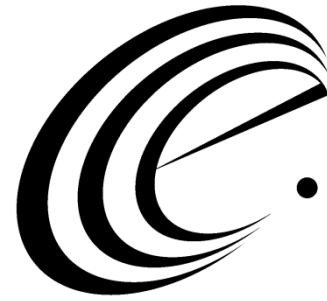


Stage 1 Crane Controller D9803D4 Instructions



Coast to Coast *For Hardware* ENTERTAINMENT *Revision 9 and Firmware Rev 37 or newer.*

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Cautions

The crane controller board is an ESD sensitive device, and care must be taken when handling the board when not installed, as ESD can damage the board. Beware the following:

1. Do not change fuses while power is applied.
2. Pay attention to polarity and pin offsets on the connectors.
3. This board supports both TTL level (from a 12V DC supply) and relay-interface (120V AC supply) to the bill acceptor. Do not use both at once, or damage to the bill acceptor and board could result.
4. Do not ship the bare board in bubble wrap or packing peanuts: Ship in an anti-static bag, and if no anti-static bag is available, wrap the board in paper first, and then pack the board for shipping.

Introduction

The Coast to Coast Stage 1 Crane Controller Boards D9803D4 Rev 9 and newer with firmware revision 37 and over, as shown in

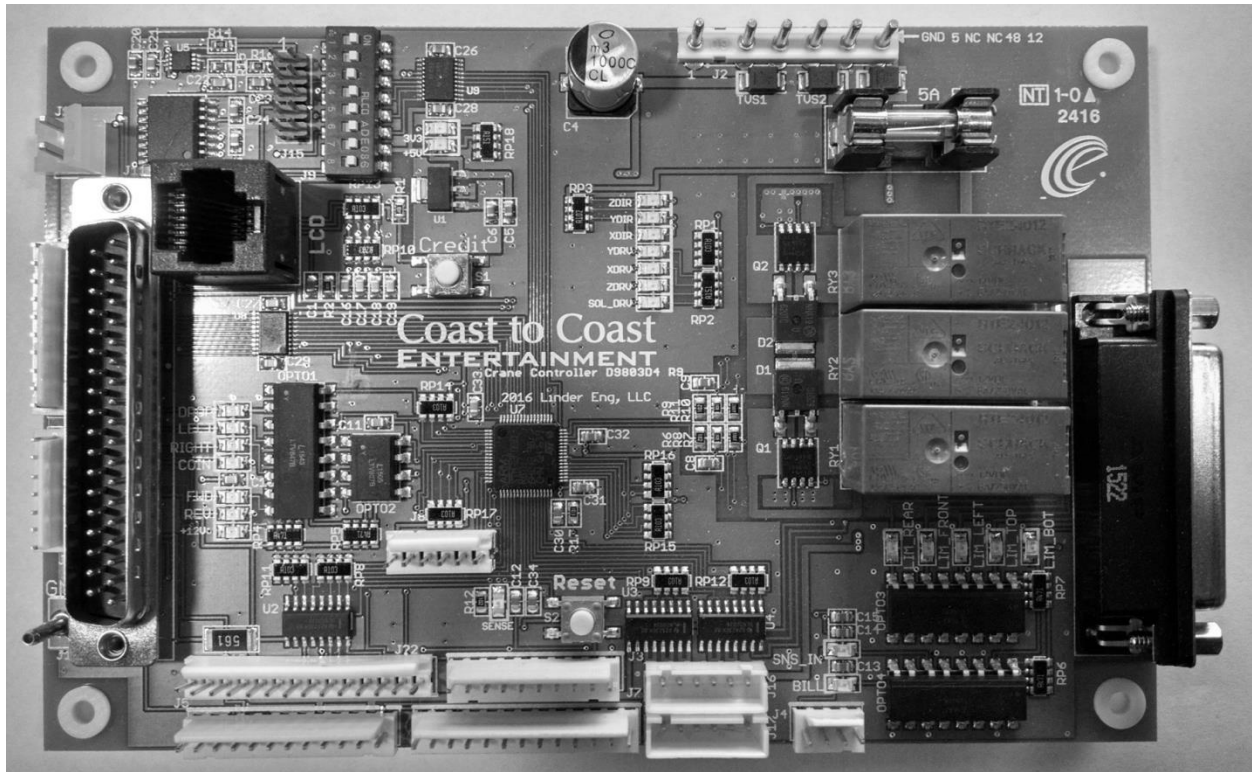


Figure 1 are covered by this manual. The board is compatible with chassis using both the 37-pin “big cable” as well as chassis equipped with individual cables for all functions. The connectors are labeled the same as the other crane controllers sold by Coast to Coast. The board has advanced on-board diagnostics, visual status indicators for all input and output pins, and advanced AutoClaw Technology. Game settings are configured via a menu-driven LCD interface. The game maintains various internal counters for game economics as well as user-configurable claw power settings. Key signals are available on different headers, to enable custom harnesses to retrofit other manufacturer's crane control cabinets.

There are two on-board buttons. A free credit button is located to the right of the LCD hand control connector, and a reset button is located at the bottom center of the board.

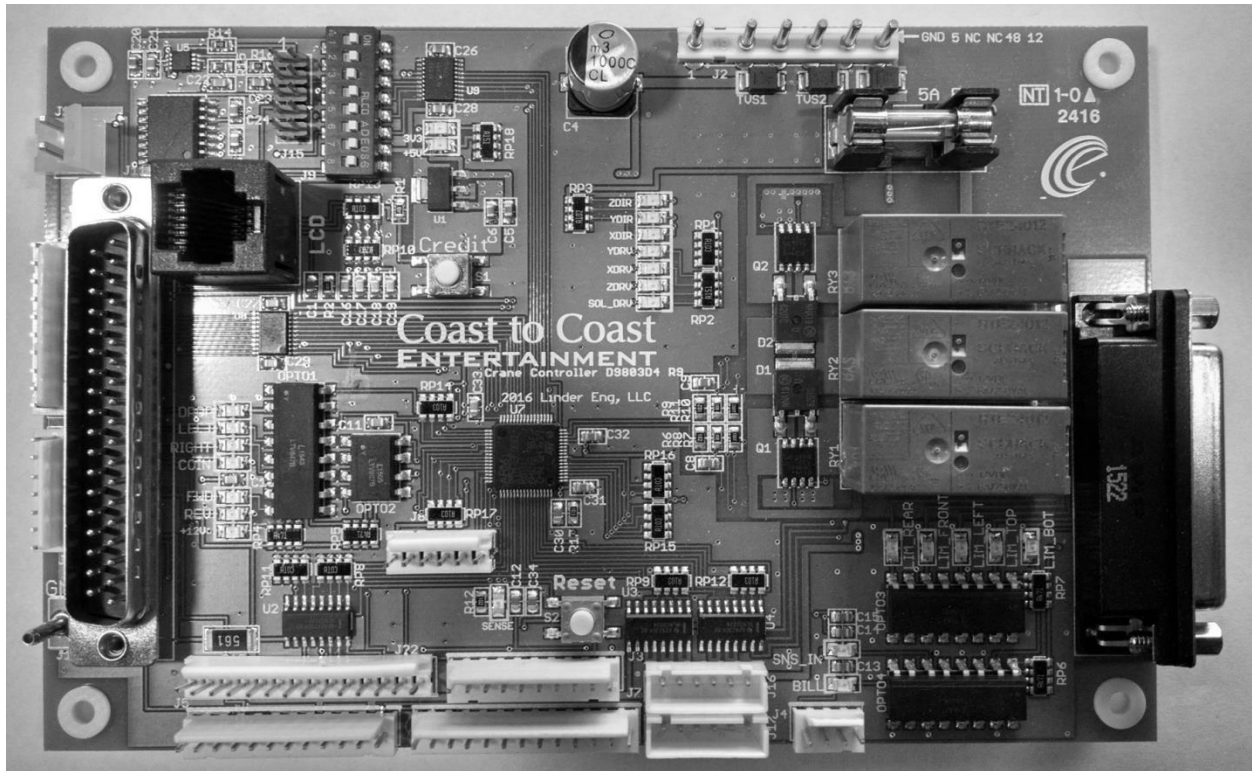


Figure 1: Rev 9 Crane Controller Board

Power-up Self Tests

When the board is first started, 88 will flash in the LED display as a lamp test. Then, the current game firmware revision will flash in the LED display as well. Following this, the self-test is entered, with numbers counting down and corresponding text messages displayed on the LCD screen indicating the current test that is being executed. If the test fails, the game halts with the error code flashing on the LED display and the error's information displayed on the LCD display.

NOTE: Holding down the LCD Control's select switch on startup will bypass the power-up self-test. This is useful for troubleshooting and maintenance, as this allows access to the game's diagnostic and test menus without successfully passing the power-up test. This feature can be used to unjam a wound-up string, for example.

NOTE: Holding down the drop pushbutton when the game's power switch is turned on will run a more complete set of tests which also tests the rear limit and claw bottom limit switch. This allows a full test of all gantry components when necessary.

Upon successful completion of the self-test, the LED display shows "00" and the cabinet LED bars begin to flash, if the internal flasher connector is used.

A troubleshooting table is presented in Table 1 indicating the error code, LCD display message, and possible corrective action. Note that Error 17 and 16 are only checked when the drop button is held down on game start. In general, if the game passes 15-13, but fails on one of 12-07, it means the limit switches are operational, and one of the motor drive or direction relays are bad, or else the cable harness is damaged. To test individual motors and switches bypass the self-test by holding down the LCD Control's select button until 00 shows in the display. The menu system can now be accessed to test individual motors and systems, as described on Page 8.

Error 05 and 04 check the claw drive electronics by measuring voltages on the board at different claw power levels. It is possible a failing or shorted claw would produce a 05 or 04 error, even if the drive electronics are functional.

Once the game has tested 17 down to one, it goes back to 18, which tests the status of the toy sensor. This is the last test, as the other systems need to be functional to enable the controller to accurately test the toy sensor.

Error	LCD Error Message	Possible Action
19	Game Test Start	Starting test. No action.
18	Sensor Test	No signal was received from the Toy sensor when the claw was moved into its site line. Check toy sensor and observe status using the test toy sensor menu option.
17	Back switch chk	Gantry rear switch closure not detected. Check back switch.
16	Bot. switch chk	Claw bottom switch not detected. Check claw switches and harness.
15	Z Drive Check	Claw vertical motion not detected. Check top switch and motor fuse. Possible bad relay.
14	X Drive Check	Claw left-right motion not detected. Check left side switch and motor fuse. Possible bad relay.
13	Y Drive Check	Claw forward-reverse motion not detected. Check front switch and motor fuse. Possible bad relay.
12	X- Drive Check	Claw right motion not detected. Check motor fuse and switch.
11	X+ Drive Check	Claw left motion not detected. Check motor fuse and switch.
10	Y- Drive Check	Claw rear travel not detected. Check motor fuse and switch.
09	Y+ Drive Check	Claw forward travel not detected. Check motor fuse and switch.
08	Z- Drive Check	Claw descent not detected. Check motor fuse and switch.
07	Z+ Drive Check	Claw raise not detected. Check motor fuse and switch.
06	Fuse Check	Fuse blown. Check fuses.
05	Claw stuck ON	Claw stuck ON. Replace claw power transistor.
04	Claw stuck OFF	Claw stuck OFF. Replace claw power transistor.
03	Coin Stuck	Coin signal set incorrectly.
02	Bill Stuck	Bill credit detector stuck on.
01	EEPROM check	EEPROM bad. Game may not store values. Send board in for service.
00	Game Start	Game running. All tests passed, or else game diagnostics bypassed by holding down controller knob on startup.

Table 1 - Debugging messages and corrective actions

LED indicators

The control board has several LED indicators to aid in troubleshooting and game status when the game is being played. If the LED changes on the board when a switch is operated, it means the wire carrying the signal to the board is good, and the problem lies on the controller board itself. Testing by looking at LEDs first can make the LCD menu based testing more useful. For LEDs indicating output, if the LED is on it means the controller is trying to turn that device on. This could mean a problem in the wiring or a bad relay or fuse.

There are 27 LEDs to indicate game state. All the LEDs and their operation are described in Table 2.

Location	PCB Label	Description
By 37-pin connector, indicates status of inputs supplied over 37 pin connector.	Drop	Drop button has been pressed.
	Left	Joystick is pressed in left direction.
	Right	Joystick is pressed in right direction.
	Fwd	Joystick is pressed down.
	Coin	Flashes when coin acceptor accepts a coin.
	Rev	Joystick is pressed up.
	+12V	12 Volt DC Supply is present.
By 25-pin connector, indicates status of inputs supplied over 25 pin connector and aux contacts	Lim_Rear	Rear limit switch is closed.
	Lim_Front	Front limit switch is closed.
	Lim_Left	Left limit switch is closed.
	Lim_Top	Top limit switch is closed.
	Lim_Bot	Bottom limit switch is closed.
	Sns_In	Flashes when toy detector detects a win.
	Bill	Flashes when bill acceptor contacts close.
Next to reset button	Sense	Toy detector is enabled when lit.
Located in center of board, next to relays	YDRV	Y-axis (front / back) energized
	XDRV	X-axis (left / right) energized
	ZDRV	Z-axis (up/down) energized
	ZDIR	Z direction select (up/down)
	YDIR	Y direction select (front/back)
	XDIR	X direction select (left/right)
	SOL_DRV	Brightness indicates relative strength of claw

Table 2 - Status LED indicators and description

Game Play

Game play will begin automatically when enough cash has been deposited for one credit.

Different sounds effects are played depending on the cash settings. Coins being inserted will cause the game to play the "cash" sound, and bills inserted will cause the game to play the "bill" sound. Once a set of credits is being used up, only the game play music will be heard, and no cash acceptance sound effects are available until all the credits presently showing on the LED display are exhausted.

The front LED display shows the number of credits remaining to be played in between games, and the game time remaining when the game is being played.

During game play, the LCD Control will show a status screen indicated number of plays, number of wins and cash in and cash out cumulative counters.

The game operation options adjustable using the LCD controller. This includes auto-learning of approximate claw powers based on toy weight, as well as various options concerning claw power and play until win style options.

Menu System

The game is either in play mode or menu mode. Any time you see menu options on the LCD display, the game is in menu mode. The machine will accept and process credits while in menu mode, but will not actually allow the game to be played. The LCD interface panel does not need to be connected to the controller board for game operation, although if it is, the screen will show cash counter information about game play. When in menu mode, the LED credit display on the game will count down from 60, to serve as a timeout. If no menu selections are made within 60 seconds, the game automatically restarts into play mode. When making menu changes, be sure to select "the SAVE Config & Play" option.

Navigating the menu system is by way of the encoder knob. Pressing the knob selects options, and rotating the knob scrolls up or down through menu options.

When in menu mode, the game is not playable, and when in play mode, the menu mode is not accessible. If there are credits in the machine, the only way to access the menu system is to either (1) play through all the credits, or (2) hold down the encoder knob and finish the current game cycle. The game checks the status of this pushbutton when it ends one game cycle and resets the timer for the next, and can enter into menu mode at this time. When using this method, the number of credits currently in the machine is unaffected, unless the counter reset option is executed. The counter reset which clears all the game's internal counters.

Throughout the menu system, a > in front of the option indicates cursor position in the menu, and a * in front of the option indicates that that option is currently active to change. Generally, pushing the knob select switch when a > is visible will change that option to display a *, allowing it to be changed. Pushing the knob select switch when * is displayed next to an option will return to scrolling through the menu with the > cursor.

The "top level" menus are as follows, described in the following subsections:

1. SAVE Config & PLAY
2. Game Counters
3. Test System
4. Cash Options
5. Claw Options
6. Sound Options

SAVE Config & PLAY

This option saves the changes, exits the menu system, and restarts the game in play mode. When this option is selected, the game writes the current configuration settings to EEPROM and returns to play mode with the LCD showing game status.

Game Counters

The game counter submenu contains record keeping information. In games equipped with electromagnetic counters, these counters will increment along with the internal firmware counters. The internal firmware counters maintain all values unless explicitly reset in the counter menu or reset by loading default settings. All values are reset to zero when the "reset counters" option is selected.

Game Counters contains a submenu consisting of the following options:

1. Exit Menu
Exits back to the top level
2. Lifetime:\$xx.x
Shows the total lifetime cash accrued.
3. # Plays:xx
Indicates the total number of game plays.
4. # Wins:xx
Indicates the total number of wins.
5. # Coins:xx
Indicates the total number of coins accepted by the coin acceptor.
6. # Dollars:xx
Indicates the total number of dollars accepted by the bill changer.
7. Life \$ in / \$ out:xx%
Indicates the ratio of cash in / cash out in percent, calculated from lifetime \$ in, toy value, and number of wins.
8. Reset Counters
Holding the select button on "Reset Counters" will cause the display to read "Hold 4 sec" and will begin to countdown to zero. When this counter reaches zero, all the in-game counters will be reset to zero.
9. Factory Reset
Holding the select button on "Factory Reset" operates similar to "reset counters", except this option resets all game settings to the factory defaults, and clears all counters. This resets cash and credits settings configured in the Cash menu as well as resetting the counters.

Test System

The test system menu includes options useful for manually operating motors for testing, claw string replacement, or other maintenance operations. It allows for manually driving all motors and inspecting game state.

Test System contains a submenu consisting of the following options:

1. Exit Test Menu
Exits back to the top level
2. LED Display:
Selecting the LED display option allows the user to scroll through digits on the game's LED display. This can be used to test for damaged LEDs in the display or cable / driver chip issues. The knob can be used to roll all the way from 0 to 99 on the LED display. Pushing the button again exits the LED display test mode.
3. Flasher:
Selecting the Flasher test option allows the user to scroll through all possible lighting combinations on the chassis' LED flashing light bars. This can be used to find bad light bars, test wiring, or locate a bad LED channel on the control board.
4. Gantry:
Selecting the Gantry test menu allows the user to manually drive motors on the gantry. Once a * is shown by this option, the available options are DONE, Back, Fwd., Right, Left, Up, Down. Selecting any of these will cause the gantry to move in that direction. Holding the select switch down will cause about a 1/2 second burst of movement on the axis selected. To leave this option, scroll to DONE and push the select knob.
5. Claw:
The Claw test menu allows for manual driving of the claw to any power from 0 to 100%. The measured claw voltage is also displayed on the LCD display while this option is selected. Pushing the select wheel leaves the test mode and sets the claw power to 0. This option is set to internally time out, so that the claw solenoid is not accidentally damaged. The claw test menu can be used to test the amount of strength necessary for a new prize, and the voltage reading can be used to check the operation of the analog voltage meter inside the cabinet.
6. Stick:
The Stick menu allows the user to verify that the processor is correctly reading input from the chassis control panel. Selecting this option will cause the LCD display to show the current status of the control panel, including words like Left, Right, Front, Back, and PB when the drop pushbutton is pressed. Press the select wheel again to leave this menu.
7. All System:
The All System test begins the game without requiring cash to be inserted, and is provided primarily as a way to bench-test games under service.
8. Sensor:
The Sensor test option enables the toy sensor and displays it's status in real time on the cabinet light bars. When this option is selected, the LCD reads "Case LEDs = sensor". Dropping items down the toy chute will cause the case LEDs to illuminate, thus allowing an easy way to align and test the sensor to the toys being dispensed.

Cash Options

The cash options menu includes settings related to the cash handling of the game. This is primarily for game counters, and includes toy value settings and cash per credit options. Changing these values will not affect the game counters.

Cash Options contains a submenu consisting of the following options:

1. Exit menu
Selecting this option leaves the Cash Options menu
2. Per Play:#\$x.xx
This menu option allows you to set the amount of cash per credit. Options available are \$10, \$5, \$2, \$1, \$0.50 and \$0.25.
3. Toy Value:\$x.xx
This menu option allows you to set the value of each toy. This option is adjustable in \$0.25 increments from \$0.25 to \$100, and \$10 increments after \$100 to \$2500.
4. Disable at \$10:
Selecting this option toggles between YES and NO. If enabled, the bill and coin acceptors will be disabled whenever the game's internal cash counter indicates that there is more than \$10 of cash waiting to be played in the game.
5. NJ Bonus:
Enables the NJ Bonus feature. Turning this on provides extra credits according to NJ State Law.
6. Length:xx Secs
This option allows the game length to be set. Possible options are 1 to 99 seconds.
7. Play Until Win
This option makes the game play until a win is detected by the toy sensor, effectively allowing the game to be played until a win with only one credit deposited.

Claw Operation Modes

The claw options menu changes settings related to claw strength and operation. The game operates in AutoClaw™ or WinRate modes. Claw operation mode is selected via the Claw Mode menu, discussed below.

AutoClaw

In AutoClaw mode, the game ramps from the pickup voltage to the carry voltage over a period of time determined by the programmed profit margin desired, as well as the previous number of wins and losses of the game. AutoClaw uses user defined parameters, including the Pickup and Carry clawpower settings, as well as the Toy Value and Earn \$XX Per Prize settings in the Cash menu.

Winrate

The Winrate mode always uses the PICKUP power setting to grab a toy. The claw power setting is then dropped to the CARRY power setting when the claw reaches the top of the gantry. Every programmable (5-2500) number of plays, the game sets the claw to the WIN power setting for the duration of that play.

Claw Options Menu

Claw Options contains a submenu consisting of the following options:

1. Exit Claw Menu
Selecting this option leaves the Claw Options menu.
2. Mode

The mode menu selects between AutoClaw and Winrate. When “Mode: AutoClaw” is shown, the following option shows “AutoClaw”. When “Mode: Winrate: Win every xx plays is shown”, the AutoClaw option is not available, and the game operates in Winrate mode.

3. Win every xx plays.

Only available in Winrate mode, the user selects how often the game plays at the Win claw power level by setting this value. Possible options range from 5 to 2500 plays between win power levels.

4. AutoClaw

Only available in AutoClaw mode, this function automatically populates the Pickup and Carry percentages for running the AutoClaw algorithm. To use AutoClaw, scroll to the AutoClaw option and select it. The menu will change to “AutoClaw: Start?” Pushing the select knob here will cause the claw to close on the toy, and game will slowly ramp the power down until the claw's grip on the toy is released. The power level will be shown in the LED display as the claw power ramps down. If no toy drop is detected, the screen will say "AutoClaw: No Drop", and the toy detector system should be verified. Otherwise, the LCD will show "AutoClaw: Complete", and the Pickup and Carry percentages will be set. These can still be changed by hand using the Pickup and Carry menu options.

5. Pickup:xx%

This option selects the claw power used to initially grab the toy when the claw is first dropped in both AutoClaw and Winrate modes.

6. Carry:xx%

This option selects the lowest power used when in AutoClaw mode. When in Winrate mode, this option selects the claw power selected after the claw is lifted to the top of the gantry.

7. Win:xx%

This option option is not used in AutoClaw mode. In Winrate mode, this is the power setting used for the full game cycle (from pickup through to toy drop) when it is time for the machine to win.

8. Center @ Start:

Selecting this option will toggle between Yes and No, to decide if the gantry will center itself at the middle of the playfield at the start of the game. If no, the gantry won't move at all when the game begins.

9. Pause @ Top:

This option allows you to select the number of milliseconds (ms) the game waits after the toy has reached the top limit switch. The default value is one second, but can be various up and down to fine tune the behavior of the claw for various size toys.

10. Chute:

The Chute: menu allows you to select where the toy chute is located. This allows the controller board to be used in different style cabinets. Valid options are Front Left, Front Right, Back Left, and Back Right. This setting effects where the toy is dropped by the claw after a pickup, as well as the testing. The claw will always return to the front left corner after each play, even if the chute is located in a different location.

11. Bad Sensor:

Bad Sensor allows the operator to disable the toy sensor if the game needs to operate without it. Do not use this with the Play until Win option, as without the win signal, the game could play forever on one credit. Also, Bad Sensor can be set automatically by the game itself, depending on the setting of "Sns Tst Intvl:" discussed below. Once the sensor is repaired, this option can be set back to "No" to resume normal operation of the game. If the game automatically detects a bad sensor, it is recommended that the game have its counters cleared to provide accurate counts of game plays and wins.

12. Sns Tst Intvl:xx hr

This option is "Sensor Test Interval" in hours. If you do not want to have the game autotest the toy sensor, leave this to 0. A value other than zero is interpreted as number of hours between tests. The game will drive the gantry to the drop chute, extend the claw until the toy sensor registers, and then retract the claw and return to the front left home position. This test will be performed every "Sensor Test Interval" hours. If the toy sensor does not respond in time during this test, then the game automatically sets the Bad Sensor option to Yes, which forces the game to operate in a default manner and not record wins or losses.

In addition to Sensor Test, the game automatically plays a sound if loaded on the SD card during this test. This enables the sensor test option to also be used as a sort of attract mode. When the game is being played, operation of the sensor test is inhibited until the current credit on the machine is exhausted. This means that the test will run immediately after that last game is played, if the value of Sensor Test Interval is elapsed while the game is being played.

Sound Options

The sound options menu is used to adjust the game sound volume, as well as to play the sound effects from the controller

Sound Options contains a submenu consisting of the following options:

1. Exit Sound Menu
Selecting this option leaves the sound menu
2. Volume:xx/32
This option allows you to set the game's volume. Possible values are 00 (mute) to 32 (loudest).
3. Play:
This option allows you to select which sound effect to play. Options are DONE, Sensor Test, Begin, Music, Coin, Bill, Drop, Chomp, Raise, Win, Lose, Bye.

Pin Header Descriptions

There are eight connectors on the board, as well as several sets of headers as described below. The board has been designed to be easy to interface with other machines as well using industry-standard connectors. There are duplicate connectors on-board: The 37-pin Chassis connector J11 includes the pins from J6, J8, J6, J10, and J12. The Bill connector, J1, is used for relay-based Bill acceptor interfaces. J17 includes pins for interfacing with the TTL signals for 12V-driven bill acceptors.

What follows is a review of all connectors, including pinouts and wiring information. All metallic housings on connectors are grounded, and for proper ESD operation an earth grounding connector needs to be plugged in to the grounding pin, otherwise the board can be sensitive to static discharge through cables connected to the board.

J1: DB25 Gantry Interface Connector

J1 is a female DB25 connector to which the gantry connector can connect. This connector carries the power for the 48V motors and claw solenoid. It also carries the signals from the gantry position limit switches. Limit switches are optically isolated and LEDs are available for all functions on this port. All motor and solenoid voltages are supplied directly by the 48V power supply. Should a different motor and solenoid voltage be required, this voltage can be supplied directly to the "48V" pin on the power supply connectors. The Gantry interface connector pinout is described in Table 3.

Pin	Description	Pin	Description
1	Forward Motor +	14	Forward Motor -
2	Horizontal Motor +	15	Horizontal Motor -
3	Vertical Motor +	16	Vertical Motor -
4	Solenoid +	17	Solenoid -
5	Rear Limit Switch	18	Gnd (Rear Limit)
6	Front Limit Switch	19	Gnd (Front Limit)
7	Unused	20	Gnd (Left Limit)
8	Left Limit Switch	21	Gnd (Top / Bottom)
9	Top Limit Switch	22	Gnd
10	Bottom Limit Switch	23	Gnd
11	Unused	24	Gnd
12	Unused	25	Gnd
13	Unused		

Table 3 - J1 DB-25 Gantry Connector Pinout

J2: Power Input Connector

J2 is the power supply input connector. For static protection, J14 (the ground lug) must be attached to an earth ground. The 5 volt supply is for all the control logic, and is internally regulated to 3.3 volts for certain low voltage components. The 12 volt supply is used for relay and external switch control circuits. The 48 volt supply drives the motors and claw solenoid, and is switched by electronics that are voltage independent. Should a lower voltage motor set or claw be required, the input voltage on the 48 volt pin can be lowered as low as 12 V for reliable operation. The voltage on the 48 V supply pin must not go above 55 volts to avoid damage to the power switching components. The pinout for these connectors is described in Table 4.

J2 Pin	J8 Pin	Description
1	1	DC Ground (Not connected to Earth)
2	2	+5 Volt Logic Supply
3	N/A	Unused
4	N/A	Unused
5	3	+48 Volt Claw and Motor Supply

6	4	+12 Volt DC relay and switch ckt. supply
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Table 4 - J2 and J8 Voltage Supply Headers

J3: 10 pin 0.1" header

J3 is a 10 pin 0.1" header. This header is provided to be compatible with the existing game's harness. This connector provides signals for the toy detector, free play button within the chassis, ground, and +12V. The same signals are available on the J6 Accessory connector. The pinout for J6 is described in Table 5.

Pin	Description	Pin	Description
1	+12 Volts	6	Unused
2	Ground	7	Unused
3	Toy Detect Out	8	Unused
4	Toy Detect In	9	Unused
5	Free Play Pushbutton	10	Unused

Table 5 - J3 10 pin 0.1" Header for toy detector and free play pushbutton

J4: 4 pin 0.1" Header for relay-output Bill Acceptor

J4 provides a dry contact interface from the game's bill acceptor relay. The input pulses are treated by the firmware as four-pulses per dollar, where each time the relay closes pin 1 and 3 a pulse is registered. The game also supports TTL level signaling and bill disable pins which are available on the J6 accessory header. This connector is pin-compatible with the existing 4-pin bill acceptor header.

Pin	Description
1	Bill Relay Input
2	Unused
3	GND
4	Unused

Table 6 - J4 4 pin 0.1" Header for bill acceptor

J5: 12 pin 0.1" header

J5 is a 12 pin 0.1" header. This header is provided to be compatible with the existing game's harness. This connector drives two electromechanical counters and provides +12V. The same signals are available on the J6 Accessory connector. The pinout for J5 is described in Table 7.

Pin	Description	Pin	Description
1	Ground	7	Unused
2	Coin Acceptor Gnd	8	Coin Acceptor Gnd
3	Coin Inhibit out	9	Counter 3
4	Unused	10	Counter 1
5	Coin signal in	11	+12 Volts
6	Unused	12	Unused

Table 7 - J5 12 pin 0.1" Header for 2 electromechanical counters

J6: 7 pin 0.1" header

J6 is a 7 pin 0.1" header. This connector carries the signals from the joystick and drop pushbutton, as summarized in Table 8.

Pin	Description
1	Drop Pushbutton
2	Unused
3	Left joystick switch
4	Right joystick switch
5	Fwd joystick switch
6	Rev joystick switch

Table 8 - J6 7 pin 0.1" header for joystick and pushbutton

J7: 13 pin 0.1" header

J7 is a 13 pin 0.1" header. This connector carries only 3 signals, the pushbutton LED signals and one of the electromechanical counters.

Pin	Description
1-2	Unused
3	Counter 2
4	Button LED +
5	Button LED -
6-13	Unused

Table 9 - J7 13 pin 0.1" header for button LED / Counter 2

J8: 6 pin Programming Port

J8 is a 6 pin 0.1" connector for firmware updates and board debugging. Do not connect anything to this connector.

J9: RJ-45 LCD Control and Configuration Hand Controller

J9 is located on the top left of the board, above the 37-pin game chassis connector. It is a standard RJ-45 connector which is used to interface with the Hand Controller. The hand controller is used to set game parameters, including game run time, toy value, game cost, and claw power settings. More detail on the use of the controllers' menu options is available on page 6.

J9 can use standard Ethernet patch cables between the connector and the hand controller. For reliable operation, keep the cable length less than 10 feet. This connector is not for Ethernet, and only the hand controller should be plugged in to this connector.

The board will operate normally without the hand controller plugged in. Plugging in the hand controller while the game is running can cause the game to restart. Pinouts of the hand controller interface are described in Table 10.

Pin	Description
1	+5V Supply to hand controller
2	Ground

3	LCD_RX (Data to LCD display module)
4	EXT_ENC_A (A Phase rotary encoder input)
5	EXT_ENC_B (B Phase rotary encoder input)
6	EXT_ENC_PB (Rotary encoder pushbutton)
7	Unused
8	Ground

Table 10- J9 RJ45 Hand Controller Interface Pinouts

J10: 10 pin 0.1" header

J10 is a 10 pin 0.1" header. This connector is for the 7-segment LED display.

Pin	Description	Pin	Description
1	5V Display Power	6	BCD 10A
2	GND display power	7	BCD 1D
3	BCD 10D	8	BCD 1C
4	BCD 10C	9	BCD 1B
5	BCD 10B	10	BCD 1A

Table 11 - J10 10 pin 0.1" header for LED display

J11: DB37 Crane Chassis Connector

J11 is a male 37-pin D-sub connector which mates directly to the 37-pin connector inside chassis of the crane machine. This game replaces 90% of the harness wiring of the older board. The only chassis-signals not carried on J11 are the bill acceptor, toy detector, and electromechanical counters. These signals are available on other headers on the board.

A straight-through DB37F to DB37M ribbon cable is included with the board for Coast To Coast games. Should the board be used in other crane machines, the DB37 connector can be split out into other harness styles to support other cabinets. The pinout for this connector are described in Table 12.

Pin	Description	Pin	Description
1	7-Segment Display +5V	20	Coin Inhibit Signal
2	7-Segment Display Ground	21	Unused
3	DISP10D: 10's place BCD D	22	Solenoid- (Analog Meter +)
4	DISP10C: 10's place BCD C	23	Solenoid+ (Analog Meter -)
5	DISP10B: 10's place BCD B	24	Unused
6	DISP10A: 10's place BCD A	25	Unused
7	DISP1D: 1's place BCD D	26	Unused
8	DISP1C: 1's place BCD C	27	Unused
9	DISP1B: 1's place BCD B	28	Drop pushbutton input
10	DISP1A: 1's place BCD A	29	Joystick Left microswitch
11	Coin Acceptor Ground	30	Joystick Right microswitch
12	Coin Acceptor Output Signal	31	Joystick Forward microswitch
13	Unused	32	Joystick Back microswitch
14	Coin Acceptor +12V supply	33	Joystick common
15	Speaker + pin	34	Button LED plus
16	Speaker - pin	35	Button LED minus

17	Unused	36	Unused
18	Unused	37	Unused
19	EARTH connection		

Table 12 - J5 DB-37 Chassis Connector Pinout

J12: 2 pin 0.156" header

J12 is a 2 pin 0.156" header. This connector runs the claw power meter in the cabinet.

Pin	Description
1	Claw Voltage Meter +
2	Claw Voltage Meter -

Table 13 - J12 2 pin 0.156" header for claw power meter

J14: Ground Lug

J14 is a single pin connector for the chassis ground connection.

J16, J17: 6 pin 0.1" LED Flasher connectors

J12 and J13 are connectors for the chassis LED light bars. The crane controller board takes the place of the separate flasher board, putting the LED bars under control of the main CPU for the rest of the game. These pins are attached internally to low side drives: The LEDs in the bar share the +12V rail, and the LED control circuit connects them to ground as required. The pinout for these connectors is illustrated in Table 14.

Pin	Description
1	+12 Volts
2	LED Bar 0
3	LED Bar 1
4	LED Bar 2
5	LED Bar 3
6	LED Bar 4

Table 14 - J16, J17 7 pin LED Flasher connectors

J22: 14 pin 0.1" Accessory Header

J6 is a 14 pin 0.1" header that mates with MTA100 style connectors. This connector is included to provide all the signals on J3, J4, J5 and J7, as well as some additional signals. Should the controller need to be used in a different chassis, an adapter cable can be made that fits this header to other cabinet harnesses. The pinout for J6 is described in Table 15.

Pin	Description	Pin	Description
1	Bill TTL	8	Toy Detect In
2	Bill IEN	9	+12 Volts
3	+12 Volts	10	Counter 1
4	+12 Volts	11	Counter 2
5	GND	12	Counter 3
6	GND	13	Free Play Pushbutton
7	Toy Detect Out	14	GND

Table 15 - J17 14 pin 0.1" Accessory Header