

Control System - D-20XX

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Components

For G2 (Touchscreen Equipped) Machines

See: [REELEX G2 Controls Operation](#), or use the on-screen help function.

Control Cabinet and Terminal

The D-20XX control system is an embedded computer based on the ISA standard platform hardware. The three standard buses are available on the bus-board; ISA – 8 bit; EISA – 16 bit; PCI – 32 bit. The computer provides all the necessary controls for the motors, valves, sensors, etc. for the D-20XX machine.

The controller consists of several components. The major components are:

- An embedded computer with keyboard/pad and monitor on slide-out terminal
 - Up/Down counters boards (W602 & W603) for motor encoders, some bus interrupt generation signals and length counter
 - 48 I/O Board for various input and output signals
- D/A board with (6) 10 bit
 - If online mode use ADIO-1600 Board for A to D
 - DeviceNet Card
- Output boards with relays (for valves, motor enables, contactors)
 - Isolated Input boards for sensors and limit switches
- DC motor drives:
 - Winding spindle
 - Traverse
 - Boxing Table
 - 3 Gear Motors
- Power supplies for valves, sensors, chuck motors

Embedded Computer

The computer in the D-20XX is a standard IBM platform (ISA, EISA, PCI) consisting of the following:

- Industrial chassis with fan and 250W power supply
- Back plane with:
 - 10 ISA/EISA slots
 - 4 PCI slots
- Single board Pentium processor 133mhz containing at least the following:
 - 4MB DIMM RAM
 - 8MB Flash ROM “Disk on a Chip” or “Disk on Module - IDE header” (used as C: drive)
 - SVGA
 - 2 Comm ports
 - 3.5 Inch Floppy Drive / USB drive

Computer Hardware

A number of boards are plugged into the motherboard to provide the necessary controls for the D-20XX machine:

DeviceNet Card CIF30	Provides most of the functions for the pneumatic valve operations, and the sensor and limit switch inputs.
PCDIO48	Provides expansion of bus interrupt #10 for receiving interrupts from various sensors.
D/A board	Contains (6) 10 bit D/A outputs for controlling 3 DC motor drives: Spindle, Traverse, and Boxing table.
W602	Receives spindle/traverse encoder pulses counts up/down binary depending on direction. The board also provides a buffered input for the length counter pulses. The length counter pulses provide a signal to bus interrupt #12.
W603	Receives table encoder pulses and counts up/down binary depending on direction. The board also provides a 1024hz signal to bus interrupt #11 and a 128 hz signal to bus interrupt #5. • If using online mode, ADIO-1600 board is used for analog to digital for the UDA laser/height reference

Operating System

At all times, the Pentium CPU in the D-20XX operates in real time. During the boot process the BIOS provides the POST (Power On System Test) as in any other computer. Once the POST is completed, an operating system is installed that provides minimal boot software. The software allows for standard computer maintenance such as formatting disks, copying programs to disk, etc. When the D-20XX software is in memory, the D-20XX controller uses no operating system support at all, and all hardware is under control of the D-20XX software.

Main Software Description

The interrupts described above briefly interrupt out of the main programs. The main programs are made up of several routines that run concurrently and share the processor's time between them (when not interrupted).

Conceptually, the mechanical part of the D-20XX is broken up into 3 parts: 1) Coiler; 2) Turret; 3) Boxer. The Coiler consists of the spindle and associated parts, traverse, and the cutter/grabber. The Turret consists of the assembly that contains the 2 mandrels that rotate to bring the coil to the Boxer. The Boxer consists of the boxing table, gluing station, tube insertion station, and box loading station. Each of the conceptualized "machines" has its own control program. Therefore, the Boxer sequence, for instance, may occur at different points in the flow of the other two. As an example, the Boxer side may drop an empty box and make a second attempt to fetch it. Now the Boxer side is several seconds behind what would be considered its normal sequence. This will not affect the Coiler side or Turret. Even if the Boxer side is not ready for a coil the Coiler will not wait for the Boxer to catch up. It will transfer on schedule. The Turret will decide whether requests from the Coiler can be honored. As long as the Boxer has removed the coil from the Boxer side mandrel, the transfer will take place even though the Boxer sequence is showing that it is not ready.

The main programs consist of:

- Coiler side routine
- Turret routine
- Guarding
- Boxer side routine
- Boxer side exception routine

The programs (Coiler Remove, Turret, and Boxer Remove) can detect certain mechanical failures (ex: jammed box). When this occurs, the routine terminates and initiates the exception routine. The exception routine attempts to resolve the situation and may require human intervention. Information will be displayed on the MESSAGE CENTER. If the exception can be resolved, the exception program resets the mechanical parts for that “machine” and restarts the terminated program.

Bus Interrupts

Once the D-20XX software is in memory, the program shuts down all unused hardware interrupts. However, the priorities are left unaltered. All software provided by BIOS or DOS for any interrupts used by the D-20XX is replaced by the D-20XX.

The following is a list of bus interrupts that are used by the D-20XX and their functions:

Interrupt #1 Redirected to another keyboard/pad routine. The keystrokes are simply placed in memory and interpreted by interrupt #5 (Explained later).

Interrupt #10 Redirected to a routine that handles inputs from many sources. Among them are the Spindle sensor interrupt, the traverse sensor interrupt, and the boxing table sensor interrupt.

Interrupt #11 1024hz interrupt. This interrupt provides the following machine support:

- Reads all encoders (at 1024hz) so that all other programs have up to date motor positions available in memory.
- Winding program algorithm
- Traverse positioning
- Mask support for interrupt #10
- Some high accuracy timers

Interrupt #12 Length Counter. The mouse driver is replaced. The routine that runs with this interrupt counts by a predetermined length (provided by scaling factor) and provides flags at various Preset lengths that is used by the 32hz interrupt (Interrupt #5).

Interrupt #5 32 hz interrupt. This interrupt provides most of the support for the following:

- Calculation of motor speeds
- Calculation of wire line speed

- Calculation of Spindle RPM
- Calculation of Traverse RPM
- Interpretation of keyboard/pad inputs passed by Interrupt #1
- Monitors machine status such as motor overloads.
- Provides the Boxing Table and Spindle Positioning control for the main machine routines.
- Monitors and provides the controls for button box inputs.
- Controls the acceleration and deceleration of the winding spindle.
- Monitors the length counter and determines what actions to take for the various operational modes:
 - Mode 1 – Constant RPM;
 - Slow at Preset 1
 - Stop at Preset 2 and transfers if ready
 - Mode 2 – Calculated Constant Line Speed
 - Slow at Preset 1
 - Stop at Preset 2 and transfers if ready
 - Mode 3 – Mode 1 with sequential printing
 - Mode 4 – Mode 2 with sequential printing
 - Mode 5 – Online, follow dancer
 - Mode 6 – Mode 5 with sequential printing
 - Mode 7 – Online, Configurable take up speed profile for smoother transition when accumulators empty.
 - Mode 8 – Not Used
 - Mode 9 – Not Used

HMI Touchscreen Overview

See: [REELEX G2 Controls Operation](#), or use the on-screen help function.

Terminal Screen Overview

NOTE: For “G2” machines equipped with touchscreen HMI, the following information applies to the pull-out computer screen and keyboard located inside the control cabinet. For all other machines, the following is the primary control system.

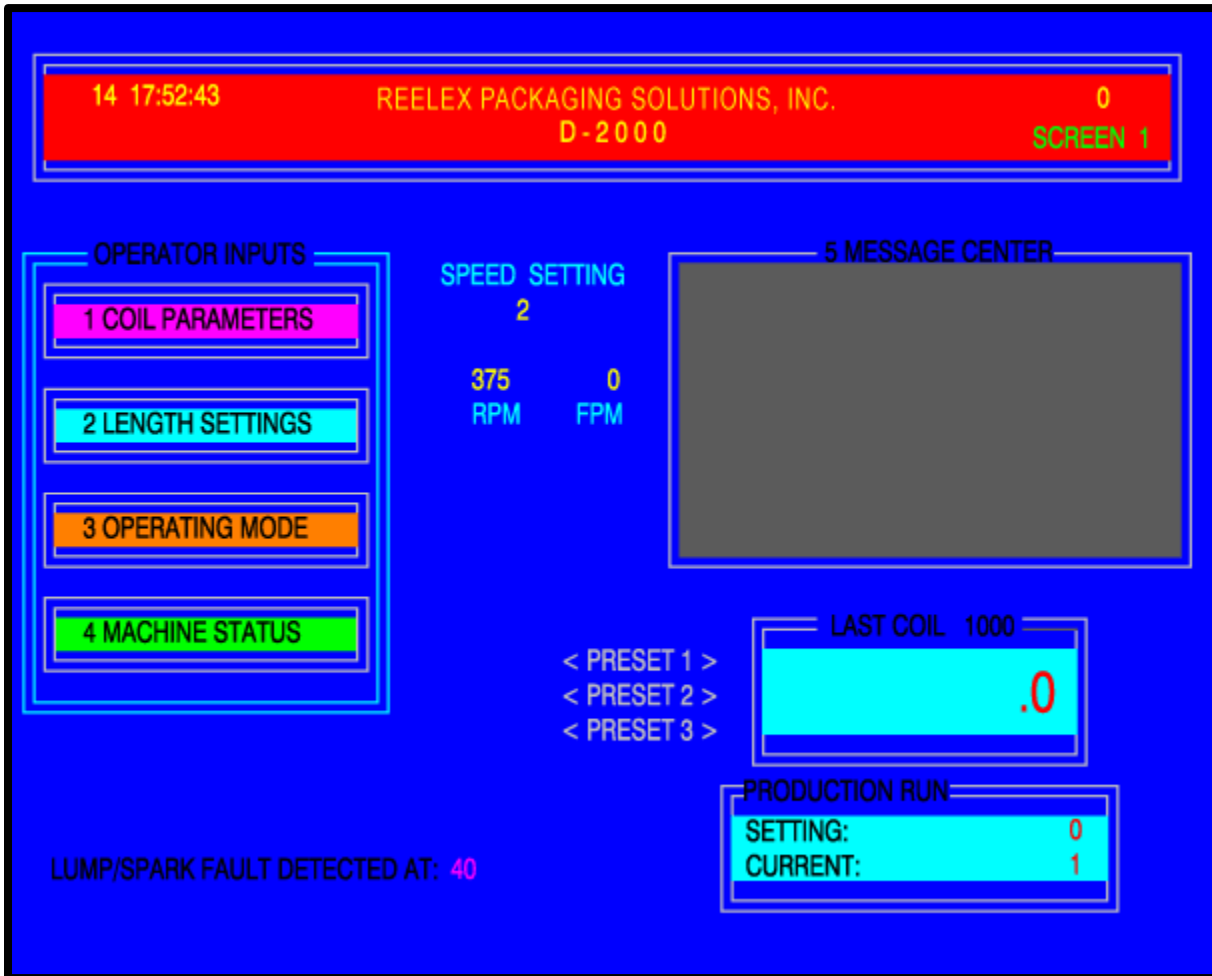
To navigate from one Screen to the next use the PAGE UP and PAGE DOWN keys on the keyboard/pad. Use the up and down arrows to choose what variable to change except for “Screen 1”. In this case enter the number on the keyboard/pad that corresponds to the variable. When a variable is blinking then it can be changed. Press the ENTER key to save changes. Press ESC to exit a particular area.

- Screens 3,4,5, & 14 are Read Only Screens.
- Screens 6,7, 8 and 15 can be viewed by pressing U (Unhide) or A (Appear), press H (Hide) or D (Disappear) again to return to default Screens. Of the hidden Screens, Screen 6 and Screen 7 are read-only.
- The length count is displayed in the top right hand corner of every Screen.

Locking Screens

The Screen Lockout key switch is located inside the controller. This locks out all Screens higher than Screen 6. Only Screens 1-6 are displayed when the Screens are locked out. The lockout key must be in the unlocked (full access) position to change values on Screen 8 (Adjustable Timers) This keeps operators from changing variables that maintenance or qualified personnel should only change. On Screen 1 Coil Parameters and Length Setting variables can also be locked out by adjusting the number that corresponds to the variable on Screen 12. (See Screen 12 for details.)

Screen 1 – Main Screen



This is the main Screen that appears on reset of the D-20XX machine. This Screen has operator inputs one through four. To select an input press a number 1-4. This will open another window where variables can be entered.

The length is displayed in 2 places on the Screen. One in the upper right hand corner above the Screen 1 label and the other in the box labeled LAST COIL. The number to the right is the length of the last coil and the number below is the length of the present coil. To change the length scalar see Screen 20.

The Message Center displays information about the status of the machine. If the machine has stopped due to a fault, i.e. payoff not running, it will display the fault. Low supply warnings and box malfunctions are also displayed. Warning messages are accompanied by an alarm. This Screen can be used with Screen 4 (pending switches) for troubleshooting. Press number 5 to see a history of the last 32 messages with the time they occurred.

The messages are color coded as follows:

Color	Meaning
White	General comments
Yellow	Caution
Red	Causes machine to stop
Green	Go
Brown solid bar	reset was started

SPEED SETTING: The Speed Setting is the current spindle speed. Turning the speed selector switch on the button box clockwise will increase the number (speed). Turning it counterclockwise will decrease the number (speed). The speed can be adjusted from speed 1 to speed 10. The RPM setting will also change as the speed changes. To change the RPM settings for a particular speed, see Screen 11. The RPM for a particular speed can not be changed from this Screen. The FPM (feet per minute) is the line speed of the machine as it is running.

Preset 1-3 Indicators: The indicators on the Screen will change color when the length counter reaches that number. For example if Slow Down is set for 100, then < Preset 1 > will change color (from gray to white) when the length counter reads 900. It will go back to gray when preset 2 is reached (in modes 1,2, & 5), sequential count is done (modes 3, 4 & 6) or the length is reset.

NOTE: If the machine is not ready to transfer it will stop in modes 1 & 2 at Preset 2, but continue to wind in modes 3,4, (if sequential signal not received) & 5 until it reaches Preset 3.

LAST COIL: Shows the length of the last coil. If the number is red it means there was a fault on the coil. If a Sparker/Lump is detected it is indicated in the lower left hand and the length where it occurred.

Screen 1A – Coil Parameters

14 17:52:43 REELEX PACKAGING SOLUTIONS, INC. 0
D-2000 SCREEN 1

OPERATOR INPUTS

1 UPPER RATIO	36
2 LOWER RATIO	34
3 DENSITY PROGRAM	80
4 HOLE SIZE	85
5 HOLE SHIFT	2
6 HOLE TAPER	3

SPEED SETTING
2
375 RPM 0 FPM

5 MESSAGE CENTER

LENGTH
.0

PRODUCTION RUN
SETTING: 0
CURRENT: 1

Operator Inputs

When Screen One is displayed enter 1 on the keyboard/pad. The window above appears which contains 6 choices. Select a number 1-6 and on-Screen keypad will appear. Now press numbers on the keyboard/pad to change the number. Press the ENTER key to store the number or the ENTER key to exit.

1/2. Upper/Lower Ratios (Gains): The ratios are based on the OD of the cable. The smaller the cable, the lower the ratios (gains). The ratios (gains) and length also determine the size of the coil. The lower the number in the ratios (gains), the smaller the coil. The larger the average number in the ratios (gains) the larger the coil. Refer to the PACKAGING CHART in the manual for the proper settings for the size wire to be wound. Please note that the packaging chart uses the average of the ratios (gains) for the maximum and minimum settings. The UPPER and LOWER ratios (gains) should not be set to the same number. The machine will run in Upper Ratio (gain) for a layer and then switch to Lower Ratio (gain) for a layer and then back to Upper Ratio (gain). This continues throughout the coil.

3. **DENSITY PROGRAM:** The Density Program software upgrade adds a new wind parameter to your existing REELEX coiling machine. This new setting, called “variable density” increases the number of crossovers (places where the wire crosses over itself) as the coil builds. This increases the density of the wind resulting in smaller, denser REELEX coils and potentially reducing package sizes by up to 15%. The Density Program also staggers the location of the crossovers so they occur at irregular intervals. In addition to allowing for increased coil density, the shifting of the crossovers have a significantly positive effect on the electrical performance of data cables such as Category 5e, Category 6 and more. This means products that previously performed marginally in electrical testing can now be packaged in REELEX with little or no degradation in performance.

4. **HOLE SIZE:** Determines the size of the hole in the coil. This value is the number of degrees determining the size of the hole. This number should be set so the tube fits snugly in the hole. A typical number would be around 85.

5. **HOLE SHIFT:** As the coil builds up, the hole in the coil starts to shift (curve). The Hole Shift variable will increase when the wire diameter increases. This variable will straighten out the hole. A typical number would be 3 for 0.2 inch diameter cable. Typical values range from 0 to 6.

6. **HOLE TAPER:** As the coil’s size increases the circumference increases which makes the hole larger at the top (outer end) of the coil than at the bottom (inner end) of the coil. The Hole Taper variable will increase when the wire diameter increases. This variable makes the hole the same size throughout the coil. If there is a zero in this variable the hole would increase as the coil increases. A typical setting would be 3 for .2 inch diameter cable. Typical values would range from 0 to 6.

Input Coil Parameter Permission levels are as follows:

Input	Permission Level
Upper Ratio	= 01h or 1 decimal
Lower Ratio	= 02h or 2 decimal
Density	= 04h or 4 decimal
Hole Size	= 08h or 8 decimal
Hole Shift	= 10h or 16 decimal
Hole Taper	= 20h or 32 decimal

Add the decimal value of the parameter that is accessible by the operator and enter the value in Coil Parameter Permissions on Screen 12. For example, a value of “63” enables access to all the parameters. A value of “3” enables access to the first two.

Screen 1B – Length Settings

14 17:52:43 REELEX PACKAGING SOLUTIONS, INC. 0
D-2000 SCREEN 1

OPERATOR INPUTS

- 1 COIL PARAMETERS
- 2 LENGTH SETTINGS**
- 3 SHUTDOWN
- 4 PRODUCTION RUN
- 5 SLOWDOWN
- 6 RESET PRODUCTION RUN

SPEED SETTING
2
375 RPM 0 FPM

5 MESSAGE CENTER

LENGTH
.0

< PRESET 1 >
< PRESET 2 >
< PRESET 3 >

PRODUCTION RUN
SETTING: 0
CURRENT: 1

When Screen One is displayed enter 2 on the keyboard/pad. The window above appears, which contains 6 choices. Enter a number 1-6 to select a value to change. An on-Screen keypad will appear. Now press numbers on the keyboard/pad to change the number. Press the < Enter > key to store the number or the < ESC > key to exit.

1. **COIL LENGTH (< Preset 2 >):** The desired length. When the length counter reaches this number (in modes 1, 2, and 5 only) the machine will transfer and the < Preset 1 > indicator will return to it gray color.
2. **SLOWDOWN (< Preset 1 >):** The length the machine starts to slow down at before the end of the coil. When it reaches this number, < Preset 1 > will be highlighted (turn white). This number should be changed with deceleration of the payoff and D-20XX in mind. See Screen 11 to change deceleration time. It is essential for the D-20XX to be at Low speed before it transfers. This insures the correct pre-transfer operations to make a proper transfer. The D-20XX will make several wraps around the finished coil prior to transfer. This makes for a clean cut as well as prohibiting loose wraps from falling off the coil during transfer. If the number is set too high, the machine will continue to wind (overshoot) past Preset 2 and the coil length will increase.

3. **SHUTDOWN (< Preset 3 >):** The machine will stop when the length counter reaches this number. The machine can reach Preset 3 in any mode.

4/5. PRODUCTION RUN & SLOWDOWN: Enter the desired wire length for a certain product or supply reel. For example, for a supply reel of 30,000 feet, set the production run for 30,000 and the machine will stop when it reaches the entered number. Set the “Slowdown” length to start decelerating the machine in order to stop at the “Production Run” length. “Slowdown” will stop the machine and turn the current length numbers yellow, but the machine can be restarted. Reaching the production run length value will turn the current length number red, and “reset Production Run” must be used to resume winding.

NOTE: If the Production Run is set to “0” then it’s disabled.

6. **RESET PRODUCTION RUN:** Select this number from the menu and another window will appear. Select ENTER to cancel or ENTER to reset the production run.

Input Permission Settings

Lock outs and permissions can be set on [Screen 12](#).

Input Length Settings Permission levels are as follows:

Input	Permission Level
Coil length	= 01h or 1 decimal
Slowdown	= 02h or 2 decimal
Shutdown	= 04h or 4 decimal
Production Run	= 08h or 8 decimal
Production Run Slowdown	= 10h or 16 decimal
Reset Production Run	= Always Accessible
Oper Seq Window at	= 100h or 256 decimal
Stop if Seq not seen at	= 200h or 512 decimal

Add the decimal value of the parameter that is accessible by the operator and enter the value in Length Setting Permissions on Screen 12. For example a value of “24” gives access to Production Run and Production Run Slowdown. The “Reset Production” run is always available.

Screen 1C – Operating Modes



When Screen One is displayed, press 3 on the keyboard/pad and the window above appears which contains 9 modes. Press a number 1-9 (only 1-6 used) to change the mode. Select a number and a description to the lower left will appear. Press ENTER to store the number or ENTER to exit.

Mode 1	Mode 2	Mode 3
Constant RPM	Calculated Constant Line Speed	Sequential Print
Slow at Preset 1	Slow at Preset 1	Constant RPM
Transfer at Preset 2	Transfer at Preset 2	Slow at Preset 1
		Transfer when Seq. Done
Mode 4	Mode 5	Mode 6
Sequential Print	Follow Dancer	Follow Dancer
Calculated Constant Line Speed	Online	Online
Slow at Preset 1	Transfer at Preset 2	Slow at Preset 1
Transfer when Seq. Done		Transfer when Seq. Done

Input Permission Settings

Lock outs and permissions can be set on [Screen 12](#).

Input Operating Mode Permission levels are as follows:

Input	Permission Level
Mode 1	= 01h or 1 decimal
Mode 2	= 02h or 2 decimal
Mode 3	= 04h or 4 decimal
Mode 4	= 08h or 8 decimal
Mode 5	= 10h or 16 decimal
Mode 6	= 20h or 32 decimal

Add the decimal value of the parameter that is accessible by the operator and enter the value in Length Setting Permissions on Screen 12. For example a value of “3” gives access to modes 1 and 2 only.

Screen 2 – Last 64 Coil Lengths/Seq. Settings

REELEX PACKAGING SOLUTIONS, INC.
D-2000

0
SCREEN 2

OPEN SEQUENTIAL WINDOW AT: 980
STOP IF SEQUENTIAL SIGNAL NOT SEEN BY: 1000

LAST 64 COIL LENGTHS:

1000	1000	1000	1000	997	1002	1001	998
1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000

TOTAL LENGTH: 0,000,000,000

<PROGRAM VERSION> <DATE>

On this Screen, use the arrow keys to select what number to change. If the number is blinking then it may be changed.

Open Sequential Window at: When the length counter reaches this number the computer looks for the sequential reset mark from the printer or UV sensor. Only in modes 3, 4 & 6.

Stop if Sequential Signal not seen by: The machine will stop if the sequential mark is not seen by the time the length counter has reached this number.

Last 64 Coil Lengths: This Screen shows the length count of the last 64 coils. It is read only. If the number is red there is a fault on the coil. In modes 1 and 2, the number will display the preset 2 value for completed coils.

Total Length: Displays total length run.

Program Version: Displays current program version and date.

Screen 3 – Encoder / D to A / RPM Settings

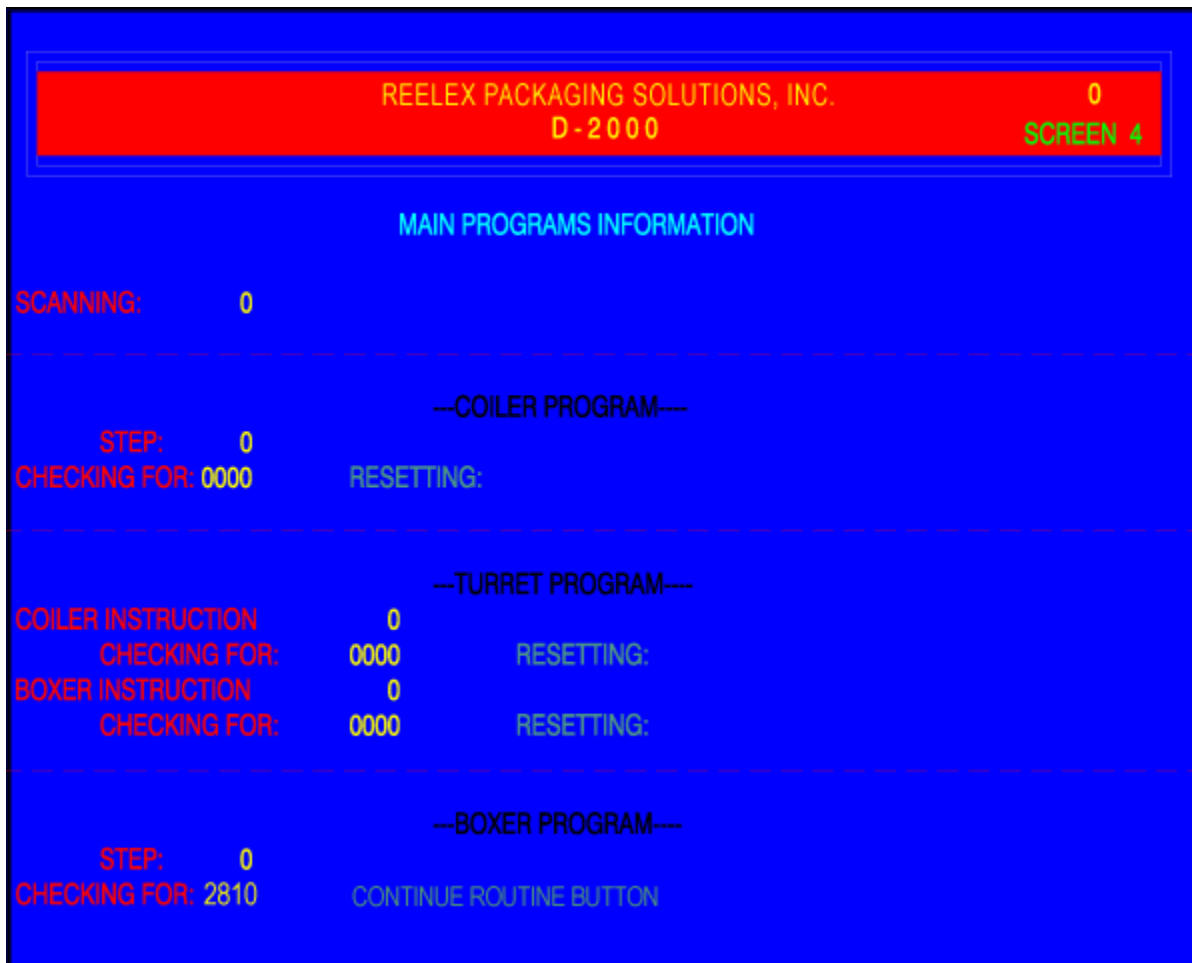
REELEX PACKAGING SOLUTIONS, INC.			
D-2000			
0			
SCREEN 3			
	ACT	ADJ	
SPINDLE ENCODER:	549	360	TRAVERSE POSITION ERROR: 0
TRAVERSE ENCODER:	719	0	
BOXING TABLE ENCODER:	0		DISPLACEMENT PER
EXTRA BINARY COUNTER:	0		SCREEN UPDATE
SPINDLE D/A:	2048	SPINDLE	TRAVERSE
TRAVERSE D/A:	2048	0	0
BOXING TABLE D/A:	2048	0	0
SPINDLE SENSOR LOC:	0	0	0
TRAVERSE SENSOR LOC:	0	0	0 DEGREES
BOXING TABLE LEFT SENSOR:	0	0	0
MIDDLE SENSOR:	0	0	0
RIGHT SENSOR:	0	0	0
TARGET WINDING RPM:	750	0	0
DESIRED WINDING RPM:	150	0	0
ACTUAL WINDING RPM:	0	0	0
ACTUAL TRAVERSE RPM:	0	0	0

This is a read only Screen that shows information on various parts of the machine.

Input	Range
Spindle and Traverse Encoders: Range	= 0-719
Boxing Table Encoder: Range *Extra Binary Counter not used	= 0-65535
Spindle D/A Range	= 0-4095
Traverse D/A Range	= 0-4095
Boxing Table D/A Range	= 0-4095
Spindle and Traverse Location Range	= 0-719 (Actual –Location=Adjusted)
Boxing Middle sensor Location *Boxing Table left and Right sensor not used	= 0-65535 (Initial –Location=Adjusted)
Target Winding RPM	= 0 - 750 (target value written to D to A for drive reference)
Desired Winding RPM	= desired RPM at a given point in time

Actual Winding RPM	= 0 - 750 (over 750 may cause mechanical damage to traverse)
Actual Traverse RPM	= 0 – 750 (changes when ratios/gains switch)

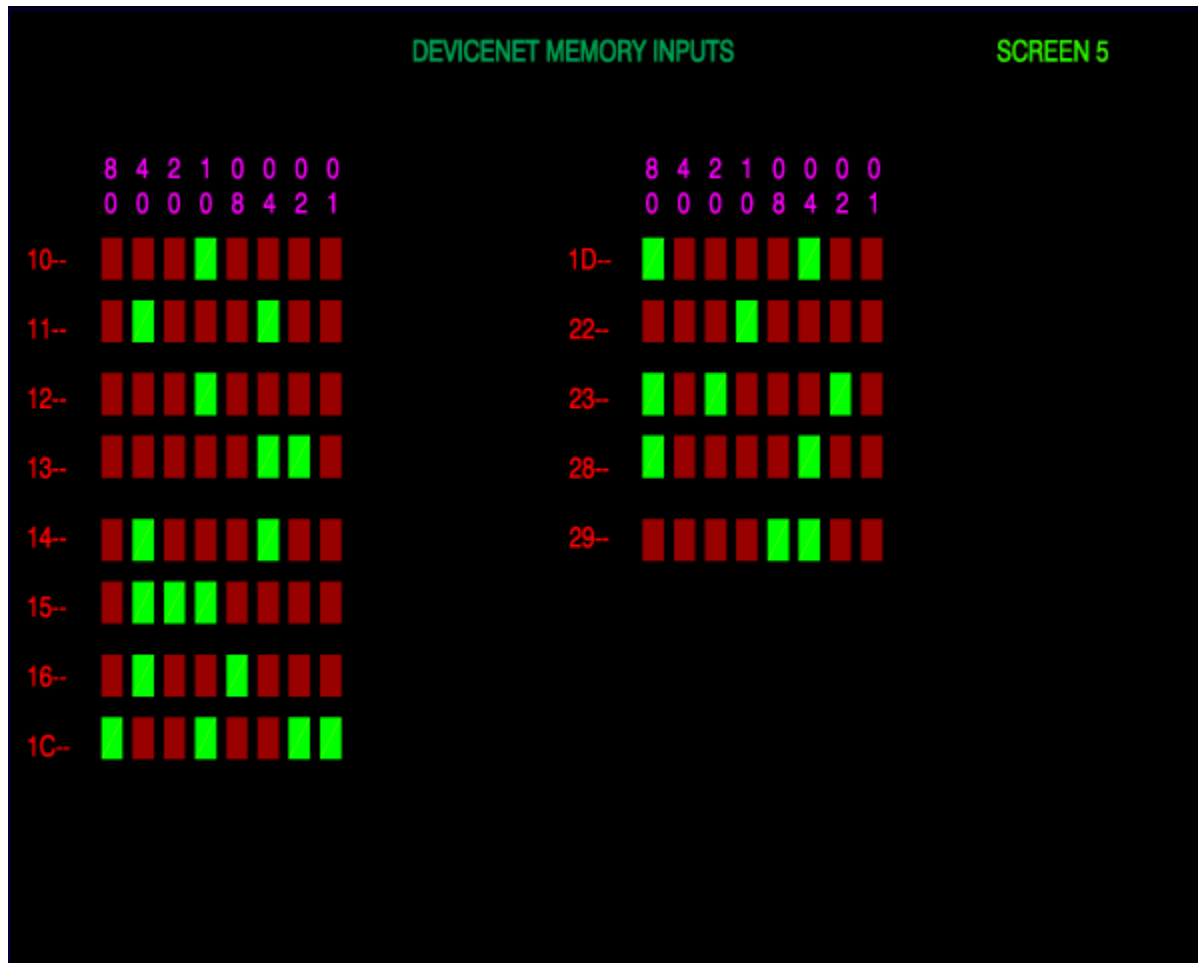
Screen 4 – Main Programs Information



This Screen shows the three main programs that are running at the same time. The Screen displays the current step and also what switch the program is looking for next. This Screen is very helpful in troubleshooting of the machine. If the routine can't continue, it displays what the program is waiting for. The number after "CHECKING FOR" corresponds to the I/O address and also the wire number of the individual switch to help in the search of a fault. Switch number and descriptions can be found in the manual with an accompanying picture. The scanning number will read 0 to 65,535.

On reset, both the COILER and TURRET program will say "machine resetting" but the boxer program will check switches for all three programs. This only happens on reset.

Screen 5 – DeviceNet Memory Inputs



Input	Node
10 & 11	corresponds to Node 1
12 & 13	corresponds to Node 2
14 & 15	corresponds to Node 3
16	corresponds to Node 4
1C & 1D	corresponds to Node 5
22 & 23	corresponds to Node 6
28 & 29	corresponds to Node 7

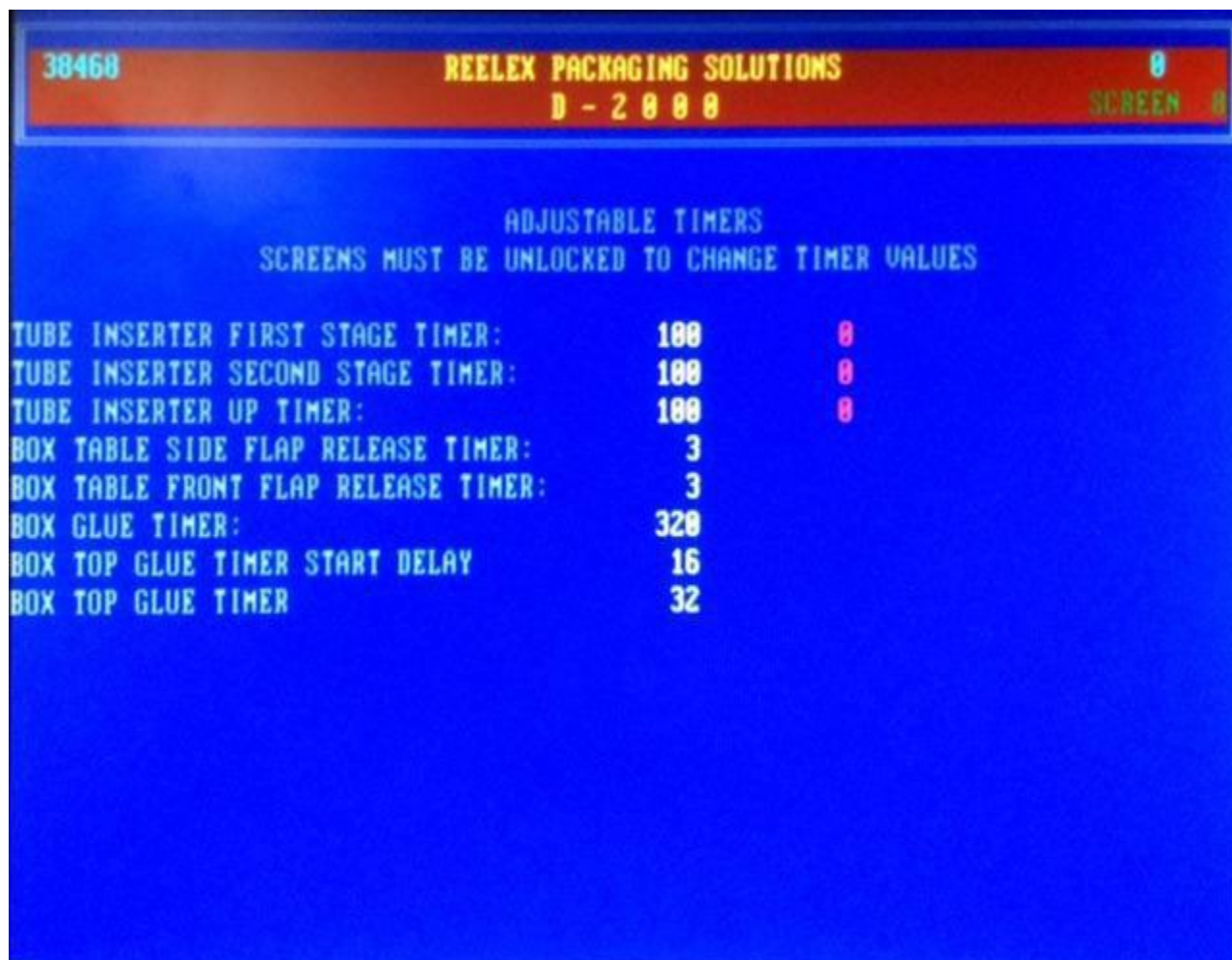
This Screen indicates what DeviceNet inputs are on or off. To read the chart, read across first, then down.

Look at 10-01. It is off (red). Look at a drawing with the nodes labeled (DWG #20096, #20625 or #20631).

1001 is on Node 1 and is the “TUBE ROTATE HOLD” switch.

Look at 10-10. It is on (green). Look at a drawing with the nodes labeled (DWG #20096, #20625 or #20631). 1010 is on Node 1 and is the “TUBE HOLDER VERTICAL DOWN” switch.

Screen 8 – Adjustable Timers



Tube Inserter Timers:

Displayed value is 1/32th of 1 second. Set the white number in the left-hand column to approximately 10 units greater than the time required. The pink column on the right is the time remaining when the event does not exceed the set value. A value of “0” in the right-hand column indicates that the motion has timed out. This will result in the top of the box remaining un-glued.

- **Tube Inserter First Stage Timer:** Monitors the time the tube inserter travels down to the coil with the jaws closed.
- **Tube Inserter Second Stage Timer:** Monitors the time the tube inserter travels down after the jaws open at the mid position.

- **Tube Inserter Up Timer:** Monitors the time the tube inserter travels up until the mid switch is triggered.

Box Table Flap Release Timers:

- **Box Table Side Flap Release Timer:** Adds a pulse of air that releases the side compression of the box while the glue is hardening. Zero is no pulse, larger values increase effect.
- **Box Table Front Flap Release Timer:** Adds a pulse of air that releases front compression prior to gluing. This allows the box to shift into square condition as needed. Zero is no pulse, larger values increase effect.

Glue Timers:

- **Box Glue Timer:** Adds additional glue setup time by delaying the motion of the box loading assembly as it loads a new box.
- **Box Top Timer Start Delay:** Delays the start of the glue that is applied to the top center of the box. A zero value will result in glue application as soon as the assembly begins to retract from the box.
- **Box Top Glue Timer:** Controls the duration of glue applied to the top center of the box.

Screen 11 – Speed Settings

REELEX PACKAGING SOLUTIONS, INC.
0

D-2000
SCREEN 11

ACCELERATION TIME: 12 SEC

DECELERATION TIME: 15 SEC

LOW SPEED: 100

SPINDLE SPEED INTEGRATOR RATE: 2

SPINDLE POSITIONING SPEED: 100

----- SPEED SETTINGS -----

RPM	SLOWDOWN		LINE SPEED	SLOWDOWN
075	100	1	300	100
150	100	2	200	100
225	100	3	150	100
300	100	4	120	100
375	100	5	100	100
450	100	6	86	100
525	100	7	75	100
600	100	8	67	100
675	100	9	60	100
750	100	10	54	100

On this Screen, use the arrow keys to select what number to change. If the number is blinking then it can be changed.

Acceleration Time: How long it will take the D-20XX to ramp up to full speed after the start button is pushed or transfer is completed.

Deceleration Time: How long it will take the D-20XX to ramp down to low speed when Preset 1 is reached or stop when the stop button is pressed.

Low Speed: The speed the machine ramps down to when Preset 1 is reached. (Typically 50-100 RPM)

Spindle Integrator Rate: Rate at which the integrator is calculated for position. (Typically 2)

Spindle Positioning Speed: Speed in RPM that spindle positions at. (Typically 100 RPM)

Constant Line Speed Parameters:

RPM:		LINE SPEED:	
8" mandrel	10" mandrel	ms/pulse	FT/MIN
95	76	300 =	200
145	116	200 =	300
190	152	150 =	400
238	190	120 =	500
286	229	100 =	600
334	267	86 =	700
382	306	75 =	800
430	344	67 =	900
477	382	60 =	1000
525	420	55 =	1100
573	458	50 =	1200
620	496	48 =	1300
668	534	43 =	1400
717	574	40 =	1500

NOTE: RPM is a target that is calculated before wire is added to the diameter of the mandrel and may need to be adjusted. RPM target can be decreased to reduce overshoot.

- Constant line speed assumes 1 pulse per foot. If needed use LINE SPEED SAMPLE RATE on Screen 20 to produce 1 pulse per foot with given setup.
- Constant line speed is in milliseconds and represents the time between footage counts for a given speed (ms/pulse).
- Constant line speed (ms) can be trimmed for desired speed.

Speed Settings:

- See [Screen 20](#) for more settings.

RPM

The machine can be set to have 10 speeds numbered 1-10. Set the RPM (modes 1 & 3) and slowdown (Preset 1) length for each speed setting.

Constant Line Speed

Set the Line Speed (modes 2 & 4) and slowdown (Preset 1) length for each speed setting. In order to find the correct line speed settings (the column headed "LINE SPEED") use the following formula:

$$\text{Desired Line Speed} \div 60,000 = X$$

$$1 \div X = \text{Value entered in column}$$

For example, say you want speed setting 6 to equal 600 FPM (feet per minute):

$$600 \div 60,000 = 0.01$$

$$1 \div 0.01 = 100$$

100 is the number entered in the "LINE SPEED" column

NOTE: When operating with constant line speed (modes 2 and 4) the RPM setting in the left column may require adjustment. The RPM value is the target and once desired line speed is obtained, the RPM is trimmed. If under or overshoot occurs, adjust the targeted RPM value for desired effect.

Screen 12 – Positions & Permissions

REELEX PACKAGING SOLUTIONS, INC.		0
D-2000		SCREEN 12
BOXING TABLE POSITIONS		
GLUE:	LINE DIRECTION (0=L TO TO R):	0
BOX LOAD: 4575	DANCER ZERO OFFSET:	0
BOX UNLOAD 5915	COIL PARAMETER PERMISSIONS:	63
COMPRESSION: 4900	LENGTH SETTING PERMISSIONS:	63
FLAP START: 17468	OPERATING MODE PERMISSIONS:	31
COIL LOAD: 29000	LUMP/SPARKER MODE:	257
POSITION #7: 7000	MAINT OPERATION MODE NUMBER:	2
POSITION #8: 8000		
PAYOUT HOLE POSITION: 249		
TRAVERSE CUT-OVER POSITIONS		
CUT: 270	SET TRAVERSE OILER TIMING TO	
HAND-OFF: 50	0 SEC EVERY 0 HRS	
RESET: 50	STOP ON NO LENGTH COUNT:	0
SPINDLE TRACK: 139	ENDFORM DROP TIME ADDER:	0
WRAP: 180		

This Screen shows different variables which control the boxing table positions and traverse cut-over positions. Use the arrow keys on the keyboard/pad to choose a variable. The variable number that can be changed will blink. Once these are set they should not be changed unless something mechanically moves. Typical settings shown above.

Positions and Adjustments

Box Table Positions:

- 500 equals about 1 inch on the boxing table for D-2000's and 300 equals about 1 inch for D-2050's.
- Increasing the number moves the table closer to the spindle
- 8 are spares

Traverse Cut-Over Positions:

- Values must be tried due to orientation and pickup location.

- These positions get the wire ready for transfer, cut, and lay the wire properly so it can be grabbed by the tube loader later on.

The guide tube will position in the following order:

1. **Reset:** When the machine resets, the guide tube will position here so it is out of the way of moving parts.
2. **Wrap:** When the transfer begins the guide tube will position toward the winding side to get the wire in position for the cable to wrap. This is done to get the cable in position to cut. This position should be just outside the “hole” area away from the turret to avoid the cable from covering the hole when the spindle turns. Several wraps are essential for proper transfer.
3. **Cut:** The guide tube will move to this position in order for the cutter/grabber to cut the wire.
4. **Hand-Off:** The traverse moves toward the boxing side in order to position the cable so the mandrel segment can grab the wire. The gear motor will open the mandrel to grab the wire.
5. **Spindle Track:** Once the wire has been grabbed by the mandrel the guide tube will move toward the Spindle Track Position so the cable with the help of a roller can be guided on the mandrel and into the notch on the segment toward the boxing side.

Payout Hole Position:

- Moves the hole position for proper placement of the tube.

Line Direction:

- Should be 0 if left to right (shown on last page); should be 1 if right to left machine.

Dancer Zero Offset:

- Used in mode 5 and 6 (online, follow dancer) to adjust the height of Universal Dancer Assembly (UDA) feeding the D-20XX.

Operator Permissions

NOTE: Permissions are handled on the HMI via a user/password security system. Each user has permissions varying by function. If permissions are set at the terminal, the HMI will simply be unable to enter new values.

To use Coil Parameter Permissions ([See Screen - 1A Coil Parameters](#)):

Input	Permission Level
Upper Ratio	= 01h or 1 decimal
Lower Ratio	= 02h or 2 decimal
Density	= 04h or 4 decimal
Hole Size	= 08h or 8 decimal

Hole Shift	= 10h or 16 decimal
Hole Taper	= 20h or 32 decimal

Add the decimal value of the parameters that are accessible by the operator and enter the value in Coil Parameter Permissions on [Screen 12](#). For example, a value of “63” enables access to all the parameters. A value of “3” enables access to the first two.

To use Length Setting Permissions ([See Screen – 1B Length Settings](#)) :

Input	Permission Level
Coil length	= 01h or 1 decimal
Slowdown	= 02h or 2 decimal
Shutdown	= 04h or 4 decimal
Production Run	= 08h or 8 decimal
Production Run Slowdown	= 10h or 16 decimal
Reset Production Run	= Always Accessible
Oper Seq Window at	= 100h or 256 decimal
Stop if Seq not seen at	= 200h or 512 decimal

Add the decimal value of the parameters that are accessible by the operator and enter the value in Length Setting Permissions on Screen 12. For example, a value of “24” gives access to Production Run and Production Run Slowdown. Reset Production Run is always available.

Operating Mode Permission levels are as follows:

Input	Permission Level
Mode 1	= 01h or 1 decimal
Mode 2	= 02h or 2 decimal
Mode 3	= 04h or 4 decimal
Mode 4	= 08h or 8 decimal
Mode 5	= 10h or 16 decimal
Mode 6	= 20h or 32 decimal

Add the decimal value of the parameters that are accessible by the operator and enter the value in Mode Permissions on Screen 12. For example a value of “3” gives access to modes 1 and 2 only.

Modes

Lump/Sparker Mode (See Screen 20 to enter sparker length):

Input	Permission Level
Sound Alarm	= 01h or 1 decimal
Do Not Glue Top	= 02h or 2 decimal
Stop Machine (Operator Intervention)	= 100h or 256 decimal
Ramp to Low Speed	= 200h or 512 decimal

Add the decimal value of the desired options:

- A value of 257 will sound the alarm and stop the machine. If Preset 2 is reached the machine will wind and box the good coil and stop after transfer.

Maintenance Operation Mode Number:

- Normally 2 when normal production.
- 64 to run in maintenance mode. Machine will go through most motions without a box and no glue.

Stop on No Length Count:

- Use this input parameter to modify the following behaviors:

Input	Value
Stop winding if no Counter Pulse	= 01h or 1 decimal
Delay spindle withdrawal from coil until boxer is ready	= 02h or 2 decimal
Cable Pull-through sensor installed	= 04h or 4 decimal

Endform Droptime Adder:

- Endform droptime is the time it takes for the endform on the turret to lower from the top switch to the bottom switch when loading a coil on a box. This value is learned during the reset routine without a coil, and will release the endform brake for this duration of time when loading a coil onto the box. Endform Droptime Adder adds time to this value, extending the time the brake is released from the turret endform when placing the coil on the box (table). . Displayed value is 1/32 of 1 second.

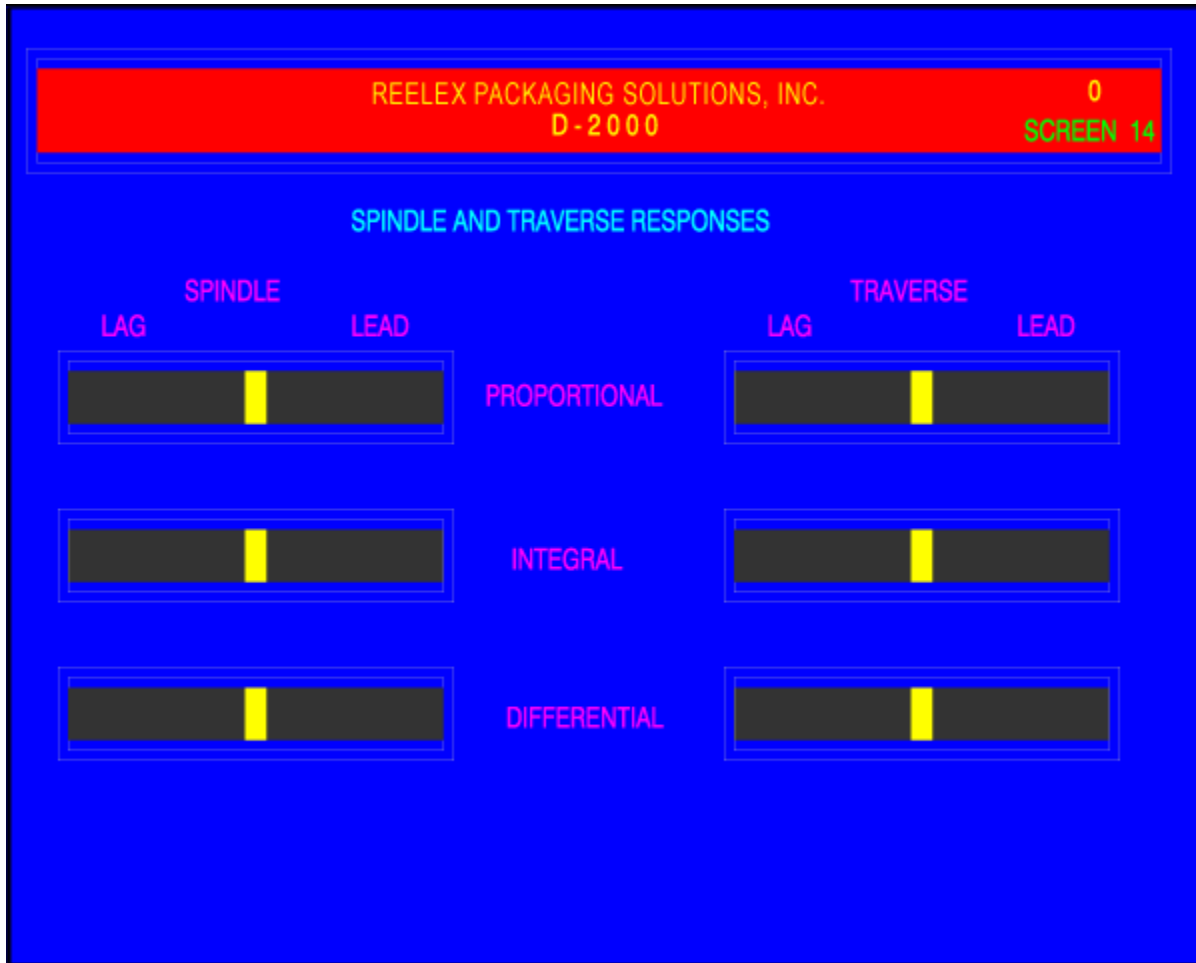
Screen 13 – Drive Control PID Parameters

REELEX PACKAGING SOLUTIONS, INC.				
D-2000				
0				
SCREEN 13				
	PROP	INTEGRAL TIME	GAIN	DIFF
SPINDLE VEL:	1	2	100	2
SPINDLE POS:	1	20000	200	20
TRAVERSE VEL:	1	0	0	0
TRAVERSE POS:	3	300	200	2
BOXING TABLE VEL:	1	0	0	0
BOXING TABLE POS:	1	3000	100	0
CONSTANT LINE SPD:	0	1500	1500	0
ONLINE SPINDLE CONTROL:	1	0	0	8

This Screen allows changing of the drive control PID parameters for the Spindle, Traverse, and Boxing table. The Constant Line Speed function is used for trimming. The Online Spindle Control function is used for spindle control via a dancer. The velocity function is used on the spindle only and these parameters are used to calculate constant RPM. These values need not change after setup.

To change the values use the arrow keys to select the variable, type desired number and press enter. See Screen 14 to look at the results graphically.

Screen 14 – Spindle & Traverse Responses



This is a read only Screen that shows graphs of the Proportional, Integral, and Differential responses of the Spindle and Traverse drives while running.

For optimal coils, the traverse integral should stay close to center. Movement of several block out of center indicates poor traverse positioning. See drive tune up in manual. Spindle graphs are used only during spindle positioning at transfer.

Screen 15

REELEX PACKAGING SOLUTIONS, INC.							0
D - 2 0 0 0							SCREEN 15
gen_var	1	2	3	4	5	6	
1	10	12	13	14	15	16	
2	128	128	23	24	25	26	
3	31	32	33	34	35	36	
4	41	42	43	44	45	46	
5	51	52	53	54	55	56	
6	61	62	63	64	65	66	
7	71	72	73	74	76	76	
8	81	82	83	84	85	86	

This Screen displays generic variables that can be used by REELEX for program development.

Screen 20 – Counter Pulse Value/Sequential Distance

REELEX PACKAGING SOLUTIONS, INC. 0
D-2000 SCREEN 20

COUNTER PULSE VALUE: 1.000000

SEQUENTIAL PRINT / CUT -----

PRINTER / SENSOR DISTANCE: 25.000000

LOOK FOR TRAVERSE STOP: 8.000000 FROM END

LINE SPEED SAMPLE RATE (LENGTH PULSES/SAMPLE): 1
LINE SPEED SCALING FACTOR: 60000

SPARKER/LUMP DISTANCE: 36

FLAG NO-GLUE TOP AT 65000 THEN EVERY 65000

Counter Pulse Value:

- Default is 1 Pulse = 1 foot
- If 4 Pulse per foot counter wheel is being used, divide 1 by 4 and Counter Pulse Value will be 0.25

Printer / Sensor Distance:

- Distance from the printer/sensor to the cut position. In sequential print modes 3, 4 or 6, this distance is pulled after the sequential signal is seen before the cut.

Look for Traverse Stop:

- Distance in feet before end of coil when traverse will begin to position for wrap. Too large of a number will have excessive wraps, and too small of a number will not allow enough footage for proper positioning. . (Must have a value of at least two-times the circumference of the finished coil entered).

Line Speed Sample Rate:

- Enter the number of Length Counter Pulses per sample
- If 1 Pulse per foot counter wheel, enter 1
- If 4 Pulse per foot counter wheel, enter 4

Line Speed Scaling factor (See Screen 11 for additional settings):

- Used to adjust displayed value on Screen 1.
- 60000 is the base number (used for 1 pulse per foot wheel). Divide by length pulses per sample
- If 4 Pulse per foot counter wheel, enter 15000.

Sparker/Lump distance (See Screen 12 for Lump/Sparker Mode):

- Enter the number of feet from the Sparker/Lump to the cut position on the spindle. When a fault signal is seen (sparker/lump), this distance is pulled in after the fault signal before the cut.

Flag No-Glue Top at ____ and then every ____ :

- Enter the length to leave the top of the box unglued for testing and enter how often it is to be repeated. To test one coil enter a zero after “then every”.