- (a) Audible alarm panel drawing - ED-5D141-1.
- (b) Audible alarm panel and exit pilot lamp circuit drawing - SD-5D017-01.
- (c) Cabling information for wiring cabinets - ED-5D100-11.
- (d) Cabling information for wiring frames - ED-5D047-30.
- (e) 5ESS Assignment Rules - SD-5D007-01.
- (f) Processor system circuit - SD-4C122-01.
- (g) Fuse panel circuit for 7 inch case - SD-5D034-01.
- (h) Fuse panel circuit for 6 inch case - SD-5D053-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 Test steps for AAC - TN137.

1. Energize the board with -48V on pin 000 or 001 and 48V return on pin 002 or 003. Confirm that the contact of K5 opens at this time. Confirm that opto-isolator U6 output is saturated.
2. Inject 5 mA into MN (pin 350 with pin 254 as the return path). Confirm that K3 and K6 picked up.
3. Remove the 5 mA drive into MN. Confirm that K3 remains picked up and that K6 has dropped out.
4. Before proceeding further, ensure that a minimum of 5 seconds have elapsed since step 1 began.
5. Inject 5 mA into MJ (pin 255 with pin 355 as the return path). Confirm that K2 picks up and that K7 is cycling as shown in Figure 1 in SD-5D008-01.
6. Remove the 5 mA drive into MJ. Confirm that K2 remains picked up and that the cycling of K7 stops with K7 dropped out.
7. Inject 5 mA drive into CR (pin 356 with pin 256 as the return path). Confirm that K1 picks up and that K7 is cycling as shown in Figure 2 in SD-5D008-01.
8. Remove the 5 mA drive into CR. Confirm that K1 remains picked up and that the cycling of K7 stops with K7 dropped out.
9. Confirm that current in the -48V power feed does not exceed 150 mA.

10. Inject 5 mA into RET (pin 253 with pin 353 as the return path). Confirm that K1, K2, and K3 now drop out.

11. De-energize the board. Confirm that the K5 contact has closed and that opto-isolator U6 output is open.

12. With -48 ABRTN connected, connect -48V in series with 2K through 8K ohm to FA0 (pin 300). Confirm that opto-isolator U7 outputs zero and one are saturated.

13. Remove the voltage from FA0 (pin 300) and confirm that opto-isolator U7 outputs zero and one are open.

14. Connect -48V in series with 2K through 8K ohm to FA1 (pin 301). Confirm that opto-isolator U8 outputs zero and one are saturated.

15. Remove the voltage from FA1 (pin 301) and confirm that opto-isolator U8 outputs zero and one are open.

5.02 Test steps for SAC - TN867.

1. Energize board with -48V on pin 000 and 48V return on pin 002.
2. To test opto-isolator XX, connect SCXXNO to SCXXCM. Verify that the SCXX opto-isolator outputs for side 0 and 1 are saturated.
3. Without removing the previous connection (step 2), connect SCXXNC to SCXXCM. Verify that the SCXX opto-isolator outputs for sides 0 and 1 are open.

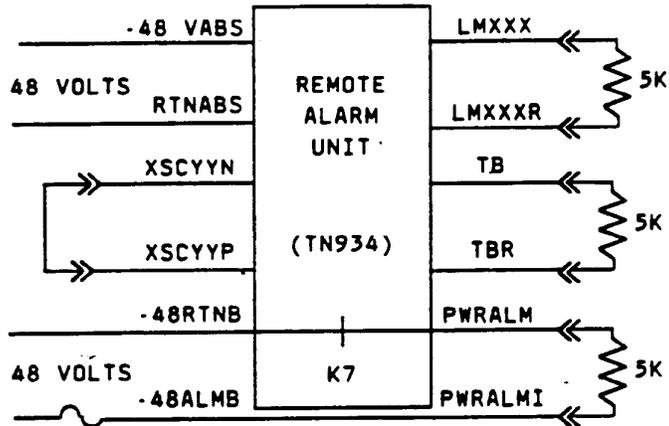


Figure 1. Circuit Diagram for the Remote Alarm Unit Test

4. Remove the connections from SCXXNO and SCXXNC. Verify that the SCXX opto-isolator outputs for sides 0 and 1 are open.
 5. De-energize the board by disconnecting pins 000 and 002. Confirm that relays K1 and K2 release.
- 5.03 Test steps for RAU - TN934
1. Connect a 5,100 ohm load resistor from lead PWRALM1 to lead PWRALM. Connect the minus lead of a 48V power supply through the fuse/filter panel to lead -48ALMB and connect the plus lead to the -48RTNB lead (ground). As shown in Figure 1, a current greater than 5mA should flow in the load resistor. Measure the voltage from pins 032, 132, 033, or 133 to pins 232, 332, 233, or 333. This voltage should be zero.
 2. Connect the minus lead of a 48V power supply to lead -48VABS and the plus lead to lead RTNABS (ground). The current through the load resistor in step one should be less than 0.5mA. The voltage measured from pins 032, 132, 033, or 133 to pins 232, 332, 233, or 333 should be 48V. The voltage from pins 232, 332, 233, or 333 to ground should be -48V.
 3. Connect 5,100 ohm load resistors between the following leads: MNAUD and MNAUDR, TB and TBR, LMPCR and LMPCRR, LMPMJ and LMPMJR, LMPMN and LMPMNR, and LMPST and LMPSTR. As shown in Figure 1, a current of less than 0.5mA current should flow in these resistors.
 4. Connect the following leads together: OSC08P to OSC08N,

OSC09P to OSC09N, OSC10P to OSC10N, and OSC11P to OSC11N. A current greater than 5mA should flow in the load resistors connected in step 3. Current in the resistor connected from lead MNAUD to lead MNAUDR flows for about 5 seconds. Current in the resistor connected from lead TB to lead TBR cycles on and off for 5 seconds. Current in all other load resistors flows until the connections made in this step are removed. Remove the connections made in this step. No current should flow in the load resistors.

5. Connect the following leads together: 1SC08P to 1SC08N, 1SC09P to 1SC09N, 1SC10P to 1SC10N, and 1SC11P to 1SC11N. A current greater than 5mA should flow in the load resistors connected in step 3. The current flow is the same as that observed in step 4. Remove the connections made in this step. No current should flow in the load resistors.

6. Remove all connections, load resistors, and power supplies. This test sequence is complete.

SECTION IV - REASONS FOR REISSUE

A. Changed and Added Functions

- A.1 The remote alarm unit circuit pack was added to provide the interface necessary for audible and visual alarms in a remote switching module (RSM).

B. Changes in Apparatus

- B.1 Added

Remote Alarm Unit Circuit

D. Description of Changes

- D.1 The remote alarm unit circuit pack was added to provide the interface necessary to convert the output of the metallic service unit to audible and visual alarms.

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