Board ID Printer
User Manual
(for use with the Linear High Grader system)

Document Revision History

Version	Date	Description	Firmware	By
1.18	2018-Apr-06	Added Micro-Pulse	1.8.0.0	EDG10
1.17	2015-Aug-05	Shifted Binary ID	1.7.0.0	EDG10
1.16	2015-Jun-08	Nozzle Trim adjustments	1.6.0.0	EDG10
1.15	2014-Oct-03	Added FRM Critical I/O config.	1.6.0.0	EDG10
1.14	2014-Aug-21	Binary vs BCD printing. Motor Dynamic Pressure adjustment. Telnet debug.	1.5.0.0	EDG10
1.13	2014-Jun-10	Added printhead maintenance, nozzle replacement procedures and FRM hookup. Document cleanup and reformatting.	1.4.1.1	EDG10
1.12	2013-Jan-03	Binary printhead Adjust motor voltage for low pressure alarms. Added descriptions for SIM screen fields	1.4.0.2	EDG10
1.11	2012-Nov-21	Company logo	1.4.0.2	EDG10
1.10	2012-June-25	Added Debug Screen descriptions	1.4.0.2	EDG10
1.9	2011-Oct-21	High Speed printhead	1.3.1.2	EDG10
1.8	2010-May-27	ID Repeat		EDG10
1.7	2010-Jan-18	Printhead replacement procedure		EDG10
1.6	2009-Nov-30	Design changes		EDG10
1.5	2009-Jun-05	Beta updates		EDG10
1.4	2008-Oct-30	Updated company name and logo		PIC10
1.3	2006-Oct-27	Added information on Print Config settings, as per H. vanBruggen.		L. Mackay
1.2	2006-Sep-25	Added note re: using number pad, as per K. Harmata.		L. Mackay
1.1	2006-Aug-29	Revisions from H. vanBruggen.		L. Mackay
1.0	2006-Aug-25	Initial release. Filename: *srv1\root\OE\Library\Manuals_Current\Board IDPrinter\CNMBoardIDPrinter_UserManual.doc*		L. Mackay C. Harper K. Harmata

Contents

1. What's New

Firmware	Date	Feature	Summary
1.8.0.0	**2018/04/06**	Micro-Pulse	Enables generation of Micro-Pulses to the printhead nozzles when the transfer has stopped.
		Debug	Fixed error in number of spray patterns detected
1.7.0.0	**2015/08/05**	Shifted Binary	Added Shifted Binary ID and config
		ID Repeat	Removed ID Repeat and config setting
1.6.0.0	**2015/06/08**	Nozzle Trim	Added nozzle trim adjustment to handle nozzle activation delays.
		Board IDs	Set IdAck after processing rather than after receipt of the ID.
		Display Controller	Re-ordered the screens on the Display Controller to better match usage requirements.
		Configuration	Added FRM critical I/O configuration. Changed PrintGo from Active Hi to Active Low and updated the Critical I/O configuration accordingly.
		Diagnostics	Debug updates through the telnet interface.
1.5.0.0	**2014/08/21**	Speed	Speed tested to 4000fpm. The Status display shows the max encoder speed since the last printer power cycle rather than the spec limit.
		Binary Characters	Added true Binary ID print. Re-named previous Binary print to BCD (Binary Coded Decimal).
		Dynamic Pressure	Adjust the motor speed (ink pressure) on hi/low pressure alarms or low encoder speeds for better ink spray control.
		Diagnostics	Added Telnet interface to allow access to all configuration parameters, debug flags and messages. Added several new debug flags. Show the PrintGo count for each ID to detect errors.
		Bug Fix	Fixed zero gap between digits.
1.4.1.1	**2014/05/02**	Bug Fix	Range check on level sensor for proper display. Stop flashing icons after alarms auto-clear.
1.4.1.0	**2014/04/25**	Alarms	Continue printing with any alarm active. Added counters to filter max/min temperature and level alarms. Auto-clear alarms after cause removed.
		Bug Fix	Set Sim defaults to inactive for normal operation.
1.4.0.4	**2013/10/21**	Bug Fix	Disable print buffer before alarm check so it can't be printed.
1.4.0.3	**2013/05/29**	Alarms	Added counter to filter max/min pressure alarms.

Firmware	Date	Feature	Summary
		Binary Characters	Added binary (BCD) characters to print IDs on the display.
		Dual Config	Added dual configuration structure to support different printheads in production testing.
		Bug Fix	Improvements to ID Ack timing accuracy. Adjust max entry values for Ink PSI, Pressure and Level to allow higher settings.
1.4.0.2	**2012/02/14**	TGS Sync	Increased max sync length to 48".
		Bug Fix	Fix rounding error in ThouPerSync calc.
1.3.1.3	**2012/02/06**	Spray Limit	Force all nozzles off after a specified max delay.
1.3.1.2	**2011/07/19**	Max Speed	Removed max speed limitations.
		TGS Sync	Added Sync marks for TGS operation.
		Debug	Improved PrintGo debug prints.
		Parm Calc	Added calc for ThouPerSync.
		Bug Fix	Marked ISR variables as shared.

Table 1. What's New

2. Customer Support

USNR provides customer support staffed 24 hours a day, 7 days a week by trained service technicians.

If you need help solving a problem with your Board ID Printer, please collect the following information before calling us:

- All relevant data on the problem (symptoms, descriptions, etc.).
- All troubleshooting procedures that you followed.

To contact Customer Support:

24-hour Phone	250-832-8820
Email	service@newnes-mcgehee.com

Note: Charges may apply for Customer Support service.

2.1 Parts and Delivery

Our parts department provides quality parts and service that ensure the reliability and performance of your Board ID Printer throughout its lifetime.

Please read Authorized Return (NRA) Program before sending us failed parts.

To contact the Parts Department:

Hours of Operation	7:00 A.M. - 4:30 P.M. Pacific time, Monday - Friday
Regular Parts Service	250-832-7116
After-Hours Line	250-832-8820
Email	parts@newnes-mcgehee.com
Fax	250-833-3032

2.1.1 Authorized Return (NRA) Program

To ensure the most efficient service, please follow this procedure when returning parts to USNR.

To exchange or return parts, our parts department requires the following information:

- your company address and specific shipping instructions
- contact names for both commercial and technical questions
- the purchase order (PO) number of the failed part
- the part number of the failed part
- a description of the failed part, including:
  - serial number (if applicable)
  - the reason the part failed (if known)

Once you have given us this information, your Customer Support Representative will:

- give you a Return Authorization (NRA) number that must be included on the shipping documents when you return the failed part
- tell you where to send your failed part
- open a sales order for the full price of the new part
- arrange to ship the new part to you

When we receive the failed part from you (accompanied by the NRA number), we will examine it and determine if a credit is owed to you. If the part is under warranty, we will issue a credit for the invoice amount. Otherwise, a credit will be issued for the difference between the invoice amount and the exchange price.

3. Safety

3.1 Document Symbols

Warning symbol indicating potential personal hazard, use extreme caution.

Caution: Indicates the potential for equipment damage if actions are not carried out properly, proceed carefully.

Note: Informational procedure note or tip.

3.2 Printer Safety

The ink used in the USNR Board ID Printer contains methanol (methyl alcohol), which is a potential health and safety hazard. Always follow appropriate safety precautions when handling the ink or working on the ink system:

- Before handling the ink mixture, read all supplied Material Safety Data Sheets covering handling and disposal of this product (see attached Appendix).
- Always wear gloves, safety goggles, and respirator when handling ink or servicing the ink system.
- Always work in a well-ventilated area. Symptoms from exposure to ink fumes include burning eyes, coughing, dizziness and headache.
- Methanol is highly flammable. Keep away from heat, sparks and open flame.

Methanol in the ink is highly flammable. **Do not smoke while handling the ink. Keep ink away from heat, sparks and open flame.**
Read all supplied Material Safety Data Sheets regarding this product. Work in a well-ventilated area and wear gloves, safety goggles, and respirator.

In addition to the above ink-related precautions:

- Always follow appropriate lock-out procedures when servicing the printer system.
- The ink system is under pressure. Do not disconnect any hose fittings or ink system components when the system is running.
- The printer is connected to 120 VAC power. Always use appropriate electrical safety precautions.

4. System Overview

The USNR ID Printer is a high speed printer system used to apply IDs on boards for tracking purposes. The printer is typically located on the outfeed of the USNR LHG in a planermill application and applies IDs to the boards as they exit the LHG at speeds up to 4000 ft/min. The printer uses a UV Fluorescent ink that gets picked up by a downstream ID Reader (USNR IDR) after the board has been switched to a lugged transfer.

As each board is scanned through the LHG, an ID is assigned to the board for tracking purposes. The board ID is sent from the FRM to the ID printer over a serial cable interface in plain ASCII format. The ID is converted by the printer to a series of nozzle activations to spray the ID on the board.

Once the ID has been received and processed, the printer holds the ID and waits for a **PrintGo** signal from FRM to start the printing process. Each nozzle activation is broken down into a series of 'strokes' and each stroke is broken down into a number of encoder ticks. The encoder ticks are tracked by the printer to determine the start/stop activation points for each nozzle.

Each digit in an ID is exactly 5 strokes wide. The size and number of encoder ticks per stroke is determined by the Printer Config setup. The fixed width of 5 strokes per digit allows each character to be mapped to a series of on/off activations. This is particularly important on the USNR Martian or other Character sets where several nozzle activations may be required for each digit to complete. This is not important on the USNR BCD or Binary Character sets where each bit in the character is always sprayed with a single nozzle activation.

Note: The Board ID Printer only prints a board identification number, not a grade or decision for the board.

Figure 1. Printer Console and Martian ID Marks on a Board

4.1 Components

The Board ID Printer consists primarily of a console unit and a printhead unit, attached to one another by a heavy-duty cable conduit.

The printer console contains a 9-liter ink reservoir, pumping system, ink filter, and printhead microcontroller. On top of the console are the user interface touchscreen, power button, and warning lights. The console is situated beside the lumber transfer where an operator can access it.

The printhead is located on the underside of a metal plate at the LHG outfeed, with five nozzles spraying upwards at about a 45deg angle. The printhead is attached to the printer console by an umbilical cord containing the ink line and control cables.

Figure 2. Printer Console

Figure 3. Printhead Mount

The printhead microcontroller in the console receives character and encoder information from the LHG FRM. It uses this information to apply the correct character to each board by controlling the time each nozzle sprays. The microcontroller also monitors ink temperature, ink pressure, and ink level and generates warnings if these items need attention.

The pumping system in the console pressurizes the ink, which is supplied to the printhead through the umbilical cord.

The printhead heats the ink and the spray nozzles release a specific amount to each board being printed. ID characters are produced by lines of ink. The line length is determined by the “on time” of each nozzle; as the board travels through the print zone, the ink spray becomes a line on the board.

There are two cables attaching the ID Printer to the Linear High Grader (LHG):

- A serial cable connected to the COM port of the LHG FRM computer transfers data between the printer and the LHG, such as the ID number to print and alarms generated during

operation.

- A printer data cable connected to various IO points controls print timing and verification that the ID was printed correctly.

Figure 4. Top Console, Printhead Microcontroller

Figure 5. Bottom Cabinet, Ink Reservoir and Pump

Figure 6. Printhead Drive Electronics

4.2 Alarms

A number of alarms are generated by the ID Printer to indicate operational problems or maintenance requirements. Alarms can be either **Warning** or **Fatal**, depending on the severity. **Warning** alarms are meant to provide an indication that some maintenance should be performed on the printer at the next available opportunity. **Fatal** alarms usually indicate that immediate maintenance is required. Alarms are generated for the Ink Pressure, Temperature and Reservoir Level.

Both alarm types are triggered when hi/low threshold levels set in the **Alarm Configuration** are crossed. When an alarm is triggered, an icon on the top of the **Status Screen** flashes to indicate the source of the fault.

On printers with firmware V1.4.0.3 or earlier, a **Fatal Alarm** causes the printer to stop printing and forces maintenance to be performed. The alarm must be manually cleared after the alarm condition is corrected. Starting on V1.4.1.0, **Fatal Alarms** were changed so they no longer halt printing. The alarm is still indicated but the printer will continue to run. The alarm also clears automatically once the alarm condition is corrected.

When a **Fatal** or **Warning Alarm** is generated, alarm messages are sent to the NFS via the FRM serial port connection. These alarms can be used by the NFS to trigger alarm events. Depending on the NFS Alarm setup, these can be displayed on the Infomaster or cause other system actions, halt the transfer for example.

4.3 Print Buffers

The printer contains several internal buffers that hold various IDs or marks to be printed. Two of the buffers are used for board IDs and two for control marks. The two board ID buffers allow the printer to be processing the nozzle activations for one ID while printing the current ID on a board. This alleviates a lot of timing issues between the FRM sending board IDs and the printer printing them. The **Buffer Select** mechanism should normally be enabled by setting **useBufSel** to 1 in **frmincfg.txt**. Wiring from the printer's control cable to the FRM Critical I/O is also required for **BufSel** and **PrintSel** signals.

As IDs are sent to the printer, the **BufSel** control signal from the FRM Critical IO routes the ID to a particular buffer inside the printer. A low signal routes it to buffer 0 and a high to buffer 1. A separate **PrintSel** line from the FRM is used in a similar way to select which buffer to print from when the **PrintGo** signal is asserted. If both the **BufSel** and **PrintSel** signals are not used or disconnected, the printer will process and print all IDs from buffer 0.

The other two buffer select lines are **Sync** and **Resync**, also from the FRM Critical IO. These operate similar to the **PrintSel** signal except they select a predefined mark to be printed. When the FRM asserts one of these signals high, the associated control mark buffer is selected and gets printed when the **PrintGo** signal is asserted. This functionality can be disabled by configuration (**frmincfg**) or by disconnecting the control signals.

Note: On systems that have both the **PrintSel** and **Sync**/**Resync** lines configured, the **Sync**/**Resync** lines have priority over the **PrintSel** buffer selection so the control marks are printed instead of any buffered IDs if one of those signals is active.

4.4 Dynamic Pressure Adjustment

Starting with version 1.5.0.0 of the ID Printer, a setting is included to enable **Dynamic Pressure** adjustment of the ink system by controlling the pump motor voltage and therefore speed and pressure. The control loop allows a voltage adjustment by up to +/- 50% of the nominal config voltage in 5% steps to a max of 5.0V and min of 1.45V (default). Adjustment stops at +/- 50% of nominal regardless if the max/min voltages have been reached or will stop if the max/min voltages are reached before the adjustment limit.

The motor voltage is reduced when the transfer is running <2000fpm or when a high pressure alarm occurs and increased when the speed is >2000fpm or a low pressure alarm occurs. The reduced pressure prevents excessive ink from being sprayed on the board at lower speeds while the increased pressure ensures that enough ink is applied at higher speeds. When no alarm or speed conditions are active, the motor is adjusted to the nominal configured voltage.

Note: The transfer must be halted or the **Dynamic Pressure** setting disabled to allow setting the initial ink pressure without the motor speed changing.

4.5 Board ID Marks

The USNR ID Printer is capable of three different styles of ID print, a **Martian** Character set, a **Binary Coded Decimal** Character (BCD) set or a **Binary** Character set. The Martian characters use different printed shapes to represent different numeric characters. The BCD characters use binary weighted nozzle positions to generate all numeric and hex characters (0-9, A-F) as individual digits. The Binary characters convert the ID into a series of 1's and 0's to spray the ID.

4.5.1 Martian ID

As mentioned, the Martian Characters use different shapes to represent the different numeric characters in an ID. The shapes were specifically chosen to ease the character recognition in the IDR. Below is the complete Martian Character set.

0 1 2 3 4 5 6 7 8 9

Table 2. Martian ID Characters

The different characters are strung together to form the ID to be printed. In this case, the ID is repeated to form a completed Dual ID (ID1 & ID2).

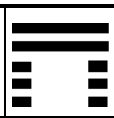
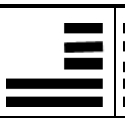
ID1 = 1468				ID2 = 1468			
							
1	4	6	8	1	4	6	8

Table 3. Martian ID Layout

Normally, the board ID mark is used only by the Linear High Grader system, not by the grader. However, you may sometimes need to identify a specific board for product setup or

troubleshooting purposes. In these cases, the characters printed on the board can be translated into a numerical board ID as follows.

The characters are printed on the board so that a grader standing on the lumberline side of the transfer can pull a board toward him with his right hand and read the characters in their proper orientation, as shown here:

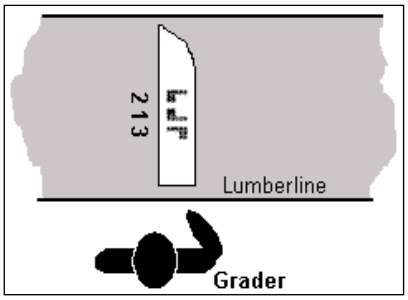


Figure 7. Martian ID Orientation

Note: The printer can also be configured to print characters rotated 180° from the above example (see **Print Configuration**). This can be useful for left-handed operators, or operators standing on the non-lumberline side of the transfer. The IDR configuration will need to be changed accordingly.

4.5.2 BCD ID

Binary Coded Decimal (BCD) IDs use a set of binary weighted lines to generate the different digit values. Each line is summed per digit to get the digit value. In addition to the standard 0-9 characters, BCD IDs also use hex values A-F (dec 10-15) as part of the Hamming error correction mechanism. The table below shows the weighting of each line in the BCD print. The center line (nozzle 3) is a reference line and carries no weight value to the ID.

Bit	Image	Binary Value
1		1
2		2
-		Reference Line, no value
3		4
4		8

Table 4. BCD ID Line Weights

The single line in the 0 digit below is the reference line, since there are no weighted lines printed the sum is 0. Digit 7 has weighted lines printed for 4 + 2 + 1 = 7.

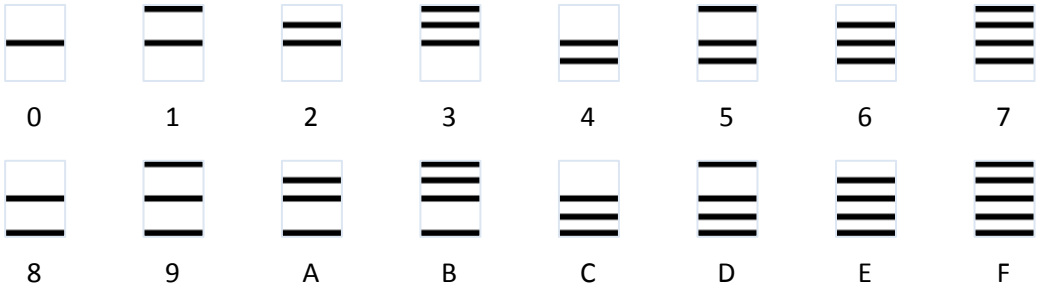


Table 5. BCD Characters

The complete ID string is composed of a Start Block, 3 or 4 digit ID1, Hamming Code (optional), Duplicate ID2 (optional) and End Block.

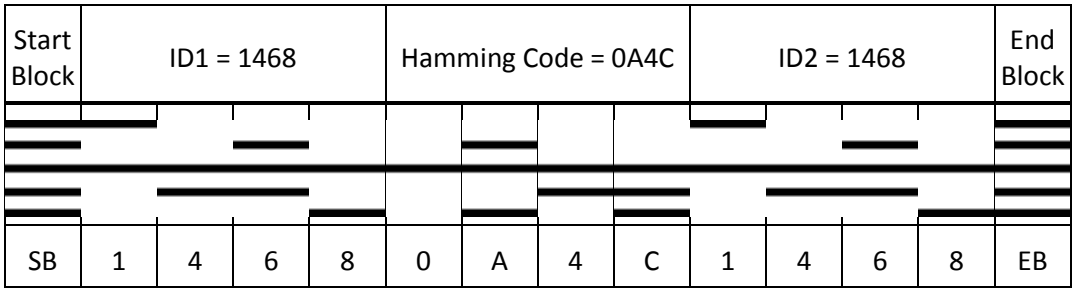


Table 6. BCD ID Layout

Each block represents one complete digit of the ID. The third nozzle in the printhead is used to spray a reference line down the middle of the ID, the other nozzles spray weighted lines either above or below the reference line. The reference line does not carry any weight value. Note the reference line extends from the beginning of the Start Block all the way through the End Block.

4.5.3 Binary ID

Binary IDs are similar to the BCD IDs in that IDs are printed onto the board as a Binary sequence. However, rather than individual digit blocks as in the BCD IDs, Binary IDs are printed as a series of 1's and 0's representing a complete ID. The center reference line is still sprayed so a Binary 0 has just nozzle 3 active while a Binary 1 has all nozzles active.

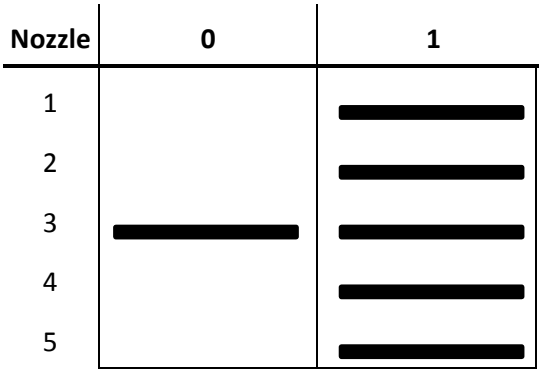


Table 7. Binary ID 0's and 1's

The complete ID string is composed of a Start Block, the Binary ID and an End Block. The reference line extends from the beginning of the Start Block all the way through the End Block. For an ID of

869 for instance, a sequence of 1101100101 plus the two end blocks would be sprayed onto the board.

Start Block	ID = 869									End Block
SB	1	1	0	1	1	0	0	1	0	1	EB

Table 8. Binary ID Layout

The number of bits used sets the length of the print and maximum ID that can be generated. Typically a 10bit sequence is generated resulting in possible IDs from 0-1023. The center reference line and start/end blocks are also sprayed but Duplicate IDs and Hamming Codes are not used. Binary IDs are essentially printed 4 times across the width of the board while dual IDs are printed only twice down the length.

4.5.4 Shifted Binary ID

The Binary Shift ID follows the same format as the standard Binary ID except the lower bits on nozzles 4 & 5[1] are shifted and wrapped by half the total number of bits in the ID relative to the upper bits on nozzles 1 & 2[1]. Nozzle 3 is still the reference line. For a 10 bit ID, the lower bits are shifted by 5 character positions for a bit sequence of 5-9, 0-4.

Start Block	ID = 869										End Block
Bits	0	1	2	3	4	5	6	7	8	9	
Bits	5	6	7	8	9	0	1	2	3	4	

Table 9. 10 Bit Binary Shift Layout

[1] These ID layouts are all shown from the IDR point of view. The default is to print the ID rotated 180 deg so nozzles 4 & 5 at the IDR are actually physical nozzles 2 & 1 at the printer, and the characters/bits are all printed in reverse order. With this configuration the MSB shows up at the IDR in the top left corner of each print. This is a legacy issue from the original printer design.

Configurations using an odd number of bits have the extra bit on leading edge of the ID. On a 9 bit ID, the bits are still shifted by 5 character positions giving a bit sequence of 4-8, 0-3.

Start Block	ID = 359									End Block
Bits	0	1	2	3	4	5	6	7	8	
Bits	4	5	6	7	8	0	1	2	3	

Table 10. 9 Bit Binary Shift Layout

4.5.5 Hamming Code (8/4)

Hamming codes can be used for error correction on **BCD IDs**. This is a method for encoding data such that any one-bit error in the ID can be corrected, and any 2-bit errors can be detected. The ID printer uses the more robust 8/4 version of Hamming that encodes 4 bits of data to one 8-bit byte (8/4 encoding). See the section **Encoding** below.

Since the encoded Hamming byte includes the original data nibble, only the extra four Hamming bits need to be printed separately. The other four data bits come from either ID1 or ID2 and are merged with the Hamming Nibble for decoding.

The Hamming code is inserted after the first and before the second (optional) IDs and consists of the same number of characters as each ID. Each character in the ID is mapped to a new Hamming character as indicated in the table below. The letters A-F are hex values for decimal numbers 10-15.

The Hamming codes can be used in conjunction with dual ID, sequence correction etc in the ID Reader to increase accuracy performance.

Encoding Table

The table below shows the initial 4 bit BCD data value and associated Hamming Nibble.

Digit Value	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Hamming Code	7	0	9	E	A	D	4	3	C	B	2	5	1	6	F	8

Table 11. Hamming Codes

Encoding Algorithm

The 8/4 encoding is quite simple; if the input nibble is the 4-bit value:

```
b3, b2, b1, b0
```

with b3 being the most significant bit, then the output hammed byte is the 8-bit value:

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Encoding	b3	b3^b2^b1	b2	!b2^b1^b0	b1	!b3^b1^b0	b0	!b3^b2^b0

Table 12. Hamming Encoding

where **^** represents bitwise exclusive-or and **!** is bitwise not.

This code has the property that every value is four bits different from all other values. A one-bit error is correctable and a two-bit error is detectable but not correctable.

Below are all 16 encoded nibbles.

Data nibble					Hammed byte									Hamming nibble				
	b3	b2	b1	b0		b7	b6	b5	b4	b3	b2	b1	b0		b3	b2	b1	b0
0 =	0	0	0	0	**15** =	0	0	0	1	0	1	0	1	**7** =	0	1	1	1
1 =	0	0	0	1	**02** =	0	0	0	0	0	0	1	0	**0** =	0	0	0	0
2 =	0	0	1	0	**49** =	0	1	0	0	1	0	0	1	**9** =	1	0	0	1
3 =	0	0	1	1	**5E** =	0	1	0	1	1	1	1	0	**E** =	1	1	1	0
4 =	0	1	0	0	**64** =	0	1	1	0	0	1	0	0	**A** =	1	0	1	0
5 =	0	1	0	1	**73** =	0	1	1	1	0	0	1	1	**D** =	1	1	0	1
6 =	0	1	1	0	**38** =	0	0	1	1	1	0	0	0	**4** =	0	1	0	0
7 =	0	1	1	1	**2F** =	0	0	1	0	1	1	1	1	**3** =	0	0	1	1
8 =	1	0	0	0	**D0** =	1	1	0	1	0	0	0	0	**C** =	1	1	0	0
9 =	1	0	0	1	**C7** =	1	1	0	0	0	1	1	1	**B** =	1	0	1	1
A =	1	0	1	0	**8C** =	1	0	0	0	1	1	0	0	**2** =	0	0	1	0
B =	1	0	1	1	**9B** =	1	0	0	1	1	0	1	1	**5** =	0	1	0	1
C =	1	1	0	0	**A1** =	1	0	1	0	0	0	0	1	**1** =	0	0	0	1
D =	1	1	0	1	**B6** =	1	0	1	1	0	1	1	0	**6** =	0	1	1	0
E =	1	1	1	0	**FD** =	1	1	1	1	1	1	0	1	**F** =	1	1	1	1
F =	1	1	1	1	**EA** =	1	1	1	0	1	0	1	0	**8** =	1	0	0	0
	b3	**b2**	**b1**	**b0**		**b3**	**321**	**b2**	**!210**	**b1**	**!310**	**b0**	**!320**		**b6**	**b4**	**b2**	**b0**

Table 13. Hamming Encoding

Decoding Table

Decoding a hammed byte back in to a 4-bit nibble can be done using the table below, or by a bit-twiddling algorithm. In the table, the upper/lower nibbles of the hammed byte value are used to index the row (most significant nibble) and column (least significant nibble), and the decoded nibble is read out of the table (hex).

MSN \ LSN	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	1!	-	1	1!	-	0	1	-	-	2!	1!	-	A!	-	-	7!
1	-	0!	1!	-	0!	0	-	0!	6!	-	-	B!	-	0!	3!	-
2	-	C!	1!	-	4!	-	-	7!	6!	-	-	7!	-	7!	7!	7
3	6!	-	-	5!	-	0!	D!	-	6	6!	6!	-	6!	-	-	!7
4	-	2!	!1	-	4!	-	-	9!	2!	2	-	2!	-	2!	3!	-
5	8!	-	-	5!	-	0!	3!	-	-	2!	3!	-	3!	-	3	3!
6	4!	-	-	5!	4	4!	4!	-	-	2!	F!	-	4!	-	-	7!
7	-	5!	5!	5	4!	-	-	5!	6!	-	-	5!	-	E!	3!	-
8	-	C!	1!	-	A!	-	-	9!	A!	-	-	B!	A	A!	A!	-
9	8!	-	-	B!	-	0!	D!	-	-	B!	B!	B	A!	-	-	B!
A	C!	C	-	C!	-	C!	D!	-	-	C!	F!	-	A!	-	-	7!
B	-	C!	D!	-	D!	-	D	D!	6!	-	-	B!	-	E!	D!	-
C	8!	-	-	9!	-	9!	9!	9	-	2!	F!	-	A!	-	-	9!
D	8	8!	8!	-	8!	-	-	9!	8!	-	-	B!	-	E!	3!	-
E	-	C!	F!	-	4!	-	-	9!	F!	-	F	F!	-	E!	F!	-
F	8!	-	-	5!	-	E!	D!	-	-	E!	F!	-	E!	E	-	E!

Table 14. Hamming Decoding

n	Data is correct, no errors
n!	One bit error detected and corrected
-	More than one bit error detected, not correctable

Decoding Algorithm

The algorithmic approach shows what is going on more clearly. Assuming the Hammed byte is:

```
h7, h6, h5, h4, h3, h2, h1, h0
```

With h7 being the most significant bit, we compute:

```
p  = h7 ^ h6 ^ h5 ^ h4 ^ h3 ^ h2 ^ h1 ^ h0
c0 = h7 ^ h5 ^ h1 ^ h0
c1 = h7 ^ h3 ^ h2 ^ h1
c2 = h5 ^ h4 ^ h3 ^ h1
```

If the parity, p, is correct (equal to 1) then either 0 or 2 errors occurred. If all the check bits, c0, c1, c2 are equal to 1 then the byte was received with no errors, otherwise it was damaged beyond repair (two or more errors).

If p is 0, then there was a single bit error detected that can be recovered:

c0	c1	c2	meaning
1	1	1	error in bit h6
1	1	0	error in bit h4
1	0	1	error in bit h2
0	1	1	error in bit h0
0	0	1	error in bit h7
0	1	0	error in bit h5
1	0	0	error in bit h3
0	0	0	error in bit h1

Table 15. Hamming Single Bit Errors

The erroneous bit should be flipped. Note that there is actually no need to fix errors in bits h6, h4, h2 and h0 since they are not used in the decoded nibble. After flipping bits if necessary, the decoded nibble is then:

```
h7, h5, h3, h1
```

4.6 Nozzle Trim

Control of the nozzle spray is encoder based to accurately position the IDs on the board surface. The IDR also requires a certain level of accuracy of the sprayed marks in order to recognize the ID characters. The nozzles themselves are spec'd for operation at 4KHz, this speed is required to spray IDs on the board at transfer speeds of up to 4000fpm.

Since the nozzles are mechanical devices, the activation timing can change slightly after an initial wear-in period. Depending on the mill, this wear-in period can vary from less than one week to several weeks or considerably longer. The amount of timing drift is actually quite small but with transfer speeds of 3000-4000 fpm they are enough to extend spray mark lines across digit boundaries and cause errors on the ID Reader.

The ID Printer incorporates a Nozzle Trim feature to compensate for the timing drift after wear-in. The trim adjustment is through a feedback loop with the IDR but can also be manually entered on the printer console. Recognition of nozzle trim errors by the IDR is based on the alignment seen on the lead and trail framing characters in the ID print compared to the reference line on nozzle 3. When errors are detected, the IDR sends an adjustment message to the printer to trim the nozzle activation offsets.

4.6.1 Nozzle Adjustment

Adjustment of each nozzle lead and trail trim will extend the printhead operation time without degrading the IDR character recognition. Each spray mark is comprised of 5 strokes with each stroke being made up by a number of encoder ticks (configuration dependent). The combination of strokes and ticks sets the nozzle activation offset and overall character width. Ticks can be added to or subtracted from the nozzle activation sequence to lengthen or shorten the sprayed mark. The minimum adjustment increment is limited to the encoder tick resolution (typically 33-66 thou). Each character must still start at the correct position on the board, it's just the nozzle activation timing within that position that must be changed.

The figure below shows typical nozzle timing errors on a Binary style ID. The lead edge is on the left and the #1 nozzle is on the top. The lead edges on all nozzles looks fairly clean but the trail edge of nozzle #2 can be seen extending beyond the boundary for each bit in the ID.

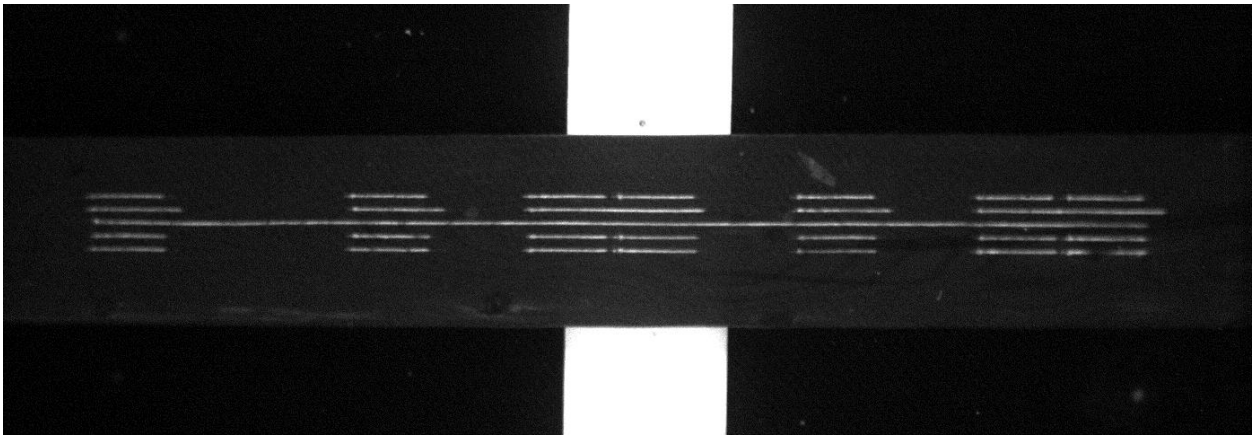


Figure 8. Lead/Trail Timing Errors

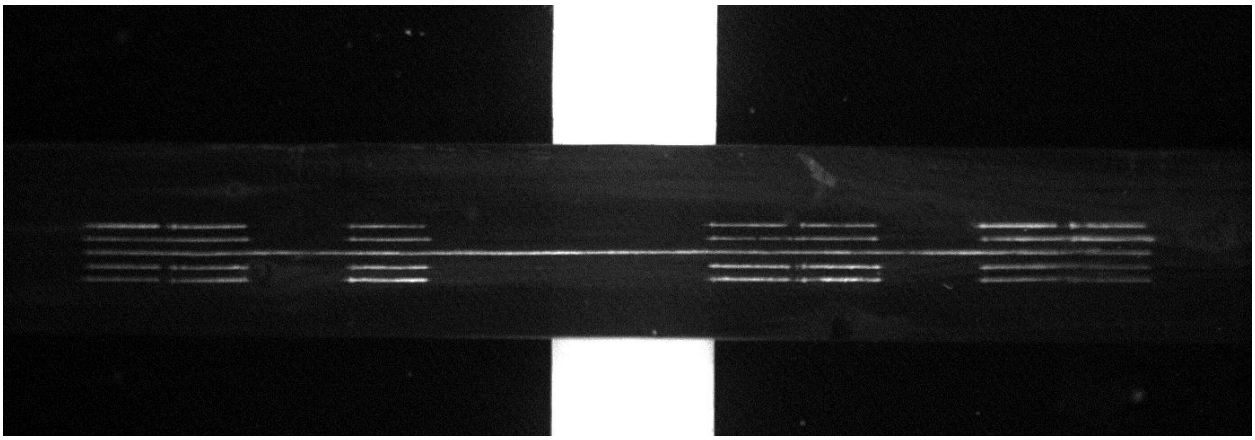


Figure 9. Lead/Trail Timing Corrected

After trim corrections were sent to the printer, nozzle #2 can be seen to stop closer to the end of the spray mark boundaries. The spray does extend slightly beyond the end of the boundary but has been corrected to within the encoder tick resolution limitation outlined above.

4.6.2 Automatic Adjustment

Automatic adjustment of the nozzle trim is accomplished as a feedback loop with the IDR. The IDR checks the lead frame mark for lead edge alignment and the trailing frame mark for trail edge alignment. A number of samples are checked to get the average adjustment required. Based on these readings, the IDR sends a message with incremental offset adjustments for each nozzle to the ID Printer.

These values are added to any existing adjustments in the Nozzle Alignment table and saved to Flash. The values will be immediately active and will be the default values on the next boot.

4.6.3 Manual Adjustment

Provisions have been made to allow manually entering the lead/trail trim adjustments through the Printer's Nozzle Alignment screen. An actual ID or the built in Calibration marks can be used to measure the amount of adjustment required for each nozzle. Once the values are entered in the Nozzle Alignment screen, they are stored in Flash. The values will be immediately active and will be the default values on the next boot.

Although manual entry is possible, the trim values entered are correct for the transfer speed the ID or Calibration marks were printed at. Since the transfer is typically stopped when accessing the printer console, the printer will assume the transfer speed to be 2000fpm. If that's not the case, there will be an error in the manually entered trim values and they will have to be adjusted further or allowed to adjust automatically by the IDR feedback loop.

4.6.4 Transfer Speed

All nozzle trim errors detected by the IDR are distance based but the activation delays on the nozzles themselves are timing based. This means that the offsets measured by the IDR are correct for the transfer speed the ID's were printed at. When the ID Printer receives a trim adjustment from the IDR, it calculates a scaling factor based on the current transfer speed. As the transfer speed changes, the scaling factor is used to adjust the trim values to compensate for the timing changes.

If the transfer is stopped when the trim adjustment is sent, the printer will calculate the scaling factor at 2000fpm. Any difference in the speed the scaling factor is calculated at compared to the actual speed the ID was printed at can result in a small error in the trim calculation and trim adjustment of the printed mark. When this happens, the IDR will detect the error and send a new trim correction.

4.6.5 Adjustment Limit

Adjustments are limited to slightly less than 50% of each digit width for both lead and trail alignment. For 4KHz operation the nozzles need to be activated for a minimum of 250us to fire properly. At 4000fpm this represents 0.2" of travel. With a typical encoder tick size of 0.066" this requires 4 ticks for 0.2" of travel. The actual minimum tick width is configuration dependent and is

calculated by the printer when a trim adjustment is made. The total tick width of a character can't be reduced below this value.

On a printer configured with 3 encoder ticks per stroke and 5 strokes per character, each character is made up of 15 ticks. Since a minimum of 4 ticks is required to fire the nozzles, there are 11 ticks of possible nozzle trim adjustment. The marks will also only be trimmed by half the ticks from either the lead or trail edge so the maximum each edge can be adjusted is 5 ticks (half tick adjustments are not possible) or 0.330" in this case.

4.6.6 Rotated IDs

Normally the IDs are printed on the board so that a grader standing on the lumberline side of the transfer can pull a board with his right hand and read the characters in their proper orientation. The printer can also be configured to print characters rotated 180° to facilitate left-handed operators or operators standing on the non-lumberline side of the transfer.

Rotating the ID swaps the lead/trail ends and reverses the nozzle row order so that nozzles 1&5 and 2&4 are swapped. The IDR camera is normally rotated in these cases to keep the ID in the correct orientation for the character recognition algorithm.

The printer automatically corrects trim messages from the IDR to rotate the nozzle and trim direction based on the ID rotation flag but manually entered trim values are not.

4.6.7 Nozzle Disable

All nozzles can be enabled or disabled either automatically by the IDR or through the Nozzle Status screen. This function can be used to disable any nozzles that can't be corrected by nozzle trim adjustments and are still causing problems. The intent is to allow the printer to run until a scheduled maintenance period when the nozzle or printhead can be replaced.

Nozzles can be disabled on any character set but the function is mainly applicable to Binary IDs since that character set can still be decoded with missing sprays from individual nozzles. Martian and BCD IDs both use line positions to indicate different character values and aren't suitable for disabled nozzle operation. There could be an argument made on Martian prints to allow operation with either nozzles 1 or 2 failed or nozzles 4 or 5 failed since these are duplicates of each other. Nozzle 3 should not be disabled on Binary or BCD IDs since it provides the center reference line to the IDR for alignment and detection.

At present, the nozzle disable mask is not stored in the printer flash and all nozzles default to enabled when the printer is turned on. If individual nozzles need to be disabled again, the IDR will need to disable them after power up. This ensures that when a printhead is replaced, all nozzles will be enabled when the printer is turned on. The down side of this is that the IDR needs to recognize the failed nozzle again before disabling it.

4.6.8 IDR-Printer Communications

All communications between the IDR and ID Printer is over a 100Mb TCPIP connection using the following parameters:

Device	IP Address	Port	Mask
IDR	192.168.100.16	NA	255.255.255.0
ID Printer	192.168.100.54	2345	255.255.255.0

Table 16. Table 2 IDR – ID Printer TCPIP Configuration

The IP addresses are setup so the printer and IDR can communicate over the LHG network connection. This allows the IDR to send the LHG alarm messages for the nozzle trim adjustments and it also allows telnet access to the ID Printer for diagnostic purposes. Message traffic for nozzle trim is very low and shouldn't affect any other devices on the network.

5. User Interface Screens

The touchscreen located on top of the printer console is your window into the ID Printer. It lets you enter settings and monitor printer functions.

You can select most items simply by touching that part of the screen. Items that are too small to be selected on-screen can be selected using the cursor control keypad beneath the screen.

Figure 10. Touchscreen and Keypad on Printer Console

There are two unlabeled buttons on the main keypad that have been programmed to allow adjusting the display contrast. Press either the **Contrast Up** or **Contrast Down** buttons to set the display view angle depending on the installation location. The display contrast adjusts one step each time the key is pressed. Hold the key down to rapidly step through the adjustment range.

On the left side of the touchscreen are “tabs” that let you open different screens. The touchscreen displays the following screens:

- Status Screen
- Control Screen
- Print Configuration
- Alarm Configuration
- Nozzle Align
- System Configuration
- Debug Screen
- Simulation Configuration
- Nozzle Counts
- Nozzle Test
- About
- Debug Configuration

Note: If you make changes on any screen, you must press the **Apply Changes** button for your changes to take effect.

Note: If you use the number pad to enter values on a screen, you must press the **Enter** key after the value is complete to enter it into the desired field (for example, to enter 4000 in the **Max Speed** field, press **4000 Enter**). When you have finished all your changes, press **Apply Changes** to save the new settings.

5.1 Status Screen

The Status screen shows the current **Ink Pressure**, **Temperature** and **Level** directly below the screen icons. On the side of each icon are the high/low level alarm thresholds. If any of the alarm thresholds are reached, the screen icon will flash and the yellow (**Warning**) or red (**Fatal**) Alarm Lamps will light on the printer console. To set the warning limits, see the **Alarm Configuration** screen. To reset triggered warning lights, see **Reset Alarms**.

Note: Starting with ID Printer rev 1.4.1.0, Fatal and Warning Alarms automatically clear once the alarm condition has been rectified.

This screen also shows the current and maximum speed of boards passing through the print zone, and the last four IDs that were printed.

To see this screen, press the **Status** tab on the left of the touchscreen.

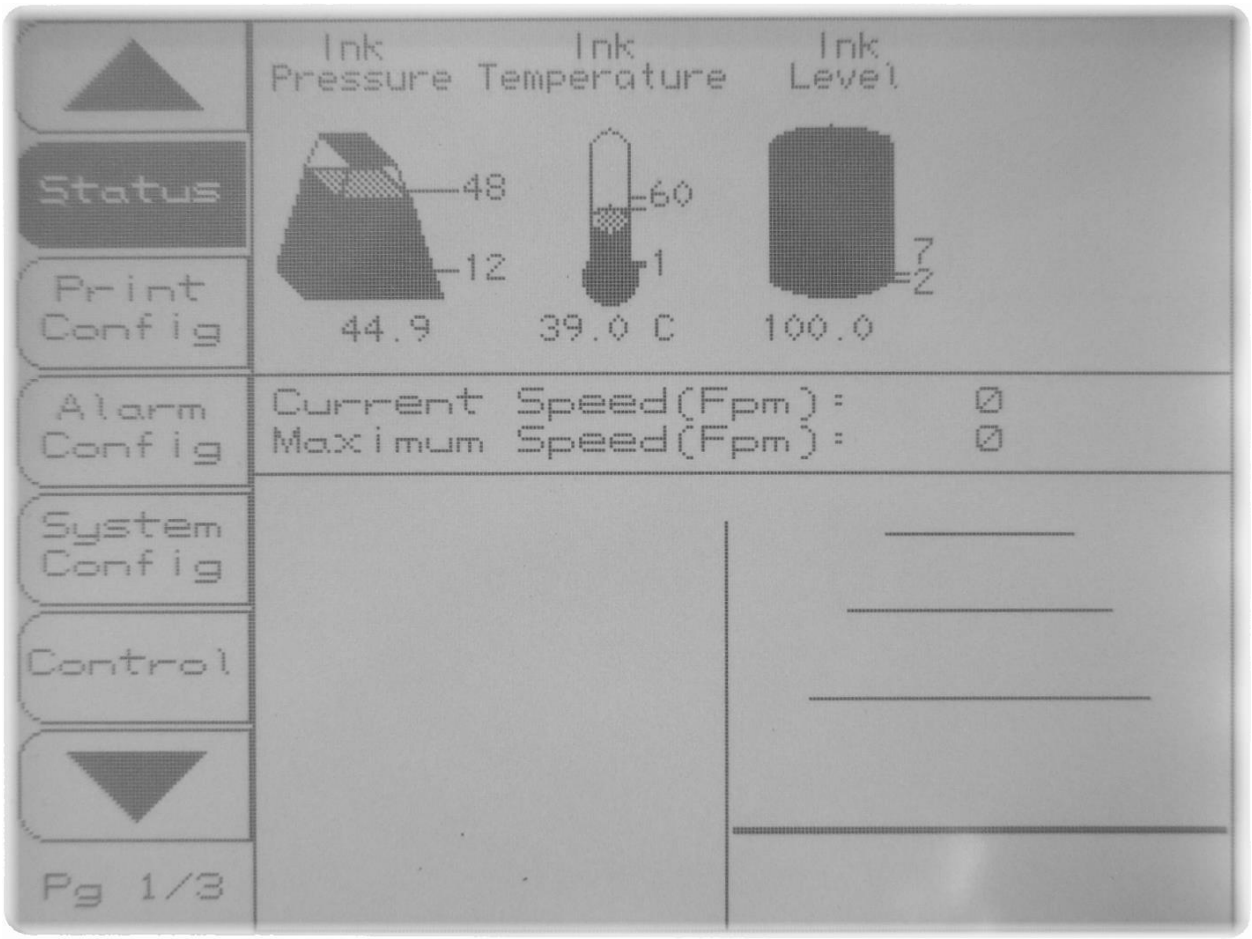


Figure 11. Status Screen

Parameter	Description
Ink Pressure	Shows the ink pressure measured at the printhead and is normally set between 25-40psi. See **Adjust the Ink Pressure** to make changes.
Ink Temperature	The ink temperature should normally read 40°C (113°F). The temperature is fixed by hardware design and is not adjustable.
Ink Level	Shows the amount of ink in percent remaining in the carboy.
Current Speed	Shows the current transfer speed in feet per minute (fpm).
Maximum Speed	Shows the maximum transfer speed in fpm since the last power cycle.

Table 17. Status Screen

5.2 Print Configuration

The **Print Configuration** screen lets you adjust certain printer settings. These settings should be set at system installation and whenever the printhead is serviced or replaced.

To see this screen, press the **Print Config** tab on the left of the touchscreen.

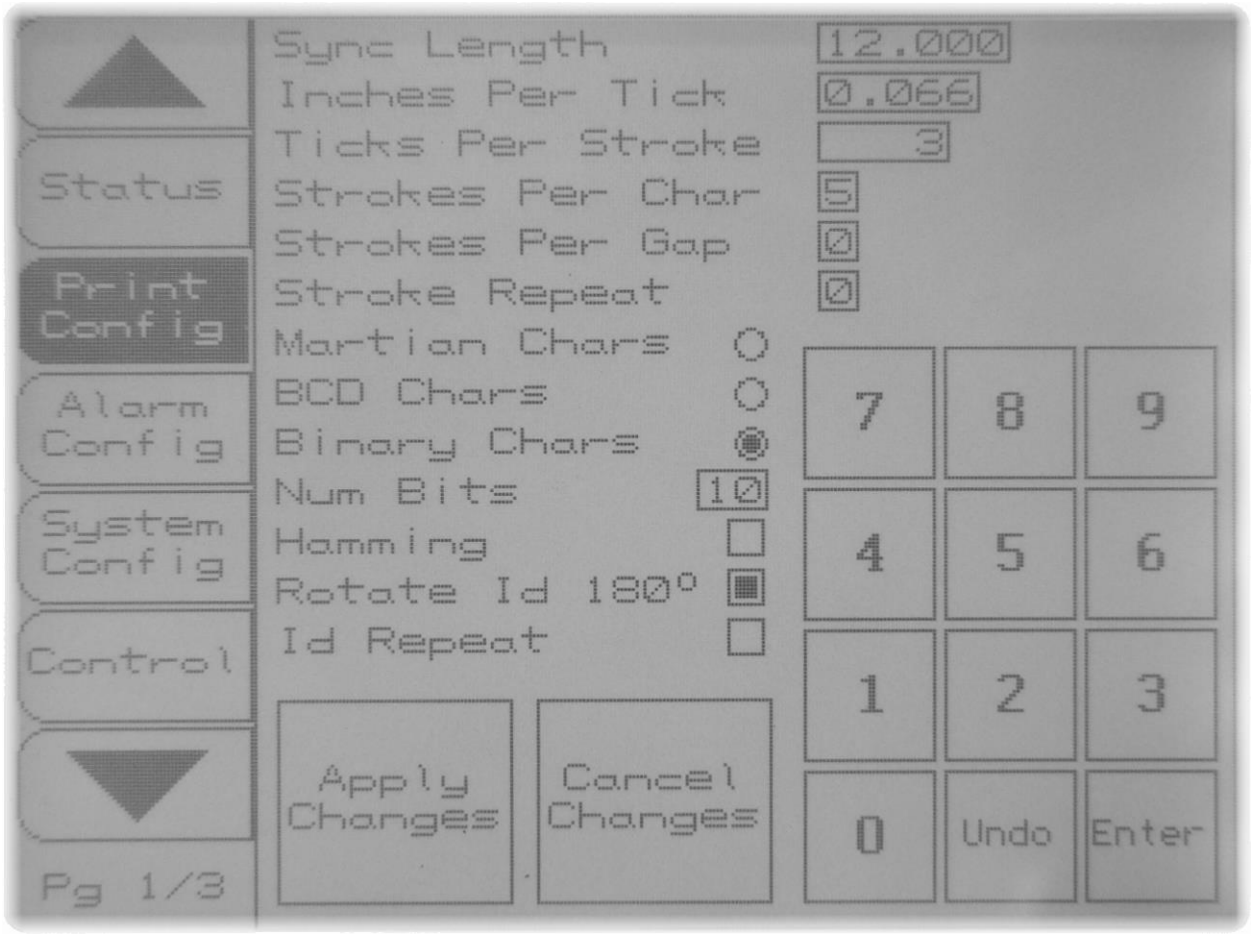


Figure 12. Print Configuration Screen

Parameter	Default	Min	Max	Description
Sync Length[2]	12.000	0.000	48.000	This is a special function on the ID Printer to print periodic sync marks on boards. These sync marks are used for a downstream board tracking system and are not required for standard printing applications.
Inches per Tick[3]	0.066	0.001	1.000	To determine this value, divide the LHG outfeed roll circumference by the number of encoder ticks per revolution for the outfeed roll, then multiply the result by the encoder prescale.

[2] Must match setting in **frmincfg**.

[3] Calculated based on the LHG Outfeed roll circumference, the encoder ticks per revolution and the encoder prescale in **frmincfg**.

Parameter	Default	Min	Max	Description
				For example, a 33" roll and a 4000 tick per rev encoder with a prescale of 4 will result in a value of 0.033". 33 / 4000 * 4 = 0.033 The "encoder prescale" value is shown in the ID Printer Data section of ***C:\Newnes\LHG\Cfg\frmincfg.txt***.
Ticks Per Stroke	3	1	100	This is the number of encoder ticks that make up one stroke in the character map.
Strokes Per Char[4]	5	5	5	**This value must be set to 5**. The character map is built internally by the controller based on 5 strokes per character row.
Strokes Per Gap	0	0	9	This sets the character gap and should only be adjusted in conjunction with the capabilities of the IDR. This value can be set to 0 for BCD or Binary IDs and is typically around 3 for Martian characters.
Stroke Repeat	0	0	9	This is a Stroke multiplier for the Strokes Per Char and Strokes Per Gap values and is almost always set to 0. The multiplier is calculated as: Mult = (StrokeRepeat + 1) Setting to 0 uses the current settings. Setting to 1 is a x2 multiplier, 2 is a x3 multiplier etc.
Martian Chars	0	0	1	Select this checkbox to enable printing of Martian Characters
BCD Chars	0	0	1	Select this checkbox to enable printing of BCD Characters
Binary Chars	1	0	1	Select this checkbox to enable printing of Binary Characters
Num Bits	10	1	16	Number of bits to use for conversion of the ID to Binary
ID Shift	0	0	1	Select this checkbox to enable Shifted Binary IDs
Hamming	0	0	1	Select this checkbox to enable hamming code insertion. This is used in conjunction with BCD characters on the high-speed printhead.
Rotate ID 180°	1	0	1	Select this checkbox to rotate the printed board ID by 180 degrees. This can be useful for left-handed operators, or operators standing on the non-lumberline side of the transfer.

Table 18. Print Configuration

[4] Strokes per Char must be set to 5 the same as in **frmincfg**.

5.3 Alarm Configuration

The **Alarm Configuration** screen lets you define when to trigger warnings relating to ink temperature, ink pressure or ink level.

Note: Setting the max alarm thresholds to the max allowed value or the min thresholds to 0 will disable the alarm. This is not recommended since there will be no notification of problems on the ID Printer. This is useful for debugging purposes only.

To see this screen, press the **Alarm Config** tab on the left of the touchscreen.

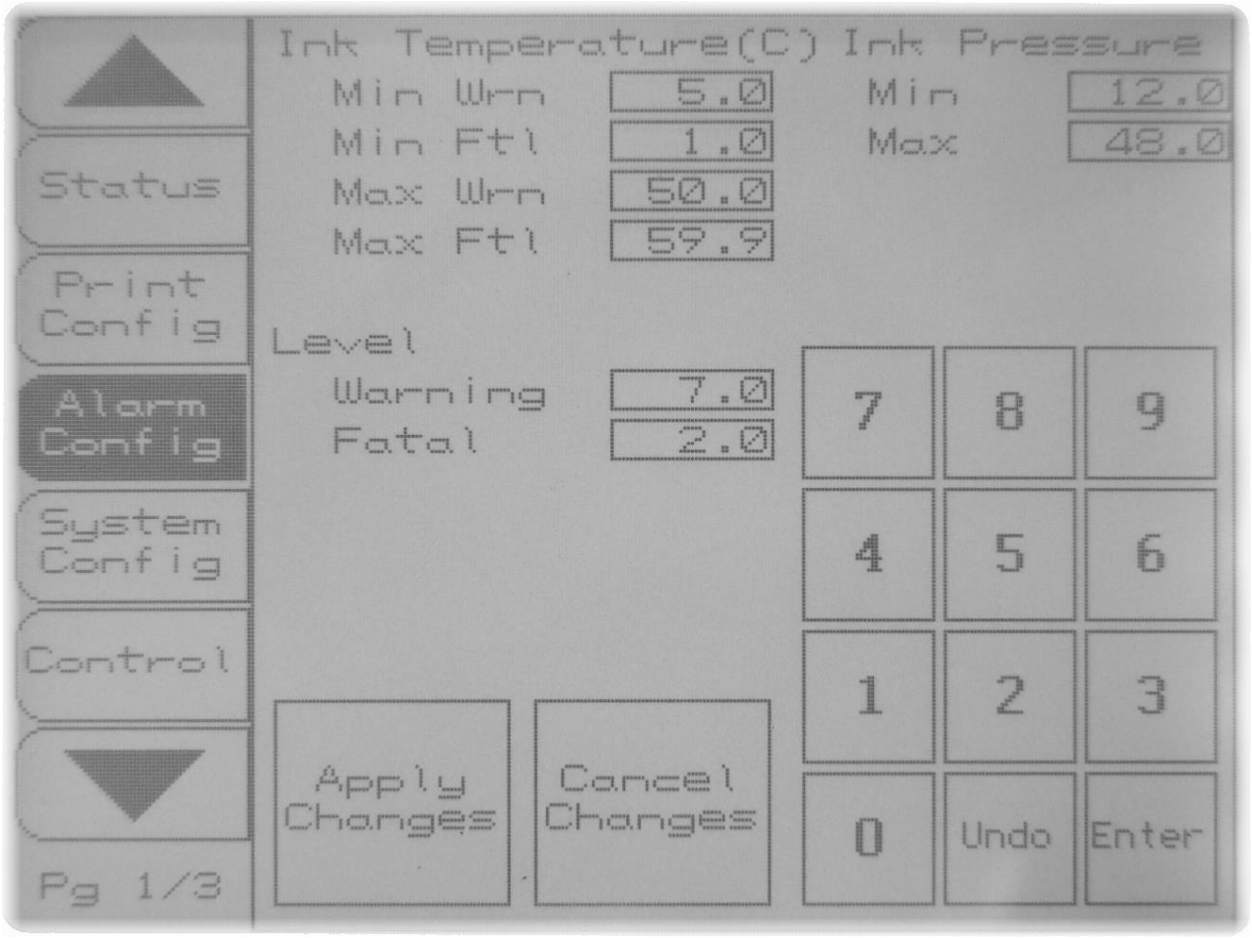


Figure 13. Alarm Configuration Screen

Alarm	Parameter	Default	Min[5]	Max[5]	Description
Ink Temperature	**Warn**				Specifies the minimum and maximum ink temperatures. If the temperature drops below the minimum, or rises above the maximum, a **Warning Alarm** will be generated (yellow light on the printer console will illuminate).
	Min **Max**	5.0 50.0	1.0 5.0	50.0 59.9	
	Fatal				Specifies the absolute minimum and maximum ink temperatures. If the temperature drops below the minimum, or rises above the maximum, a **Fatal Alarm** will be generated (red light on the printer console will illuminate).
	Min **Max**	1.0 59.9	0.0 50.0	5.0 119.9	
Ink Pressure	**Min** **Max**	12.0 48.0	0.0 12.0	48.0 72.0	Specifies the minimum and maximum allowed ink pressure (in psi). If the pressure drops below the minimum, or rises above the maximum, a **Fatal Alarm** will be generated (red light on the printer console will illuminate).
Ink Level	**Warning**				Specifies the ink level percentage that will trigger a warning. If the ink level in the reservoir drops below this, a **Warning Alarm** will be generated (yellow light on the printer console will illuminate).
	Min	7.0	2.0	120.0	
	Fatal				Specifies the minimum allowed ink level percentage. If the ink level in the reservoir drops below this percentage, a **Fatal Alarm** will be generated (red light on the printer console will illuminate). This can be set to 0.0 to disable fatal alarms.
	Min	2.0	0.0	7.0	

Table 19. Alarm Configuration

Note: The **min/max** limits interact as values are entered since the **Warning** and **Fatal** alarm ranges can't overlap. For instance, setting the min **Ink Level Warning** alarm to 7.0% limits the upper range of the max **Ink Level Fatal** alarm to 7.0%. Likewise, the min **Fatal** alarm setting of 2.0% limits the lower end of the **Warning** alarm to 2.0%.

[5] The min/max values will change as values are entered since their ranges cannot overlap.

5.4 System Configuration

The **System Configuration** screen is set at system installation by a USNR technician and should normally not need to be changed.

To see this screen, press the **System Config** tab on the left of the touchscreen.

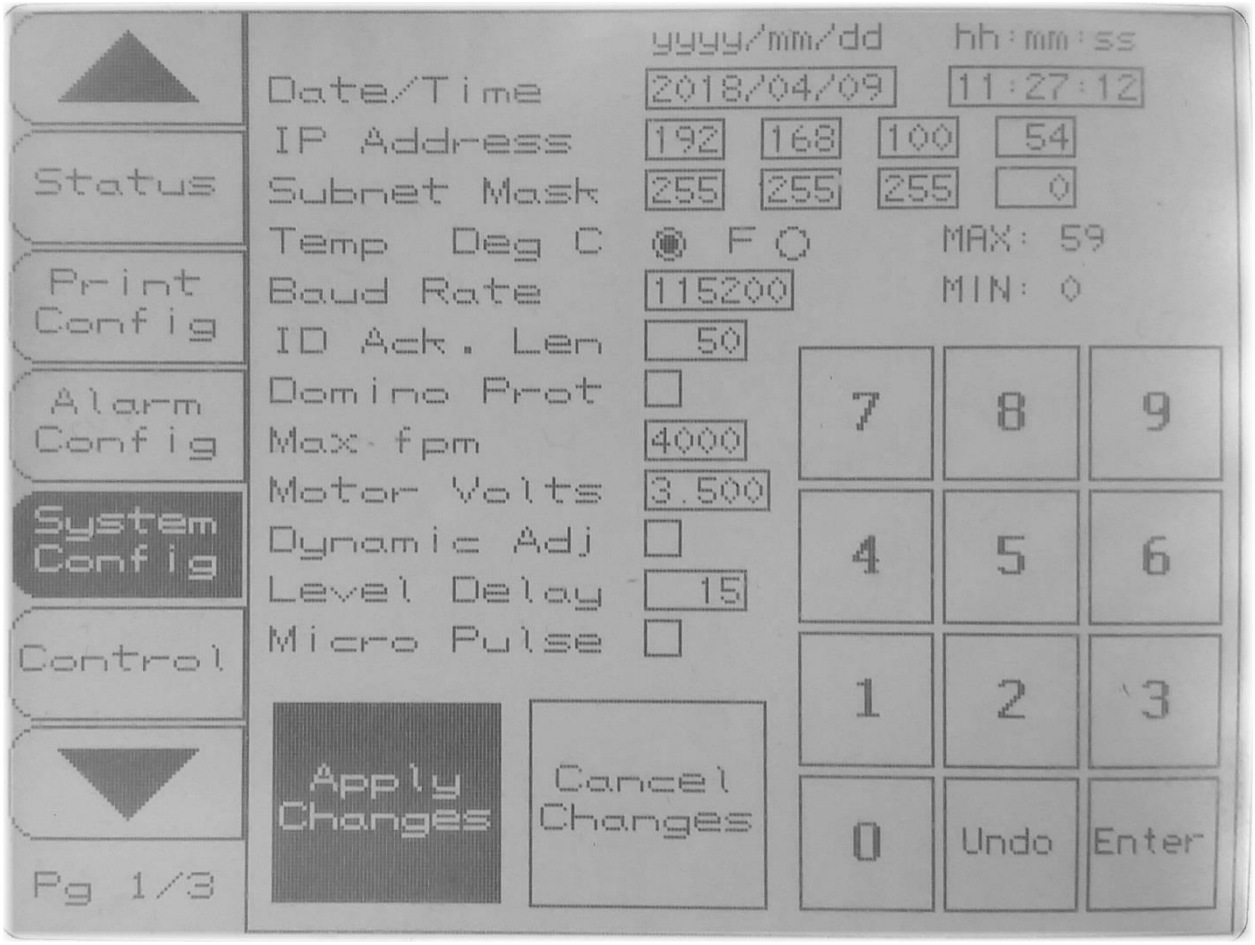


Figure 14. System Configuration Screen

Parameter	Default	Min	Max	Description
Date/Time[6]	1980/01/01	-	-	Specifies the current date and time from the Real Time Clock on the Display Controller.
IP Address	192.168.100.54	0	255	IP Address for Telnet interface
Subnet Mask	255.255.255.255	0	255	Subnet Mask for Telnet interface
Temperature	deg C	C	F	Specifies whether this printer system measures temperature in Celsius or Fahrenheit.

[6] Enable battery backed RAM on the Display Controller by removing the plastic tab from the internal battery clip before setting the date and time values or they will be lost on the next power cycle.

Parameter	Default	Min	Max	Description
Baud Rate[7]	115200	0	115200	Specifies the baud rate used in communication between the ID Printer and the LHG FRM.
ID Ack Len	50	0	1000	Specifies the length of the signal in milliseconds to acknowledge receipt of a board ID from the LHG FRM computer.
Domino Prot[7]	0	0	1	Select this checkbox to use the Domino communication protocol for communication between the ID Printer and the LHG. Most ID Printer applications use the USNR Protocol so this box should be un-checked.
Max fpm	4000	891	5000	This value indicates the max encoder based speed the printer is intended to operate at. The original functionality of this setting has been changed so the value is only used for display purposes.
Motor Volts	2.500	1.450	5.000	Sets the control voltage to the pump motor to adjust the speed and should normally be set to 2.500 – 3.500V. The minimum voltage is 1.450V, the maximum is 5.000V.
Dynamic Adj	1	0	1	Enables adjustment of the pump motor voltage to control the ink pressure during printer operation. The voltage can be adjusted by up to +/- 50% of the nominal voltage in 5% steps to a max of 5.0V and min of 1.45V (default).
Level Delay	15	0	100	Applies a filter (in seconds) to stabilize the level sensor readings. The level sensor can be affected by vibration which will cause the readings to fluctuate.
Micro-Pulse[8]	1	0	1	Enables generation of Micro-Pulses to the printhead nozzles when the transfer has stopped. Micro-Pulses periodically vibrate the valve solenoid to help prevent ink clogs in the nozzle.

Table 20. System Configuration

[7] Must match setting in **frmincfg**

[8] Requires Nozzle Driver Board firmware V2.3 or higher.

5.5 Control Screen

The Control screen lets you control various operations of the ID printer such as **Calibration**, **Alarm Reset** and **Nozzle Test**. It is also used in the **Nozzle Alignment** procedure.

To see this screen, press the **Control** tab on the left of the touchscreen.

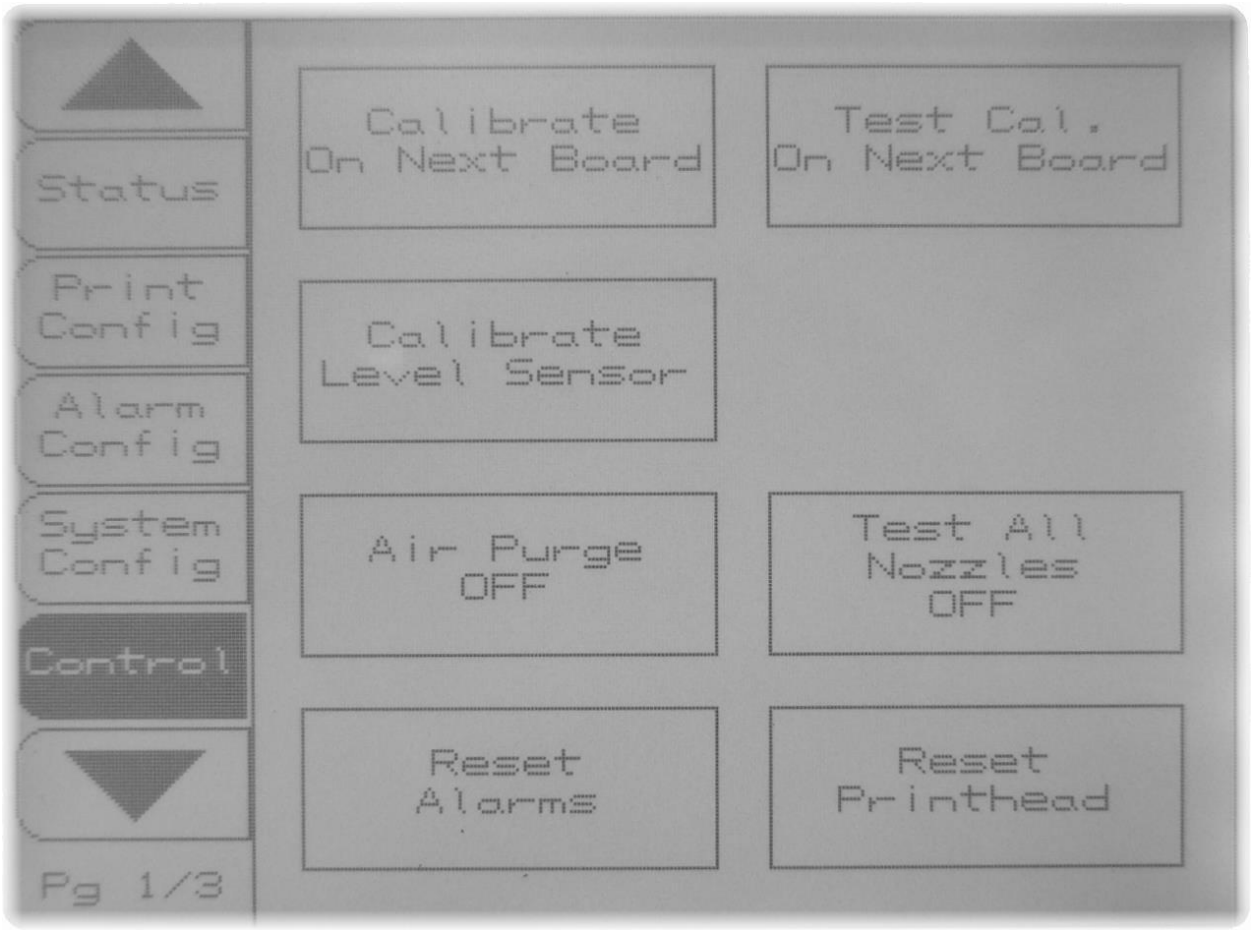


Figure 15. Control Screen

Parameter	Description
Calibrate on Next Board	Press this button to activate all nozzles at the same time when the next board passes through the print zone. See **Nozzle Alignment** for details.
Test Cal on Next Board	Press this button to test the nozzle alignment by activating all nozzles according to the values entered on the **Nozzle Align** screen.
Calibrate Level Sensor	Press this button to **Calibrate** the **Ink Level Sensor**. This should be performed periodically when the carboy is re-filled.
Air Purge	Press this button to purge any air in the ink plumbing system. This will temporarily increase the pump motor speed to force air through the regulator and back to the reservoir.
Test All Nozzles	Press this button to activate and test all nozzle valves. To activate an individual nozzle, see the **Nozzle Test** screen.
Reset Alarms[9]	Press to reset the alarm lamps once the fault is corrected.
Reset Printhead	Press to reset all nozzle Alignment Lead/Trail values, recalculate the nozzle trim adjustments and activate all nozzles. Normally used when a printhead is replaced to set the default operating conditions.

Table 21. Control Screen

[9] Alarms clear automatically starting with printer firmware rev 1.4.1.0.

5.6 Nozzle Align

The **Nozzle Align** screen lets you enter the fixed offset adjustment distance for each nozzle on Martian style printheads. It also allows entering nozzle activation trim adjustments to advance or delay the lead/trail timing of individual spray marks.

To see this screen, press the **Nozzle Align** tab on the left of the touchscreen.

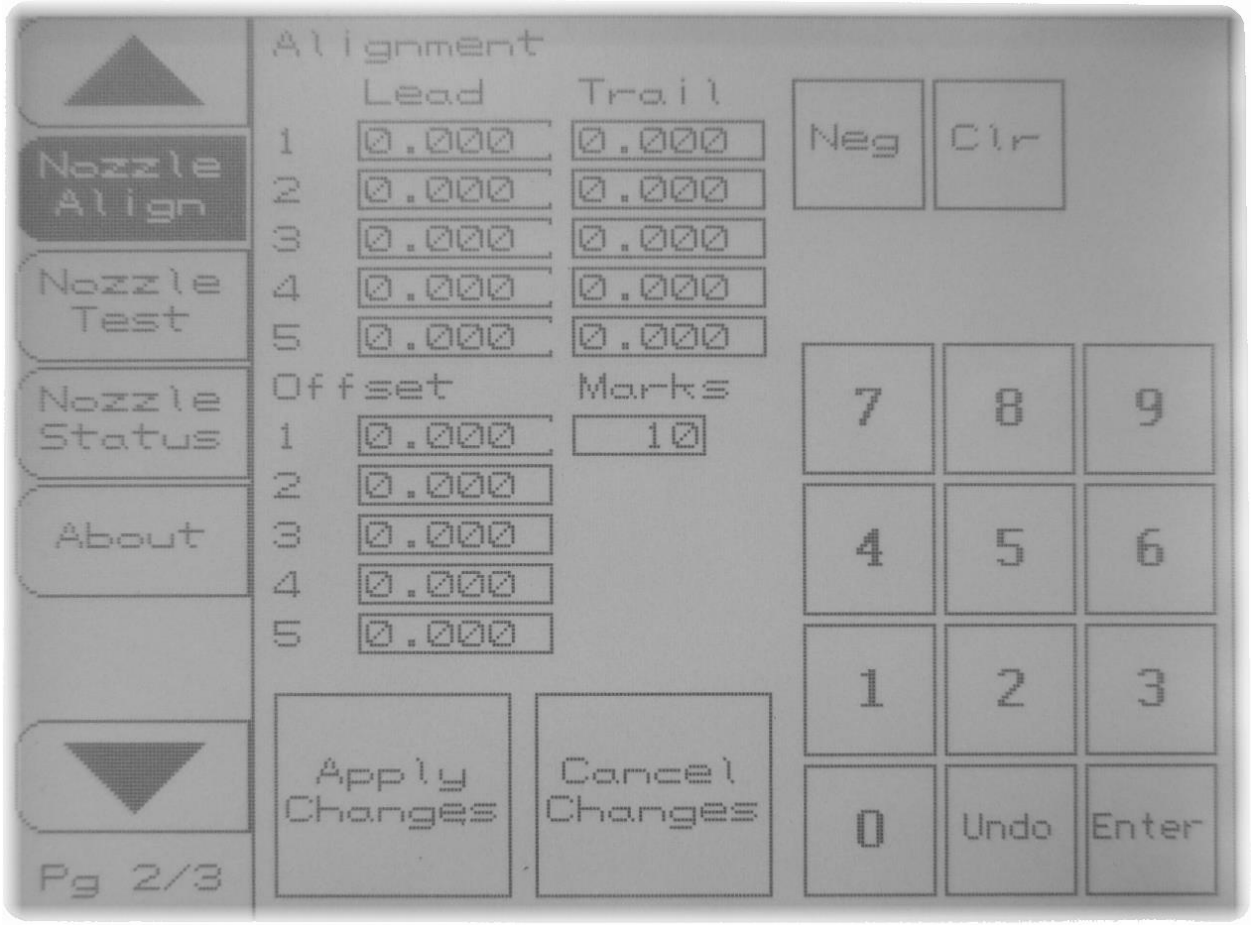


Figure 16. Nozzle Alignment Screen

Parameter	Default	Min	Max	Description
Alignment Lead/Trail	0.000	0.000	±65.535[10]	Nozzle Alignment Trim. These values specify trim adjustments to each nozzle's lead/trail activation timing. Positive values delay the timing, negative values advance it.
Neg	-	-	-	Converts the currently active nozzle trim to a negative value.
Clr	-	-	-	Clears all nozzle trim values.
Offset	0.000	0.000	9.999	These values set the offset between nozzles as determined by Nozzle Alignment calibration. The default values shown are valid for the Martian printhead design. For the High Speed (Binary) printhead, these should all be set to 0. For either printhead, the offsets can be adjusted based on the Nozzle Alignment calibration.
Marks	10	1	100	Specifies the number of consecutive spray marks to print for the Printhead Calibration and Test Cal functions. See Control Screen.

Table 22. Nozzle Configuration

[10] Although the field is capable of entering trim adjustments of ±65.535 inches, the actual trim adjustment is limited to slightly less than half the character width on both the lead and trail edges of the spray marks. The ID Printer automatically calculates the max trim adjustment values and displays those when the Apply button is pressed.

5.7 Nozzle Test

The **Nozzle Test** screen lets you test each ink spray nozzle individually. When you press a button, that nozzle will spray a series of ramping pulses over about 4-5 secs (you can press the button again to turn off the nozzle sooner). The ramping pulses helps clear debris from the nozzles.

Note: Nozzle 5 is the nozzle closest to the fenceline; Nozzle 1 is farthest away.

To test all nozzles simultaneously, see the **Control Screen**.

To see this screen, press the **Nozzle Test** tab on the left of the touchscreen.

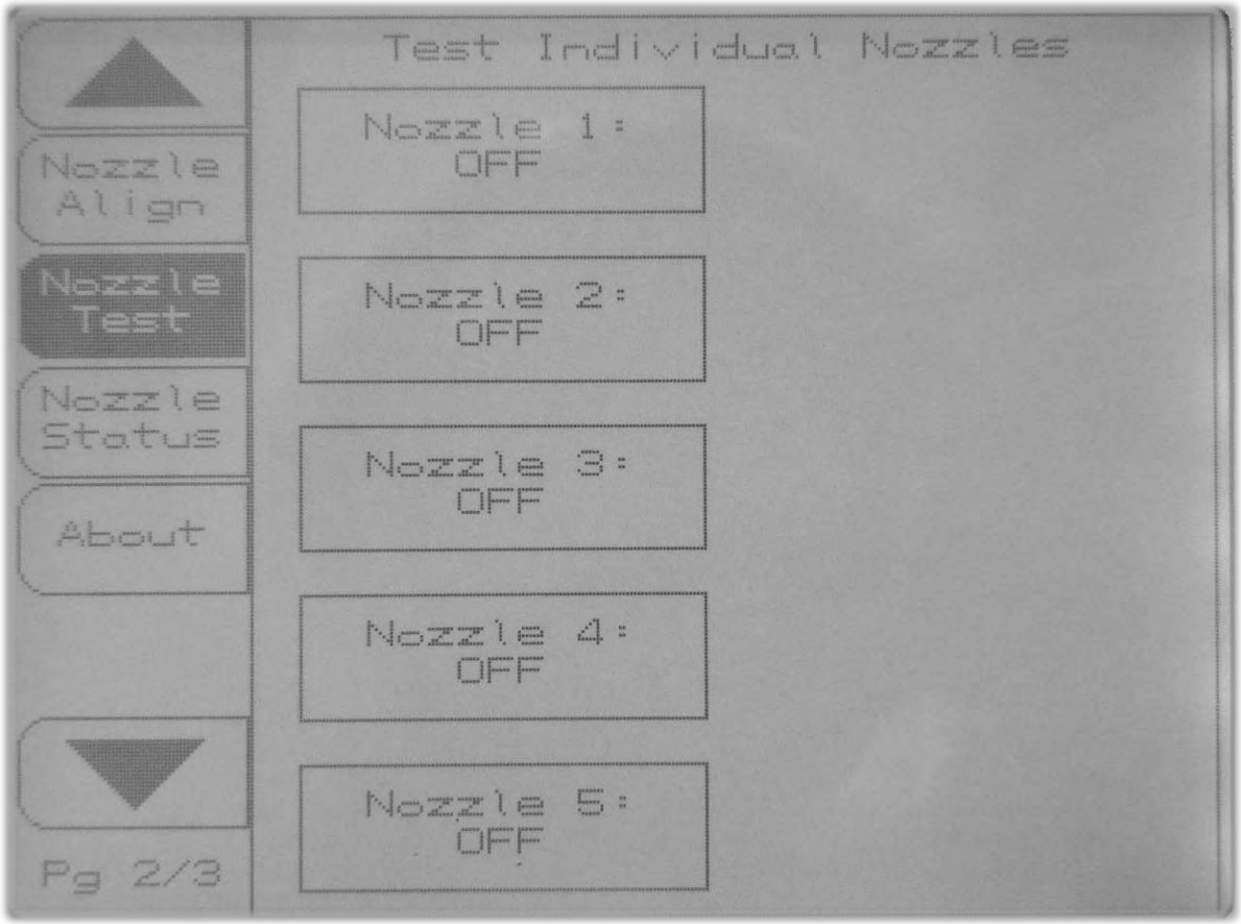


Figure 17. Nozzle Test Screen

5.8 Nozzle Status

The **Nozzle Status** screen displays the enabled state and the number of activations for each nozzle in the printhead. Problem nozzles can be disabled by clearing the check box next to the nozzle number. The enabled flags are not stored in flash and all nozzles default to activated after a power cycle. This information may be used by USNR technicians for troubleshooting or system maintenance.

To see this screen, press the **Nozzle Status** tab on the left of the touchscreen.

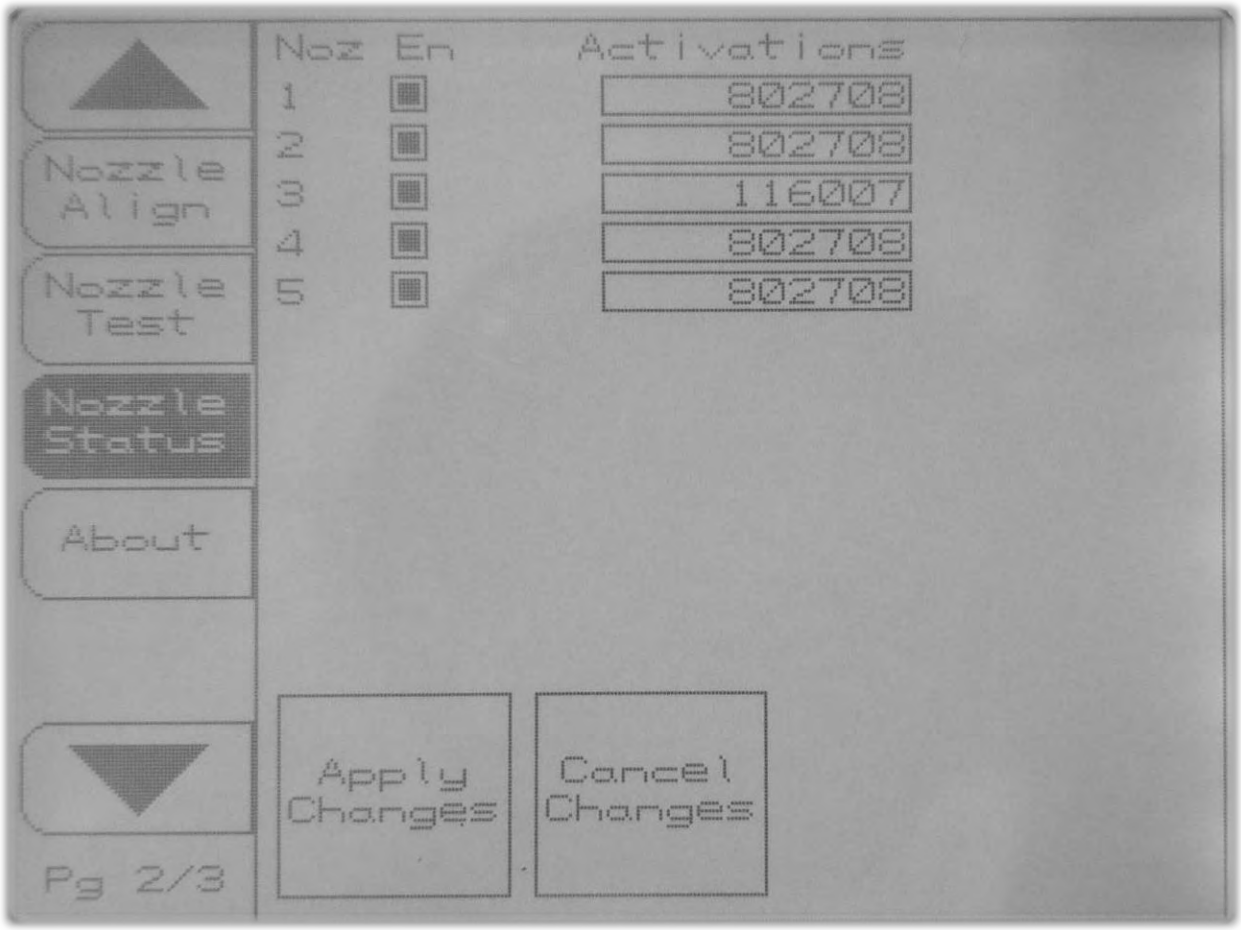


Figure 18. Nozzle Status Screen

Parameter	Default	Min	Max	Description
Noz En	1	0	1	Enable or disable the selected nozzle. The flags are not stored in flash and all nozzles revert to activated after a power cycle.
Activations	0	0	4,294,967,296	Displays the total activation counts for each nozzle.

Table 23. Nozzle Status Screen

5.9 About

The **About Screen** shows information about the printhead microcontroller and the user interface (GUI) controller. To see this screen, press the **About** tab on the left of the touchscreen.

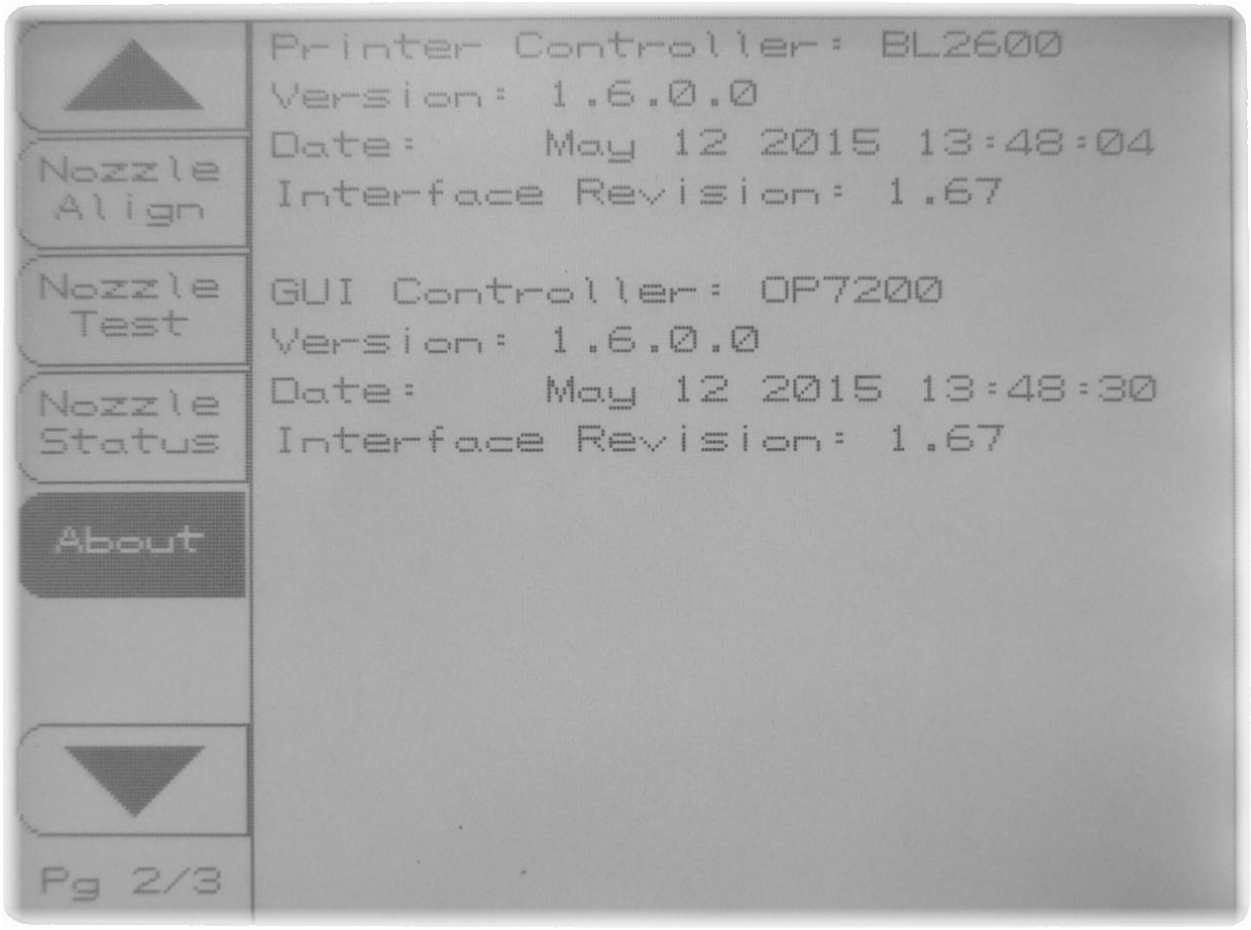


Figure 19. About Screen

5.9.1 ID Printer Version String

sw_version.sw_revision.major_rev.minor_rev

sw_version	Software version of the ID Printer indicates changes required to support a particular hardware configuration or a complete change in architecture. The software version must match the components used and should be the same for the main and display controllers.
sw_revision	Software revision of the ID Printer that affects the compatibility level between controllers. For instance, a change to the Flash Config structure may affect compatibility. Both the main and display controllers must be at the same software revision to communicate with each other or support new functionality.
major_rev	Adds functionality to one or both controllers without impacting compatibility. The main and display controllers can be at different major rev levels.

minor_rev	Bug fix only that doesn't add functionality. The main and display controllers can be at different minor rev levels.

Table 24. About Screen

5.10 Debug Configuration

The **Debug Configuration** screen lets you turn on/off certain debug options for system troubleshooting. The options selected here control messages sent to the **Debug Screen**.

Note: Ensure that these options are turned **OFF** for normal production or they can negatively affect print quality. The debug flags are maintained over a printer power cycle and must be manually turned **OFF**.

To see this screen, press the **Debug Config** tab on the left of the touchscreen. Turn on or off the desired debug function and press the **Apply Changes** button to put your changes into effect.

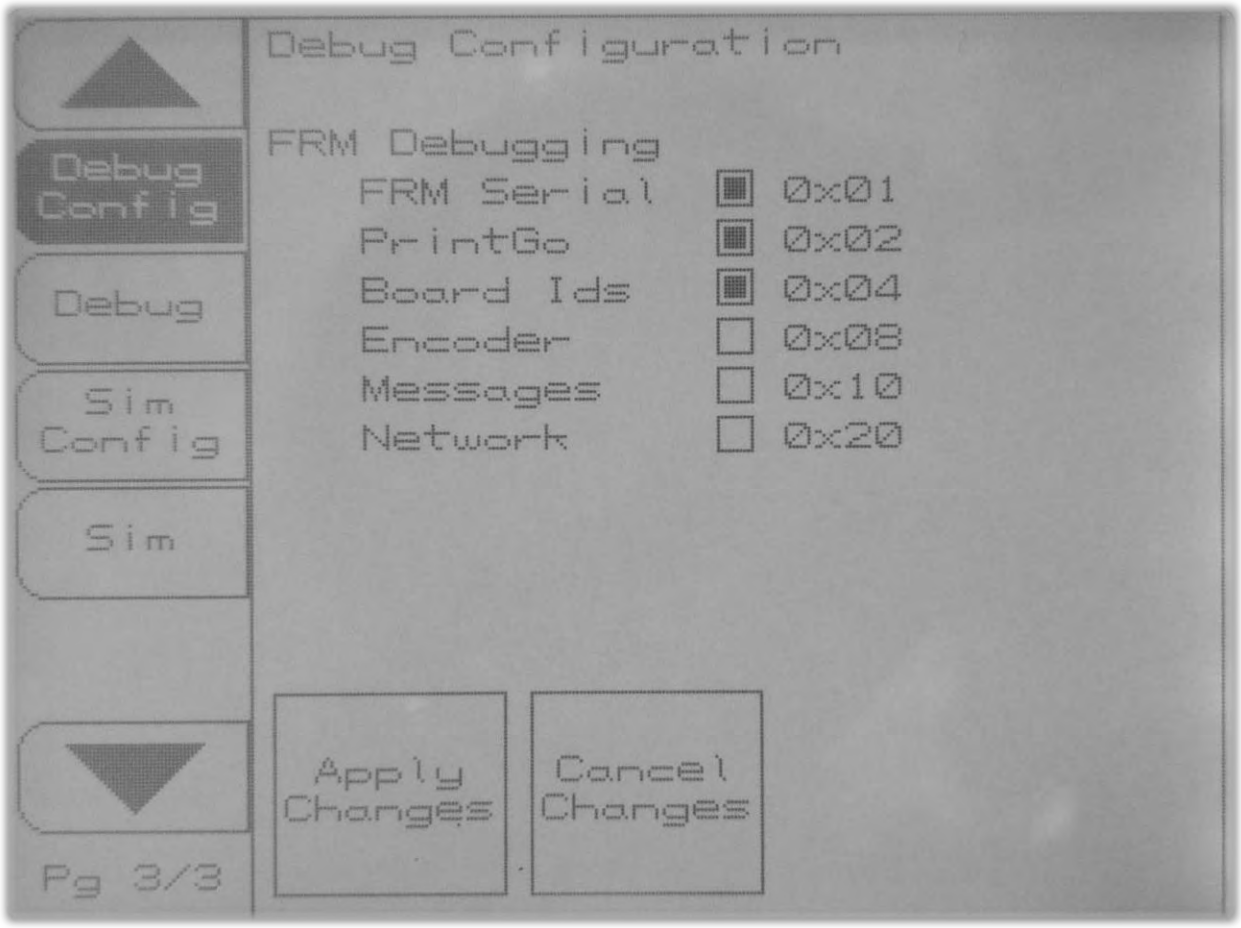


Figure 20. Debug Configuration Screen

Debug Flag	Description
FRM Serial	Shows received serial messages **ss** from the FRM, usually an ID. ***Received message ss***
PrintGo	Indicates a **PrintGo** was received from FRM. The ID in buffer **n** will be printed with **xx** patterns to spray for this ID. ***bGotPrintGo[n], cntPrintGo[n] = xx***
Board IDs	Indicates the buffer **n** that ID **ss** will be sent to for printing. ***buffer[n] = ss***
Encoder	Prints the encoder speed periodically
Messages	Shows message communications between the main and display controllers. This is usually configuration messages etc and shows that the two controllers are talking to each other.
Network	Shows the connectionstate and errors on the Telnet network connection.

Table 25. Debug Configuration

5.11 Debug Screen

The **Debug Screen** displays system messages to help with troubleshooting. The types of messages displayed here depend on which debug levels are selected on the **Debug Configuration** screen.

To see this screen, press the **Debug** tab on the left of the touchscreen.

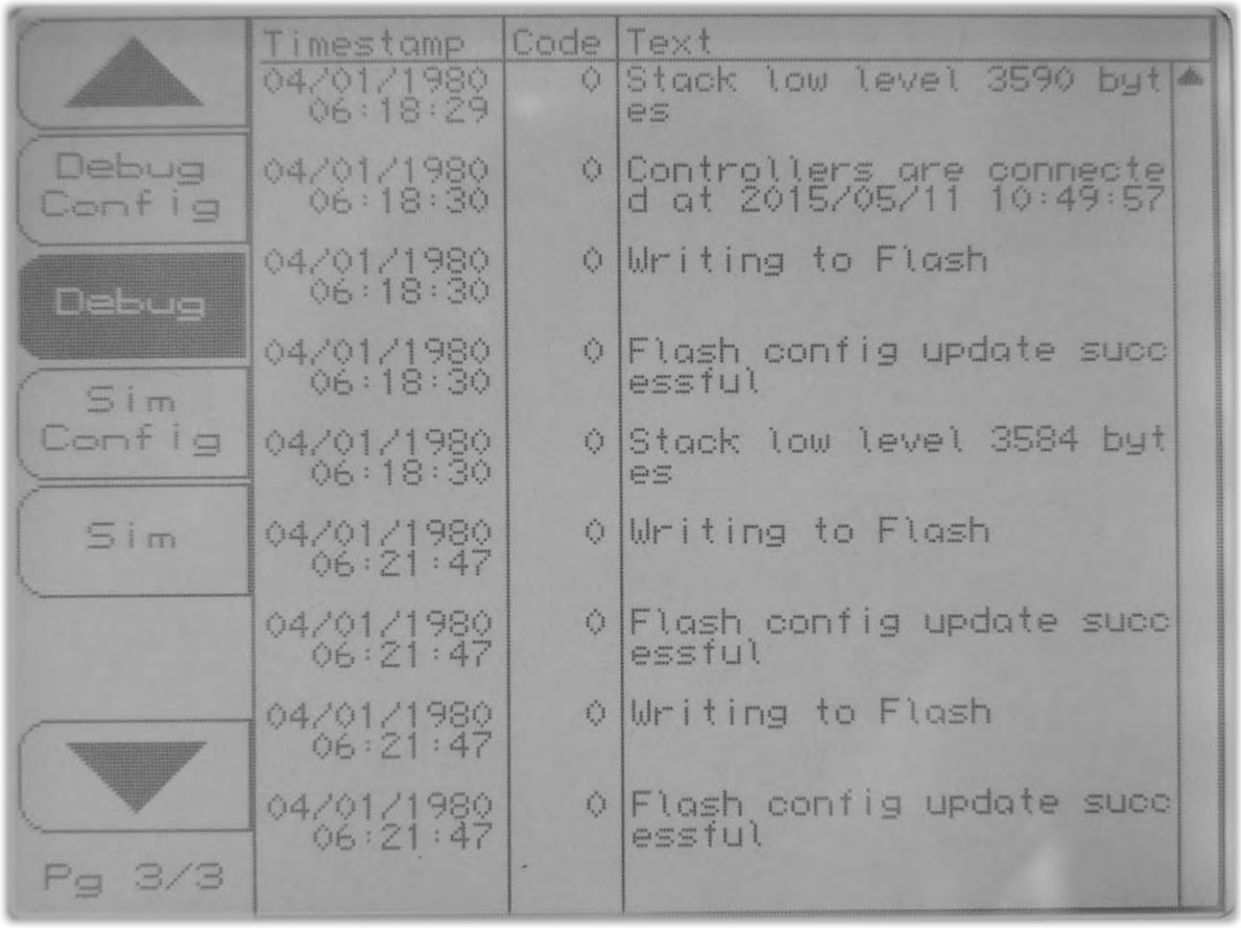


Figure 21. Debug Screen

Below is a list of the different debug messages printed by the ID printer, the debug flags controlling them and their meaning.

Level	Debug Text	Flag[11]	Description
Informational	Writing Flash.		Flash update at startup.
	Nozzle activation counts reset.		Indicates nozzle activation counts have been reset.
	Printer: Main Controller started!		Printer startup message.
	Alarms have been reset!		Alarms condition has been cleared.
	Received message **ss**	DebugSerial	Received a serial message from the FRM, usually an ID.
	bGotPrintGo[**n**]	DebugPrintGo	Received a PrintGo for buffer **n**

[11] Some messages require debug flags to be set before they are displayed. Messages without a flag shown are always printed when they occur.

Level	Debug Text	Flag[11]	Description
	cntPrintGo[**n**] = **xx**	DebugPrintGo	Received **xx** PrintGo's for buffer **n** for the current ID.
	buffer[**n**] = **ss**	DebugBoardID	The received ID **ss** was sent to buffer **n**
Errors	Warning alarm **ss**		Warning alarm active, message sent to FRM.
	Fatal alarm **ss**		Fatal alarm active, message sent to FRM.
	Flash config error, msgSize **xx** != rcvSize **yy**		Config message error from FRM, the config is not updated.
	Error. Buffer overrun waiting for end of data.		The FRM message size was >= 256 bytes, the message is ignored.
	Received invalid ID char **ss**, flushing ID		The FRM message contained characters other than 0-9, the buffer is flushed.
	Error. Buffer overrun while getting ID data.		The FRM message size was >= 256 bytes, the buffer is flushed.
	Buffer **n** no patterns, ID **ss** invalid.		Error building the spraymap for the indicated buffer and ID and won't be printed.
	PrintGo[**n**] error, not ready to print.	DebugPrintGo	A PrintGo was received for buffer **n** before the spraymap was completed, the printgo is ignored.
	PrintGo[**n**] error, duplicate printgo.	DebugPrintGo	A second PrintGo was received for buffer n while the printer was already printing, the second printgo is ignored.
	Buffer **n** already active, ID **ss** rejected.		Buffer **n** is currently printing an ID, the new ID **ss** is rejected.

Table 26. Debug Screen

5.12 Simulation Configuration

The **Simulation Configuration** screen is used to setup the printer parameters for simulation. This screen may be used by USNR technicians for troubleshooting during system installation; it should never be changed by the operator.

To see this screen, press the **Sim Config** tab on the left of the touchscreen.

Note: As of ID Printer version V1.6.0.0 the Simulation Configuration screen is only visible on special debug builds and not standard production builds. The simulation functions can still be accessed through the Telnet command interface.

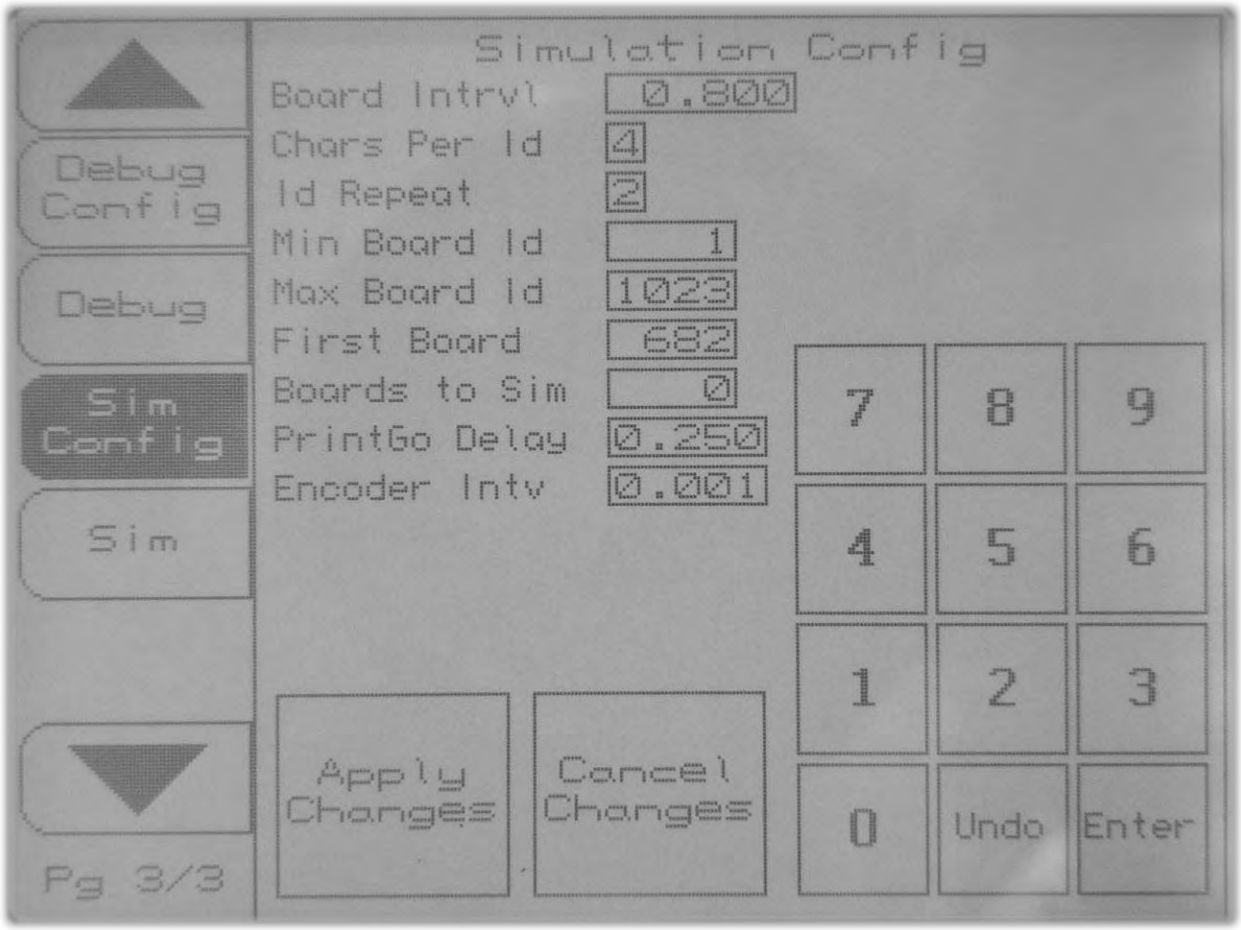


Figure 22. Simulation Configuration Screen

Parameter	Default	Min	Max	Description
Board Intrvl	1.000	0.001	99.999	Interval between simulated board IDs (sec). This interval should be the same as the **PrintGo** interval to print every ID. Setting it higher or lower will cause IDs to be repeated or skipped respectively.
Chars Per Id	4	0	4	Number of characters to simulate per ID, typically 3 or 4.
Id Repeat	2	0	9	Number of times to repeat the simulated ID (1 for single ID, 2 for dual ID).
Min Board Id	1	0	9999	Minimum board ID to simulate.
Max Board Id	9999	0	9999	Maximum board ID to simulate.
First Board Id	1	0	9999	First board ID to simulate.
Boards to Sim	0	0	9999	Set to the number of IDs to simulate or 0 for continuous.
PrintGo Delay	0.250	0.000	9.999	Delay after the board ID is simulated before a PrintGo signal is asserted.
Encoder Intv	0.001	0.000	1.000	Interval between encoder ticks (sec) when **Sim Encoder** is enabled. This sets the transfer speed for simulation.

Table 27. Simulation Configuration

5.13 Simulation Control

The **Simulation** screen is used to set the I/O signals to simulate and to start/stop simulation. This screen may be used by USNR technicians for troubleshooting during system installation; it should never be changed by the operator.

To see this screen, press the **Sim** tab on the left of the touchscreen.

Note: As of ID Printer version V1.6.0.0 the Simulation Control screen is only visible on special debug builds and not standard production builds. The simulation functions can still be accessed through the Telnet command interface.

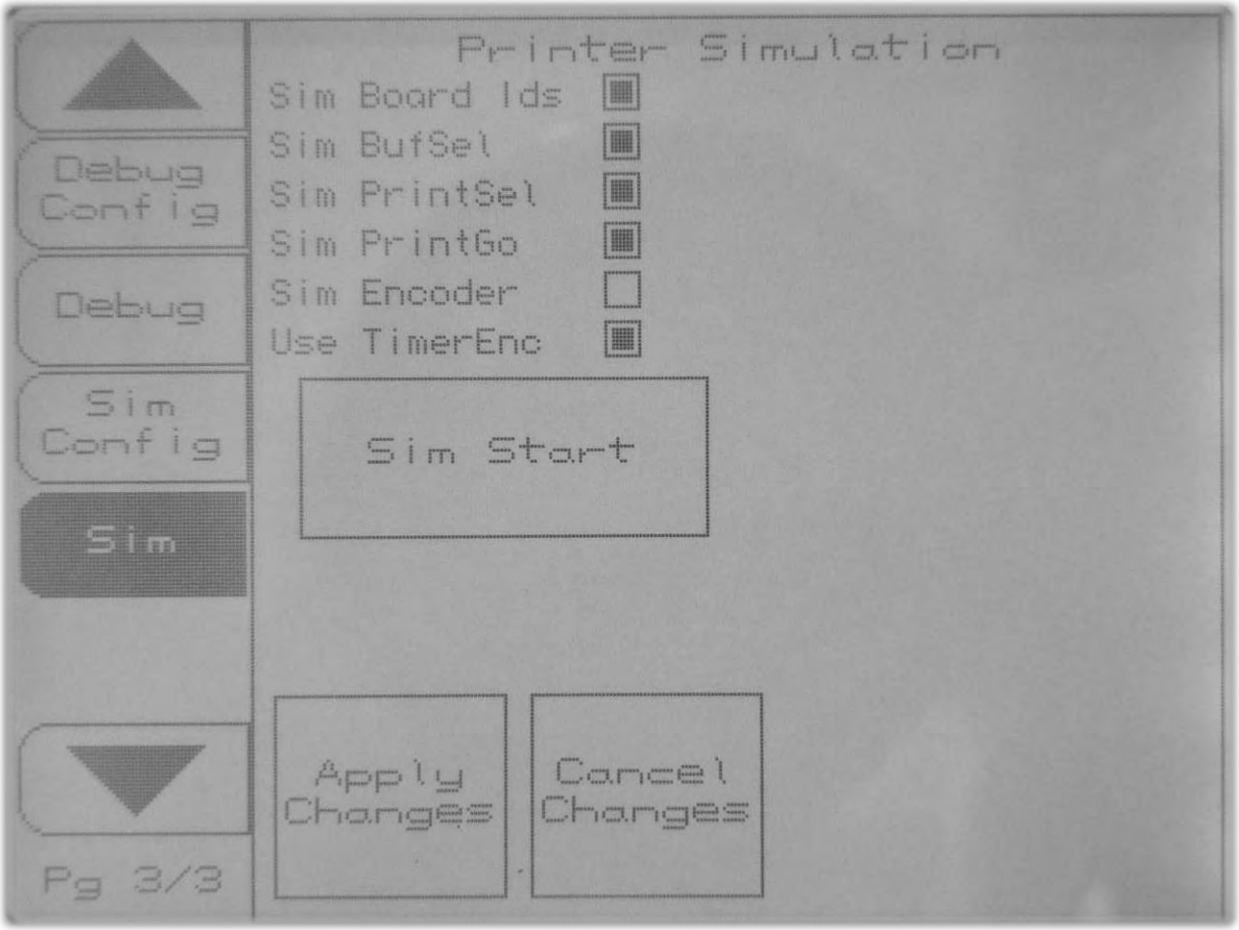


Figure 23. Simulation Control Screen

Parameter	Default	Min	Max	Description
Sim Board Ids	0	0	1	Simulates Board IDs and sends them through the controller as if they came from the FRM.
Sim BufSel	0	0	1	Toggle the internal ID buffers to simulate **Buffer Select**.
Sim PrintSel	0	0	1	Toggle the internal print buffers to simulate **Print Select**.

Parameter	Default	Min	Max	Description
Sim Print-Go	0	0	1	Simulate the **PrintGo** signal to print the current ID by calling the **PrintGo ISR**.
Sim Encoder	0	0	1	Simulate encoder ticks to trigger the **Encoder ISR** at the specified Encoder Interval. **NOTE: Use Internal Enc** must be cleared when simulating the encoder.
Use TimerEnc	0	0	1	Simulate encoder ticks using the internal (fixed) interval timer to trigger the Encoder Timer ISR. The internal encoder speed is faster than is possible with the **Sim Encoder** flag and interval. **NOTE:** Overrides **Sim Encoder** when set.
Sim Start	0	0	1	Button to control Simulation. **Sim Start** – press to start simulation, the button changes to Sim Stop. **Sim Stop** – press to stop simulation, the button changes to Sim Start.

Table 28. Simulation Configuration

6. Printer Operation

6.1 ID Printer On / Off

1. Pull out the power button on top of the printer console, the green lamp will illuminate.
2. Using the **Status Screen** on the printer console's touchscreen display, verify that the ink temperature is 40°C (104°F) and ink pressure is 25-40 psi. (Correct pressure should be achieved almost immediately; it may take a few minutes to reach the correct temperature.) The pump should run continuously while the printer is on.
3. Using the **Control** or **Nozzle Test** screens, activate all spray nozzles 3–5 times (or more as required) to remove any air from the ink system or anti-freeze in the printhead (see **Nozzle Test** for details).
4. Begin running boards through the Linear High Grader system.
5. Inspect boards for correct board IDs. If the characters are not satisfactory, align the spray nozzles (see **Nozzle Alignment**).
6. To turn the printer off, press the power button on top of the printer console.

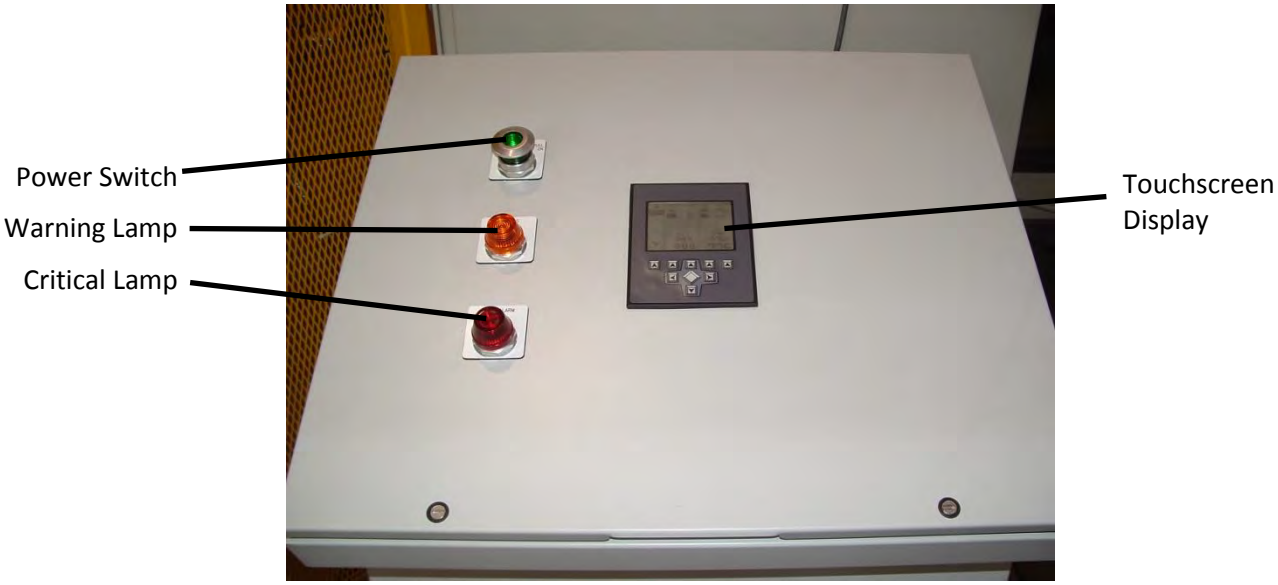


Figure 24. Printer Controls

6.2 Ink Reservoir

Fill the ink reservoir inside the printer console periodically or when a light on the console warns that the ink level is low. (To define the ink level warning, see the **Alarm Configuration**).

WARNING

Methanol in the ink is highly flammable. **Do not smoke while filling the ink reservoir. Keep ink away from heat, sparks and open flame.**
Before handling ink, read all supplied Material Safety Data Sheets regarding this product. Work in a well-ventilated area and wear gloves, safety goggles, and respirator.

To fill the ink reservoir:

1. Power off the ID Printer.

2. Remove the filler cap and level sensor assembly on top of the ink reservoir inside the printer console.
3. Fill the reservoir, taking care to prevent contaminates entering the ink system.
4. Replace the cap.
5. Turn on the ID printer and follow the **Ink Level Sensor Calibration** procedure below.

WARNING

Do not disconnect the regulator to reservoir return line with the pump motor running. Doing so will increase the ink pressure to a catastrophic failure point in the system.

Figure 25. Ink Reservoir

6.3 Level Sensor Calibration

An ink level sensor is included to measure the level in the ink carboy. The level sensor consists of a PVC sense-tube inside the tank that is connected to a pressure transducer on the IDPDA board with 1/8” Teflon tubing. A second Teflon tubing also connects from the carboy lid to the pressure transducer to measure ambient pressure inside the tank. Ensure the sense tubing (center of lid) is connected to the top port on the DP2 transducer on the IDPDA board and the ambient tubing (side of lid) is connected to the bottom port of DP2.

When ink is added to the carboy and the lid is re-attached, an air bubble gets trapped inside the PVC sense-tube. Depending on the ink level inside the carboy, the air pressure inside the sense-tube increases compared to the ambient pressure. The ink level is determined by comparing the pressure in the sense tube to the ambient air pressure in the carboy.

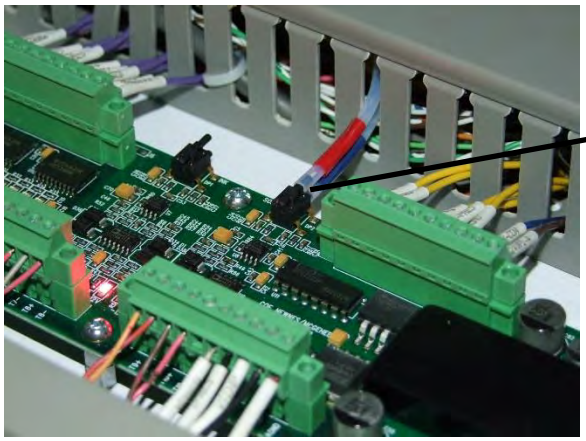


Figure 26. Level Sensor, Carboy and IDPDA Board

The **Ink Level** icon is displayed on the top band of the **Status Screen** and is used to generate both **Warning** and **Fatal** alarms based on the **Alarm Configuration** settings. For the ink level to be read accurately the sensor must be setup for both the low and high fill mark. This is normally done by service technicians at USNR but may require adjustment after a refill or if the ink levels appear off.

To calibrate the ink level sensor:

1. Remove the filler cap and level sensor tube assembly from the reservoir tank. Use a clean cloth and wipe the surface of the sensor tube to remove any excess ink.
2. Fill the carboy to the appropriate full level.
3. On the **Display Controller**, select the **Control Screen** and press **Calibrate Level Sensor**. The control text will change to **Calibrate Low Level**.
4. With the sensor tube in open air, press the **Calibrate Low Level** control. The low level setting will be calibrated after a few seconds and the control text will change to **Calibrate High Level**.
5. Replace the filler cap and sensor tube assembly in the carboy and secure the lid.

Note: The level sensor works by measuring the pressure of air trapped in the sensor tube. Ensure that the tube is held vertically when inserting into the reservoir tank to trap the air bubble.

6. Press the **Calibrate High Level** button on the control screen. After a few seconds the high level will be calibrated and the control text will display **Calibrate Level Sensor** again.

The ink level icon on the display **Status Screen** should now indicate the reservoir tank is full, reading at or very near 100%.

Note: The level sensor is quite simple and provides an indication of the ink level in the reservoir. It should be virtually maintenance free but may require occasional re-calibration.
If the ink level read on the display controller appears to be significantly out, try removing and replacing the filler cap and sensor tube assembly from the reservoir to re-trap the air bubble.

6.4 Ink Pressure Adjustment

You can monitor ink pressure from the **Status Screen**. Normal operating pressure is 25-40 psi depending on line speed, character size etc. The minimum pressure is 10 psi and maximum is 50 psi. Values outside a pre-defined range will cause a **Printer Alarm** to be generated (to define these limits, see the **Alarm Configuration** screen).

You can adjust the pressure using the regulator in the console lower cabinet. To adjust the ink pressure:

1. Ensure the transfer is stopped or the **Dynamic Adj** parameter is disabled.
2. Pull out the regulator knob to release the lock.
3. Turn the knob clockwise to increase pressure, or counter-clockwise to decrease pressure. Observe the printhead ink pressure on the display console Status Screen.
4. Push the knob back in to lock again.
5. Check the ink pressure on the **Status Screen**, it should read close to the mechanical regulator setting.

Note: The ink pressure shown on the status screen is the pressure read by a sensor inside the printhead, this may be slightly different than the pressure indicated on the regulator but should be within 3-5 psi.

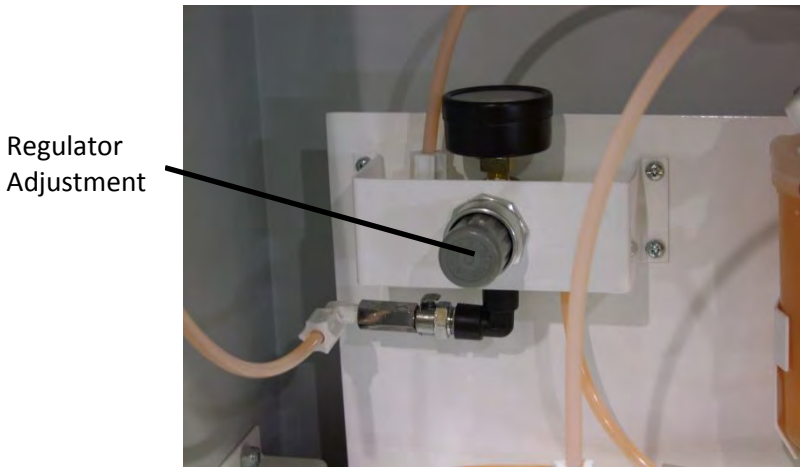


Figure 27. Ink Pressure Regulator

6.5 Nozzle Alignment

This nozzle alignment procedure is an important step in configuring your Board ID Printer if the Martian Character set is being used.

Writing the ID characters on each board requires precise timing of the ink spray nozzles. Since the nozzles are physically offset from one another on Martian style printheads, the printer must know when to activate each nozzle so the ink spray from each nozzle aligns with the others. The following nozzle alignment procedure ensures the precisely timed activation of each nozzle.

Note: Nozzle alignment is normally only required on **Martian Character** printheads and usually only when the printhead gets replaced. **BCD & Binary** (HighSpeed) printheads don't usually require nozzle alignment so all values on the **Nozzle Align** tab can be set to 0.000.

To align the ink spray nozzles:

1. Stop production through the Linear High Grader.
2. On the printer console, press the **Status** tab to open the **Status Screen**.
3. Make sure the ink pressure is adjusted according to the site requirements.
4. Press the **Control** tab to open the **Control Screen**.
5. Press the **Calibrate on Next Board** button to generate an alignment test pattern on the next board that passes though the print zone.
6. Run a board through the LHG.
7. Remove the test board from the line and inspect the test pattern. The test pattern is composed of five lines, each sprayed by an individual nozzle. The nozzles all activate at the same time, so the offset between each line is due to the physical position and reaction time of each nozzle:

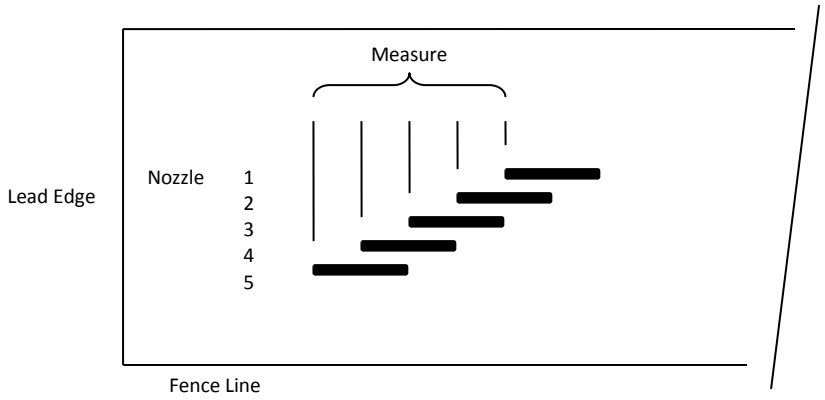


Figure 28. Nozzle Alignment

Note: Board IDs and test patterns are printed on the underside of the board as it passes through the print zone. This drawing shows the board flipped over to show the test pattern.

8. The test pattern is printed a configurable number of times on the board (see **Nozzle Align**). Select a clean calibration mark (not on damaged fiber, knots etc) and using calipers measure and record the distances between the lead edge of Nozzle 1 and the lead edge of Nozzles 2 – 5 (Nozzle 5 is closest to the fenceline; Nozzle 1 is farthest away). All measurements are relative to the lead edge of the Nozzle 1 line. Add an offset of 1.000" to each measurement recorded (Nozzle 1 will be at 1.000").
9. Press the **Nozzle Align** tab to open the **Nozzle Alignment** screen.

10. On the **Nozzle Alignment** screen, enter the values you recorded in Step 8 into the field beside each nozzle number. Remember to press the **Enter** button after each nozzle offset is entered.
11. Press the **Apply Changes** button.

To verify the nozzle alignment:

1. On the printer console, press the **Control** tab to open the **Control Screen**.
2. Press the **Test Cal on Next Board** button.
3. Run a board through the LHG and then remove it from the line.
4. The board should show five printed lines aligned as shown:

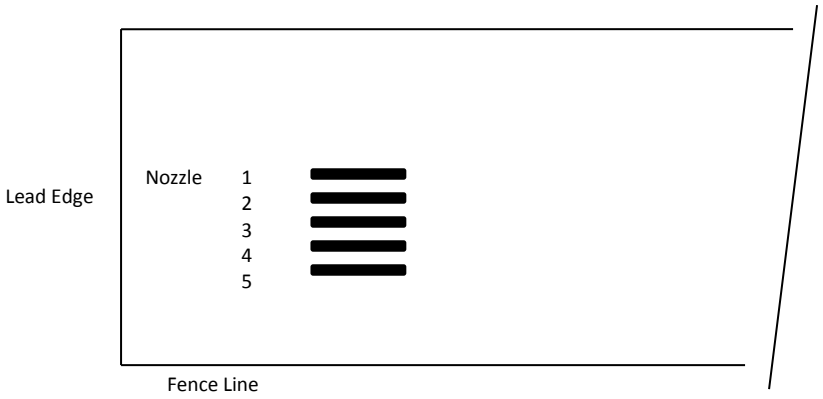


Figure 29. Nozzles Aligned

5. If all the nozzles are not aligned, adjust the misaligned nozzles and re-test. Increasing the alignment value will move the mark to the right, decreasing it will move it left.

6.6 Print Configuration

There are a number of parameters that affect the print size and quality. The default **Printer Configuration** values are setup to generate an ID that is 12” in length. This matches the basic system configuration and field of view for the standard IDR.

These parameters may need to be changed if, for instance, the **BCD Character** set is used, **Hamming Characters** are added, single vs dual ID, the number of digits is different or the 24” field of view IDR is used. In these cases the length of the printed ID should be adjusted to better match the system requirements.

The following table is a copy of an **Excel Worksheet** (*PrintConfig.xlsx*) that calculates the different print parameters required to get a desired print length. The main parameters that affect print length are the **Encoder Prescale** (**frmincfg**), **Ticks per Stroke** and **Strokes per Gap**. The values shown are typical for a 4 Digit Dual ID **Martian Character** print. The grey highlighted cells are the calculated values. Contact USNR if a copy of the spreadsheet is required.

Parameter	Value	Max	Min	Units	Notes
Max speed	4000	4000	0	fpm	
Encoder PPR	4000			ppr	
Outfeed Roll circumf	33.00			inches	
Encoder Prescale	8			divider	frmincfg
Inches per Tick[12]	0.066	0.296	0.003	inches	ID Printer
Ticks per Stroke	3	9999	1		ID Printer
Strokes per Char[13]	5	5	5	**ALWAYS 5!**	ID Printer, frmincfg
Strokes per Gap	3	9	0		ID Printer
Num Characters	8			dual ID	frmincfg
Character Width	0.990			inches	
Gap Width	0.59			inches	
Print Length[14]	12.05			inches	frmincfg

Table 29. Print Configuration

Note: The **Print Length** calculation is based on the **Num Characters** only. The number of characters entered must be adjusted for Single/Dual ID. For BCD/Binary print, extra characters must always be added for the two Framing marks and Hamming code if enabled. The total gap sizes are added to the print length automatically. A four digit dual BCD ID with Hamming characters would require:

2 x 4 ID + 4 Ham + 2 Frame = 14 Characters.

The **Print Length** would be 21.58” in that case.

[12] **Inches per Tick** is set based on the Outfeed Roll circumference and the **Encoder Prescale** values.

[13] **Strokes per Char** must always be 5, DO NOT CHANGE.

[14] Set **printLength** in **frmincfg** to match.

6.7 LHG Alarm Configuration

Alarms generated by the ID Printer are sent to the NFS once per minute for as long as they are active. These can be configured on the NFS Alarm Setup screen to trigger an LHG Alarm based on '**n**' occurrences out of '**x**' events. The trigger can be used to display a message on the NFS or InfoMaster (eg, Check Ink Level) or control the lumber flow (eg, halt the transfer). Typically the alarms are set to display a message on the InfoMaster after a single occurrence.

Alarm codes for the USNR ID Printer overlap the Domino printer codes. The alarm text needs to be changed to reflect the USNR Alarms as shown in the table below. Only the USNR Alarms are produced by the USNR ID Printer.

FRM Alarm	Domino Alarm	Domino Text	USNR Alarm	USNR Text
11020000	FRM_NO_FAULT_IDINK_EVT	No faults on ink bus!	-	
11020001	FRM_BAD_VISC_IDINK_EVT	Viscosity out of range!	INK_PRESS_FATAL	Ink Pressure Alarm
11020002	FRM_INK_FAULT_IDINK_EVT	Ink system fault!	INK_TEMP_FATAL	Ink Temperature Alarm
11020003	FRM_INK_TIMEOUT_IDINK_EVT	Ink reservoir timed out!	INK_LEVEL_FATAL	Ink Level Alarm
11020004	FRM_VISC_ERROR_IDINK_EVT	Viscometer error!	-	
11020005	FRM_INK_24H_IDINK_EVT	Ink reservoir has 24 hours to go!	INK_TEMP_WARN	Check Ink Temperature
11020006	FRM_INK_2H_IDINK_EVT	Ink reservoir has 2 hours to go!	-	
11020007	FRM_MKUP_EMPTY_IDINK_EVT	Make-up is empty!	INK_LEVEL_WARN	Check Ink Level

Table 30. Alarm Codes

6.8 FRM Configuration

A number of parameters exist in the **frmincfg.txt** file that control the operation of the ID Printer. The configuration includes values for both the USNR and Domino style printers, some are common to both and some are specific to one or the other. The following tables show all the ID Printer related parameters with typical values and a brief explanation of functionality. There is also a column that indicates whether the parameters are specific to either printer or common to both.

6.8.1 ID Printer Data

Parameter	Value	Units	USNR	Domino	Description
useCP	1	(0/1)	X	X	Always 1 to enable **C**ommercial **P**rinter
useCPCharSet	0	(0/1)		X	Use internal font
addBraces	0	(0/1)		X	Adds '[' and ']' to FRM message (ID)
printHex	0	(0/1)		X	FRM sends Digits in hex
printMode	0	(0, 1, 2)	X	X	Print location on board, (0=lead, 1=trail, 2=both)
periodicPrint	0	(0/1)	X	X	Repeat ID down length of board for cut-in-two
charsPerId	3	(0-n)	X	X	Number of characters to print per ID
brdIdRepeat	1	(0-n)	X	X	Single or Dual ID
spacesBetweenIds[15]	0	(0-n)		X	Number of spaces between dual IDs
strokeRepeat	3	(0-n)		X	Repeat strokes for wider character
charGap	3	(0-n)		X	Blank strokes between characters
charWidth[16]	5	(0-n)		X	Strokes per character, **ALWAYS 5!**
syncCharWidth	0	Strokes		X	Width of a single Domino Sync Char in strokes
charSet	1	(0-n)		X	Built in character set to use
photoeyeId	0	(0 <= x < 4)	X	X	Board detect photo-eye ID
encoderId	2	(0 <= x < 4)	X	X	Encoder ID
encoderPrescale	8	(0-n)	X	X	Encoder divider for printer ticks
serialDelay	10000	(0.001")	X	X	Board detect till ID send delay
periodicDelay	24000	(0.001")	X	X	Distance between IDs for periodicPrint
switchDelay	24000	(0.001")	X	X	Lead/trail switch location for both end print
minPrintGap	3000	(0.001")	X	X	Minimum gap between IDs
minLength	60000	(0.001")	X	X	Minimum board length for valid detect
cpCharSetName	CPSetMart05x07.cpc	string		X	Character set to print

[15] **spacesBetweenIds** must be 0 for USNR ID Printer

[16] Strokes per Character (**charWidth**) is always 5.

6.8.2 Printer1 & 2 Configuration

Parameter	prt1	prt2	Units	USNR	Domino	Description
enabled	1	0	(0/1)	X	X	Enable Printer1 or Printer2 config
useNewnesIdPrinter	1	0	(0/1)	X		Using a USNR (Newnes) printer
useBufSel	1	0	(0/1)	X	X	Enable Buffer Select
baudRate[17]	115200	19200	baud	X	X	FRM serial baud rate
printHeadLoc	82500	82500	(0.001")	X	X	Photo-eye to printhead distance
leadBrdEndDist	24000	24000	(0.001")	X	X	ID to lead end distance
trailBrdEndDist	24000	24000	(0.001")	X	X	ID to trail end distance
printLength[18]	12000	12000	(0.001")	X		Length of printed ID
printGoHold	50	2000	(0.001")	X	X	Distance the PrintGo signal will be held active
baseMNR	90	90	(hex)		X	Printer ID
bPrintBold	0	0	(0/1)		X	Print two strokes for each stroke
printGoDelayStrokes	2	2	(strokes)	X	X	Delay strokes before asserting PrintGo
flightTime	35	35	(ms)		X	Time for drops to reach board
flightTimeStrokes	25	25	(strokes)		X	Strokes to adjust for flightTime
serialPort	0	1	(0-n)	X	X	FRM serial port for comms to the ID Printer
printSyncMarks	0	0	(0/1)	X	X	Print TGS Sync marks
syncFrequency	10	0	(1 in n)	X	X	Print a TGS Sync mark every n boards
syncTrailBrdEndDist	24000	0	(0.001")	X	X	TGS Sync mark to board trail end distance
syncPrintLength[19]	24000	0	(0.001")	X		Length of TGS Sync mark
syncCharsToPrint[20]	**0**	0	(0-n)		X	Number of **x**" Sync chars for sync mark length
syncSpacesToPrint**	**0**	0	(0-n)		X	Number of **x**" spaces between sync mark and ID

Table 31. FRM Configuration

[17] Must match setting in ID Printer

[18] Calculated in **PrintConfig.xlsx**

[19] Must match setting in ID Printer

[20] **syncCharsToPrint** and **syncSpacesToPrint** must be 0 for USNR ID Printer. For Domino, the size of the sync char (**x**) is set by the **syncCharWidth** parameter.

6.8.3 Critical I/O

Critical I/O Data	idx	type	card	point	ioType	state	invert
FRM_ID_1_SEMOUT_CIO	107	2	0	31	0	0	1
FRM_ID_1_DAISY_CIO	108	2	0	30	0	0	1
FRM_ID_1_BUFSEL_CIO	109	2	0	60	1	0	1
FRM_ID_1_PRINTSEL_CIO	110	2	0	62	1	0	1
FRM_ID_1_PRINTGO_CIO	111	2	0	63	1	0	1[21]
FRM_ID_1_SYNCSEL_CIO	112	2	0	59	1	0	1
FRM_ID_1_RESYNCSEL_CIO	113	2	0	58	1	0	1

Table 32. FRM Critical I/O

Critical I/O Data Flag	Description	Settings
idx	I/O index	Internal identifier for the I/O function
type	I/O card type	TIO = 0 DIO96 = 1 TECIO = 2
card	I/O card identifier	I/O card number in the computer
point	I/O point identifier	I/O card point ID
ioType	Input/Output type	Input = 0 Output = 1
state	Startup state	Active = 1 Inactive = 0
invert	I/O logic inversion	Invert = 1 Non-Invert = 0

Table 33. Critical I/O Data

[21] Set this value to 0 for printer revs 1.5.0.0 and earlier. Set it to 1 for printer revs 1.6.0.0 or later.

7. Printer Maintenance

The USNR Board ID Printer is specifically designed to require minimal maintenance. The main requirements are to keep the printhead and nozzles clean and the ink reservoir full.

Take care when maintaining the ink system to prevent contaminates entering the ink.

See Safety before performing any maintenance procedures. Be aware of the hazards associated with the printer ink.

- Clean the printhead nozzles at the beginning of every shift by washing gently with water and rubbing lightly with a soft bristle toothbrush to remove any debris. Pitch can be removed by lightly brushing with rubbing alcohol. Purge the nozzles 3 – 5 times after cleaning, see **Test All Nozzles** on the **Control Screen**.

Caution: **Be careful** not to push debris into the nozzle openings.
Do not use excessive force brushing the nozzles as this may damage the nozzle orifice or internal seal.
Do not use compressed air directly on the nozzle openings as this may force debris into the nozzle and damage the internal seal.
Do not use gasoline or other petroleum based products to clean the printhead.

- Fill the Ink Reservoir as required. A light on the printer console will illuminate if the ink level drops below the levels set on the **Alarm Configuration** screen.
- Visually inspect and **Replace the Ink Filter** as required to maintain proper ink pressure.
- Clean spills with water as required.
- Replace the individual nozzle if any leak or no longer spray properly.
- Replace the Printhead Assembly if nozzle replacement doesn't fix the printhead.

Do not disconnect any ink plumbing lines with the pump motor running. Doing so can increase the ink pressure to a catastrophic failure point in the system.
Always turn OFF the printer system during service or when replacing components.

- Quick disconnects are installed to allow easy removal of the ink reservoir, filter, pump, and printhead. When disconnected, the quick disconnects stop the flow of ink. If a component is replaced, you may need to remove and re-install the existing tubing and quick disconnects onto the replacement component. Always use Teflon tape for ink tube fittings. Always use PTFE tubing and ink components for methanol resistance. See the tubing diagram at the back of this user manual for details.

Caution: Use care to ensure that all quick disconnects are clean by rinsing lightly with water. Any contamination entering the ink system can clog the internal filters or print nozzles causing a system failure.
The male quick disconnect has a small rubber O-Ring near the tip to provide a good seal. Damage to the O-Ring can cause the quick disconnect to leak. Wetting the O-Ring with water will ease the connection.

7.1 Printhead Replacement

If cleaning or nozzle replacement doesn't correct a printhead print quality, it may need to be replaced.

To replace the printhead assembly:

1. Turn OFF and lock-out the Linear High Grader.
2. Push in the power button on the printer console to turn off the printer.
3. Remove the ink line quick-disconnect from the printhead.
4. Disconnect the power/signal connector.
5. Remove the four ¼-20 screws from the printhead.
6. Lower the printhead out of the positioning plate.
7. To install the new printhead, attach it to the positioning plate using the four screws.
8. Re-attach the power/signal connector.
9. Re-attach the ink line quick-disconnect to the printhead.

Caution: Use care to ensure the ink line and printhead quick disconnects are clean by rinsing lightly with water before connecting to the printhead. Any contamination entering the printhead can clog the internal filter or print nozzles causing a printhead failure.

10. Turn ON the printer and the Linear High Grader.
11. Check for leaks around the printhead.
12. Using the **Control** or **Nozzle Test** screen, activate all spray nozzles 3–5 times (or more as required) to remove any air from the ink system (see **Nozzle Test** for details).

Note: New printheads are shipped with an anti-freeze solution (windshield washing solution) inside to prevent freezing damage during storage. It may take 5-10 flushes before ink can be seen from the nozzles. Normal operation will also flush the anti-freeze from the printheads.

13. Follow the **Nozzle Alignment** procedure.
14. Return the entire (old) printhead assembly to USNR for repair (see **Parts and Delivery**).

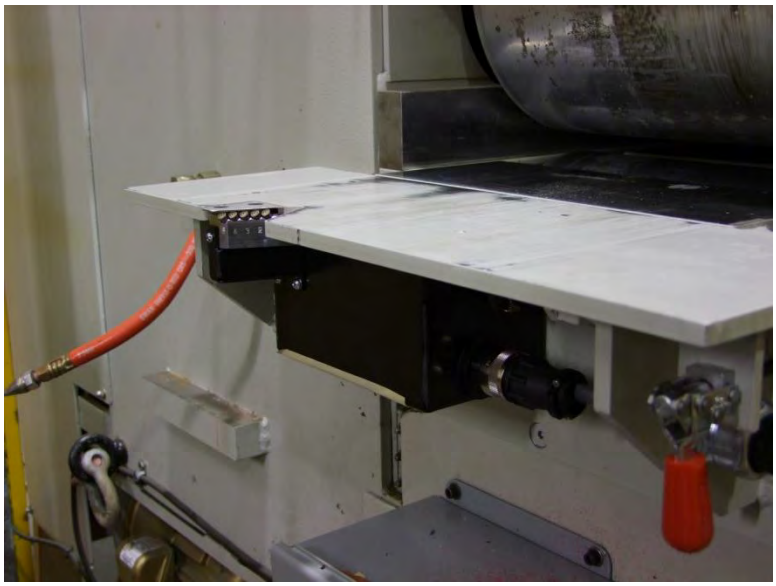


Figure 30. Printhead and Outfeed Plate

7.2 Ink Filter Replacement

Change the ink filter periodically or as required depending on usage. Fluctuating ink pressure while printing is an indication that the filter may require replacement.

WARNING

Methanol in the ink is highly flammable. **Avoid all spark sources and do not smoke while changing the filter.**
Before handling a used filter, read all supplied Material Safety Data Sheets regarding the ink. Work in a well-ventilated area and wear gloves, safety goggles, and respirator.

To change the ink filter:

1. Turn off the printer power.
2. Disconnect the quick-connects on the ink filter.
3. Remove the filter and discard according to the Material Safety Data Sheet.
4. The filter normally ships with new quick connect fittings attached. If not, remove the quick-connect fittings from the old filter and attach to the new filter. Use five wraps of Teflon tape to properly seal the fittings.

   Caution: It is easy to over-tighten and strip the threads of the fittings on the filter. **Do not over-tighten the fittings**.

5. Install the new filter.
6. Reconnect the quick-connects.
7. Resume operation and check for leaks. Check ink pressure on the Status Screen.

Figure 31. Ink Filter

7.3 Ink Pump Replacement

WARNING

The ink pump and motor can get hot during operation. Allow the unit to cool before attempting to replace the pump.

To replace the ink pump assembly:

1. Push in the power button on the printer console to turn off the printer.
2. Disconnect the two ink line quick-connects from the pump.
3. Disconnect the power cable.
4. Remove the pump.

Note: The pump normally ships with all quick-connects and hoses attached for quick replacement. If not, the parts will have to be transferred over from the original pump. Use five wraps of Teflon tape to properly seal the fittings.

Caution: It is easy to over-tighten and strip the threads of the fittings on the filter. **Do not over-tighten the fittings**.

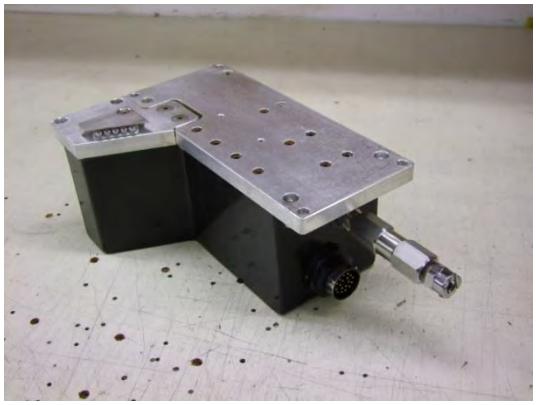
5. Install the new pump, attach the power cable, and attach the two ink lines.
6. Turn ON the printer and check for leaks.

Figure 32. Ink Pump

7.4 Printhead Maintenance

There are two styles of printhead used on the ID Printer application. The first is the standard printhead used for printing the **Martian Character** set. The second is a “highspeed” printhead designed to print the **BCD** and **Binary Character** set. The maintenance procedures for both style printheads are the same.

Both printheads use the same nozzles, electrical and ink connections and are fully interchangeable. The main difference between the two is the orientation of the nozzles with respect to the direction of lumber flow through the LHG. The Standard printhead has the nozzles mounted at roughly 30 deg to the flow of lumber while the Binary printhead has the nozzles mounted at 90 deg. The line spacing on a Standard printhead is tighter than the Binary printhead and is more suitable to the Martian character set. The wider spacing on the Binary printhead are more suitable to BCD or Binary character sets.



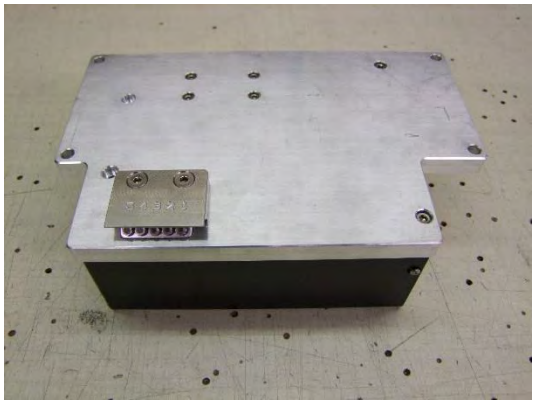


Figure 33. Standard (Martian) printhead Binary Printhead

The basic maintenance that can be performed on the printhead is cleaning and nozzle replacement. A regular cleaning schedule is required to keep the printheads operating at their peak performance. Nozzle replacement is possible to allow quick repair of a failed printhead to reduce down time.

7.4.1 Tools

Three tools are required for printhead maintenance on the ID printer, a 1/8” Allen wrench to remove the nozzle cover plate, a nozzle removal tool for nozzle replacement and a soft bristle toothbrush for cleaning. A Waterpick and ultrasonic cleaner can also be used to assist in cleaning.

Figure 34. Nozzle removal tool

7.4.2 Printhead Cleaning

One of the most important aspects of printhead maintenance is regular cleaning. During normal operation, ink and sawdust can build up around the nozzles and affect print quality. Cleaning the nozzles will ensure peak performance from the ID Printer printhead.

Tools required:

- Clean Water
- Soft Bristle Toothbrush
- Waterpick (optional)

Caution: Do not use solvents or chemical cleaners to clean the printhead. Use only clean water and a mild detergent (eg dishsoap) for cleaning.

Cleaning the printhead is fairly straight forward. The ink used for the ID Printer is a methanol base and is quite water soluble. Normally a soft bristle toothbrush can be used with plain water to clean the printhead and nozzles. Some sites have used a Waterpick to help cleaning around the nozzles.

To clean the printhead:

1. Turn off the ID Printer and Lock Out the system following appropriate lockout procedures.
2. Pour a small amount of water directly over the nozzles and gently clean with a soft bristle toothbrush to remove any large debris.

   Caution: Do not flood the printhead with water while cleaning. The printhead is designed to be water resistant but not waterproof. Excess water can leak into the printhead and cause damage to the electronic components inside.

   Caution: When cleaning the nozzles with a soft bristle toothbrush, be careful to not force the bristles into the nozzle orifice. Doing so can push debris into the nozzle and cause a failure.

3. Continue cleaning with water and toothbrush to remove ink buildup. A Waterpick can be used to help clean ink around the nozzles themselves.
4. Ensure that all nozzle orifices are clear of any debris or ink residue.

7.4.3 Nozzle Cleaning

All printheads are flushed with an anti-freeze solution (windshield washing solution) and the tips of the nozzles are sealed with petroleum grease prior to shipping. This prevents freezing damage to the internal plumbing of the printhead and also prevents residue from drying out in the nozzle tip during storage. If a printhead has been sitting on a shelf for a number of months, it's possible that the liquid inside the nozzles has dried anyway and the nozzles may not fire. Cleaning the nozzles can bring them back.

Tools required:

- Nozzle tool
- 1/8" Allen wrench
- Mild Detergent (eg dishsoap)
- Ultrasonic Cleaner (optional)

To free a stuck nozzle:

1. With the printer turned **ON**, go to the **Nozzle Test** tab and press the screen button for the affected nozzle.
2. Repeat the nozzle test several times until the nozzle starts to fire.
3. As an alternate, press the **Test All Nozzles** on the **Control** tab several times. This is useful if several nozzles are stuck.
4. If the nozzle fails to activate it can be removed and cleaned as outlined below.

Cleaning a stuck nozzle:

1. Turn the ID Printer **OFF** and Lock Out the system following appropriate lockout procedures.
2. Remove the printhead from the LHG outfeed plate and bring to a clean area before removing a nozzle.
3. Remove the affected nozzle (see **Nozzle Replacement**) and place in a container with warm water and mild detergent for several minutes.
4. An ultrasonic cleaner can be used instead if one is available.

Caution: Do not use solvents or chemical cleaners to clean the nozzles. Use only a mild detergent (eg dishsoap) for cleaning. Thoroughly rinse the nozzles before installation after cleaning.

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5. Replace the nozzle, re-install the printhead and test.

7.4.4 Nozzle Replacement

The nozzles used on the printhead for the ID Printer are a high quality valve made of stainless steel with jeweled seating surfaces. The valves are rated at 200,000,000+ activations and typically last well beyond that. As with any mechanical part, component wearout and failure will still occur.

The nozzles are threaded into the nozzle mount frame that have integral O-ring fittings. A special tool supplied with the ID Printer fits into flutes around the nozzle to allow easy removal.

Tools required:

- Nozzle tool
- 1/8” Allen wrench

Note: The standard printhead is shown in the nozzle replacement section. Procedures for the highspeed printhead are similar.

To replace a nozzle:

1. Turn off the ID Printer and Lock Out the system following appropriate lockout procedures.
2. Remove the printhead from the LHG outfeed plate and bring to a clean area before removing a nozzle.

   Note: The nozzle replacement can be done with the printhead mounted in place on the LHG outfeed plate, however, it is recommended that the printhead be removed and brought to a clean area for maintenance to prevent debris from falling in the open nozzle port and causing problems.

3. Using a 1/8” Allen wrench, remove the nozzle cover plate from the top of the printhead.
4. Thoroughly clean the nozzles with plain water to prevent debris falling in the mounting hole when the nozzle is removed.

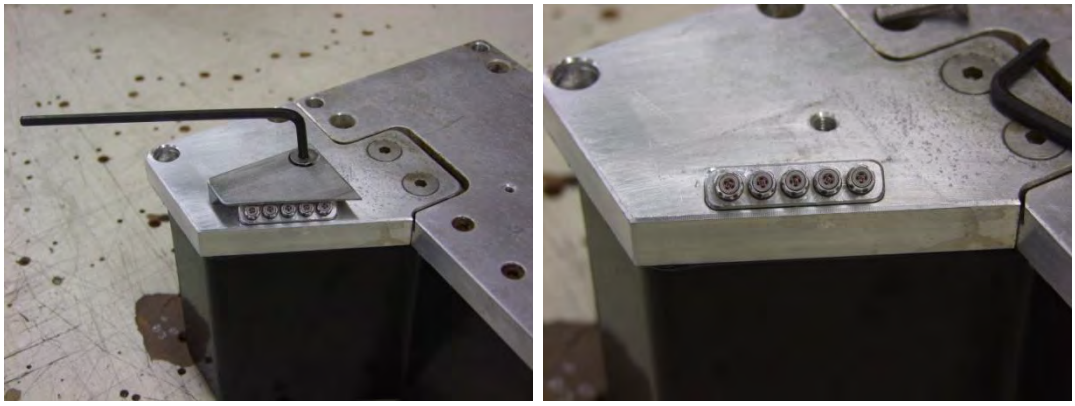

Figure 35. Remove the Nozzle Cover Plate

Caution: Ensure the printhead nozzles are thoroughly cleaned before attempting replacement. Debris falling into the mounting hole when the nozzle is removed can plug the nozzle and cause it to fail.

5. Place the nozzle tool on the failed nozzle ensuring that the flutes on the tool mesh with the nozzle.
6. Unscrew the nozzle in a CCW direction until the threads disengage.

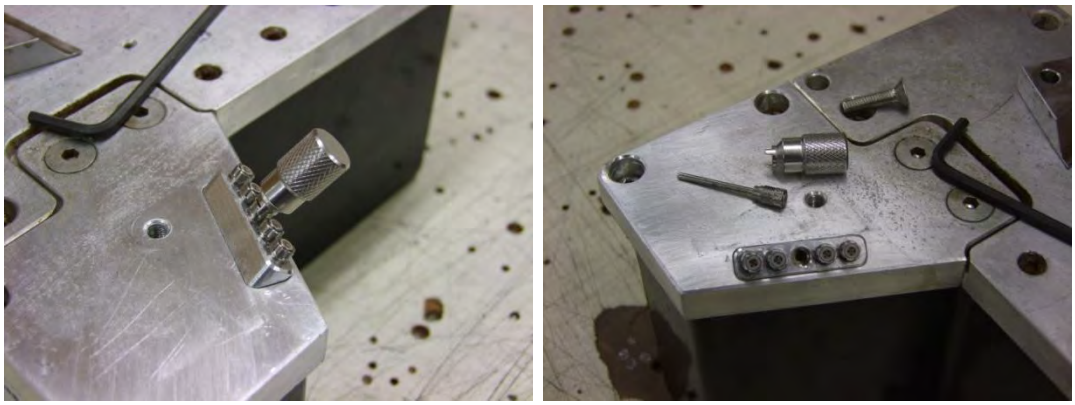

Figure 36. Use the nozzle tool to remove the nozzle

7. Carefully pull the nozzle straight out and set aside. The O-ring fitting may provide some slight resistance as the nozzle stem is pulled through. The O-ring is hidden and remains inside the nozzle mount. Make sure debris does not fall into the mounting hole.
8. Remove the new nozzle from its storage bag and check there is no debris present, especially over the opening at the end of the nozzle stem. Insert the nozzle into the frame and gently push the nozzle stem through the O-ring until the threads engage. Slightly wetting the stem with water first will make insertion easier.
9. Use the nozzle tool to screw the nozzle in place in a CW direction until it is snug. Do not over-tighten the nozzle.
10. Replace the nozzle cover and firmly secure with the mounting screw. Make sure the nozzle cover plate is aligned evenly over the nozzles and does not cover the nozzle orifice.
11. Re-install the printhead on the LHG outfeed plate.
12. Perform a nozzle alignment check and verify valve operation before using the printhead.

Note: The nozzles are threaded and fit accurately into the machined nozzle mount. Re-alignment through the ID Printer **Nozzle Align** screen is not typically necessary after a nozzle replacement.

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8. Troubleshooting

8.1 Diagnostic Table

Area	*Problem*	*Solution*
Alarms	Yellow (warning alarm) light on printer console is illuminated	Find the cause of the alarm by checking the **Status** and **Debug Screens**. Correct the problem, and **Reset Alarms**.
	Red (critical alarm) light on printer console is illuminated	Find the cause of the alarm by checking the **Status** and **Debug Screens**. Correct the problem, and **Reset Alarms**.
	Ink level low alarm	Fill the Ink Reservoir in the printer console and **Reset Alarms**. If the ink level still reads low, **Calibrate the Ink Level Sensor**. Verify the level sensor tube connection to the IDP board in the top printer console (see **Calibrate the Ink Level Sensor**).
	Ink pressure hi/low alarm	Adjust the Ink Pressure to 25-40 psi and **Reset Alarms**. Visually verify the ink filter is not plugged (low pressure). Verify all ink tubing is connected and quick-connects are ‘clicked’. If everything checks OK, Replace the Printhead Assembly.
	Ink temperature hi/low alarm	When the printer is first powered up it can take a few minutes for the ink heater to reach its target temperature (40C). The ink temperature alarm is disabled for the first 5 min of operation to prevent false alarms. In some cases, the heater block may not have reached its set temperature within this timeout period. Allow the heater temperature to stabilize for a few minutes and **Reset Alarms**. Verify the **Alarm Configuration** settings. If the alarm persists (can’t be cleared) or the ink does not reach the target temperature, Replace the Printhead Assembly.
	Periodic low ink pressure alarms	Check for air bubbles trapped in the ink lines or filter. Perform an **Air Purge** from the printer **Control Tab**.

Area	Problem	Solution
		The printhead pressure can fluctuate from its initial setting during normal operation. Having too low an ink pressure setting or too tight an **Alarm Configuration** may cause periodic low ink pressure alarms. Adjust the Ink Pressure to 25-40 psi. Verify the ink low pressure alarm is set lower than the operating pressure (eg set to 10 psi, see **Alarm Configuration**). Increase the motor voltage on the **System Configuration** screen (eg, from 2.5 -> 3.0V)[22]. When the motor voltage needs to be increased to maintain printhead pressure, it's an indication that the main filter may be getting plugged and needs to be replaced. If these settings are correct it's possible that the printhead filter is plugged, Replace the Printhead Assembly.
Pump	Pump not running	Check pump power breaker in the top console enclosure. Check electrical connections to the pump. Replace the Ink Pump.
	Pump runs noisy	Slightly change the motor voltage on the **System Configuration** screen so the pump runs at a different speed. Replace the Ink Pump.
	Pump runs hot	Decrease the motor voltage on the **System Configuration** screen. Ensure the pump volume and pressure are adequate for operational speed. Replace the Ink Pump.
	Pump magnetic decoupling (the coupling torque between the magnets is lost, the pump head stops turning, and the motor speed increases).	Turn off the printer power, wait for the pump to stop completely, turn on the power, and wait for ink pressure to return. This problem may be caused by ink pressure set too high. **Adjust the Ink Pressure** to 25-40 psi.

[22] The motor can be set up to 5.0V for full speed operation. Higher voltages make the pump run hotter and may impact pump life. Always use the minimum motor voltage possible.

Area	Problem	Solution
Ink System	Ink Leaking	Check that all quick-disconnects are properly seated. There should be a “click” when they are properly connected. Flush lightly with water if the connector latch is “sticky” to ease connection. Ensure that all hose couplers are securely tightened. These should be finger tight only or the connector threads can be stripped. Use Teflon tape to help seal the connectors.
	Level sensor not reading the correct level	Incorrect readings are likely caused by an air leak in the sensor tube or a bad level sensor calibration. Check that the sensor air hose coupler on top of the reservoir lid is tight and the hose is seated properly. Check that the hose connection to the pressure sensor on the IDP board is snug. Ensure the small check valve on top of the reservoir lid is not blocked. Remove the reservoir lid and replace to re-trap the air bubble. Perform a level sensor calibration.
Printhead	One or more nozzles fail to activate	Clean the printhead lightly with a soft bristle toothbrush and water. Ensure there is no pitch or debris covering the nozzle tip. Purge nozzles by using the **Nozzle Test** screen on the ID Printer console. Cycle several times to “un-stick” the nozzle. Check LEDs **T1-5** on the **IDP** board inside the Printer Console for nozzle activations. Check the **+5V, +12V** and **-12V** LEDs on the IDP board. Check LEDs **NOZ1-5** for nozzle activations on the **Nozzle Driver** in the junction box between the printer console and printhead. Check **LED1 & 2** for power on the **Nozzle Driver** board. If there is a problem with either the **IDP** or **Nozzle Driver** board contact USNR Service personnel for assistance in troubleshooting. Remove the affected nozzle and clean in a water bath or ultrasonic cleaner. Replace the nozzle Return printhead for repair

Area	Problem	Solution
	Nozzles activate but print quality is poor[23]	Verify print quality is degrading readings at IDR Clean printhead and nozzles Replace nozzle Return printhead for repair
	Printhead pressure fluctuates[24]	Check ink system for trapped air bubbles Check for debris on ink line quick connect Temporarily disable pressure alarms to troubleshoot, see **Alarm Config** Return printhead for repair
	Filter in printhead plugged	Replace the Printhead Assembly
Operation	ERROR: Reset Printer	This error is displayed on the touchscreen interface when communication is lost between the main and touchscreen controllers indicating a possible controller failure. Carefully check for loose wires around the Display and Main Controller boards inside the Printer Console. Cycle the main power switch to reset the printer controllers to see if that clears the error. If the error persists, contact USNR Customer Support.
	Communication failure to LHG	Restart the printer system. Check the cabling between the printer and the LHG. Turn on the **FRM Serial** diagnostic on the **Debug Config** screen and observe messages on the **Debug Screen** as the LHG is rebooted. Replace the ID Printer to FRM serial cable
	High unrecognized character rate on the ID Reader	Clean printhead nozzles, see **Maintenance**. Adjust the Ink Pressure. Check Nozzle Alignment. Replace nozzle.

[23] The nozzles used on the USNR ID Printheads are high quality, precision engineered components that should last for many millions of individual activations. Even so, some initial degradation in print quality may be noticed within the first week or two of operation. This normally doesn't affect the recognition rate at the IDR and is not considered a failure.

[24] Pressure fluctuations that occur in the printer's ink system don't normally cause a problem with printing. However, on printer firmware revs 1.4.0.3 and earlier, a pressure fluctuation could cause an alarm to fire and halt the printer.

Area	Problem	Solution
		Replace printhead.
	Partial ID printed	Indicates a timing issue between processing IDs from FRM and printing simultaneously. Occurrence is usually related to board speed and gap size between boards. The issue can be reduced by adjusting the **serialDelay** parameter in **frmincfg**. Using **Buffer Select** with the ID Printer usually prevents this from occurring.
	Duplicate ID printed on successive boards	Indicates that the **Buffer Select** / **Print Select** interface is not working. Ensure **useBufSel** is enabled in **frmincfg**. Verify the wiring for **BufSel** and **PrintSel** lines from the FRM Critical IO interface to the printer. Enable the **PrintGo** and **Board ID** debug flags on the **Debug Config** screen. Verify that IDs are received alternating between buffers 0-1 on the **Debug Screen**: buffer[**0**] = 1234, buffer[**1**] = 1235, buffer[**0**] = 1236 Verify that **PrintGo's** are occurring from alternate buffers 0-1 on the **Debug Screen**: bGotPrintGo[**0**], nn patterns bGotPrintGo[**1**], nn patterns bGotPrintGo[**0**], nn patterns

Table 34. Troubleshooting

8.2 Telnet Console

Starting with version 1.5.0.0 of the ID Printer, a simple **Telnet** interface has been added to help with printer diagnostics. All the ID Printer debug flags and configuration settings[25] can be retrieved and most can be set through the Telnet console. All debug print statements are directed to the **Telnet console** when it's connected and the ID Printer's **Debug Screen** when it's not. This allows access to the printer without halting or locking out the system to diagnose problems or make changes.

The Telnet interface is accessed through the ID Printer's main controller board Ethernet connection. The default **IP Address** is **192.168.100.54** and **Subnet Mask** is **255.255.255.**0. This allows the controller board to be connected to the LHG optimizer network through a switch or router and accessed from any of the LHG computers. The **IP Address** and **Subnet Mask** can be changed on the printer's **System Configuration** screen if needed. The standard Telnet **port 23** (fixed) is used for the connection. Any Telnet application can be used, HyperTerminal works well.

8.2.1 Commands

Below is a table of the commands available through the interface. Enter '**?**' to bring up the **Help** screen. All commands are lower case.

Cmd	Description	Notes	
g	Get config val	**g** **gS**	Gets all config values (same as **g0**) Gets config values for section '**S**' (1-9)
s	Set config val	**sPvN**	Sets config parameter '**P**' to value '**N**'.
x	Set Flash defaults	**x**	Sets all configuration to default values
f	Save config to Flash	**f**	Saves config to flash, enter '**y**' when prompted to continue, anything else to abort.
l	Get debug level	**l**	Displays the current debug flag setting
d	Set debug level	**d** **dF** **dxF**	Clears all debug flags (same as **d0**) Toggles debug flag '**F**' (1-9) Same as above but the flag value is hex
r	Run simulation	**r**	Starts simulation with the current parameters
h	Halt simulation	**h**	Halts simulation
m	Reset main	**m**	Resets the main controller
p	Reset display	**p**	Resets the display controller
t	Profile data	**t**	Displays task CPU usage
u	Memory usage	**u**	Shows memory usage
c	Check stack	**c**	Displays stack low water mark

[25] The debug flags and configuration settings that are normally accessed through the ID Printer console, not the settings in frmincfg.txt.

Cmd	Description	Notes	
z	Clear trim adjust	z	Resets trim adjustment values for a new printhead
?	Help	?	Prints this help list

Table 35. Debug Commands

8.2.2 Get Config Value

Command '**g0**' (or just '**g**') prints a list of all the config parameters and flags on the system. At the beginning of each line is an **ID** field that corresponds to the **Config Section ID** (**SID**) or **Parameter ID** (**PID**) that can be used for the **Get/Set** commands.

The SIDs below can be used to 'get' the different Config Sections of the ID Printer.

SID	Desc
0	Print all config values
1	Printer Status
2	Print Config
3	Alarm Config
4	Nozzle Offsets
5	System Config
6	Sim Config
7	Nozzle Activations
8	Revision Data
9	Debug Config

Table 36. Config Sections

For example, the command '**g5**' would bring up the **System Config** section as shown below.

```
dbg:     5: System Config
dbg:    67:   Max Speed             4000 (fpm)
dbg:   103:   Domino Protocol      FALSE
dbg:   102:   Dynamic Adj           TRUE
dbg:    68:   BaudRate            115200
dbg:    69:   ID Ack Duration         50 (ms)
dbg:    70:   Cfg Motor Volts       2500 (mV)
dbg:    71:   Set Motor Volts       2500 (mV)
dbg:    90:   Temperature Scale      deg (C)
dbg:    72:   Level Delay            15 (sec)
dbg:     0:   Level Cal Lo           0.0 (V)
dbg:     0:   Level Cal Hi          10.0 (V)
dbg:     0:   IP Addr:Mask         192.168.100.54:FFFFFF00
```

8.2.3 Set Config Value

Setting config values through the Telnet interface requires a specific command format as follows:

sPvN

where:

s The set command
P The parameter (PID) to be changed
v The value token
N The value to set

Caution: Range checking is not performed on the values entered through the Telnet console so it is possible to set incorrect configurations. Be sure to understand the setting and acceptable value ranges before attempting to make changes.

Note: Parameters changed through the **Set Config Value** command are not automatically stored to Flash and will revert to the previous values after a power cycle. Make sure to save the changes to Flash if needed.

The table below lists the **Section** and **Parameter IDs** for each value that can be set through the Telnet console. PIDs with a 0 value are either read only or can't be set through the Telnet console and have to be changed directly on the ID Printer display interface.

The parameter **ThouPerTick** has a **PID** of **41** and a value of **66** (0.066"). To change **ThouPerTick** to **33** (0.033"), enter:

s41v33

SID	Section	PID[26]	Parm	Value	Unit
1	Printer Status[27]	0	Controller started	2015/05/19 16:21:29	
		0	Main last reset	Hardware	
		0	Display last reset	Hardware	
		0	IDR connected	FALSE	
		0	Telnet connected	192.168.74.184	
		0	Current ID	01230123	
		0	Buffer Select[28]	Active	
		0	Print Select	Active	
		0	Sync Select	Not Active	
		0	ReSync Select	Not Active	
		0	Current Speed	0	(fpm)
		0	Avg Speed	0	(fpm)
		0	Max Speed	0	(fpm)

[26] Parameters that are read-only on the Telnet console are identified by a '0' PID field.

[27] Default values show the current status of the printer. Active alarms are printed for Ink temperature, pressure and level.

[28] Buffer, Print, Sync and ReSync Select lines will show **Active** if they have toggled at least once since the last reboot. Buffer Select will show **Not Active** if two IDs are received in a row without toggling.

SID	Section	PID[26]	Parm	Value	Unit
		0	Ink Temp	39.9	(C)
		0	Ink Press	45.2	(psi)
		0	Ink Level	100.0	(%)
		45	Thou per Sync	12000	(thou)
		46	Thou per Tick	66	(thou)
		47	Ticks per Stroke	3	
		0	Strokes per Char	5[29]	
		49	Strokes per Gap	0	
		50	Stroke Repeat	0	
2	Print Config	111	Use Martian Map	FALSE	
		112	Use Bcd Map	FALSE	
		113	Use Bin Map	TRUE	
		51	Num Bits	10	
		121	Use Hamming	FALSE	
		120	Rotate Brd Id 180	TRUE	
		122	ID Shift	FALSE	
		57	Warn Min Ink Temp	5.0	(C)
		55	Fatal Min Ink Temp	1.0	(C)
		56	Warn Max Ink Temp	50.0	(C)
		54	Fatal Max Ink Temp	59.9	(C)
3	Alarm Config	52	Fatal Min Ink Press	12.0	(psi)
		53	Fatal Max Ink Press	48.0	(psi)
		59	Warn Ink Lvl	7.0	(%)
		58	Fatal Ink Lvl	2.0	(%)
		75	Num Cal Marks	10	
		60	1 Offset	0	(thou)
		61	2 Offset	0	(thou)
4	Nozzle Offsets	62	3 Offset	0	(thou)
		63	4 Offset	0	(thou)
		64	5 Offset	0	(thou)
		65	1 Align	0	(thou)
		66	2 Align	0	(thou)
4	Nozzle Lead Trim	67	3 Align	0	(thou)
		68	4 Align	0	(thou)
		69	5 Align	0	(thou)
		70	1 Align	0	(thou)
4	Nozzle Trail Trim	71	2 Align	0	(thou)
		72	3 Align	0	(thou)

[29] Strokes per Char must always be 5 and can't be changed.

SID	Section	PID[26]	Parm			Value		Unit
		73	4 Align			0		(thou)
		74	5 Align			0		(thou)
4	Nozzle Trim	0	Noz	Lead		Trail		
				Scale	Ticks	Scale	Ticks	
		0	1	0.00E+00	0	0.00E+00	0	
		0	2	0.00E+00	0	0.00E+00	0	
		0	3	0.00E+00	0	0.00E+00	0	
		0	4	0.00E+00	0	0.00E+00	0	
		0	5	0.00E+00	0	0.00E+00	0	
		0	Nozzle Trim Status			0x00000000		
5	System Config	0	RTC			42150.36485		
		0	IP Addr:Mask			192.168.74.19:FFFFFF00		
		109	Temperature Scale			deg. C		
		88	BaudRate			115200		
		89	ID Ack Duration			50		(ms)
		124	Domino Protocol			FALSE		
		87	Max Speed			4000		(fpm)
		90	Cfg Motor Volts			3500		(mV)
		0[30]	Set Motor Volts			3500		(mV)
		123	Dynamic Adj			FALSE		
		91	Level Delay			15		(sec)
		0	Level Cal Lo			0.0		(V)
		0	Level Cal Hi			10.0		(V)
6	Sim Config	114	Sim Brd ID			FALSE		
		115	Sim BufSel			FALSE		
		116	Sim PrintSel			FALSE		
		117	Sim PrintGo			FALSE		
		118	Sim Encoder			FALSE		
		119	Use Internal Enc			FALSE		
		100	Brd ID Interval			1000		(ms)
		101	Chars per ID			4		
		102	ID Repeat			2		
		103	Min Brd ID			1		
		104	Max Brd ID			9999		
		105	Start Brd ID			1		
		106	Num Boards to sim			0		
		107	PrintGo Delay			500		(ms)
		108	Encoder Interval			1		(ms)

[30] This parameter shows the actual motor voltage set if **Dynamic Adj** is enabled.

SID	Section	PID[26]	Parm		Value	Unit
7	Nozzle Status	0	Noz	State	Activations	
		125	1	ENABLED	0	
		126	2	ENABLED	0	
		127	3	ENABLED	0	
		128	4	ENABLED	0	
		129	5	ENABLED	0	
8	Revision Data[31]	0	Main Controller		BL2600	
		0	Version		1.6.0.0	
		0	Date		May 12 2015 13:48:04	
		0	Interface		Revision: 1.67	
		0	Display Controller		OP7200	
		0	Version		1.6.0.0	
		0	Date		May 12 2015 13:48:30	
		0	Interface		Revision: 1.67	
9	Debug Config[32]	130	Debug Frm Serial		FALSE	0x01
		131	Debug PrintGo		FALSE	0x02
		132	Debug Board IDs		FALSE	0x04
		133	Debug Encoder		FALSE	0x08
		134	Debug Msg		FALSE	0x10
		135	Debug Network		FALSE	x020

Table 37. Config Parameters

8.2.4 Flash

Two commands are included for Flash, '**f**' saves the config to Flash and '**x**' forces the Flash config to default values. The save command will write any changes made to Flash so they will be used as the default configuration on the next boot. When the command is entered the user is presented with:

```
Save config to Flash? (y/n)
```

Enter '**y**' to save, anything else to cancel. The Flash write status will be displayed on the Telnet console. Saving to Flash stores both the configuration parameters and debug flags.

The set defaults command ('**x**') also brings up a confirmation prompt:

```
Set default config? (y/n)
```

Entering '**y**' causes the printer to override the config flag in Flash and forces the processor to reboot. When it reboots, the Flash will be set with the default parameters the same as a fresh install.

[31] The default values show the current build version.

[32] The Debug Flags have both a parameter ID and a hex value that can be used to enable them, see Debug Flags below.

Note: The default configuration values are not necessarily the values used on site. Be careful to not overwrite a configuration without making note of the original settings first. Entering the '**g**' command is a good way to get a list of current config values.

8.2.5 Debug Flags

Entering the '**l**' command will display the **Debug Flags** currently set. The start of each line indicates the command IDs that can be set using the **sPvN** command. The command strings **s104v1** and **s106v1** could be used to turn the **PrintGo** and **Encoder** debug flags on. Entering a value of 0 (eg **s104v0, s106v0**) could be used to turn them off.

```
dbg:   103:   Debug Frm Serial 0x01    FALSE
dbg:   104:   Debug PrintGo    0x02    TRUE
dbg:   105:   Debug Board IDs  0x04    FALSE
dbg:   106:   Debug Encoder    0x08    TRUE
dbg:   107:   Debug Msg        0x10    FALSE
dbg:   108:   Debug Network    0x20    FALSE
```

Each line of the Debug Flag list also includes a hex value after the flag description that can be used with the '**d**' command. Entering the debug flags in hex can be easier since multiple flags can be set at once by adding the flags together. To enter a value in hex, precede it with a lower case '**x**'.

For example, to turn on the **PrintGo** and **Encoder** debugs (x2 + x8 = xA, remember that decimal values 10-15 are A-F in hex) enter:

dxA

Entering it again will toggle both flags off. To turn on the **Debug Network** and **PrintGo** flags (x20 + x2 = x22), use:

dx22

The flags could also have been set using decimal values:

d10 (hex A = dec 10)
d34 (hex 22 = dec 34)

8.2.6 Simulation

The simulation commands allow '**r**'unning and '**h**'alting simulation on the ID Printer. The Simulation config can be accessed and changed through the Get/Set Config commands or the printer console.

The printer is not normally run in simulation mode at a mill site and should generally be left off (halted). Simulation may be useful to check the operation of the printer without having the rest of the LHG running.

Caution: The printer is fully operational in simulation mode and will cause the printhead to spray ink as IDs and PrintGos are simulated.

8.2.7 Reset

Both the Main and Display controllers can be individually reset from the Telnet console. The '**m**' command resets the Main controller and '**p**' resets the Display. When the main controller is reset, the display may show:

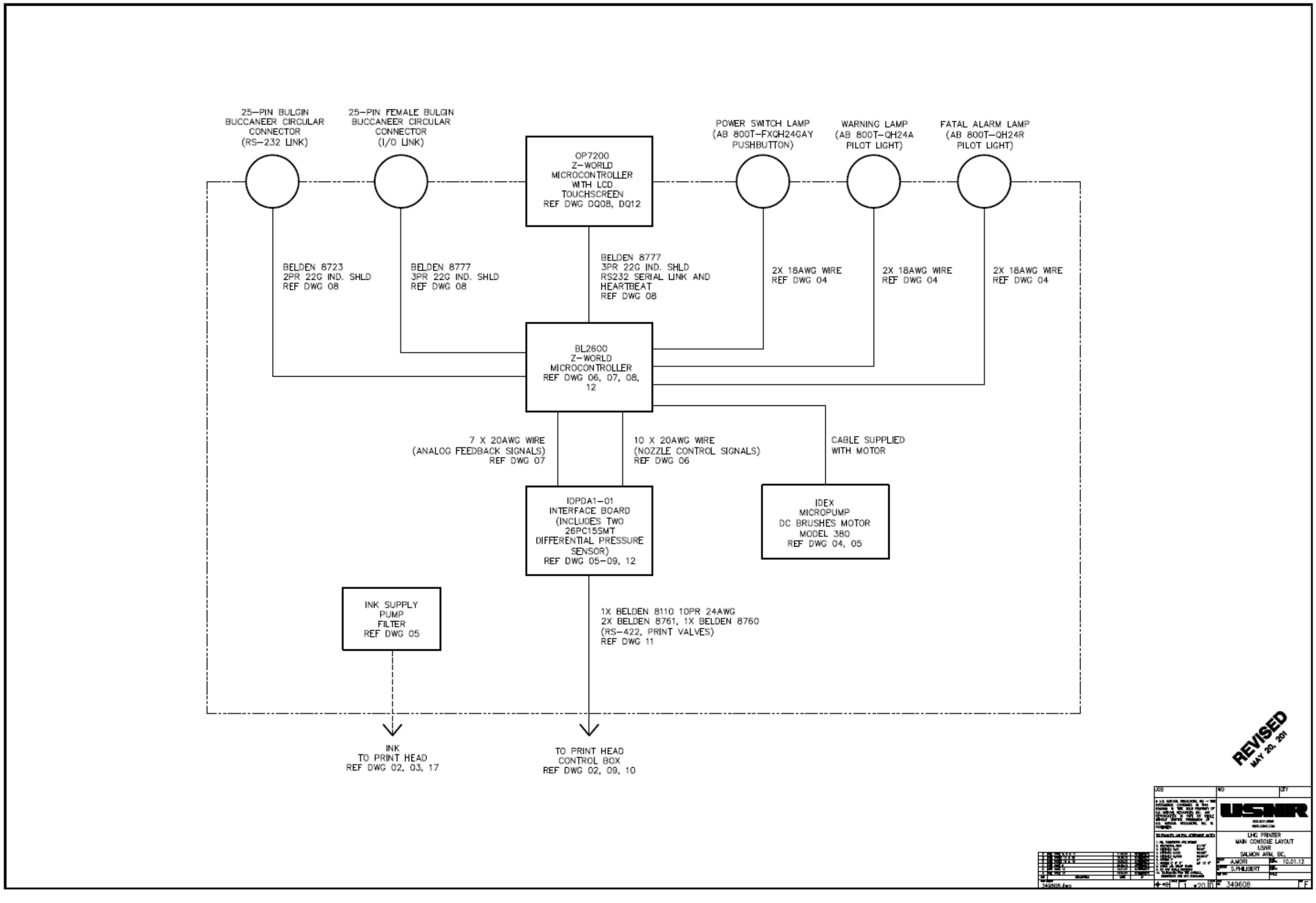
```
ERROR: Reset Printer
```

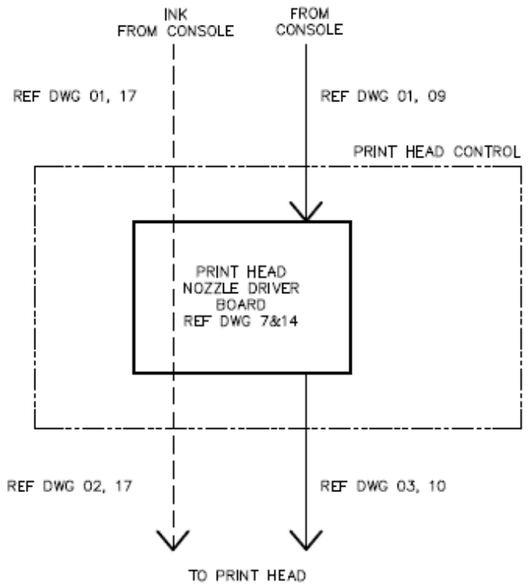
This is normal as the Display controller loses the heartbeat ping from the Main controller until the reset is finished, the normal display should resume after a few seconds. The LCD screen goes blank when the Display controller is reset.

Note: The Telnet connection gets dropped when the Main controller is reset.

Resetting the controllers is useful for instance to ensure default values have been updated to Flash and are active after a reboot, or to clear any temporary config changes and revert to the stored Flash values.

9. Printer Console



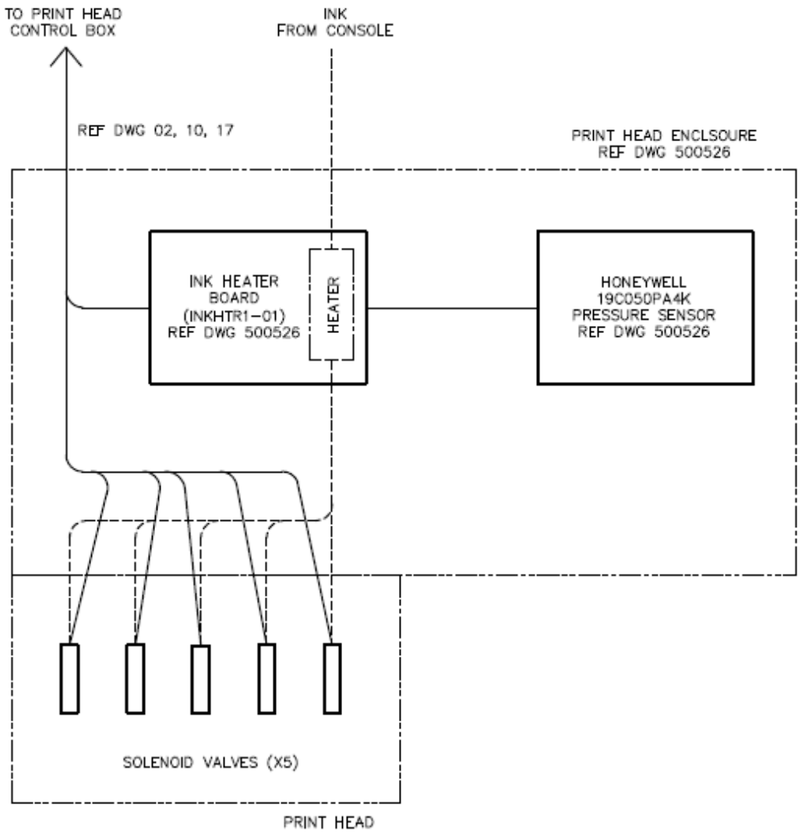


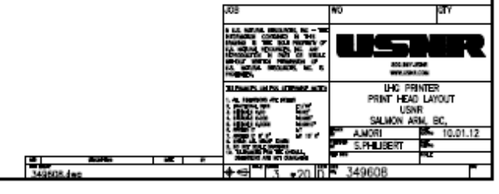
JOB | WO | QTY

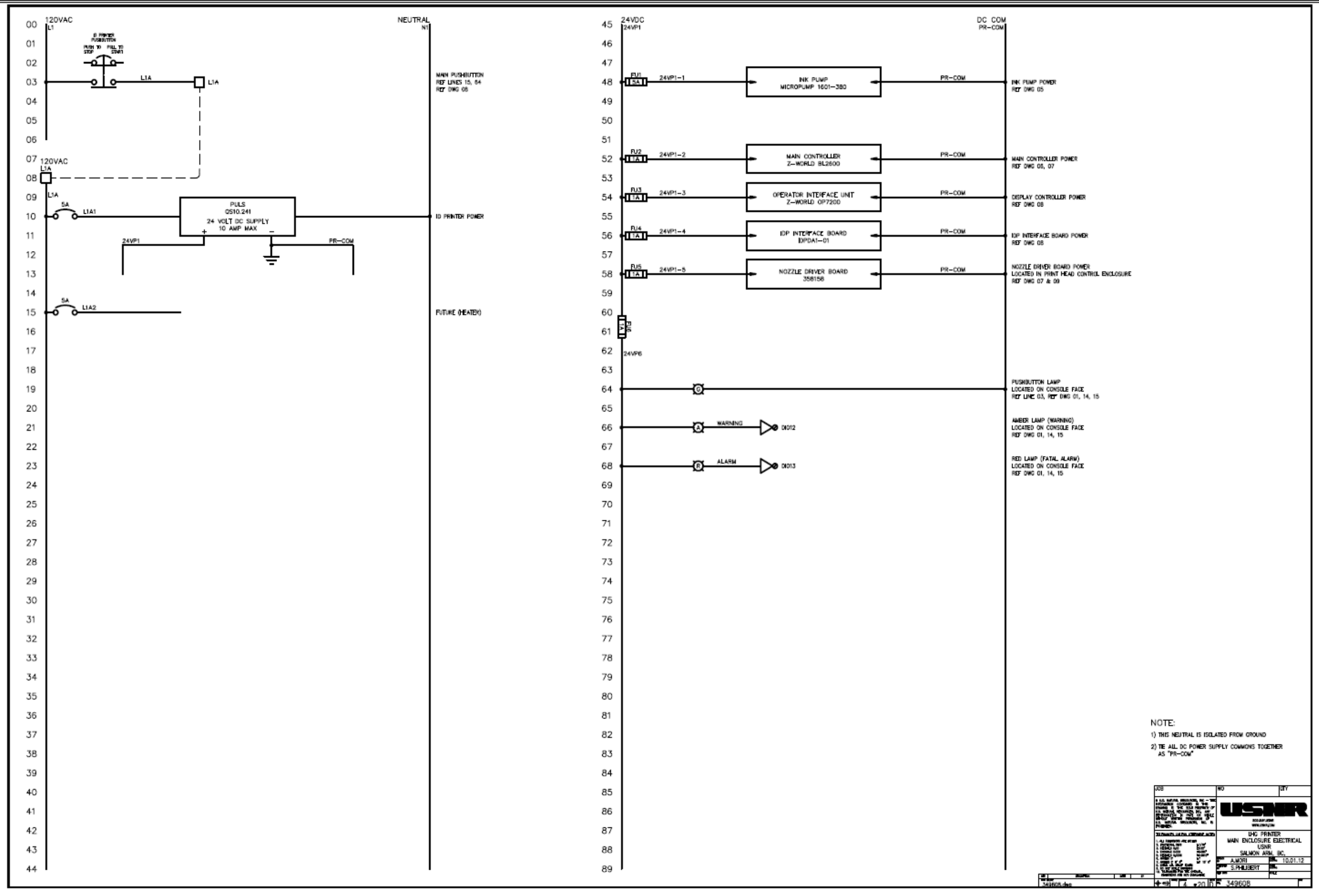
UHC PRINTER
PRINT HEAD CONTROL LAYOUT
USNR
SALMON ARM, BC.

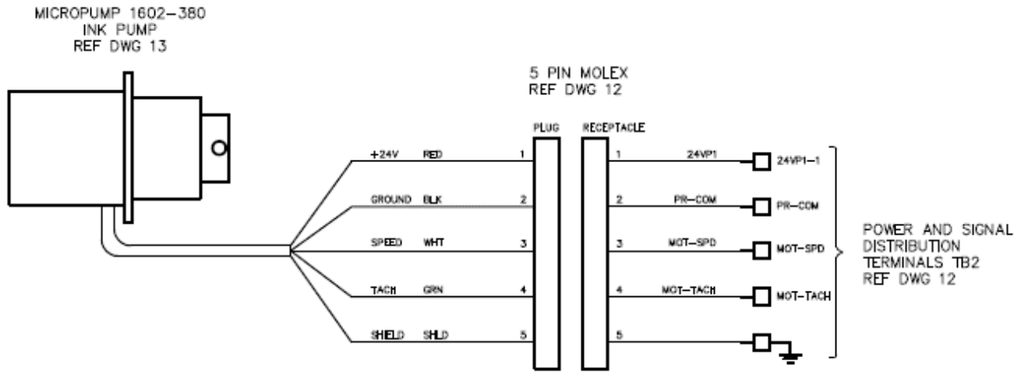
A.MORI 10.01.12
S.PHILIBERT

SIZE 349608 REV


TO PRINT HEAD
CONTROL BOX
INK
FROM CONSOLE
REF DWG 02, 10, 17
PRINT HEAD ENCLSOURE
REF DWG 500526
INK HEATER
BOARD
(INKHTR1-01)
REF DWG 500526
HEATER
HONEYWELL
19C050PA4K
PRESSURE SENSOR
REF DWG 500526
SOLENOID VALVES (X5)
PRINT HEAD


JOB
NO
QTY
USNR
UHC PRINTER
PRINT HEAD LAYOUT
USNR
SALMON ARM, BC.
DRN A.MORI
DATE 10.01.12
APP'D S.PHILIBERT
DWG NO 349608
SIZE B
SCALE 1 = 20
REV


120VAC
L1
NEUTRAL
N1
ID PRINTER PUSHBUTTON
PUSH TO STOP
PULL TO START
L1A
MAIN PUSHBUTTON
REF LINES 15, 64
REF DWG 05
120VAC
L1A
PULS
QS10.241
24 VOLT DC SUPPLY
10 AMP MAX
5A
L1A1
ID PRINTER POWER
24VP1
PR-COM
5A
L1A2
FUTURE (HEATER)
24VDC
24VP1
DC COM
PR-COM
FU1
5A
24VP1-1
INK PUMP
MICROPUMP 1601-380
INK PUMP POWER
REF DWG 05
FU2
1A
24VP1-2
MAIN CONTROLLER
Z-WORLD BL2600
MAIN CONTROLLER POWER
REF DWG 05, 07
FU3
1A
24VP1-3
OPERATOR INTERFACE UNIT
Z-WORLD OP7200
DISPLAY CONTROLLER POWER
REF DWG 08
FU4
1A
24VP1-4
IDP INTERFACE BOARD
IDPDA1-01
IDP INTERFACE BOARD POWER
REF DWG 08
FU5
1A
24VP1-5
NOZZLE DRIVER BOARD
358158
NOZZLE DRIVER BOARD POWER
LOCATED IN PRINT HEAD CONTROL ENCLOSURE
REF DWG 07 & 09
FU6
1A
24VP6
PUSHBUTTON LAMP
LOCATED ON CONSOLE FACE
REF LINE 03, REF DWG 01, 14, 15
WARNING
DI012
AMBER LAMP (WARNING)
LOCATED ON CONSOLE FACE
REF DWG 01, 14, 15
ALARM
DI013
RED LAMP (FATAL ALARM)
LOCATED ON CONSOLE FACE
REF DWG 01, 14, 15
NOTE:
1) THIS NEUTRAL IS ISOLATED FROM GROUND
2) TIE ALL DC POWER SUPPLY COMMONS TOGETHER AS "PR-COM"
JOB
WO
QTY
UHC PRINTER
MAIN ENCLOSURE ELECTRICAL
USNR
SALMON ARM, BC.
A.MORI
10.01.12
S.PHILIBERT
349608
349608.dwg

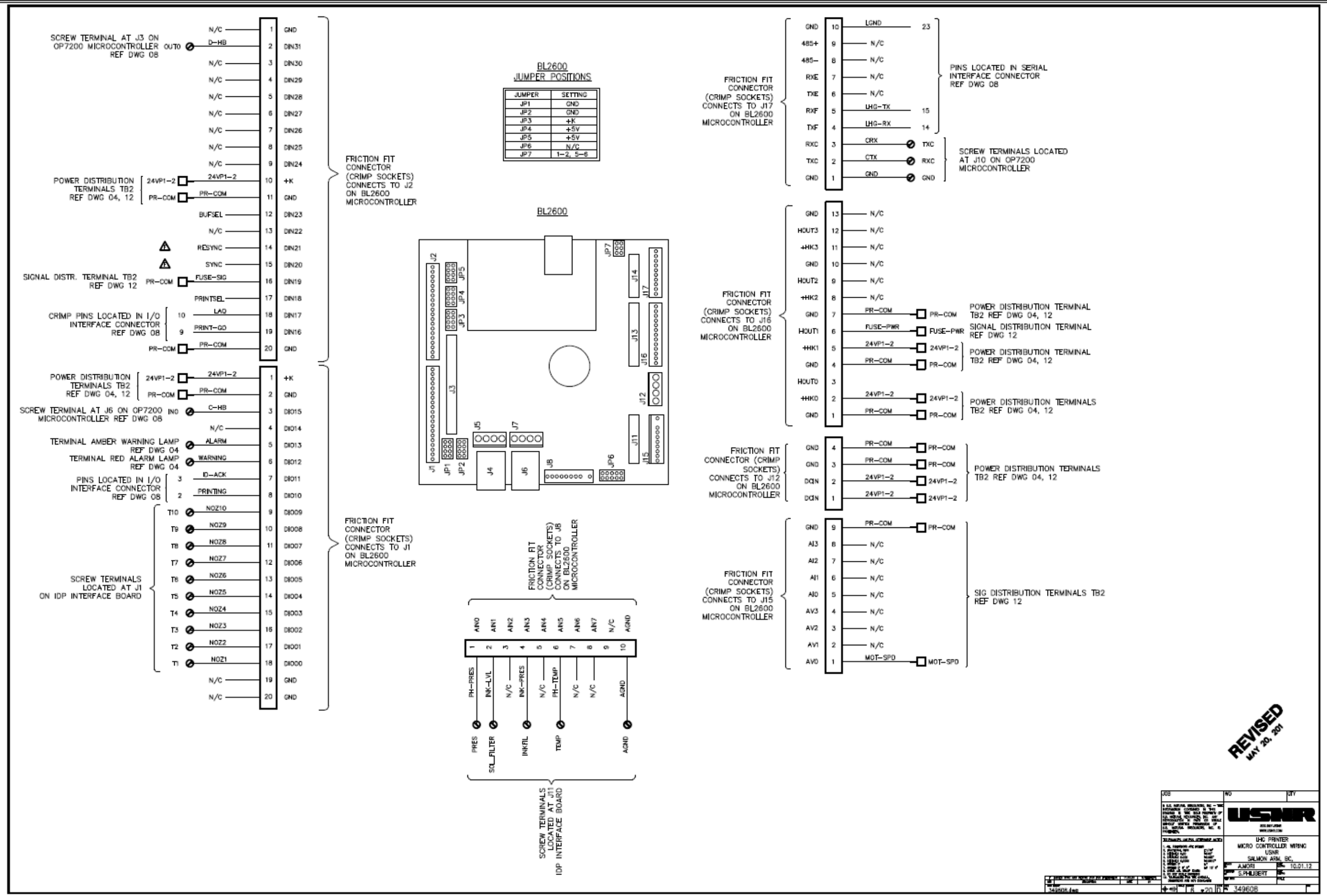


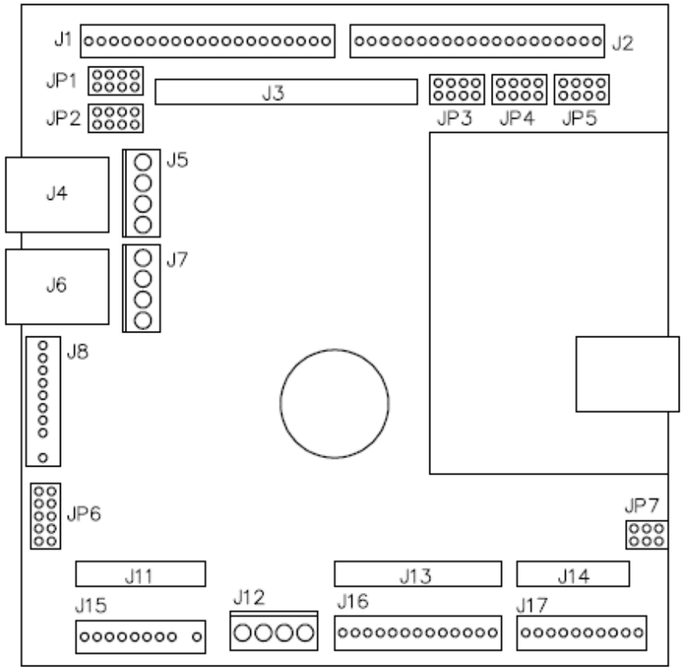
JOB WO QTY

UHC PRINTER
PUMP AND LEVEL SENSOR WIRING
USNR
SALMON ARM, BC.

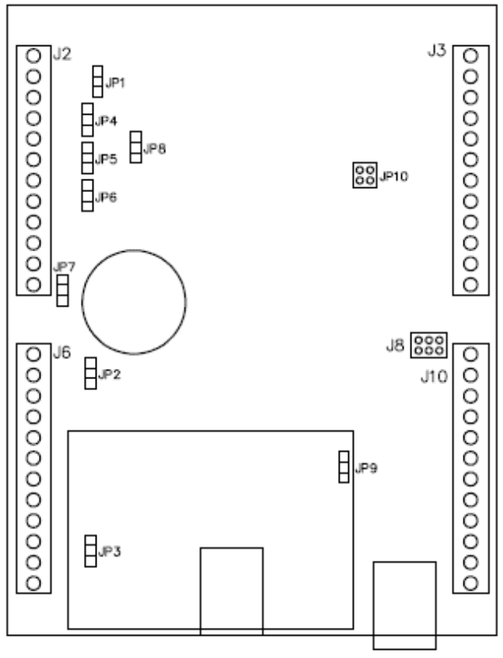
A.MORI 10.01.12
S.PHILIBERT

SIZE 5 SCALE 20 DWG NO 349608

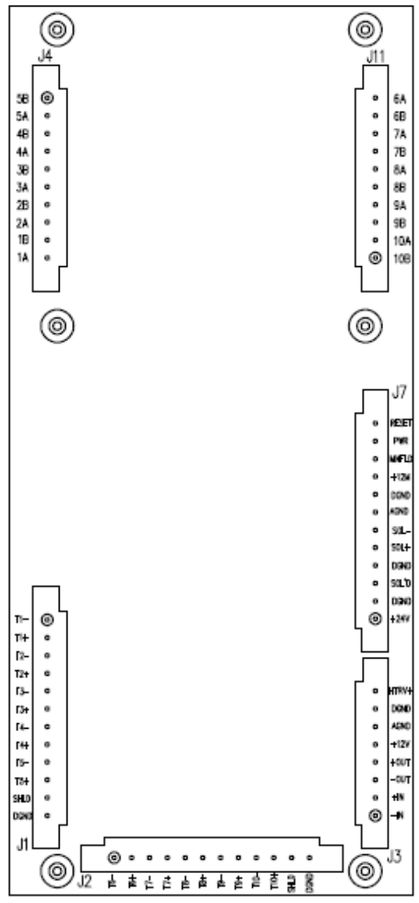

SCREW TERMINAL AT J3 ON OP7200 MICROCONTROLLER REF DWG 08
OUT0
D–HB
POWER DISTRIBUTION TERMINALS TB2 REF DWG 04, 12
24VP1–2
PR–COM
SIGNAL DISTR. TERMINAL TB2 REF DWG 12
CRIMP PINS LOCATED IN I/O INTERFACE CONNECTOR REF DWG 08
LAQ
PRINT–GO
FRICTION FIT CONNECTOR (CRIMP SOCKETS) CONNECTS TO J2 ON BL2600 MICROCONTROLLER
SCREW TERMINAL AT J6 ON OP7200 MICROCONTROLLER REF DWG 08
IN0
C–HB
TERMINAL AMBER WARNING LAMP REF DWG 04
ALARM
TERMINAL RED ALARM LAMP REF DWG 04
WARNING
PINS LOCATED IN I/O INTERFACE CONNECTOR REF DWG 08
ID–ACK
PRINTING
SCREW TERMINALS LOCATED AT J1 ON IDP INTERFACE BOARD
FRICTION FIT CONNECTOR (CRIMP SOCKETS) CONNECTS TO J1 ON BL2600 MICROCONTROLLER
BL2600
JUMPER POSITIONS
JUMPER SETTING
JP1 GND
JP2 GND
JP3 +K
JP4 +5V
JP5 +5V
JP6 N/C
JP7 1–2, 5–6
BL2600
FRICTION FIT CONNECTOR (CRIMP SOCKETS) CONNECTS TO J17 ON BL2600 MICROCONTROLLER
PINS LOCATED IN SERIAL INTERFACE CONNECTOR REF DWG 08
LHG–TX
LHG–RX
CRX
CTX
SCREW TERMINALS LOCATED AT J10 ON OP7200 MICROCONTROLLER
FRICTION FIT CONNECTOR (CRIMP SOCKETS) CONNECTS TO J16 ON BL2600 MICROCONTROLLER
FUSE–PWR
POWER DISTRIBUTION TERMINAL TB2 REF DWG 04, 12
SIGNAL DISTRIBUTION TERMINAL REF DWG 12
POWER DISTRIBUTION TERMINALS TB2 REF DWG 04, 12
FRICTION FIT CONNECTOR (CRIMP SOCKETS) CONNECTS TO J12 ON BL2600 MICROCONTROLLER
FRICTION FIT CONNECTOR (CRIMP SOCKETS) CONNECTS TO J15 ON BL2600 MICROCONTROLLER
MOT–SPD
SIG DISTRIBUTION TERMINALS TB2 REF DWG 12
FRICTION FIT CONNECTOR (CRIMP SOCKETS) CONNECTS TO J8 ON BL2600 MICROCONTROLLER
PH–PRES
INK–LVL
INK–PRES
PH–TEMP
PRES
SCL_FILTER
INK/TIL
TEMP
AGND
SCREW TERMINALS LOCATED AT J11 IDP INTERFACE BOARD
REVISED MAY 20, 201
LHC PRINTER MICRO CONTROLLER WIRING
USNR
SALMON ARM, BC.
AJMORI
10.01.12
S.PHILIBERT
349608



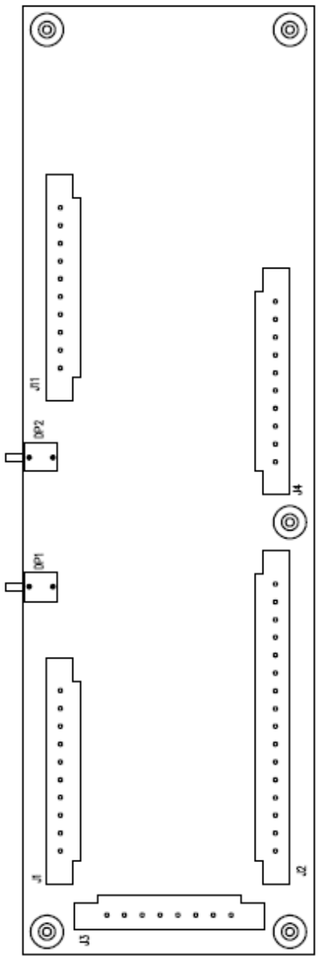
BL2600
MICROCONTROLLER



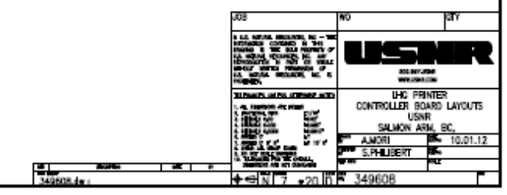
OP7200
DISPLAY
MICROCONTROLLER



358158
NOZZLE DRIVER BOARD



IDPDAPCB1–02
IDP BOARD OVERLAY



ITEM	QTY	DESCRIPTION	LG/AR/WT	DWG – P/N
1	1	CABLE 3C 14G CAB TIRE	0.50	102CB143X3Y
2	1	CABLE 5PR 24G INDSHLD BELD8105	2.00	102B105BELDEN
3	1	CABLE 2PR 22G INDSHLD BELD8723	1.00	102B723BELDEN

POWER DISTRIBUTION TERMINALS
REF DWG 04, 12 TB1

L1 — L1 — BULGIN PIN# L
N1 — N1 — N
GND — G

CABTYRE ROYAL 14/3 SJOW (1)

POWER CONNECTOR
BULGIN 3–PIN BOX–MOUNT
REF DWG 13

FRICTION FIT CONNECTORS (CRIMP SOCKETS)
LOCATED AT J1 AND J2
ON BL2600 MICROCONTROLLER
REF DWG 06

POWER DISTRIBUTION TERMINALS
REF DWG 04, 12

			BULGIN PIN#
DIN23	BUFSEL	BRN/WHT	7
DIN18	PRINTSEL	WHT/BRN	8
DIO10	PRINTNG	GRN/WHT	2
DIO11	ID–ACK	WHT/GRN	3
DIN16	PRINT–GO	WHT/ORG	9
DIN17	LAQ	ORG/WHT	10
24VP1	24VP1	GRY/WHT	25
DIN21	RESYNC	WHT/GRY	24 ⚠
PR–COM	PR–COM	BLU/WHT	1
DIN20	SYNC	WHT/BLU	4 ⚠
		SHIELD	

⚠ I/O CONNECTOR
BULGIN 25–PIN BOX–MOUNT
REF DWG 01, 13

BELDEN 8105
5PR 24G SHLD (2)

FRICTION FIT CONNECTOR (CRIMP SOCKETS)
LOCATED AT J17
ON BL2600 MICROCONTROLLER
REF DWG 06

			BULGIN PIN#
RXF	LHG–TX	RED	15
N/C		BLK	23
TXF	LHG–RX	WHT	14
GND	LGND	GRN	23

SERIAL COMMUNICATION CONNECTOR
BULGIN 25–PIN BOX–MOUNT
REF DWG 01, 13

WIRING TO LID OF CONSOLE

BELDEN 8723
2PR 22G IND. SHLD (3)

SCREW TERMINALS
LOCATED AT J3
ON OP7200 MICROCONTROLLER

+PWR	24VP1	24VP1	24VP1–3	POWER DISTRIBUTION TERMINALS TB2 REF DWG 04, 12
–PWR	PR–COM	PR–COM	PR–COM	
+K	24VP1	24VP1	24VP1–3	
GND	PR–COM	PR–COM	PR–COM	

SCREW TERMINALS
LOCATED AT J10
ON OP7200 MICROCONTROLLER

RXC	CTX	WHT 2	TXC	FRICTION FIT CONNECTOR (CRIMP SOCKETS) LOCATED AT J17 ON BL2600 MICROCONTROLLER REF DWG 06
GND	GND	BLK 1	GND	
TXC	CRX	GRN 3	RXC	
N/C		BLK	N/C	

SCREW TERMINAL AT J3 ON OP7200 MICROCONTROLLER	OUT0	D–HB	RED 2	DIN31	CRIMP SOCKET AT J2 ON BL2600 MICROCONTROLLER REF DWG 06
SCREW TERMINAL AT J6 ON OP7200 MICROCONTROLLER	IN0	C–HB	BLK 4	DIO15	CRIMP SOCKET AT J1 ON BL2600 MICROCONTROLLER REF DWG 06

BELDEN 8777
3PR 22G IND. SHLD (2)

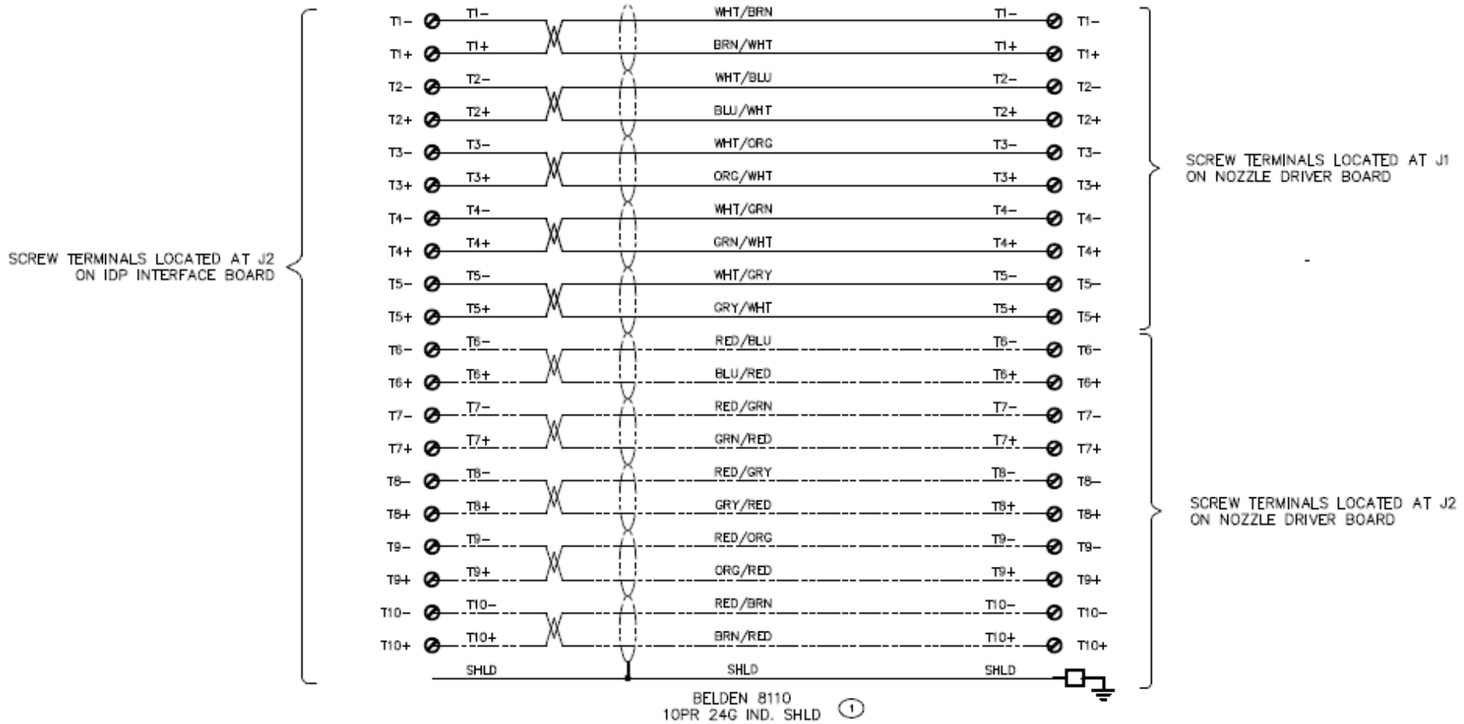
SCREW TERMINALS
LOCATED AT J11
ON IDP INTERFACE BOARD

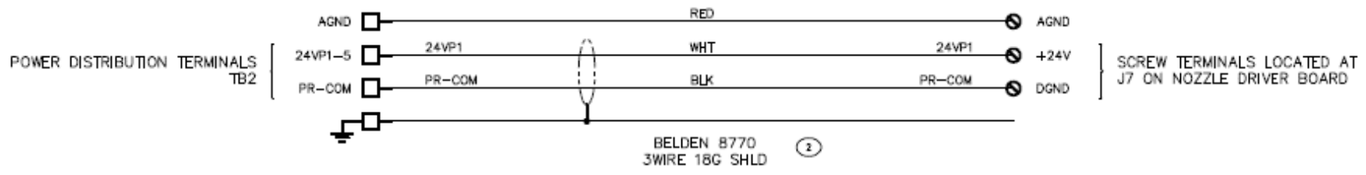
+24V	24VP1	24VP1	24VP1–4	POWER DISTRIBUTION TERMINALS TB2 REF DWG 04, 12
DGND	PR–COM	PR–COM	PR–COM	

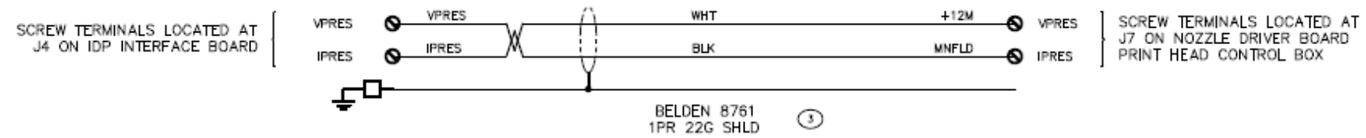
REVISED
MAY 20, 2011

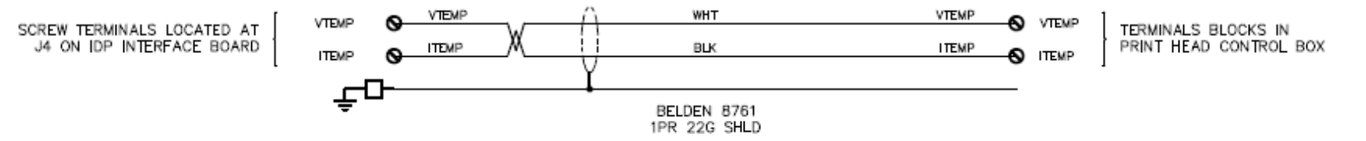
JOB	NO	QTY
USNR		
LHC PRINTER MAIN ENCLOSURE WIRING USNR SALMON ARM, BC.		
DRN AJMORI	DATE 10.01.12	
CHKD S.PHILIBERT	DWG	
APP'D	FILE	
349608.dwg	SHT 1 OF 1	DWG NO 349608

ITEM	QTY	DESCRIPTION	LG/AR/WT	DWG – P/N
1	1	CABLE 10PR 24G SHLD	4.00	BELDEN8110
2	1	CABLE 3C 18G SHLD BELDEN8770	4.00	10Z8770BELDEN
3	1	CABLE 1PR 22G SHLD	12.0	8761



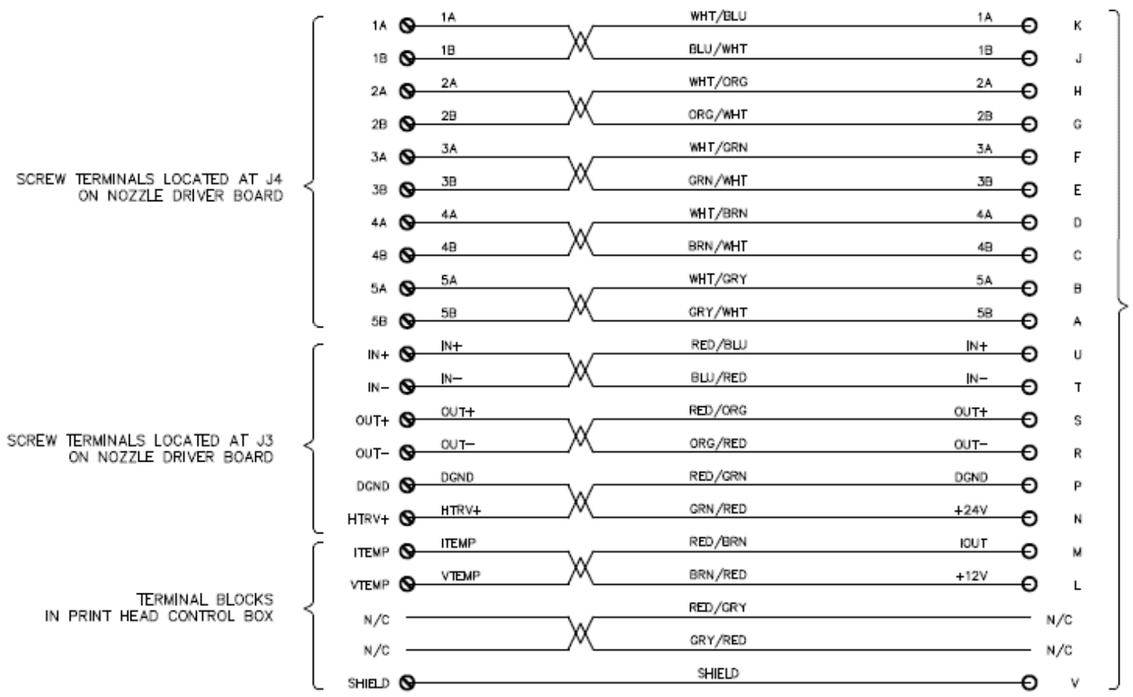




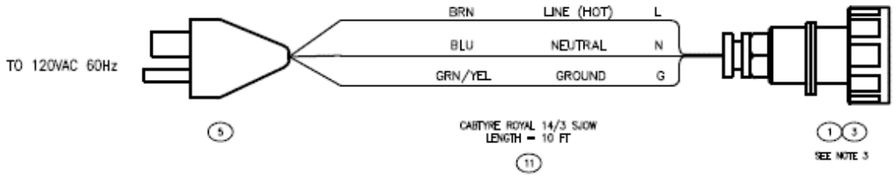


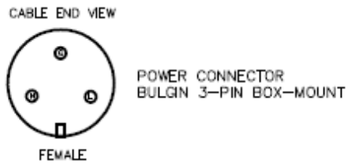
JOB | WO | QTY
USNR
LHC PRINTER
PRINT HEAD CONTROL WIRING
USNR
SALMON ARM, BC.
AJMORI 10.01.12
S.PHILIBERT
SCALE 1:1 SHEET 1 OF 1
DWG NO 349608
REV

ITEM	QTY	DESCRIPTION	LG/AR/WT	DWG – P/N
1	1	CABLE 10PR 24G SHLD	2.00	BELDEN8110
2	1	CONN S16/19C REV PLUG SKT CONT		182926–0530
3	19	CONN SOCKET GOLDFLASH 24–28AWG		182990–0090
4	1	CONN S16/19C CABLE CLAM		182922–1340

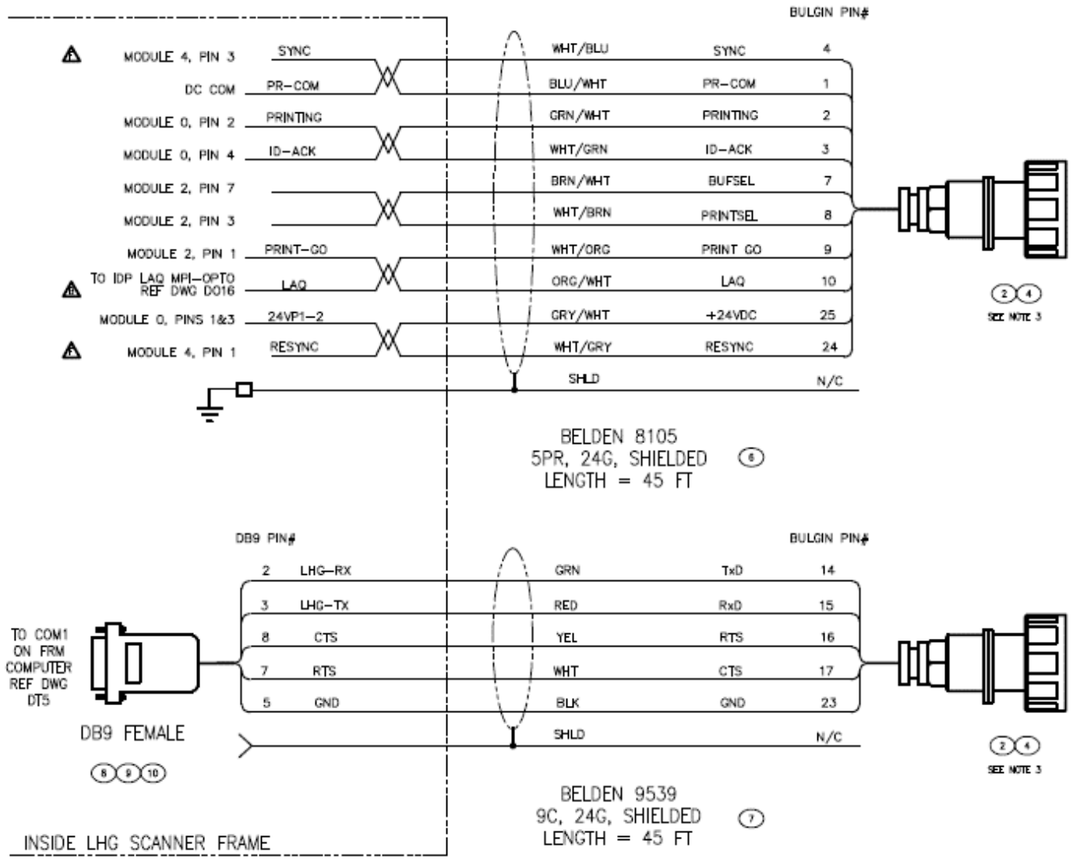


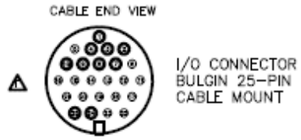
JOB	NO	QTY
USNR		
UHC PRINTER PRINT HEAD CONTROL WIRING USNR SALMON ARM, BC.		
AJMORI	10.01.12	
S.PHILIBERT		
349608.dwg	10 = 20	349608

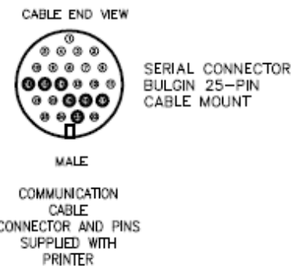




ITEM	QTY	DESCRIPTION	LG/AR/WT	DWG - P/N
1	1	3 POLE FITTED SOCKET		PX0731-S
2	2	25-PIN BUCCANEER CABLE CONNECT		PX0620-P
3	2	CRIMP SOCKETS, PKG OF 10		SA3179
4	2	CRIMP PINS, PKG OF 10		SA3180
5	1	LEVITON CORD END (NL)		5025965-W-30
6	1	CABLE 5PR 24G UNSHLD BELDEN 8105	14.00	10261058BELDEN
7	1	CABLE 9C 24G SHLD BELDEN 9539	14.00	10262424A9
8	1	CONN DB9 HOOD STR METAL PLAST		AGF09KME
9	1	CONN DB9 FEM RECP SHELL ZINC		1222052053-1
10	5	SOCKET 20-24AWG DB CRIMP FEM		12268504-9
11	1	CABLE 3C 14G CAB TIRE	3.00	10202144JY





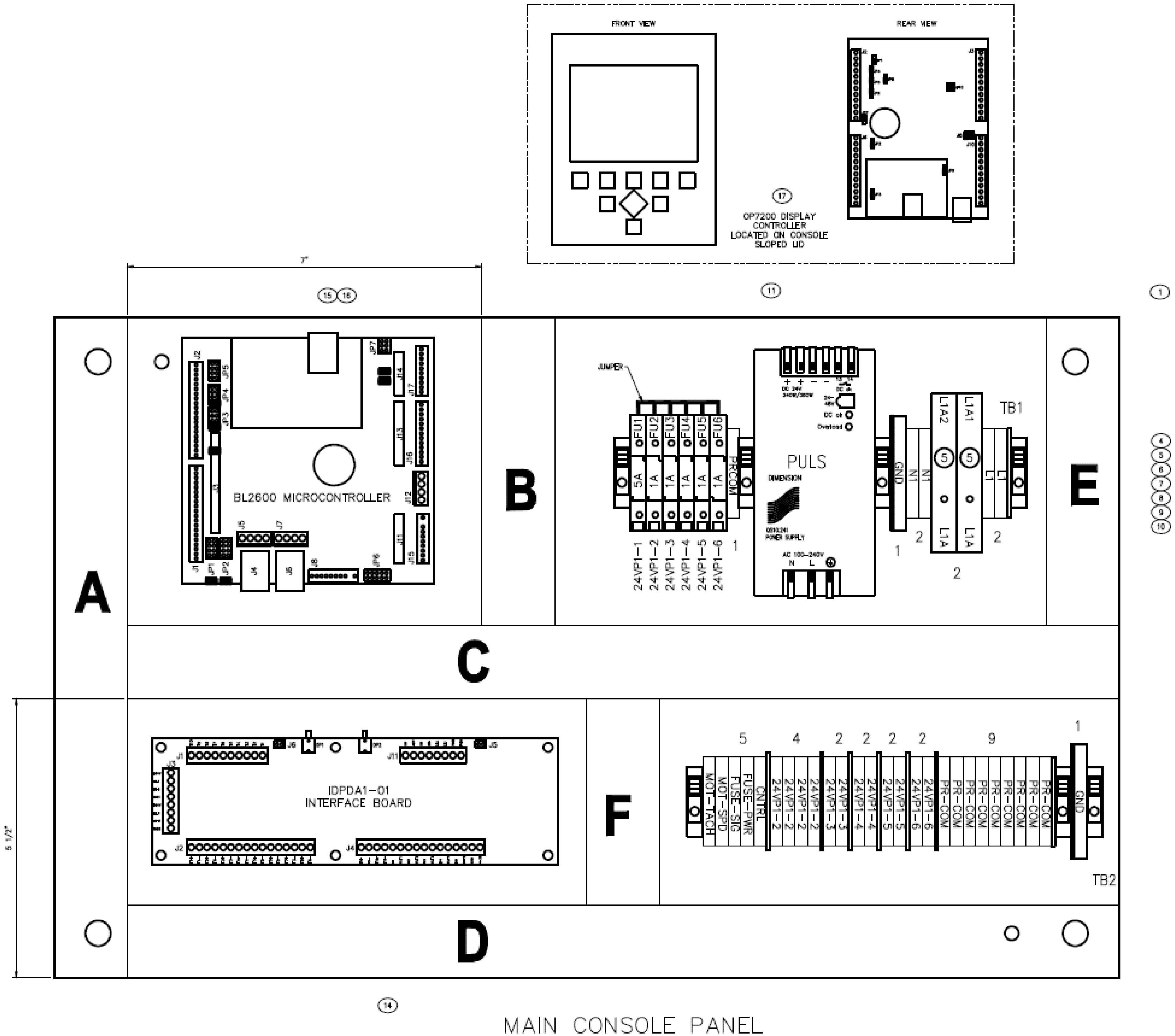


NOTES:

1. SIGNAL WIRES +5VDC, OPTO COMMON +, CTS AND RTS ARE NOT USED FOR CNM ID PRINTER.
2. THESE ARE CONNECTED FOR COMPATABILITY WITH DOMINO PRINTER SYSTEM
3. EXTRA PINS AND SOCKETS USED FOR PANEL MOUNT CONNECTORS. REF DWGS 08, 14

REVISED MAY 20, 2011

JOB	NO	QTY
	USNR	
LHG PRINTER CONSOLE EXTERNAL CABLING USNR SALMON ARM, BC.		
DRN AJMORI	DATE 10.01.12	
APPD S.PHILIBERT	CHK	
SHT 1 OF 1	SCALE	
349608.dwg		349608



ITEM	QTY	DESCRIPTION	LG/AR/WT	DWG – P/N
1	1	BACK PANEL 24X16		A-24P16
2	0.5	ALLEN BRADLEY 199-DR1		315444
3	1	DUCT 50037 1-1/2 X 2		602S0037
4	31	WELAND WK4/U GREY TERM BLOCK		602WK4-U
5	2	WELAND AP2.5-4 END PLATES		602AP2.5-4
6	6	WELAND TW2.5-4 PARTITION		602TW2.5-4
7	2	WDMLR GND LUG EK6/35 TS35		M2-01694
8	2	WDMLR CCTBRKR 5A MCB TS32/35		91018.0
9	6	WDMLR FUSE IND 24VDC TS32/35		2227.6
10	6	WDMLR END BRACKET EW35 TS35		3835.6
11	1	POWER SUPPLY 24V/10A SW PULS PULS MODEL QS10.2		500602
14	1	ID PRINTER DATA ACQ PCA V1R2		IDPDAPCA1-02
15	1	EMBEDDED INDUSTRIAL CONTROLLER		500643
16	1	CONNECTOR KIT FOR 500642		500644
17	1	OPERATOR INTERFACE TOUCHSCREEN		349589
18	1	CONN RECEPT 5POS 2MM CRIMP		500666
19	5	CONN CRIMP FEM FOR 500666		500667

TERMINAL RAIL LENGTHS

RAIL	DESCRIPTION	LENGTH" (METERS)
TB1	TS32 "U" RAIL	8-1/2" (0.22M)
TB2	TS32 "U" RAIL	8-1/2" (0.22M)

WIRE DUCT LENGTHS

DUCT	DESCRIPTION	LENGTH" (METERS)
A	1.5" X 2" (WxH)	13" (0.33M)
B	1.5" X 2" (WxH)	6" (0.15M)
C	1.5" X 2" (WxH)	18-1/8" (0.46M)
D	1.5" X 2" (WxH)	18-1/8" (0.46M)
E	1.5" X 2" (WxH)	6" (0.15M)
F	1.5" X 2" (WxH)	4" (0.10M)

ASSEMBLY NOTES:

1) ALL TERMINAL TRACKS ARE "U-RAIL", TS35.

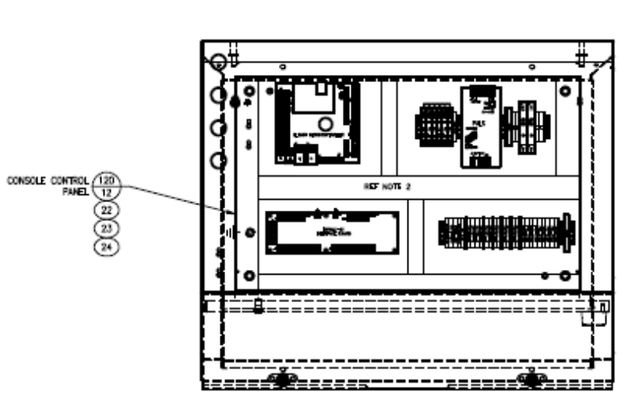
2) 1 = G3RD-X02SN-US-D
2 = G3R-OA202SZN
3 = G2R-1-SND-DC24

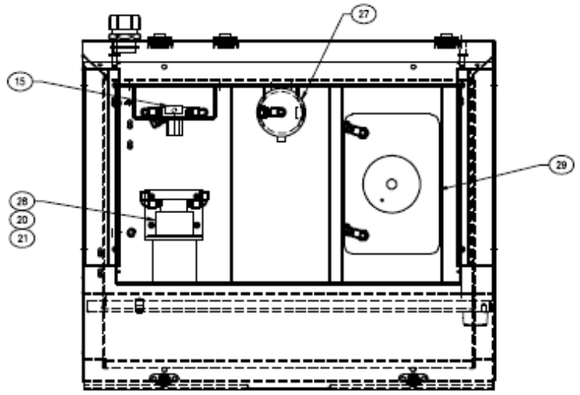
3) MAINTAIN STANDARD SEPARATION FOR AC AND DC WIRING. CROSSING WIRES ALLOWED AT 90 DEGREES ONLY.

4) RIVET WIRE DUCT TO PANEL. MAX 6" SEPARATION.

IHC PRINTER CONSOLE CONTROL PANEL LAYOUT
USNR
SALMON ARM, BC.
A.MORI 10.01.12
S.PHILIBERT
349608

ITEM	QTY	DESCRIPTION	LG/AR/WT	DWG - P/N
1	1	CONCEPT SLOPED CONSOLE - STEEL		500641
2	1	SHELF, ID PRINTER CONSOLE		500520
3	2	SLIDE MOUNT, ID PRINTER CONSOLE		500521
4	1	DRAWER, ID PRINTER CONSOLE		500522
5	1	REGULATOR BRACKET, ID PRINTER		500523
6	1	FILTER MANIFOLD, ID PRINTER		500524
7	1	STAND, ID PRINTER CONSOLE		500525
8	1	DRAWER SLIDE 12		776-3273
9	2	25-SOCKET BUCCANEER PANEL-MNT		PX0822-S
10	1	3 POLE FROM PANEL MOUNT SOCKET		PX0730-P
15	1	REGULATOR WITH RELIEF VALVE		500645
18	1	CONN, LTPMCF 1 90		3254
19	1	CONDUIT 1" FLEXIBLE BLACK	1.00	LA100-30-BLACK
20	22	.25-20NC X .5 LG. HEX		J2-00125
21	22	.25-20NC HEX NUT, NYLOC, BRAIDE		J2-01221
22	4	.375-16NC X 2.5 LG., HEX HEAD		J2-00334
23	4	.375-16NC HEX NUT, NYLOC,		J2-00023
24	8	.375 DIA. FLAT WASHER, STANDARD		J2-00084
25	1	800-BUY USNR, WWW.USNR.COM,		N2-00159
27	1	FILTER ASSEMBLY (LHC PRINTER)		353892
28	1	PUMP ASSEMBLY (LHC PRINTER)		353893
29	1	CARBOY ASSEMBLY (LHC PRINTER)		353894
30	1	WATERPIK, CORDLESS, USED ON ID PRINTER NOZZLES		357702

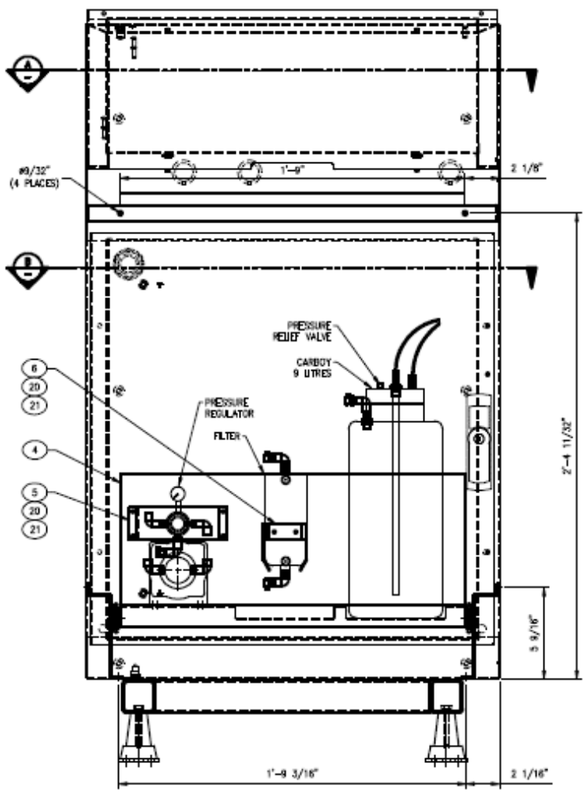




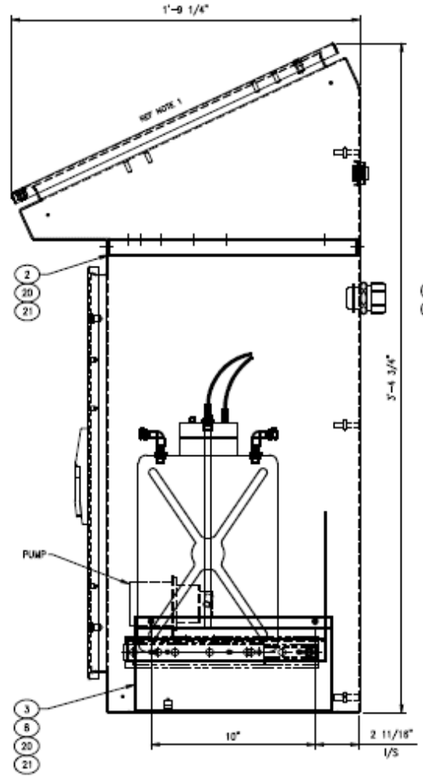
30

TOP - SHELF
1/4"=1"

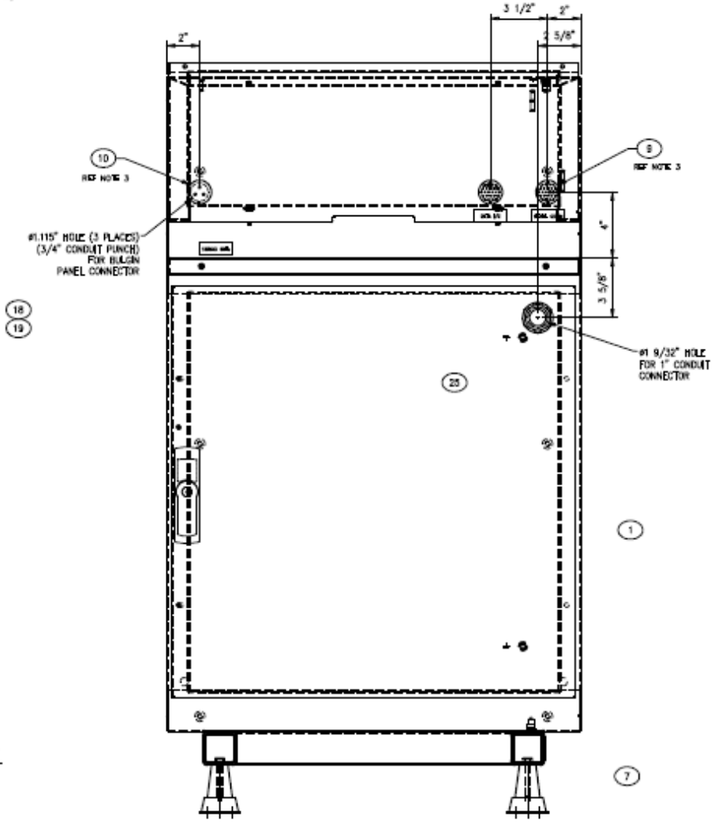
TOP - DRAWER
1/4"=1"



FRONT
1/4"=1"



SIDE
1/4"=1"



BACK
1/4"=1"

NOTES:
1. CONSOLE SLOPED TOP CUTOUT DETAILS REF DWG 15
2. PANEL LAYOUT AND PARTS REF DWG 13
3. CONNECTOR PINOUTS REF DWGS 08, 11
4. ALL TUBING AND FITTING REF DWGS 17, 18

REVISED
October 12, 2010

JOB	NO	QTY

USNR

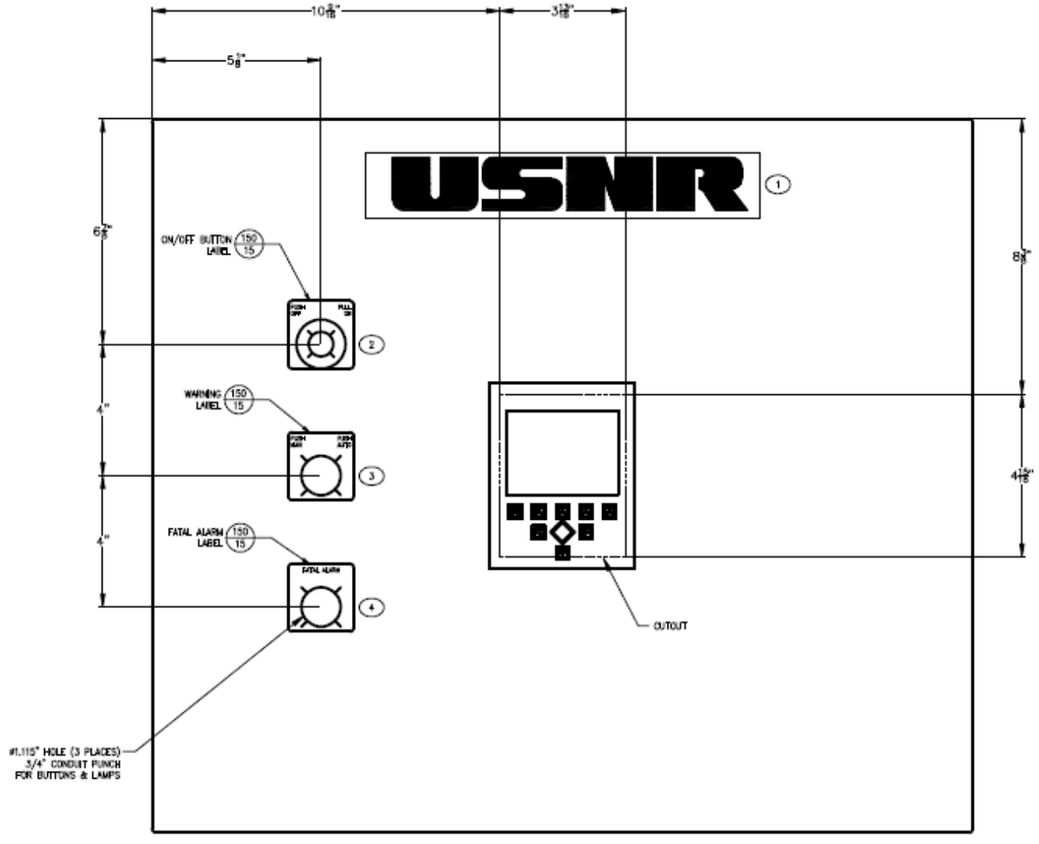
LHC PRINTER
CONSOLE COMPONENT LAYOUT
USNR
SALMON ARM, BC.

DRN	AJMORI	10.01.12
APP	S.P-HILBERT	

SIZE D | SCALE 1:20 | DWG NO 349608

349608.dwg

ITEM	QTY	DESCRIPTION	LG/AR/WT	DWG – P/N
1	1	DECAL, RED 12", USNR		305853
2	1	30 24V P/P 2P MNT WSH LED		500603
3	1	30 24V PLT LT LED AMBER		347337
4	1	30 24V PLT LT LED RED		800F-QH24R



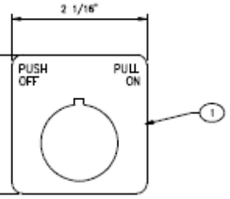
CONSOLE LID
1/2"=1"

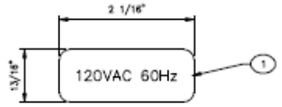
JOB	NO	QTY
USNR		
I-HC PRINTER CONSOLE INTERFACE LAYOUT USNR SALMON ARM, BC.		
DRN A.MORI	DATE 10.01.12	
APP S.P.HILBERT	DWG	
SHT SIZE 14 x 20	FILE 349608	REV

ITEM	QTY	DESCRIPTION	LG/AR/WT	DWG — P/N
1	1	GRAVOPLY WHT/BLK LTR ADHSV BCK 0.13 SQ. FT		200-221-AD

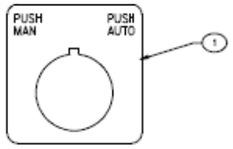
D

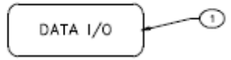
ON/OFF BUTTON LABEL



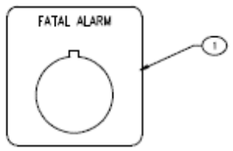


WARNING LABEL





FATAL ALARM LABEL

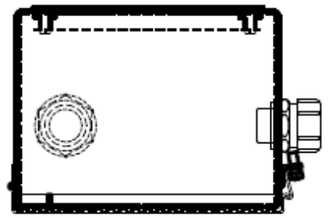


JOB	NO	QTY

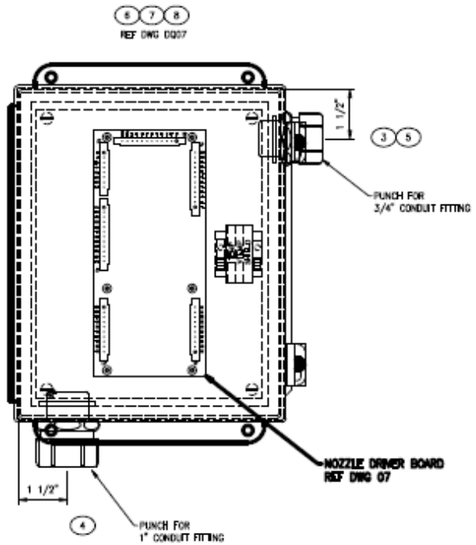
IHC PRINTER CONSOLE CONTROL LABELS USNR SALMON ARM, BC,

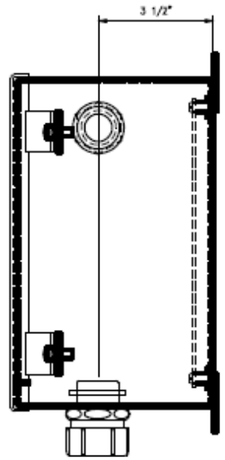
DRN	AJMORI	DATE	10.01.12
CHKD	S.PHILIBERT	DATE	
APP'D		DATE	
SIZE	349608		

ITEM	QTY	DESCRIPTION	LG/AR/WT	DWG – P/N
1	1	ENCLSURE CHOC		A10DBSCH
2	1	BACK PANEL- 10X8		A10PB
3	2	CONN, LTMKF 3/4 S		5233
4	1	CONN, LTMKF 1 S		5234
5	1	CONDUIT 3/4" FLEXIBLE BLACK	0.70	LA075-30-BLACK
6	1	ID PRINTER NOZZLE DRIVER BOARD, V2R01, N02DRVPCA2-01		358158
7	8	STAND-OFF 6-32 X 1 AL M-FM		2025063201X1ALMFM
8	6	6-32UNC X .375 LG., HEX SOCKET		42-01405
9	3	WIELAND WK4/U GREY TERM BLOCK		602WK4-U
10	1	WIELAND AP2.5-4 END PLATES		602AP2.5-4
11	2	WOMUR END BRACKET EN35 T535		3835.6
12	1	ALLEN BRADLEY 199-DR1	0.04	V0082267

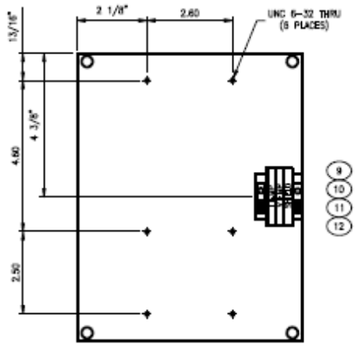


PRINT HEAD CONTROL BOX (1)



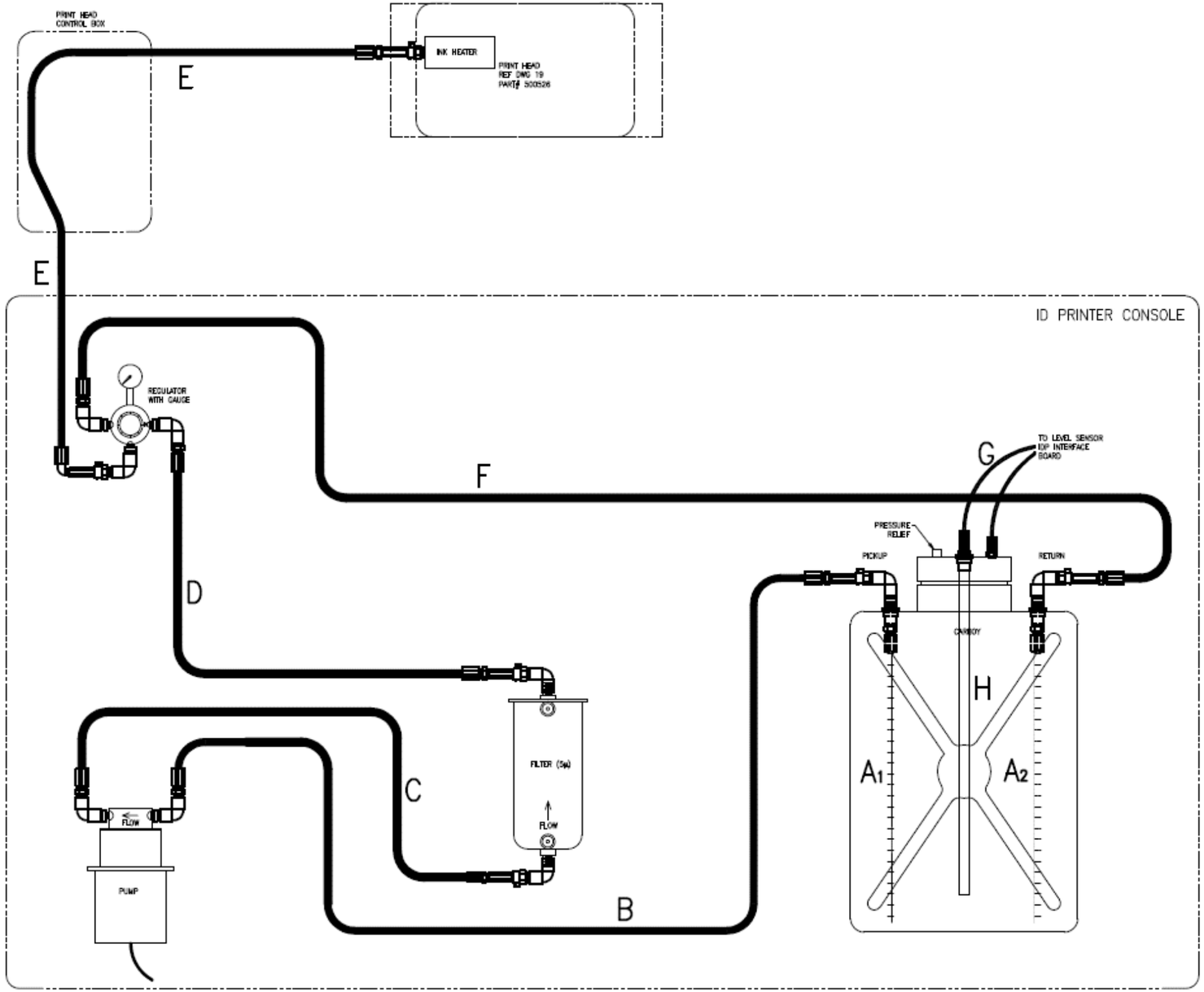


PANEL LAYOUT (2)



REVISED
SEPTEMBER 23, 2011

JOB	NO	QTY
	USNR	
	IHC PRINTER PRINT HEAD CONTROL ENCLOSURE USNR SALMON ARM, BC.	
	DRN AJMORI DATE 10.01.12 CHKD S.PHUBERT DATE APP'D DATE	
349608.dwg	16 • 2010	349608



ASSEMBLY NOTES:

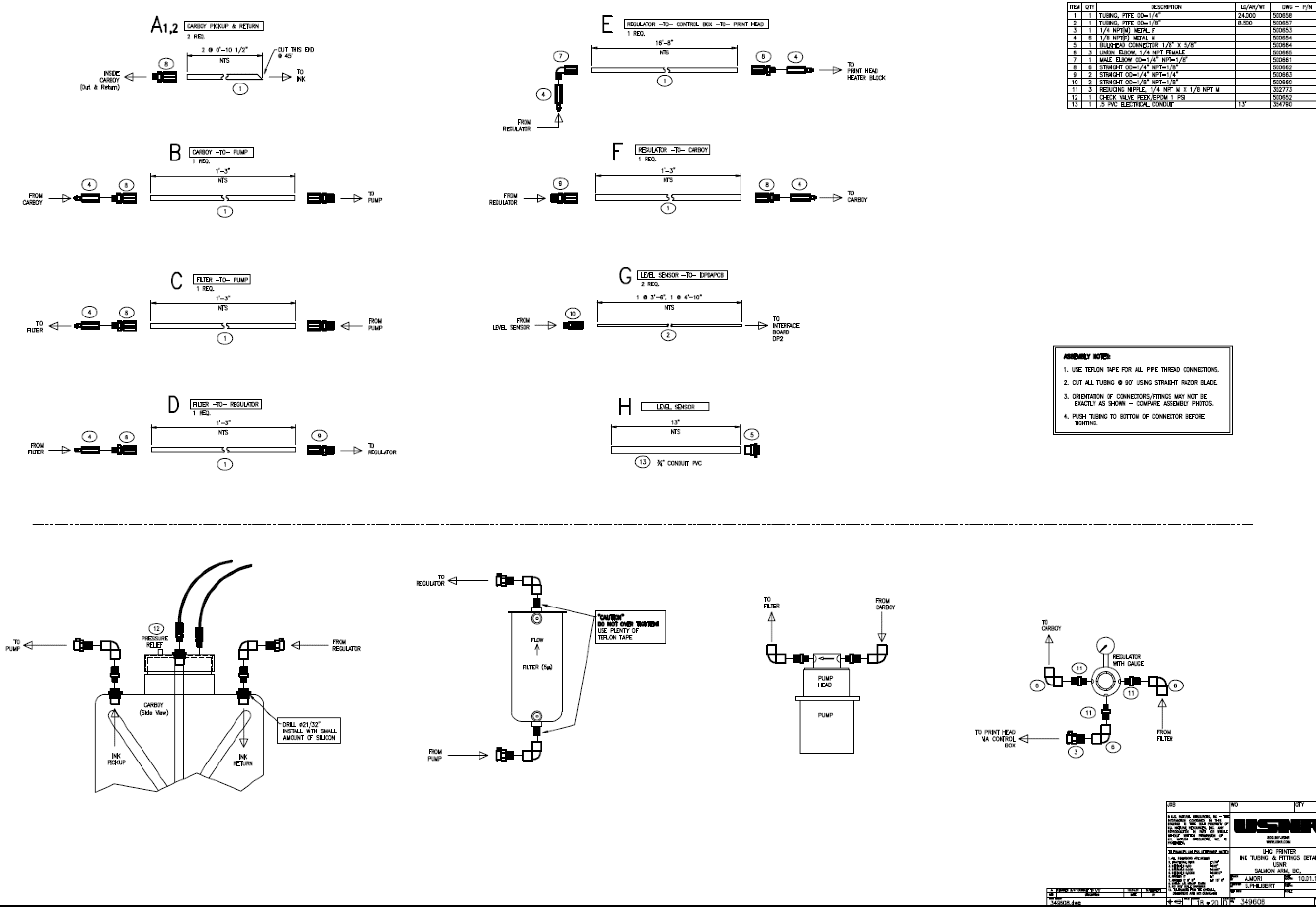
1. USE TEFLON PASTE FOR ALL PIPE THREAD CONNECTIONS.
2. CUT ALL TUBING @ 90° USING STRAIGHT RAZOR BLADE.
3. ORIENTATION OF CONNECTORS/FITTINGS MAY NOT BE EXACTLY AS SHOWN – COMPARE ASSEMBLY PHOTOS.
4. PUSH TUBING TO BOTTOM OF CONNECTOR BEFORE TIGHTING.

JOB	NO	QTY

USNR

UHC PRINTER
INK TUBING & COMPONENTS LAYOUT
USNR
SALMON ARM, BC.

DRN	AJMORI	DATE	10.01.12
APP	S.PHILIBERT	REV	
MFG APP		TITLE	
349608.dwg	17 x 20 (D)	DWG	34960B

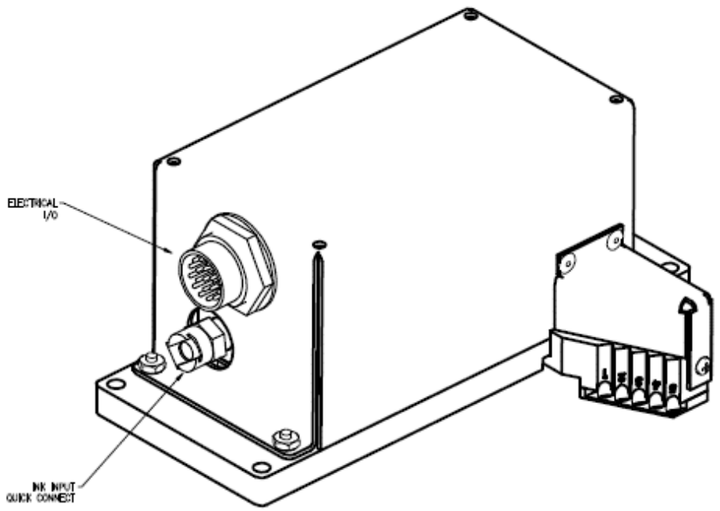


ITEM	QTY	DESCRIPTION	LG/AR/WT	DWG - P/N
1	1	TUBING, PTFE OD=1/4"	24.000	500658
2	1	TUBING, PTFE OD=1/8"	8.500	500657
3	1	1/4 NPT(M) METAL F		500653
4	6	1/8 NPT(F) METAL M		500654
5	1	BULKHEAD CONNECTOR 1/8" X 5/8"		500664
6	3	UNION ELBOW, 1/4 NPT FEMALE		500665
7	1	MALE ELBOW OD=1/4" NPT=1/8"		500661
8	6	STRAIGHT OD=1/4" NPT=1/8"		500662
9	2	STRAIGHT OD=1/4" NPT=1/4"		500663
10	2	STRAIGHT OD=1/8" NPT=1/8"		500660
11	3	REDUCING NIPPLE, 1/4 NPT M X 1/8 NPT M		352773
12	1	CHECK VALVE PEEK/EPDM 1 PSI		500652
13	1	.5 PVC ELECTRICAL CONDUIT	13"	354760

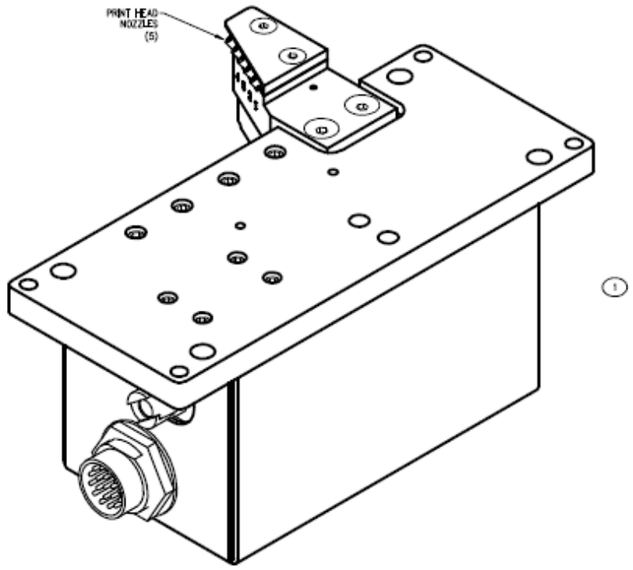
ASSEMBLY NOTES:

1. USE TEFLON TAPE FOR ALL PIPE THREAD CONNECTIONS.
2. CUT ALL TUBING @ 90° USING STRAIGHT RAZOR BLADE.
3. ORIENTATION OF CONNECTORS/FITTINGS MAY NOT BE EXACTLY AS SHOWN - COMPARE ASSEMBLY PHOTOS.
4. PUSH TUBING TO BOTTOM OF CONNECTOR BEFORE TIGHTING.

ITEM	QTY	DESCRIPTION	LG/AR/WT	DWG – P/N
1	0	ID PRINT HEAD, GYGER		350280



PRINT HEAD – BOTTOM
FULL SIZE



PRINT HEAD – TOP
FULL SIZE

REVISED
October 12, 2010

JOB	NO	QTY

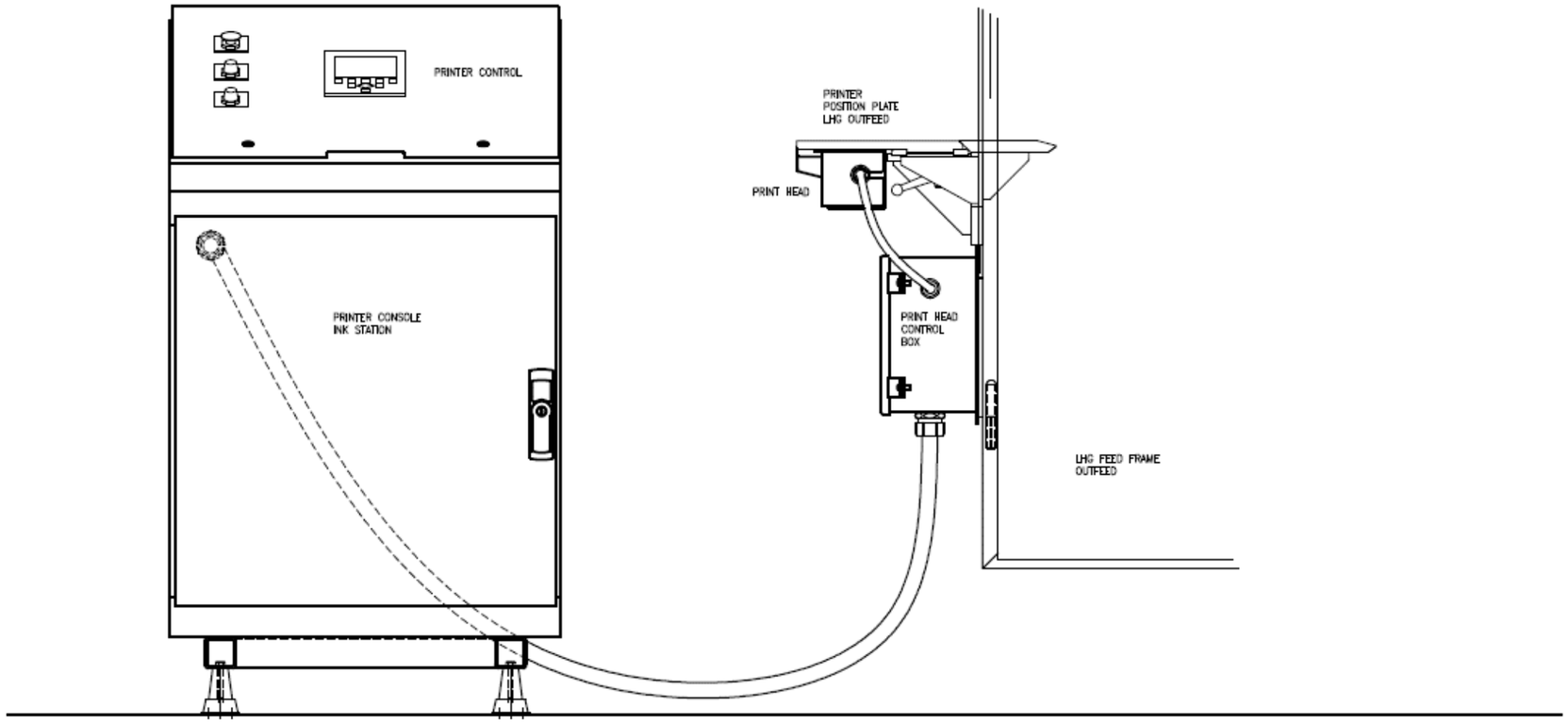
IHC PRINTER
PRINT HEAD LAYOUT
USNR
SALMON ARM, BC.

DR	AJMORI	10.01.12
APP	S.PHILIBERT	

SIZE B SCALE 1:1 DWG NO 349608

ITEM	QTY	DESCRIPTION	LG/AR/WT	DWG – P/N
1	1	ID PRINTER CONSOLE ASSEMBLY		349608

PRINTER SYSTEM OVERVIEW (1)
NTS



JOB	NO	QTY

LHG PRINTER
PRINTER SYSTEM OVERVIEW
USNR
SALMON ARM, BC.

DRN	AJMORI	DATE	10.01.12
APP	S.PHILIBERT	DWG	
TOP ASY		FILE	

SIZE 20 x 20 | DWG NO 349608 | REV

10. FRM Wiring

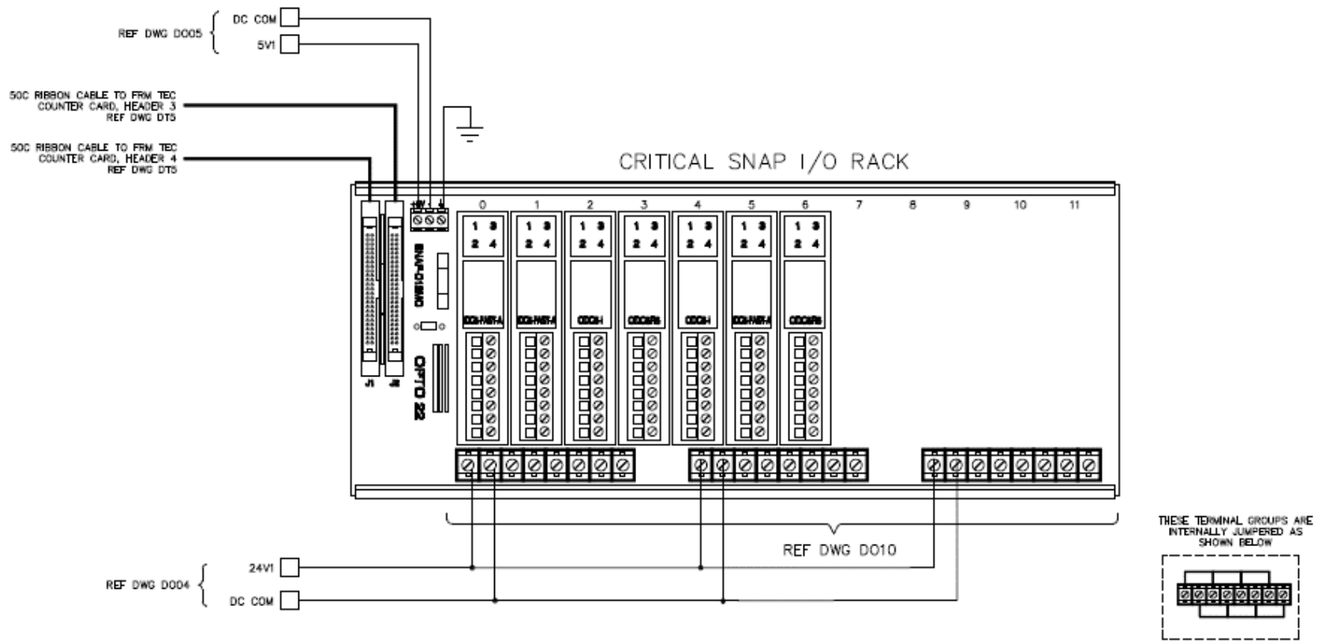
The following signals are used as the control interface between the FRM Critical IO and the USNR ID Printer.

Signal			
FRM	**ID Printer**	**I/O[33]**	**Description**
+24V	+24Vdc	I	+24Vdc from printer. Provides pull-up for ODC module
Printing	Printing	I	Indicates the printer is actively printing
ID Ack	ID Ack	I	Acknowledgement from the printer for ID receipt
PrintGo	PrintGo	O	Print start command
PrintSel	PrintSel	O	Selects the ID Printer buffer for PrintGo
BufSel	BufSel	O	Selects the ID Printer buffer for the received ID
DC Com	DC Com	I	DC common (GND)
Sync	Re-Sync[34]	O	Selects the Sync mark buffer for PrintGo
Re-Sync	Sync	O	Selects the Re-Sync mark buffer for PrintGo
IDP-LAQ	LAQ	O	Divided encoder ticks to the printer
24VP1	+24Vdc	I	+24Vdc from printer. Provides pull-up for MPI Opto module

[33] Signal direction is relative to the FRM Critical I/O.

[34] The Sync and Re-Sync lines are swapped between the FRM Critical IO and the ID Printer interface. These signals are only needed if the Sync marks are to be printed and can be left disconnected otherwise.

ITM	QTY	VIS. NO.	DESCRIPTION	SIZE	WEIGHT
60	(1) REQ'D		SNAP I/O RACK 624610-DO		NTS

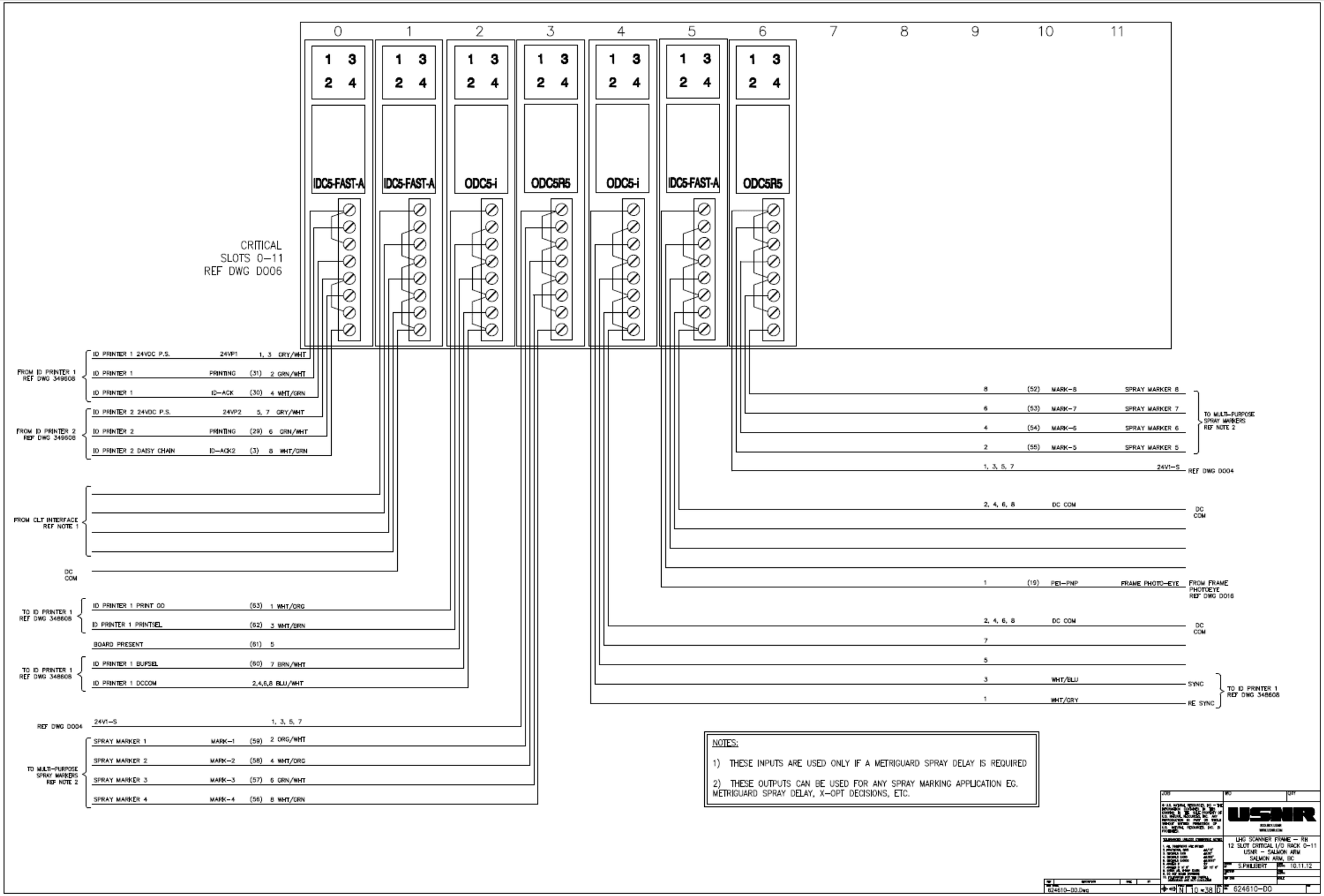


LHG SCANNER FRAME – RH
SNAP I/O LAYOUT
USNR – SALMON ARM
SALMON ARM, BC

S.PHILIBERT 10.11.12

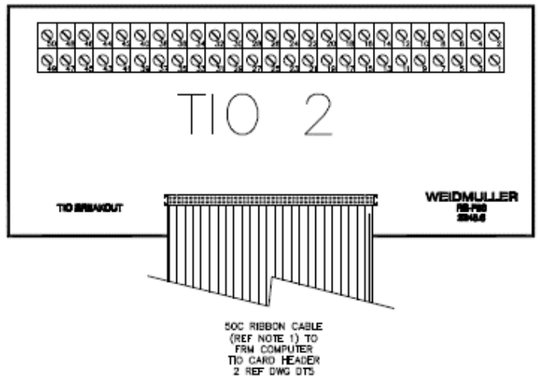
624610-DO.Dwg

624610-DO


0 1 2 3 4 5 6 7 8 9 10 11
IDC5-FAST-A
IDC5-FAST-A
ODC5-i
ODC5R5
ODC5-i
IDC5-FAST-A
ODC5R5
CRITICAL
SLOTS 0–11
REF DWG D006
FROM ID PRINTER 1 REF DWG 349608
ID PRINTER 1 24VDC P.S. 24VP1 1, 3 GRY/WHT
ID PRINTER 1 PRINTING (31) 2 GRN/WHT
ID PRINTER 1 ID–ACK (30) 4 WHT/GRN
FROM ID PRINTER 2 REF DWG 349608
ID PRINTER 2 24VDC P.S. 24VP2 5, 7 GRY/WHT
ID PRINTER 2 PRINTING (29) 6 GRN/WHT
ID PRINTER 2 DAISY CHAIN ID–ACK2 (3) 8 WHT/GRN
FROM CLT INTERFACE REF NOTE 1
DC COM
TO ID PRINTER 1 REF DWG 348608
ID PRINTER 1 PRINT GO (63) 1 WHT/ORG
ID PRINTER 1 PRINTSEL (62) 3 WHT/BRN
BOARD PRESENT (61) 5
TO ID PRINTER 1 REF DWG 348608
ID PRINTER 1 BUFSEL (60) 7 BRN/WHT
ID PRINTER 1 DCCOM 2,4,6,8 BLU/WHT
REF DWG D004
24V1–S 1, 3, 5, 7
TO MULTI–PURPOSE SPRAY MARKERS REF NOTE 2
SPRAY MARKER 1 MARK–1 (59) 2 ORG/WHT
SPRAY MARKER 2 MARK–2 (58) 4 WHT/ORG
SPRAY MARKER 3 MARK–3 (57) 6 GRN/WHT
SPRAY MARKER 4 MARK–4 (56) 8 WHT/GRN
8 (52) MARK–8 SPRAY MARKER 8
6 (53) MARK–7 SPRAY MARKER 7
4 (54) MARK–6 SPRAY MARKER 6
2 (55) MARK–5 SPRAY MARKER 5
TO MULTI–PURPOSE SPRAY MARKERS REF NOTE 2
1, 3, 5, 7 24V1–S REF DWG D004
2, 4, 6, 8 DC COM DC COM
1 (19) PE1–PNP FRAME PHOTO–EYE FROM FRAME PHOTOEYE REF DWG D016
2, 4, 6, 8 DC COM DC COM
7
5
3 WHT/BLU SYNC
1 WHT/GRY RE SYNC
TO ID PRINTER 1 REF DWG 348608
NOTES:
1) THESE INPUTS ARE USED ONLY IF A METRIGUARD SPRAY DELAY IS REQUIRED
2) THESE OUTPUTS CAN BE USED FOR ANY SPRAY MARKING APPLICATION EG. METRIGUARD SPRAY DELAY, X–OPT DECISIONS, ETC.
LH9 SCANNER FRAME – RH
12 SLOT CRITICAL I/O RACK 0–11
USNR – SALMON ARM
SALMON ARM, BC
S.PHILIBERT 10.11.12
624610–D0.Dwg
624610–D0

TIO BREAKOUT TERMINAL SCHEDULE

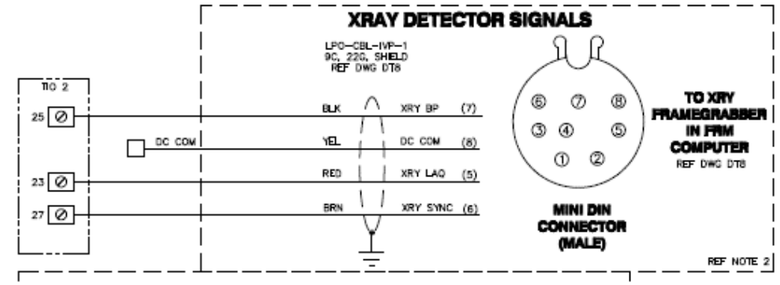
TERMINAL	WIRE LABEL	FROM/TO	TERMINAL	WIRE LABEL	FROM/TO
1			26	XRY BP–	XRY DETECTOR BP–
2			27	XRY SYNC+	XRY DETECTOR SYNC+
3			28	XRY SYNC–	XRY DETECTOR SYNC+
4			29	VIS_LAQ+	VIS SENSOR LAQ+
5			30	VIS_LAQ–	VIS SENSOR LAQ–
6			31	VIS_BP+	VIS SENSOR BP+
7			32	VIS_BP–	VIS SENSOR BP–
8			33	PE1–5V	MPI–OPTO, 01A
9			34	VIS SYNC+	VIS SENSOR SYNC+
10			35	FAKE PE	NOT CONNECTED
11			36		
12			37		
13			38	UV_BP	UV BE–OPTO BIN+
14			39		
15			40	UV_SYNC	UV BE–OPTO ZIN+
16			41		
17	LPR LAQ+	LPR SENSOR LAQ+	42	SENS5_BP	NOT CONNECTED
18	LPR LAQ–	LPR SENSOR LAQ–	43		
19	LPR BP+	LPR SENSOR BP+	44	SENS5_SYNC	NOT CONNECTED
20	LPR BP–	LPR SENSOR BP–	45		
21	LPR SYNC+	LPR SENSOR SYNC+	46	IDP LAQ	IDP LAQ MPI–OPTO, TTL
22	LPR SYNC–	LPR SENSOR SYNC–	47		
23	XRY LAQ+	XRY DETECTOR LAQ+	48	FRM TEST	NOT CONNECTED
24	XRY LAQ–	XRY DETECTOR LAQ–	49		
25	XRY BP+	XRY DETECTOR BP+	50		

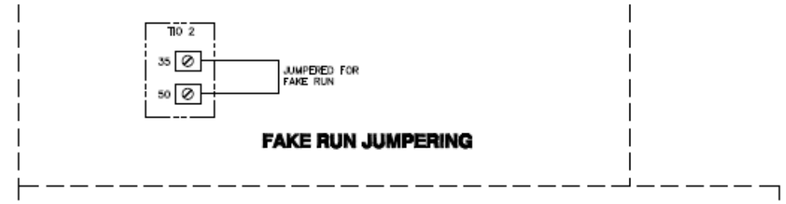


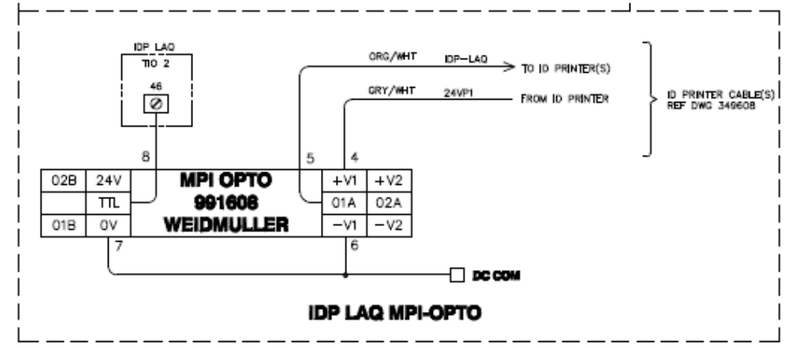
NOTES:

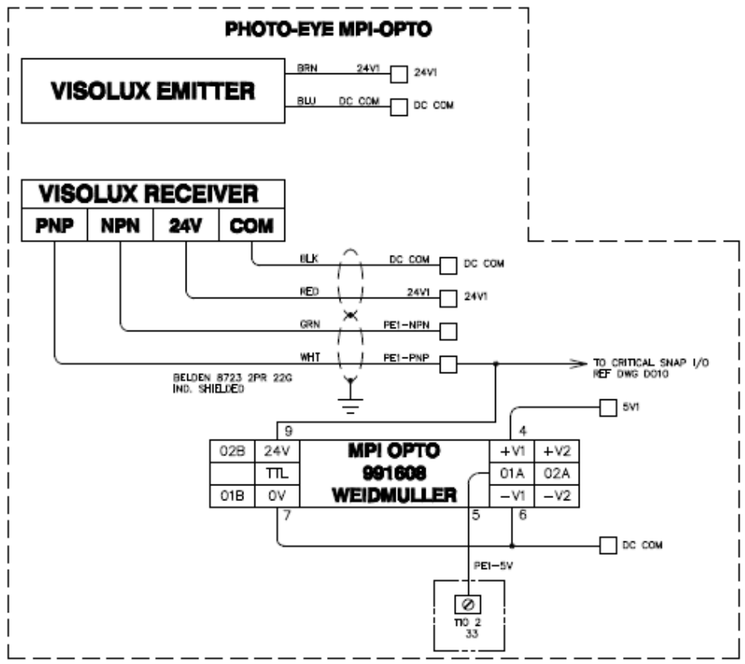
1) THIS CABLE TO BE BUILT TO THE JOB USE FLOORSTOCK AS REQUIRED

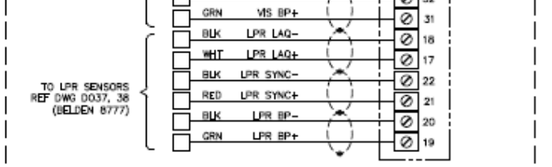
2) THIS CABLE IS PRESENT ONLY IF THE X–RAY SYSTEM IS INSTALLED

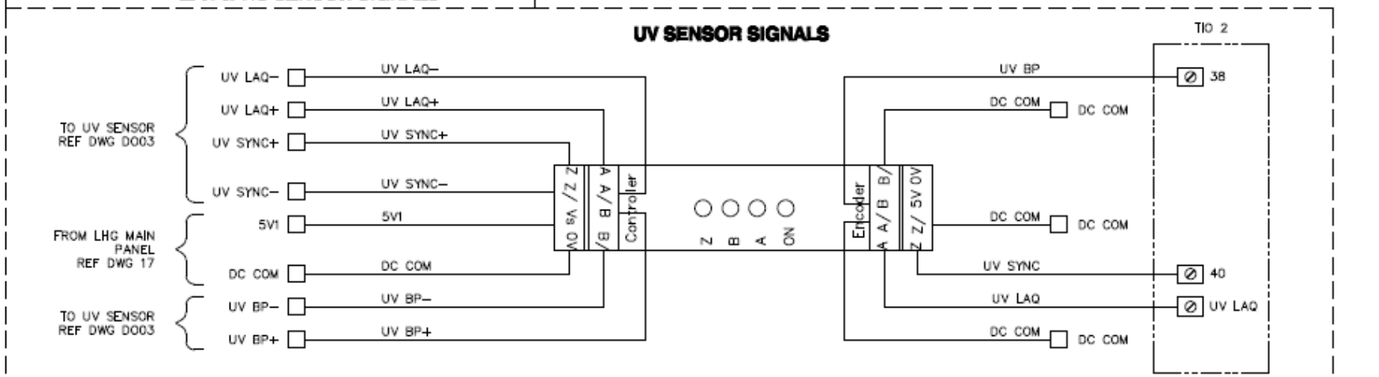












REVISED
APRIL 13, 2011

LHG SCANNER FRAME – RH
TIE ID BREAKOUT
USNR – SALMON ARM
SALMON ARM, BC
S.PHILIBERT 10.11.12
624610–D0.Dwg
624610–D0

11. Ink MSDS

ELLIOTT BAY INDUSTRIES

Material Safety Data Sheet

Original Date: 07/12/2006
Revision: Initial Release

Elliott Bay Industries
26609 – 79th Ave. South
Kent, WA 98032
Tel: 253-854-6563
Fax: 253-854-9272

Section 1 – Product Information

Coe Newnes McGehee
Formula #11
For industrial use only.

Section 2 – Ingredients

Chemical Name:	CAS	Amount
Methyl Alcohol	00067-56-1	~ 78 %
Polyethylene Glycol	025322-68-3	< 0.01%
Polyethylene glycol Octylphenyl ether	099036-19-5	< 2%
Trimellitic Acid	528-44-9	< 0.01%

Section 3 – Hazards Identification

Emergency Overview:

DANGER!
POISON!
FLAMMABLE!

Keep away from heat, sparks, and open flame. May be fatal if swallowed.
Warnng Statement: Caution – Do not contact with the eyes skin or clothing. May be harmful if inhaled, only use with adequate ventilation. Risk of serious damage to eyes, may cause blindness if swallowed. Store in tightly closed containers.

Potential Health Effects
Primary Routes of Exposure: Routes of entry for solids and liquids include eye and skin contact, ingestion and inhalation. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquefied gases.

Expected Route of Entry:

Inhalation:	No
Skin Contact:	No
Eye Contact:	No
Ingestion:	No
Skin Absorbtion:	No

Acute Overexposure Effects:
Inhalation: Harmful if inhaled. Symptoms include respiratory tract irritation, coughing, disssiness, and headache.

1

ELLIOTT BAY INDUSTRIES

Skin Contact: Prolonged or repeated skin contact may result in irritation.
Eye Contact: Contact with the eyes may result in irritation and/or bruning.
Ingestion: Harmful if swallowed. Ingestion may result in nausea, vomiting and gastric disturbances. High Concentrations can cause blindness, dizziness, central nervous system depression and hearing loss.

Chronic Overexposure Effects: Chronic overexposure can lead to anemia and damage to the liver, kidneys, lungs and spleen. There are no other known chronic effects associated with this material.

Section 4 – First Aid Measures

First Aid Procedures – Skin: Wash affected areas with soap and water. Remove and launder contaminated clothing before reusing. If irritation develops seek medical attention.
First Aid Procedures – Eyes: Immediately rinse eyes with running water for 15 minuets. Get immediate medical attention.
First Aid Procedures – Ingestion: If swallowed, dilute with large amounts of water and immediately induce vomiting. Never give fluids or induce vomiting if the victim is unconscious or having convulsions. Get immediate medical attention.
First Aid Procedures – Inhalation: Move victim to fresh air. Aid in breathing, if necessary and get immediate medical attention.
First Aid Procedures – Notes to Physicians: None Known.
First Aid Procedures – Aggravated Medical Condition: No data is available which addresses medical conditions that are generally recognized as being aggravated by exposure to this product. Please refer to the effects of overexposure section for effects observed in animals.
First Aid Procedures – Special Precautions: None Known.
Other First Aid Procedures: No other first aid needed.

Section 5 – Fire Fighting Measures

	Deg.
Flash Point:	12°C
Autoignition:	463°C

Extinguishing Media: Use CO2, dry chemical, or alcohol foam extinguishing media. Water may be ineffective.
Fire Fighting Procedures: Firefighters should be equipped with self-contained breathing apparatus and turn out gear. Use water to cool nearby containers and structures. Do not direct a solid stream of water or foam into hot, burning pools. This may cause frothing and increase fire intensity.
Unusual Hazards: Vapors may flow along surfaces to distant ignition sources and flash back.
Additional Fire and Explosion Data: None Known.

Section 6 – Accidental Release Measures

General: Remove all potential ignition sources. Spills should be contained, taken up with an inert material, and placed in suitable container(s) for disposal in a licensed facility. Flush affected area with water.
Prevent liquid from entering drains, soil, surface water and ground water.
This material is not regulated by RCRA or CERCLA ("Superfund").
Wear appropriate respiratory protection and protective clothing and provide adequate ventilation during clean-up.
Other Spill/Leak Procedures: No other spill procedures necessary.

Section 7 – Storage and Handling

General: Store in a cool, dry, well-ventilated flammable liquids area or cabinet. Protect containers from physical damage. Bond and Ground containers when transferring liquids. Keep containers tightly sealed when not in use.
Other Storage and Handling Data: No other specific storage requirements.

ELLIOTT BAY INDUSTRIES

Section 8 – Personal Protection

Clothing: Chemical resistant gloves, coveralls, apron, boots as necessary to prevent skin contact.
Eyes: Chemical goggles; also wear a face shield if splashing hazard exits. Maintain eye washing station nearby.
Respiration: If vapors or mists are generated and concentration exceeds the P.E.L., wear a NIOSH/MSHA approved air-supplied respirator as appropriate and/or handle in a fume hood.
Ventilation: Use local exhaust to control to recommended P.E.L.
Other Personal Protection Data: None under normal conditions.

Section 9 – Physical Properties

Color:	Yellow/Orange
Form/Appearance:	Liquid
Odor:	Mild alcohol odor

	Typical	Low/High	U.O.M.
Specific Gravity:	.88	.8-1.24	
pH:		8-9	SU

	Typical	Deg.	@	Pressure
Boiling Pt:	~ 65°C	C	1	Atmospheres
Freezing Pt:	< 0°C	C	1	Atmospheres
Decomp. Tmp:	Not Available			
Solubility in Water				
Description:	Miscible			

Section 10 – Stability and Reactivity

Stability Data: Stable
Incompatibility: Incompatibile with strong acids and strong oxidizers. Alkali metals.
Conditions/Hazards to Avoid: Heat, sparks, open flame.
Hazardous Decomposition Products: Oxides of carbon (CO, CO2), Formaldehyde.
Polymerization: Does not occur.
Other Reactivity Data: None known.

Section 12 – Ecological Information

No applicable data for this section.

Section 13 – Disposal Consideration

Waste Disposal: Incinerate under controlled conditions and/or bury as a solid in a licensed facility. Do not discharge into waterways or sewer systems.
Container Disposal: Dispose of in a licensed facility. Recommend crushing or other means to prevent unauthorized reuse.

Section 14 – Transportation Information

DOT Proper shipping Name: N/A

DOT Technical Name: N/A

DOT Primary Hazard Class: N/A

ELLIOTT BAY INDUSTRIES

DOT Secondary Hazard Class: N/A

DOT Label Required: N/A

Dot Placard Required: N/A

Dot Poison Constituent: N/A

EBI Commodity Codes: UN/NA Code: E/R Guide: NA
Bill of Lading Description: Not Regulated by the Department of Transportation.

Section 15 – Regulatory Information

TSCA Inventory Status
Listed on Inventory: Yes – All components of this product are listed on the TSCA Inventory.
RCRA Haz. Waste: No – Not as Sold.
CERCLA : No Reported Qty.: (If Yes)
SARA TITLE III SECTION 313 :

Reactive Hazard:	No.
Pressure Hazzard:	No.
Fire Hazard:	Yes.
Immediate/Acute:	Yes.
Delayed/Chronic:	Yes.

Section 16 – Other Information

Hazard Ratings: EBI currently uses the National Paint & Coating Association (NPCA) rating system. The use of an asterisk (*) in the HMIS rating indicates the potential for chronic health effects.

	Health:	Fire:	Reactivity:	Personal Protection:
HMIS	3	3	1	H

This product is hazardous or contains components, which are hazardous according to the OSHA Hazard Communication Standard.

Section 16 – Other Information (continued)

Important: While the descriptions, designs, data and information contained herein are presented in good faith and believed to be accurate, it is provided for your guidance only. Because many factors may affect processing or application/use, we recommend that you make tests to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied including warranties of merchantability or fitness for a particular purpose are made regarding products described or designs, data or information set forth, or that the products, designs, data or information may be used without infringing the intellectual property rights of others. In no case shall the descriptions, information, data or designs provided be considered a part of our terms and conditions of sale. Further, you expressly understand and agree that the descriptions, designs, data and information furnished by EBI hereunder are given gratis and EBI assumes no obligation or liability for the description, designs, data and information given or results obtained, all such being given and accepted at your risk.

END OF DATA SHEET