ENGEL STANDARD COILINE CONTROLLER MANUAL

***** TABLE OF CONTENTS *****

GENERAL OPERATING INFORMATION

INTRODUCTION

The Engelrun controller is a marriage of the E.C.-11 and E.C.-21 systems and is a computer system specially designed to control sheet metal processing machines. These machines convert coils of sheet metal material into cut parts, which may include: vee notches, end notches, and hole punches. Ductwork for the heating, air conditioning, and ventilation industry is the completely assembled end product of these parts.

The controllers boast a user-friendly operator interface. This type of software design allows easy data entry; the operator has only to enter a minimal amount of information. In addition, there is capability of programming one hundred separate jobs. The software can track a total of fifteen different coils at once. With a coil number assigned to a job, the software will track the total linear feet used on a coil. An ASCII report file, maintained continuously, provides production statistics such as material square footage consumed and required production time. This is just a sampling of some the controllers capabilities.

The integrated Engelrun system controls a two-speed line. This type of line slows the advancing material, then stops before each operation. Operating the controller itself is straightforward. The controller uses an incremental shaft angle encoder to sense material movement. This encoder generates a pulse train that is equal to an exact amount of material movement. The controller then counts the pulses and activates the appropriate machine functions when the preprogrammed movement has occurred. As mentioned earlier, two-speed line operation allows the machine to slow the material before reaching the point of operation. This concept contributes to the production of very accurate parts.

The controller accepts data input via a keyboard located on the front panel. The controllers display device is a high resolution VGA monitor. This monitor allows the user to view an entire page of setup, job, coil, or status information at one time. Data is input, or changed, by observing the screen and using the appropriate keys located on the front panel.

GENERAL SPECIFICATIONS

The following is a general specification for the controller. A NEMA 12 console houses the control system. The console size varies depending on the quantity of purchased options, in general, the E.C.-11 used a 24-inch console, and the E.C.-21 incorporates a 48-inch console.

Resolution:	.010 inch with a l2 inch wheel Accuracy output turned on within 25 microseconds of operation excluding errors in machine tolerance.
Maximum Counting Speed:	200 feet per minute
Maximum Part Length:	9999.99 inches
Maximum job Quantity:	9999
Number of Batches:	100
Pattern Types:	5 each - (Blank, Flat, L-duct, U-duct, and Wrapper)
Input Power:	115 VAC 10%, 50-60 Hz (132vac-109vac)
Outputs:	Forward, Slow, Reverse, Shear, End Notch, Vee Notch, Die Select, Hole Punch

FRONT PANEL CONTROLS

On the front panel of the controller console are IO lighted pushbutton switches and a 101 -key keyboard on the console deck. The operator passes information to the controller with the switches and keyboard.

The functions of the push button switches are as follows:

HALT
The HALT key is used to stop the machine from running material in automatic mode. The red lamp indicates that the controller is in the HALT mode.

RUN
The RUN key is used to initiate an automatic run of the controller. The green lamp indicates that the controller is in the RUN mode.

REMOTE DATA LINK
The DATA LINK key is used to turn the remote link on or off. The blue lamp indicates when the remote data link is on. Office communications on the older versions can take place during a run condition, destroying existing, running data. See the ENGELINK section of this manual for more information.

MANUALSHEAR
The MANUAL SHEAR key is used to manually cycle the shear output when the line is in the HALT mode. The yellow lamp indicates when the shear output is “on" in either the HALT or RUN mode.

RESET
The RESET push button is used to reset the controller when a job is being processed. First level reset (pressed once for short period of time). Use: Drop out of run mode. Second level reset - referred to as a long or total reset (pressed once for a long period of time). Screen will display "Down stream data destroyed" Use: Destroy data setups to LOM, Brake, etc.

MANUAL VEE NOTCH
The MANUAL VEE NOTCH key is used to manually cycle the vee notch output when the line is in the HALT mode. The yellow lamp indicates when the vee notch output is "on" in either the HALT or RUN mode.

MANUAL END NOTCH
The MANUAL END NOTCH key is used to manually cycle the end notch output when the line is in the HALT mode. The yellow lamp indicates when the end notch output is on" in either in HALT or RUN mode.

FRONT PANEL CONTROLS

MANUAL SLOW
Overrides the PLC slow output. This function is not an input to the PLC and overrides the PLC slow control. This function button can be held 'in' for manual slow overall operation, (i.e. Initial forward automatic threading of first part).

METRIC
Changes the screen display and keyboard inputs from English units to metric units, pressing the push button again, changes the screen display from metric units to English units.

The following are the descriptions of the functions of the keyboard keys:

ADD LINE
The INSERT key is used in the batch mode to insert a new line at the current cursor position.

DEL LINE
The DELETE key is used in the batch mode to delete the line that the cursor is currently on. For further information on deleting lines, see the section titled 'RUN MODE.'

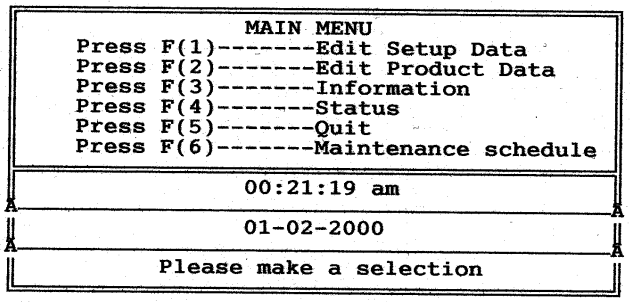
UP-DOWN ARROW
The UP or DOWN ARROW key is used in all modes of operation to move the cursor up or down to the next data line. The position of the cursor in respect to the data line is retained.

LT-RT ARROW
The LEFT or RIGHT ARROW key is used in all modes of operation to move the cursor left or right. The position of the cursor in respect to the data column is retained.

PAGE UP-DN
The PAGE UP or DN key is used in the setup and batch modes to view the next screen or page of data. In the setup mode, if the current page is page 3, pressing the page down key will cause the screen to display page 4. In the batch mode, pressing PAGE DN will cause the screen to show the next page of batch data unless the cursor is presently on the last page.

The opening screen after initializing is the STATUS screen, this will inform the operator the present status of the system. Press ESCAPE to exit to MAIN menu. (See

FRONT PANEL CONTROLS



ENGELRUN / version 12.0 X86 machine software
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FI - EDIT SETUP DATA (See page 1)
The FI key is used to enter the setup mode from the main menu. If the security key located on the front panel is not on, data may be reviewed, but may not be changed.

F2 - EDIT PRODUCT DATA (See page 1)
The F2 key is used to enter the product mode from the main menu.

F3 - INFORMATION (See Page 1)
The F3 key is used to view the help screens.

F4 - STATUS (See Page 8)
The F4 key will display the machine status as controlled by the controller. Some items and functions on the machine are not controlled by the controller but by external circuitry or controls.

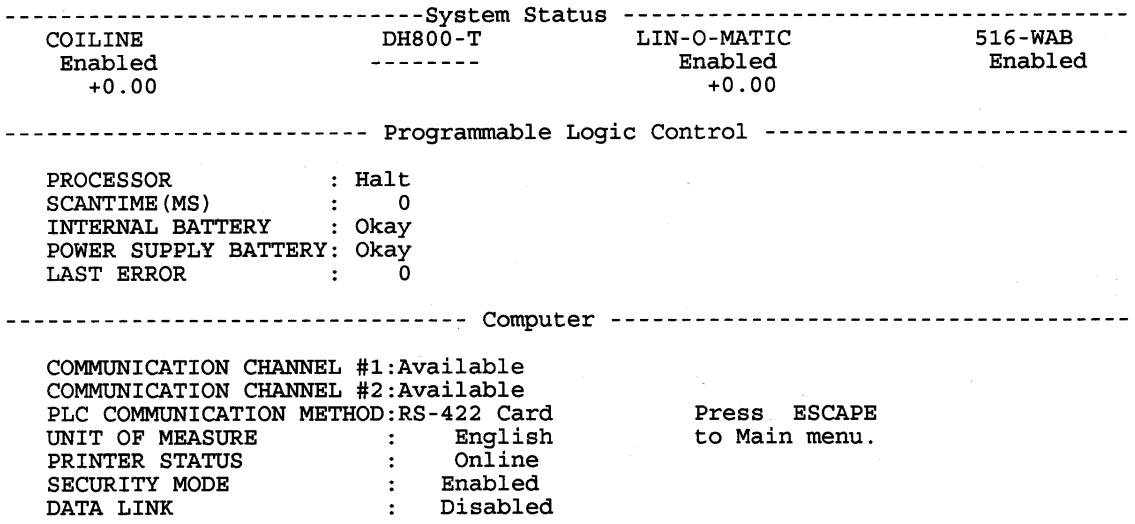
F5 - Quit
The F5 key will update the production; setup, maintenance, report and coil files from the latest information in the PLC, then will copy those files to the disk drive.

F6 - Maintenance (See Page 1)
The F6 key will display the present maintenance time count down from various items recommended maintenance times.

NOTE: An expected COM 2 will display if missing. An expected good setup file will display if missing.

STATUS SCREEN

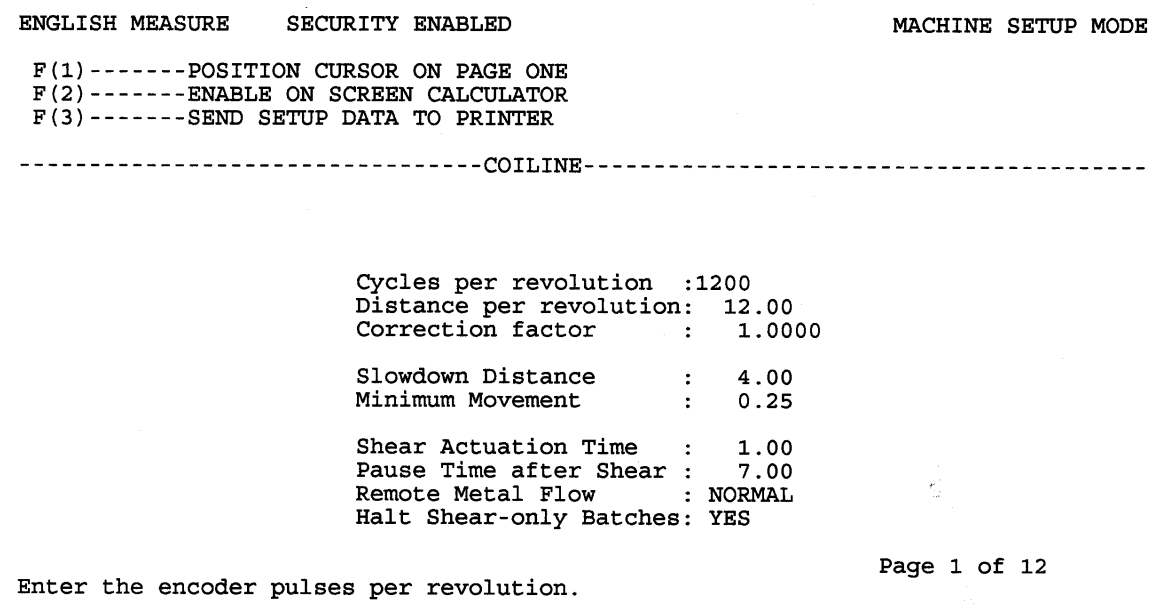
F7-Shell (See Page 1)
The F7 key will cause the system to shell out to a file in DOS to allow operation of third party programs. This feature is not on the standard version, but may be requested.



The Status screen will indicate the status of the parameters of the system. Though this picture is not in color, the actual screen on the system is in color. The items that are not available are in RED and items available in GREEN.
Internal battery is the battery in the PLC.
Power supply battery is the battery in the power supply.
Last Error will give an indication code of any errors in the PLC portion of the system.
Communication channel 1 is required to have office link.
Communication channel 2 is required to operate a wrapper brake.
Unit of measure is green for English and amber for Metric.

NOTE: An expected good setup file will display if missing.

SETUP MODE SCREEN PAGE 1



F1 – Position cursor on page one. No matter which setup page you are on, this function will return to this page.

F2 - CALCULATOR
The F2 key is used, while in the setup or production screen, to enable the on screen calculator. The calculator has the capability of exporting a result back to the main program.

F3 - PRINT OUT
The F3 key is used, while in the Setup or production screen, to make a hard copy of the setup or production data.

Cycles per Revolution entry is based upon the counts of the encoder. This information is normally printed on the nameplate of the encoder.

Distance per revolution is based on the circumference of the encoder wheel.

Correction Factor is a multiplier used by the systems calculation to correct for wear on the encoder wheel.

Slowdown distance is the amount of distance used to bring the hydraulic drive to a complete stop.

Minimum Movement is the smallest forward movement after a reverse movement to reduce system hysteresis from chains and gears.

Shear Actuation Time is the time allotted to perform a complete shear. The system does not track the up or down position of the shear.

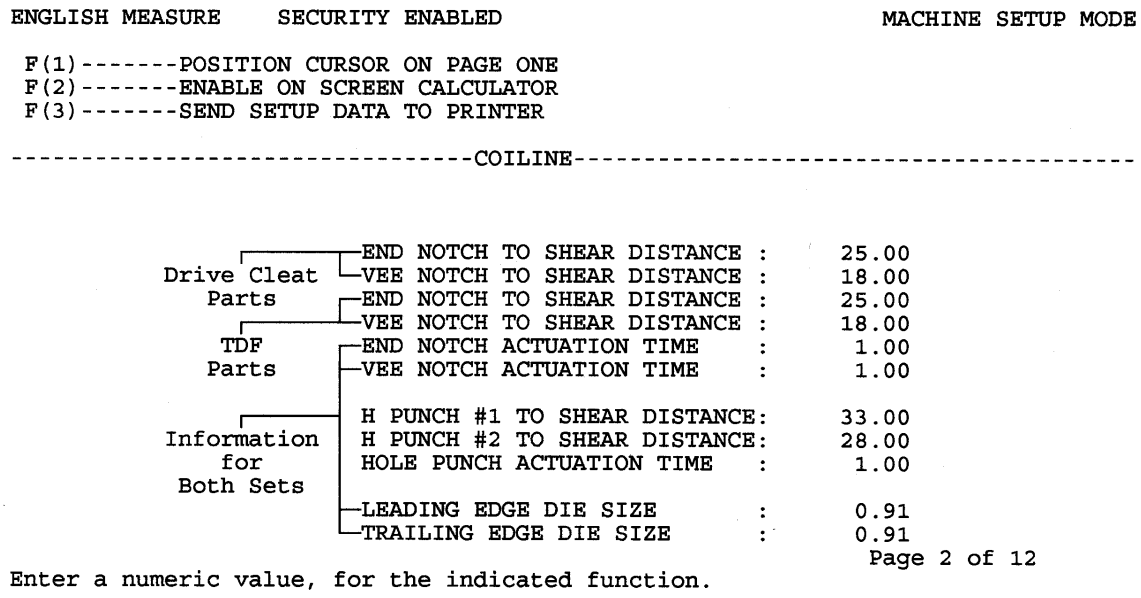
SETUP SCREEN PAGE 1 cont'd

Pause Time After Shear is the delay used between parts. Blank parts can have less delay time, while wrapper parts must have more time between parts to give the brake sufficient time to complete and eject the part.

Remote Metal Flow will determine the length or width to be leading or trailing edge. In NORMAL mode, the machine is Z-shaped and the length is the resulting leading edge. In REVERSE mode, the machine is U-shaped and the width will be the resulting leading edge.

Halt – shear only parts Normally the controller stops the line at the completion of each batch (or job). However, if a NO response is given, there will be no halt between batches of blanks.

SETUP SCREEN PAGE 2



END NOTCH TO SHEAR DISTANCE is the distance from the center of the end notch die to the center of the shear die (See appendix R).

VEE NOTCH TO SHEAR DISTANCE is the distance from the center of the vee notch die to the center of the shear die (See appendix R).

END NOTCH ACTUATION TIME is the time required f r the end-notch output to be on" to complete an end notch operation.

SETUP SCREEN PAGE 2 cont'd

VEE NOTCH ACTUATION TIME The VEE NOTCH ACTUATION TIME is the time required for the vee-notch output to be "on" to complete a vee notch operation.

HOLE #1 PUNCH TO SHEAR DISTANCE is the distance from the center of the #1 hole punch die to the shear edge of the shear. This distance can be determined in the same manner as for the end notch die. The hole punch production screen entries will be by- passed (no hole punch available), by entering zero in the hole punch to shear distance.

HOLE #2 PUNCH TO SHEAR DISTANCE is the distance from the center of the #2 hole punch die to the shear edge of the shear. This distance can be determined in the same manner as for the end notch die. The hole punch production screen entries will be by- passed (no hole punch available), by entering zero in the hole punch to shear distance. The #2 punch can be actuated with the punch select switch on the far side of the punch frame.

HOLE PUNCH ACTUATION TIME is the time required for the hole punch output to be "on" to complete a hole punch operation.

LEADING EDGE DIE SIZE is the distance from the trailing edge of the notch die to the center of the notch die. This parameter is used in the calculation of the position of the trailing edge lock of the part.

TRAILING EDGE DIE SIZE is the distance from the leading edge of the notch die to the center of the notch die. This parameter is used in the calculation of the leading edge lock of the part.

SETUP SCREEN Pages 3 and 4

```
ENGLISH MEASURE     SECURITY ENABLED                          MACHINE SETUP MODE

 F(1)-------POSITION CURSOR ON PAGE ONE
 F(2)-------ENABLE ON SCREEN CALCULATOR
 F(3)-------SEND SETUP DATA TO PRINTER

----------------------------------COILINE-----------------------------------------

                 {LOCK 1} LEADING EDGE LOCK SIZE :     0.00
                          TRAILING EDGE LOCK SIZE:     0.00
                          BACKGUAGE BRAKE OFFSET :     0.00
                          CORNER ROTATION FACTOR :     0.00
                          PART STRETCH ALLOWANCE :     0.00
                 {LOCK 2} LEADING EDGE LOCK SIZE :     0.00
                          TRAILING EDGE LOCK SIZE:     0.00
                          BACKGUAGE BRAKE OFFSET :     0.00
                          CORNER ROTATION FACTOR :     0.00
                          PART STRETCH ALLOWANCE :     0.00
                 {LOCK 3} LEADING EDGE LOCK SIZE :     0.00
                          TRAILING EDGE LOCK SIZE:     0.00
                          BACKGUAGE BRAKE OFFSET :     0.00
                          CORNER ROTATION FACTOR :     0.00
                          PART STRETCH ALLOWANCE :     0.00
                                                        Page 3 of 12
Enter a numeric value, for the indicated function.
```

SETUP SCREEN Pages 3 and 4 cont'd

LOCK X TRAILING EDGE LOCK SIZE is the distance from the leading edge of the notch pattern to the center of the notch pattern and makes the trailing edge notch of the part. The controller uses this parameter when a batch is programmed that includes a lock X pattern.

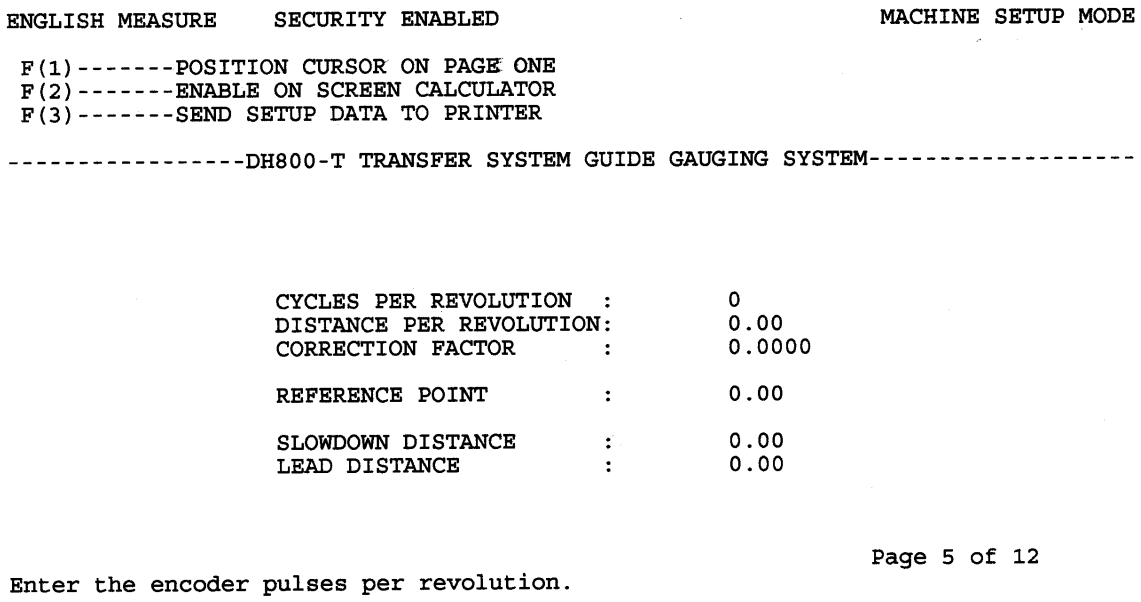
BACKGAUGE BRAKE OFFSET - SINGLE BEND parameter is used to position the L-shape brake back-gauge guides wider than the programmed leading edge. This parameter is added to the programmed position and is transmitted to the brake when a job is run.

CORNER ROTATION FACTOR parameter is used to tell the controller how much to shift the vee notches on the part. The shift can be either forward or backward, and this pattern shifting takes place at the Coiline.

PART STRETCH ALLOWANCE parameter is used to tell the controller how much to lengthen or shorten each leg of the part. This allows compensation for part stretch that occurs in a brake system when the part is bent.

There are 6 groups of settings, different sets for large or small Pitts, S-D, etc.

SETUP SCREEN Page 5



Cycles per Revolution entry is based upon the counts of the encoder. This information is normally printed on the nameplate of the encoder.

Distance per revolution is based on the circumference of the encoder wheel.

SETUP SCREEN Page 5 cont'd

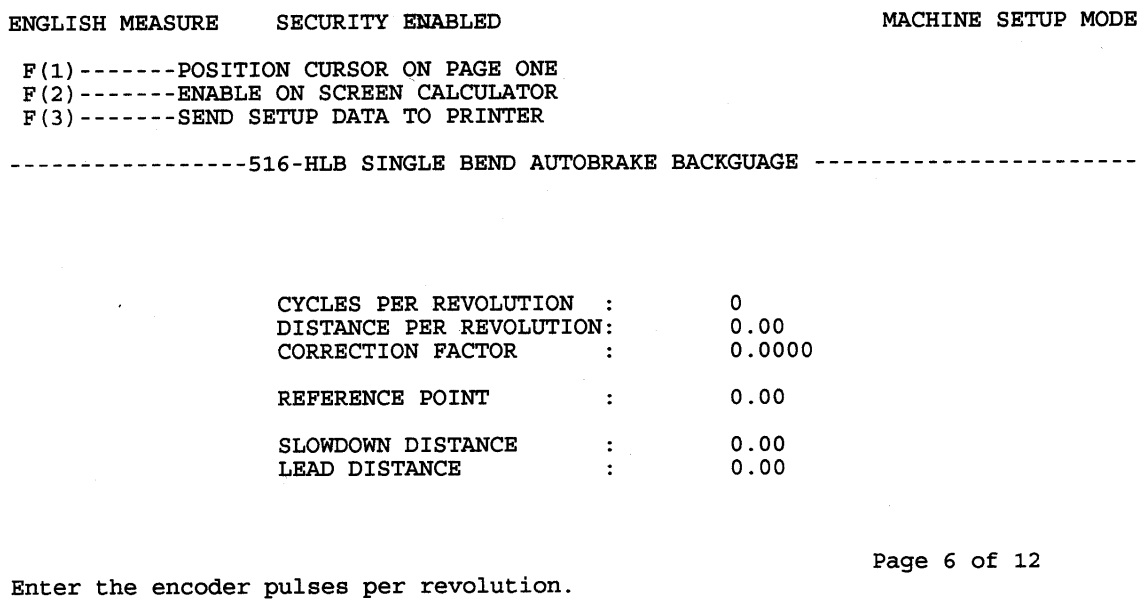
Correction Factor is a multiplier used by the systems calculation to correct for wear on the encoder wheel.

REFERENCE POINT parameter is used to tell the controller the dimension for the home position.

Slowdown distance is the amount of distance used to bring the hydraulic drive to a complete stop.

LEAD DISTANCE parameter is used to correct for overrun in the back-gauge drives. If the stopping point is always off by the same amount, then you can enter that value here.

SETUP SCREEN Page 6



Cycles per Revolution entry is based upon the counts of the encoder. This information is normally printed on the nameplate of the encoder.

Distance per revolution is based on the circumference of the encoder wheel.

Correction Factor is a multiplier used by the systems calculation to correct for wear on the encoder wheel.

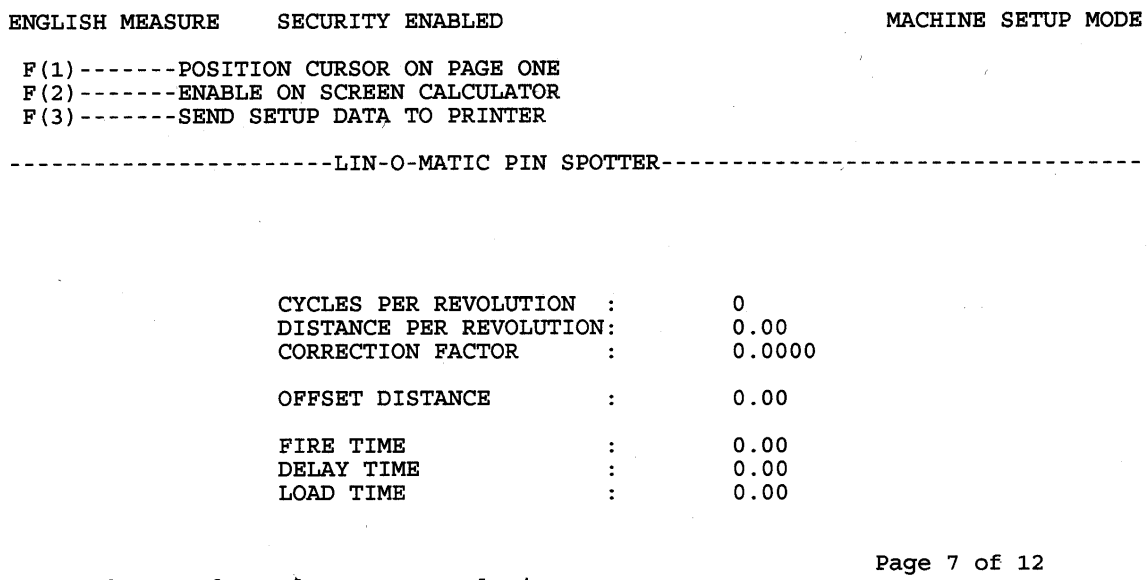
SETUP SCREEN Page 6 cont'd

REFERENCE POINT parameter is used to tell the controller the dimension for the home position.

Slowdown distance is the amount of distance used to bring the hydraulic drive to a complete stop.

LEAD DISTANCE parameter is used to correct for overrun in the back-gauge drives. If the stopping point is always off by the same amount, then you can enter that value here.

SETUP SCREEN Page 7



Cycles per Revolution entry is based upon the counts of the encoder. This information is normally printed on the nameplate of the encoder.

Distance per revolution is based on the circumference of the encoder wheel.

Correction Factor is a multiplier used by the systems calculation to correct for wear on the encoder wheel.

Offset Distance parameter is used to tell the controller the distance to offset all rows of pins.

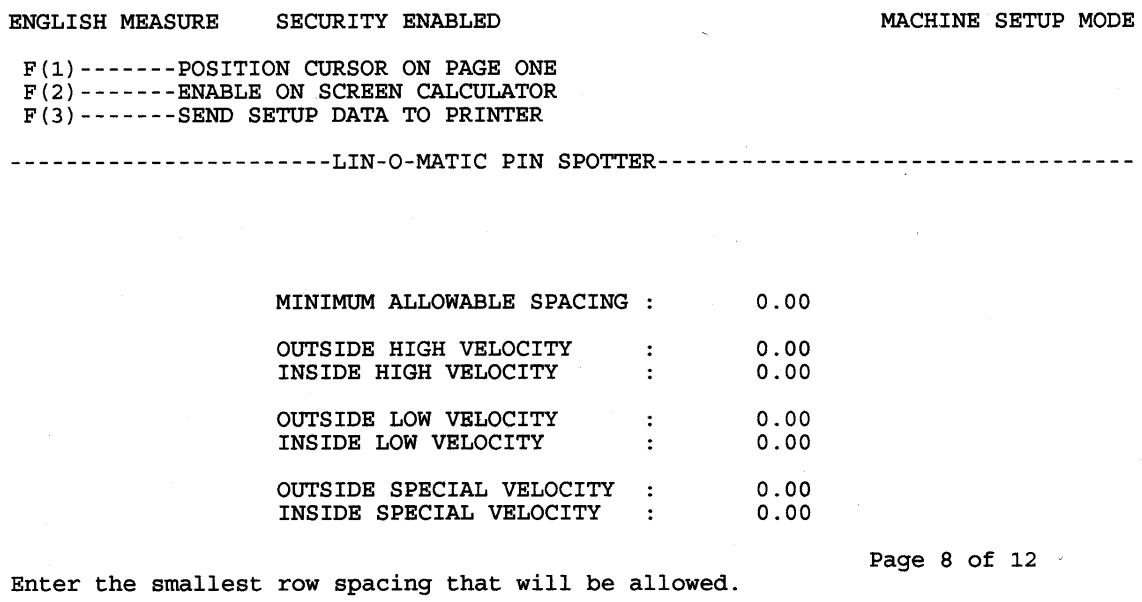
FIRE TIME parameter is used to tell the controller how much time to allow when firing pins on insulated duct.

SETUP SCREEN Page 7 cont'd

DELAY TIME parameter is used to tell the controller how much time to allow before loading a new pin. This parameter is only required on older style pin-spotters.

LOAD TIME parameter is used to tell the controller how much time to allow when loading new pins. This parameter is only required on older style pin-spotters.

SETUP SCREEN Page 8



MINIMUM ALLOWABLE SPACING is the shortest distance the pins are allowed apart.

OUTSIDE (H/L/S) VELOCITY is the distance for pins in outside rows. Inside and outside velocities will be the same for the Dura-dyne pin-spotter. Grip nails can be different settings.

INSIDE (H/L/S) VELOCITY is the distance for pins in inside rows. Inside and outside velocities will be the same for the Dura-dyne pin-spotter. Grip nails can be different settings.

VELOCITY SETTINGS are used to tell the controller what pin spacing pattern to use when making insulated duct.

SETUP SCREEN Pages 9 through 11

```
ENGLISH MEASURE    SECURITY ENABLED                          MACHINE SETUP MODE

 F(1)-------POSITION CURSOR ON PAGE ONE     DRIVE TYPE     :          API
 F(2)-------ENABLE ON SCREEN CALCULATOR     REFERENCE POINT:        11.00
 F(3)-------SEND SETUP DATA TO PRINTER

------------------516-WAB MULTIPLE BEND AUTOBRAKE BACKGUAGE--------------------

                   {GROUP 1} CORNER ROTATION FACTOR:   0.00
                             OFFSET BEND LOCATION 1:   0.00
                             OFFSET BEND LOCATION 2:   0.00
                             OFFSET BEND LOCATION 3:   0.00
                             PART STRETCH ALLOWANCE:   0.00
                   {GROUP 2} CORNER ROTATION FACTOR:   0.00
                             OFFSET BEND LOCATION 1:   0.00
                             OFFSET BEND LOCATION 2:   0.00
                             OFFSET BEND LOCATION 3:   0.00
                             PART STRETCH ALLOWANCE:   0.00
                   {GROUP 3} CORNER ROTATION FACTOR:   0.00
                             OFFSET BEND LOCATION 1:   0.00
                             OFFSET BEND LOCATION 2:   0.00
                             OFFSET BEND LOCATION 3:   0.00
                             PART STRETCH ALLOWANCE:   0.00
                                                          Page 9 of 12
Enter a numeric value, for the indicated function.
```

Note: The parameters on these pages will only affect the brake.

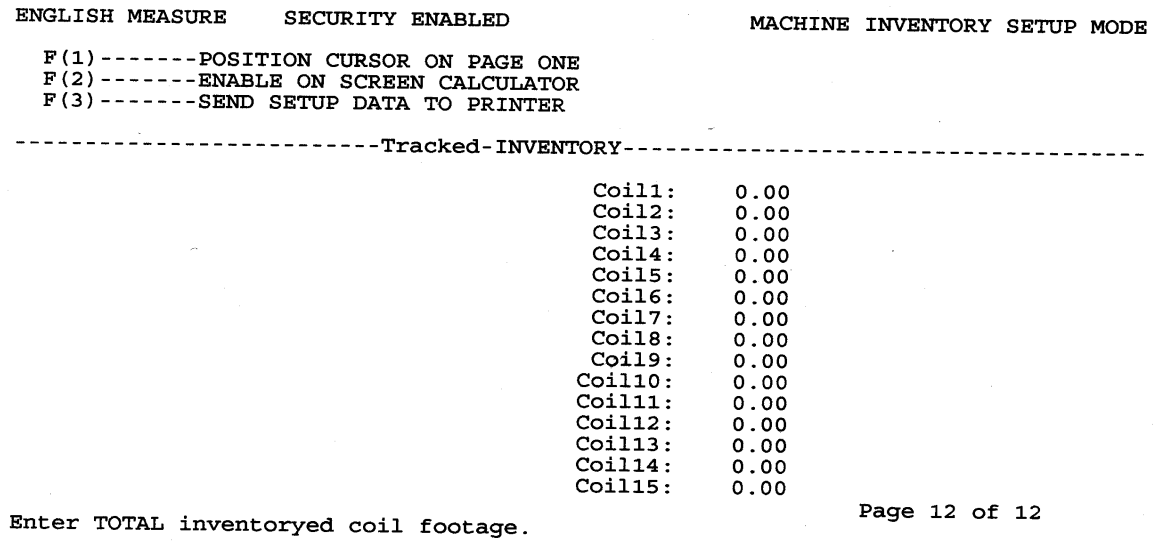
CORNER ROTATION FACTOR parameter is used to tell the controller how much to shift the vee notches on the part. The shift can be either forward or backward, and this pattern shifting takes place at the Coiline.

OFFSET BEND LOCATION X parameter is used to tell the controller how much to offset the bending point when a full wrapper brake system is installed. This allows for material thickness and different type locks.

PART STRETCH ALLOWANCE parameter is used to tell the controller how much to lengthen or shorten each leg of the part. This allows compensation for part stretch that occurs in a brake system when the part is bent.

There are 9 groups of settings; each can be used for different gauges, types or connectors.

SETUP SCREEN Page 12



TOTAL INVENTORY COIL is a programmable inventory of material in footage on pre-assigned coils. This entry is connected to the Ga column on the production screen. Instead of entering the gauge of the material, enter the assigned coil number. If tracking of inventory of a coil is desired, enter a total footage for a coil number I through 15. This coil will then be displayed on the coil screen (F4) screen from the Production screen as it is tracked.

PRODUCTION MODE pages 1 through 7

```
ENGLISH MEASURE                                     Production Data ENTER/MONITOR Mode
  Press F(1)-------Position cursor on page one            PAGE 1    of 7
  Press F(2)-------Enable on screen calculator       Job      :          0
  Press F(3)-------Send product data to printer      Quantity:           0
  Press F(4)-------Coil / material information       Length   :        0.00
  Press F(5)-------Purge andsort job data            Next Op.:
  Press F(6)-------Erase all job data                Count    :        +0.00
  Press F(7)-------Label Development and Print
 Job   Quantity Type   Length    Width   Lk  Ga-Wd   VE   CO  HPL HPT  Wb  STAT
      1      1    W     12.00    12.00   1   24-60   N    D   J   J    1    RDY
      2      0    W      0.00     0.00   1   24-60   N    D   X   X    1    ***
      3      0    W      0.00     0.00   1   24-60   N    D   X   X    0    ***
      4      0    W      0.00     0.00   1   24-60   N    D   X   X    0    ***
      0      0    B      0.00     0.00   1    0- 0   N    N   X   X    0    ***
      0      0    B      0.00     0.00   1    0- 0   N    N   X   X    0    ***
      0      0    B      0.00     0.00   1    0- 0   N    N   X   X    0    ***
      0      0    B      0.00     0.00   1    0- 0   N    N   X   X    0    ***
      0      0    B      0.00     0.00   1    0- 0   N    N   X   X    0    ***
      0      0    B      0.00     0.00   1    0- 0   N    N   X   X    0    ***
      0      0    B      0.00     0.00   1    0- 0   N    N   X   X    0    ***
      0      0    B      0.00     0.00   1    0- 0   N    N   X   X    0    ***
      0      0    B      0.00     0.00   1    0- 0   N    N   X   X    0    ***
      0      0    B      0.00     0.00   1    0- 0   N    N   X   X    0    ***
      0      0    B      0.00     0.00   1    0- 0   N    N   X   X    0    ***
Enter a job identifier up to six digits in length.
```

Job refers to a job number, this is a number only, no characters.

Quantity range of values for the quantity is I to 9999. A job must have a quantity in order to receive a RDY (ready) status.

Type The controller has the capability of producing 5 different parts. These range from B (blank) to, W (Wrapper duct) and are detailed below. Toggle the types by pressing any key, or press the letter key itself for your choice.

> ***TYPE B (blank)*** is a shear only or blank part. This means the parts are simply cut to the length programmed with no other operations. No braking of part.
>
> ***TYPE F (flat)*** is a flat piece of duct with the end notch and hole patterns punched. This type of part would be used where four separate pieces are used to make one cross section of duct. No braking of part.
>
> ***TYPE L (L-shape)*** parts and have end notch pattern and a single vee notch, hole punch as programmed. This part would form an L-shaped section of duct.
>
> ***TYPE U (U-shape)*** have an end notch pattern and two vee notches, hole punches as programmed. This part would form a U-shaped section of duct.

TYPE W (wrapper) parts are wrapper parts and have an end notch pattern and three vee notches, hole punches as programmed. This part would form a box-shape when bent.

Length and Width
Types B and F requires only a length entry. This should be the finished length of the part.
Types L through W requires both a length and width and should represent the finished dimensions of the part.

Lock type is the next item encountered in the production schedule. The lock type value must range between 1 and 6. This value represents the lock pattern desired as input in the setup mode.

GA-WD This represents the coil to use for production of the parts. This is generally entered as gauge and width of the coil, hence the acronym.

A valid entry here can range from 00-00 to 99-99. A 00-00 entry will disable coil tracking. If this value matches a value in the coil stack then tracking is enabled for that coil. If no match is found, and there is room in the stack, the new coil will be tracked.

An error message is generated if the coil stack is full and you try to enter a new coil size. Remember the computer tracks only 15 coils. Enter the coil width in inches if you are going to use the data in the report file. Otherwise the file will contain meaningless information. Refer to the coil mode section for more details.

duct *VE*locity This option is for machines with pin- spotter controllers used to automatically fasten insulation to ducts with metal pins. Ducts with different velocities require different pin spacing. Using the information specified in this column, the controller passes the required pattern information to the pin-spotter.

Option details are as follows:
N - No insulation used
H - High velocity duct
L - Low velocity duct
S - Special velocity duct

This column is bypassed if a type B (shear only part) is selected.

PRODUCTION MODE pages 1 through 7 cont'd

***CO*nnector** type specification.
The option types are:
Drive cleat
Transverse
None.
Selection is made by pressing any key to toggle the display, or you may press the letter key itself for your choice.

Depending on the connector type specified by the operator, the controller will activate the respective dies when doing any punching operations. Also, the controller will use the information entered in the setup mode for the die selected in its internal part calculations. For example, if the drive cleat die option is selected, the controller will use the die information entered under the drive cleat header in the setup mode. If the transverse die option is selected, the controller will use the die information entered under the transverse cleat header in the setup mode.

If neither set is selected, the presses will not fire, but the lock allowance will show up in the total part length.

HPL or HPT) the hole punch option is selected by pressing any key to toggle the display prompt from X to A through R.

Selecting a hole punch code will cause the controller to cycle the hole punch die according to the code pattern selected.

Part types Flat, L-shape, U-shape, and Wrapper may use the hole punch option. See Appendix C for further details.

***W*rapper *b*rake** Valid numbers for this area are 0-9. A zero will cause the full wrapper brake to by-pass all parts created by this batch. Whereas a selection will cause the part to be produced using the group data as programmed in the setup data area.

***STAT*us** When a job is keyed in, the **RDY** (ready) status assignment is automatic, assuming enough data was input. The operator may alter any job that is not in work, that is, a status other than **WRK** (work).

A status of **NXT** (next) indicates that the operator desires the batch to be the next produced. Only one batch may have the **NXT** (next) status at any given time. After the **NXT** (next) batch is run, execution will continue sequentially down the screen. A status of **SKP** (skip), when selected, causes the controller to leap over the batch entirely.
The status of **RES** (reset) will result from a batch started but reset.

RUN MODE

The purpose of the run mode is to produce the parts programmed. When the operator presses the RUN pushbutton, you enter this mode.

The RUN may have to be pressed numerous times if there are material, lock or connector changes.

Pressing the HALT pushbutton will halt the operation of the machine, but it will still restrict the altering of most parameters, (the job in work will remain blue color).

Pressing the HALT then RESET pushbuttons will cause the control to exit the run mode completely. At the completion of a job, the controller also will exit the run mode.

Upon entering the run mode, the controller will begin processing material from where it left off if it was previously in the run mode and not RESET (manually or automatically).

Once running, the batches are produced in the order that they appear in the job list. The only exception to this is by batches with NXT (next) or SKP (skip) status.

A batch whose status is NXT (next) will be run before any RDY (ready) batches.

When completed, execution continues with other RDY (ready) batches sequentially down the screen. Only one batch may have NXT (next) status at any given time.

A batch whose status is SKP (skip) will be skipped.

Inserting or deleting batches using the **INSERT** or **DELETE** key respectively may alter the job order.
To insert a batch, position the cursor anywhere on the line where you want the line to be inserted and press the INSERT key. The controller will shift the data down one line starting with the current job. This shift will continue to the bottom of the production schedule.

If the job stack is full, it is impossible to insert a job. If the operator wishes to run the same job again, re-enter any parameter and this will restore the job to RDY (ready) status.

To delete a job, place the cursor anywhere on the line you wish deleted, then press the DELETE key. The controller will delete the line and move the entire job list up one line starting at the current line. A job in production cannot be deleted. An attempt to delete a job currently in work results in an error message.

RUN MODE cont'd

When the controller enters the run mode, it searches the job list looking for a job with NXT (next) status. If none is found, it searches for job with a RES (reset), or RDY (ready) status. If the controller finds no job to process, it issues the error message: JOB STACK EMPTY.

When the controller finds a job with NXT (next), RES (reset), or RDY (ready) status, it begins processing that job. Depending on which additional equipment is installed with the Coiline, the controller will prompt the operator with questions concerning coil changes, die placement changes, and roll form head position changes. If any of these messages appear, simply follow the instructions on the screen.

During the processing of a batch, the status column of the batch will contain the word WRK, indicating that the batch is currently in work.

After a batch is processed, the controller will change the batch status to DNE (done). This indicates job completion.

If you exit the run mode by pressing the HALT pushbutton, the batch status will remain WRK (work).

If you then press the RESET pushbutton, the status changes to RES (reset). Therefore, you may not delete a batch in work unless the controller is first reset.

After a batch is completed, the controller will exit the run mode and enter the halt mode. To run the next available job, simply press the RUN pushbutton again. If you wish to change the order in which the batches are being processed, change the status of appropriate batches to NXT (next), or SKP (skip).

The current controller status is observable anytime while in the batch mode by viewing the upper right-hand section of the controller screen.
The information lines contain the following data:

1. Job number being processed.
2. Quantity left to be made.
3. Current length of part being made.
4. Description of next event to occur.
5. Maintenance Due will be displayed between the displays of the next event.
6. Location of part in the coiline.

After the completion of a batch and entry into a new job, the controller checks several parameters to see if a message to the operator is warranted. One of these parameters is the indication of a different coil than the previous batch. If this occurs, the controller will prompt the operator to check the coil.

RUN MODE cont'd

This action will confirm that the proper material is ready for fabrication. A prompt for a die change will appear if required.

Another feature of this controller is the generation of a job report file (REPORT.TXT), which contains the job number, quantity left to run, square footage of material used, coil identifier, and a time and date stamp. This file is written to each time a job is completed or reset. It is maintained until its length grows greater than 100 Kilobytes, at which time it is written over by the new data.

COIL MODE

The controller is capable of storing information pertaining to 15 different coils of material. The operator can review this information by pressing F4 in the batch mode or SETUP page 14. With the display in the PRODUCTION screen, the controller will display all active coils with the following information:

1. Gauge and width or coil number
2. Total length run (footage)
3. Remaining inventory of tracked coils

To reset a coil counter, place the pointer on the coil you wish to reset using the arrow keys, then press the R key.

To clear a coil, position the cursor on the coil you want to clear and press the C key. The controller will first confirm that the coil is not in use. Then, and only then, can the deletion take place.

To print the production screen coil information, press the 'Shift' key and the 'Print Screen' key, simultaneously. This will produce a hard copy of the screen.

COIL MODE

The sequence of operation for coil inventory is:

A. The tracked coil footage must be entered on page 14 of the SETUP screen.
B. The Ga column must contain the corresponding inventory coil number.
C. The STAT column must be entered.
D. The COIL DATA (F4) screen, displayed on the production screen, must be ESCaped from to accept and update the footage used, before the footage is subtracted from the remaining amount.

Notes: If Reset is pressed on a pointed-to coil on the Production F4 Screen, it will reset the footage used and NOT update the remaining amount.

ERROR MESSAGES

The controller can detect certain operator errors. These are reported as messages on the last line of the screen.

Errors must be acknowledged and cleared by pressing any key. The messages you may see are shown below:

ACCEPTABLE RANGE 25 - 1200 PULSES PER REVOLUTION
ACCEPTABLE RANGE.5 - 2.0 CORRECTION FACTOR
ACCEPTABLE RANGE 0 - 99.99 SECONDS
ACCEPTABLE RANGE 0 - 327.67 INCHES OR 8322.81 MM
ACCEPTABLE RANGE 1 - 6 LOCK TYPE
ACCEPTABLE RANGE 1 - 99 CODE FOR COIL GAUGE
ACCEPTABLE RANGE 1 - 99 CODE FOR COIL WIDTH
ACCEPTABLE RANGE 0 - 199.99 inches or 5079.74 mm
ACCEPTABLE RANGE 1 - 199.99 inches OR 5079.74 mm
ACCEPTABLE RANGE 0 - 9 FULL WRAPPER BRAKE OFFSET GROUP
ANOTHER JOB CANNOT BE INSERTED
BATCH IN PROCESS CANNOT BE DELETED
BATCH IN PROCESS CANNOT BE ALTERED
CHECK SETUP FILES
COIL STACK IS FULL ANOTHER COIL CANNOT BE ADDED
COM 2 COMMUNICATIONS ERROR
CURRENT BATCH IS EMPTY
DISKETTE NOT READY / DISKETTE DRIVE FAILURE
ILLEGAL PIN SPACING
INVALID KEYSTROKE
JOB STACK EMPTY
JOB STATUS MARK (NXT) CAN ONLY BE ASSIGNED TO ONE JOB
MAINTENANCE DUE
SECURITY KEY-SWITCH IS OFF, SETUP DATA CANNOT BE ALTERED
STACK IS FULL ANOTHER JOB CANNOT BE INSERTED
THE LOCK TYPE SPECIFIED HAS NOT BEEN DEFINED
THE JOB STACK CANNOT BE ERASED IF A BATCH IS IN PROCESS
TOTAL LOCK SIZE MUST BE NO MORE THAN 2X DIE SIZE

END NOTCH LOCK TYPES

The controller is capable of handling up to six different notch widths per die configuration. This allows the machine to be able to make a notch pattern that is up to twice the actual notch die size.

When the controller encounters a part with a notch pattern, it compares the machines programmed die size to the parts programmed notch size.

If the notch size is greater than the actual die size, the controller will DOUBLE NOTCH the material to produce a notch pattern that is equal to the programmed notch size.

If the notch size is smaller than the actual die size, the controller will notch the material once. And when the part reaches the cutoff press, the controller will DOUBLE SHEAR the part to eliminate the excessive notch pattern.

This means that the controller will, shearing once for the trailing edge of one part and once for the leading edge of the next part.

SETUP DATA SHEETS

COILINE PAGE 1

Description	Your Data	RANGE
Cycles per revolution	----------	25 - 1200 ppr
Distance per revolution	----------	.25 - 20.00 inches
Correction factor	----------	.50 - 2.0
Slowdown distance	----------	0 - 199.99 inches
Minimum movement	----------	0 - 199.99 inches
Shear actuation time	----------	0 - 99.99 seconds
Pause time after shear	----------	0 - 99.99 seconds
Remote metal flow	----------	Normal - Reverse
Halt shear-only batches	----------	Yes - No

COILINE PAGE 2

DRIVE CLEAT PUNCHES

End-notch to shear distance	----------	0 - 199.99 inches
Vee-notch to shear distance	----------	0 - 199.99 inches

TRANSVERSE CLEAT PUNCHES

End-notch to shear distance	----------	0 - 199.99 inches
Vee-notch to shear distance	----------	0 - 199.99 inches

SETUP DATA SHEETS cont'd

COILINE PAGE 2 CONT'D

Description	Your Data	RANGE
HOLEPUNCH		
Hole punch #1 to shear distance	----------	0 - 199.99 inches
Hole punch #2 to shear distance	----------	0 - 199.99 inches
Hole punch actuation time	----------	0 - 99.99 seconds
End-notch actuation time	----------	0 - 99.99 seconds
Vee-notch actuation time	----------	0 - 99.99 seconds
Leading edge die size	----------	0 - 199.99 inches
Trailing edge die size	----------	0 - 199.99 inches
COILINE PAGE 3		
(Lock 1)		
Leading edge lock size	----------	0 - 199.99 inches
Trailing edge lock size	----------	0 - 199.99 inches
Back-gauge brake offset	----------	0 - 199.99 inches
Corner rotation factor	----------	0 - 199.99 inches
Part stretch allowance	----------	0 - 199.99 inches

SETUP DATA SHEETS cont'd

COILINE PAGE 3 CONT'D

Description	Your Data	RANGE
(Lock 2)		
Leading edge lock size	----------	0 - 199.99 inches
Trailing edge lock size	----------	0 - 199.99 inches
Back-gauge brake offset	----------	0 - 199.99 inches
Corner rotation factor	----------	0 - 199.99 inches
Part stretch allowance	----------	0 - 199.99 inches
(Lock 3)		
Leading edge lock size	----------	0 - 199.99 inches
Trailing edge lock size	----------	0 - 199.99 inches
Back-gauge brake offset	----------	0 - 199.99 inches
Corner rotation factor	----------	0 - 199.99 inches
Part stretch allowance	----------	0 - 199.99 inches

COILINE PAGE 4

(Lock 4)		
Leading edge lock size	----------	0 - 199.99 inches
Trailing edge lock size	----------	0 - 199.99 inches
Back-gauge brake offset	----------	0 - 199.99 inches
Comer rotation factor	----------	0 - 199.99 inches

SETUP DATA SHEETS cont'd

COILINE PAGE 4 CONT'D

Description	Your Data	RANGE
Part stretch allowance	----------	0 - 199.99 inches
(Lock 5)		
Leading edge look size	----------	0 - 199.99 inches
Trailing edge lock size	----------	0 - 199.99 inches
Back-gauge brake offset	----------	0 - 199.99 inches
Corner rotation factor	----------	0 - 199.99 inches
Part stretch allowance	----------	0 - 199.99 inches
(Lock 6)		
Leading edge lock size	----------	0 - 199-99 inches
Trailing edge lock size	----------	0 - 199-99 inches
Back-gauge brake offset	----------	0 - 199-99 inches
Corner rotation factor	----------	0 - 199-99 inches
Part stretch allowance	----------	0 - 199-99 inches

DH800-T TRANSFER SYSTEM, GAUGING SYSTEM PAGE 5

Cycles per revolution	----------	25 - 1200 ppr
Distance per revolution	----------	0 - 199-99 inches
Correction factor	----------	.5- 2.0

SETUP DATA SHEETS cont'd

COILINE PAGE 5 CONT'D

Description	Your Data	RANGE
Reference point	----------	0 -199-99 inches
Slowdown distance	----------	0 -199-99 inches
Lead distance	----------	0 -199-99 inches

516-HLB/AB SINGLE BEND BRAKE BACK-GAUGE PAGE 6

Cycles per revolution	----------	25 - 1200 ppr
Distance per revolution	----------	0 - 199-99 inches
Correction factor	----------	1.5- 2.0
Reference point	----------	0-199-99 inches
Slowdown distance	----------	0-199-99 inches
Lead distance	----------	0-199-99 inches

LIN-0-MATIC PIN SPOTTER PAGE 7

Cycles per revolution	----------	25 - 1200 ppr
Distance per revolution	----------	0 - 199.99 inches
Correction factor	----------	.5 - 2.0
Offset	----------	0 - 199.99 inches
Fire time	----------	.01 - 99.99 seconds

SETUP DATA SHEETS cont'd

COILINE PAGE 7 CONT'D

Description	Your Data	RANGE
Delay time	----------	.01 - 99.99 seconds
Load time	----------	.01 - 99.99 seconds

LIN-0-MATIC PIN SPOTTER PAGE 8

Minimum allowable spacing	----------	0 - 199.99 inches
Outside high velocity	----------	0 - 199.99 inches
Inside high velocity	----------	0 - 199.99 inches
Outside low velocity	----------	0 - 199.99 inches
Inside low velocity	----------	0 - 199.99 inches
Outside special velocity	----------	0 - 199.99 inches
Inside special velocity	----------	0 - 199.99 inches

516-WAB MULTIPLE BEND AUTOBRAKE BACKGAUGE PAGE 9

(GROUP1)

Corner rotation factor	----------	0 - 199.99 inches
Offset bend location 1	----------	0 - 199.99 inches
Offset bend location 2	----------	0 - 199.99 inches
Offset bend location 3	----------	0 - 199.99 inches
Part stretch allowance	----------	0 - 199.99 inches

SETUP DATA SHEETS cont'd

COILINE PAGE 9 CONT'D

Description	Your Data	RANGE
(GROUP 2)		
Comer rotation factor	----------	0 - 199.99 inches
Offset bend location 1	----------	0 - 199.99 inches
Offset bend location 2	----------	0 - 199.99 inches
Offset bend location 3	----------	0 - 199.99 inches
Part stretch allowance	----------	0 - 199.99 inches
(GROUP 3)		
Corner rotation factor	----------	0 - 199.99 inches
Offset bend location 1	----------	0 - 199.99 inches
Offset bend location 2	----------	0 - 199.99 inches
Offset bend location 3	----------	0 - 199.99 inches
Part stretch allowance	----------	0 - 199.99 inches

516-WAB MULTIPLE BEND BACKGAUGE PAGE 10

(GROUP 4)		
Corner rotation factor	----------	0 - 199.99 inches
Offset bend location 1	----------	0 - 199.99 inches
Offset bend location 2	----------	0 - 199.99 inches
Offset bend location 3	----------	0 - 199.99 inches

SETUP DATA SHEETS cont'd

516-WAB MULTIPLE BEND BACKGAUGE PAGE 10 CONT'D

Description	Your Data	RANGE
Part stretch allowance	----------	0 - 199.99 inches
(GROUP 5)		
Comer rotation factor	----------	0 - 199.99 inches
Offset bend location 1	----------	0 - 199.99 inches
Offset bend location 2	----------	0 - 199.99 inches
Offset bend location 3	----------	0 - 199.99 inches
Part stretch allowance	----------	0 - 199.99 inches
(GROUP 6)		
Corner rotation factor	----------	0 - 199.99 inches
Offset bend location 1	----------	0 - 199.99 inches
Offset bend location 2	----------	0 - 199.99 inches
Offset bend location 3	----------	0 - 199.99 inches
Part stretch allowance	----------	0 - 199.99 inches

516-WAB MULTIPLE BEND BACKGAUGE PAGE 11

(GROUP 7)		
Corner rotation factor	----------	0 - 199.99 inches
Offset bend location 1	----------	0 - 199.99 inches

SETUP DATA SHEETS cont'd

516-WAB MULTIPLE BEND BACKGAUGE PAGE 11 CONT'D

Description	Your Data	RANGE
Offset bend location 2	----------	0 - 199.99 inches
Offset bend location 3	----------	0 - 199.99 inches
Part stretch allowance	----------	0 - 199.99 inches
(GROUP 8)		
Corner rotation factor	----------	0 - 199.99 inches
Offset bend location 1	----------	0 - 199.99 inches
Offset bend location 2	----------	0 - 199.99 inches
Offset bend location 3	----------	0 - 199.99 inches
Part stretch allowance	----------	0 - 199.99 inches
(GROUP 9)		
Corner rotation factor	----------	0 - 199.99 inches
Offset bend location l	----------	0 - 199.99 inches
Offset bend location 2	----------	0 - 199.99 inches
Offset bend location 3	----------	0 - 199.99 inches
Part stretch allowance	----------	0 - 199.99 inches

SETUP DATA SHEETS cont'd

COIL INVENTORY PAGE 12

COIL NUMBER	FOOTAGE
COIL #1	----------
COIL #2	----------
COIL #3	----------
COIL #4	----------
COIL #5	----------
COIL #6	----------
COIL #7	----------
COIL #8	----------
COIL #9	----------
COIL #10	----------
COIL #11	----------
COIL #12	----------
COIL #13	----------
COIL #14	----------
COIL #15	----------

FILE STRUCTURE

There are five (5) files that the user can manipulate using their self-developed software. The information included here is given strictly as a guide for our customers. Engel Industries does not intend to write software for other than Engel equipment. It is the responsibility of the customers' programmer to maintain compatibility between any external computers and the Coiline control system. The files are listed below.

PRODUCT.DAT

SETUP.DAT

LABEL.DAT

COIL.DAT

REPORT.TXT

A few points that pertain to all the data files (.DAT), is as follows. All files are the random access type. All numeric data is left justified, single precision, and stored using the IEEE format. The acronym IEEE represents the Institute of Electrical and Electronics Engineers. The IEEE format differs from the Microsoft Binary Format in that it extends the single precision range of numbers and obtains more accurate results.

FILE STRUCTURE cont'd

Also co-processor support is easier to implement. The ENGELRUN and ENGELINK software was written using Microsoft's Professional Development System (PDS 7.x).

Data that involves measured amounts uses the English measurement system.

The **SETUP** file contains all the machine's setup data and has the following characteristics. It uses a record length of four (4) bytes and contains one hundred and eleven (147) entries, for a total file length of five hundred and twenty-eight (588) bytes. Each record, or entry, represents one data item. The data is stored in the order that they appear in the setup area of the Engelrun program. When the stored data does not represent numeric data, as in the following examples, then the following special values are stored in its place.

Remote Metal Flow:	Normal = O	Reverse = 1 Halt
Shear-only Batches:	Yes = O	No = 1

The **PRODUCT** file contains the machine's production schedule, and has the following characteristics. It uses a record length of fifty-two (52) bytes, and contains one hundred entries, for a total file length of five thousand two hundred (5200) bytes.

FILE STRUCTURE cont'd

Each record, or entry, represents thirteen (13) data items, and each of these occupies four (4) bytes of storage area. The data is stored in the order that they appear in the production schedule, both horizontally and vertically. To explain further, each entry in the file represents one batch, and each of the thirteen (13), four (4) byte blocks in a record represents one of the production schedule's data columns. Record one (1) is the first job's data and record one hundred (100) is the last job's data. In this way, a simple matrix is formed composed of production data.

When the stored data does not represent numeric data, as in the following examples, then the following special values are stored in its place.

Type: Blank = 66 Flat = 70 L-shape =76

U-shape = 85 Wrapper = 87

VE: High = 72 Low = 76 None = 78

CO: DC = 68 None = 78 TDF = 84

HP: X = 88 A = 65 B = 66 C = 67 D = 68 E = 69 F = 70

G = 71 H = 72 I = 73 J = 74 K = 75 L = 76 M = 77

N = 78 O = 79 P = 80 Q = 81 R = 82

FILE STRUCTURE cont'd

STAT = 42 Dne = 68 Nxt = 78 Rdy = 82

Res = 86 Skp = 83 Wrk > 87

The **LABEL** file contains the machine's header and label comment data and has the following characteristics. It is composed of ASCII string data, uses a record length of one hundred and sixty-five (165) bytes, and contains one hundred entries, for a total file length of sixteen thousand five hundred (16500) bytes. Each record, or entry, represents five (5) data items, and each of these occupies thirty-three (33) bytes of storage area. The data is stored in the order that they appear in the production schedule's label display box. To explain further, each entry in the file represents one label, and each of the five (5), thirty-three (33) byte blocks in a record represents one of the two header lines, and one of the three label comment lines. Record one (1) is the first job's label data, and record one hundred (100) is the last job's label data.

The **COIL** file contains the machine's coil data, and has the following characteristics: It uses a record length of eight (8) bytes, and contains fifteen entries, for a total file length of one hundred and twenty (120) bytes.

FILE STRUCTURE cont'd

Each record, or entry, represents two (2) data items, and each of these occupies four (4) bytes of storage area. The data is stored in the order that they appear in the production schedule's coil display box. To explain further, each entry in the file represents one coil of material, and each of the three (3), four (4) byte blocks in a record represents one of the three coil data elements stored, the first being the coil identifier, the second is the coil usage amount.

Combining the gauge and width into one numeric value makes up the coil identifier. To do this, multiply the gauge by one hundred and add the width to this. Record one (1) is the first coil's data and record fifteen (15) is the last coil's data.

The **REPORT** file contains the machine's job progress data and has the following characteristics. It is a sequential file. A record is written to this file upon completion of a job, or when the EC-21 controller has reset a job in work. If the file length is allowed to grow to over 1 00,000 (one hundred thousand) bytes, then the file will be deleted, and a new one will be created. The information that follows will describe the format of the file.

FILE STRUCTURE cont'd

REPORT FILE CONT'D

JN:xxxxxx JN is the job identifier as programmed in the production schedule.

QTR:Xxxx QTR represents the quantity to run to complete the job at the time the record was written. Normally this will be zero. But, if the job was reset, the value shown will be the quantity required to complete the job.

GW:xx-xx GW is the gauge and width of the material used to produce the job.

SQF:Xxxxxxx SQF represents the total square footage of material required to complete the job.

TDS:xx:xx:xx - xx:xx:xx / xx-xx-xxxx TDS is a standard time and date stamp that shows the completion time of the batch.

CALCULATOR

This tool is accessible to the user while in the setup or production schedule areas. Entry is gained by simply pressing the F2 key. A list of special features is always displayed with the calculator for quick reference. Its total capabilities include the four basic functions and squaring, square root, reciprocal, and exponential math.

An additional enhancement is the ability to export the current value in the display back to the highlighted entry in main program for further use.

CALCULATOR

Based on the algebraic type calculator, it is quite easy to operate.

Some sample problems are detailed below.

Problem: 2 + 5 - 3 = ?

Keystroke	Display
2	2
+	2
5	5
-	7
3	3
enter	4

Problem: (12*10/5=?)

Keystroke	Display
12	12
*	12
10	120
/	120
5	5
=	24

CALCULATOR

The function keys provide the calculator with some additional capabilities.

Fl - Clear the display.

Pressing this key once clears the numeric entry in progress. Pressing the key again will clear the entire calculator.

F2- Change-sign

Pressing this key toggles the display from positive to negative.

F3 - Export result

Pressing this key will take the value in the display and place it in the highlighted item the main program.

F4- Pi

Pressing this key will place the constant PI (3.141592654) in the display.

F5 - Square

Pressing this key will square the number in the display.

F6 - Reciprocal

Pressing this key will give the reciprocal of the number in the display.

CALCULATOR

F7 - Square root

Pressing this key will give the square root of the number in the display.

F8 - Exponential math

Pressing this key will give the exponential result of the last numeric values keyed into the calculator.

An example follows:

Problem $(2)^3$

Keystroke	Display
2	2
+	2
3	3
F8	8

Since the calculator is based on the standard algebraic model, one of the following keys must be used to load the initial value. These include +, -, *, /, =.

Also, the ENTER key may be substituted for the EQUAL key at any time. All functions can be chained together, excepting exponential math. This feature requires both allocated storage areas.

TROUBLESHOOTING GUIDE

This troubleshooting guide is designed to aid the operator when attempting to isolate a problem in the machine or control unit. The guide consist of four sections ...

1. Troubleshooting Length Problems
2. Checking Measuring System Accuracy
3. Checking Sequence of Operation
4. Troubleshooting the Machine

Section 1 covers common problems as they relate to length errors. The recommendations given assume that the tests in sections 2 and 3 have been run successfully.

Section 2 explains how to examine the accuracy of the measuring system.

Section 3 describes the machine's normal sequence of operation.

Section 4, details the possible electrical and mechanical solutions to common problems. These tests should be run whenever there is a problem. They should also be used by anyone who wishes to become familiar with the basic functions of the machine and the control system.

TROUBLESHOOTING GUIDE

LENGTH PROBLEMS - SECTION I

The Engel length control system consists of the following four basic elements ...

1. The Encoder, to sense the material.

2. Controller, to count the encoder pulses.

3. Controller 1/0, (inputs and Outputs), to command the machine to slow, stop, or actuate a press.

4. The machine, to respond to the controller.

Any of these may cause a length problem, which is often difficult to isolate. The test outlined in this section will aid the reader in locating the fault and verifying that the controller is properly measuring the material. The following text explains the theory behind the counting system.

The controller is able to measure the material that is driven through the machine by means of an incremental optical encoder. This device generates a precise number of pulses for a given amount of rotation. The controller, in turn, counts these pulses and, thereby, tracks the angular displacement of the encoder shaft. To translate these pulses into material movement, we incorporate a measuring wheel.

TROUBLESHOOTING GUIDE

This wheel has a precise circumference of 12 inches - this equates to 3.820” diameter. Machining tolerance of the wheel is held to ±.0005. When the measuring wheel is attached to the encoder shaft (with one of the set screws in the middle of the flat on the encoder shaft), a complete precision measuring system is provided. As the material moves, the wheel rotates the encoder shaft, which causes the encoder to produce an exact quantity of square wave pulses proportional to the distance of material travel.

The pulse train generated by the encoder consists of two identical pulse patterns that are 90° out of phase. These pulses are sent from the encoder on two separate channels. Depending on which channel is leading or lagging, the controller will count up or down.

This type of encoder is known as a quadrature encoder, and is commonly used in bi-directional measuring systems.

The resolution of the system - the smallest measurable quantity is equal to the circumference of the measuring wheel divided by the number of pulses generated in one revolution. Typically, a system that uses an encoder that generates 1200 pulses per revolution, and a 12-inch in circumference wheel, will have a resolution of .010 inch.

In this example, the rotation of the encoder for one turn would indicate that exactly 12 inches of material has moved across the machine's surface. We can assume this is true when the machine and all of its components are new. After some period of time though, the wheel will begin to wear, then the CORRECTION FACTOR will have to be adjusted. The CORRECTION FACTOR is incorporated into most quality measuring systems. This

Mathematical multiplier allows compensation for material elements, which tend to wear over a period of time. The correction factor works in conjunction with CYCLES PER REVOLUTION and DISTANCE PER REVOLUTION parameters. The initial values of these variables are as follows:

1.00000 CORRECTION FACTOR

CYCLES PER REVOLUTION 1200

DISTANCE PER REVOLUTION 12.00

Length inaccuracies can be attributed to two common causes- repeatability errors and linearity error. The mechanic’s of the machine, most notable of which is response time, generally influences repeatability.

TROUBLESHOOTING GUIDE

Low response time can cause excessive overshoot, whereas, high response time can cause such abrupt speed changes that the encoder wheel may slip on the material. The latter can also be very destructive to the machine itself by damaging the drive gears and causing eventual drive failure. Both of these conditions can be very detrimental to the accuracies by which parts are produced on the machine. Fortunately, repeatability errors can generally be dealt with in the area of speed control. Low and high response time problems, such as excessive overshoot, may be diminished or eliminated by increasing the amount of slowdown distance or decreasing the velocity of the fast and slow speeds.

Exclusively the encoder wheel causes linearity errors. The encoder wheel should be checked for roundness. An elliptical shaped wheel should be replaced immediately. Be sure to check the wheel alignment. It should be parallel to the material and perpendicular to the nearest pinch roll.

Make the necessary adjustments before continuing. The following text will explain some common length problems, as well as the solution to alleviate the problem.

TROUBLESHOOTING GUIDE

1. The measured part length is always long. The error affects all parts produced on the machine. Solution:

The encoder wheel is most likely slipping on the material.

Check the alignment of the encoder wheel to material and the nearest pinch-roll. Also, ensure that the encoder wheel is held down on the material with sufficient pressure.

2. The measured part length is always short. The error becomes more substantial as the part length increases. Solution:

The encoder wheel is worn.

You can adjust the correction factor to compensate for this. Before doing this, however, you should check the alignment of the encoder wheel.

3. The measured part length is always long.

The error becomes more pronounced as the length of the part increases. Solution:

The encoder wheel has enlarged due to the absorption of a liquid substance or the measuring surface has a build up of dirt and other material. Replace or clean the wheel then check the alignment.

TROUBLESHOOTING GUIDE

The most important thing to remember when servicing a measuring system is that the encoder assembly is the heart of the system. Errors are usually caused by misalignment. We cannot stress this enough. A properly aligned wheel must be within ±. 50° of true parallel and perpendicularity.

The following formula may be used to correct any additional length errors. Be sure to use this formula only after all of the aforementioned steps have been completed.

NCF = OCF X PL / AL

Where:

NCF = New Correction Factor

OCF = Old Correction Factor

PL = Programmed Length

AL = Actual Length

When determining the value for PL, the user should run three blank parts - shear only, and average their measured lengths.

The optimum length is ten feet for most standard lines. If your line produces longer parts, you should use the mid-point of your longest part length.

TROUBLESHOOTING GUIDE

MEASURING SYSTEM ACCURACY - SECTION 2

The following text will detail the test that should be performed on any of our systems when a length problem cannot be resolved.

If the system passes this test, you can be assured that the encoder itself is not at fault.

1. Raise the encoder slightly, and place an object beneath the encoder bracket. This will allow the encoder to spin freely without moving the material.
2. Scribe a mark on the side of the encoder wheel - near the edge.

Also place a corresponding mark on the material adjacent to the mark etched on the encoder wheel. Rotate the encoder wheel so both marks are lined up.

3. Be sure that the screen, visible on the controller, is displaying the current status of the length counter.

4. Reset the control, and verify that the current count is zero.

5. Turn the encoder slowly in the direction of normal material travel keeping track of each revolution.

When you have completed ten full revolutions, realign the two marks, and record the displayed count value. The count should be 120.00.

A slight variance in this number is acceptable-usually no more than 1 or 2 counts. This is attributed to human error.

6. Now rotate the encoder wheel in the opposite direction, again keeping track of complete revolutions. When you have completed ten full revolutions, realign the two marks and note the current count value. The ideal count is 0.00. A small variance is acceptable.

8. If the recorded count values are within the specified range, the test can be considered a success.

Note: If, during this test, you notice the last digit of the count oscillating between two numbers, stop and check the encoder cable. The most common reason for this is a broken wire in the encoder cable. Perform a continuity test on the each wire in the cable. An ohmmeter should be used for this test. This instrument will also indicate when a wire has an excessive amount of resistance. If the wires in the cable pass the continuity test, and each wire appears to have equal resistance between the two ends, then the encoder can be assumed to be defective.

TROUBLESHOOTING GUIDE

SEQUENCE OF OPERATION - SECTION 3

A malfunction in the measuring system can often times be very difficult to track down. When parts are being produced, multiple timed events can take place rapidly. The following text will describe how the system should operate under normal circumstances. If you need to service the machine during this test, disconnect the main power before beginning the work.

1. Before proceeding, be sure all personnel in the area are aware of the test in progress. At times during this test the machine will perform some automatic functions.

2. Press the CONTROL POWER ON pushbutton. The pushbutton should illuminate indicating that the control power is on. If you do not get this indication, check all fuses and guard switches.

3. Press the START pushbutton for the hydraulic power unit.

This pushbutton should also illuminate. If the power unit will not start, check all guard switches and all overload relays in the main panel.

4. Clear the leveler by backing out the material until only the selector station holds it. Be sure to disengage the selector station so that the material will be immobile.

5. Turn off the hydraulic power unit.

6. Raise the encoder slightly, and place an object beneath the encoder bracket.

(This will allow the encoder to spin freely above the material table.)

7. Press the RESET pushbutton. Hold it down until you see a message on the display confirming that all downstream data has been eliminated.

8. Press the START pushbutton for the hydraulic power unit. The same result as that obtained in step 3 should occur.

9. Press the FORWARD jog pushbutton. The leveling rolls should rotate in the direction of normal material travel. if the rolls do not move, then check the wiring from the pushbutton station to the control console and also from the console to the valve.

10. Press the REVERSE jog pushbutton. The leveling rolls should rotate in the opposite direction of normal material travel. If the rolls do not move, then check the wiring from the pushbutton station to the control console and also from the console to the valve.

11. Press the manual SHEAR pushbutton. The shear should actuate for the amount of time that has been entered into the setup data area. Press any other applicable die actuator pushbuttons. The resultant action should be for the preprogrammed length of time. If you fail to see the expected motion, you will have to check the appropriate components in the circuit.

12. Program a cut-to-length, shear only, part into the production schedule. Be sure the job status is marked - ready (RDY).

13. Press the RUN pushbutton. Several prompts may appear on the screen depending on the control system you have. Accept the default values.

14. The pinch-rolls should start rotating in the forward direction. The rolls should rotate slowly for a limited period of time, then accelerate to the preset fast speed. It may be helpful to note here that the normal fast speed is 50 to 60 feet per minute (FPM), while slow is normally 6 to 10 FPM. If the rolls remain in a slow speed state, turn the encoder wheel slightly in the direction of material travel to shift to high speed. If this step is required, it only indicates that the control uses a distance-traveled formula as opposed to a timed function.

15. Rotate the encoder wheel until the count value is equal to the part length minus the slowdown distance. When this mark is reached, the pinch-rolls should decelerate to slow speed.

16. Continue to rotate the encoder wheel slowly. When the count reaches the programmed length of the part, the pinch-rolls will stop. The shear will actuate. The batch counter will decrement its count by one. The line should remain stopped for an amount of time equal to the restart delay time as input into the setup data area. The machine will resume action at step 14 after this delay.

If a problem occurs while performing this test that cannot be easily rectified, please refer to section 4 of this manual.

The solutions detailed in this section of the manual may readily solve your problem allowing you to quickly return to production.

THE MACHINE - SECTION 4

This area is designed as a quick aid. Here the user should find the solution to many of the most common problems we have encountered. The person who is troubleshooting the system must have some knowledge of electrical, hydraulic, and pneumatic systems. Also, a simple VOM meter is required in some instances.

TROUBLESHOOTING GUIDE

If, after referring to this section, you still cannot resolve your situation, please call our office and speak to one of our knowledgeable service technicians.

1. The hydraulic power unit will not start. Solution:

A. Check the incoming three-phase power. Be sure all three legs are delivering the proper voltage.

B. Check the output of the control transformer. The standard 10% electrical tolerance applies. (109vAC to 132vAC) lf 12OvAC cannot be obtained... be wrong on the high side.

C. Check all fuses in the electrical panels.

D. Check the overload relay - reset if required.

E. Check all guard switches.

F. Check the motor starter and controlling pushbuttons.,

2. The motor starter energizes - hydraulic pump does not start. Solution:

A. Check the incoming three-phase power. Be sure all three legs are delivering the proper voltage.

B. Check voltage at the contactor, overload relay, and motor.

C. Check the coupling between the motor and hydraulic pump.

3. The pinch-rolls will not rotate in the jog mode. Solution:

A. Check the pushbuttons and wiring. This can be accomplished easily by referring to the electrical drawing. Check the appropriate input module. Verify that the light emitting diode (LED) is illuminated. If you are sure the signal is reaching the proper input module terminal, then replace the defective module.

B. Check the wiring from the output module to the control valve. This can be accomplished easily by referring to the electrical drawing. Check the appropriate output module. Verify that the LED is illuminated. If the LED is not illuminated, then replace the defective output module. If the LED is illuminated, then check the fuse on the output module.

C. Make a voltage check at the control valve. If the signal is present, replace the control valve or the coil.

D. If your machine has hole punch, insure that the punch is in the up position and that the up punch" sensor is illuminated.

4. The pinch-rolls drive the material in fast speed only. Solution-.

A. Refer to the electrical drawing, and verify that the slow signal is present. Check the appropriate output module, verify that the light emitting diode (LED) is illuminated. If the LED is not illuminated, then replace the defective output module. If the LED is illuminated, then check the fuse on the output module.

B. Make a voltage check at the control valve. if the signal is present replace the control valve or the coil.

C. If the machine slow function is actually actuated by a air cylinder, then verify that the air supply is available and at the proper pressure. Also, check the mechanical connection where the cylinder is attached to the pump or valve.

5. The pinch-rolls drive the material in slow speed only. Solution:

A. Refer to the electrical drawing and verify that the slow signal is not present. Check the appropriate output module. Verify that the light emitting diode (LED) is not illuminated. If the LED is off, but a signal is still present, then replace the module.

B. If the machine slow function is actually actuated by a air cylinder, then verify that the air supply is available and at the proper pressure. Also, check the mechanical connection where the cylinder is attached to the pump or valve.

6. One or more manual operations do not function.

A. Verify that you are in HALT or HAND mode. Manual operations are locked out while in any automatic.

B. If the operation is of a timed nature, then check the value you have entered in the setup data area. Even if this function has worked before, take the time to verify that the data is not corrupt.

C. Check the pushbutton and wiring. This can be accomplished easily by referring to the electrical drawing. Check the appropriate input module. verify that the light emitting diode (LED) is illuminated. If you are sure the signal is reaching the proper input module terminal, then replace the defective module.

D. Check the wiring from the output module to the control valve. This can be accomplished easily by referring to the electrical drawing. Check the appropriate output module. Verify that the LED is illuminated.

If the LED is not illuminated, then replace the defective output module. If the LED is illuminated, then check the fuse on the output module.

E. Make a voltage check at the control valve. If the signal is present replace the control valve or the coil.

7. Production will not start when the RUN pushbutton is pressed.

A. Check the data you have entered into the production schedule. Verify that the job status is ready. When the RUN pushbutton is pressed, the job status should indicate that it is in work.

B. Check the RUN and HALT pushbuttons and wiring. The RUN pushbutton uses a normally open (NO) contact, whereas the HALT pushbutton uses a normally closed (NC) contact. The halt signal must be present in order for the system to place a job in work. This can be accomplished easily by referring to the electrical drawing. Check the appropriate input module. Verify that the light emitting diodes (LED) are illuminated.

If you are sure the signals are reaching the proper input module terminal, then replace the defective module.

C. Check for an output signal. Remember that the system has the capability of propelling the material in both the forward and reverse directions. Determine which output signal should be present. Check the appropriate output module, verify that the light emitting diode (LED) is illuminated. If the LED is not illuminated, then replace the defective output module. If the LED is illuminated, then check the fuse on the output module.

D. Make a voltage check at the directional valve. If the signal is present, replace the valve or the coil.

ENGELINK – DOS VERSION

Introduction:

The Engelink software allows a remote computer to communicate, point to point, with the EC-21 Coiline controller, using the standard EIA RS-232C interface. Through this communication the remote computer can send messages and upload/download data to the controller on the plant floor. This frees plant personnel from the data entry process. This manual seeks to define the hardware and software parameters required to establish this link between the Engel Coiline and your office PC system.

To utilize this software, a thorough knowledge of computer systems and communication techniques is required-it is assumed that the user has such knowledge. Although this manual gives detailed data and transmission examples pertaining to the implementation of this product, it does not attempt and does not intend to teach computer programming, or communications.

ENGELINK – DOS VERSION

Engel Industries, Inc. warrants that the enclosed software will perform in accordance with the product documentation. In the event an operational error is found, then Engel Industries, Inc. will, at its option, either correct the error so that the software conforms to the product documentation, or refund an amount equal to the purchased price of the software. All claims under this warranty must be made in writing to Engel Industries, Inc. within thirty (30) days from date of purchase. The foregoing warranty is exclusive and is in lieu of all other warranties. Engel Industries, Inc. makes no other warranty of any kind whatever, express or implied; and all implied warranties of merchantability and fitness for a particular purpose are hereby disclaimed by Engel Industries, Inc. and are excluded from this sale.

ENGELINK – DOS VERSION

Hardware Requirements:

The program will run on any IBM-PC XT/AT, or 100 percent compatible, with a DOS version of 3.0 or later, at least 384k bytes of available RAM and a hard drive. The computer's config.sys file should have files= 10 and buffers=20, as a minimum value. The program creates several temporary files, so if a floppy disk is to be used it must have a capacity greater than 360k. The program is supplied on a 1.44Mb, high-density disk, so copy it to your higher capacity disk before running, and be sure it is not write protected. The link can be setup on either one of the standard Communication channels available.

The EC21 control comes with the hardware already installed for the data link option, a standard DB-25 connector is located on the side of the console for this purpose.

ENGELINK – DOS VERSION

Installation

Before continuing, be sure to make a backup copy of your Engelink disk, place the original in a safe place, and use the copy during the installation process.

Create a directory on your hard disk, copy all files from the Engelink diskette to this directory. To run the program change to the new directory and type ELKRNX, then press the ENTER key. The following may clarify this for you. Press the ENTER key after each line of input.

step 1. switch computer to root directory	> CD\
step 2. create new directory	> MD ENGEL
step 3. copy all files to new directory	>COPY A:*.* C:\Engel
step 4. change to new directory	>CD\ENGEL
step 5. run program	>ELKRNX

Command Line Options:

There are several command line options available to the user, a list of these options will be displayed on your monitor if you start the elkrnx program with a “/?” suffix. They are also listed below for your convenience.

ENGELINK – DOS VERSION

Installation

/COM2 directs software to use communication channel 2

/COM OFF disables all RS-232C communications

/HELP OFF disables screen assistance messages

/METRIC uses metric measure system for input data

/MONO sets color defaults to black and white

As an example, if using a monochrome monitor, the user could start the Elkrnx software by typing the following line at the DOS prompt.:

ENGELINK/MONO

Software Operation:

The program simulates the EC-21 very closely, the greatest difference lies in the main menu. With this program there are more available options, than with the EC-21 controller. A selection is made on the main menu by moving a pointer, using the arrow keys, then pressing the ENTER key. Depending on the selection, you may have to pick another option, using the same method. Older versions of the Engelrun and Engelink programs allowed the office to load a new setup file to the machine. These older versions also allowed transfer of production data during the Engelrun “run” condition. Both of these features have been remove due to data and machine security issues.

ENGELINK – DOS VERSION

General Data Entry:

The following instructions will guide the user through the universal process of data entry. All screens, that allow data entry, will have a menu. Select the proper screen from the menu by pressing the appropriate key. This action will cause the computer to display the requested screen. Data can be entered any time a window is open. This window will appear as a black back- ground, with a length dependent on the type of information to be input. The window will hold a limited number of characters, if this number is exceeded the characters will be wrapped. When the computer wraps the data field, the left-hand character is dropped, allowing additional space for input. To complete the input process the ENTER key must be pressed. The BACKSPACE key is used to eliminate data, one character at a time that was keyed in by mistake. When appropriate, the ARROW, HOW PAGE UP, and PAGE DOWN cursor control keys can be used to speed up the entry process. When an entry requires a letter input, the proper letter key should be pressed, if another key is used the computer will exchange the key for a valid key, and toggle the two to arrive at a legitimate response.

ENGELINK – DOS VERSION

Setup Mode:

The setup screens are primarily used to input machine parameters, that may require an occasional change. These values will normally be quite different from one machine to another. This mode contains thirteen pages of setup data. The prompts are listed below with a brief explanation, for your convenience.

CYCLES PER REVOLUTION number of pulses generated by encoder

DISTANCE PER REVOLUTION circumference of the encoder wheel

CORRECTION FACTOR a multiplier used to match the encoder to the system

SLOWDOWN DISTANCE amount of deceleration time required by the machine

MINIMUM MOVEMENT smallest forward move allowed

PAUSE TIME AFTER SHEAR part spacing time value

REMOTE- METAL FLOW direction of flow of downstream components

HALT SHEAR-ONLY BATCHES enables capability to run blanks continuously

END NOTCH TO SHEAR DIST distance from shear to the user reference on die

VEE NOTCH TO SHEAR DIST distance from shear to center of notch die

HOLE PUNCH #1 TO SHEAR DIST distance from shear to center of hole punch #1 die

ENGELINK – DOS VERSION

Setup Mode:

HOLE PUNCH #2 TO SHEAR DIST distance from shear to center of hole punch #2 die

ACTUATION TIME allocated time to fire the designated dies

LEADING EDGE DIE SIZE distance from user reference to dies rear edge

TRAILING EDGE DIE SIZE distance from user reference to dies forward edge

NOTCH X LEADING EDGE leading edge lock allowance for part

NOTCH X TRAILING EDGE trailing edge lock allowance for part

BACKGAUGE BRAKE OFFSET bend point offset for L-shape brake

REFERENCE POINT home position measurement for gauging equipment

LIN-0-MATIC OFFSET pin shifting value to align pins on insulated parts

VELOCITY SETTINGS pin spacing values for insulated parts

CORNER ROTATION FACTOR value that will shift V-notches as a group on part

OFFSET BEND LOCATION X bend point offset for full wrapper brake

ENGELINK – DOS VERSION

Batch Mode:

The production schedule screens allow the user to input pertinent information, concerning part manufacture. The mode contains seven pages, for a total' of one hundred separate jobs. The prompts are listed below with a brief explanation, for your convenience.

JOB NUMBER an identifier for a particular job

QUANTITY number of pieces, (I - 9999)

TYPE Blank, Flat, L-shape, U-shape, or Wrapper

LENGTH dimensional data for first, and if necessary third leg of duct

WIDTH dimensional data for second, and if necessary forth leg of duct

LOCK lock pattern to use, (I - 6)

GA-WD gage of material to track - width of material (see hole punch)

VE velocity setting for Lin-0-Matic insulator, None, Hi, Lo, Special

CO die selection, used on eight-die coiline, None, Dc, TDF

HP punch hole code (X, A THROUGH R)

ENGELINK – DOS VERSION

Batch Mode:

WB wrapper brake group number of f set to use, (l - 9)

STAT insufficient data available to process

STAT DNE job has been completed normally

STAT NXT job has priority on job stack

STAT RDY job is ready to be processed

STAT RES job is has been reset

STAT SKP job will be skipped

STAT WRK job is in work

Batch Delete Function:

You can-use this function only while in the batch mode. This function will allow the computer to delete a job. To activate this f unction, all that is necessary, is to locate the input window on the job you want to delete. Pressing the DELETE key will cause the computer to attempt to delete the job. If the operation should fail, a message will appear at the bottom of the screen, giving the reason f or the failure. There is really only one reason for an error to occur, and that is an attempt to delete a job that is currently being processed; this is not allowed.

ENGELINK – DOS VERSION

Batch Mode:

Batch Insert Function:

You can use this function only while in the batch mode. This function will allow the computer to insert an empty job, above the current window region. To activate this function, all that is necessary, is to locate the input window on the job directly below where you want an empty job to be installed. Pressing the INSERT key will cause the computer to attempt to insert the job. If the operation should fail, a message will appear at the bottom of the screen, giving the reason for the failure. There are two ways for an error to occur, one is an attempt to insert a job above an empty; and the second, is an attempt to insert a job unto a full job stack.

Batch Label Function:

You can use this function only while in the batch mode. This function will allow the user to develop and printout labels that are generally placed on the finished part at the end of its manufacture. The labels have a standard format for part data, but the user can enter three lines of comments up to thirty-three characters in length.

ENGELINK – DOS VERSION

Batch Mode:

The part data that is included on the is the job, type of part, connector, insulation, gauge, length X width, piece number, and date of manufacture. The minimum label size required by the software is 4 X 2 15/16 inches. The labels should be continuous form and be single width. These are standard label specifications, and they should be readily available.

Batch Sort Function:

You can use this function only while in the batch mode. This function will allow the computer to sort the entire job stack. Select the type of sorting desired from the menu, using the ARROW keys. When the pointer is positioned next to your choice press the ENTER key. The computer will then sort the--production schedule, automatically, per your specification. When the computer is sorting through the production schedule it will reset any job with a status of *** to the normal defaults associated with this status code.

ENGELINK – DOS VERSION

Batch Mode:

Batch Coil Function:

You can use this function only while in the batch mode. This function will allow the computer to display the status of up to fifteen coin the data displayed includes the coil identifier, and length total. The length totals will be either in feet, or meters depending on which system of measure the software are interpreting. The individual coil totals can be reset, or the coil itself can be deleted. To reset the total, position the indicator arrow, next to the coil to be reset. Press the R key the coil totalizer will then be set to zero. To clear the entire coil from the coil stack, position the indicator arrow, next to the coil to be cleared. Press the C key, assuming the coil is not programmed in the production schedule, the coil will be deleted from the coil stack, and the totalizer for that coil will be set to zero.

Coils I through 15 are reserved for coil inventory. These coil totals can be entered in the SETUP screen page 12 and the system will automatically reduce the inventory by the amount used, if accepted. If the amount used is reset or cleared, that amount will not be subtracted from the inventory.

ENGELINK – DOS VERSION

Data Printout and Calculator:

The software has the capability of providing a printout, or hard copy, of the machine setup, or production data. To obtain a printout simply press function key F3, while in the setup, or production schedule areas. When the computer prints out the data it will start with a standard header, which will include the -type of data, and the current date and time.

When doing a production schedule dump, the computer will print only jobs with a status other than ***. The current coil / material information will be included at the end of a production schedule printout. If the requested data is not available, the computer will print a short message stating this.

Calculator:

An on-screen calculator is available to the user in either the setup, or production schedule mode. The operation of the calculator is very straight forward, with one special feature, and that is the exportation of the accumulator back to the main program.

Calculator cont'd

To export the accumulator, simply press the E key at the end of the calculation session. The accumulator will then be inserted into the current window, to accept this value the user must then press the ENTER key. To input a negative amount, press the S key, this will cause the accumulator to be toggled negative and positive each time the key is pressed. The standard functions of the calculator include addition, subtraction, multiplication, and division. If the result of a calculation is out of the range of the display window, an E will displayed indicating this fault. Use the ESC key to exit the calculator mode without using the export feature.

ENGELINK – DOS VERSION

Transmission Process:

Electrical Configuration:

The RS-232C standard has two categories of equipment. They are DTE and DCE that is Data Terminal Equipment, and Data Communications Equipment respectively. If two devices of the same classification are connected together then one or more pairs of signals must be switched over for proper operation. The EC-21 controller is wired as a DCE device, with the CTS/RTS and DSR/DTR, (Clear To Send/Ready To Send and Data Set Ready/Data Terminal Ready), signals disabled. To establish communication only three wires are necessary, they are receive data on pin 2, transmit data on pin 3, and signal ground on pin 7. It should be noted that generally RS-232C communications are limited to a distance of fifty feet, but with special cables this can be extended up to approximately two hundred feet. For greater distances it is recommended that a converter be used to change the RS-232C signals to RS-422A signals, this will allow communication distances up to four thousand feet.

ENGELINK – DOS VERSION

Transmission Process:

Data Configuration:

The data configuration is in the standard ten-bit format. This includes one start bit, seven data bits, one parity bit, and one stop bit. There is only one interface configuration available. The link can be established using the following specifications.

Baud Rate: 9600

Parity: Even

Start Bits: 1

Data Bits: 7

Stop Bits: 1

The remote computer is considered the line master, or host device. All transmissions use the standard ASCII code. The software line discipline is half duplex, characters are not echoed back to the host device. The EC-21 controller will not initiate transmissions, except in response to a valid command from the host. All messages must start with STX (ASCII 2), and end with ETX (ASCII 3), followed by a checksum byte, and ending the transmission with EOT (ASCII 4).

ENGELINK – DOS VERSION

Transmission Process:

The checksum is calculated by summing the ASCII weight of each character in the message, excluding the control characters. A typical exchange of data between the EC-21 control and a remote computer would be as follows.

The remote computer initiates a message:

STX (ASCII 2) 1 start of text MESSAGE

ETX (ASCII 3) 1 end of text CHECKSUM

EOT (ASCII 4) / end of transmission

If the message is received without errors the EC-21 will respond with:

STX (ASCII 2) start of text

ACK(ASCIT 6) acknowledge ETX (ASCII 3) end of text

EOT (ASCII 4) 1 end of transmission

If the message was received with an error, the EC-21 will not respond. The remote computer should start the transmission over, after a three second timeout. There is 1 group of data that can be transmitted over the data link, this is the production schedule.

ENGELINK – DOS VERSION

Transmission Process:

The EC-21 expects to receive and transmit the data in a complete group, if an error occurs during a transmission, the complete group must be transmitted again. Production data must be transmitted in the following order, first the job data, next the coil data, and finally the label data. If the transmission contains production data, then an item number must also be included in data stream, this will inform the computer as to the destination of the data that follows. Examples of this are given in appendix B of this manual.

Computer Link Functions:

All transmissions must include a function code, this code allows the computer to decipher the data, and act upon it in an appropriate manner. The general form of a transmission either to or from the EC-21, is first a function code, followed by an underline, (ASCII 95), then the data field.

ENGELINK – DOS VERSION

Transmission Process:

The 12 function codes recognized by the EC- 21 are listed below. Elkrnx, except those marked by an asterisk recognizes most of these codes.

Function Codes	Functions
A (ASCII 65)	Message
C (ASCII 67)	Receive Production Data
D (ASCII 68)	Receive Coil Data
E (ASCII 69)	Receive Label Data
F (ASCII 70)	Send Setup Data
G (ASCII 71)	Send Production Data
H (ASCII 72)	Send Coil Data
I (ASCII 73)	Send Label Data
K (ASCII 75)-	Clear Production Data At Machine
L (ASCII 76)-	Reset The Machine

All transmissions take the form of a ASCII string of data, and must be in the format stated above. If any transmission does not meet the stated criteria it will be ignored.

ENGELINK – DOS VERSION

File Structure:

There are four (4) files that the user can manipulate, using their self-developed software. The information included here is given strictly as a guide for our customers. Engel Industries does not intend to write software for other than Engel equipment, it is the responsibility of the customer's programmer to maintain compatibility between, any external computers and the coiline control system. The files are listed below.

PRODUCT.DAT

SETUP.DAT

LABEL.DAT

COIL.DAT

A few points that pertain to all the files, is as follows. All files are the random access type. AN numeric data is left justified, single precision, and stored using the IEEE format. The acronym IEEE represents the Institute of Electrical and Electronics Engineers. The IEEE format differs from the Microsoft Binary Format, in that it extends the single precision range of numbers, and obtains more accurate results, also coprocessor support is easier to implement.

ENGELINK – DOS VERSION

File Structure: cont'd

Data that involves measured amounts uses the English measurement system.

The setup file contains all the machine's setup data, and has the following characteristics. It uses a record length of four (4) bytes, and contains one hundred and eleven (134) entries, for a total file length of four hundred and forty-four (536) bytes. Each record or entry represents one data item. The data is stored in the order that they appear in the setup area of the Elkrnx program. When the stored data does not represent numeric data, as in the following examples, then the following special values are stored in its place.

Remote Metal Flow-. Normal = 0 / Reverse = 1

Halt Shear-only Batches: Yes = O/No = I

The product file contains the machine's production schedule, and has the following characteristics. It uses a record length of fifty-two (52) bytes, and contains one hundred entries, for a total file length of five thousand two hundred (5200) bytes. Each record or entry represents thirteen (13) data items, and each of these occupies four (4) bytes of storage area.

ENGELINK – DOS VERSION

File structure: cont'd

The data is stored in the order that they appear in the production schedule, both horizontally and vertically. To explain further, each entry in the file represents one batch, and each of the thirteen (13), four (4) byte blocks in a record represents one of the production schedule's data columns. Record one (1) is the first job's data and record one hundred (100) is the last job's data. In this way a simple matrix is formed composed of production data. When the stored data does not represent numeric data, as in the following examples, then the following special values are stored in its place.

Type:	Blank = 66	Flat = 70	L-shape = 76	
	U-shape = 85	Wrapper = 87		
VE:	High = 72	LOW = 76	None = 78	
CO:	DC = 68	None = 78	TDF = 84	
Stat	*** = 42	Dne = 68	Nxt = 78	Rdy = 82
	Res = 86	Skp = 83	Wrk => 87	

The exception to the above rules is the Hole Punch. The hole punch leading and trailing is a combination of the leading and trailing codes that is converted to a single number and stored in the setup file.

ENGELINK – DOS VERSION

File structure: cont'd

The PC program decodes this number (from 0 to 360) to the correct HPL and HPT character.

ENGELINK – DOS VERSION

Label Data:

The **LABEL** file contains the machine's label comment data, and has the following characteristics. It is composed of ASCII string data, uses a record length of ninety-nine (99) bytes, and contains one hundred entries, for a total file length of nine thousand nine hundred (9900) bytes. Each record or entry represents three (3) data items, and each of these occupies thirty-three (33) bytes of storage area. The data is stored in the order that they appear in the production schedule's label display box. To explain further, each entry in the file represents one label, and each of the three (3), thirty-three (33) byte blocks in a record represents one of the three label comment lines. Record one (1) is the first job's label data and record one hundred (100) is the last job's label data.

The coil file contains the machine's coil data, and has the following characteristics. It uses a record length of eight (8) bytes, and contains

fifteen entries, for a total file length of one hundred and twenty (120) bytes.

ENGELINK – DOS VERSION

Label Data: cont’d

Each record or entry represents two (2) data items, and each of these occupies four (4) bytes of storage area. The data is stored in the order that they appear in the production schedule's coil display box. To explain further, each entry in the file represents one coil of material, and each of the two (2), four (4) byte blocks in a record represents one of the two coil data elements stored-, the first being the coil identifier and the second is the coil usage amount. The coil identifier is made up by combining the gage and width into one numeric value, to do this, multiply the gauge by one hundred and add the width to this. Record one (1) is the first coil's data and record fifteen (15) is the last coil's data.

Tuning Procedure for Compumotor

On some of the EC-21 full lines, the back-gauge drive was a Compumotor. Other systems were equipped with an API drive. This procedure is applicable to the Compumotor only.

With the system exited by the “QUIT" (F5) from Engelrun program and air is removed to brake. Insure carriage moves (smoothly), all bolts are tight and preposition at mid area of travel.

COMPUTER SCREEN:

Display	Type in	Action
C>	A:	[enter]
A>	COMMTEST	[enter]
Comm. I or 2	2	[enter]
(blank screen)	E	[enter]

You should get a ">” symbol. You may have to input an "E" several times.

A>	OFF	[enter]
	1CMR12800	[enter]
	ON	[enter]
	SAVE	[enter]

Motor will move with next step. (Movement may be very small amount... a vibration)

$	Tune: 1, 1	[enter] no spaces

(This can take up to two minutes to complete)

>Tuning complete

	SAVE	[enter]
	SSA0(zero)	[enter]
	“ESC"	

Press escape to exit COMMTEST program. Reapply air supply to brake. Restart Engelrun

Tuning Procedure for Compumotor cont'd

Calibrate the Brake.

Start auto job with 12"X12" or greater, 0(zero) lock-sizes offsets

Ensure brake sets up to 12", if not check correction factor for brake. If good, then check setup at 20", 30", 40", 50" and 60". Adjust correction factor as necessary.

Otherwise, quit Engelrun and run tuning procedure again.

Note: The Tuning procedure calculates its own gains and offsets to match motor and driver and may need to be performed 3 or 4 times for best accurateness.

Current limit setup when motor or driver are changed. System is "QUIT" from Engelrun program.

COMPUTER SCREEN:

Display	Type in	Action
C>	A:	[enter]
A>	COMMTEST	[enter]
Comm. 1 or 2	2	[enter]
(blank screen)	E	[enter]

You should get a">" symbol. You may have to enter an "E' several times. Read motor FLA on motor label and multiply by .95, this will be your new CCP value.

OFF	[enter]
CCP (above value)	[enter]
ON	[enter]
SAVE	[enter]
SSAO (zero)	[enter]
"ESC"	

Failure to perform this setup could cause the mismatched drive motor to burn out if the system is prevented to move.

Communications transmission:

Transmission Examples: (receive data from machine)

1. Receive Message:

STX + A + + message + ETX + checksum + EOT

2. Receive Setup Data:

STX + B + + item number + + data + ETX + checksum EOT 3. Receive Production Data:

STX + C + + item number

+ + data + + data + + data + + data + + data + + data + + data

+ + data + + data + + data + + data + + data + ETX + checksum

+ EOT 4. Receive Coil Data-

STX + D + -+ item number

+ + data + + data

+ ETX + checksum + EOT

5. Receive Label Data:

STX + E + + item number

+ + data + + data + + data

+ ETX + checksum + EOT

6. Receive Report File Data:

STX + M + + data + ETX + checksum + EOT 7. Receive Report File Length:

STX + Z + + data + ETX + checksum + EOT

Hole Punch information

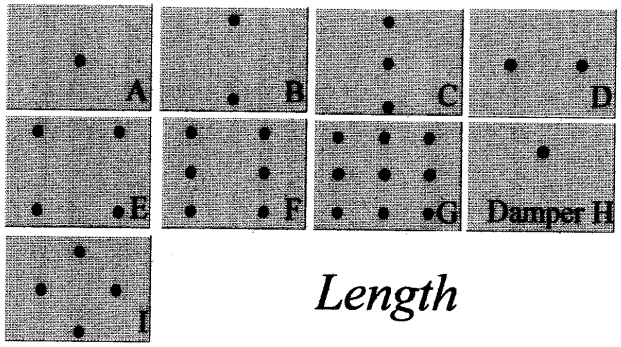
To verify the hole punch to shear distance:
With the system normal (not in run), press the manual shear push button on the front of the console. Press the manual hole punch push button on the front of the console. The 4' "C" pattern is automatically selected and punched.
If your system has a Dual Head Punch Master, the #1 punch has just been cycled. There is an unmarked switch on the far side of the Punch Master. Flip this switch "on" over ride the control system and invoke the #2 punch. Again press the manual hole punch push button on the front of the control console.
Note: Insure that the bypass switch is returned to the off position.
Drive the material forward and measure the distance of the first hole to shear distance. If this is your selection for punch #1 then enter this distance in the setup screen for Hole Punch #1 to Shear distance.
If your system is a single head punch master, then enter "0" (zero) for the other hole punch to shear distance.
It does not matter to the control system which punch head is # 1 or #2, the hole punch code on the production screen read codes "A" thru "I" as exactly the same patterns as "J" thru "R". I.e. "A" = "J" and "I" = "R". The difference is that when the system reads a pattern from "A" to "J", it turns on punch #1 and any pattern from "I" to "R", it turns on punch #2. On single head punch systems, it will invoke the only head the same for both codes.
The program reads the width of the material as entered into the production screen and will automatically set up the proper center and outer hole punches. The hole punch is designed to property punch holes in 4', 5', or 6'material. If your material is not one of these selections, enter the next smaller size of 4', 5' or 6' material selection to ensure that the holes on the "D" thru "I" patterns do not enter the TDF or CEF areas.
The duration of the hole punch is determined by the time entered in the hole punch actuation time from the setup mode.

Hole Punch information cont'd

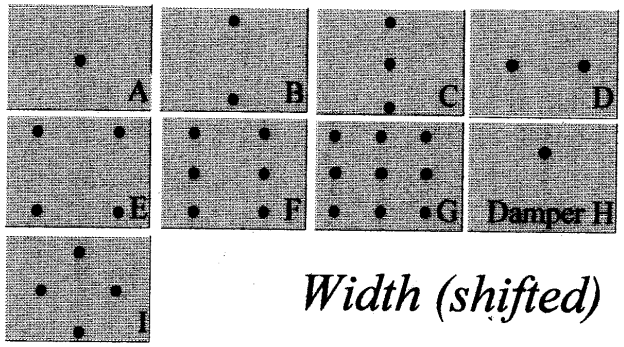
It is recommended care be observed in attempting to reduce the hole punch operation time, due to the mass of the hole punch itself. The factory setting is I second. Refer to Hydraulic pressure setting.
Pattern "I" is a special pattern as per SMACMA requirement. The H pattern will produce the Damper hole punch.
On the earlier versions of hole punch, the damper punch was not installed, therefore the damper was a combination of other punches to put the damper approximately 18" from the edge. In this case the Damper hole will be the 6' center punch on a 48" material, the 4' outer punch on 60" material and the 5' center punch on 72" material.
On the present versions, the damper hole is a separate punch and is located between the guide punch and the 4' center punch at approximately 20" from the guide side.

Blank parts will not contain end-notches, vee-notches or hole punches.
Flats can be either a leading edge panel (non shifted) or a trailing edge panel (shifted holes). All leading edge selections are "non-shifted" and all trailing edge selections are "shifted". This feature is the same for single or dual head punches.
L-type parts contain one leading edge and one trailing edge.
U-type parts contain one leading edge, one trailing edge and another leading edge.
W-type parts contain one leading edge, one trailing edge, another leading edge and another trailing edge.
The hole punch does not have any maximum size limitations. The minimum size is limited to 5 panels of hole punch within the leveler area. For a 33" hole punch to shear distance, the smallest panel can be 6½".

Hole Punch 1 Patterns



Length

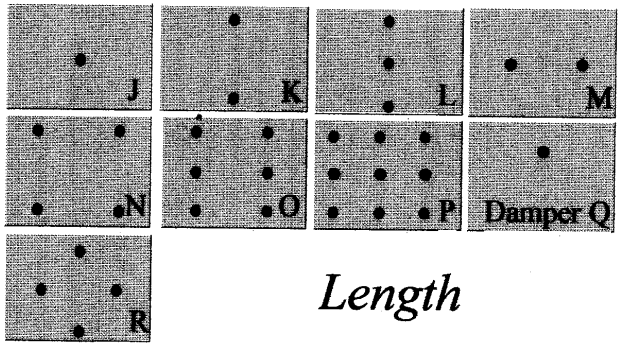


Width (shifted)

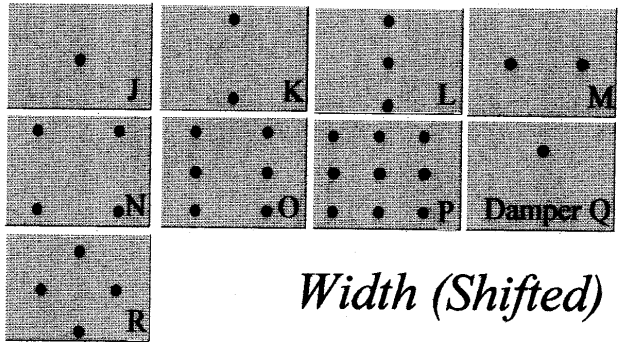
Direction of Flow →

Direction of Flow →

Hole Punch 2 Patterns



Length



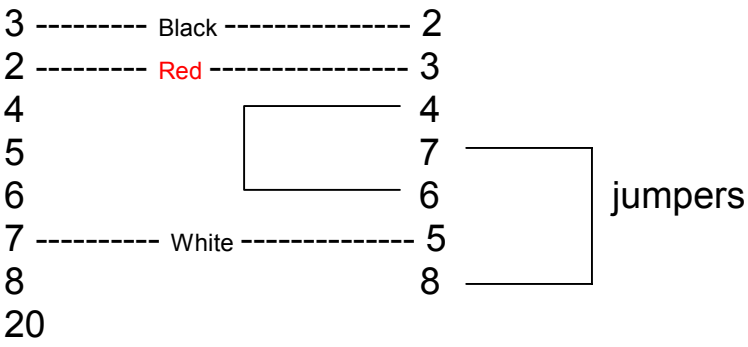
Width (Shifted)

Cabling

Com 1

Console to Office

B-25 connector DB-9 connector



Com 2

Console to Brake

B-25 connector DB-9 connector

2 --------- Black --------- 2

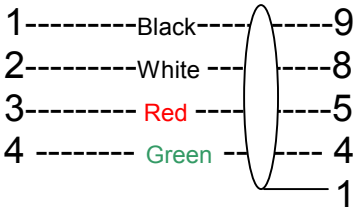
3 --------- Red ---------- 3

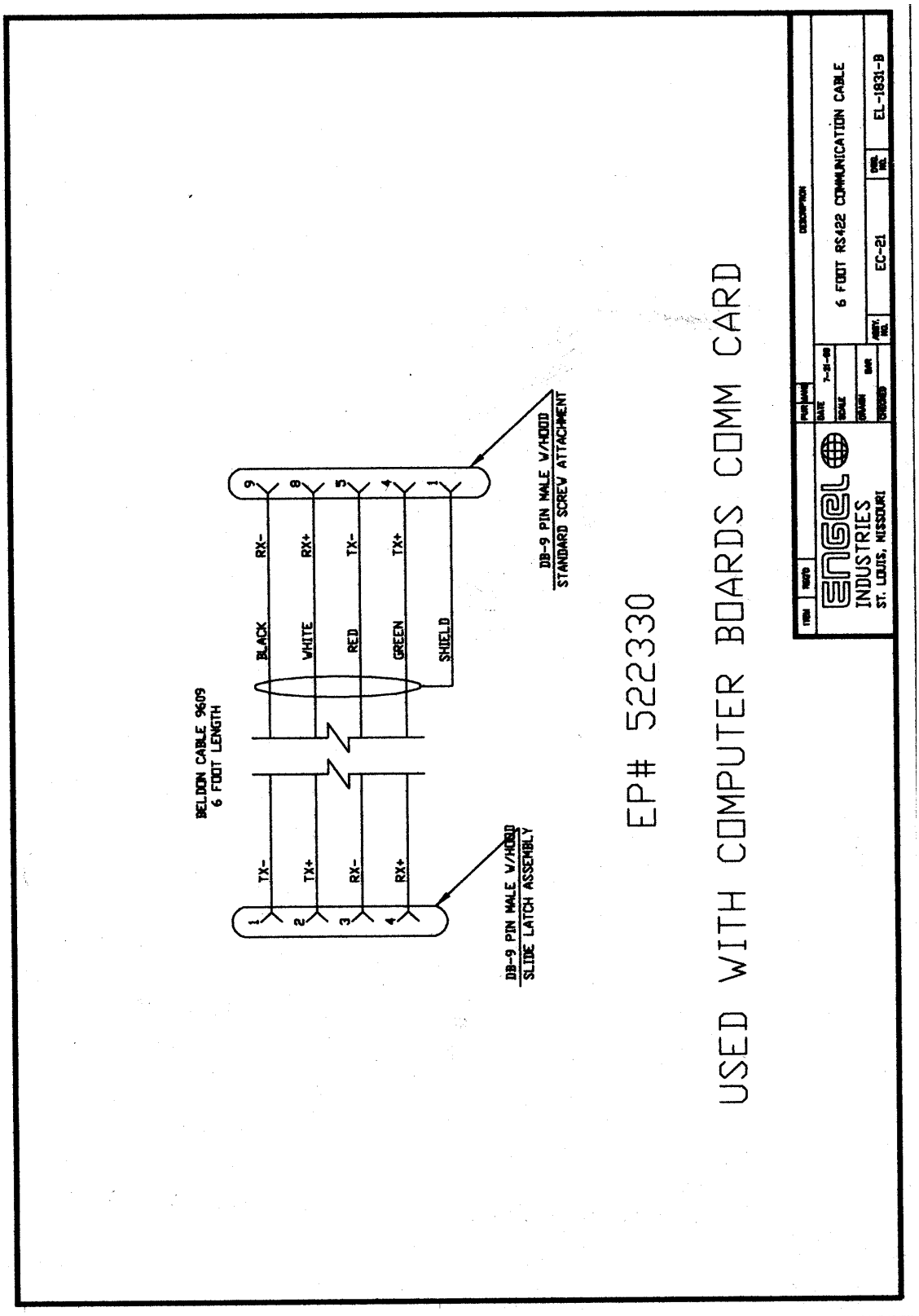
7 ---------- White -------- 5

Com 3

PC to Sy/Max PLC

DB-9 male to DB-9 male





Com 3 (PC) to Sy/Max PLC

Machine Bonding

The Engel machine is to be bonded together electrically to form and a single ground potential, which is then connected to a single source ground from the customers' power source. The machine is bonded as shown on next page, variations can be used with variations in the layout of the machine, but this is our required method. The bonding jumper is a "grounded conductor" of #4 or #6 THHN copper stranded with green covering.

The customer will supply a #4 OR #6 THHN copper stranded with green covering "grounded conductor" to the source drop at the leveler power center referred to as the "A box".
This "grounded conductor" will bond to the back-plane, power center panel (the can) and to the side of the machine frame. This is the only "grounded conductor" to bond in this fashion.

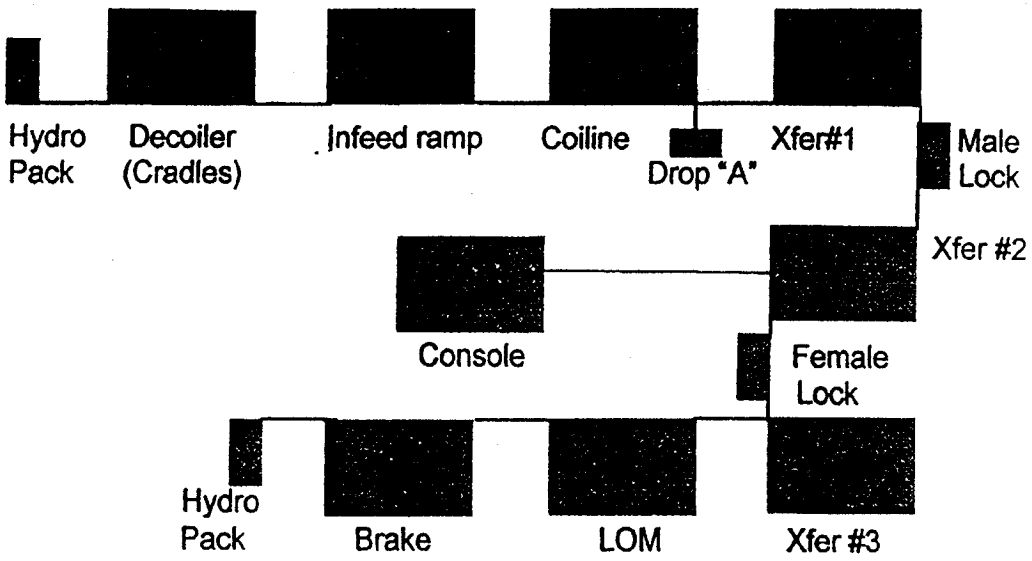
There may be other power drops to other sections of the machine with a "grounded conductor", this "grounded conductor" does not have to be of the #4 or #6 AWG (unless required by NEC). These other "grounded conductors" will tie only to the back plane of their associated drop. NEC requirements for bonding can be performed by weld or tapped threaded bolt. Our recommendation is to either weld or tap ¼"-20 hex head bolt to an area of the frame that is continuous, at both ends of the machine section.

A #4 or #6 AWG THHN is then attached, via a ground lug #2-14 CU9AL.

A crimped "stak-on" is not suitable for a bonding connector. The bonding of "outside the machine" areas are the responsibility of the customer, i.e. air supply lines, nearby plasma cutters, etc. Under no circumstances will the Engel machine be connected to a grounding rod.

Warning: The customer needs to be informed that product warranty may be voided by faulty electrical source. It is required that the customer insure proper source connections and that the source voltage must be maintained within +1- 10% of machine specifications. Contact Engel Industries if further assistance is needed.

Machine Bonding cont'd



Service Tech:

Date:

Company:

Panel Drop "A" source #1

Source A-B:
B-C:
C-A:
Control voltage:

Source #2:
A-B:
B-C:
C-A:

Source #3:
A-B:
B-C:
C-A:

Source #4:
A-B:
B-C:
C-A:

Source #5:
A-B:
B-C:
C-A:

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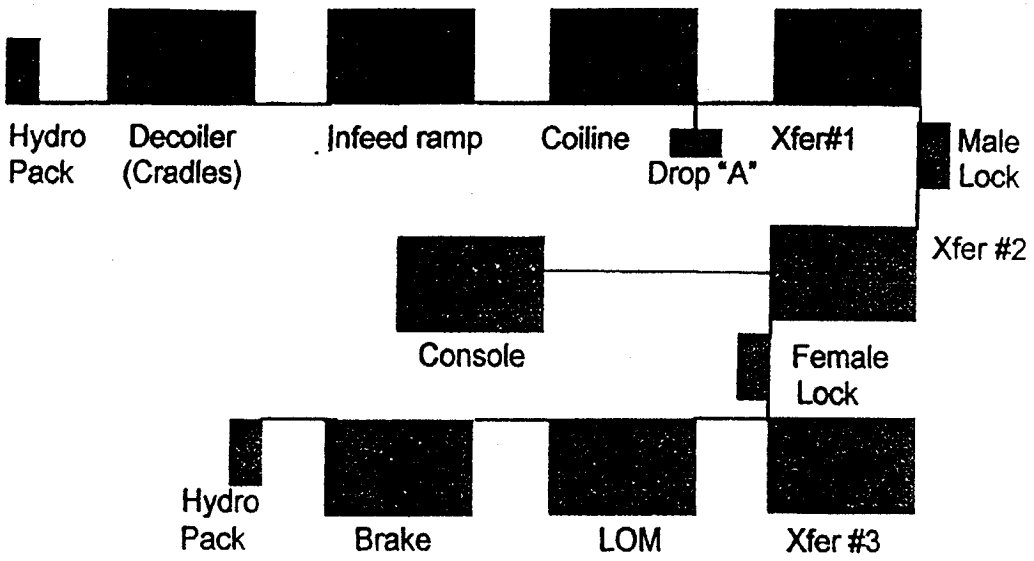
Machine Bonding cont'd



Service Tech:

Date:

Company:

Panel Drop "A" source #1

Source A-B:
B-C:
C-A:
Control voltage:

Source #2:
A-B:
B-C:
C-A:

Source #3:
A-B:
B-C:
C-A:

Source #4:
A-B:
B-C:
C-A:

Source #5:
A-B:
B-C:
C-A:

CALIBRATION OF HLB

This procedure will ensure that the accuracy of the brake position does not have to be readjusted at delivery .

The first item to be set is the home position and reference. Adjust the control pots as outlined in the general setup reference drawings as supplied by electric shop lead man.

Set the slow-down distance to 2" with the correction factor set to 1.0000 on the 516-AB setup page.

The second item is to decrease (if necessary) the "Max" pot in 10% increments from original settings (Full CCW), until the carriage returns to the same reference point.

Using the Production screen, Type = L, Width = 6, Lk = 1, CO = N.

Ensure that the #1lock setup is set to all zeros.

Brake will have to be Calibrated after every change made to the information on the 516-HLB setup page.

Reset the Production screen information to move carriage between 6" and 50". Ensure that the brake position is within 1/16". If not then (reference ~= 0) re-adjust the correction factor .

Formula:

Commanded distance divided by measured distance times old correction factor = new correction factor

Re-calibrate and check again.

After completion of this procedure, apply a dab of fingernail polish to pot and knob of back-gauge drive board. This will prevent vibration or accidental movement of pots.

Procedure To Make new Operating Disk

Step 1: Copy operating disk to another office computer under its own folder. i.e. "C:\Engelrun"

Step 2: Insert old disk into machine computer and reboot. When the screen display shows "Starting MS-DOS ...", press F8.

Answer "Y" to all questions up to process AUTOEXEC.BAT [Y/N]", enter "N".

Step 3: ..Copy A:*.* C:\" [enter]

Step 4: Type in "C:\" [enter]

Step 5: Type in "format A:/SN A:" [enter]

Step 6: System will prompt you to remove or insert disks as it needs them.

Step 7: After making a formatted disk, check disk by inserting new disk in drive A: and rebooting. (Ctl-Alt-Del)

Step 8: If problem, repeat steps 1 to 6.

Step 9: Return to office computer and copy the contents of the Engelrun folder to the new disk. (exception: COMMAND.COM).

Or Step 9: Repeat steps 1 to 4.

Step 10: Insert new disk and type in "copy C:*.* A:\".

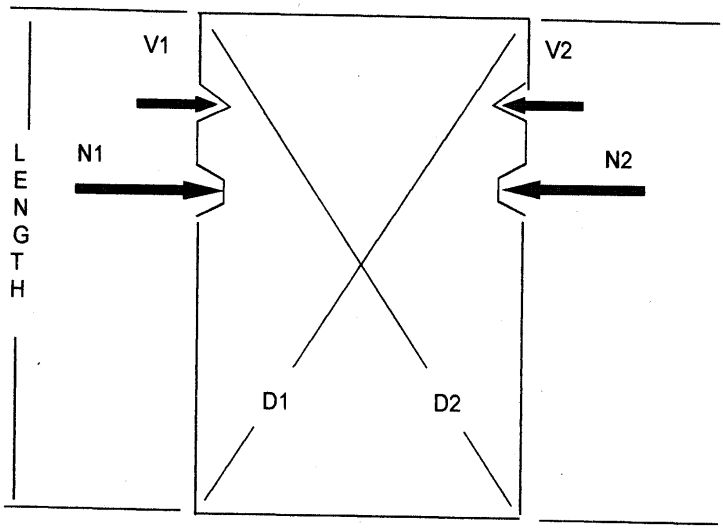
(exception:COMMAND.COM)

Preventing Razor cuts at Shear

When using the TDF connector on the production screen for connectors, it has been found that the combination of connector size and shear position causes a trim off of the first part of every job to be less than .25". This action puts additional stress on the shear blade, causing premature wear out of the blade edge.

The fix to this problem is to manually advance the material .5" past the shear, press the reset button then press "run". This action will add the additional .5" to the approximate .03" trim. This will only affect the first part of the job.

Quick Coil Line Check Out



Program five blank panels at 120"

While in manual or halt, manually actuate all dies and punches including shear.

Press "RUN" and produce the five blanks.

The first piece should have the following facts:

V1 = V2 = Vee Notch to Shear distance

N 1 = N2 = N Notch to Shear distance

D1 = D2

HP(left) = HP(right) [Hole punch not shown]

If D1 is not = D2 then check square of metal to shear or metal travel. Adjust pinch rolls to adjust travel, adjust shear to metal for square cut.

If V1 is not = V2 then adjust side of the notcher frame to square to shear.

If V1 = V2 but N1 is not = N2 then adjust notcher frame a distance to be medium of the error distance.

If HP(left) is not = HP(right), then adjust punch frame to square.

LENGTH = the average of the five lengths.

Correction Factor = 120 / LENGTH * old correction factor = new correction factor.

Leveler Pinch Rolls Adjustment

Starting from the in-feed ramp towards the dies, the first adjustable roll is the brake roll, "to brake the back of the metal". The next pinch roll is the flattener roll, "to flatten out the metal". The following guide is not an absolute perfect adjustment, but a guide to get the metal very close to flat. Number of turns from bottomed out adjustment.

Gauge	Brake Roll:	Flattener Roll:
26	33/4	6⅞
24	3⅞	7⅛
22	3 ¼	10 ⅛
20	3	10 ⅛
18	2 ½	10 to 10 ⅛

Bead setting: Start at zero then up 2 turns to 2½ turns ** 26 Ga. to 18 Ga.
The following data has proven to be close findings:

SHT-GS	SETTINGS IN THOUSANDS	BRAKE	FLATTENER
GS 16G48120	16GA 48"X 120" GAL V	280	415
GS 16G4896	16GA 48"X96" GAL V	280	415
GS16G60120	16GA 60"XI20" GAL V	280	400
GS18G48120	18GA48"XI20" GALV	250	375
GS18G4896	18GA48"X96" GALV	250	375
GS18G60120	18GA 60"XI20" GALV	250	400
GS20G48120	20GA 48"XI20" GALV	240	420
GS20G48144	20GA 48"X 144" GAL V	240	420
GS20G4896	20GA 48"X96" GAL V	240	420
GS20G60120	20GA 60"XI20" GAL V	140	400-440
GS22G48120	22GA 48"XI20" GALV	185-205	380-420
GS22G4896	22GA 48"X96" GAL V	"	"
GS22G60120	22GA 60"XI20" GAL V	160	420
GS24G36120	24GA 36"XI20" GALV	200	280
GS24G3696	24GA 36"X96" GAL V	"	"
GS24G48120	24GA 48"X 120" GAL V	150	400
GS24G4896	24GA 48"X96" GAL V	"	"
GS24G60120	24GA 60"X120" GALV	180	320
GS26G36120	26GA36"X120"GALV	170	300
GS26G3696	26GA 36"X96" GAL V	"	"
GS26G48120	26GA 48"X 120" GAL V	190	320
GS26G4812090	26GA 48"X120" GALV G-90STAMPED	"	"
GS26G48144	26GA 48"X 144 " GAL V	"	"
GS26G4896	26GA 48"X96" GAL V	"	"
GS26G60120	26GA 60"X120" GALV	160	320
GS28G36120	28GA 36"X120" GAL V	140	350
GS28G3696	28GA 36"X96" GAL V	"	"
GS28G48120	28GA 48"X120" GALV	100-135	300
GS28G4896	28GA 48"X96" GAL V	"	"

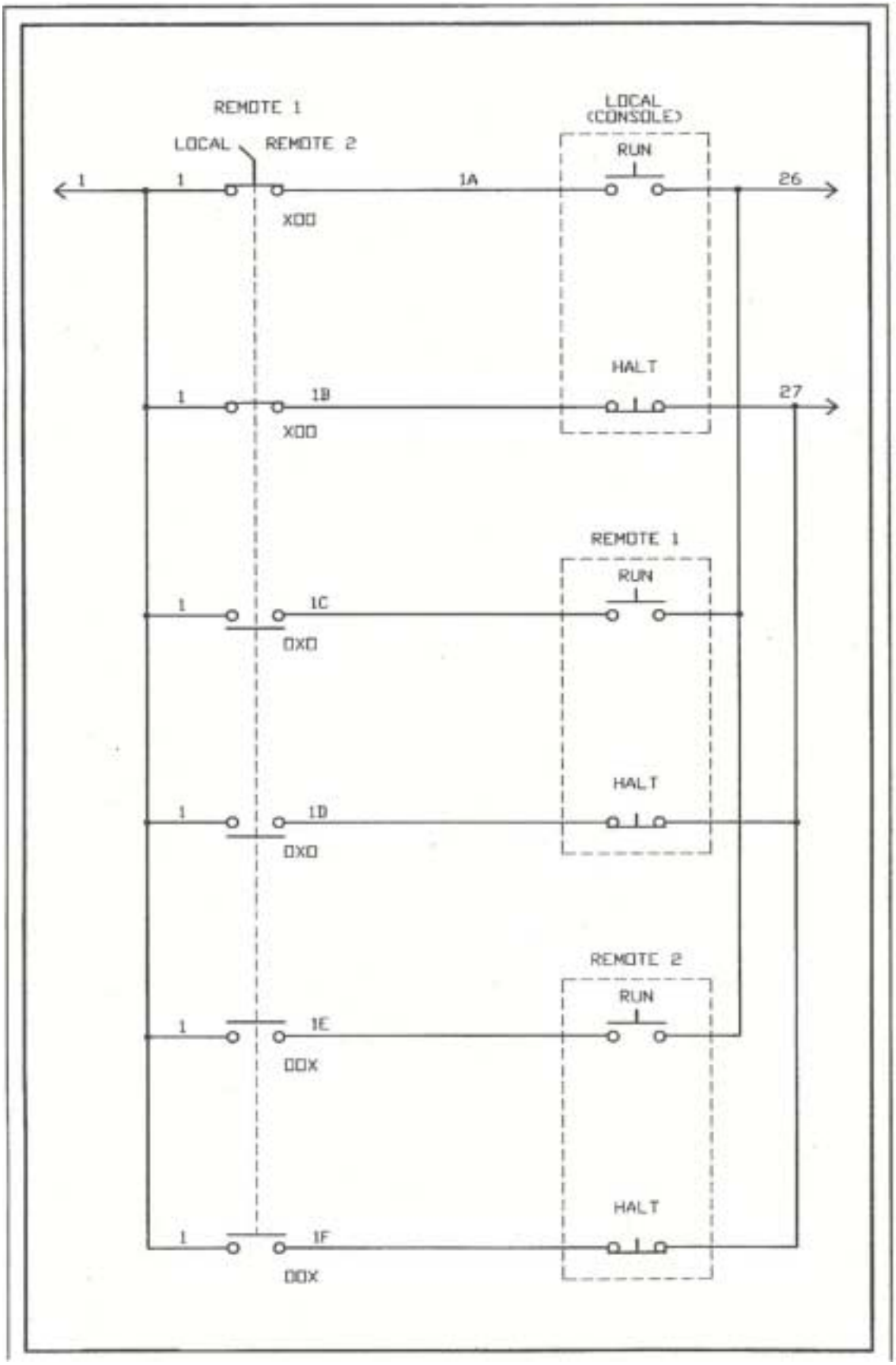
REMOTE RUN-HALT

2 STATION REMOTE

Qty	Part#	Description
1	551220-26	SQ D LEGEND PLATE
4	531161	T & B ½" CORD CONNECTOR
1	551012	SQ D BLACK SHROUD
*5	551101	SQ D CONTACT BLOCK N. O.
*6	551102	SQ D CONTACT BLOCK N. C.
*4	551115	SQ D STANDARD PUSH BUTTON
1	551171	SQ D BLACK SELECT SWITCH KNOB
1	551194-1	SQ D BLACK SHROUD
*2	551410	SQ D RED LENS
*2	551225	SQ D GREEN LENS
1	551446	SQ D 3-POS SELECTOR SWITCH
*2	552308	HOFFMAN PUSH-BUTTON ENCLOSURE
100ft	561005	16ga. 4 CONDUCTOR CORD
*2	551953	GE P/B STATION CR2943NA102A

*If the GE station is used, then reduce the number of contact blocks and lens by number of GE stations used. If GE stations are used then do not order any push buttons. GE stations include enclosure and buttons with labels.

NOTE: The selector switch contacts MUST be "brake before make" type.


REMOTE 1
LOCAL
REMOTE 2
LOCAL
(CONSOLE)
RUN
1
1
1A
26
XOO
HALT
1
1B
27
XOO
REMOTE 1
RUN
1
1C
OXO
HALT
1
1D
OXO
REMOTE 2
RUN
1
1E
OOX
HALT
1
1F
OOX

Adjusting Brake Stop Arm Rack

Note: This procedure is usually required after the machine has been operated for the first 300 hours. This procedure is only required as needed, estimated once every one or two years, if that much.

NOTE: Care should be taken when ever working on or near the brake stop arms due to forceful swing action.

Indications: the brake stop arms need adjustment when there is vertical movement allowed with the stop arms commanded "in".

Location: under the out-feed side of the brake is the cylinder driving the stop arm rack & pinion. In the area between the stop arms, there is a cover over the rack & pinion, remove this cover. On the out-feed side of the rack, is a ⅜" square head bolt with a ⅝" jam nut.

Procedure: Remove cover. Loosen the jam nut (if installed) and the allen head setscrew. Program the machine control with for an “L” or better job. Leave coiline hydraulics off and brake hydraulics on, press the run button.

Lift adjustment: After the arms come in, attempt to lift the arms by hand, if arms do not lift then go to *tightening procedure*. If the arms lift up, then remove air supply. Loosen the jam nut at junction of the cylinder piston and rack fixture. Turn the cylinder piston to unscrew piston from rack fixture until the piston has retracted to about one third the lifted distance of the arms. There must be at least 3 threads of the piston into the rack. If less then 3 threads exposed, else refer to *rack adjustment*. Tighten the cylinder piston jam nut and the “allen” head set screw. If there is not a jam nut, it is recommended that a drill of proper size be used to dent the side of the piston prior to installing “allen” head set screw. Reapply air supply and attempt to lift the arms again. If arm does not lift then proceed to *tightening procedure*, else return to *Lift adjustment*.

Tightening procedure: With a proper size wrench fitting the square head bolt, turn the bolts until tight. Do not over tighten to cause breakage of bolt. Tighten the jam nut on bolt. Replace rack & pinion covers.

Rack adjustment: Remove air supply. Loosen the “rack roller bearing” retaining bolts. This will allow the roller bearing to moved far enough back or to be removed to allow the piston fixture to be pushed down (retracted) by two or more rack teeth. Reinstall the roller bearing assembly to rack. Proceed to *Lift adjustment*.

Converting a system from operating disk to Hard drive.

Power "off" computer. Insert disk into "A" drive. Power "on" computer.
When display shows "Starting MS DOS". Press F8.
System will ask "Y/N" to all steps in the config.sys and autoexec.bat files.
Answer "N" to all questions.

Type	Display
“a:\” [enter]	"C:\>"...
"format c:/s/v" [enter]	

(If large hard drive, system will notify you that maximum is 2000kb.)
System will take some time, but let it do its thing.
When complete, remove disk from "A" drive and reboot.
Display will show "Date and Time. .."press [enter] to both.

Type	Display
"md\engel" [enter]	
"cd\engel" [enter]	"C:\ENGEL\>"
"copy a:*.* c:" [enter]	
"md elk" [enter]	“C:\ENGEL\>”
"cd elk" [enter]	“C:\ENGEL\ELK\>”
"A:"	“A:\>”
"cd elk" [enter]	“A:\ELK\>”
"copy a:*.* c:"	

Switch to laptop computer
If in NT, use the explorer folder and find a:autoexec.bat.
Highlight the file and right-click. Choose "edit"
If in DOS, type in "A:" [enter]
Type in "edit autoexec.bat" [enter], it will look like this:

```
@ECHO OFF
CLS
VERIFYOFF
BREAK OFF
ECHO “************************************************”
ECHO “ Setting up the computer -Please standby... “
ECHO “************************************************”
C:
COPY A:*.D?? C: /V > NUL
COPY A:REPORT.TXT C: /V > NUL
A:ERN50
CLS
ECHO “************************************************”
ECHO “ Closing down the computer -Please standby... “
ECHO “************************************************”
COPY C:PRODUCT.DAT A: /V > NUL
COPY C:REPORT.TXT A: /V > NUL
COPY C:SETUP.DAT A: /V > NUL
COPY C:LABEL.DAT A: /V > NUL
```

COPY C:COIL.DAT A: /V > NUL
COPY C:REPORT.TXT A: /V > NUL
COPY C:MAINT.DAT A: /V > NUL
*ECHO "***"*
ECHO " You may now remove power from the computer... "
*ECHO "***"*

Using the keyboard controls, make it look like this:
@ECHO OFF
CLS
VERIFYOFF
BREAK OFF
*ECHO "***"*
ECHO " Setting up the computer -Please standby... "
*ECHO "***"*
CD\engel
ERN50
CLS
*ECHO "***"*
ECHO " Closing down the computer -Please standby. .."
*ECHO "***"*
*ECHO "***"*
ECHO " You may now remove power from the computer... "
*ECHO "***"*

"Save file as C:autoexec.bat"

LOADING COILS

I) Position coil a minimum of 8" off the floor. Remove banding and wrapping only.

2) Remove retainer pins and retainer banding from both end bearings of spindle shaft completely.

3) Loosen allen-head setscrews and remove bearing from drive end of spindle shaft.

4) Set fork lift forks to 21" O.D. width and load 'Coil lifter' onto forks.

5) Lift coil Tensioner wheel (operator side air lever) to clear new coil.

6) Move coil lifter into spool and lower both flange locking levers onto the guide side of the spool.

Caution: Be sure the CDA is disconnected from the spool shaft before lifting the spool from the cradle. The CDA unit may be derailed when lifted. Disconnect the green ground wire from the ground lug before moving the
CDA.

7) Lift and remove spool from cradle.

8) Check coil wind direction and insert shaft into the guide side of the spool.

9) Insert controller side spool flange into coil on shaft.

10) Attach lifting chain to the lift lug of removable flange.

Caution: Lifting the coil without the chain attached to flange will cause damage to the guide flange and shaft. This may also cause the coil to drop unexpectedly.

11) Align flange bolts to the flat sides of shaft and tighten both bolts.

12) Lift and transport spool to a position 12" above bearing seats.

13) Install spacers onto shaft to allow a maximum of 1/4" space blank allowance, install bearing with flange in or out, according to need and tighten both allen-head setscrews on the flat sides of the shaft.

14) Lower the spool into the cradle bearing seats and replace retainer bands and pins to both bearings.

15) Roll the Coil Drive Assembly (CDA) to center of spool and slide coupler sleeve onto the square end of the shaft. Snap on the retainer spacer.

16) Attach green grounding wire to the ground lug.

17) Cut and remove all banding from the coil and lower the tensioner wheel to the coil.

UNCOILING METAL

1) Place drive direction lever on CDA assembly to neutral or center position.

2) Place the CDA selector switch to unwind position.

3) Turn on the control power switch at the control panel. Turn power on the coil line.

4) Jog material to advance the metal from the coil to the guide edge of the ramp.

5) Lower the ramp drive wheel.

6) Use the jog switch to advance the metal up the ramp to with in ½" of the rollers.

7) Move the ramp guide adjustment to bump the material, then back off ½ turn. Lock guide wheel down.

8) As soon as the bench rollers grip the metal, raise the ramp drive roller to release the metal.

CAUTION: Do not operate both the ramp drive rollers and the bench rollers at the same time. This will cause the material to be driven to one side of the pinch rolls causing error in the tracking of the material.

9) Back off the notchers allow material to clear.

10) Jog the metal to the shear and trim the end to square, using the manual shear.

S & Drive Duct -Setup

I) Set the by-pass toggle switch to “OFF”, advance the metal forward for S&D setting and lock the adjustment wheels down.

2) Set the air toggle switch forward (notchers move to “IN” position), prior to adjusting notchers. Unlock the control wheel on the notcher and adjust it in to just touch metal, back it off 6 turns on both notcher settings and lock the adjustment wheels in place. Notch and measure a piece of metal to be sure it measures 13/16" to 7/8" deep.

3) Check and adjust both male/female settings on the Pittsburgh/Snap-Lock roller settings.

4) C.E.F. -Bring guide head all the way in.

5) Set toggle switches to the left. (Raise the by-pass doors)

6) Adjust the operator heads to the stock width + 1/8" using a sheared strip from the coil stock to be used.

7) Adjust Line-O-Matic guides to "0" and 60".

8) Adjust the T. D. F (Transverse Duct Flange) rollers to by-pass using the long set bolts, and adjust the guide heads out to maximum width (all the way back).

9) Set the by-pass toggle switches to by-pass (doors down position).

BLANKING METAL

I) Lower the “back stop / guide” on transfer table #1.

2) For beaded material, jog the material to a position prior to, or in front of, the beading roller. Set the beading roll to 2 ½ turns up from bottom position.

CAUTION: With the hydraulic power off, feel by hand the position of the beading rings to see that they are positioned in the grooves before running material through them. Damage to the rings could occur if rings are not in place.

3) Position receiving table in front of open transfer table #1.

4) Program and run blanks from the control panel.

Liner Setup

1) **Speed switch settings**:
    1 = 2lb liner (slowest, to allow for more pins)
    2 = 1lb liner
    3 = No liner (fastest setting)

2) **Air valve:** Turn on all four valves (down is on).

3) **Squaring Pins:** Toggle the air switch to "ON" (left) for squaring pins up.

4) **Glue valve:** Set to the "red line" position for “ON”.

5) **Sensor switch:** Set to on position (down position).

6) **Liner:** Check to see that the liner is advanced through the rollers up to the shear blades.

7) **Glue spray heads:** Remove the caps install the glue heads. Head #1 installs on the guide side and # 11 on the operator side. The glue heads must be in sequential order to prevent glue from being sprayed on the conveyor belts and frame (Placing a piece of liner in the drip tray will make clean up easier later).

8) **Closing down**: Reverse the settings above and place all the glue spray heads in a bucket of water to prevent their drying out.

If more than a day or two of storage is required, use the hose attachment and flush out the spray heads of adhesive before storage until next needed.

CAUTION: Liner pins are very hot just after spot welding in place. Use caution when lifting ductwork from the conveyor. Wear gloves for your protection.

CDA Adjustments

We have found that the general settings for the “Soft start and torque” on the CDA is:

Torque Adjust Clutch:	70
Soft Start Clutch:	40
Torque Adjust Brake:	70
Soft Stop Brake:	40

As the rolls become heavier (heavier gage), some decrease is required to keep the system from overloading the drive (blowing fuses).

The red switch settings labeled “Soft start/stop enable” are:

CL: ON

BR: ON

NOTE: The adjustments should **NEVER** be set to maximum or minimum. As this will cause damage to the cradle, material and CDA drive system.

T.D.F. DUCT -Setup

1) Adjust notchers in to touch metal and back off 1/4 turn to just clear stock.

2) Toggle switch is set to the back position with adjustment wheels locked.

3) Set C.E.F. to by-pass. (Guide side out or all the way back.)

4) Set C.E.F. toggle switches to the doors down position.

5) Set C.E.F. guide to material width plus 1/8". (From door to door.)

6) T.D.F. toggle switch is set to doors open.

7) Adjust the guide side head “in” to stop position.

8) Set operator side guides to T.D.F. (short bolts).

9) Set operator side head with the adjustment wheel to the stock width being used, + 1/8"

10) Set the Line-O-Matic guide setting to 1 7/8"on the two guide side guide adjustments and 58 1/8" for the two operator side guide adjustments..

Adjusting Brake Clamp Rack

Indications: The brake clamp needs tightening when there is chattering noise or jerky movement of the clamp.

Location: Under the in-feed side of the brake is the cylinder driving the rack & pinion. On the in-feed side of this rack, are two 3/8” square head bolts. The bolts are locked in place by a 5/8” jam nut each.

Procedure: Loosen the jam nuts. With a proper size wrench fitting the square head bolts, turn the bolts “in” until tight. **Do not over tighten to cause breakage of bolt.** Tighten jam nuts on bolts.

Notes: This procedure is usually required after the machine has been operated for the first 300 hours. This procedure is only required as needed, estimated once every one or two years, if that much.

Care should be taken whenever working on or near any machinery that swings, moves or pinches.

Duct-Mate Duct setup

1) Check C.E.F. – Set both guides to widest position, by-pass doors down.

2) Check T.D.F. – Set both guides to widest position, by-pass doors down.

3) Set guides on the Line-O-Matic to 0” on guide side and 60” on operator side.

4) Set C.E.F. operator side to material width + 1/8”.

5) Set T.D.F. operator side to material width + 1/8”.

6) Check Snap-lock / Pitts. Settings.

PLC and PC Program History

System3, System4 and Sys423x's

The oldest coiline systems using the SPC-401 PLC's used the System4x ladder programs and could only use the "Engelrun.exe" PC program.

The next coiline systems using the SPC-423 PLC's version 1 used the System3x ladder programs and could only use the "Engelrun.exe" PC program.

The next generation of coiline systems using the SPC-423 PLC's version 2 used the Sys423A or Sys423B ladder programs and could only use the "Engelrun.exe" PC program.

The above PLC and PC programs above were specific to register addresses and or wiring differences between machines.

The last generation of the non-hole punch control system is the Sys423C. The register address' and wiring assignments are pretty much the same as the latest systems today with hole punch, with the exception of the brake hydraulic by-pass valve and hole punch codes. The older WAB's and L brakes did not have a "Form head down" output and used that output for the unloader valve. The hole punches select of "Y/N" will confuse the ladder program into attempting to punch a hole with not have a punch available. The Sys423X (A, B, C) systems can be easily upgraded by loading a new ladder and PC program.

Sys423Hx to Sys423HI

The Sys423hx series of PLC ladder programs were all hole punch capable programs. These programs went through a series of changes in what and how the machine performed tasks.

Sys423HI

This program is the last of the Sy-Max ladder programs and can be used in any control system back to and including the Sys423A system by setting the hole punch to shear distance and hole punch actuation time to zero. The PC program would also have to be upgraded to the Ern70. Another issue is the hydraulic brake systems with the "un-loader valve". See below.
This issue can be remedied by strapping the 1017-16 input high, this will operate the "form-head down" output (1033-16) to operate the un-loader valve.

The Sys423HI program input 1013-15 can be strapped high to actuate the "combo" damper hole; this is for systems that **do not have a separate damper hole punch**. Using a different punch for different material widths produces the "damper hole". The 6' center punch on 4' material, 4' outer punch for 5' material, and 5' outer punch for 6' material. This produces a problem for 5' machines that do not have 6' punches.

Additional capabilities of Sys423HI ladder programs over the earlier ladders:

1. Up to 360 damper and reinforcement hole patterns for up to a dual-head hole punching system.

2. Automatic actuation/deactivation of LOM glue guns from VE selection 1029-16.

3. Improvement of the sequential event procedures reducing the brake operation process time.

4. Prevention of brake "Manual Clamp Down" during "Run" condition.

5. Faster brake stop positioning.

6. Strappable selection of "IN" or "OUT" for "L-brake" and "DH800" calibration positions, via 1013-14.

7. Control of the Cleat-edge roll-form switching cylinder (replacing the stepping relay).

8. Strappable selection of "combo" or damper punch selection, via 1017-16.

9. Strappable selection of "un-loader" valve or "form-head down" systems, via 1017-16.

10. Two job batching of production work, both LOM and brake.

11. Hole punch pattern of 3 rows by 3 holes now available as "F"

Ern70 PC program

The Engelrun programs were divided between the 286-processor computers and the 386 or better processor computers. The 286 Engelrun programs would run on the newer processor but would have very slow cursor movement and screen updating. The Ern70 program will not function properly on the 286 computers and it is recommended to operate on Pentium or better.

Additional capabilities of the Ern70 over the earlier version programs:

1. Notifying operator that the system has a Com 2 error.

2. Notifying operator that the “setup” file has been automatically replaced through disk fault.

3. Selected 15 Coil inventory and use tracking.

4. Maintenance time tracking and notification of due items.

5. In-color status of system and parameters (red = off, green = on, amber = other).

6. Up to 360 damper and reinforcement hole punch patterns for up to a dual-head punch system.

7. More informational initialization and shut down screens.

8. Stream lined “setup” pages, displaying only the setup pages that are used.

9. Device calibration (L-brake, WAB and DH800) from any display page in manual condition.

10. Customer label header memory.

11. Automatic actuation/deactivation of LOM glue guns from VE selection.

12. Improved help file.

13. Office to machine “product” file loading during “in-work condition”.

14. Prevention of office to machine “setup” file loading.

15. The ability to Shell out to “Shell. Bat” file. Used with Advanced Cutting CAD software (third party, not affiliated with Engel Industries) has a version of software that is operator controlled.

Communication links with Engelrun

Control processes

Most office link programs are “Office controlled”. Meaning that the office initiates the upload or download of the “Product.dat” file. There is a third party program that is “Operator controlled”. The operator can initiate the upload of the “Product.dat” file from the unmanned running office computer.

Engelink

Engelink is a DOS based program designed to communicate with the Engelrun machine PC program. This program is Office controlled. It has been outdated due to the introduction of the damper and reinforcement hole punch.

This program will allow the office to download (from machine to office) the setup, production, coil and report data to the office display. It will allow the office to modify the setup and production data and upload (from office to machine) this modified data back to the machine. This program will allow messages to be sent between the office and machine. The only requirement from the machine is that the “Data link” be on.

This program is compatible to all the Engelrun programs without damper and reinforcement hole punch.

Elkrnx

This program is DOS based, designed to communicate with the Engelrun programs that either have or do not have the damper and reinforcement hole punch frames. This program is Office controlled. This program is not compatible to the older versions of Engelrun with the hole punch column of “Y or N”.

This program will allow the office to download the setup, production, coil and report data to the office display. It will allow the office to modify the setup and production data but will allow only the production data to be uploaded to the machine. This program will allow messages to be sent between office and machine. The only requirement is that the machine “Data link” be on.

Engelink for Windows

This program is a separately sold program that is designed to operate on any 95, 98, NT, ME or 2000 windows operating system.

This program is Office controlled. This program is an Microsoft Access based database program. It will self load the required programs to operate without the customer office computer having the Windows Office system.

This program will allow the office to load or save files destined for the machine under any file name. When sent to the machine, the machine will see it as "Product.dat".

The benefit of this program is that third party programs (i.e.: plasma cutting programs) can produce up-loadable files using the MS Access file formats.

BEWARE

The earlier versions of Engelrun programs will allow new production data to be transferred to the machine when the machine is in the "RUN" condition. Doing so will have ***adverse effects on the production being run immediately following the upload.***

Information as to what is required in file communication and protocols is given in the Engelrun or the Engelink for Windows manual.

Engel Industries

Memo

To:

From: Rory Biggs

CC:

Date:

Re: Upgraded program

Power-up control system as normal.
Record on a paper your present setup values.
With control power *removed* swap PLC's in rack.
Insert the one of the new disks in PC.
Apply control power.
As soon as the "STATUS" page is on screen, press only the escape key.
Press F1 to enter setup data.
Enter all setup information from the written record.
Perform a brake calibration if equipped.
Quit program, finish to "Remove Power" message.
Restart control and then swap to backup disk and quit again.
Send Loaner back to Engel Industries when you feel the operation is acceptable.

Differences of new program:

System will batch multiple jobs by counting the parts produced by each section.

"Run" can be initiated as soon as the coiline has completed its present job, the brake will change its setup when it completes the number of parts in the job.

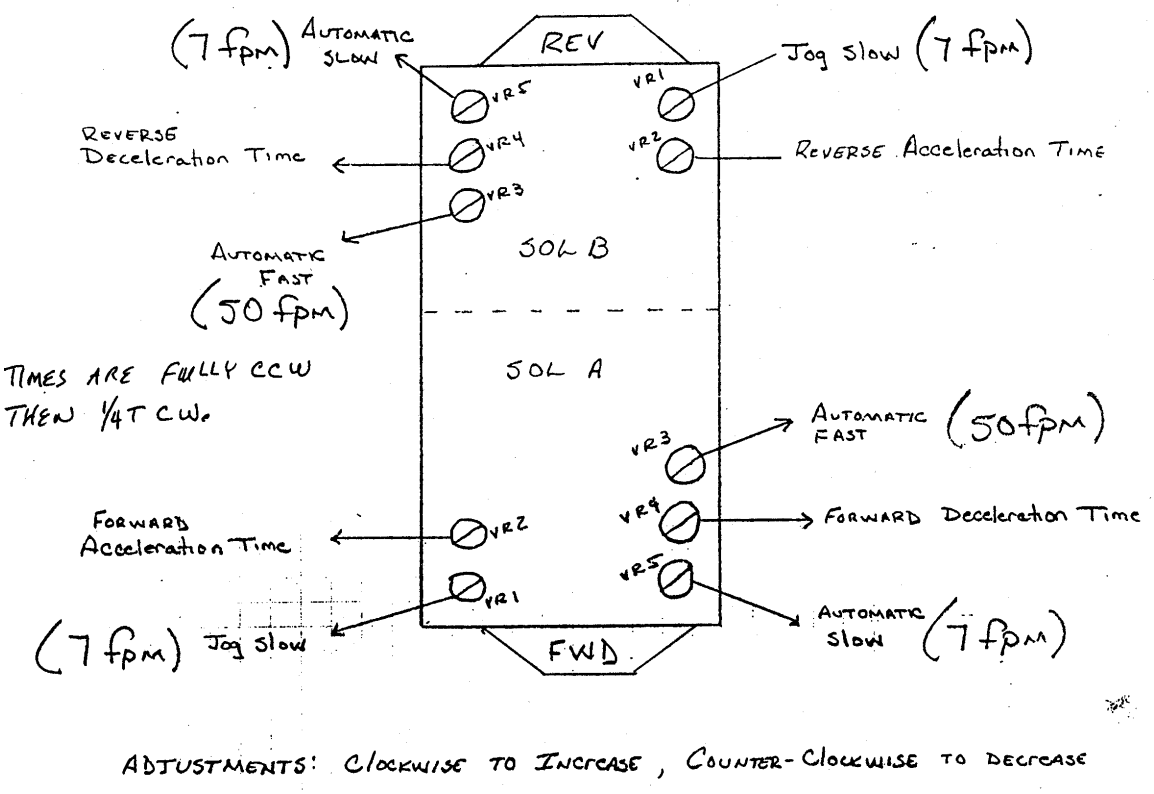
The hole punch has been changed to perform a 3 X 3 pattern, see attached sheet.

WARNING:

If a part is removed between the coiline and the brake, the system will have to be stopped, reset and started to account for the removed part.

Regards,

Rory Biggs



Directional valve used in airless coilines.

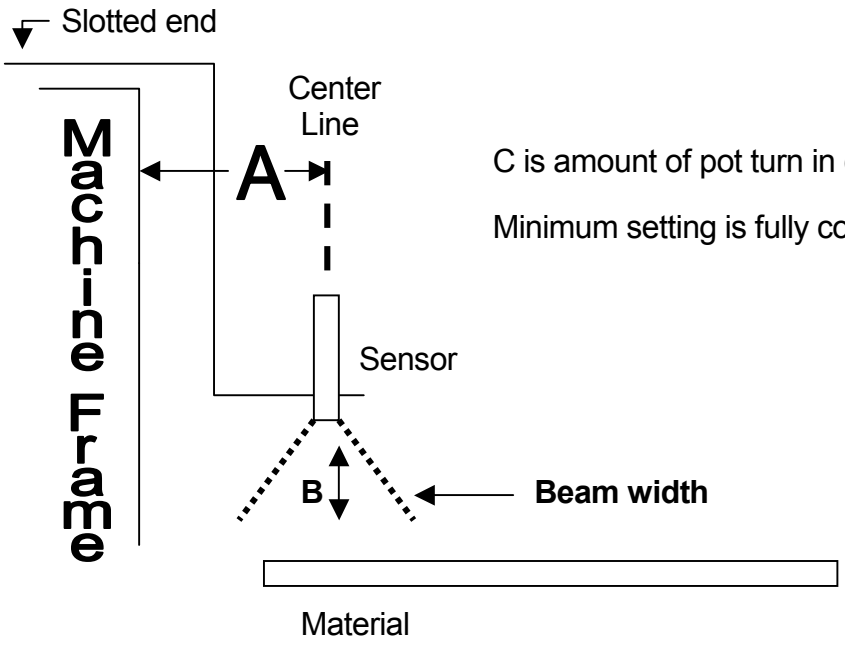
To:

From: Rory Biggs

CC:

Date: 7/11/01

Re: CEF sensor



C is amount of pot turn in clockwise direction

Minimum setting is fully counter-clockwise.

Minimum setting for pot: .25T to 1T clockwise
Minimum distance for A: 4.8cm (1.875”)
Sensor beam width: 1cm (.375”) at 1cm (.375”) from material
Range distance for B: 3.2cm (1.25”) with C @ .25T to 8.9cm (3.5”) with C @ 1T
Optimum position for A: center of the V notch, on a 1.6cm (.625”), A = 5.1cm (2”)
Optimum position for B: 1cm (.375”)
There is a 2mm (.0625”) clockwise twist to mount when set in mid position between station 1 and 2.