

**DIGITAL CLOCK DISTRIBUTOR  
DCD-400, DCD-ST2 and DCD-CIM  
MAINTENANCE**

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## 1. GENERAL

1.01 This practice provides maintenance procedures for the Digital Clock Distributor (DCD-400/ST2/CIM) System. The DCD is installed in a standard 23-inch rack.

1.02 This practice has been reissued due to editorial changes. No change bars are used.

1.03 The following acronyms are used in this document:

ACI	Analog Clock Input card
ACO	Alarm cutoff
AI	Alarm Interface card (DCD-ST2)
CI	Clock Input card
DCD	Digital Clock Distributor
DS1	Digital Signal, Level 1 (1.544 Mb/s)
FA	Fuse and Alarm card (DCD-400/CIM)
HS TOxA	Hot spare card
LOS	Loss of signal
MCA	Matrix Controller Automatic card
MCA-2	Matrix Controller Automatic-2 card
MTIE	Maximum time interval error
SCIU	Synchronous Clock Insertion Unit card
ST2	Stratum-2 Clock
ST2E	Enhanced Stratum-2 Clock
ST3	Stratum-3 Clock
ST3E	Enhanced Stratum-3 Clock
TOAA	Timing Output Analog Automatic card
TOCA	Timing Output Composite Clock Automatic card
TOLA	Timing Output Logic Level Automatic card
TOTA	Timing Output T1 Automatic card
TOxA	Timing Output card

**Note:** Throughout this practice, information common to the CI and ACI cards is referenced as “clock input” or “input card”. Information common to the CI card is referred to as “CI”; and the ACI is referred to as “ACI”.

**Note:** Information common to the ST2, ST2E, ST3E, and ST3 clock cards is referenced as “clock card” or “ST card.” Information unique to the ST2 is referred to as “ST2”; information unique to the ST2E is referred to as “ST2E”; the ST3E is referred to as “ST3E”; the ST3 is referred to as “ST3”.

**Note:** A lowercase “x” is used in card nomenclature as a variable to indicate all cards of that

type (e.g., “TOxA” represents TOAA, TOCA, TOLA, and TOTA cards).

## 2. PREVENTIVE MAINTENANCE

2.01 The DCD System is a self-sustaining system and does not require any preventive maintenance.

## 3. TROUBLESHOOTING

### A. Troubleshooting Considerations

3.01 Most alarm conditions in the DCD System are not out-of-service or service-affecting conditions. The system is designed with redundant power, reference inputs, clock input cards, stratum clock cards and output card protection switching.

3.02 The only true out-of-service condition is when ALL power is lost to a shelf, or ALL reference inputs AND both stratum clock cards fail. In most cases, these two conditions are caused by operating errors from hasty attempts at troubleshooting alarm conditions in the system before proper alarms analysis is performed.

3.03 Before taking any action on the system, such as removing cards, first consider the following DOs and DON'Ts about troubleshooting the DCD System:

1. **DO** write down any alarm and normal lamp conditions in the shelf. These will help you to determine where to look for the cause of the condition.
2. **DO** determine if any network elements (NE) being timed from the DCD System are in alarm, or reporting slips.
3. **DO** use the DCD System manual and available job aids to assist you.
4. **DON'T** touch the shelf until you have analyzed the condition and know the possible result of any planned corrective actions.
5. **DON'T PANIC!** Both major and minor alarms in the shelf require immediate attention. But, very few alarms in the DCD System are service affecting. IMPROPER corrective actions could be service affecting.

6. **DO** take your time. An operating error can affect ALL network elements in the office.
7. **DON'T** remove an ST clock card from the shelf, unless you are certain it is the cause of the condition. This is especially true if the ST clock card(s) is (are) in the Holdover mode (its HOLD OV/HOLDOVER lamp is lit, or its HOLD OV/HOLDOVER and INP TOL lamps are lit). Removal of both ST clock cards in this condition will cause total loss of all outputs from the shelf and/or system.
8. **DON'T** touch the shelf until you have been properly grounded.
9. **DO** contact your supervisor, technical support and/or Telecom Solutions if you are not sure what to do.

**3.04** Always follow proper electrostatic discharge (ESD) precautions when handling DCD shelf cards. This includes, but is not limited to:

- Wearing a properly grounded and tested wrist strap when handling cards.
- Storing DCD cards only in antistatic packaging provided by the factory.

**B. Interpreting System Alarms, Lamps And Trouble Isolation**

**3.05** The DCD System AI/FA card will always generate contact closure MAJOR and/or MINOR alarms (both Office Alarm and Shelf Status [remote] contact closures are activated) for abnormal conditions in the shelf. In addition, Shelf Status PRTA (port alarm), CLKL (clock loss), BATTALM (battery alarm, DCD-ST2 only), and Clock Status A and B indicators (DCD-ST2 only) are activated to assist in trouble isolation and repair.

**3.06** When a system alarm is generated the office audible alarm is activated. Press the alarm cutoff (ACO) pushbutton on the AI/FA card, in the DCD shelf with the alarm, to silence the office audible alarm. The ACO does not deactivate the office visual alarm or any remote alarms. The ACO will automatically reset when the alarm condition is cleared or when another type of alarm is generated. For example, if the ACO pushbutton was previously pressed for a MINOR alarm, and a new MAJOR alarm is generated, then the ACO will reset (the ACO lamp

goes off) and the office audible alarm will sound again.

**3.07** When troubleshooting, write down all abnormal and normal lamp conditions for the shelf with the alarm lamp lit on its AI/FA card. This will assist in analyzing and isolating the cause of the condition. DO NOT start removing or replacing cards to attempt to clear alarms, as it could lead to crashing the office timing system.

**3.08** Tables to aid in troubleshooting are listed in this section. Use Table A to determine which table to reference for a particular card or situation. Refer to Table B through Table I to assist in trouble isolation and repair. Use Figure 1 to assist in locating shelf backplane switches, terminals and connectors. Use Figures 2 through 17 to assist in interpreting the shelf and card lamp indications.

**3.9** When troubleshooting locally, use the ABNORMAL CARD LAMPS and ACTIVATED OFFICE ALARMS columns on the Alarm Condition tables (Table B, Table D, and Table F) to assist in trouble isolation. When troubleshooting from a remote location, use the ACTIVATED SHELF STATUS and ACTIVATED CLOCK STATUS A AND B columns on the Alarm Condition tables to assist in trouble isolation. Note the CONDITION TYPE # and locate that CONDITION TYPE # on the associated Corrective Action table (Table C, Table E, or Table G) for conditions and probable cause information, and possible corrective actions to be taken to correct the trouble.

**3.10** Once the basic trouble has been isolated and it has been determined that an individual card is defective, perform the appropriate card replacement procedure in this practice.

**Table A. Troubleshooting**

CLOCK TYPE	GO TO TABLE
<b>INPUT CARD OR CLOCK CARD PROBLEMS</b>	
ST2E	B
ST2	B
ST3E	D
ST3	F
<b>MISCELLANEOUS PROBLEMS</b>	
Any	H

Table B. Input and ST2 or ST2E Alarm Conditions (DCD-ST2 Shelf Only)

AI LAMPS	ABNORMAL CARD LAMPS	ACTIVATED OFFICE ALARMS AND SHELF STATUS	ACTIVATED CLOCK STATUS A AND B	CONDITION TYPE # (NOTE)
None lit	ST2 A and/or ST2 B = Only FREE RUN and ACTIVE lit ST2E A and/or ST2E B = Only HOLDOVER (green) and ACTIVE (green) lit	None	ST A = LOCKED and FREERUN <b>and/or</b> ST B = LOCKED and FREERUN	1
None lit	ST2 A and/or ST2 B = LOCKED off ST2E A and/or ST2E B = LKD off	None	ST A = LOCKED <b>and/or</b> ST B = LOCKED	2
MAJOR and MINOR lit	Input cards A and B = FAIL lit, frequency/bit rate lamp off, SR FL lit (ACI only) ST2 A and B = FREE RUN flashing ST2E A and B = HOLDOVER flashing green ALL TOxA = FAIL lit, ST and INPUT off. Option lamps are all off or all on MCA/MCA-2 = 10 PORT ALM lit	Audible and Visual = MAJOR and MINOR Shelf Status = MAJSI, MINSI, and CLKL	ST A = LOCKED and FREERUN flashing <b>and/or</b> ST B = LOCKED and FREERUN flashing	3
MINOR lit	ST2 A and B = INP TOL and HOLD OV lit, LOCKED off ST2E A and B = INP TOL, HOLDOVER (red), and ACTIVE (green) lit, LKD off	Audible and Visual = MINOR Shelf Status = MINSI (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MIN)	ST A = INPUT TOL, HOLDOVER, and LOCKED <b>and</b> ST B = INPUT TOL, HOLDOVER, and LOCKED	4
MINOR lit	ST2 A or B = INP TOL and HOLD OV lit, possibly LOCKED off ST2E A or B = INP TOL, HOLDOVER (red), and ACTIVE (green) lit, possibly LKD off	Audible and Visual = MINOR Shelf Status = MINSI (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MAJ or MIN)	ST A = INPUT TOL, HOLDOVER, and possibly LOCKED <b>or</b> ST B = IINPUT TOL, HOLDOVER, and possibly LOCKED	4
MINOR lit	ST2 A and B = INP UNLKD and LOCKED lit	Audible and Visual = MINOR Shelf Status = MINSI (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MAJ or MIN)	ST A = INPTS UNLKD <b>and</b> ST B = INPTS UNLKD	5

Table B. Input and ST2 or ST2E Alarm Conditions (DCD-ST2 Shelf Only) (Contd)

AI LAMPS	ABNORMAL CARD LAMPS	ACTIVATED OFFICE ALARMS AND SHELF STATUS	ACTIVATED CLOCK STATUS A AND B	CONDITION TYPE # (NOTE)
MINOR lit	ST2 A or B = INP UNLKD lit. LOCKED lit or off	Audible and Visual = MINOR Shelf Status = MINSI (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MAJ or MIN)	ST A = INPTS UNLKD and possibly LOCKED <b>or</b> ST B = INPTS UNLKD and possibly LOCKED	6
MINOR lit	ST2E A and/or B = DRIFT lit. SRC A and/or B flashing green	Audible and Visual = MINOR Shelf Status = MINSI (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MAJ or MIN)	ST A = INPTS UNLKD <b>and/or</b> ST B = INPTS UNLKD	7
MINOR lit	Input cards A and B = FAIL lit, frequency/bit rate lamp off, SR FL lit (ACI only) ST2 A and B = HOLD OV lit, LOCKED and REF A and B off ST2E A and B = HOLDOVER (red) and ACTIVE (green) lit, LKD and SRC A and B off	Audible and Visual = MINOR Shelf Status = MINSI and CLKL (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MIN)	ST A = LOCKED and HOLDOVER <b>and</b> ST B = LOCKED and HOLDOVER	8
MINOR lit	Input cards A or B = FAIL lit, frequency/bit rate lamp on or off, SR FL lit (ACI only) ST2 A = REF B lit if input card A FAIL lamp lit, possibly LOCKED off. ST2 B = REF A lit if input card B FAIL lamp lit, possibly LOCKED off. ST2E A = SRC B lit if input card A FAIL lamp lit, possibly LKD off. ST2E B = SRC A lit if input card B FAIL lamp lit, possibly LKD off.	Audible and Visual = MINOR Shelf Status = MINSI and CLKL	ST A = possibly LOCKED <b>or</b> ST B = possibly LOCKED	9

Table B. Input and ST2 or ST2E Alarm Conditions (DCD-ST2 Shelf Only) (Contd)

AI LAMPS	ABNORMAL CARD LAMPS	ACTIVATED OFFICE ALARMS AND SHELF STATUS	ACTIVATED CLOCK STATUS A AND B	CONDITION TYPE # (NOTE)
MINOR periodically lights, then goes off	Input card A and/or B = FAIL periodically goes on and off. First occurrence, the SRC ACT/SRC ACTIVE on FAIL card goes off and lights on the other card. ST2/ST2E A and/or B = First occurrence, REF/SRC A and/or B change to the other REF/SRC lamp and possibly LOCKED/LKD off	Audible and Visual = Periodic MINOR Shelf Status = Periodic MINSI and CLKL (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MAJ or MIN)	ST A = First occurrence LOCKED <b>and/or</b> ST B = First occurrence LOCKED	10
MAJOR lit	ST2 A or B = FAIL lit. LOCKED and possibly REF A and B off ST2E A or B = FAIL lit. LKD and possibly SRC A and B off, OSC lit red	Audible and Visual = MAJOR Shelf Status = MAJSI	ST A = LOCKED <b>or</b> ST B = LOCKED	11
MAJOR and MINOR lit	ST2 A and B = INP TOL and HOLD OV lit, LOCKED off ST2E A and B = INP TOL HOLDOVER (red), and ACTIVE (green) lit, LKD off	Audible and Visual = MAJOR and MINOR Shelf Status = MAJSI MINSI, and CLKL (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MAJ)	ST A = INPUT TOL, HOLDOVER, and LOCKED <b>and</b> ST B = INPUT TOL, HOLDOVER, and LOCKED	4
MAJOR and MINOR lit	Input cards A and B = FAIL lit, frequency/bit rate lamp off, SR FL lit (ACI only) ST2 A and B = HOLD OV lit, LOCKED and REF A and B off ST2E A and B = HOLDOVER (red) and ACTIVE (green) lit, LKD and SRC A and B off	Audible and Visual = MAJOR and MINOR Shelf Status = MAJSI and MINSI (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MAJ)	ST A = LOCKED and HOLDOVER <b>and</b> ST B = LOCKED and HOLDOVER	8
Note: Refer to Table C for the corrective action to take for each condition type.				

Table C. Input and ST2 or ST2E Corrective Actions  
DCD-ST2 Shelf Only

CONDITION TYPE # (FROM TABLE B)	CONDITION AND PROBABLE CAUSE	CORRECTIVE ACTIONS
1	No input cards installed. Outputs are as accurate as the freerunning clock cards.	Install at least one input card (Chart 2).
2	In a 10-second to 5 minute period, the input reference has drifted out of spec. ST2/ST2E is trying to reconverge and lock to the input reference. If successful, its LOCKED/LKD lamp will light. If not, it will try to converge until its pull-in range is exceeded, which causes the INPUT TOL alarm and enters HOLD OVER mode (CONDITION TYPE #4). Does not affect outputs.	May have been a phase transient on input reference. Wait 5 to 20 minutes to see if the ST2/ST2E card's LOCKED/LKD lamp lights. If not, isolate and repair input reference facility.
3	Input reference A and B failed and the ST2/ST2E A and B clock cards have recently (5 to 60 minutes) been removed and then resealed. All outputs are squelched.	Check input reference connections at the shelf and source ends. Reconnect if required. Isolate and repair input reference facilities, if required.
		Wait for ST2/ST2E A and B to stabilize and come on-line.
4	The input reference for the ST2/ST2E with its INP TOL and HOLD OV/HOLDOVER lamps lit has excessive jitter, wander, or severe frequency offset (out of pull-in range of ST2/ST2E cards).	Fix input source facility for the ST2/ST2E with its INP TOL and HOLD OV/HOLDOVER lamps lit.
	For ST2 Issue E or later - Possibly a defective input card.	Replace the associated input card (Chart 1).
	For ST2 Issue D or prior - Possibly the ST2 card's output frequency is offset.	If the ST2 cards are Issue D or prior, then upgrade the cards, one at a time, to Issue E or later (Chart 5). If condition returns, then isolate and repair the input reference.

**Table C. Input and ST2 or ST2E Corrective Actions  
DCD-ST2 Shelf Only (Contd)**

<b>CONDITION TYPE # (FROM TABLE B)</b>	<b>CONDITION AND PROBABLE CAUSE</b>	<b>CORRECTIVE ACTIONS</b>
5	<p>The two input reference signals have an out of spec frequency difference. Not a service affecting condition. One or both input references are not Stratum-1 quality. Condition is most likely caused by severe wander on the input reference. The condition may come and go over minutes, hours, or days, depending on frequency and amplitude of wander.</p>	<p>Remove one input reference and apply a single input reference to both DCD shelf input terminals. If access jacks are provided on inputs, patch from the primary reference MON jack (from line facility) to the DCD input IN jack. INP UNLKD lamps go off immediately. May light again when LOCKED/LKD lamp lights.</p> <ul style="list-style-type: none"> <li>• If INP UNLKD lamps remain off for more than one hour, then isolate wander on the input reference and repair or select a new input reference.</li> <li>• If INP UNLKD lamps remain lit for more than 2 hours, then replace ST2/ST2E cards, one at a time, and repeat tests (basically a trial and error operation).</li> </ul>
	<p>On the ST2 card, Issue D or prior, the output frequency may have shifted greater than inputs unlocked specs, but less than input tolerance specs.</p>	<p>If ST2 cards are Issue D or prior, then upgrade the cards, one at a time, to Issue E or later. If condition returns, then isolate and repair input reference.</p>
6	<p>Valid inputs unlocked condition is both ST2 cards are locked to their input reference (LOCKED lamps are lit) and both cards' INP UNLKD lamps are lit. If only one ST2 card's INP UNLKD lamp is lit, the ST2 card is defective.</p>	<p>Replace the ST2 card (Chart 5).</p>
7	<p>Input reference A and/or B rate of frequency change, compared to ST2E output has exceeded the Drift specification. The green flashing SRC (A and/or B) lamp(s) indicates which input reference is drifting.</p>	<p>Isolate and repair the input reference (A and/or B) facility (the one associated with the green flashing SRC [A and/or B] lamp).</p>
8	<p>Both A and B input sources have failed.</p>	<p>Check input reference connections at the shelf and source ends. Reconnect if required. Isolate and repair input reference facilities, if required.</p>
	<p>The input reference facility framing format rearranged from D4 to ESF, or vice versa, and the input card options were not changed to match it.</p>	<p>Change the option switch settings to match the current framing format of the input reference facilities.</p>
	<p>The input reference has been recently reasigned, and the signal amplitude is too high.</p>	<p>Wire a 100 ohm, 1/4 watt resistor across T and R input terminals on the shelf backplane.</p>
	<p>Both input cards have failed.</p>	<p>Replace both input cards (Chart 1).</p>



**Table C. Input and ST2 or ST2E Corrective Actions  
DCD-ST2 Shelf Only (Contd)**

<b>CONDITION TYPE # (FROM TABLE B)</b>	<b>CONDITION AND PROBABLE CAUSE</b>	<b>CORRECTIVE ACTIONS</b>
9	Input reference A or B has failed (frequency/bit rate lamp off) or has exceeded BPV, OOF, or excessive zeros parameters (frequency/bit rate lamp lit). Note: ST2/ST2E card's LOCKED/LKD lamp will be off if ST2/ST2E card is still converging on new input reference.	Check input reference connections at the shelf and source ends. Reconnect if required. Isolate and repair input reference A or B facility (one associated with the input card displaying a lit FAIL lamp).
	Input card A or B has failed. Note: ST2/ST2E card's LOCKED/LKD lamp will be off if ST2/ST2E card is still converging on new input reference.	Replace the input card with the FAIL lamp lit (Chart 1).
	The input reference facility framing format rearranged from D4 to ESF, or vice versa, and the input card options were not changed to match it.	Change the option switch settings to match the current framing format of the input reference facilities.
	The input reference has been recently reasigned, and the signal amplitude is too high.	Wire a 100 ohm, 1/4 watt resistor across T and R input terminals on the shelf backplane.
10	Input reference facility (A and/or B) line coding rearranged from AMI to B8ZS and input card(s) option switches were not set to match the change. Input card BPV spec periodically exceeded.	Change input card(s) option switch settings from AMI to B8ZS.
11	ST2 /ST2E A or B card has failed	Replace failed ST2/ST2E card (Chart 5 or Chart 6)

Table D. Input and ST3E Alarm Conditions (DCD-400, DCD-ST2 or DCD-CIM Master Shelf )

AI/FA LAMPS (NOTE 1)	ABNORMAL CARD LAMPS	ACTIVATED OFFICE ALARMS AND SHELF STATUS (NOTE1)	ACTIVATED CLOCK STATUS A AND B (DCD-ST2 SHELF ONLY)	CONDITION TYPE # (NOTE 2)
None lit	ST3E A and/or ST3E B = Only FREE RUN and ACTIVE lit	None	ST A = LOCKED and FREERUN <b>and/or</b> ST B = LOCKED and FREERUN	1
None lit	ST3E A and/or ST3E B = LOCKED off	None	ST A = LOCKED <b>and/or</b> ST B = LOCKED	2
MAJOR and MINOR lit	Input cards A and B = FAIL lit, frequency/bit rate lamp off, SR FL lit (ACI only) ST3E A and B = FREE RUN flashing, ACTIVE and LOCKED are off ALL TOxA = FAIL lit, ST and INPUT off. Option lamps are all off or all on MCA/MCA-2 = 10 PORT ALM lit	Audible and Visual = MAJOR and MINOR Shelf Status = MAJSI, MINSI, and CLKL	ST A = LOCKED and FREERUN flashing <b>and/or</b> ST B = LOCKED and FREERUN flashing	3
MINOR lit	ST3E A and B = INP TOL and HOLD OV lit, LOCKED off	Audible and Visual = MINOR Shelf Status = MINSI and CLKL (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MIN and SW1, position 5 on each ST3E set to MIN)	ST A = INPUT TOL, HOLDOVER, and LOCKED <b>and</b> ST B = INPUT TOL, HOLDOVER, and LOCKED	4
MINOR lit	ST3E A or B = INP TOL and HOLD OV lit, LOCKED off	Audible and Visual = MINOR Shelf Status = MINSI and CLKL (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MAJ or MIN and SW1, position 5 on each ST3E set to MIN)	ST A = INPUT TOL, HOLDOVER, and LOCKED <b>or</b> ST B = INPUT TOL, HOLDOVER, and LOCKED	5
MINOR lit	Input cards A and B = FAIL lit, frequency/bit rate lamp off, SR FL lit (ACI only) ST3E A and B = HOLD OV lit, LOCKED and REF A and B off	Audible and Visual = MINOR Shelf Status = MINSI and CLKL (HOLDOVER ALARM switch SW11 on backplane set to MIN and SW1, position 5 on each ST3E set to MIN)	ST A = LOCKED and HOLDOVER <b>and</b> ST B = LOCKED and HOLDOVER	6
MINOR lit	Input cards A or B= FAIL lit, frequency/bit rate lamp on or off, SR FL lit (ACI only) ST3E A and B = possibly LOCKED off	Audible and Visual = MINOR Shelf Status = MINSI and CLKL	ST A = possibly LOCKED <b>and</b> ST B = possibly LOCKED	7

Table D. Input and ST3E Alarm Conditions (DCD-400, DCD-ST2 or DCD-CIM Master Shelf ) (Contd)

AI/FA LAMPS (NOTE 1)	ABNORMAL CARD LAMPS	ACTIVATED OFFICE ALARMS AND SHELF STATUS (NOTE1)	ACTIVATED CLOCK STATUS A AND B (DCD-ST2 SHELF ONLY)	CONDITION TYPE # (NOTE 2)
MINOR periodically lights, then goes off	Input card A and/or B = FAIL periodically goes on and off. First occurrence only the SRC ACT/SRC ACTIVE on FAIL card goes off and lights on the other card. ST3E A and/or B = First occurrence, REF A and/or B change to the other REF lamp and possibly LOCKED off	Audible and Visual = Periodic MINOR Shelf Status = Periodic MINSI and CLKL (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MAJ or MIN)	ST A = First occurrence LOCKED <b>and/or</b> ST B = First occurrence LOCKED	8
MAJOR lit	ST3E A or B = FAIL lit. LOCKED and possibly REF A and B off	Audible and Visual = MAJOR Shelf Status = MAJSI	ST A = LOCKED <b>or</b> ST B = LOCKED	9
MAJOR and MINOR lit	ST3E A and B = INP TOL and HOLD OV lit, LOCKED off	Audible and Visual = MAJOR and MINOR Shelf Status = MAJSI, MINSI, and CLKL (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MAJ and SW1 position 5 on each ST3E set to MAJ)	ST A = INPUT TOL, HOLDOVER, and LOCKED <b>and</b> ST B = INPUT TOL, HOLDOVER, and LOCKED	4
MAJOR and MINOR lit	ST3E A or B = INP TOL and HOLD OV lit, LOCKED off	Audible and Visual = MAJOR and MINOR Shelf Status = MAJSI, MINSI, and CLKLI (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MAJ and SW1 position 5 on each ST3E set to MAJ)	ST A = INPUT TOL, HOLDOVER, and LOCKED <b>or</b> ST B = INPUT TOL, HOLDOVER, and LOCKED	5
MAJOR and MINOR lit	Input cards A and B = FAIL lit, frequency/bit rate lamp off, SR FL lit (ACI only) ST3E A and B = HOLD OV lit, LOCKED and REF A and B off	Audible and Visual = MAJOR and MINOR Shelf Status = MAJSI, MINSI, and CLKL (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MAJ and SW1 position 5 on each ST3E set to MAJ)	ST A = LOCKED and HOLDOVER <b>and</b> ST B = LOCKED and HOLDOVER	6

## Notes:

1. If SW1 position 5 on either ST3E card is set for MAJ, it will cause MAJOR and MINOR alarm conditions when its HOLD OV lamp is lit, regardless of the setting (MAJ or MIN) of the HOLDOVER ALARM switch SW11 on the DCD-ST2 backplane. Both ST3E cards' SW1 switches and SW11 on the DCD-ST2 backplane must be set to MIN to cause only a MINOR alarm condition when the ST3E card's HOLD OV lamp is lit. If both ST3E cards are set to MIN, and the DCD-ST2 backplane SW11 is set to MAJ, then both ST3E cards' HOLD OV lamp must be lit to cause a MAJOR alarm condition.
2. Refer to Table E for the corrective action to take for each condition type.

Table E. Input and ST3E Corrective Actions (DCD-400, DCD-ST2 or DCD-CIM Master Shelf)

CONDITION TYPE # (FROM TABLE D)	CONDITION AND PROBABLE CAUSE	CORRECTIVE ACTIONS
1	No input cards installed. Outputs are as accurate as the freerunning clock cards.	Install at least one input card (Chart 2).
2	In a 10 second period to 5 minute, the input reference has drifted out of spec. ST3E is trying to reconverge and lock to the input reference. If successful, its LOCKED lamp will light. If not, it will try to converge until its pull-in range is exceeded, which causes the INPUT TOL alarm and enters HOLD OVER mode (CONDITION TYPE #4). Does not affect outputs.	<p>May have been a phase transient on input reference. Wait 5 to 20 minutes to see if the ST3E card's LOCKED lamp lights. If not, isolate and repair input reference facility.</p> <p>If the ST3E has been installed for less than 6 hours, then wait for the ST3E to fully converge on the input reference. During this period, the LOCKED lamp may go on and off several times.</p>
3	Input reference A and B failed, and the ST3E A and B clock cards have recently (5 to 35 minutes) been removed and then reseated. All outputs are squelched.	<p>Check input reference connections at the shelf and source ends. Reconnect if required. Isolate and repair input reference facilities, if required.</p> <p>Wait for ST3E A and B to stabilize and come online.</p>
4	The active input reference has excessive jitter, wander, or severe frequency offset (out of pull-in range of ST3E cards). Does not affect outputs for several hours. Outputs are as accurate as clock in holdover mode.	<p>Press the transfer (XFR) pushbutton on either input card to switch source (SRC) active to the other input card (SRC ACT/SRC ACTIVE lamp goes off on one input card and lights on the other). Then observe the INP TOL and HOLD-OVER lamps and perform one of the following:</p> <ol style="list-style-type: none"> <li>1. If the INP TOL and HOLDOVER lamps on the ST3E cards go off in approximately 2 minutes, then isolate and repair input reference facility, and/or replace the previously active input card (Chart 1 and/or Chart 2).</li> <li>2. If the INP TOL and HOLDOVER lamps do not go off in approximately 2 minutes, then isolate and repair both input reference facilities, and/or replace both input cards (Chart 1 and/or Chart 2).</li> </ol>

Table E. Input and ST3E Corrective Actions (DCD-400, DCD-ST2 or DCD-CIM Master Shelf )

CONDITION TYPE # (FROM TABLE D)	CONDITION AND PROBABLE CAUSE	CORRECTIVE ACTIONS
5	One of the ST3E cards is not functioning properly. Outputs are off frequency if the ST3E A is not functioning properly.	Trial and error; replace ST3E cards one at a time (Chart 4). Hint: If no network elements (NE) being timed from DCD outputs are not reporting slips, then replace ST3E B first. If NEs are reporting slips, then replace ST3E A first.
6	Both A and B input references have failed.	Check input reference connections at the shelf and source ends. Reconnect if required. Isolate and repair input reference facilities, if required.
	The input reference facility framing format rearranged from D4 to ESF, or vice versa, and the input card options were not changed to match it.	Change the option switch settings to match the current framing format of the input reference facilities.
	The input reference has been recently reassigned, and the signal amplitude is too high.	Wire a 100 ohm, 1/4 watt resistor across T and R input terminals on the shelf backplane.
	Both input cards have failed.	Replace both input cards (Chart 1).
7	Input reference A or B has failed (frequency/bit rate lamp off) or has exceeded BPV, OOF, or excessive zeros parameters (frequency/bit rate lamp lit). Note: ST3E card's LOCKED lamp will be off if ST3E card is still converging on new input reference.	Check input reference connections at the shelf and source ends. Reconnect if required. Isolate and repair input reference A or B facility (one associated with the input card displaying a lit FAIL lamp).
	Input card A or B has failed. Note: ST3E card's LOCKED lamp will be off if ST3E card is still converging on new input reference.	Replace the input card with the FAIL lamp lit (Chart 1).
	The input reference facility framing format rearranged from D4 to ESF, or vice versa, and the input card options were not changed to match it.	Change the option switch settings to match the current framing format of the input reference facilities.
	The input reference has been recently reassigned, and the signal amplitude is too high.	Wire a 100 ohm, 1/4 watt resistor across T and R input terminals on the shelf backplane.
8	Input reference facility (A and/or B) line coding rearranged from AMI to B8ZS and input card(s) option switches were not set to match the change. Input card BPV spec periodically exceeded.	Change input card(s) option switch settings from AMI to B8ZS.
9	ST3E A or B card has failed. Outputs are not affected.	Replace failed ST3E card (Chart 4).

Table F. Input and ST3 Alarm Conditions  
DCD-400, DCD-ST2 or DCD-CIM Master Shelf

<b>AI/FA LAMPS</b>	<b>ABNORMAL CARD LAMPS</b>	<b>ACTIVATED OFFICE ALARMS AND SHELF STATUS</b>	<b>ACTIVATED CLOCK STATUS A AND B (DCD-ST2 SHELF ONLY)</b>	<b>CONDITION TYPE # (NOTE)</b>
MAJOR and MINOR lit	ST3 A and B = FAIL, LOCK, and REF B lit	Audible and Visual = MAJOR and MINOR  Shelf Status = MAJSI, MINSI, and CLKL. (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane is set to MAJ or MIN)	None	1
MAJOR and MINOR lit	Input cards A and B = FAIL lit, frequency/bit rate lamp off, SR FL lit (ACI only) ST3 A and B = FAIL, LOCK, and REF B lit	Audible and Visual = MAJOR and MINOR  Shelf Status = MAJSI, MINSI, and CLKL. (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane is set to MAJ or MIN)	None	2
MINOR lit	Input card A or B = FAIL lit, frequency/bit rate lamp off or lit, SR FL lit (ACI only) ST3 A and B = REF (A or B) lamp lit (associated with input card with FAIL lamp off)	Audible and Visual = MINOR  Shelf Status = MINSI, and CLKL (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane is set to MAJ or MIN)	None	3
MINOR lit	ST3 A and B = LOCK lit	Audible and Visual = MINOR  Shelf Status = MINSI (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane is set to MAJ or MIN)	None	4
MINOR periodically lights, then goes off	Input card A and/or B = FAIL periodically goes on and off. First occurrence only the SRC ACT/SRC ACTIVE on FAIL card goes off and lights on the other card.	Audible and Visual = Periodic MINOR  Shelf Status = Periodic MINSI and CLKL (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane set to MAJ or MIN)	None	5
MAJOR lit	ST3 A or B = FAIL lit	Audible and Visual = MAJOR  Shelf Status = MAJSI (HOLDOVER ALARM switch SW11 on DCD-ST2 backplane is set to MAJ or MIN)	None	6

Note: Refer to Table G for the corrective action to take for each condition type.

Table G. Input and ST3 Corrective Actions (DCD-400, DCD-ST2 or DCD-CIM Master Shelf )

CONDITION TYPE # (FROM TABLE F)	CONDITION AND PROBABLE CAUSE	CORRECTIVE ACTIONS
1	No input cards installed. Outputs are as accurate as freerunning clock cards. Timed network elements reporting high slip rate.	Install at least one input card (Chart 2).
2	Input references A and B has failed (frequency/bit rate lamp off) or has exceeded BPV, OOF, or excessive zeros parameters (frequency/bit rate lamp lit).	Check input reference connections at the shelf and source ends. Reconnect if required. Isolate and repair input reference facilities, if required.
	The input reference facility framing format rearranged from D4 to ESF, or vice versa, and the input card options were not changed to match it.	Change the option switch settings to match the current framing format.
	The input reference has been recently re-assigned, and the signal amplitude is too high.	Wire a 100 ohm, 1/4 watt resistor across T and R input terminals on the shelf back-plane.
	Both input cards have failed.	Replace both input cards (Chart 1).
3	Input reference A or B has failed (frequency/bit rate lamp off) or has exceeded BPV, OOF, or excessive zeros parameters (frequency/bit rate lamp lit).	Check input reference connections at the shelf and source ends. Reconnect if required. Isolate and repair input reference A or B facility (if required).
	Input card A or B has failed.	Replace the input card with the FAIL lamp lit (Chart 1).
	The input reference facility framing format rearranged from D4 to ESF, or vice versa, and the input card options were not changed to match it.	Change the option switch settings to match the current framing format.
	The input reference has been recently re-assigned, and the signal amplitude is too high.	Wire a 100 ohm, 1/4 watt resistor across T and R input terminals on the shelf back-plane.

Table G. Input and ST3 Corrective Actions (DCD-400, DCD-ST2 or DCD-CIM Master Shelf ) (Contd)

CONDITION TYPE # (FROM TABLE F)	CONDITION AND PROBABLE CAUSE	CORRECTIVE ACTIONS
4	Active input reference has exceeded pull-in range of ST3 cards. Timed network elements reporting high slip rate.	Press transfer (XFR) pushbutton on either input card to switch SRC (source) ACTIVE lamp to the other input card. ST3 A and B LOCK lamps go off in less than 40 seconds. Isolate source of frequency offset on input reference facility and repair.
5	Input reference facility (A and/or B) line coding rearranged from AMI to B8ZS and input card(s) option switches were not set to match the change. Input card BPV spec periodically exceeded.	Change input card(s) option switch settings from AMI to B8ZS.
6	ST3 A or B card has failed and squelched its outputs. Outputs are receiving their reference from the ST3 with its FAIL lamp off. Outputs are not affected.	Replace the ST3 card (A or B) with the FAIL lamp lit (Chart 3).



**Table H. Shelf and Output Alarm Conditions (Not Related to Input and ST Conditions)**  
**All Shelves: Master or Expansion**

<b>A/FA LAMPS</b>	<b>ABNORMAL SHELF AND CARD LAMPS</b>	<b>ACTIVATED OFFICE ALARMS AND SHELF STATUS</b>	<b>ACTIVATED CLOCK STATUS A AND B (DCD-ST2 SHELF ONLY)</b>	<b>CONDITION TYPE # (NOTE)</b>
None lit	All lamps on all cards are off	Audible and Visual = MAJOR and MINOR Shelf Status = MAJSI, MINSI, and BATTALM (DCD-ST2 only)	None	1
MINOR lit	MCA/MCA-2 = All 10 PORT ALM lamps lit	Audible and Visual = MINOR Shelf Status = MINSI	None	2
MINOR lit	Any TOxA card = PORT ALM lit Output protection pushbutton lamps = Lamp over TOxA card with PORT ALM lit, and like HS TOxA card light for a short period of time (approx 3 seconds) then goes off MCA/MCA-2 = AUTO lamp flashes for approx 6 seconds when HS protection switch is activated and released.	Audible and Visual = MINOR Shelf Status = MINSI and PRTA (SW1 positions 3 and 5 on MCA-2 set to MAJ or MIN)	None	3
MAJOR lit	Shelf fuse A or B = Lamp lit	Audible and Visual = MINOR Shelf Status = MINSI, and BATTALM (DCD-ST2 only). POWER ALARM switch SW11 on DCD-ST2 backplane is set to MIN)	None	4
MAJOR lit	Any TOxA, ST, or MCA-2	Audible and Visual = MAJOR Shelf Status = MAJSI (MCA-2 SW1, positions 3 and 5 set to MAJ)	None	5
MAJOR and MINOR lit	Shelf fuse A or B = Lamp lit	Audible and Visual = MAJOR Shelf Status = MAJSI, MINSI, and BATTALM (DCD-ST2 only). (POWER ALARM switch SW11 on DCD-ST2 backplane is set to MAJ)	None	4
MAJOR and MINOR lit	Any TOxA card = FAIL lamp lit Output protection pushbutton lamp = Lamps lit over TOxA with FAIL lamp lit and like HS TOxA card (HS protection switch activated).	Audible and Visual = MAJOR and MINOR Shelf Status = MAJSI and MINSI (MCA-2 SW1, positions 3 and 5 set to MIN)	None	5

Table H. Shelf and Output Alarm Conditions (Not Related to Input and ST Conditions)  
All Shelves: Master or Expansion (Contd)

AI/FA LAMPS	ABNORMAL SHELF AND CARD LAMPS	ACTIVATED OFFICE ALARMS AND SHELF STATUS	ACTIVATED CLOCK STATUS A AND B (DCD-ST2 SHELF ONLY)	CONDITION TYPE # (NOTE)
MAJOR and MINOR lit or MINOR lit or None lit (MAJOR and MINOR lit if MCA-2 SW1, positions 3 and 5 set to MAJ; if SW1 set to MIN, then MIN lit; if set to NO ALARM, then None lit)	Output protection pushbutton lamps = Lamps over TOxA cards and HS cards alternately light and then go off.	Audible and Visual = MAJOR and MINOR or MINOR or None Shelf Status = MAJSI and MINSI. or MINSI or None (MAJOR and MINOR if MCA-2 card SW1 set to MAJ; MINOR if SW1 set to MIN; none if SW1 set to NO ALARM)	None	6
MINOR lit or MAJOR and MINOR lit  (MINOR if MCA-2 SW1, positions 3 and 5, are set to MIN or NO ALARM; MAJOR and MINOR lit if set to MAJ)	Any TOxA card = PORT ALM lit Output protection pushbutton lamps = Lamps lit over TOxA card with PORT ALM lit, and like HS TOxA card.	Audible and Visual = MINOR or MAJOR and MINOR Shelf Status = MINSI and PRTA or MAJSI, MINSI, and PRTA (MINOR if SW1 positions 3 and 5 on MCA-2 set to MIN or NO ALARM; MAJOR and MINOR if set to MAJ)	None	7

Table H. Shelf and Output Alarm Conditions (Not Related to Input and ST Conditions)  
All Shelves: Master or Expansion (Contd)

AI/FA LAMPS	ABNORMAL SHELF AND CARD LAMPS	ACTIVATED OFFICE ALARMS AND SHELF STATUS	ACTIVATED CLOCK STATUS A AND B (DCD-ST2 SHELF ONLY)	CONDITION TYPE # (NOTE)
MINOR lit or MAJOR lit or None lit (MINOR lit if MCA-2 SW1, positions 3 and 5 set to MIN; if SW1 set to MAJ, then MAJOR is lit; if set to NO ALARM, then None lit)	Output protection pushbutton lamps = Lamps lit over a TOxA card and like HS TOxA cards MCA-2 = MAN lamp is flashing	Audible and Visual = MAJOR or MINOR or None Shelf Status = MINSI or MAJSI or None (MINOR lit if MCA-2 SW1, positions 3 and 5 set to MIN; if SW1 set to MAJ, then MAJOR is lit; if set to NO ALARM, then None lit)	None	8
Note: Refer to Table I for the corrective action to take for each condition type.				

**Table I. Shelf and Output Corrective Actions  
(Not Related to Input and ST Conditions)  
All Shelves: Master and Expansion**

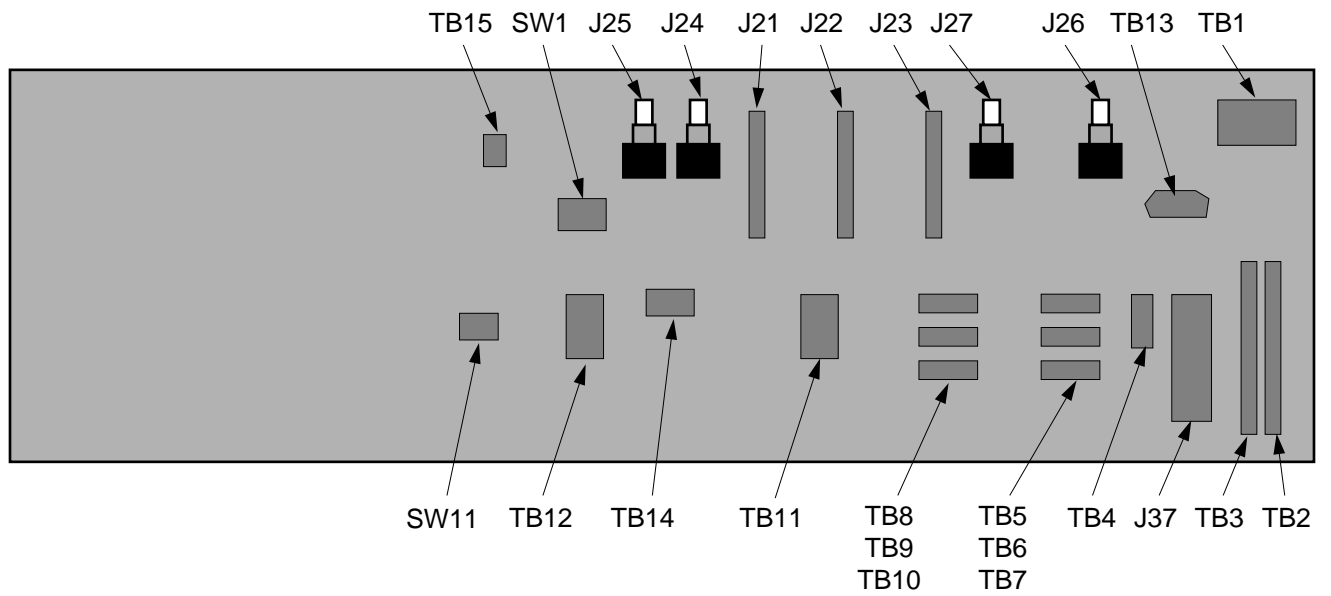
<b>CONDITION TYPE # (FROM TABLE H)</b>	<b>CONDITION AND PROBABLE CAUSE</b>	<b>CORRECTIVE ACTIONS</b>
1	Loss of Battery A and B to shelf. All outputs are squelched. Causes could be from operating error, office battery source failure, blown fuses, or a component failure, e.g., isolation diode which shorts battery to battery return.	<ol style="list-style-type: none"> <li>1. Determine cause of loss of battery and repair.</li> <li>2. Restore office battery source.</li> <li>3. Replace blown fuses in battery distribution bays, miscellaneous fuse bays, and panels, and/or on DCD shelf.</li> </ol>
2	Communication between MCA/MCA-2 and TOxA cards is not functioning. Microprocessor on the MCA/MCA-2 is failed or garbled. Does not affect outputs. Automatic TOxA protection switching function disabled. Manual TOxA protection switching function is still operational.	<ol style="list-style-type: none"> <li>1. No TOxA cards in shelf. Install at least one TOxA card.</li> <li>2. No input references or input cards, <i>and</i> no clock cards installed. Install at least one clock (ST) card (Chart 3, Chart 4, Chart 5, or Chart 6).</li> <li>3. MCA/MCA-2 communications bus or microprocessor garbled. Remove and reinsert the MCA/MCA-2 card to clear bus and microprocessor.</li> <li>4. MCA/MCA-2 microprocessor failed. Replace MCA/MCA-2 card (Chart 9).</li> </ol>

**Table I. Shelf and Output Corrective Actions  
(Not Related to Input and ST Conditions)  
All Shelves: Master and Expansion (Contd)**

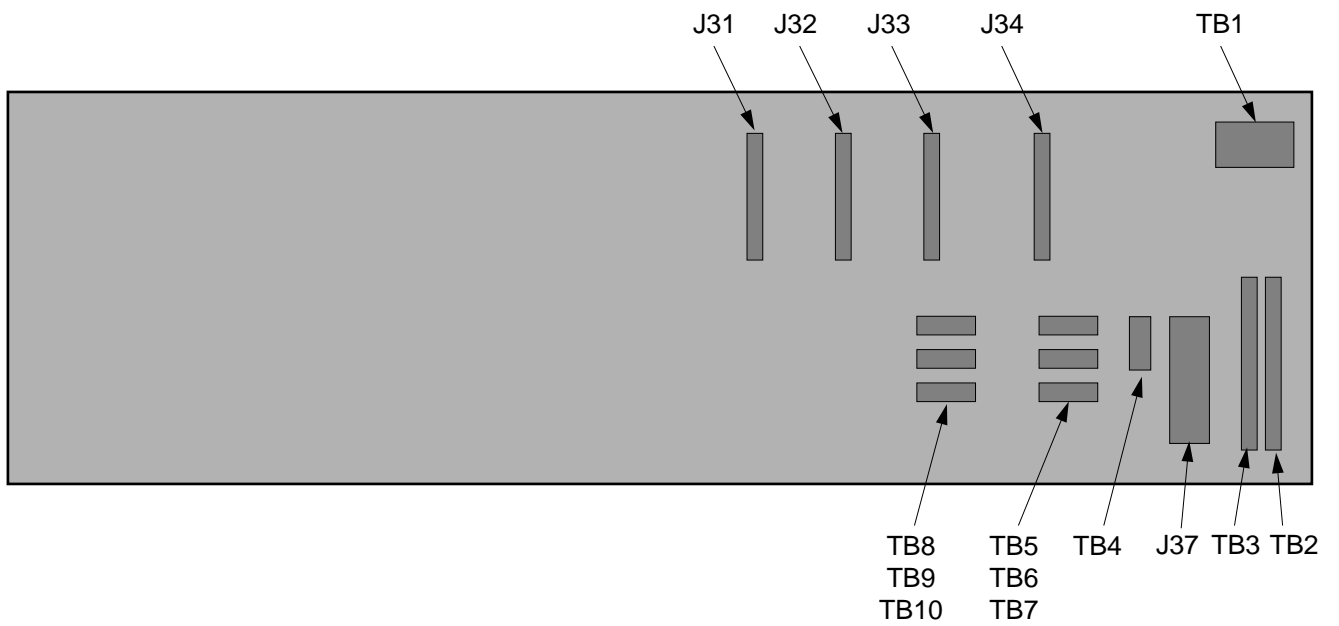
<b>CONDITION TYPE # (FROM TABLE H)</b>	<b>CONDITION AND PROBABLE CAUSE</b>	<b>CORRECTIVE ACTIONS</b>
3	<p>HS protection switch activated, then released because of:</p> <ul style="list-style-type: none"> <li>• Unterminated cable on TOTA output,</li> <li>or,</li> <li>• Shorted cable on TOxA output.</li> </ul> <p>When the condition occurred, a HS protection switch was activated, PORT ALM on TOxA goes off, and lights on the HS TOxA card, output protection pushbutton lamps over the TOxA and HS light, MCA/MCA-2 AUTO lamp flashes, HS protection switch releases, PORT ALM on HS TOxA goes off and lights on TOxA, output protection pushbutton lamps go off, and MCA/MCA-2 AUTO lamp stops flashing (duration = 3 to 6 seconds). Non-failed ports on TOxA with PORT ALM lit lost output for one millisecond during HS protection switch activation and release. Failed TOxA port is out of service.</p>	<ol style="list-style-type: none"> <li>1. Press and hold the output protection pushbutton over the TOxA card with PORT ALM lamp lit. MCA/MCA-2 lights PORT ALM lamp(s) of failed TOxA port. Release pushbutton.</li> <li>2. Isolate and repair cable or NE connected to that TOxA port.</li> <li>3. If port connection is new and not yet terminated at NE, then either insert disabling pin in that port's disabling jack on TOxA card faceplate, or remove cable from output wire-wrap panel, or place an appropriate resistor termination across tip (T) and ring (R) of cable at NE end, until ready to connect cable at NE end.</li> </ol>

**Table I. Shelf and Output Corrective Actions  
(Not Related to Input and ST Conditions)  
All Shelves: Master and Expansion (Contd)**

<b>CONDITION TYPE # (FROM TABLE H)</b>	<b>CONDITION AND PROBABLE CAUSE</b>	<b>CORRECTIVE ACTIONS</b>
4	Loss of Battery A or B to shelf. Does not affect outputs. Causes could be from operating error, blown fuse, or a component failure, e.g., isolation diode which shorts battery to battery return.	<ol style="list-style-type: none"> <li>1. Determine cause of loss of battery and repair.</li> <li>2. Replace blown fuses in battery distribution bays, miscellaneous fuse bays, and panels, and/or on DCD shelf.</li> </ol>
5	Card with FAIL lamp lit has failed, except for input card which causes a MINOR alarm when its FAIL lamp lights. Outputs are not affected if MCA/MCA-2 and HS slots are equipped.	Replace the card with the FAIL lamp lit (Chart 7 and/or Chart 8). Release HS protection switch, if activated, by pressing lit HS pushbutton until switch releases.
6	A TOxA card's microprocessor has lost its ability to process data. The TOxA cards are alternately being switched to HS protection and then released. One millisecond loss of outputs each time a TOxA is switched to or released from HS protection.	Manually switch each TOxA card to the HS, replace the TOxA card (Chart 7) and release the HS switch. Continue until the malfunctioning TOxA card is located and removed from the shelf.
7	<p>Output port failed on TOxA card with PORT ALM lamp lit. HS protection switch activated. Loss of output on failed port. Other output on same TOxA lost for one millisecond when HS protection switch activated.</p> <p>When condition occurred, a HS protection switch was activated, PORT ALM lamp on TOxA card remained lit, output protection pushbutton lamps over TOxA and HS slots lit, and MCA/MCA-2 card's AUTO lamp flashes for 6 seconds and then lights steady.</p>	<ol style="list-style-type: none"> <li>1. Press and hold the output protection pushbutton over the TOxA card with the PORT ALM lamp lit. MCA/MCA-2 lights PORT ALM lamp(s) of failed TOxA port. Release pushbutton.</li> <li>2. Remove TOxA card with PORT ALM lamp lit.</li> <li>3. Set option switch settings on the replacement TOxA card identical to settings on removed TOxA card.</li> <li>4. Insert replacement TOxA card in shelf slot and wait 10 seconds for TOxA to warm-up. Verify ST, INPUT and OPTION lamps are lit and PORT ALM and/or FAIL lamps are not lit.</li> <li>5. Press output protection pushbutton over HS TOxA until pushbutton lamps go out (releases HS switch). MCA/MCA-2 card's AUTO lamp flashes for 6 seconds and then lights steady.</li> </ol>
8	TOxA card manually switched to HS TOxA card	Release the manual HS switch by pressing for 3 seconds, the lit pushbutton over the HS TOxA card.



(a)  
DCD-400, DCD-CIM Shelves



(b)  
DCD-ST2 Shelf

Figure 1. Rear View of Shelves

#### 4. CARD REPLACEMENT PROCEDURES

4.01 Each card in the system, except for the AI and FA cards, has a FAIL lamp on its front panel. This lamp lights when the power supply or the microprocessor on the card has failed. When a card's FAIL lamp is lit, its output is squelched and it may be removed from the shelf without negative effect to the shelf's operation.

**Note:** Always use the Alarm Conditions tables (Table B, Table D, Table F, and Table H) to isolate the source of the trouble before removing or replacing cards.

**Caution:** *Reseating cards in attempts to clear alarms is not a recommended course of action. This action may cause loss of ALL timing in the office.*

**Note:** If a replacement card does not clear the trouble symptom, remove the replacement card and install the original card, after reverifying its option switch settings.

**Note:** When removing or replacing a card, do not "drag" it in or out slowly.

**Note:** When a replacement card is inserted, verify that its FAIL lamp does not light. If its FAIL lamp lights, it is defective and should be replaced with another card.

4.02 Refer to Chart 1 through Chart 10 for instructions on card replacement.

##### A. Clock Input Cards

4.03 Refer to Chart 1 and Chart 2 for clock input card replacement procedures.

##### B. Clock Cards

4.04 Never remove both clock cards at the same time if their HOLD OV/HOLDOVER or FREE RUN lamps are lit. This action will cause ALL DCD system outputs to fail. Swapping clock cards that are not in holdover mode or freerun mode may cause hits on the outputs. Always use the Alarm Conditions tables (Table B, Table D, Table F, and Table H) to properly isolate the trouble condition before attempting to fix the trouble by card replacement.

4.05 Refer to Chart 3 through Chart 6 for recommended procedures for replacing clock cards.

##### C. Output Cards

###### TOxA (Protected) Cards

4.06 Refer to Chart 7 for recommended procedures for replacing TOxA cards.

###### SCIU Card

4.07 Refer to Chart 8 for instructions on replacing the SCIU card.

##### D. MCA/MCA-2 and AI/FA Cards

###### MCA-2 Card

4.08 Refer to Chart 9 for instructions on replacing the MCA/MCA-2 card.

###### AI/FA Cards

4.09 Refer to Chart 10 for instructions on replacing the AI/FA card.



Chart 1. Failed CI/ACI Card Replacement

STEP	PROCEDURE
	Use this procedure to replace a failed CI or ACI clock input card in shelves equipped with ST2, ST2E or ST3E clock cards, whether or not the CI/ACI card FAIL lamp is lit, also for shelves equipped with ST3 clock cards and the CI or ACI card FAIL lamp is lit.
1	Press the ACO pushbutton on the AI/FA card to silence the office audible alarm, if the shelf is in alarm.
2	<p>If the shelf is equipped with ST3E cards and the CI/ACI card FAIL lamp is not lit, check the status of the SRC ACT/SRC ACTIVE lamp. If lit, press the transfer (XFR) pushbutton on either CI/ACI card. If the CI/ACI card's FAIL lamp is lit, regardless of the type of ST card in the shelf, then proceed to the next step.</p> <p><b>Requirement:</b> The SRC ACT/SRC ACTIVE lamp on the other CI/ACI card lights and its lamp goes off.</p>
3	Remove the failed card or the card to be removed from the shelf.
4	Set option switches on the replacement card like the removed card and insert it in the shelf. Wait for the CI/ACI card to acquire the input reference signal (8 to 40 seconds). Then, if desired, press the XFR pushbutton to make the new CI/ACI card active, if in a shelf equipped with ST3/ST3E clock cards.

Chart 2. Non-failed CI/ACI Card Replacement

STEP	PROCEDURE
	<p>Use this procedure to replace non-failed CI/ACI cards which have valid input reference signals and the shelf is equipped with ST3 clock cards, to prevent phase movements (hits) on the outputs.</p> <p><b>Caution: Removing a non-failed CI/ACI card with a valid input reference signal from a shelf equipped with ST3 cards will cause the DCD system's outputs to run and hit all the network elements (NE) timed from the DCD system. To properly remove a non-failed CI/ACI card, the input reference must be removed first, which squelches the CI/ACI card's output. This does not apply to failed CI/ACI cards, since their outputs are already squelched.</b></p>
1	<p>Remove the input reference signal to the shelf associated with the CI/ACI card to be removed. Perform one of the following:</p> <ol style="list-style-type: none"> <li>a. If the reference input has a miscellaneous SYNC jack at the DSX-1, then insert an open plug or the end of a patch cord in the SYNC jack to kill the input reference signal.</li> <li>b. If the input reference has an external bridging repeater, then insert an open plug or the end of a patch cord in the OUT jack at the bridging repeater to kill the input reference signal.</li> <li>c. If the input reference signal is directly cabled from the source to the DCD shelf, then either lift the leads off the input A (TB5, TB6, or TB7) or input B (TB8, TB9, or TB10) wire-wrap terminals on the backplane of the DCD shelf, or short the tip (T) and ring (R) together of input A or input B on the backplane using a clip cord that is no longer than 2 inches.</li> </ol> <p><b>Caution: A clip cord longer than 2 inches may not look like a short to the CI/ACI card and the input reference may continue to drive it.</b></p> <p><b>Requirement:</b> The DS1 lamp is off and the FAIL lamp is lit on the CI card, or the SRC FAIL and INPUT FAIL lamps are lit red on the ACI card.</p> <p><b>Note:</b> Do not proceed if the requirements have not been met. This is an indication that the input reference has not been properly removed.</p>
2	Remove the CI/ACI card. Removal at this time has no effect on the DCD shelf's outputs.
3	<p>Set the option switches on the replacement card like the removed card and insert it in the shelf.</p> <p><b>Requirement:</b> The DS1 lamp is off and the FAIL lamp is lit on the CI card, or SRC FAIL and INPUT FAIL lamps are lit red on the ACI card.</p>
4	Restore the input reference by removing the open plug, clip cord, or reconnecting the leads to input A or input B wire-wrap terminals on the DCD shelf backplane.
5	Wait for the input card to acquire the input reference signal (8 to 40 seconds). Then, if desired, press the XFR pushbutton to make the new CI/ACI card active.

Chart 3. ST3 Card Replacement

STEP	PROCEDURE
	<p>Use this procedure to replace ST3 cards. The only time an ST3 card should be replaced is if its FAIL lamp is lit, or if it is in the ST A slot and its LOCK or LOCK and FAIL lamps are not lit and the network elements (NE) being timed from the shelf are reporting slips. The second condition is questionable because the problem is probably a timing loop and not a bad ST3 card.</p> <p><b>Note:</b> The ST3 in the B slot (ST B) in shelves equipped with ST3 clock cards may be removed from the shelf without negative effect to the outputs, regardless if the ST3 is failed or not. If an ST3 is installed and not failed in the A slot (ST A), it is the preferred source to the output cards and may cause a hit on the outputs when it is removed from the shelf.</p>
1	<p>Press the ACO pushbutton on the AI/FA card to silence the office audible alarm, if the shelf is in alarm.</p>
2	<p>Remove the ST3 card from the shelf.</p> <p><b>Requirement:</b> If it is in the ST A slot and not failed, the ST B clock card will automatically become the preferred source for the outputs. The TOxA cards' ST and INPUT lamps should remain lit green.</p> <p><b>Note:</b> There may be a one-time phase hit to the outputs if a non-failed ST A card is removed. If ST A is failed, the ST B clock card is already the preferred source to the outputs. If ST B is being replaced, it is in standby and may be removed without negative effect to the outputs.</p>
3	<p>Insert the replacement card in the shelf. Lock it into place by rotating its locking lever downward.</p> <p><b>Requirement:</b> The FAIL lamp remains lit until it has acquired the frequency and phase of the input reference signal and then goes off (takes about 1 minute). If ST A was the replaced card it will automatically become the preferred source to the outputs when its FAIL and LOCK lamps go off. The TOxA cards' ST and INPUT lamps should remain lit.</p> <p><b>Requirement:</b></p> <p><b>Note:</b> If the other ST3 card is to be replaced also, the first ST3 card should be allowed five minutes to stabilize before replacing the second ST3 card.</p>

Chart 4. ST3E Card Replacement

STEP	PROCEDURE
	<p>Use this procedure to replace ST3E cards. The only time an ST3E card should be replaced is if its FAIL lamp is lit, or if it is in the ST A slot and its LOCKED and ACTIVE lamps are lit and the network elements (NE) being timed from the shelf are reporting slips. The last condition is questionable because the problem is probably a timing loop and not a bad ST3E card.</p> <p><b>Note:</b> The ST3E in the B slot (ST B) in shelves equipped with ST3E clock cards may be removed from the shelf without negative effect to the outputs, regardless if the ST3E is failed or not. If an ST3E is installed and not failed in the A slot (ST A), it is the preferred source to the output cards and may cause a hit on the outputs when it is removed from the shelf.</p>
1	<p>Press the ACO pushbutton on the AI/FA card to silence the office audible alarm, if the shelf is in alarm.</p>
2	<p>Remove the ST3E card from the shelf.</p> <p><b>Requirement:</b> If it is in the ST A slot and not failed, the ST B clock card will automatically become the preferred source for the outputs.</p> <p><b>Note:</b> There may be a one-time phase hit to the outputs if a non-failed ST A card is removed. If ST A is failed, the ST B clock card is already the preferred source to the outputs. If ST B is being replaced, it is in standby and may be removed without negative effect to the outputs.</p>
3	<p>Set the option switches on the replacement card like the removed card.</p>
4	<p>Insert the replacement ST3E in the shelf and lock it into place by rotating its lock lever downward.</p> <p><b>Requirement:</b> The FREE RUN lamp flashes for 30 minutes during the warm-up (stabilization) period.</p> <p><b>Requirement:</b> Upon completion of the stabilization period, the FREE RUN lamp stops flashing and goes off, and either REF A or REF B lamp lights (depending on which clock input card is the active input). This indicates that the ST3E has recognized a valid input reference signal from the clock input card and is converging on the input reference.</p> <p><b>Note:</b> If the ST3E does not recognize the input reference signal as valid it will enter its free run mode, its FREE RUN and ACTIVE lamps light solid and REF A and REF B will be off.</p> <p><b>Requirement:</b> After a REF lamp lights (5 to 20 minutes), the LOCKED lamp lights, indicating the card is within lock range of the input reference.</p> <p><b>Requirement:</b> Approximately 0.5 to 2 hours after insertion in the shelf (the time depends on the stability of the input reference), the ACTIVE lamp lights. If ST A was the replaced card it will automatically become the preferred source to the outputs when its ACTIVE lamp lights. It may take up to 6 hours for the ST3E to completely converge on the input reference. During this period its LOCKED lamp may go off and on several times as part of the converging process.</p> <p><b>Note:</b> If the other ST3E card is to be replaced also, the first ST3E card should be allowed six hours to stabilize before replacing the second ST3E card.</p>

Chart 5. ST2 Card Replacement

STEP	PROCEDURE
	<p>Use this procedure to replace ST2 cards. The only time an ST2 card should be replaced is when its FAIL lamp is lit, or its REF lamp is flashing (indicating maintenance is required within 180 days), or its LOCKED, ACTIVE and REF (A or B) lamps are lit and the network elements (NE) being timed from the shelf are reporting slips. The last condition is questionable because the problem is probably a timing loop and not a bad ST2 card.</p> <p><b>Note:</b> Ensure that the ST2 card needs to be replaced because the replacement ST2 requires one hour to warm-up and up to two hours to stabilize.</p>
1	<p>Press the ACO pushbutton on the AI/FA card to silence the office audible alarm, if the shelf is in alarm.</p>
2	<p>Verify that the input references meet ANSI T1.101 ST2 or better specifications, and both clock input cards are installed and functioning properly with both card's SRC ACTIVE lamps lit. Ensure that the SHELF MODE switch (ST2/ST3) SW1 on the shelf backplane is set to ST2.</p>
3	<p>Remove the upper and lower securing screws from the front panel of the ST2. Remove the ST2 card from the shelf.</p> <p><b>Warning:</b> <i>The ST2 card is heavier than a normal card, and must be supported with both hands during installation and removal.</i></p> <p><b>Requirement:</b> If the ST2 card's FAIL lamp was lit, then the alarm lamp on the AI/FA should go off in 10 seconds after the ST2 card is removed.</p>
4	<p>Insert the replacement ST2 in the shelf and lock it into place by rotating its lock lever downward. Secure into place by installing the upper and lower securing screws.</p> <p><b>Requirement:</b> The FREE RUN lamp flashes for 40 minutes to an hour during the warm-up (stabilization) period. Upon completion of the stabilization period, the FREE RUN lamp stops flashing and goes off, and either REF A or REF B lamp lights (depending on which clock input card is its active input). This indicates that the ST2 has recognized a valid input reference signal from its clock input card and is converging on the input reference.</p> <p><b>Note:</b> If the ST2 does not recognize the input reference signal as valid it will enter its free run mode, its FREE RUN lamp lights steady and REF A and REF B will be off.</p> <p><b>Requirement:</b> 5 to 20 minutes after a REF lamp lights, the LOCKED lamp lights, indicating the card is within lock range of the input reference. The ST2 may be made active at this time, but an additional hour or two may be needed to completely converge on the input reference.</p> <p><b>Note:</b> If this is the only ST2 card in the shelf, then the XFR pushbutton on its front panel may need to be pressed to cause its ACTIVE lamp to light. If two ST2 cards are in the shelf, then the other ST2's ACTIVE lamp is already lit (only one ST2 is active at a time). If the LOCKED lamp does not light, then verify that the input reference is at least Stratum-2 quality and does not have excessive wander, jitter, phase movement, or frequency offset on it. If so, the input reference will have to be repaired or reassigned before proceeding.</p>
5	<p>Verify that the alarm (MAJOR or MINOR) and ACO lamps on the AI/FA card are off. If desired, press the XFR pushbutton on either ST2 card to make the new ST2 card active.</p>

Chart 6. ST2E Card Replacement

STEP	PROCEDURE
	<p>Use this procedure to replace ST2E cards. The only time an ST2E card should be replaced is when its FAIL or OSC lamp is lit red, or its OSC lamp is flashing green (indicating the oscillator requires factory maintenance), or its LKD (locked), ACTIVE and SRC (A or B) lamps are lit green and the network elements (NE) being timed from the shelf are reporting slips. The last condition is questionable because the problem is probably a timing loop and not a bad ST2E card.</p> <p>Do not replace the ST2E if its INP TOL (input tolerance) and/or HOLD OVER lamp(s) are lit red, since these are indications that the input reference has failed, has excessive errors, or has excessive jitter, wander, phase movement or frequency offset. In this case the input reference should be repaired or reassigned.</p> <p><b>Note:</b> The DSBL pushbutton does not function on the ST2E card installed in the ST B slot.</p>
1	<p>Press the ACO pushbutton on the AI/FA card to silence the office audible alarm, if the shelf is in alarm.</p>
2	<p>Verify that the input references meet ANSI T1.101 ST2 or better specifications, and both clock input cards are installed and functioning properly with both card's SRC ACTIVE lamps lit. The DRIFT lamp lit amber is one indication that the input reference does not meet specs. Ensure that the SHELF MODE switch (ST2/ST3) SW1 on the shelf backplane is set to the ST2 position.</p>
3	<p>Remove the upper and lower securing screws from the front panel of the ST2E to be removed. If the card to be replaced is in slot A (ST A), press the recessed DSBL (disable) pushbutton switch with a shorting pin or paper clip to disable the output of the card. Remove the card immediately.</p> <p><b>Requirement:</b> If the ST2E card's FAIL or OSC (red or flashing green) lamps were lit, then the alarm lamp on the AI/FA should go off in 10 seconds after the ST2E card is removed</p> <p><b>Caution:</b> <i>Do not press the DSBL pushbutton on the ST2E card unless it is to be removed from the shelf, since its output will be disabled for 10 to 20 minutes. Removing the ST2E A card without pressing the DSBL pushbutton first may cause hits on the timing outputs. Do not remove the ST2E B card when the ST2E A card has been disabled.</i></p> <p><b>Warning:</b> <i>The ST2E card is heavier than a normal card, and must be supported with both hands during installation and removal.</i></p>

Chart 6. ST2E Card Replacement (Contd)

STEP	PROCEDURE
4	<p>Insert the replacement ST2E in the shelf and lock it into place by rotating its lock lever downward. Secure into place by installing the upper and lower securing screws.</p> <p><b>Requirement:</b> The HOLD OVER lamp flashes for 30 minutes to an hour during the warm-up (stabilization) period. Upon completion of the stabilization period, the HOLD OVER lamp stops flashing and goes off, and either SRC A or SRC B lamp lights (depending on which clock input card is its active input). This indicates that the ST2E has recognized a valid input reference signal from its clock input card and is converging on the input reference.</p> <p><b>Note:</b> If the ST2E does not recognize the input reference signal as valid, it will enter its freerun mode, its HOLD OVER lamp lights steady green, the ACTIVE lamp lights, and SRC A and SRC B will be off.</p> <p><b>Requirement:</b> 5 to 20 minutes after a SRC lamp lights, the LKD and ACTIVE lamps light, indicating the card is within lock range of the input reference. It may take an additional hour or two for the ST2E to completely converge on the input reference.</p> <p><b>Note:</b> If the LKD lamp does not light, then verify that the input reference is at least Stratum-2 quality and does not have excessive jitter, wander, phase movement, or frequency offset on it. If so, the input reference will have to be repaired or reassigned before proceeding.</p>
5	Verify that the alarm (MAJOR or MINOR) and ACO lamps on the AI/FA card are off.

Chart 7. TOxA Card Replacement

STEP	PROCEDURE
	<p>A HS protection switch will automatically be activated when the TOxA FAIL or PORT ALM lamp is lit, if an MCA/MCA-2 is installed in the MC slot. If the TOxA FAIL lamp is lit, then the TOxA card must be replaced. If the TOxA PORT ALM lamp is lit, then it must be determined whether it is actually a card port failure, or a shorted or unterminated cable external to the shelf (refer to Table H and Table I). If it is determined that the PORT ALM is actually a port failure on the card, then the TOxA card must be replaced.</p>
1	<p>Press the ACO pushbutton on the AI/FA card to silence the office audible alarm, if the shelf is in alarm.</p>
2	<p>Verify that an HS protection switch has been activated.</p> <p><b>Requirement:</b> If an automatic protection switch has been activated, the Output Protection pushbutton lamps are lit over the failed card and a like HS TOxA card. The MCA/MCA-2 AUTO lamp flashes for 6 seconds during the automatic protection switch activation, and then lights steadily, and the MAN lamp is off.</p>
3	<p>If a HS protection switch is not activated, then manually activate a switch by simultaneously pressing the Output Protection pushbuttons over the TOxA card with the FAIL or PORT ALM lamp lit and a like HS TOxA card.</p> <p><b>Requirement:</b> The Output Protection pushbutton lamps are lit over the TOxA card with the FAIL or PORT ALM lamp lit and a like HS TOxA card, and the MCA/MCA-2 MAN lamp will flash until the switch is released.</p> <p><b>Caution: TOxA cards must not be removed without first activating an HS protection switch to minimize the loss of output signals. The possible output loss times are as follows:</b></p> <p><b>TOxA card removal without a protection switch activated: up to 6 seconds</b></p> <p><b>Port or card failure: up to 3 seconds</b></p> <p><b>Manual switch activation/deactivation: approx. 1 ms</b></p>
3	<p>Remove the TOxA card from the shelf. Set the option switches on the replacement card like the removed card. Insert the replacement card in the shelf.</p> <p><b>Requirement:</b> The FAIL lamp on the replacement card remains off and the INPUT lamp is lit. The ST lamp will also light if the system is equipped with a clock card(s).</p>
4	<p>Wait 10 seconds after all lamps are normal on the replacement card to allow it to warm-up and generate outputs.</p>
5	<p>Press the lit Output Protection pushbutton over the HS TOxA card slot until its lamp and the Output Protection pushbutton lamp over the replacement card go off. This releases the HS protection switch and puts the replacement card on-line.</p>



Chart 8. SCIU Card Replacement

STEP	PROCEDURE
	<p>The SCIU card should not be replaced if its SYNC lamp is off or lit red (indicating loss of 4 kHz signal from ST and input cards), or its DS1A or DS1B lamp is lit red (indicating loss of signal from the traffic-carrying DS1 bit stream from either the EAST A IN or WEST B IN direction of transmission), or the HI SLIP, SLIP, and bit slip lamps are lit (indicating the EAST A IN received bit stream has a frequency offset from the DCD clock [WEST A OUT]), which are facility related problems outside the DCD System. The SCIU card must be replaced if its FAIL lamp is lit.</p>
1	<p>Press the ACO pushbutton on the AI/FA card to silence the office audible alarm, if the shelf is in alarm.</p>
2	<p>Remove the SCIU card from the shelf. Set the option switches on the replacement card identically to the removed card. Insert the replacement card into the shelf.</p> <p><b>Requirement:</b> The FAIL lamp is off, and the SYNC, DS1 A and DS1 B lamps are lit green.</p> <p><b>Caution:</b> <i>The SCIU card's inputs and outputs must be cabled from an SCIU wire-wrap module (p/n 990-40021-10) which has bypass relays that release to maintain continuity on the traffic-carrying DS1 while the SCIU card is removed from the shelf. If the SCIU inputs and outputs are cabled from a standard DCD shelf wire-wrap panel, then the SCIU <u>must</u> be patched around at the DSX-1 jacks before the SCIU is removed from the shelf.</i></p>

Chart 9. MCA/MCA-2 Card Replacement

STEP	PROCEDURE
	The MCA/MCA-2 card must be replaced if its FAIL lamp is lit or if its automatic and/or manual switching functions are not working. Use Tables G and H to isolate the condition before replacing the card.
1	Press the ACO pushbutton on the AI/FA card to silence the office audible alarm, if the shelf is in alarm.
2	<p>Verify that an HS protection switch is not activated.</p> <p><b>Warning:</b> <i>Timing to network elements will be disrupted if the above condition is not met. If activated and the MCA/MCA-2 card is removed, the HS protection switch will be released causing the outputs of the TOxA card on HS switch to be lost. If an HS switch is activated, the reason must be investigated, the condition repaired and the HS switch released before proceeding.</i></p> <p><b>Requirement:</b> The pushbutton lamps above the TOxA cards and the HS TOxA cards are not lit.</p>
3	<p>Remove the MCA/MCA-2 card from the shelf. Set the option switches on the replacement card like the removed card. Insert the replacement card in the shelf.</p> <p><b>Requirement:</b> The FAIL lamp is off, all 10 PORT ALM lamps light and then go off, and the AUTO lamp lights.</p>

Chart 10. AI/FA Card Replacement

STEP	PROCEDURE
	The AI (DCD-ST2 Shelf) and FA (DCD-400/CIM Shelves) cards may be removed or inserted in the shelf any time without negative effect to the operation of the shelf. The office alarms and shelf statuses, except the battery alarm (DCD-ST2 Shelf only), do not function while the AI/FA card is removed from the shelf.
1	Press the ACO pushbutton on the AI/FA card to silence the office audible alarm, if the shelf is in alarm. The MAJOR and MINOR lamps may or may not be lit, depending on the nature of the failure on the card.
2	Remove the AI/FA card from the shelf. (There are no option switch settings on the AI/FA card). Insert the replacement card in the shelf.  <b>Requirement:</b> The MAJOR and MINOR lamps are off. (The AI/FA card does not have a FAIL lamp.)

## 5. Repair and Return Procedures

5.01 When returning defective equipment for factory repair, obtain the following information *prior* to calling Telecom Solutions:

- a. A complete description of the trouble (alarms observed, equipment behavior, etc.), part number, serial number, issue/revision level, and warranty expiration date.
- b. If the warranty has expired, obtain a purchase order with “bill to” information.
- c. A customer field technical contact, address, phone number, and FAX number.
- d. Return shipping information.

5.02 To return defective or damaged equipment:

1. Call Telecom Solutions’ Customer Service Department (at [408]433-0910) and obtain a Return Material Authorization (RMA) number.

**Note:** Retain the RMA number for future reference. The RMA number is used by Telecom Solutions for internal tracking of the unit. Reference the RMA number in all communications with Telecom Solutions regarding the unit.

2. Pack the defective equipment, including a list containing all the information obtained above, in the *original packing material*. If unavailable, inform Telecom Solutions and the appropriate shipping material will be provided.

**Note:** Equipment *must be returned in the original packaging* or approved replacement packaging for the warranty to be honored.

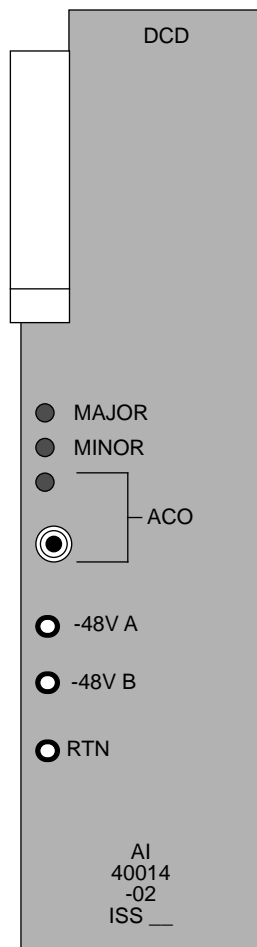
3. Mark the RMA number and the equipment serial number on the outside of the shipping carton.
4. Ship the equipment prepaid and insured to:

Telecom Solutions  
Attn: Repair and Return  
85 West Tasman Drive  
San Jose, CA 95134-1703

5.03 Repaired equipment is shipped within 10 working days after receipt by Telecom Solutions. If the equipment is under warranty, return transportation is prepaid unless the equipment was received otherwise. For equipment that is out of warranty, all transportation costs are paid by the customer.

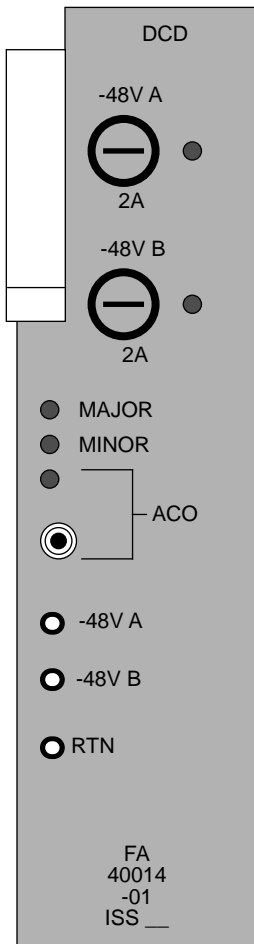
## 6. CONTROLS AND INDICATORS

6.01 The controls and indicators of the cards used in DCD shelves are shown in Figure 2 through Figure 19. Each figure includes an explanation of all front panel items.



- MAJOR: Lamp that lights red if the system or card has a major alarm.
- MINOR: Lamp that lights red if the system or card has a minor alarm.
- ACO: Lamp that lights green if the ACO pushbutton has been pressed.  
Pushbutton that, when pressed, silences the audible alarm.
- 48V A: Test point for monitoring battery A.
- 48V B: Test point for monitoring battery B.
- RTN: Test point reference for the -48V A and -48V B test points.

Figure 2. AI Control Cards and Indicators



-48V A/2A: Fuse for battery A (-48V, 2 amps)

-48V B/2A: Fuse for battery B (-48V, 2 amps)

(Lamp to right of A fuse): Lamp that lights red when the A fuse is open (major alarm).

(Lamp to right of B fuse): Lamp that lights red when the B fuse is open (major alarm).

**Caution: Always remove the FA card from the shelf prior to removing both fuses (at the same time) from the FA card. If the card is left in, a complete system failure will occur.**

Note: Loss of both fuses produces a major and a minor alarm, but the lamps do not light because the shelf has lost power.

MAJOR: Lamp that lights red if this card has a major alarm.

MINOR: Lamp that lights red if this card has a minor alarm.

ACO: Lamp that lights green when the ACO pushbutton has been pressed.

Pushbutton that, when pressed, silences the audible alarm.

-48V A: Test point for monitoring battery A.

-48V B: Test point for monitoring battery B.

RTN: Test point reference for the -48V A and -48V B test points.

**Note:** FA cards are used only on 400 and CIM shelves.

Figure 3. FA Card Controls and Indicators

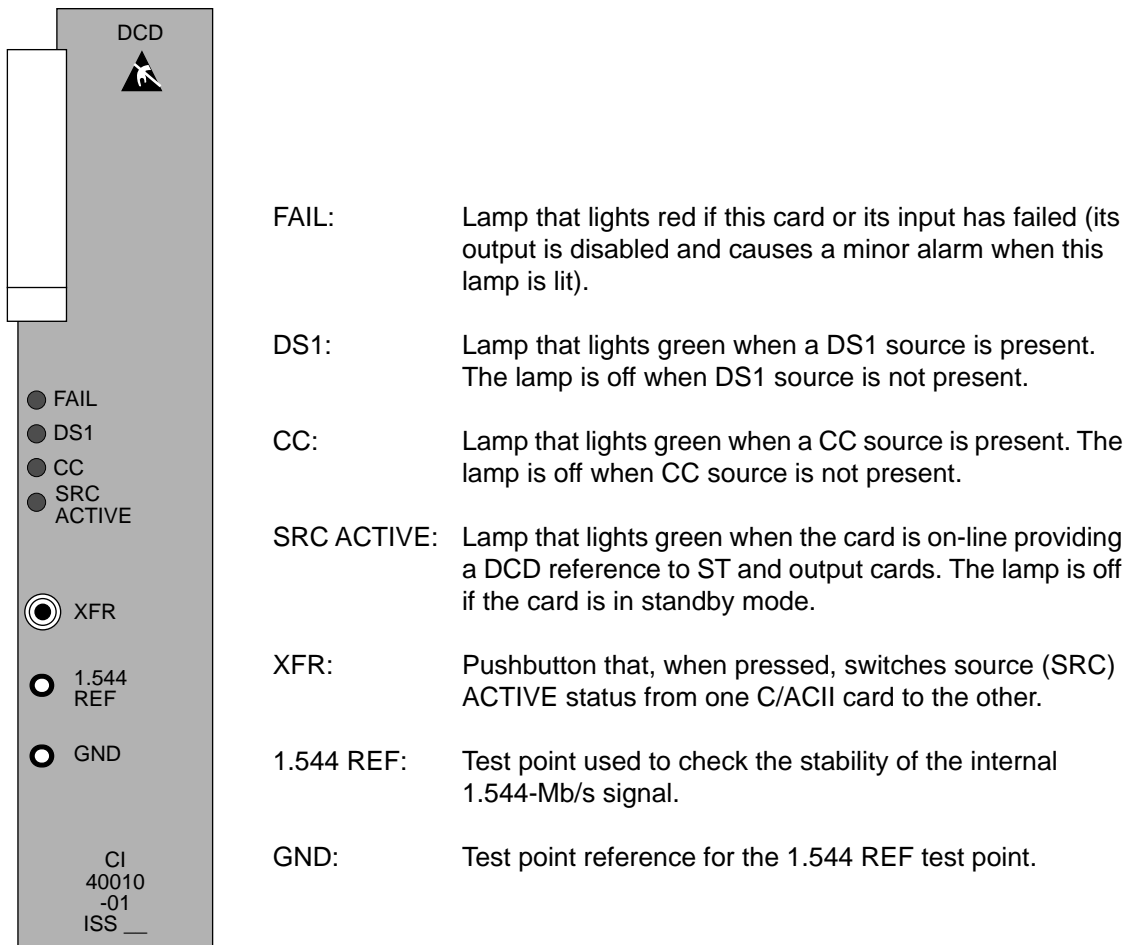
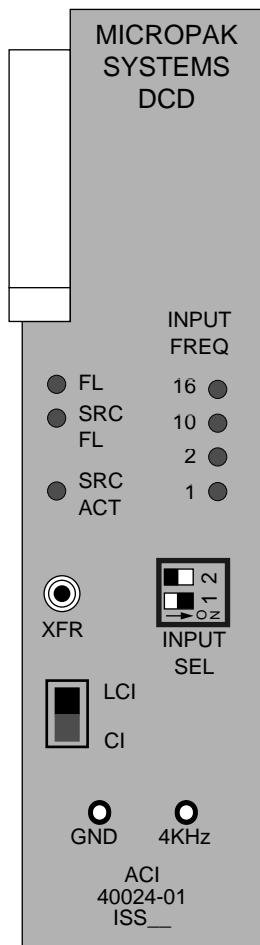


Figure 4. CI Card Controls and Indicators



- FL: Lamp that lights red if the card fails or the input fails for more than two seconds.
- SRC FL: Lamp that lights yellow if the input signal fails.
- SRC ACT: Lamp that lights green when the card is supplying system clock.
- INPUT FREQ: Lamps that light green to indicate the frequency selected by the INPUT SEL switches (16, 10, 2, or 1 MHz).
- XFR: Pushbutton switch that, when pressed, causes the active ACI card (supplying system clock) to become inactive, and the inactive ACI card to become active.
- INPUT SEL: Switch that selects the input frequency of the card as follows:
 

FREQ	#1	#2
16.384 MHz	On	On
10.0 MHz	On	Off
2.048 MHz	Off	On
1.0 MHz	Off	Off
- LCI/CI: LCI (up) Used when operating with an ST2 clock; CI (down) used when operating with an ST3E or ST3 clock.
- GND: Test point reference for the 4 kHz test point.
- 4KHz: Test point for checking the 4 kHz output of the card.

Figure 5. ACI Card Controls and Indicators



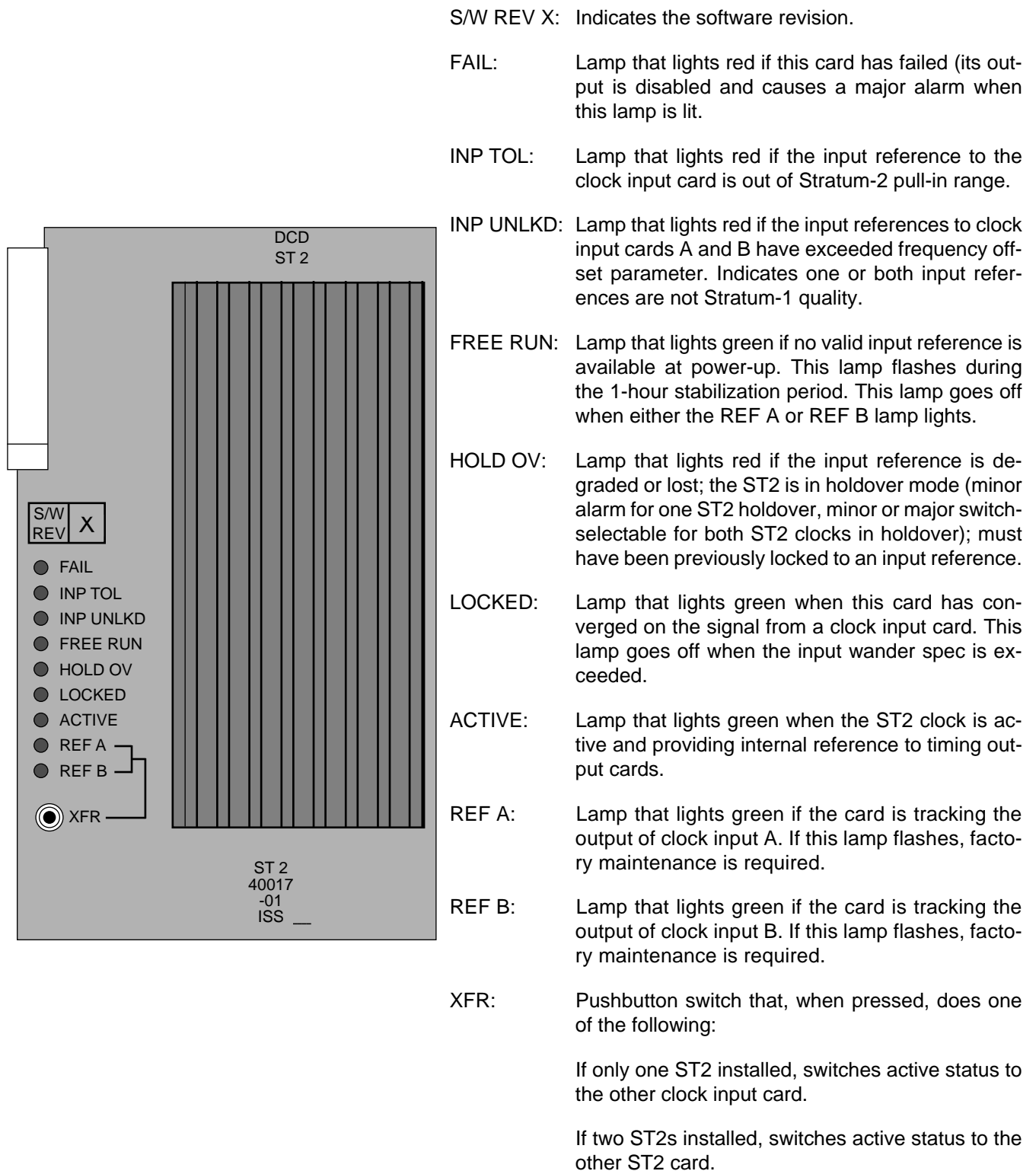
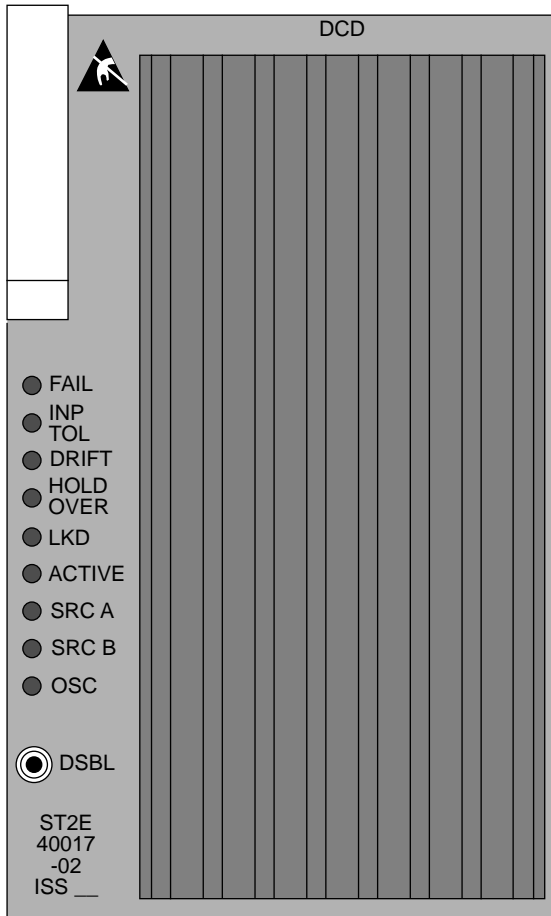


Figure 6. ST2 Card Controls and Indicators



- FAIL: Lamp that lights red if the card has failed.
- INP TOL: Lamp that lights red if the input frequency offset is greater than the pull-in range.
- DRIFT: Lamp used for factory testing only. Normally off. If lamp lights red, contact Telecom Solutions' Customer Service.
- HOLD OVER: Lamp that flashes green during warm up. Also, the lamp lights red if all clock input signals are removed or exceed the pull-in range causing the clock to go into holdover (the holdover center frequency estimate that is retained in memory is based on the average of the last 24 hours).
- LKD: Lamp that lights green when this card has converged on the signal from the clock input card.
- ACTIVE: Lamp that lights green when the ST2E is providing reference to the timing output cards.
- SRC A: Lamp that lights green if card is tracking the output of clock input card A.
- SRC B: Lamp that lights green if card is tracking the output of clock input card B.
- OSC: Lamp that lights red if the oscillator has failed and the ST2E card output is disabled; flashes green if the card needs to be returned to the factory for service.
- DSBL: A recessed pushbutton switch that, when pressed, disables the output of the card only if another clock is installed in the shelf and functioning (used to prevent phase hits when removing the card from the shelf).

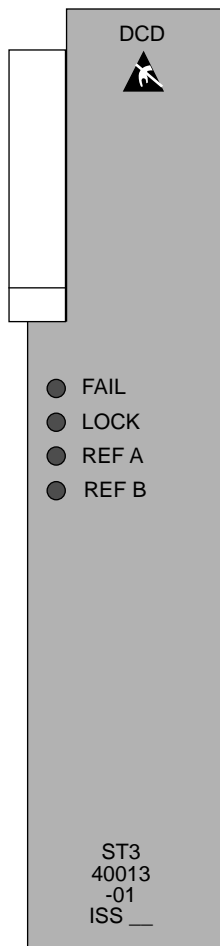
**Caution: Do not press the DSBL pushbutton switch on both ST2E cards at the same time. This will disable the output of both cards, and although the shelf will continue to supply timing signals, there will be phase hits on the timing signals.**

Figure 7. DCD-ST2E Controls and Indicators



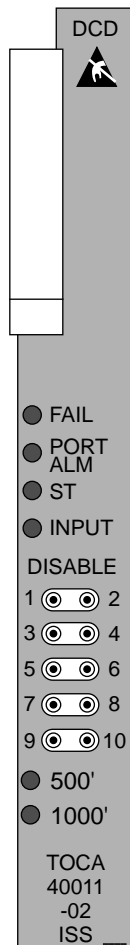
- FAIL: Lamp that lights red if the card has failed (its output is disabled and causes a major alarm when this lamp is lit).
- INPUT TOL: Lamp that lights red if the input reference to the clock input card is out of Stratum-3 pull-in range. This parameter is verified every 10 seconds.
- FREE RUN: Lamp that lights green and steady if no valid input reference is available at power up. This lamp flashes during the 30-minute stabilization period. This lamp goes off when either the REF A or REF B lamp lights.
- HOLD OV: Lamp that lights red if the input signal is not present or is out of pull-in range.
- LOCKED: Lamp that lights green when this card has converged on the signal from a clock input card. This lamp goes off when the input wander spec is exceeded.
- ACTIVE: This lamp lights green when the ST3E is active and providing internal reference to the timing output cards.
- REF A: Lamp that lights green if card is tracking the output of clock input card A.
- REF B: Lamp that lights green if card is tracking the output of clock input card B.

Figure 8. ST3E Card Controls and Indicators



- FAIL: Lamp that lights red if this card fails (major alarm).
- LOCK: Lamp that lights red when the input fails, or when the inputs are out of pull-in range.  
 Note: If the FAIL and LOCK lamps light, this is an indication that the ST3 is in holdover mode and the card is not failed.
- REF A: Lamp that lights green if the card is tracking the output of clock input card A.
- REF B: Lamp that lights green if the card is tracking the output of clock input card B.

Figure 9. ST3 Card Controls and Indicators



**FAIL:** Lamp that lights red if this card fails, all ports fail, or there is a loss of input reference to this card (major alarm).

**PORT ALM:** Lamp that lights red if one to nine outputs fail or one to six outputs have been externally shorted and the card option is set to LOCAL (minor alarm).

**ST:** Lamp that lights green when an active clock card is supplying the input reference for this card.

**INPUT:** Lamp that lights green when this card is receiving a reference signal from one or more of the following: clock input A, clock input B, or a clock card.

**DISABLE 1 – 10:** Input jacks that accept disabling pins which disable the corresponding port (1 – 10). A maximum of six ports may be disabled at one time.

**500':** Lamp that lights green when option switch SW1-4 on this board is set to the down (ON) position. (Refer to the table below.)

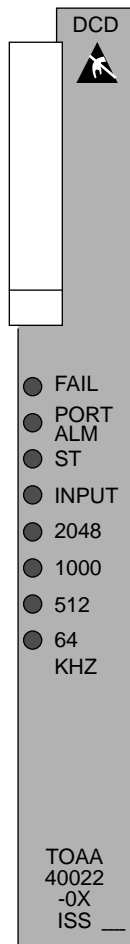
**1000':** Lamp that lights green when option switch SW1-3 on this board is set to the down (ON) position. (Refer to the table below.)

Note: Both the 500' and 1000' lamps will be off if SW1-3 and SW1-4 are set to the up (OFF) position. (Refer to the table below.)

Cable Compensation Lamps

Section		Lamp Lit		Cable Compensation
4	3	500'	1000'	
OFF	OFF	No	No	0 - 1500 ft.
ON	OFF	Yes	No	1501-2000 ft.
OFF	ON	No	Yes	2001-2500 ft.
ON	ON	Yes	Yes	2501-3000 ft.

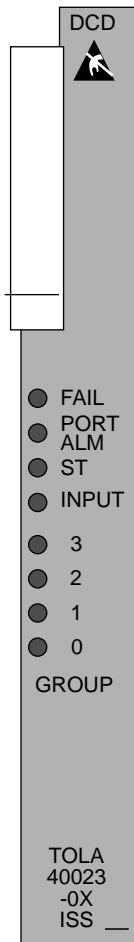
Figure 10. TOCA Card Controls and Indicators



- FAIL: Lamp that lights red if this card fails, both outputs fail, or there is a loss of input reference to this card (major alarm).
- PORT ALM: Lamp that lights red if one output fails (minor alarm).
- ST: Lamp that lights green when an active clock card is supplying the input reference for this card.
- INPUT: Lamp that lights green when this card is receiving a reference signal from one or more of the following: clock input A, clock input B, or a clock card.
- 2048: Lamp that lights green when option switch SW1 on this card has been set for an output frequency of 2.048 MHz.
- 1000: Lamp that lights green when option switch SW1 on this card has been set for an output frequency of 1.000 MHz.
- 512: Lamp that lights green when option switch SW1 on this card has been set for an output frequency of 512 kHz.
- 64 (8): (See Note) Lamp that lights green when option switch SW1 on this card has been set for an output frequency of 64 kHz (or 8 kHz, or 5 MHz).

Note: Lamps for models -01 and -02 are as shown. For model -03, the 64 kHz lamp is changed to 8 kHz; for model -05, all frequencies are 5 MHz, so no lamp is shown.

Figure 11. TOAA Card Controls and Indicators



**FAIL:** Lamp that lights red if this card fails, all ports fail, or there is a loss of input reference to this card (major alarm).

**PORT ALM:** Lamp that lights red if one to four outputs fail (minor alarm).

**ST:** Lamp that lights green when an active clock card is supplying the input reference for this card.

**INPUT:** Lamp that lights green when this card is receiving a reference signal from one or more of the following: clock input A, clock input B, or a clock card.

**GROUP 3:** Lights when Group 3 frequencies are selected.

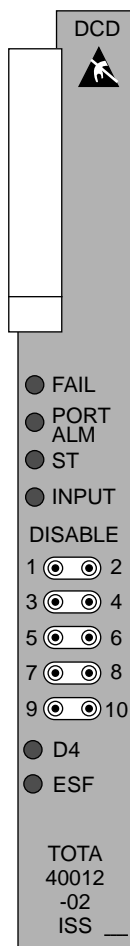
**GROUP 2:** Lights when Group 2 frequencies are selected.

**GROUP 1:** Lights when Group 1 frequencies are selected.

**GROUP 0:** Lights when Group 0 frequencies are selected.

Note: For information on the TOLA card frequencies, refer to TMSL 097-40000-55, General Description and Specifications.

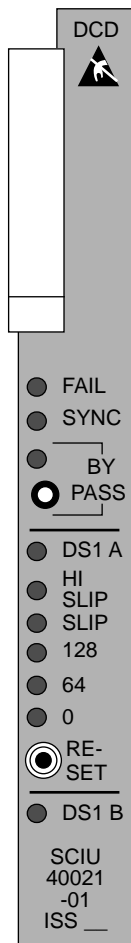
Figure 12. TOLA Card Controls and Indicators



- FAIL: Lamp that lights red if this card fails, all ports fail, or there is a loss of input reference to this card (major alarm).
  
- PORT ALM: Lamp that lights red if one to nine outputs fail or one to six ports have been externally shorted and the card option is set to LOCAL (minor alarm).
  
- ST: Lamp that lights green when an active clock card is supplying the input reference for this card.
  
- INPUT: Lamp that lights green when this card is receiving a reference signal from one CI card or more of the following: clock input A, or clock input B, or a clock card.
  
- DISABLE 1 – 10: Input jacks that accept disabling pins which disable the corresponding port (1 – 10). A maximum of six ports may be disabled at one time.
  
- D4: Lamp that lights green when the outputs are set for D4 framing.
  
- ESF: Lamp that lights green when the outputs are set for ESF framing.
  
- Note: If both the D4 and ESF lamps are lit, check optioning; only one or the other should be set.

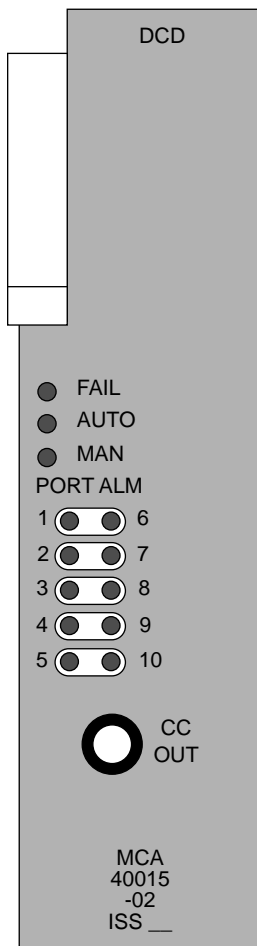
Figure 13. TOTA Card Controls and Indicators





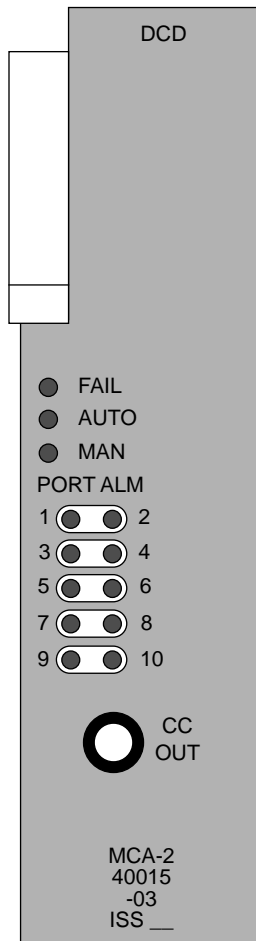
- FAIL: Lamp that lights red if this card fails, or there is a loss of input reference to this card (major alarm).
- SYNC: Lamp that lights green when a system reference is present, and red when it is not present.
- BYPASS: Lamp that lights red if the electronic bypass is activated. When Bypass is activated, the card's reclocking feature is inhibited.  
  
Jack that allows the user to bypass the card's buffer. This function is provided for test purposes only, and is not recommended for general use.
- DS1 A: Lamp that lights green when DS1 A is a valid signal; red when DS1 A has LOS, OOF (major, minor, or none alarm option settings).
- HI SLIP: Lamp that lights red when DS1A has had 8 or more frame slips (major, minor, or none alarm option settings).
- SLIP: Lamp that lights red when DS1 A has 1 or more frame slips (major, minor, or none alarm option settings).
- 128: Lamp that lights yellow when DS1 A has 128 to 192 bit slips (major, minor, or none alarm option settings [it is strongly recommended that the none option setting be used]).
- 64: Lamp that lights green when DS1 A has 64 to 127 bit slips.
- 0: Lamp that lights green when DS1 A has less than 64 bit slips.
- RESET: Pushbutton that clears the HI SLIP and SLIP alarms and lamps. It does not clear the 128 bit slip alarm and lamp.
- DS1 B: Lamp that lights green when DS1 B is a valid signal; red when DS1 B has LOS (major, minor, or none alarm option settings); and is off when SCIU is in monitor mode.

Figure 14. SCIU Card Controls and Indicators



- FAIL:** Lamp that lights red if this card fails (major alarm).
- AUTO:** Lamp that lights green when this card is in automatic switching mode, and flashes during auto switch activity.
- MAN:** Lamp that lights green when this card is in manual switching mode, and flashes when manual switch is in place.
- PORT ALM 1-10** Lamps that light red if the corresponding TOxA card on the shelf lights its PORT ALM lamp when the affected TOxA card's relay matrix pushbutton is pressed.
- CC MON:** Jack used to monitor the CC output signal.

Figure 11. MCA Card Controls and Indicators



FAIL: Lamp that lights red if this card fails (major alarm).

AUTO: Lamp that lights green when this card is in automatic switching mode, and flashes during auto switch activity.

MAN: Lamp that lights green when this card is in manual switching mode, and flashes when manual switch is in place.

PORT ALM 1-10: Lamps that light red if the corresponding timing output card on the shelf lights its PORT ALM lamp. All 10 port alarm lamps light if communication loss within the shelf or intermittent communication with all the cards is detected.

CC OUT: Test probe jack used to check the CC output signal.

Figure 16. MCA-2 Card Controls and Indicators