TABLE OF CONTENTS

1- OPENSPEED TROUBLESHOOTING OVERVIEW

1-1 Swing Table Theory and Overview

Description- This section contains the theory and operation of the patient swing table.
A block diagram of the Table Electronics is shown in 1-1. The Table Electronics interfaces with the System Support Module (SSM), Scan Room Interface (SRI), and Magnet Interface Board. The SSM supplies power for the vertical motor and the longitudinal motor drive signal. The SRI supplies power to the Table Electronics and controls longitudinal motion by monitoring the longitudinal encoder and associated limit sensors. The Magnet Interface Board monitors the lateral position limit sensors as well as the pivot position sensors (not part of the Table Electronics). The Magnet Interface board then indicates potential cradle collisions with the magnet support posts and lower cryostat cover to the SRI, which inhibits longitudinal motion appropriately. The Magnet Interface Board also monitors the pivot unlock sensor and will not indicate a valid pivot position unless the lock is engaged.
An emergency cradle release actuator is incorporated into the handle located at the rear of the cradle. The actuator requires a rotating action. This handle is to be used for pulling the cradle longitudinally.
A critical requirement of the Table Electronics is safe failure modes. The general requirements are as follows:

- Disconnected optical sensors will not allow motion or any other unsafe condition.
- Failed optical emitter diodes will not allow motion or any other unsafe condition.
- Disconnected mechanical switches will not allow motion or any other unsafe condition.
- Disconnected cables to the SRI or Magnet Interface Board will not allow motion or any other unsafe condition.

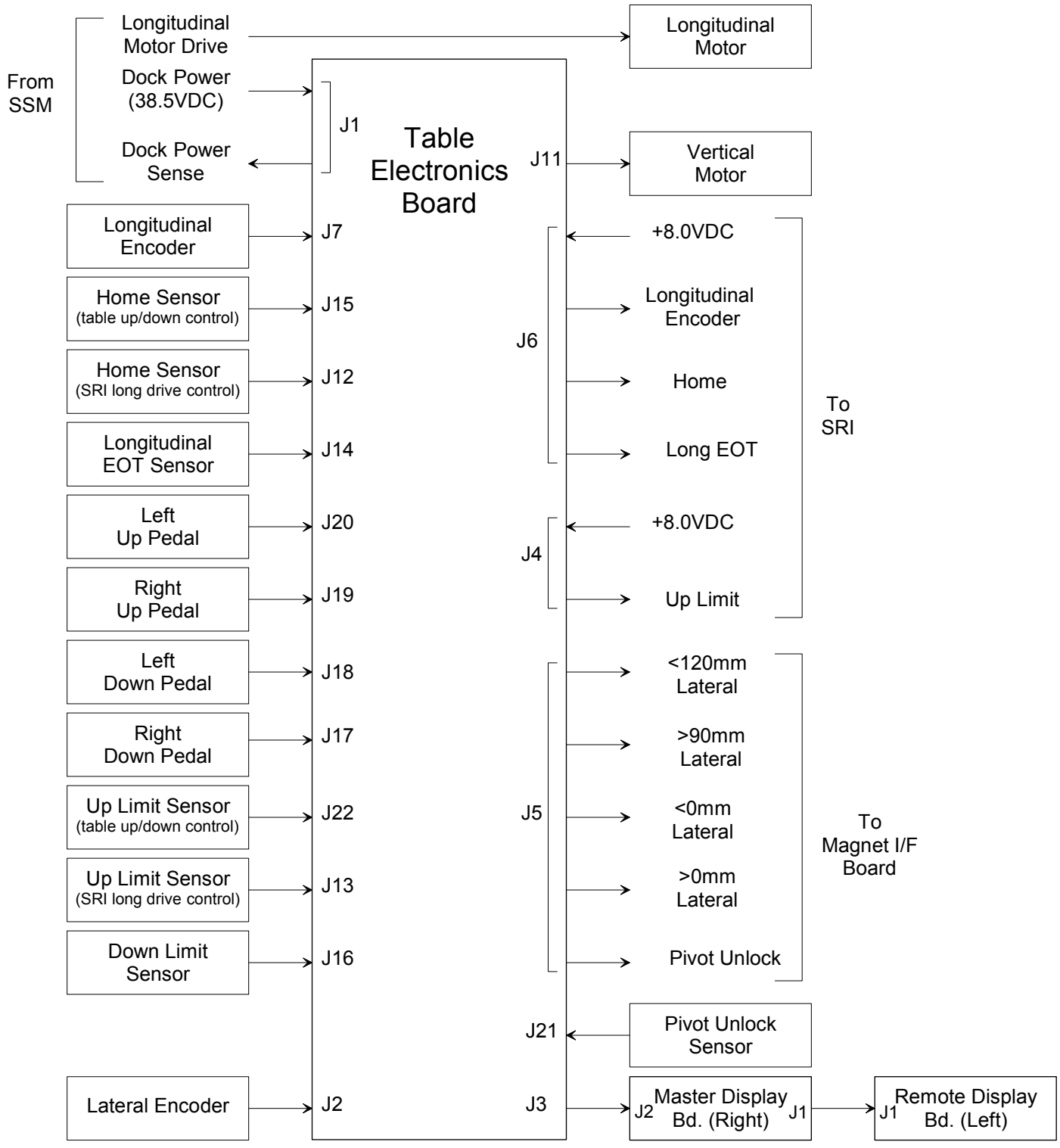


TABLE ELECTRONICS BLOCK DIAGRAM
ILLUSTRATION 1-1

1-2 Sensor Definitions

- Sensor definitions are shown in table 1-1. Note that longitudinal motion control is a function of the SRI, not the Table Electronics. The vertical motion control however, is a function of the Table Electronics.
- For opto sensors, Normally Open (N.O.) refers to light normally not detected. This is typically implemented with a reflective type sensor, which closes when a reflective object passes within its field of view.
- For opto sensors, Normally Closed (N.C.) refers to light normally detected. This is typically implemented with a transmissive type sensor, which opens when an opaque object passes through the slot between emitter and detector.

TABLE 1-1
SENSOR AND SWITCH DEFINITIONS.

Name	Type	Failure mode (when cable disconnected or emitter diode off)
Home Sensor for table up/down control	N.O. **reflective opto**, closes when at home	Open, not at home, no vertical motion
Home Sensor for SRI long drive control	N.O. **reflective opto**, closes when at home	Open, not at home
Longitudinal EOT for SRI long drive control	N.O. **reflective opto**, closes when EOT	Open, not at EOT
Left and Right Up Pedal	N.O. switch, closes to initiate vertical motion	Open, no vertical motion
Left and Right Down Pedal	N.O. switch, closes to initiate vertical motion	Open, no vertical motion
Up Limit Sensor for table up/down control	N.C. **transmissive opto**, opens when at up limit	Open, at up limit, no vertical motion
Up Limit Sensor for SRI long drive control	N.O. **transmissive opto**, closes when at up limit	Open, not at up limit, no longitudinal motion
Down Limit Sensor for table up/down control	N.C. **transmissive opto**, opens when at down limit	Open, at down limit, no vertical motion
-25 deg. Pivot Sensor	N.O. switch, closes when in position	Open, not at valid pivot position, no longitudinal motion
+25 deg. Pivot Sensor	N.O. switch, closes when in position	Open, not at valid pivot position, no longitudinal motion
0 deg. Pivot Sensor	N.O. switch, closes when in position	Open, not at valid pivot position, no longitudinal motion
Pivot Unlock Sensor	N.C. **transmissive opto**, opens when unlocked	Open, unlock condition, no longitudinal motion

1-2-1 Lateral Position

This version of the Table Electronics uses an absolute encoder to sense lateral position and will display the resultant position in millimeters. Detailed requirements are as follows:

Two identical lateral position displays are provided. One on each side of the table.
The display is located near the lateral crank on the horizontal surface of the cover.

Position display is in mm, with 1mm resolution, with range of approximately -120mm to +120mm. Leading zeroes are not displayed.
3 digits with "+" and "-" indication are provided, + to the left, - to the right for a person facing the front of the magnet. The most significant digit (MSD) does not need to be greater than "1".
Display are 0.3" high minimum, green 7-segment LED. Display drive are static, i.e. not multiplexed.
The signals LT120MM, LATRIGHT, GT90MM, and LATLEFT are developed from the lateral encoder position.
An absolute encoder, Heidenhain RC410 are utilized. The following guidelines are observed:
Receiving circuit are per Heidenhain recommendation
The lateral encoder uses the same +5VDC power as the longitudinal encoder (46-282361P1) and requires less than 175mA maximum.
The table electronics board, including lateral position logic and display circuitry, has a 500mA maximum output at 8.0VDC.

1-2-2 Longitudinal Drive

- The longitudinal encoder receives its power from the SRI.
- The longitudinal encoder provides 16 counts/mm to the SRI. Two phases are provided so that the SRI can determine direction of motion.

1-2-3 Longitudinal Motor Drive

- The longitudinal motor receives it's motor drive signals from the SSM.

TABLE 1-2
LONGITUDINAL DRIVE POWER AMPLIFIER SPECIFICATIONS

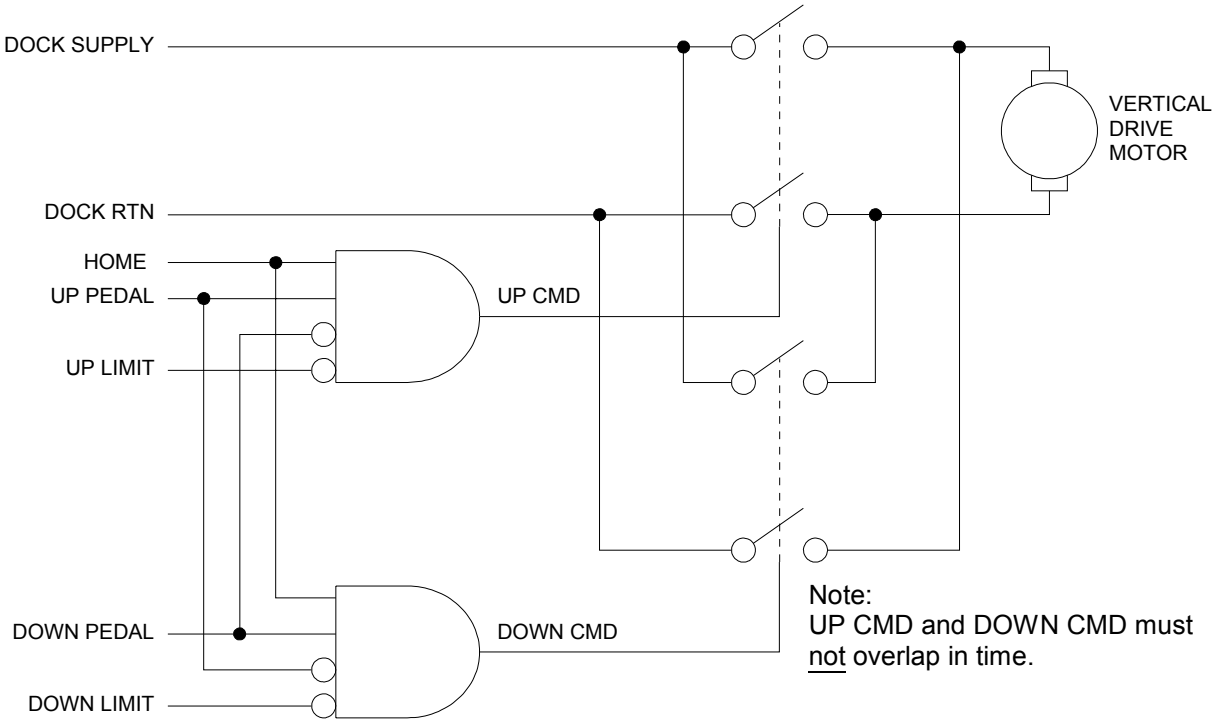
Voltage	≈±43V PWM into a 24VDC motor
Current Limit	5.0A average, ≈7.0A peak

1-2-4 Vertical (Elevation) Drive Overview

- The vertical drive function is completely contained within the Swing Table. No external control by the SRI (Scan Room Interface) is required.
- The vertical drive function is composed of the following components:
  - Up Limit Sensor
  - Down Limit Sensor
  - Home Limit Sensor
  - Up Foot Pedal Switch (two total, one on either side of the table, wired in parallel)
  - Down Foot Pedal Switch (two total, one on either side of the table, wired in parallel)
  - Vertical Drive Motor
  - Vertical Control Logic on Table Electronics Board (new design)
- The vertical drive motor receives power from the 38.5VDC Dock Motor Power Supply located in the SSM of the Power Cabinet. Remote sense leads are also provided and are utilized to guarantee 38.5VDC at the motor leads.
- All electrical components utilized are compatible with the magnetic, RF, and gradient fields present where located.

Control Logic

A functional block diagram of the vertical drive control logic is shown in Vertical Drive Control logic (See Illustration 1-2) below. Because the Dock Motor Power Supply is unipolar, a switching circuit is required on the Table Electronics Board to drive the table in both up and down directions. A timing circuit is provided to guarantee that the UP CMD and DOWN CMD signals do not overlap.



VERTICAL DRIVE CONTROL LOGIC.
ILLUSTRATION 1- 2

Home Sensor:

- A HOME SENSOR indicates that the cradle is fully retracted and in the “home” position. This is in addition to, and independent of the home limit sensor provided to the SRI.

Up and Down Limit Sensors:

- Table up and down limit sensors are provided.

Up and Down Pedals:

- Table up and down pedals are provided.
  Up Logic:
  - Up motion are initiated by actuating the UP PEDAL.
  - Up motion will continue only as long as the UP PEDAL is actuated.
  - Up motion is inhibited if the UP PEDAL and DOWN PEDAL are actuated simultaneously.
  - Up motion will only be allowed if the cradle is in the home position as indicated by the HOME SENSOR.
  - Up motion will cease when the UP LIMIT SENSOR is reached.

Down Logic

- Down motion is initiated by actuating the DOWN PEDAL.
- Down motion will continue only as long as the DOWN PEDAL is actuated.

- Down motion is inhibited if the DOWN PEDAL and UP PEDAL are actuated simultaneously.
- Down motion will only be allowed if the cradle is in the home position as indicated by the HOME SENSOR.
- Down motion will cease when the DOWN LIMIT SENSOR is reached.

Vertical Motor Power Supply:
The Dock Motor Power Supply provides power to the Vertical Drive Motor and the Longitudinal Drive system. It Is located in the System Support Module. The following specifications in table 1-3 are for reference only.

TABLE 1-3
DOCK (ELEVATION) MOTOR POWER SUPPLY SPECIFICATIONS

Voltage	38.5VDC +/-5 %
Current	15A continuous, 30A max
Foldback	Current foldback will occur at applied load ≥ 26A Foldback will occur in not less than 250ms and not more than 2 seconds

1-3 Connector Designators and signals

1-3-1 Table Electronics Board Connectors

The connectors on the Table Electronics board are designated as shown in Table 1-4 below.

TABLE 1-4
TABLE ELECTRONICS BOARD CONNECTOR DESIGNATORS.

Label	Designator	Type	Description
DOCK-PWR	J1	DB25 M	Dock power from SSM
LAT-ENC	J2	DB25 F	Lateral encoder
LAT-DSPLY	J3	DB15 F	Lateral position displays
DOCK-LMT	J4	DB15 M	Dock limit switches to SRI, +8.0VDC from SRI
LAT-POS	J5	DB15 M	Lateral position to Magnet I/F Bd.
LONG-DRV	J6	DB37 M	Longitudinal encoder and limit switches to SRI, +8.0VDC from SRI
LONG-ENC	J7	DB15 F	Longitudinal encoder
VERT-MTR	J11	2 position screw terminal	Vertical motor
SRI-HOME	J12	6 pin in-line	SRI home sensor
SRI-UP-LMT	J13	6 pin in-line	SRI up limit sensor
SRI-EOT	J14	6 pin in-line	SRI end of travel sensor
TBL-HOME	J15	6 pin in-line	Table home sensor for vertical motion
DOWN-LMT	J16	6 pin in-line	Table down limit sensor for vertical motion
R-DN-PEDAL	J17	6 pin in-line	Right down pedal
L-DN-PEDAL	J18	6 pin in-line	Left down pedal
R-UP-PEDAL	J19	6 pin in-line	Right down pedal
L-DN-PEDAL	J20	6 pin in-line	Left down pedal

Label	Designator	Type	Description
PVT-UNLCK	J21	6 pin in-line	Pivot unlock sensor
UP-LMT	J22	6 pin in-line	Table up limit sensor for vertical motion

1-3-2 Longitudinal Motor Drive Connector (To SSM J41)

The Longitudinal Motor Drive Connector is a 9 pin subminiature D male connector. The pin assignments are as shown in Table 1-4 below.

TABLE 1-4
LONGITUDINAL MOTOR DRIVE CONNECTOR

Signal Name	Pin Number	Signal Type	Notes
Mtr1	1	Analog	Motor, one terminal
Mtr2	6	Analog	Motor, other terminal
Mtr1	2	Analog	Motor, one terminal
Mtr2	7	Analog	Motor, other terminal
Mtr1	3	Analog	Motor, one terminal
Mtr2	8	Analog	Motor, other terminal
Mtr1	4	Analog	Motor, one terminal
Mtr2	9	Analog	Motor, other terminal
Ground	5	Chassis ground	

1-3-3 Dock Power Connector (To SSM J36)

The Dock Power Connector is a 25 pin subminiature D male connector. The pin assignments are as shown in Table 1-5 below.

TABLE 1-5
DOCK POWER CONNECTOR

Signal Name	Pin Number	Signal Type	Notes
Aux-rtn	1	Return	
Aux-rtn	14	Return	
Aux-rtn	2	Return	
Aux-rtn	15	Return	
Aux-rtn	3	Return	
Aux-rtn	16	Return	
	4		N/C
	17		N/C
	5		N/C
	18		N/C
	6		N/C
	19		N/C
+38.5V remote sense +	7	Power supply sense signal	
+38.5V remote sense -	20	Power supply sense signal	
	8		N/C

Signal Name	Pin Number	Signal Type	Notes
	21		N/C
	9		N/C
	22		N/C
	10		N/C
Dock +38.5V	23	Dock DC power	
Dock +38.5V	11	Dock DC power	
Dock +38.5V	24	Dock DC power	
Dock +38.5V	12	Dock DC power	
Dock +38.5V	25	Dock DC power	
Dock +38.5V	13	Dock DC power	

1-3-4 Longitudinal Drive Encoders and Limit Switches Connector (To SRI J2)

The Longitudinal Drive Encoders and Limit Switches Connector is a 37 pin subminiature D male connector. The pin assignments are as shown in Table 1-6 below.

Note: all RS422 signals will appear as logic '1' at the output of the receiver if the cable is disconnected.

TABLE 1-6
LONGITUDINAL DRIVE ENCODERS AND LIMIT SWITCHES CONNECTOR

Signal Name	Pin Number	Signal Type	Notes
LONG-ENC-A-P	1	RS422 out	Longitudinal encoder, phase A, active high
LONG-ENC-A-N	20	RS422 out	Longitudinal encoder, phase A, active high
LONG-ENC-B-P	2	RS422 out	Longitudinal encoder, phase B, active high
LONG-ENC-B-N	21	RS422 out	Longitudinal encoder, phase B, active high
LONG-ENC-C-P	3	RS422 out	Longitudinal encoder, phase C, active high
LONG-ENC-C-N	22	RS422 out	Longitudinal encoder, phase C, active high
+5VENC	4	Encoder power	Isolated power for encoder
+5VENCRET	23	Encoder GND	Isolated ground for encoder
ENCSENSE-P	5	Analog	Encoder positive sense
ENCSENSE-N	24	Analog	Encoder negative sense
HOME-P	6	RS422 out	Home limit sensor, active high
HOME-N	25	RS422 out	Home limit sensor, active high
+8VDC	7	Power	Table Electronics power
GND	26	GND	Table Electronics ground
	8		N/C
	27		N/C
LONG-EOT-P	9	RS422 out	Longitudinal EOT, active high
LONG-EOT-N	28	RS422 out	Longitudinal EOT, active high
+8VDC	10	Power	Table Electronics power
GND	29	GND	Table Electronics ground
	11		N/C
	30		N/C
	12		N/C
	31		N/C
	13		N/C
	32		N/C
	14		N/C
	33		N/C
	15		N/C
	34		N/C
	16		N/C
	35		N/C
	17		N/C

Signal Name	Pin Number	Signal Type	Notes
	36		N/C
	18		N/C
	37		N/C
GND	19	GND	Table Electronics ground

1-3-5 Dock Limit Switch Connector (To SRI J3)

The Dock Limit Switch Connector is a 15 pin subminiature D male connector. The pin assignments are as shown in table 1-7 below.

Note: all RS422 signals will appear as logic '1' at the output of the receiver if the cable is disconnected.

TABLE 1-7
DOCK LIMIT SWITCH CONNECTOR

Signal Name	Pin Number	Signal Type	Notes
DCKSTP-P	1	RS422 out	N/C, reserved
DCKSTP-N	9	RS422 out	N/C, reserved
UPLMT-P	2	RS422 out	UP LIMIT, active high
UPLMT-N	10	RS422 out	UP LIMIT, active high
	3		N/C
	11		N/C
	4		N/C
	12		N/C
	5		N/C
	13		N/C
+8VDC	6	Power	Table Electronics power
GND	14	GND	Table Electronics ground
+8VDC	7	Power	Table Electronics power
GND	15	GND	Table Electronics ground
GND	8	GND	Table Electronics ground

1-3-6 Lateral Position Connector (To Magnet Interface Board J3):

The Lateral Position Connector is a 15 pin subminiature D male connector. The pin assignments are as shown in Table 1-8 below.

Note: all RS422 signals will appear as logic '1' at the output of the receiver if the cable is disconnected.

TABLE 1-8
LATERAL POSITION CONNECTOR

Signal Name	Pin Number	Signal Type	Notes
LT120MM-P	1	RS422 out	<120mm lateral sensor, active high
LT120MM-N	9	RS422 out	<120mm lateral sensor, active high
LATRIGHT-P	2	RS422 out	>0mm lateral sensor (right), active high
LATRIGHT-N	10	RS422 out	>0mm lateral sensor (right), active high
GT90MM-P	3	RS422 out	>90mm lateral sensor, active high
GT90MM-N	11	RS422 out	>90mm lateral sensor, active high
LATLEFT-P	4	RS422 out	<0mm lateral sensor (left), active high
LATLEFT-N	12	RS422 out	<0mm lateral sensor (left), active high
SPARELAT-P	5	RS422 out	Spare lateral position

Signal Name	Pin Number	Signal Type	Notes
SPARELAT-N	13	RS422 out	Spare lateral position
PVT-UNLCK-P	6	RS422 out	Pivot unlock, active high
PVT-UNLCK-N	14	RS422 out	Pivot unlock, active high
	7		N/C
	15		N/C
GND	8	GND	

1-3-7 Optical Sensor and Switch Connectors:

The Optical Sensor Connectors are 6 pin single in-line locking type connectors. The pin assignments are as shown in Table 1-9 below.

TABLE 1-9
OPTICAL SENSOR CONNECTORS

Signal Name	Pin Number	Signal Type	Notes
Reserved	1		N/C
Cable shield drain wire	2	Chassis GND	Connect to Chassis GND on Table Electronics Bd.
Anode	3	IR Emitter +	+5.0V through current-setting resistor on Table Electronics Bd.
Collector	4	Detector collector	Pulled up to +5.0V on Table Electronics Bd.
Cathode	5	IR Emitter -	Connect to Logic GND on Table Electronics Bd.
Emitter	6	Detector emitter	Connect to Logic GND on Table Electronics Bd.

1-3-8 The Foot Pedal Switch Connectors

The Foot Pedal Switch Connectors are 6 pin, single in-line locking type connectors. The pin assignments are a subset of the Optical Sensor Connectors and are as shown in table 1-10 below.

TABLE 1-10
FOOT PEDAL SWITCH CONNECTORS.

Signal Name	Pin Number	Signal Type	Notes
Reserved	1		N/C
Cable shield drain wire	2	Chassis GND	Connect to Chassis GND on Table Electronics Bd.
Switch, other terminal	3	Switch terminal	+5.0V through current-setting resistor on Table Electronics Bd.
Switch, one terminal	4	Switch terminal	Pulled up to +5.0V on Table Electronics Bd.
	5	LGND	Connect to Logic GND on Table Electronics Bd.
	6	LGND	Connect to Logic GND on Table Electronics Bd.

1-4 Power Supply Requirements:

The Table Electronics uses +8.0VDC+/-5% @ 0.5A maximum.

Grounding and Shielding:

- The Table Electronics board is not required to be located in an enclosure for the purpose of EMI shielding.
- The Table Electronics board uses top and bottom copper area fill for the purpose of EMI shielding.
- A large copper trace is included around the edge of the circuit board which is tied to the table frame through conductive screws. This trace is referred to as chassis ground and all cable shields, including sub-D connector shells, are tied to this chassis ground.

2- DIAGNOSTICS

2-1 LED's- Color and signal states

Diagnostic LEDs are defined in Table 1-11 below.

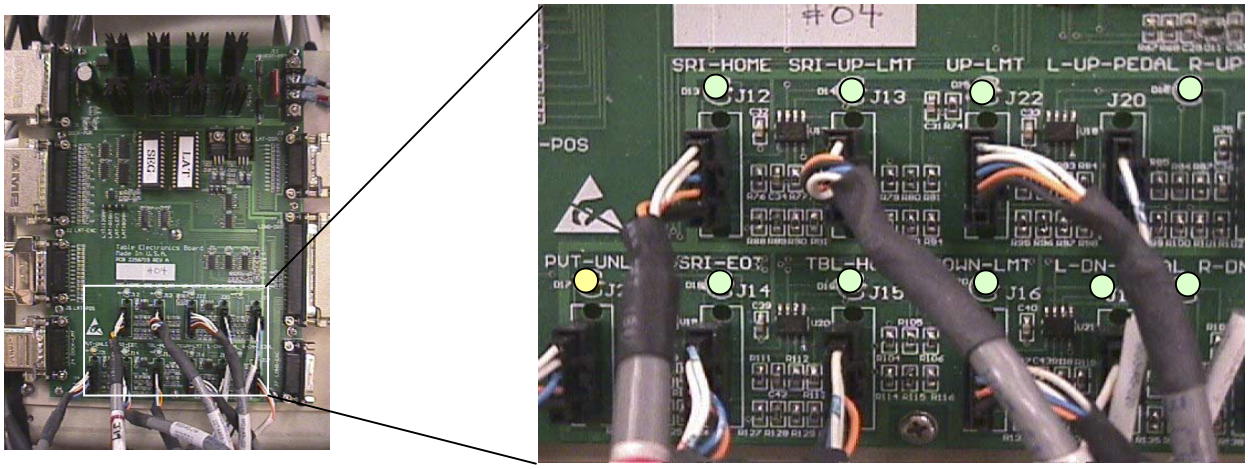
TABLE 1-11
DIAGNOSTIC LEDS.

Signal	Color	On State
Home Sensor for table up/down control	Green *	At home
Home Sensor for SRI long drive control	Green *	At home
Longitudinal EOT for SRI long drive control	Green *	At EOT
Left and Right Up Pedal	Green *	Pedal depressed
Left and Right Down Pedal	Green *	Pedal depressed
Up Limit Sensor for table up/down control	Green *	At up limit
Up Limit Sensor for SRI long drive control	Green *	At up limit
Down Limit Sensor for table up/down control	Green *	At down limit
Pivot Unlock Sensor	Yellow *	Pivot unlocked
Vertical motor UP CMD (output of 74HCT20)	Green *	Driving up
Vertical motor DN CMD (output of 74HCT20)	Green *	Driving down

2-2 Troubleshooting Test Points

The following test points are provided: +5.0VDC test point and +3.3VDC test point.

2-3 Table Electronics Board Pictural



LED's

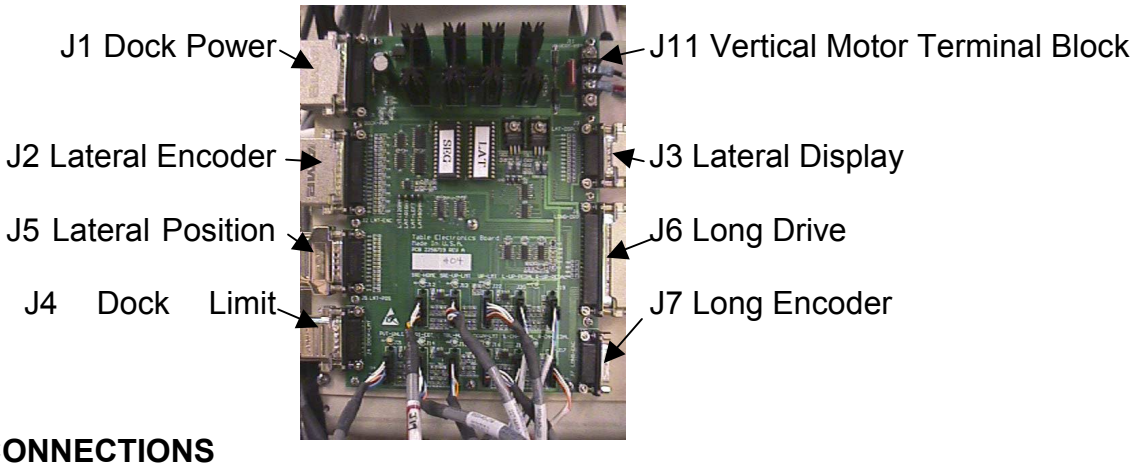
SRI-HOME (GRN)	SRI-UP-LIMIT(GRN)	UP LIMIT(GRN)	L-UP-PEDAL(GRN)	R-UP-PEDAL(GRN)	
PVT UNLOCK (YEL)	SRI-EOT(GRN)	TABLE-HOME(GRN)	DOWN-LMT(GRN)	L-DN-LMT(GRN)	R-UP-LMT(GRN)

LOCATION OF TABLE ELECTRONICS BOARD
ILLUSTRATION 1-3

Note

If any GREEN LED is ON, then the signal is satisfied and the corresponding motion is ENABLED. PVT UNLOCK (YEL) is an exception, it must be OFF. (When PVT UNLOCK is OFF, it is an indication that the Table Brake is set (on).

2-4 Cable Connections and Descriptions for the Table Electronics Board



CABLE CONNECTIONS
ILLUSTRATION 1-4

2-4-1 Condition for Cradle movement:

1. Table must be at one of the three valid positions: Zero degree, +25 or -25 degree positions. (PVT UNLOCK LED will be OFF if the table is in a valid position.)
2. The Table Brake must be set.
3. The lateral Display must read less 89mm or less at the Zero position. Or 119mm or less if the table is in one of the other two positions.
4. The Table must be at it maximum Software Up limit. (SRI-UP LIMIT LED is OFF)

2-4-2 LED configuration at Zero position (Known working condition):

Conditions:

1. Table at Zero degree position.
2. Brake set (on)
3. Cradle at HOME position (Out of magnet, completely on table)
4. Cradle at (0mm) Zero mm laterally. (Left to right)
4. No flashing eights (**8888**) or backward C (ↄↄↄↄ) - See Section 3-4 Subsystem Error codes) on Magnet Display.
5. Laser Lights are functional.

The following Table Electronics board LED's will be ON if the table is operating normally:

1. SRI-Home (Off? Perform LONG DRIVE SYSTEM CALIBRATION)
2. SRI-UP Limit
3. Table Home

If any of these three LED's is NOT on, check the physical conditions of the sensors and cables first.

1. SRI-Home (Off? Perform HFO-LONGITUDINAL DRIVE SYSTEM CALIBRATION)
2. SRI-UP Limit (Off? Perform OPENSPEED TABLE ELEVATION CALIBRATION)
3. Table Home (Off? Perform HFO-LONGITUDINAL DRIVE SYSTEM CALIBRATION)

2-5 Swing Table Electronics (T.E.) to External Connectors and Internal Table Components

Convention:  = Cable to Cable connection

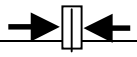
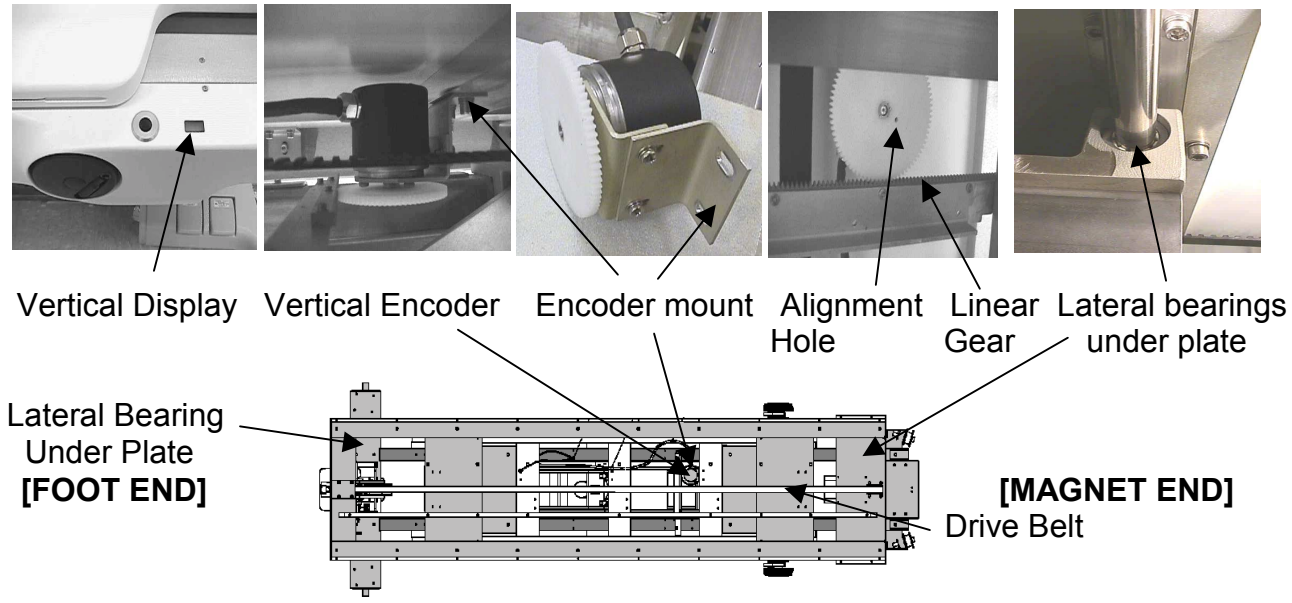
Label	T.E. Board Jack #	Run # From Table	Cable to Cable Connector/Type 	Run # To Pen Panel	Pen Panel Jack #	Signal Description & Location	Run # to System device	Jack # on system Device
DOCK-PWR	J1	884	J 11 - DB25 M-F	906	J47	**MR1 A7** Dock power from SSM	771	J43
LAT-ENC	J2	Internal	DB25 F-M			Lateral encoder (internal cable)		
LAT-DSPLY	J3	Internal	DB15 F-M			Lateral position displays (Internal cable)		
DOCK-LMT	J4	882	J 14 -DB15 M-F	859		**MG2 A33** Dock limit switches to SRI, +8.0VDC from SRI		J3
LAT-POS	J5	885	J12- DB15 M-F	866		**MG2 A40** Lateral position to Magnet I/F Bd.		J3
LONG-DRV	J6	883	J13- DB37 M-F	860		**MG2 A33** Long. encoder and limit switches to SRI, +8.0VDC from SRI		J2
LONG-ENC	J7	Internal	DB15 F-M			Longitudinal encoder		
VERT-MTR	J11	Internal	2 position screw terminal			Vertical motor		
SRI-HOME	J12	Internal	6 pin in-line			SRI home sensor		
SRI-UP-LMT	J13	Internal	6 pin in-line			SRI up limit sensor		
SRI-EOT	J14	Internal	6 pin in-line			SRI end of travel sensor		
TBL-HOME	J15	Internal	6 pin in-line			Table home sensor for vertical motion		
DOWN-LMT	J16	Internal	6 pin in-line			Table down limit sensor for vertical motion		
Right -DN-PEDAL	J17	Internal	6 pin in-line			Right down pedal		
Left -DN-PEDAL	J18	Internal	6 pin in-line			Left down pedal		
Right -UP-PEDAL	J19	Internal	6 pin in-line			Right down pedal		
Left -DN-PEDAL	J20	Internal	6 pin in-line			Left down pedal		
PVT-UNLCK	J21	871	6 pin in-line			Pivot unlock sensor	943	
UP-LMT	J22	Internal	6 pin in-line			Table up limit sensor for vertical motion		

TABLE ELECTRONICS INTERCONNECT TABLE

TABLE 1-12

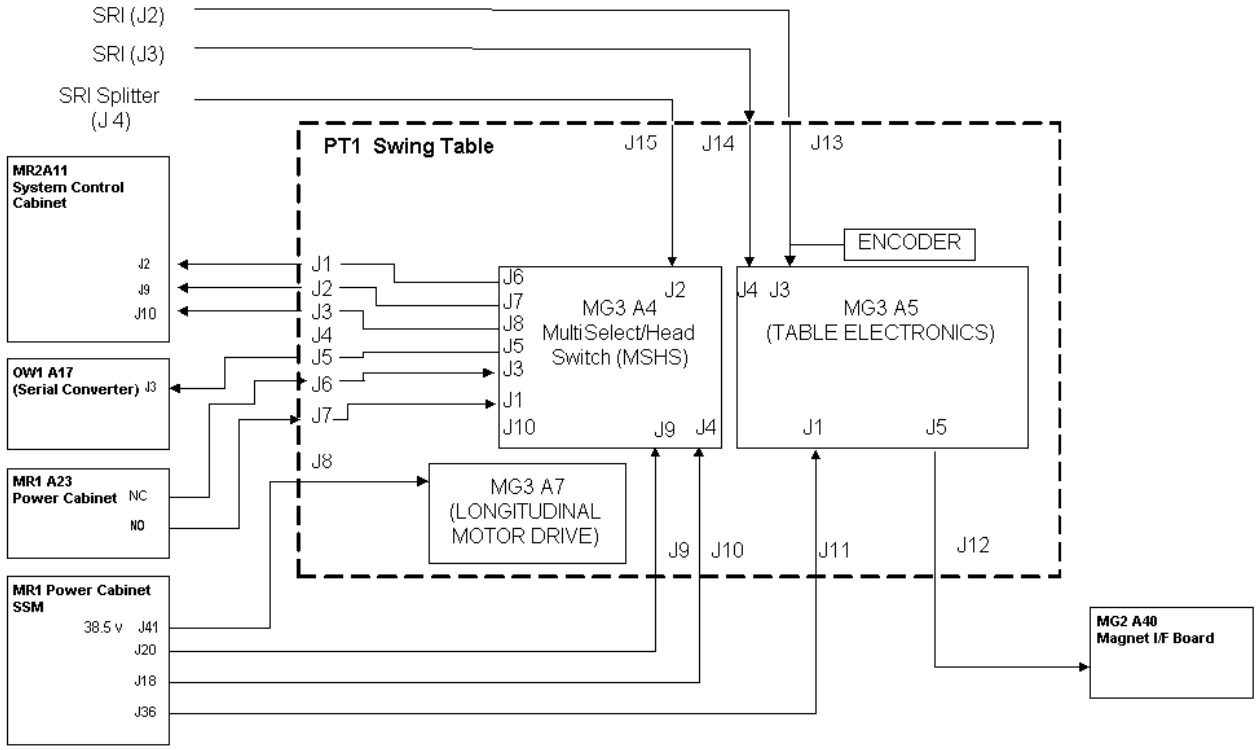
2-6 Vertical Drive System - Encoder, Lateral Bearing, Display/ Locations



VERTICAL DRIVE SYSTEM
ILLUSTRATION 1-6

2-7 Partial Block Diagram of Table Integrated with OpenSpeed System.

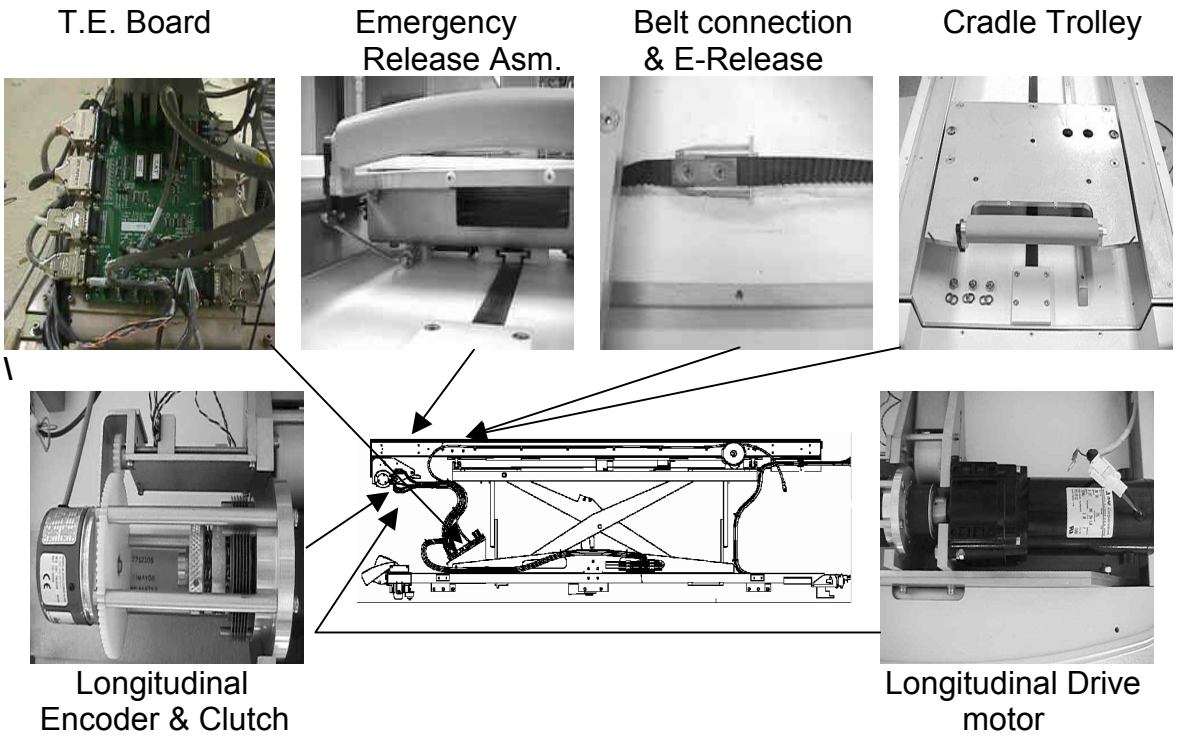
See OpenSpeed Block Diagrams & Schematics manual for further details.



3- TABLE SUBSYSTEM TROUBLESHOOTING SCENARIOS -ERROR CONDITIONS

3-1 Overview

Location of key parts



TABLE/CRADLE BREAKDOWN
ILLUSTRATION 1-8

3-2 General Information and conditions of operation

- Error codes:
  - The table error codes are also the same codes that an Operator would see if the table is not positioned correctly.

- Scanning Conditions:
  - To scan the table must be at one of the three valid (Zero, +25, -25 degree) positions.
    1. No error code should be displayed on Magnet. See (Error Codes Section 3-4)
    2. Cradle must be in the FULL UP position.
    3. Must have a valid Protocol and Landmark
    4. Object must be at ISO. (Magnet Display reads (0) Zero.
    5. Cradle at valid Lateral position. (0 to -/+89 at Zero, +120mm at +25, -120mm at - 25)
    6. No Gradient Over temperature condition must exist.

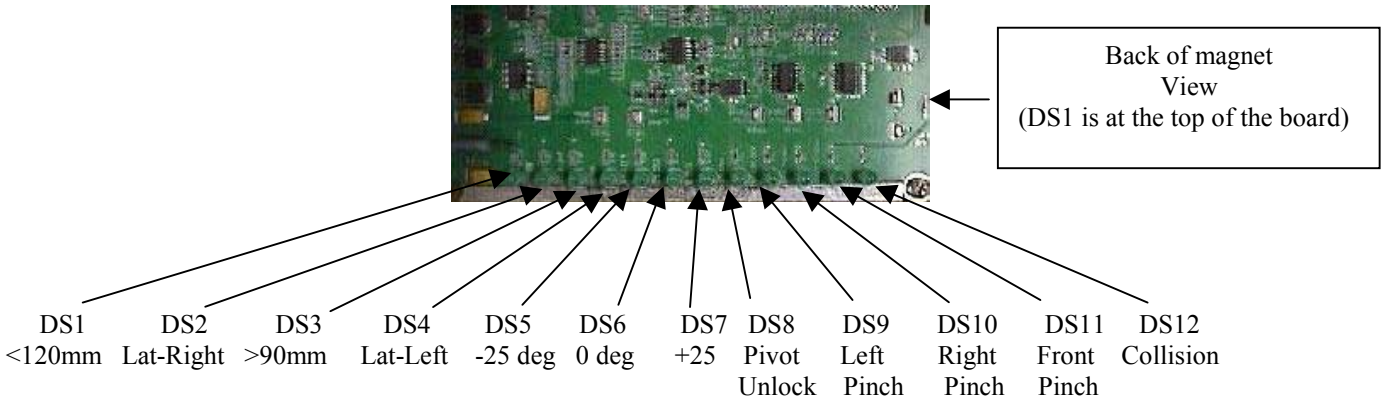
- Elevation:
  - The elevation system on the table has approximately has been designed around the nominal height of the lower magnet. It provides approximately 7mm of adjustment between the Physical Limit of the table and the SRI UP (electronic) Limit.

- Magnet I/F Status LED's:
  - This table explains what LED's should be lit in the Magnet I/F under normal conditions at all three valid positions and two invalid positions.

		0 Position	0 Position + 90	0 Position - 90	-25 and Cradle lateral -120	+25 and Cradle lateral +120	NOT AT VALID Pivot Position Cradle Lateral Position is 0	NOT AT VALID Pivot Position Cradle Lateral Position is -90
DS1	< 120mm	on	on	on			on	on
DS2	Lateral Right	on	on		on		on	
DS3	>90mm				on	on		
DS4	Lateral Left	on		on		on	on	on
DS5	-25 degree				on			
DS6	0 degree	on	on	on				
DS7	+25 degree					on		
DS8	Pivot Unlock						on	on
DS9	Left Pinch							
DS10	Right Pinch							
DS11	Front Pinch							
DS12	Collision						on	on

MAGNET IF LED STATUS- KNOWN CONDITIONS

TABLE 1-13



MAGNET I/F BOARD
ILLUSTRATION 1-9

3-3 Table Subsystem Error Codes - Quick Lookup Table

NOTE:

It is possible to get multiple error code conditions. Refer to all of the codes to solve multiple conditions. Example: Left Magnet Display is flashing ⊂ ⊂ ⊃ ⊃ **and** the Right Magnet display is reading is flashing **8888.**

Problem	Possible Solutions
Left Display Flashing: ⊂ ⊂ ⊃ ⊃ Cradle/Table Collision Indication	**Check for ONE or a COMBINATION of the following conditions:** • The table brake is NOT engaged. Engage table brake. • The brake pin is not seated into the locking hole at the wearplate. Move the table until the brake pin drops in the hole. • Operator is trying to move cradle laterally when it is in the magnet. Cradle cannot be moved laterally unless it is at its Home Position on the table. • Operator is trying to move cradle laterally while simultaneously trying to drive the cradle into in the magnet. Each axis must be moved separately. • The table is at the Center (O Degree) position and the cradle has been moved laterally, outside of the +/- 90mm limit. • The table is at the **+25** Degree position and the cradle has NOT been moved laterally, to **+120mm** position. Remove the Patient or any weight on the cradle and crank the cradle to the proper position. • The table is at the **-25** Degree position and the cradle has NOT been moved laterally, to **-120mm** position. Remove the Patient or any weight on the cradle and crank the cradle to the proper position. • (Install) The table is at the **+25** Degree position and the cradle has been moved laterally, to **+120mm** position. Reverse the wiring of the +/- 25-degree pivot position switches. (See Section 5-2) • (Install) The table is at the **-25** Degree position and the cradle has been moved laterally, to **-120mm** position. Reverse the wiring of the +/- 25-degree pivot position switches. (See Section 5-2) • (Install) brake engaged but brake pin is not extending far enough. Adjust brake sensor using the Brake Pedal Switch Calibration procedure. • Brake Sensor Failure. Replace sensor or broken wires.

The left magnet display is flashing: **UUUU** Cradle/Table Interference	**Check for ONE or a COMBINATION of the following conditions:** • The Cradle is touching pinch a sensor. (See Section 5-2) • The Patient is touching a pinch sensor. • A RF Coil cable, is touching a pinch a sensor. • A cover is touching one of the magnet downpost pinch sensors. Re-position the cover. (See Section 5-2) • A pinch sensor is sticking. Identify which sensor is sticking by opening up the Magnet I/F unit on the Sled, and looking at the LED's. Lightly tap the offending sensor until its' diagnostic LED goes off. (See Section 5-2) • A pinch sensor has been disconnected. Identify the offending sensor by opening up the Magnet I/F unit on the Sled, and looking at the diagnostic LED's. Reconnect the pinch sensor. (See Section 5-2) • A pinch sensor has failed. Identify the offending sensor by opening up the Magnet I/F unit on the Sled, and looking at the diagnostic LED's. Replace the failed pinch sensor. (See Section 5-2)
The left magnet display is flashing: 8888	**Check for ONE or a COMBINATION of the following conditions:** • The table is not at one of the three valid positions. Move table to a valid position. • Cradle is centered laterally, located between scanning positions, and brake is on. • A pinch sensor is activated AND the table brake is off. • Make sure that the table pivot position switches or their cables are not damaged.

The left magnet display is flashing: ⊂⊂⊃⊃ and the right magnet display is flashing: 8888	**Check for ONE or a COMBINATION of the following conditions:** • All pivot position switches have failed and a pinch sensor is engaged or broken or disconnected. • The pivot position switch cable has been severed, and a pinch sensor is engaged, broken or disconnected. • The pivot position switch at the location you are attempting to use is broken, or its cable has been severed, and a pinch sensor is engaged, broken or disconnected. • Cables J4 (Pivot) and J5 (Pinch) are disconnected on the Magnet I/F unit.

The left magnet display is flashing:
8888
and
The Right magnet display is also flashing
8888
	Check for ONE or a COMBINATION of the following conditions:
	• (Occurred at Install) Display is flashing this error on both sides of Magnet Display. Make sure that the J5 and J4 magnet I/F cables have not cross-connected during installation or during replacement of Magnet I/F unit.
	• Multiple problems exist. You must isolate one at a time.
	  • A combination of at least two and possibly all, signals for the table position and/or pinch sensors are not satisfied. Look for severed Pivot Position cables, broken Pinch sensors.
	  • Disconnected or broken pins at J5 and/or J4 at the Magnet I/F.
	  • Verify SRI is revision G7 or higher. Resistor R200 may have been overheated. Re-solder temporarily and Replace SRI.
	  • On G8 SRI, locate Resistor R200. (Lower Right corner of board). This is a 3 Watt 100 Ω resistor. If resistor is open it can cause the loss of +24 volt power to the Button pads on the enclosure. Replace SRI.
	  • +24 Volt Power Supply problem. Loss of +24 volt power supply in the SSM (on the Buck-H Bridge board). Verify +24Volts at pins 36 and 37 on J4 of the SRI. Or check TP5, TP4 and TP3 In magnet I/F. If all three are zero (0) volts, possible loss of +24 volts from SSM.
	  • (See Block Diagrams) +24 Volt Path: SSM -J40 to Pen Panel J14 to SRI J1. Exits SRI at J4 to SRI splitter JI. Exits SRI Splitter on J9 to Magnet Display. Exits Magnet Display board to Right (J1) and Left (J2) Control button pads.
	  • Ground Loop exists, (Potential other than 0 Volts) between Table Electronics board and Table ground. No potential should exist between TP4 (GND) of the Table Electronics board and any table metal ground point. (Table Electronics Board must be floating from system Ground). If reading other than 0 volts exists, suspect shorted braids on shielded cables from the T.E. J4 to SRI J2 and T.E. J6 to J3 of SRI. Look for any other possible reason that the ground potential would be elevated above zero (0) volts between the T.E. board and the table itself.
	  • Check for bad Lateral Display board. These two small LED boards are tied to chassis ground it is possible that a shorted isolation capacitor could cause a potential on the ground plane, which would create a potential ground loop. Unplug J6 of the Table Electronics board to confirm this is the problem. (Table operation should return if it is). Replace the offending Lateral Position Display board.
	  • More than 5 buttons depressed on the operator button pads on the front of the enclosure can load down the +24 volt supply. Check button pads for damage. Replace failed button pad. (Note: the system can operate with one button pad temporarily.)

3-5 Elevation problems/Solutions

Requirements of Elevation Motion:

5 things need to happen for table Up/Down Movement:

1. Table Center Position Switch (or +/-25 degree position) must be closed. (On)
2. Table Brake must be engaged. (On)
3. Home Limit Sensor must be on. (Note: Early model tables had a metal "button" on the Table Belt itself. This Button reflects light back into the Opto-Sensor satisfying the Table HOME signal)
4. SRI UP signal must be ON.
5. Down/Up pedal depressed.

3-5-1 Problem 1: Table Does not move up or down.

Solution 1: Cradle must be in the HOME (Cradle completely on Table) position.
Solution 2: Check the 38.5v supply Circuit breaker on the SSM.
Solution 3: Check the STATUS LED's on the Table Electronics Board. (See Table 1-11)
Solution 4: Magnet Pinch Sensor activated. See (Error Codes Section 3-3)
Solution 5: Reset TPS.
Solution 6: Reboot the computer.

3-5-2 Problem 2: When stepping on the Down pedal the table goes up.

Solution 1: The Table pedal switches have been installed incorrectly. Remove the Table Pedal assembly and re-arrange the switches to create the correct action.
Solution 2: Check that the connectors on the Table Electronics board:

J20	Left UP Pedal
J19	Right UP Pedal
J18	Left DOWN Pedal
J17	RightDOWN Pedal

TABLE ELECTRONICS TO PEDAL INTERCONNECTS

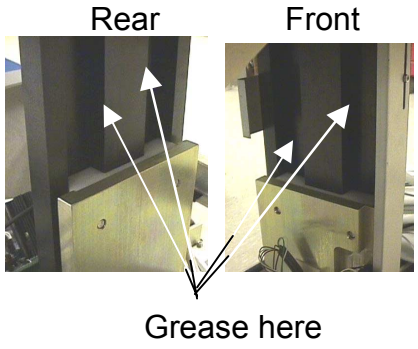
TABLE 1-13
Power Down the Table and re-arrange connector plugs per table 1-2 above.

3-5-3 Problem 3: Table does not come up far enough for the cradle to enter magnet.

Solution 1: The lower cryostat of the magnet is out of height specification. Confirm the specification has been met using the Magnet Service Manual.
Solution 2: The finish floor was not installed correctly during install, and the magnet is Sitting too high. Confirm the specification has been met by consulting with the Installation Specialist.
Solution 3: The Table Elevation Calibration Procedure has not been performed. Perform the Elevation Calibration Procedure.
Solution 4: The Magnet cryostat height, floor construction specifications are within designed specifications, and Elevation Calibration Procedure has been performed but, the Cradle to magnet transition still is not at the correct height. Consult the Installation Specialist. It may be necessary to perform the Elevation Drive Trunion Adjustment procedure (Factory Procedure). See the OpenSpeed Replacement Maintenance Section. (Note: DO NOT perform this procedure without communicating with Swing Table Design Engineering).

3-5-4 Problem 4: Elevation drive operation is erratic, shudders, (severe jerking motions).

Solution 1: Grease the Elevation Drive Guides at both ends of the table. Use any available grease. Apply it to the aluminum rail near the Teflon guides, and drive the table up and down to spread out the grease.



Solution 2: Check the SSM 38.5v power supply for proper output. There should 38.5vdc +/-5%. The voltage should be steady. The 38.5-vdc supply is shared by the Elevation (Dock) motor and the Longitudinal (cradle) drive motor.
If the voltage level is erratic or fluctuating between 43.0vdc and .1vdc the table will severly lurch or jerk during any attempt to move it. This is due to the fact that the power supply can only provide enough current to drive ONE motor at a time, and is cycling due to excessive amperage draw. The circuitry that causes the 38.5vdc to switch between the two drive motors is on the Table Electronics board.
To verify the Table Electronics board is at fault refer to the OpenSpeed Block Diagrams & Schematics manual, Patient Handling Tab Page 1-1, AND Perform the following troubleshooting steps:

1. Disconnect the cables at J47 and J11 on the Penetration Panel.
2. Check the 38.5vdc supply.
    - If you still have unstable voltage levels, replace the Dock Power Supply in SSM.
    - If the 38.5vdc is steady and constant, Reconnect J47.
        - Attempt to drive the table up or down with the buttons. If the movement is smooth, replace the Table Electronics board.
        - To verify, Reconnect J11 and J47. If the erratic table motions return, this confirms that the crossover circuitry found on the Table Electronics board that controls switching between the Dock (Elevation) motor and the Longitudinal (cradle) motor has failed. Replace the Table Electronics board.

3-5-5 Problem 5: SAFETY - Table moves Up or Down, while the cradle is extended into magnet.

Solution 1: This is an indication that the SRI HOME Sensor block is incorrectly set. This is a safety issue. You must perform The Longitudinal Drive System Calibration Procedure, specifically the SRI UP Limit Adjustment Section 3-4 SRI Home and Reverse Travel Limit Adjustment and 3-5, Forward Travel Limit Adjustment.

3-6 Swing Position Problems/Solutions

3-6-1 Problem 1: Laser Alignment lights will not come on.

Solution 1: Insure the table is at one of the three designated positions.
Solution 2: Insure that the SSM is powered on.
Solution 3: Possible Swing Table Position switch cable severed or damaged. See (Error Codes Section 3-3)
Solution 4: Reset TPS.
Solution 5: Reboot the computer.
Solution 6: Possible problem with the Magnet I/F unit. Refer to the Magnet I/F Troubleshooting and Magnet I/F Theory Procedures.

3-6-2 Problem 2: Small LED on the laser button illuminates but the lasers do not turn on.

Solution 1: The problem is most likely in the SSM. Possible Dock Power Supply Board, or CPD module. Continue troubleshooting in the SSM to Laser Light path.
Solution 2: The laser Light power is routed through the Magnet I/F unit on the Sled. It is possible that the Magnet I/F unit has failed. Replace Magnet I/F unit.

3-7 Cradle/Longitudinal Drive problems/Solutions

3-7-1 Problem 1: Cradle will not move.

Solution 1: Make sure the table is all the way up.
Solution 2: Check to make sure the Emergency Release Handle is engaged.
Solution 3: Insure that a pinch sensor is not engaged. See (Error Codes Section 3-3)
Solution 4: Insure that the SSM is powered on, and the 38.5v supply is functioning.
Solution 5: Cradle Drive Belt may have slipped and the system does not know were the cradle is. The Cradle must report the HOME position as a condition of forward movement.
Solution 6: Reset TPS.
Solution 7: Reboot the computer.
Solution 8: Replace the Dock/Light Board in the SSM.

3-7-2 Problem 2: Cradle is making excessive noise.

Solution 1: Replace the plastic roller wheel assemblies that are causing the squeaks.
Solution 2: The cradle drive belt may be too tight.

3-7-3 Problem 3: Cradle moves using " Slow-In " button only.

(Pushing the "Advance to Landmark" button may still allow table to move to landmark)
Solution 1: Check all cabling from button panels to SRI.
Solution 2: Replace the Dock/Light Board in the SSM.

3-7-4 Problem 4: Cradle does not decelerate slowly. It comes to an abrupt halt.

Note

- It is normal for the cradle to move at slow speed using the "Fast In" button, until the cradle spans the distance between the table and the magnet. It should then smoothly accelerate to fast mode of operation.

- When the cradle is fully driven into the magnet, it should decelerate and slowly come to a stop. It should not abruptly stop as if it were hitting a physical stop.

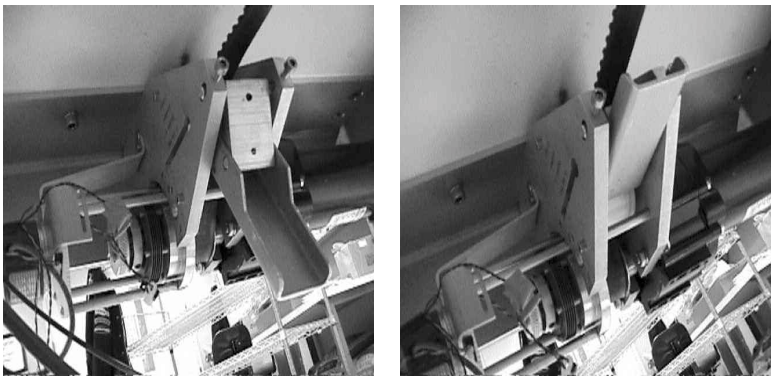
Solution 1: It is possible the cradle drive belt jumped a notch. If may be necessary to re adjust the belt and then adjust the Longitudinal Drive Assembly using the Longitudinal Drive system Calibration procedure.

3-7-5 Problem 5: Landmark or Scan Range error inhibits normal scan.

Solution 1: The cradle drive belt has skipped a notch, or several notches. This will inhibit full cradle travel. Perform the Longitudinal Drive system Calibration procedure.

3-7-6 Problem 5: The cradle makes jumping motions slipping drive belt notches.

Solution 1: The Table was recently serviced. The Cradle drive belt release lever is still disengaged.



Drive Belt Released Drive Belt Engaged
CRADLE DRIVE BELT RELEASE HANDLE
ILLUSTRATION 1-9

Solution 2: Drive belt stretched or excessively worn.

3-7-7 Problem 5: Cradle hits pinch sensor on front of magnet enclosure.

Solution: Perform the Table Elevation Functional Check, and possibly the Table Elevation Calibration Procedure.

3-7-8 Problem 6: Table Elevation Procedure does not drive table high enough.

Solution 1: Perform Elevation Drive Trunion Pin Calibration Procedure. If you need to perform this procedure it is possible that:

- Too much weight was placed on the table.
- The table was incorrectly setup at the factory.
- The magnet was setup too high at install as well.

3-7-9 Problem 7: Cannot release the brake with the cradle in the magnet.

Solution 1: This is a normal condition. The table is not allowed to swing with the cradle extended.

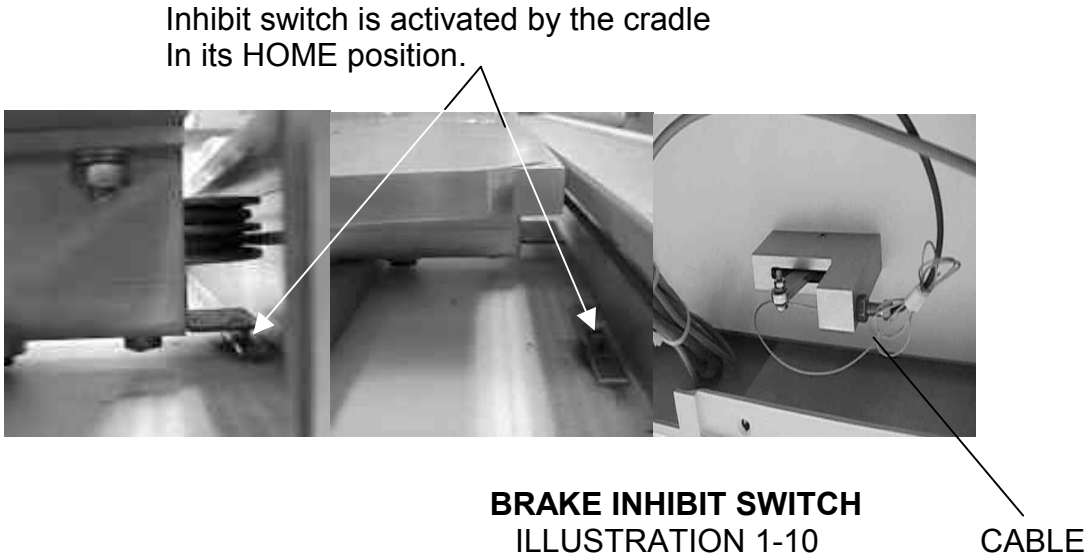


ILLUSTRATION 1-10

Solution 2: The brake cable attached to the inhibit switch has been stretched and must be adjusted or replaced. (See Replacement/Maintenance procedures).
Solution 3: The Brake Inhibit Switch mechanism has been damaged. Replace the cable. (See Replacement/Maintenance procedures).

3-7-9 Problem 5: SAFETY-Table moves Up or Down, while the cradle is extended into magnet.

Solution 1: This is an indication that the SRI HOME Sensor block is incorrectly set. This is a safety issue. You must perform The Longitudinal Drive System Calibration Procedure, specifically the SRI UP Limit Adjustment Section 3-4 SRI Home and Reverse Travel Limit Adjustment and 3-5, Forward Travel Limit Adjustment.

3-7-10 Table Jitters or shimmies side to side when lower a heavy patient.

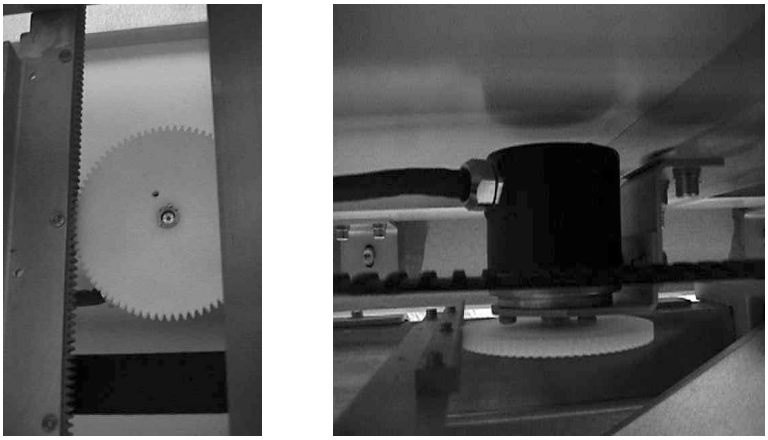
There are only a few things that could be causing this. To isolate problem remove the covers and look/listen for what is hanging up:

Solution 1: The screws that hold the 2 halves of the upper scissors cover could be too long so they catch on the lower scissors cover as the table goes down. Replace with shorter screws?
Solution 2: The slider blocks on the ends of the scissors nearest the magnet could be hanging up. Apply grease.
Solution 3: The front and/or rear vertical guides could be hanging up. Apply grease. (See section 3-5-4, Problem 4)
Solution 4: The actuator could be in trouble. Check that trunions are set the same on each side so the actuator is vertical. See Swing Table Elevation Trunion Pin Adjustment procedure.
Solution 5: Possible gas shock failure. See Gas Shock Replacement procedure
Solution 6: Failure of the actuator itself. See ELevation Drive Replacement procedure.

3-8 Lateral (Cradle Left/Right) Positioning Problems.

3-8-1 Problem 1: Lateral display does not read full + /- 120mm.

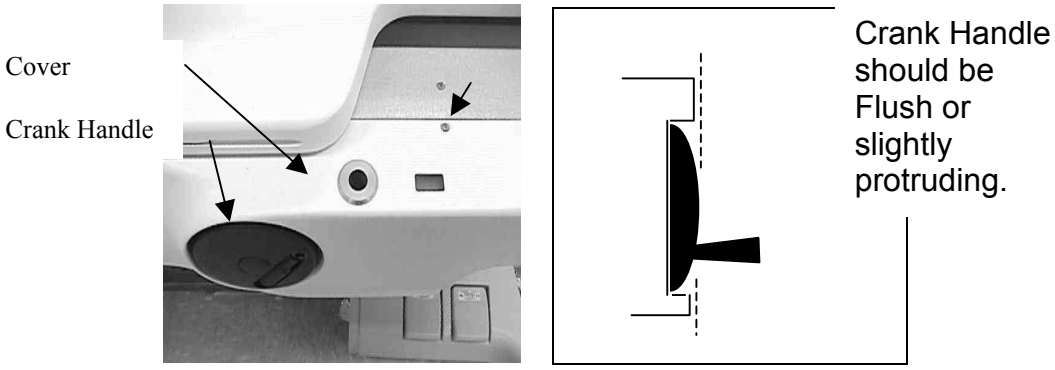
Solution 1: The encoder has the capability of displaying approximately +/- 127mm. The Lateral encoder gear slipped.
Solution 2: The lateral encoder or cabling to it, has been damaged.
Solution 3: Check the Table Electronics board and cable connections.
Solution 4: Re-adjust the lateral encoder and gear. (See Replacement/Maintenance procedures).
Solution 6: Check to make sure that the covers are not interfering with the lateral drive operation. They are a very close fit near the crank handle.



LATERAL ENCODER AND GEAR
ILLUSTRATION 1-11

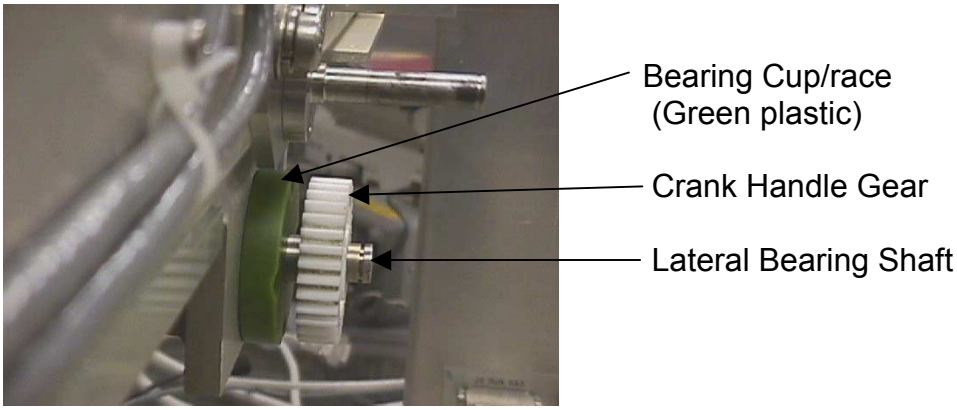
3-8-2 Problem 2: Lateral drive is sticking or hard to crank left and right.

Solution1: Apply light duty grease to lateral bearing rails, both front and back. This will require removal of most of the covers on table.
Solution 2: Any twisting motion of the top table assembly can cause the lateral bearing to bind. Determine if the tabletop is twisted by inspecting the condition of the Table Front Rail and the rear wheels. The Front Rail and rear wheels must travel in the same plane. A tabletop that is twisted may be due to damage during shipment. This would occur only during the Initial installation of the Swing Table.
Solution 3: Check to make sure that the covers are not interfering with the lateral drive operation. They are a very close fit near the crank handle. The cradle should drive laterally in both directions smoothly and without restriction. If hard cranking is encountered, check to make sure that the top cover is adjusted properly. The crank handle should not stick out pass the cover. (See illustration on top of next page)



CORRECT COVER ALIGNMENT
ILLUSTRATION 1-12

Solution 4: EARLY MODELS (first 20 units) The lateral bearing cups/races were defective. These were replaced on ALL models with an oil impregnated replacement. All tables should have the new Bearing cups/races installed. To determine if you have the updated version, inspect the lateral bearings. The cup/races will be made of a plastic material and are green in color. If necessary, contact MR Service Engineering for replacements.



LATERAL BEARING ASSEMBLY
ILLUSTRATION 1-13

3-9 Table Swing Position Problems.

3-9-1 Problem 1: Cradle hits cover, <u>front of magnet downposts</u> at -25 degree or the +25 degree positions.

Solution 1: The Table is installed too close to the magnet. This would indicate that the Table Front Rail, Rear Wearplate or both have been installed incorrectly. Check All measurements found in Section 3 of the Swing Table Install & Mechanical Center Alignment procedure. Re-install Wearplate correctly.

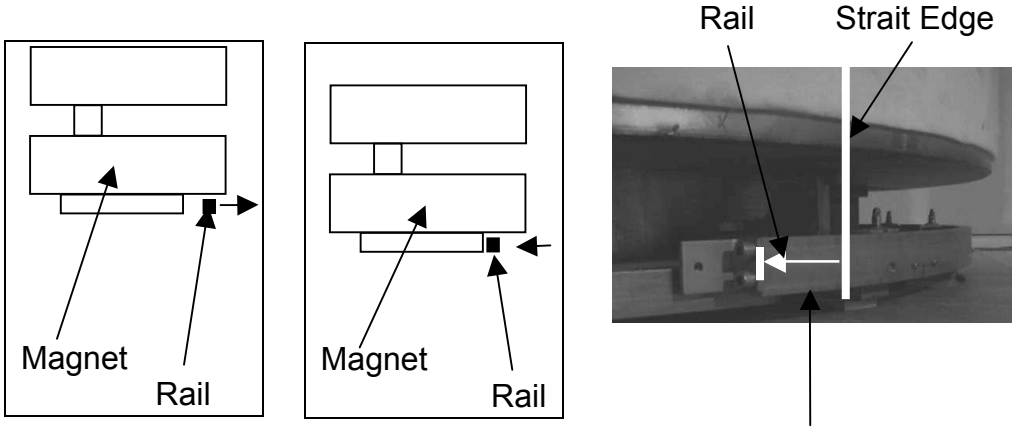
Solution 2: Using the table below, check the location of the Table Front Rail.

Measurements taken with the magnet in the following conditions:	Target Rail Location (Middle)	Minimum Adjustment (Rail pushed Back)	Maximum Adjustment (Rail pulled Forward)
Bare Cryostat surface, No blanket or Cover Wrap installed	27.81 mm 1-3/32 inches	17.983mm 11/16 inches	36.44mm 1-7/16 inches
With Blanket Installed	34.9mm 1-3/8 inches	25.07mm 1.0 inches	43.53mm 1-23/32 inches
With Blanket & Cover Wrap Installed	36.4mm 1-7/16 inches	26.574mm 1-1/16 inches	45.03mm 1-3/4 inches

RAIL MEASURMENT TABLE

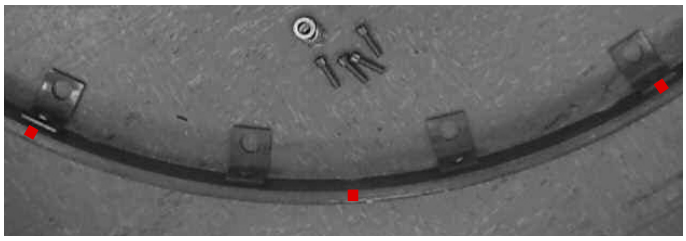
Table 1-14

How to measure: Using a measuring tape or rule, measure from the strait edge to the rail on both the left and right sides. Adjust the rail achieving equal distances on both sides and center points. (See Illustration 1-14 , 1-15 and Table 1-16).



MOVE RAIL FORWARD **MOVE RAIL BACK** **DISTANCE TO MEASURE LEFT/ MIDDLE/RIGHT**

ILLUSTRATION 1-14



MEASUREMENT POINTS
Illustration 1-15

3-9-2 Problem 2: Cradle hits cover, <u>Rear of magnet downposts</u> at -25 degree or +25

degree positions.

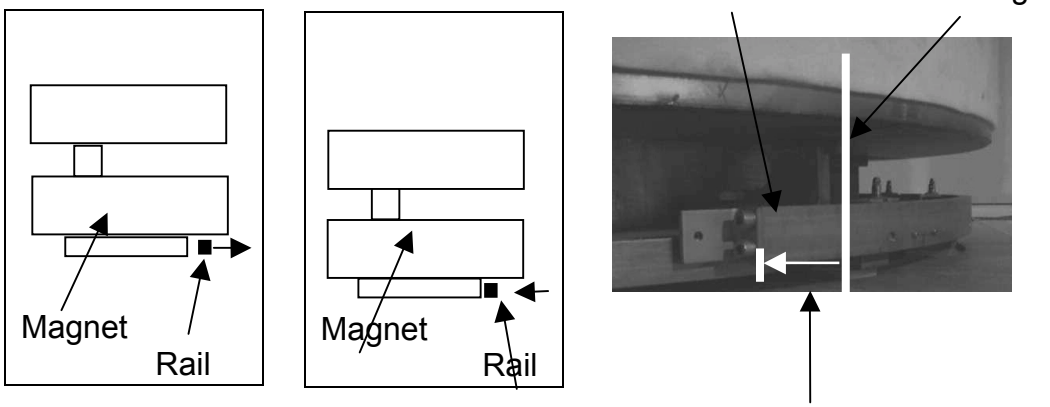
Solution 1: The Table is installed too far away from the magnet. This would indicate that the Table Front Rail, Rear Wearplate or both have been installed incorrectly. Check All measurements found in *Section 3* of the Swing Table Install & Mechanical Center Alignment procedure. Re-install Wearplate correctly.
Solution 2: Using the table on the next page, check to make sure that the Table Front Rail is located correctly:

Measurements taken with the magnet in the following conditions:	**Target Rail Location (Middle)**	**Minimum Adjustment (Rail pushed Back)**	**Maximum Adjustment (Rail pulled Forward)**
Bare Cryostat surface, No blanket or Cover Wrap installed	27.81 mm 1-3/32 inches	17.983mm 11/16 inches	36.44mm 1-7/16 inches
With Blanket Installed	34.9mm 1-3/8 inches	25.07mm 1.0 inches	43.53mm 1-23/32 inches
With Blanket & Cover Wrap Installed	36.4mm 1-7/16 inches	26.574mm 1-1/16 inches	45.03mm 1-3/4 inches

RAIL MEASURMENT TABLE

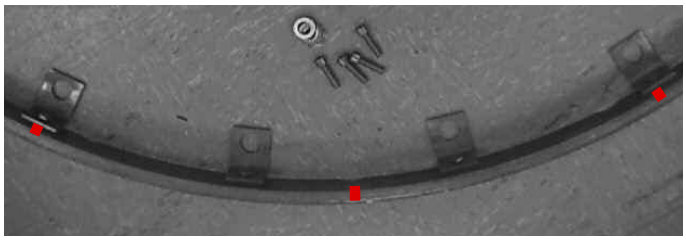
Table 1-15

How to measure: Using a measuring tape or rule, measure from the strait edge to the rail on both the left and right sides. Adjust the rail achieving equal distances on both sides and center points.



MOVE RAIL FORWARD **MOVE RAIL BACK** **DISTANCE TO MEASURE LEFT/ MIDDLE/RIGHT**

ILLUSTRATION 1-16



MEASUREMENT POINTS
Illustration 1-17

Solution 3: The table angle is more than +27 degrees in either direction. Check Measurements found in steps 1-9 in *Section 3* of the Swing Table Install & Mechanical Center Alignment procedure. Specifically, look at Illustrations 1-8, 1-9, 1-10.

3-9-3 Problem 2: When the table is positioned at the -25 degree position, and cradle driven laterally to -120mm, the cradle hits the downpost cover or pinch sensor.

Solution 1: Check measurements found in steps 1-9 in *Section 3* of the Swing Table Install & Mechanical Center Alignment procedure.

3-9-4 Problem 3: When the table is positioned at the +25 degree position, and cradle driven laterally to +120mm, the cradle hits the downpost cover or pinch sensor.

Solution 1: Check measurements found in steps 1-9 in Section 3 of the Swing Table Install & Mechanical Center Alignment procedure.

3-10 Magnet Display and Laser Alignment Problem/Solutions

3-10-1 Problem: BOTH Magnet Display and Laser Alignment lights are not working.

Solution 1: Insure the table is at one of the three designated positions.
Solution 2: Insure that the SSM is powered on.
Solution 3: Reset TPS.
Solution 4: Reboot the computer.
Solution 5: Start a New Exam.
Solution 6: Replace the Doc/Light Board in the SSM.
Solution 7: Replace the Magnet I/F unit.

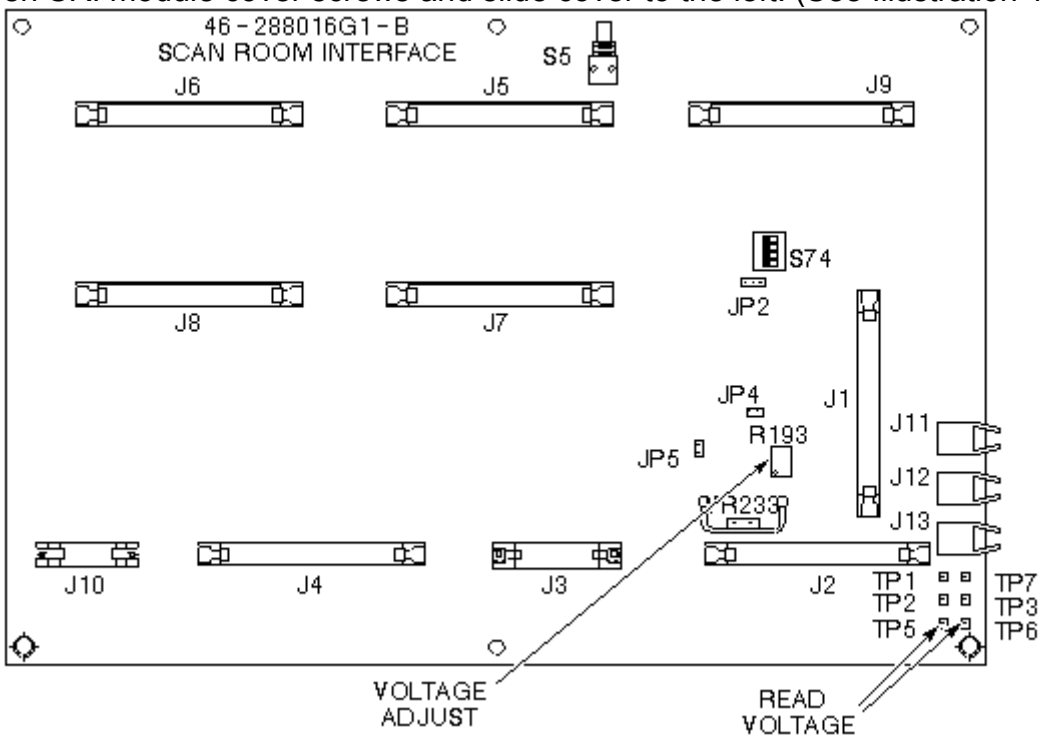
4- LONGITUDINAL ENCODER SUPPLY VOLTAGE ADJUSTMENT

4-1 Adjustment of the five volt power going to the longitudinal encoder.

This procedure is performed on the SRI (scan room interface) board. This is factory set. This section has been included, only if a problem with the encoder has been determined.

1. The SRI is located on the top of the magnet wit the Magnet I/F. Gain access to the SRI module.

2. Loosen SRI module cover screws and slide cover to the left. (See Illustration 1-9).



LONGITUDINAL ENCODER SUPPLY VOLTAGE ADJUSTMENT
ILLUSTRATION 1-18

3. With system powered up, connect meter set for dc volts to TP5 and TP6 (see Illustration 1-9).

4. Adjust R193 (located above J2 and left of J1) until a 5.0 $\pm$ 0.1 Vdc reading is indicated on the meter.

5. Slide SRI module cover closed and tighten cover screws.

6. Replace any covers or hardware that needed to be moved to perform this adjustment.

5- SRI AND MAGNET INTERFACE PROBLEMS RELATED TO THE TABLE

5-1 SRI- Scan Room Interface Problems:

5-1-1 Problem 1: SRI is causing Image Quality Problems.

Solution 1: See the SRI Troubleshooting procedure.

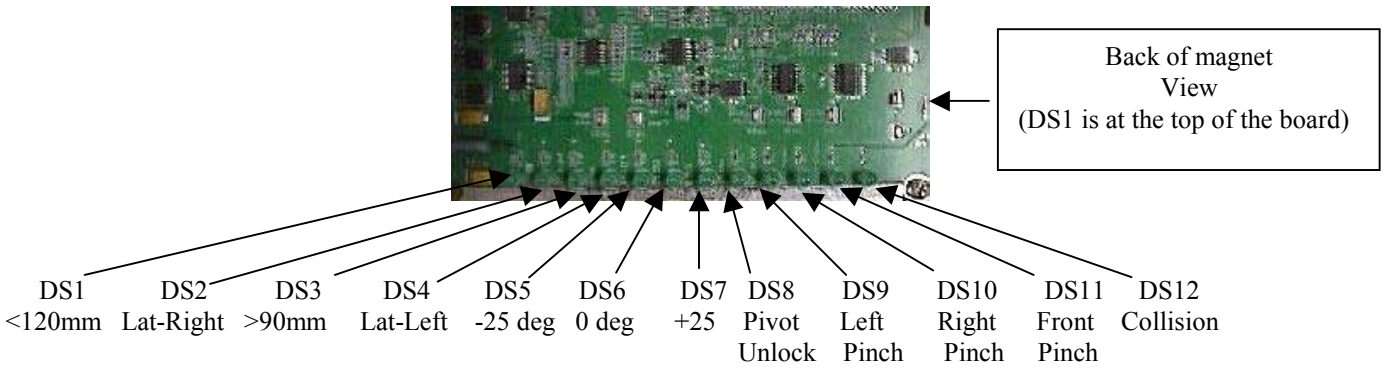
5-2 Magnet Interface (I/F) Troubleshooting/Problems.

This table explains what LED's should be lit in the Magnet I/F under normal conditions at all three valid positions and two invalid positions.

		0 Position 0	0 Position + 90	0 Position - 90	-25 and Cradle lateral -120	+25 and Cradle lateral +120	NOT AT VALID Pivot Position Cradle Lateral Position is 0	NOT AT VALID Pivot Position Cradle Lateral Position is -90
DS1	< 120mm	on	on	on			on	on
DS2	Lateral Right	on	on		on		on	
DS3	>90mm				on	on		
DS4	Lateral Left	on		on		on	on	on
DS5	-25 degree				on			
DS6	0 degree	on	on	on				
DS7	+25 degree					on		
DS8	Pivot Unlock						on	on
DS9	Left Pinch							
DS10	Right Pinch							
DS11	Front Pinch							
DS12	Collision						on	on

MAGNET IF LED STATUS- KNOWN CONDITIONS

TABLE 1-13



MAGNET I/F BOARD

illustration 1-9

5-2-1 Problem 1: Pinch Sensor error code is displayed. Can't determine which sensor is at fault.

Note

See Section 3-2 (General Information and conditions of operation) of this document for normal LED configurations on the Magnet I/F board at all legal table positions.

Solution 1: Open the Magnet I/F module by removing the screws. Observe which Pinch Sensor LED is on. They are labeled Left /Right and Center. The Left Downpost has the Floor Mounted coldhead behind it, standing at the back of the table and looking into the magnet.

If any Pinch Sensor LED is on, you will get the **UUUU** error code.

To Troubleshoot a Pinch Sensor problem:

1. Make sure the pinch sensor unit is not being activated by a cover.

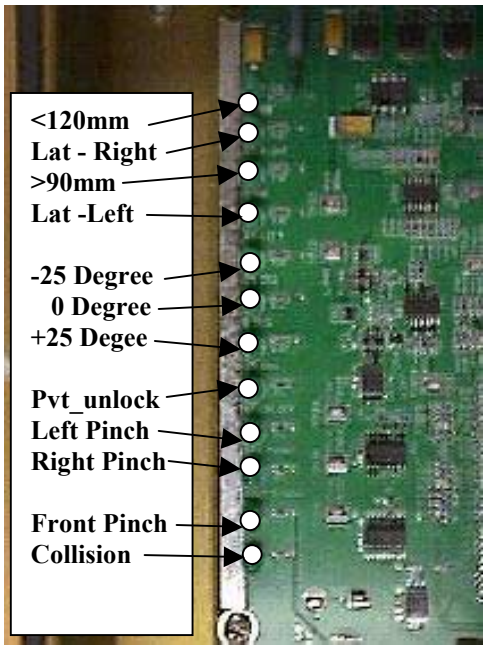
2. Make sure that nothing is touching the pinch sensor.

3. Check the cable to each pin sensor. Make sure they are securely fastened to the sensor itself, and that there is no damage to the cables. The small ribbon cable is extremely delicate.

4. A disconnected pinch sensor will cause the error code **UUUU** to appear on the display.

5. (Troubleshooting Purposes Only) Use a Pinch Sensor Defeater plug to verify proper Magnet I/F board operation related to the UUUU error condition. (See section 5-3)

6. (Troubleshooting Purposes Only) Connect a 5k ohm resistor across the pinch sensor plug, temporarily eliminating the defective pinch sensor.

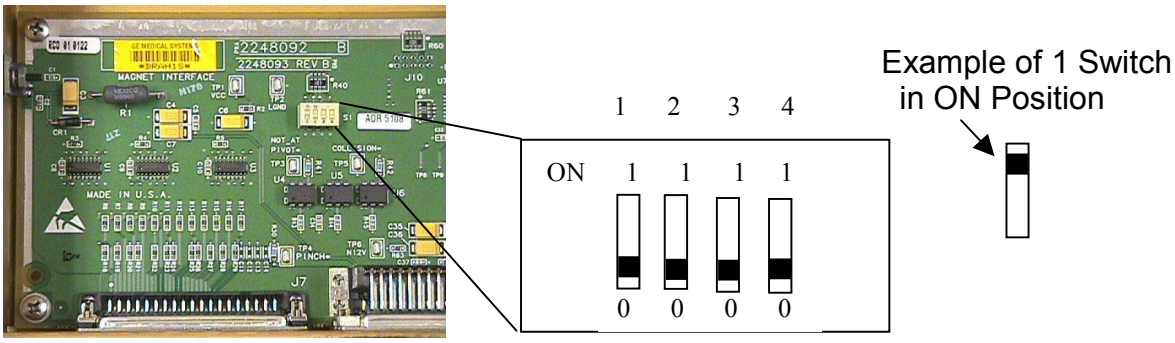


INSIDE THE MAGNET I/F UNIT - MAGNET I/F BOARD
ILLUSTRATION 1-19

Other Things to Check:

1. On Universal Magnet I/F (Part # 2254366-2 Only) Open up the Magnet I/F module and Ensure that the Quad-In-Line Switch is set to the following positions:
2. Ensure that the Quad-In-Line Switch is set to the following positions:

- OpenSpeed - All 4 switches should be in the OFF Position.
- Ovation - Switch 1 should be in the ON Position, 2,3,4 are in the OFF Position.



SWITCH CONFIGURATION (ALL SWITCHES SHOWN IN OFF POSITION FOR OPENSPEED)
ILLUSTRATION 1-19

5-3 Constructing a Pinch Sensor Defeater Plug (Used on J5 of Magnet Interface (I/F)

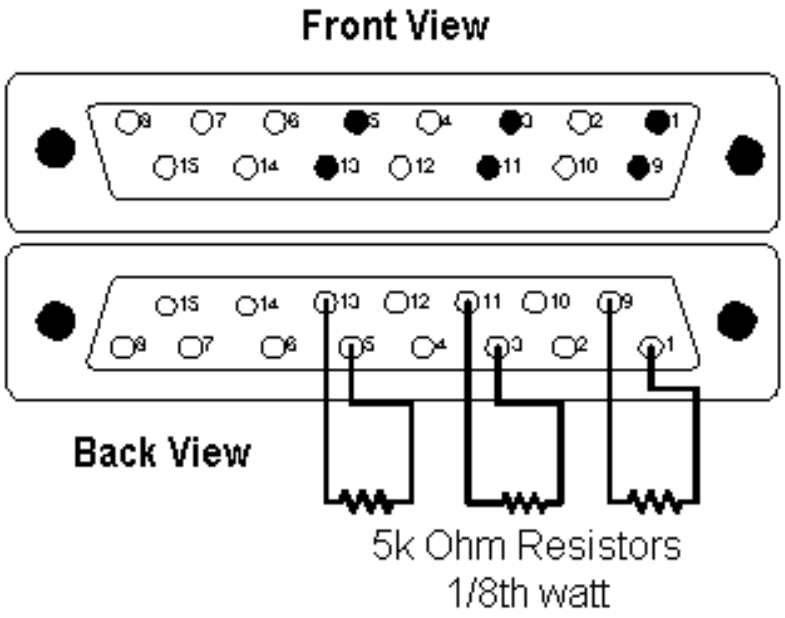
WARNING!

THE USE OF THIS DEFEATER PLUG WILL BYPASS ALL OF THE PINCH SENSORS. USE OF THE DEFEATER PLUG IS STRICKLY RESTRICTED TO TROUBLESHOOTING PURPOSES ONLY! SCANNING WITHOUT THE PINCH SENSORS ATTACHED IS PROHIBITED.

Parts List:
1. A single 15 pin female connector.
2. 3- 5k Ohm 1/8th watt resistors. (between 4k and 5.5k ohm (20%) resistors will work.)

Purpose:
Troubleshooting Only. This Defeater plug will eliminate all the pinch sensors when plugged in to J5 of the Magnet I/F, MG2 A40

Construction Directions:
Wire the connector plug as indicated in the following drawing. (Pin 1 to Pin 9, Pin 3 to Pin 11, Pin 5 to Pin 13, on J5. (To bypass pivot sensor, place a jumper wire from Pin 11 to 13 on J4.)



PINCH SENSOR TROUBLESHOOTING TOOL
ILLUSTRATION 1-20

Note:
The value of 5k ohms is a nominal value. A 4.7k ohm resistor is a very common resistor found at many local electronics stores. This will work fine.

Checking the Magnet I/F:

1. Remove the connector from J5 of the Magnet I/F Module. This cable is usually black and has three small cables coming out of it.
2. Install the Defeater plug. All the Pinch LED's should turn off and stay off. If they do, the problem is between the Magnet I/F Module and the offending pinch sensor, or the pinch sensor itself.
3. Remove the Defeater plug and re-install the orginal cable to verify your problem.

REVISION HISTORY

REV	DATE	AUTHOR	PRIMARY REASONS FOR CHANGE
A	Sept. 25, 2000	D. Hofstetter	Initial version. Swing Table Troubleshooting.
0	Oct 24, 2000	D. Hofstetter	Added more problem/solutions.
1	Mar 29, 2001	D. Hofstetter	Added measurement table related to Front Rail location. Added new problem and solutions. Added Magnet I/F and SRI Troubleshooting section. Added Table for error codes. Removed redundant Cradle problem/Solutions.
2	June 14, 2001	D. Hofstetter	Added more problem/Resolutions.
3	June 29, 2001	D. Hofstetter	Added lateral Bearing greasing recommendation in Problem/Solutions
4	Aug 22, 2001	D. Hofstetter	Added new error. Flashing 8's on both displays. Magnet I/F normal status LED condition table.
5	Sept 25, 2001	D. Hofstetter	Added problems that might be caused by the Magnet I/F. Relabeled swing positions per Design Engineering validation.
6	Oct 04, 2001	D. Hofstetter	Added more solutions. Updated Defeater plug per suggestions.
7	Dec10, 2001	D. Hofstetter	Added Solution to Lateral Drive cranking.