Operations Manual

Series 1 Ink Jet System

Revision E

5802-657

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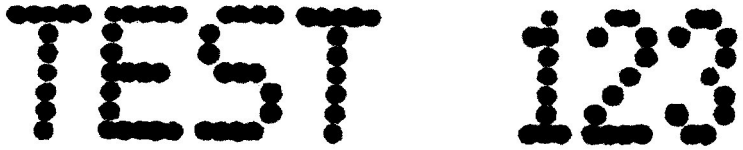
Section 1: Introduction

The Diagraph Series 1 Ink Jet System is a fast, accurate and efficient way to mark shipping containers and materials with letters, numbers and graphics. Through advanced technology, the system can accurately place high-quality printing on a product or carton at high speeds.

An ink jet system sprays small ink drops onto the surface of a carton. These drops form characters to convey a message that easily identifies the contents of the package. Ink jet printing occurs at a “printstation”, a group of printheads that print after triggering from a single photosensor.

The typical printing application includes printheads mounted on both sides of a conveyor to facilitate printing on both sides of the product or carton. Printheads on both sides that are triggered by the same photosensor comprise one printstation.

Each printstation contains from one to 16 printheads, connected to Series 1 Controllers that tell them what, where, when and how to print. A Controller can control up to four 9-dot printheads, two 18-dot heads, or two 9-dot and one 18-dot head.



Scanned sample of ink jet printing.

Section 2: Safety

Only Diagraph trained personnel should operate and service the equipment.

CAUTION: The Series 1 Ink Jet System contains hazardous voltage (115/230VAC). Unless otherwise directed, turn off the equipment's main power before:

- Performing preventive maintenance
- Servicing the equipment in any manner

ESD protection should be worn when servicing internal printed circuit boards.

After service to the equipment is completed, replace all protective devices such as grounding cables and covers before operating equipment.

WARNING: This equipment contains ink under pressure. Be sure to depressurize the system before servicing.

TSO ink contains ethanol and isopropanol. MEK ink contains methyl ethyl keytone. TWP ink contains ethylene glycol. It is extremely important to:

- Clean up all spills with the appropriate conditioners immediately and dispose of all waste according to local and state regulations.
- Wear safety glasses and protective clothing, including gloves, when handling all inks and conditioners.
- Store inks and conditioners under the recommended conditions found on the MSD sheet.

The following safety symbols will be found throughout this manual. Pay attention to these symbols wherever they appear.

Wear safety goggles when working with industrial inks or solutions!

Stop and do this before proceeding!

Caution or Warning!

NOTE:

Always disconnect power when servicing equipment!

Wear ESD protection for this procedure!

Section 3: System Components

The Diagraph Series 1 Ink Jet System has the following components:

- Controller/Ink Delivery System (CIDS)
- Bracketry
- Printhead(s) with Ink Regulator(s)
- Photosensor
- Encoder
- User Input Device -- a PC or the LC/400 Hand-Held Terminal

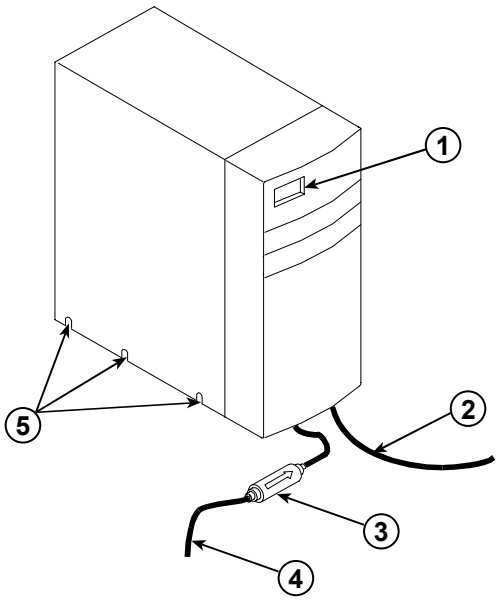
3.1 Series 1 Controller

The Series 1 Controller gathers and stores all the information required to print a message. This information can come from the following sources:

- The user input device tells the controller what message to print on the product.
- The photosensor tells the controller when to print.
- The encoder tells the controller how fast to print.

With this information, the controller knows exactly when the leading edge of the product will reach the printhead and at what rate of speed.

The controller comes in a stainless-steel case that makes it splash-proof and resistant to electromagnetic interference. The front has a hinged plastic door that gives quick access to the controls.



SERIES 1 CONTROLLER

[1] On/Off Indicator

[2] Power Cord

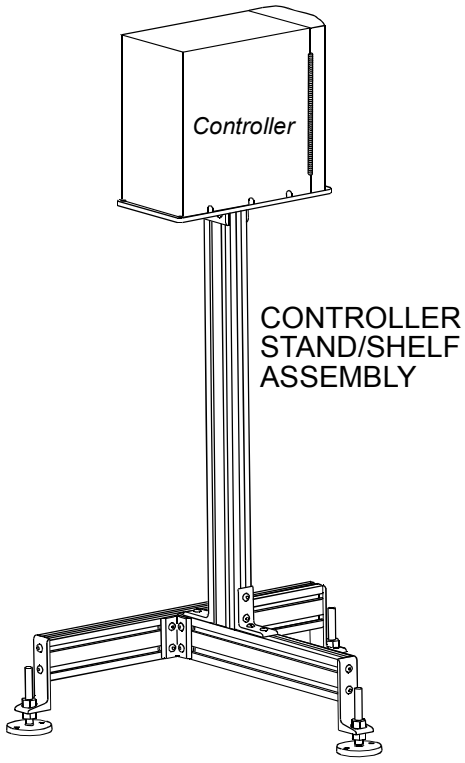
[3] Replaceable In-Line Filter

[4] Tubing From Ink Reservoir

[5] Cover Screws

3.2 Bracketry

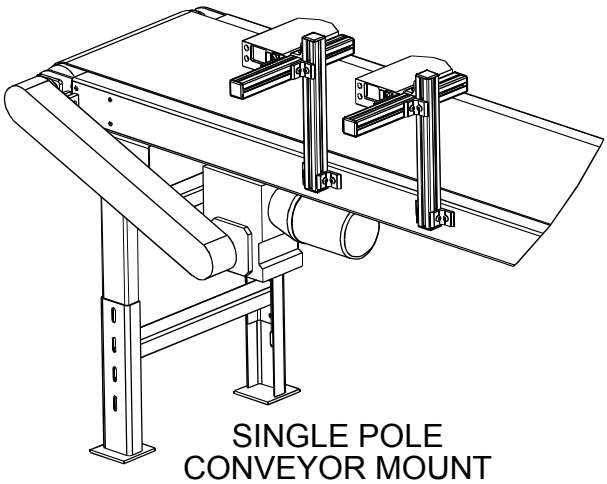
Bracketry is the structure that supports the controller/IDS, printheads and other accessories.

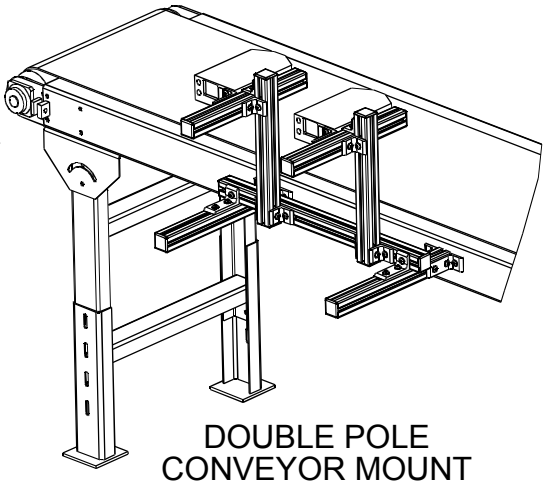


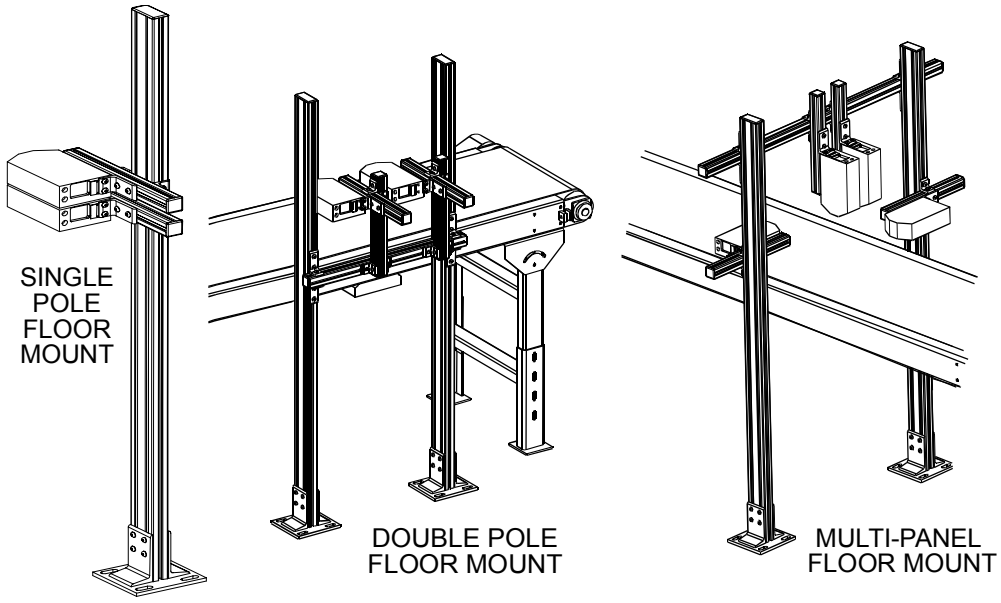
The controller/IDS is mounted on the Controller Stand/Shelf Assembly (5760-361).

Printhead bracketry is modular and can assume several configurations:

- Single pole conveyor mount
- Double pole conveyor mount
- Single pole floor mount
- Double pole floor mount
- Multi-panel floor mount


SINGLE POLE CONVEYOR MOUNT


DOUBLE POLE CONVEYOR MOUNT

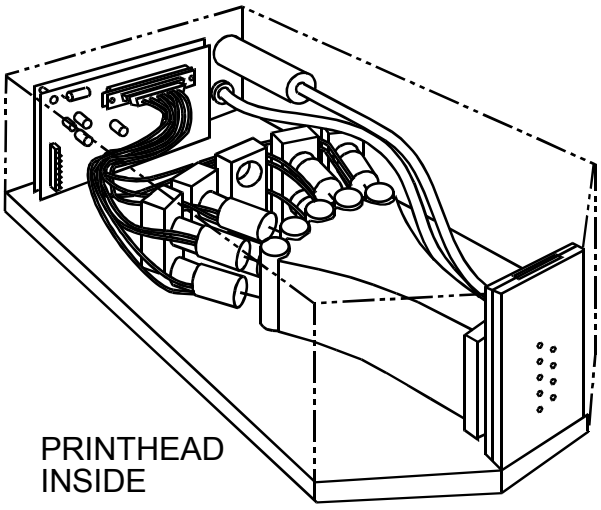


3.3 Printheads

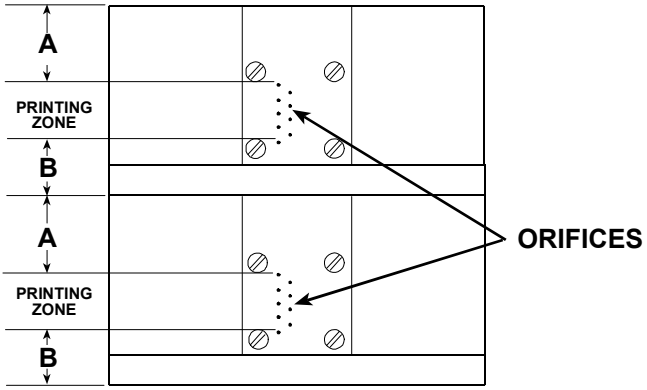
The Diagraph Integrated Valve™ (I.V.) printhead uses a flexible membrane sandwiched between two plates, which by solenoid activation propels ink droplets onto moving surfaces.

This design keeps the ink between the front plate and membrane, away from the solenoids.

The I.V. printhead is capable of printing at very high line speeds with a minimum of required maintenance. It can produce highly legible ¼" to 2" tall alphanumerics, special characters and logos.



Each type of I.V. printhead has specific distances above and below the orifices, spaces in which the printhead cannot print. These non-printing zones are critical when designing printhead layout in multi-head applications. The figure at right shows the print and non-print areas obtained when two 9-dot printheads are stacked on a vertical bracket, as in the *Single Pole Floor Mount* illustration earlier in this section. Table 1 lists the eight models of I.V. printheads and their characteristics.



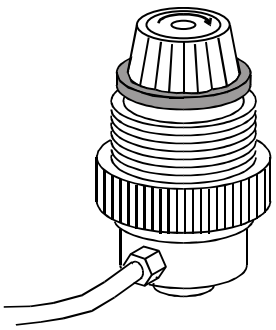
[A] Non-print Top Area **[B] Non-print Base Area**

Table 1: Printhead Models

Part Number	Type	Characteristics	Non-print Base Area (B)	Non-print Top Area (A)	Total Non-print Area (A+B)
5700-406	1/2" 9-dot Porous	Prints 1/4", 5/16" and 1/2" tall characters on porous substrate	.800"	1.14"	1.94"
5700-407	1/2" 9-dot Non-porous	Prints 1/4", 5/16" and 1/2" tall characters on non-porous substrate	.800"	1.14"	1.94"
5700-404	7/8" 9-dot Porous	Prints 7/16", 5/8" and 7/8" tall characters on porous substrate	.610"	.93"	1.54"
5700-405	7/8" 9-dot Non-porous	Prints 7/16", 5/8" and 7/8" tall characters on non-porous substrate	.610"	.93"	1.54"
5700-402	1" 18-dot Porous	Prints 1/4", 3/8", 1/2" and 1" tall characters on porous substrate	2.14"	2.10"	4.24"
5700-403	1" 18-dot Non-porous	Prints 1/4", 3/8", 1/2" and 1" tall characters on non-porous substrate	2.14"	2.10"	4.24"
5700-448	2" 18-dot Porous	Prints 1/4", 3/8", 1/2", 1" and 2" tall characters on porous substrate	1.64"	1.42"	3.06"
5700-452	2" 18-dot Non-porous	Prints 1/4", 3/8", 1/2", 1" and 2" tall characters on non-porous substrate	1.64"	1.42"	3.06"
5701-034	2" 18-dot Pigmented	Prints 1/4", 3/8", 1/2", 1" and 2" tall characters	1.64"	1.42"	3.06"

3.4 Ink Regulator

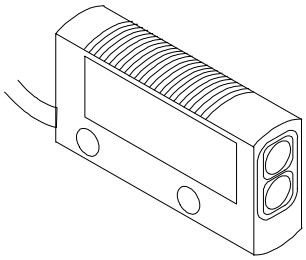
The ink regulator, supplied with the printhead, regulates ink pressure to the printhead. The regulator is preset at the factory to the correct output pressure.



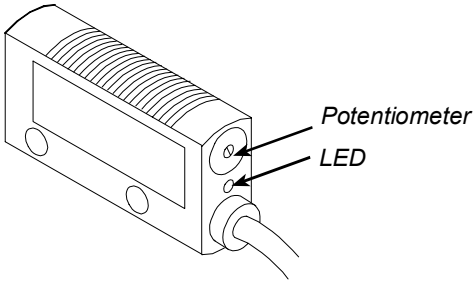
INK REGULATOR

3.5 Photosensor

The photosensor is both a light source and a sensor. It emits light and detects the arrival of a product when the product reflects the light source back to the sensor. The sensor then sends a signal to the controller to start the printing cycle. A red LED on the back of the sensor illuminates when a reflective object is detected.



PHOTOSENSOR FRONT



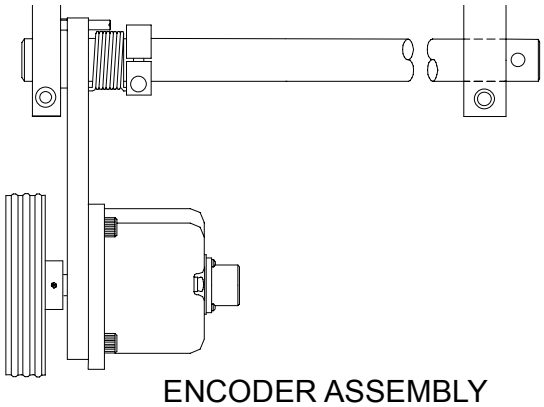
PHOTOSENSOR BACK

3.6 Encoder

The variable speed encoder assembly (5700-731) provides conveyor line speed information to the controller. The controller offers a built-in fixed speed reporter or an optional variable speed encoder.

Use the fixed speed reporter setting when the conveyor speed is constant and less than 300 feet per minute. The desired line speed is set by turning a potentiometer on the interface board until print quality is acceptable. (See Section 5, Installation.)

Use a variable speed encoder when the line speed varies or has frequent starts and stops. In addition to providing line speed information, an encoder allows automatic disabling of printing when the line stops.



ENCODER ASSEMBLY

3.7 PC Software (PC-Based Systems Only)

The IVpro software provides the following capabilities for the controller and printhead:

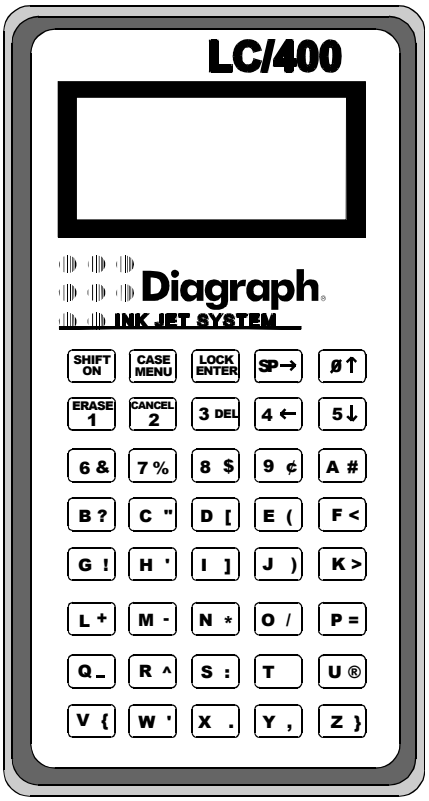
- Creating or editing a message
- Checking the status of a printhead or a printstation
- Routing a message to a printhead
- Performing utility functions

3.8 LC/400 Hand-Held Terminal (Stand-Alone Systems Only)

In a stand-alone system, the LC/400 (5700-636) is the primary tool for gaining access to the Series 1 system. It enables the user to perform the same functions listed under *PC Software,* above.

The LC/400 consists of a keypad and a liquid crystal display (LCD). Color-coded keys divide the normal upper- and lower-case keys. In addition, there are eleven function keys to carry out specific tasks such as moving the cursor or deleting a letter.

The 40-character liquid crystal display shows the new or edited message. It also displays a stored message, information about the operating status of the system, and menu items.



Section 4: Getting Started

Controller descriptions contain the following abbreviations for distinguishing features:

- 1-PH: Designed to operate a single printhead
- 2-PH: Designed to operate two printheads
- 4-PH: Designed to operate four printheads
- MS: Message Select
- NP: Non-porous for inks designed to adhere to non-porous surfaces
- P: Porous for inks designed for absorptive surfaces
- SA: Stand Alone
- PC-Based: Designed to run from a computer interface with Diagraph IVpro software

Table 2: Controller Types

Domestic/European Controllers		Japanese Controllers	
Part No.	**Description**	**Part No.**	**Description**
5700-996NP	SA-99MS 2-PH NP	5700-802NP	SA-99MS 1-PH NP
5700-996P	SA-99MS 2-PH P	5700-802P	SA-99MS 1-PH P
5700-998NP	SA-99MS 4-PH NP	5700-803P	SA-99MS 2-PH P
5700-998P	SA-99MS 4-PH P	5700-805P	SA-99MS 4-PH P
5701-002NP	PC-Based 2-PH NP	5700-807P	SA-99MS 4-PH Multi-Tasking P
5701-002P	PC-Based 2-PH P	5700-808NP	PC-Based 1-PH NP
5701-004NP	PC-Based 4-PH NP	5700-808P	PC-Based 1-PH P
5701-004P	PC-Based 4-PH P	5700-811P	PC-Based 4-PH P
		5700-812P	PC-Based 2-PH Multi-Tasking P

The Series 1 system is available with the following components, options and service kits:

Table 3: Series 1 Components

Part Number	Description
Controller/IDS Accessories	
5760-361	Controller stand/shelf assembly
5701-038	Software, CD
1301-875	50’ x ¼" bev-a-line tubing
1901-141	Power cord
5700-991	Ink filter kit
5700-277	Spare parts kit
5700-209	¼" elbow barb quick disconnect

Table 3: Series 1 Components (Continued)

Part Number	Description
5700-508	¼" barb quick disconnect
5700-934	Controller to printhead cable assembly, 25’
5700-967	Ink out beacon
5700-994	Effluent kit
1902-964	Flush bottle assembly
5700-743	Ink pressure gauge
5700-962	Replacement accumulator
5700-966	Replacement pump assembly
Standard Integrated Valve (IV) Printheads	
5700-406	½" 9-dot porous
5700-407	½" 9-dot non-porous
5700-404	7/8" 9-dot porous
5700-405	7/8" 9-dot non-porous
5700-402	1" 18-dot porous
5700-403	1" 18-dot non-porous
5700-448	2" 18-dot porous
5700-452	2" 18-dot non-porous
5701-034	2" 18-dot pigmented
Printhead Bracketry	
5760-353	Single printhead conveyor mounting kit
5760-354	Multi printhead conveyor mounting kit (requires single printhead kits)
5760-355	Printhead floor mounting kit (requires single printhead kits)
5760-356	Multi head floor mounting kit with 24" bar (requires single head kits)
5760-357	Multi head floor mounting kit with 44" bar (requires single head kits)
5760-360	Printhead angle bracket with T-nuts
Printhead Cables	
5700-245	Printhead cable assembly, 2’
5700-727	Printhead cable assembly, 10’
5700-934	Printhead cable assembly, 25’

Table 3: Series 1 Components (Continued)

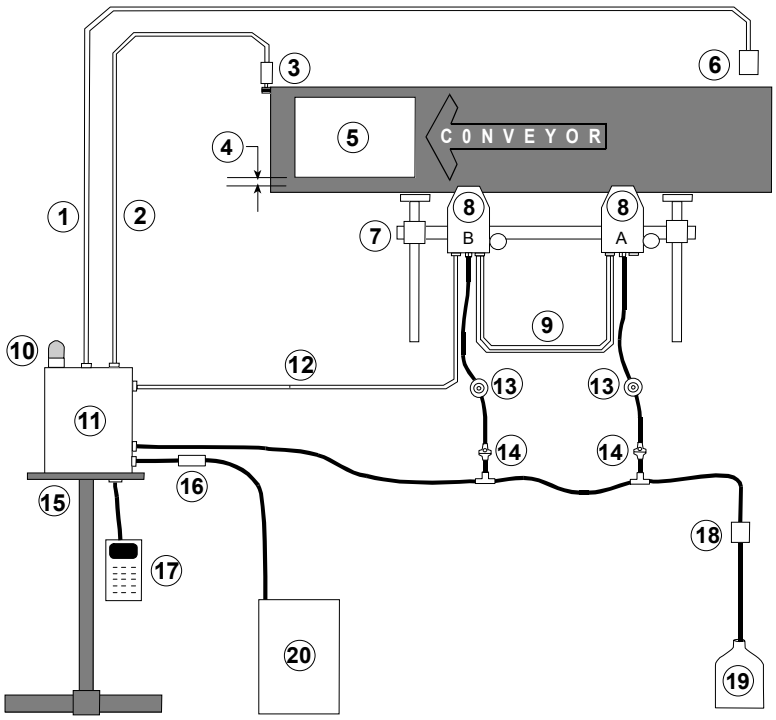
Part Number	Description
Encoder	
5700-731	Encoder assembly with mounting bracket
5700-924	Encoder 10’ extension cable
Photosensor	
5700-216	Photosensor, diffuse type
5700-933	Photosensor 10’ extension cable
5700-435	Photosensor optional mounting bracketry

Section 5: Installation

5.1 Components ID

Be sure to mount the controller and components where there is good visibility and access to controls. Be careful also to minimize the risk of collision with people and moving objects. The controller will perform best with a dedicated electrical line.

1. Photosensor cable
2. Encoder cable
3. Encoder
4. Throw distance
5. Product
6. Photosensor
7. Dual pole bracketry
8. Printheads
9. PH/PH cable
10. Ink out beacon
11. Controller/IDS
12. Controller/PH cable
13. Ink regulators
14. Quick-disconnects
15. Floor stand/shelf
16. Replaceable ink filter
17. LC/400 terminal
18. On/off flow switch
19. Effluent bottle
20. Ink



5.2 Testing the Electrical Outlet

CAUTION: The outlet must be installed near the equipment and must be easily accessible.

ATTENTION: On doit installer à côté de l'appareil une prise de courant facilement accessible.

Before installing the Series 1 Controller, verify the integrity of the 115/230VAC sourced power, in accordance with the National Electric Code (NEC) and approved local electrical codes. If using a standard 110VAC outlet, use the following procedure:

1. Place an outlet tester into the socket. (An outlet tester can be purchased at most hardware stores.)
2. If the outlet tester indicates that the outlet is wired correctly, proceed with installation.
3. If the outlet tester indicates that the outlet is wired incorrectly, tell plant maintenance immediately and do not plug the equipment onto that outlet until it is re-wired. (See Appendix C for more information.)

Electrical Line Transients

Transients on the incoming AC power line can be in the form of voltage spikes and transients, over- and under-voltage events, or noise caused by poor grounding or interference. Symptoms of power related problems can be unexplained loss of controller memory (loss of message), garbled print, and unexplained hardware resets.

The best way to eliminate these types of problems is to install the controller on a dedicated line with a line conditioner. A dedicated line refers to an AC line that only the system components are plugged into. This is most effective when the source is at the building main service entrance.

Good quality line conditioners will provide protection against all AC line problems with the exception of power outages; if power outages are a problem at the installation, an uninterruptible power supply (UPS) should be installed.

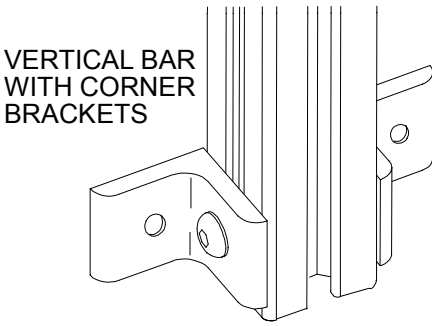
CAUTION: Not for use in a computer room as defined in the Standard for the Protection of Electronic Computer/Data Processing Equipment, ANSI/NFPA 75.

ATTENTION: Ne peut être utilissé dans une salle d'ordinateurs telle que définie dans las norme ANSI/NFPA 75 Standard for Protection of Electronic Computer/Data Processing Equipment.

5.3 Materials Required for Installation

You will need the following items:

- Bottle of conditioner
- Lint-free wipes
- Socket wrench
- 1/4" nut driver
- Set of Allen wrenches
- Ink pressure gauge (5700-743)
- Safety goggles
- Level
- Tape measure
- Effluent bottle (5700-994)



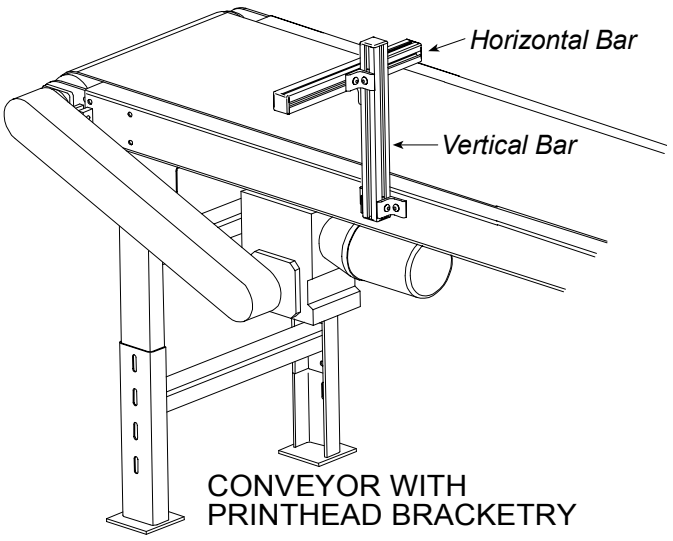
Use appropriate safety equipment and procedures. Leave printheads in their shipping cartons until all bracketry is in place and tightened down.

5.4 Installing Bracketry

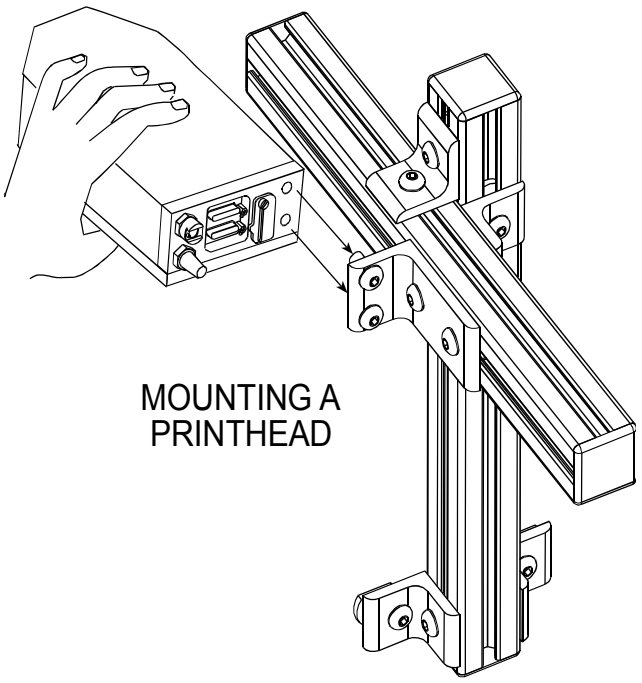
The controller/IDS is mounted on the Controller Stand/Shelf Assembly (5760-361). Follow the assembly instructions included with the parts kit.

The illustrations in this section show printhead mounting via single pole conveyor mounted bracketry. See *Section 3, System Components*, for other printhead bracketry options.

With all conveyor-mounted options, plant maintenance will need to drill holes in the conveyor for final attachment.



5.5 Mounting Printheads


MOUNTING A PRINTHEAD

Unpack the printhead(s) just before mounting on the bracketry.

Attach the printhead to the bracketry with a printhead mounting bracket as shown.

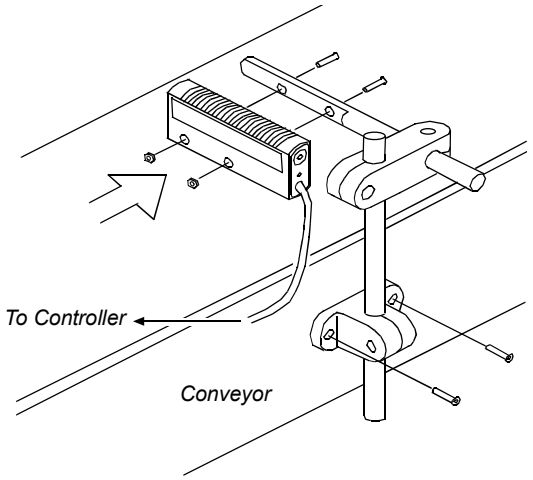
You may need to vertically adjust each bracket's horizontal bar later to fine-tune message placement. This is especially true when using multiple printheads, as message lines will need to be synchronized with each other.

The maximum vertical density of stacked 9-dot printheads is four. The maximum vertical density of stacked 18-dot printheads is two.

NOTE: When adjusting the horizontal bar or printhead mounting bracket, always support the printhead with your hand to keep it from falling forward onto the conveyor.

5.6 Mounting Photosensor Bracketry (5700-435)

1. Drill two holes into the conveyor using the photosensor bracket base to mark the drill holes.
2. Attach the base to the conveyor.
3. Slide the vertical bar into the base and tighten in place.
4. Slide the crossbar into the horizontal clamp and tighten with an Allen wrench.



5.7 Mounting the Photosensor

Position the photosensor (5700-216) approximately two inches upstream from the first printhead. The maximum placement distance is 99.9 inches minus the distance between the leading edge of the target item and the point where the message begins on the substrate. The distance between the photosensor and the farthest printhead must be less than the distance between products (leading edge to leading edge) to guarantee that all printheads have finished printing on the first item before the next item reaches the photosensor.

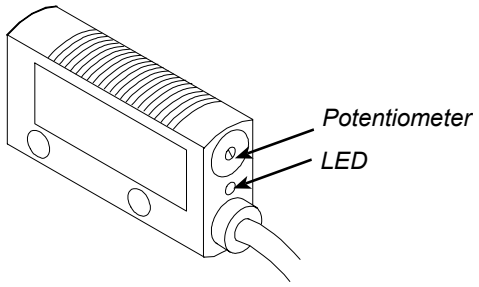
The photosensor depth range can be adjusted by turning the sensitivity potentiometer on the back of the photosensor. The photosensor normally has a range of about 30", but can be adjusted down to about 6".

CAUTION: The shorter the range, the more sensitive photosensor triggering is, increasing the possibility of false triggers from graphics on the product. It is best not to adjust sensitivity unless the 30" range is causing false triggers.

5.8 Photosensor Sensitivity Adjustment

If product sensing problems exist (not detecting product, multiple or false trips), the photosensor sensitivity may require adjustment.

1. Ensure that the photosensor is positioned perpendicular to the product.
2. Turn sensitivity potentiometer (located on the rear of the photosensor housing) counterclockwise 10 turns to limit its depth range.
3. Place object to be sensed approximately in the center of the conveyor, and rotate the sensitivity potentiometer slowly clockwise until the photocell LED illuminates.
4. Move object to the sensing distance seen in normal operation (should be less than distance in step 3). Slowly move object back and forth in front of photosensor while monitoring the LED. The LED should remain on throughout the length of the object. If the LED turns off on any part of the object, increase sensitivity until the LED remains illuminated throughout the length of the object.
5. Remove object; check that the photosensor is not sensing objects on the opposite side of the conveyor.

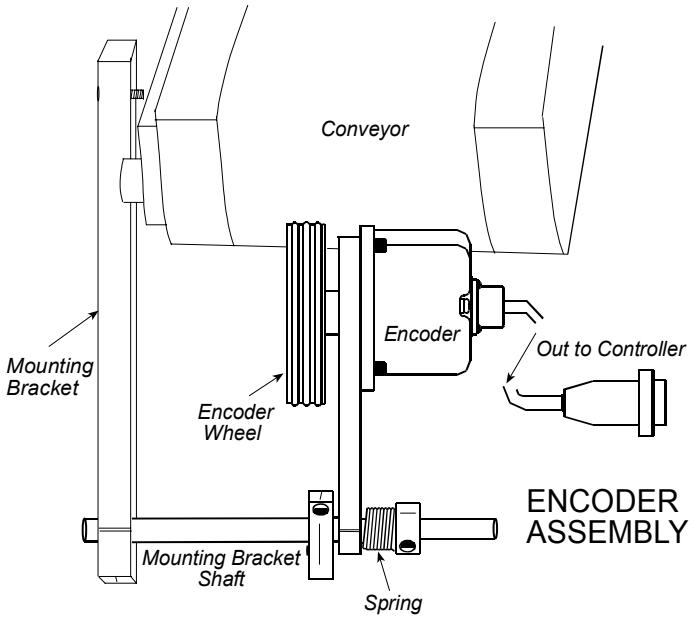


PHOTOSENSOR BACK

5.9 The Encoder

In applications where the conveyor line speed varies greatly, or where there are frequent starts and stops, it may be necessary to install an external encoder (5700-731). The encoder uses a wheel that rolls against the conveyor line to track its speed. It sends a signal to the controller, which makes adjustments for reported changes in the line speed.

It is not necessary to install the encoder immediately adjacent to the printheads. It is more important to place it where it will accurately measure the speed of the conveyor. Install it in contact with the conveyor, or with a wheel or roller moving the same speed as the conveyor.



ENCODER ASSEMBLY

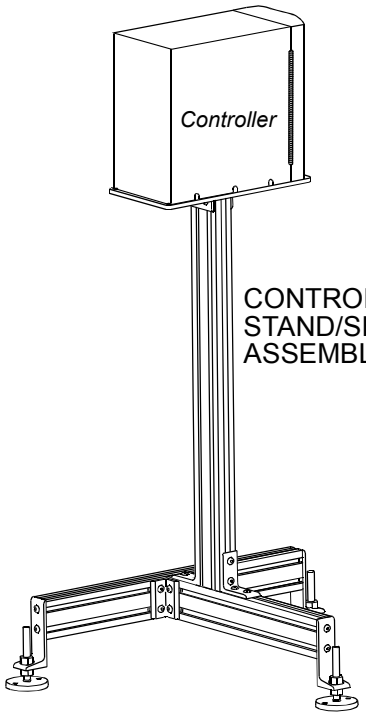
The encoder's mounting bracket is spring-loaded. Adjust the spring collar to ensure that the encoder maintains stable contact with the conveyor.

NOTE: Do not jam the encoder wheel against the surface of the conveyor. A radial force of over 40 lbs. will reduce the life of the bearings.

5.10 Setting Up the Stand/Shelf Assembly

The stand/shelf assembly (5760-361) elevates the controller to a height convenient for operations.

1. Assemble the T-stand per instruction sheet 5760-361N.
2. Remove the rubber feet from the bottom of the controller.
3. Place the controller on top of the shelf and position it so that the front panel is easily accessible.
4. Using the screws and rubber foot spacers from the bottom of the controller, securely mount the controller to the shelf.
5.



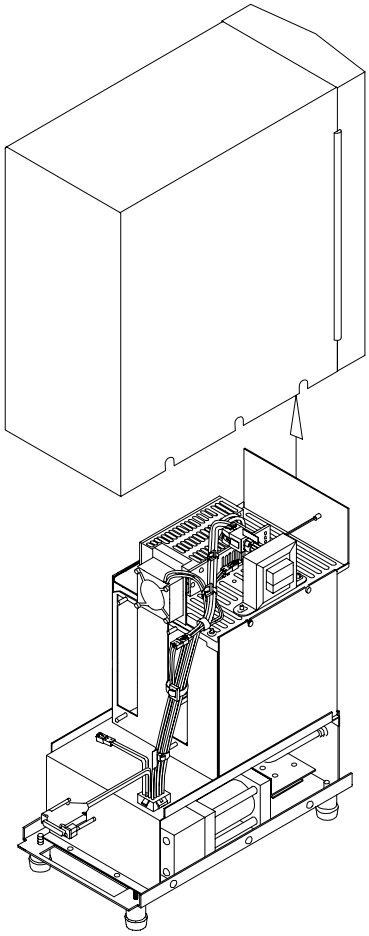
CONTROLLER STAND/SHELF ASSEMBLY

5.11 Controller Connections

Removing the Cover

1. Place the controller on a workbench.
2. Open the hinged door at the front of the unit.
3. Loosen the six cover screws with a slot head screwdriver.
4. Slide the cabinet housing up and set it aside.
5. Be sure to plug in the 5V/15V power supply and the ink out beacon. (Consult the label located on the rear panel of the IDS.)

The controller requires a constant electrical source. A properly grounded, dedicated line is recommended for ink jet equipment. A dedicated line minimizes the risk of interruptions in the printing process due to power line interference. If using an electrical source other than 115VAC, set the voltage selector switch to the correct voltage.



CONTROLLER WITH COVER OFF

Cable Connections

Verify that the 5VDC, 15VDC and Ink Out cables are connected to the interface board. The DB15 cable should be attached to the DATA port.

Gather the remaining cables that came with your system. When routing cables, make sure that ALL cables connecting to the controller pass through the base plate of the controller BEFORE they are attached to their ports.

1. Controller to First Printhead

   Attach the Printhead-Controller cable (5700-934) with the female DB15 connector to the printhead. Tighten in place with the attached jack screws.

   Slide the other end of the control cable with the male DB15 connector through the slot in the base plate and attach it to the controller. Consult the card cage silkscreen for the connector marked HEADS. Tighten in place with the attached jack screws.

2. First Printhead to Second Printhead

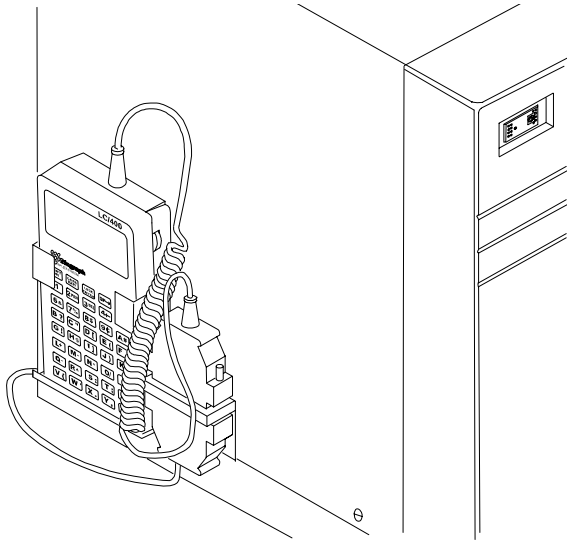
   Attach the Printhead-Printhead cable (5700-934) with the male connector to the first printhead. Tighten in place with the attached jack screws.

   Attach the other end of the printhead cable (with the female connector) to the next printhead in the printstation and tighten in place with the attached jack screws.

3. LC/400 Holster to Controller

   Connect the DB25 end of the LC/400-PHC cable into the slot on the optional LC/400 holster (5700-295). Tighten with the jack screws and standoffs supplied. Use a nut driver to tighten in place.

   Slide the DB15 end of the LC/400-Controller cable through the slot in the base plate and attach it to either DATA port on the rear panel of the controller.



4. Encoder to Controller

   Disregard this step if you are using the internal fixed speed reporter.

   Slide the DB15 end of the Encoder-Controller cable (5700-924), attached to the encoder, through the slot in the base plate and attach it to the controller. Consult the card cage silkscreen for the connector marked ENCODER.

5. Photosensor to Controller

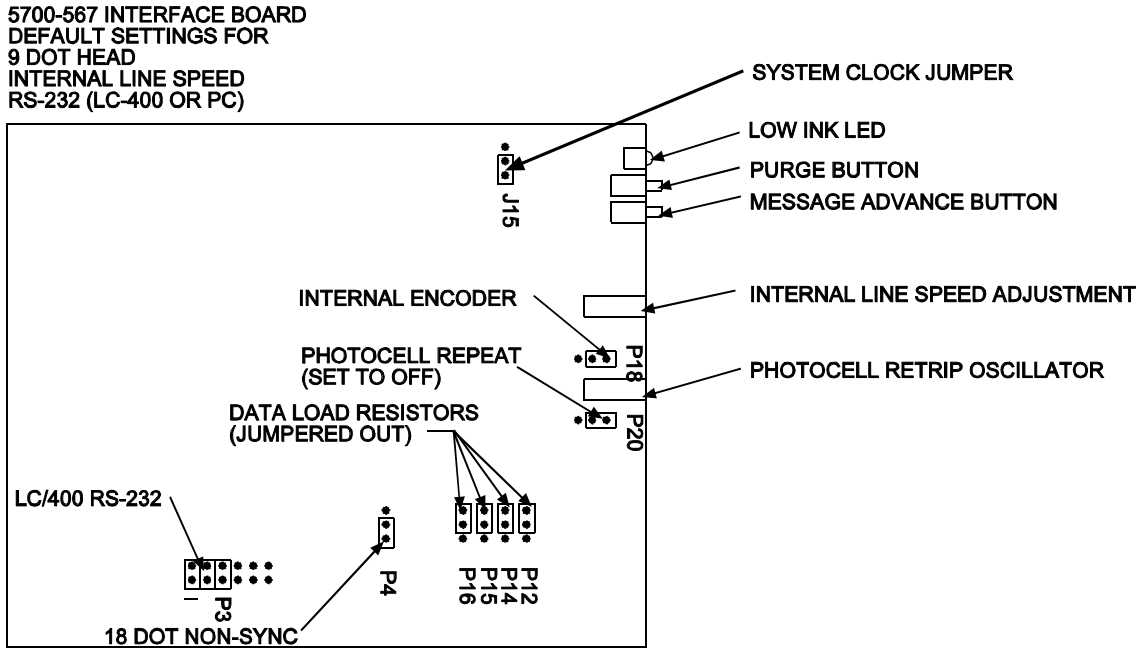
   Slide the DB9 end of the Photosensor-Controller cable (5700-933), attached to the photosensor, through the slot in the base plate and attach it to the controller. Consult the card cage silkscreen for the connector marked PHOTOCELL.

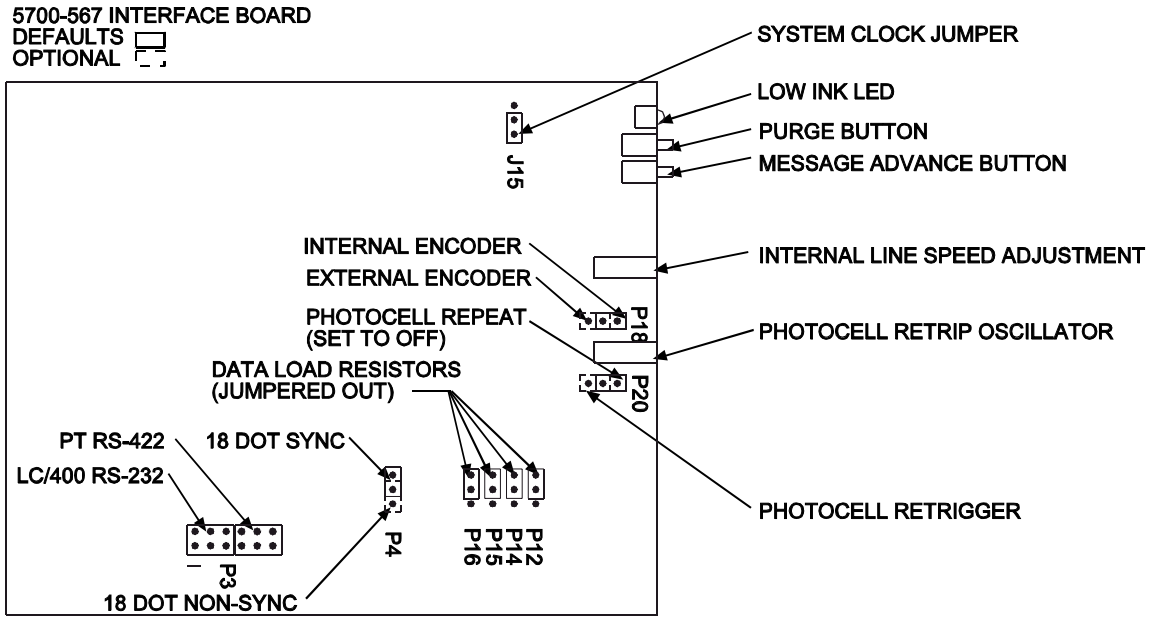
Securing Loose Cable

After making all cable connections, use plastic tie-wraps or similar straps to secure slack lengths of unused cable. Do not attempt to cut the cables to length.

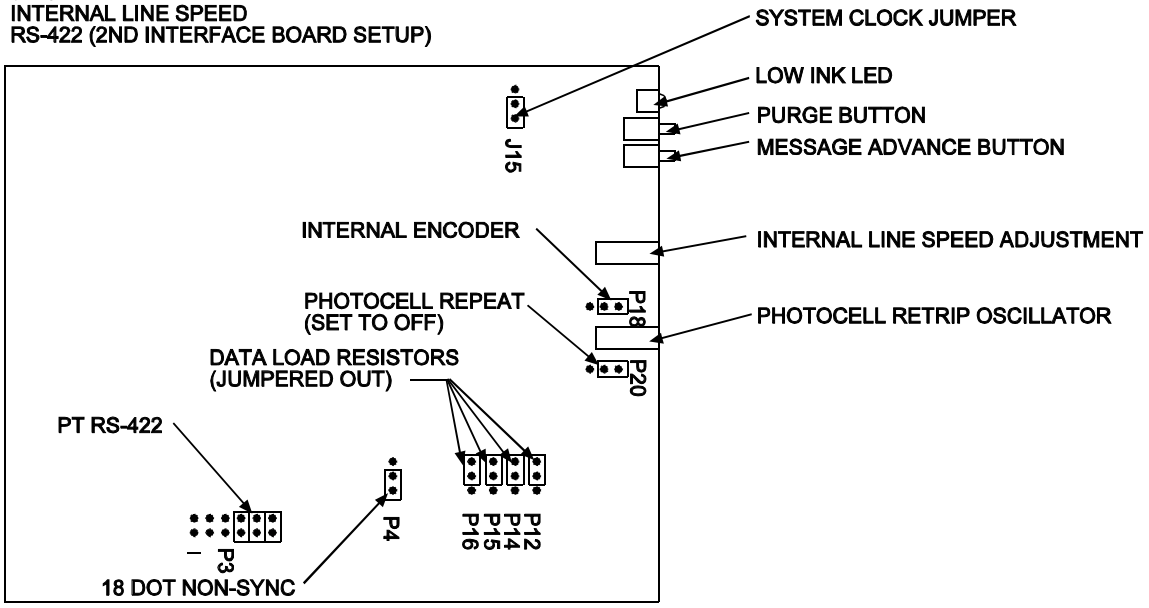
Interface Board Settings

Refer to the following diagrams for the proper jumper settings for your configuration.

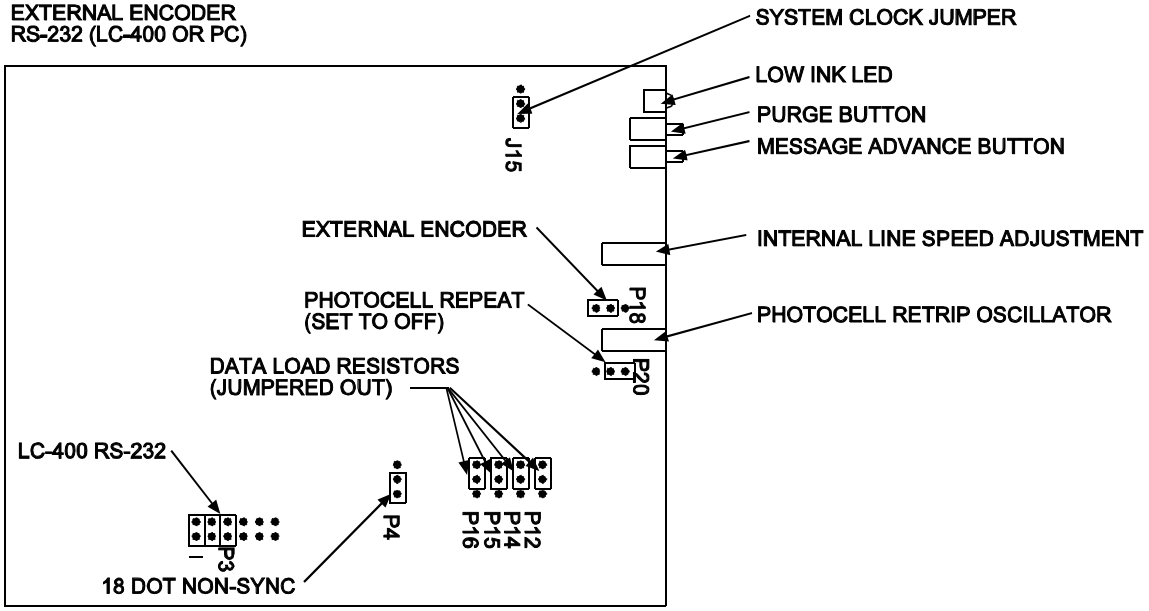




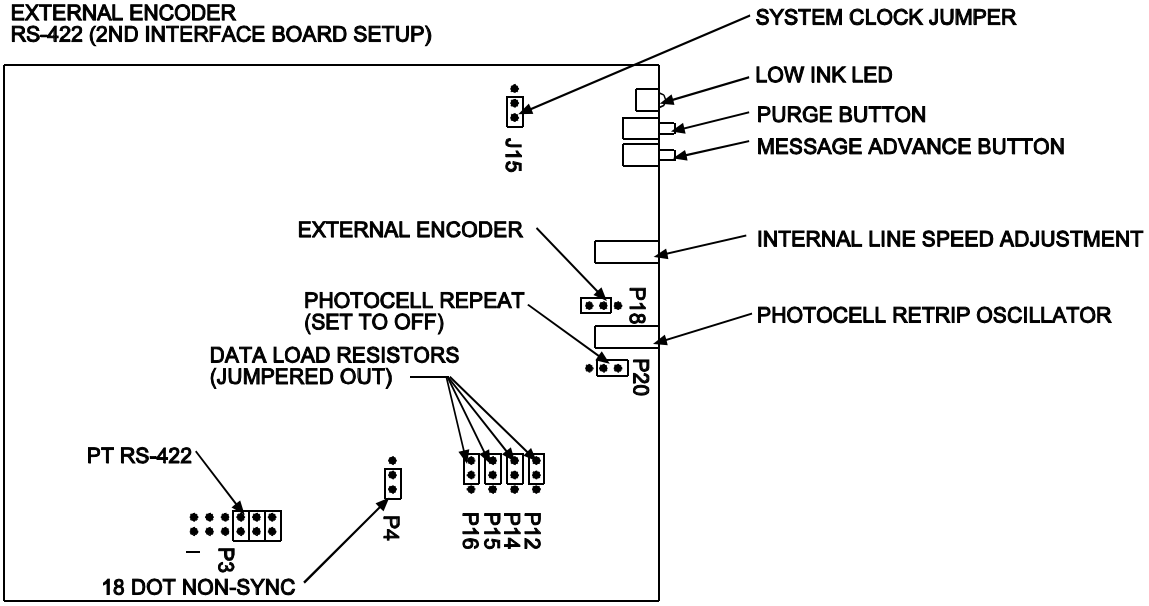
5700-567 INTERFACE BOARD
DEFAULT SETTINGS FOR
9 DOT HEAD
INTERNAL LINE SPEED
RS-422 (2ND INTERFACE BOARD SETUP)



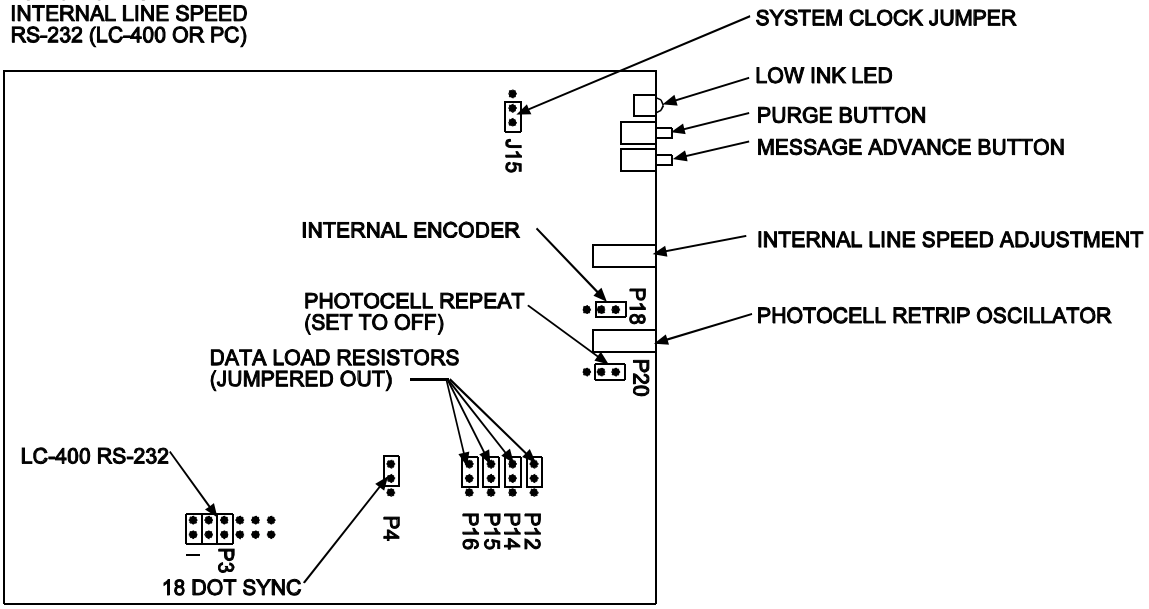
5700-567 INTERFACE BOARD
DEFAULT SETTINGS FOR
9 DOT HEAD
EXTERNAL ENCODER
RS-232 (LC-400 OR PC)



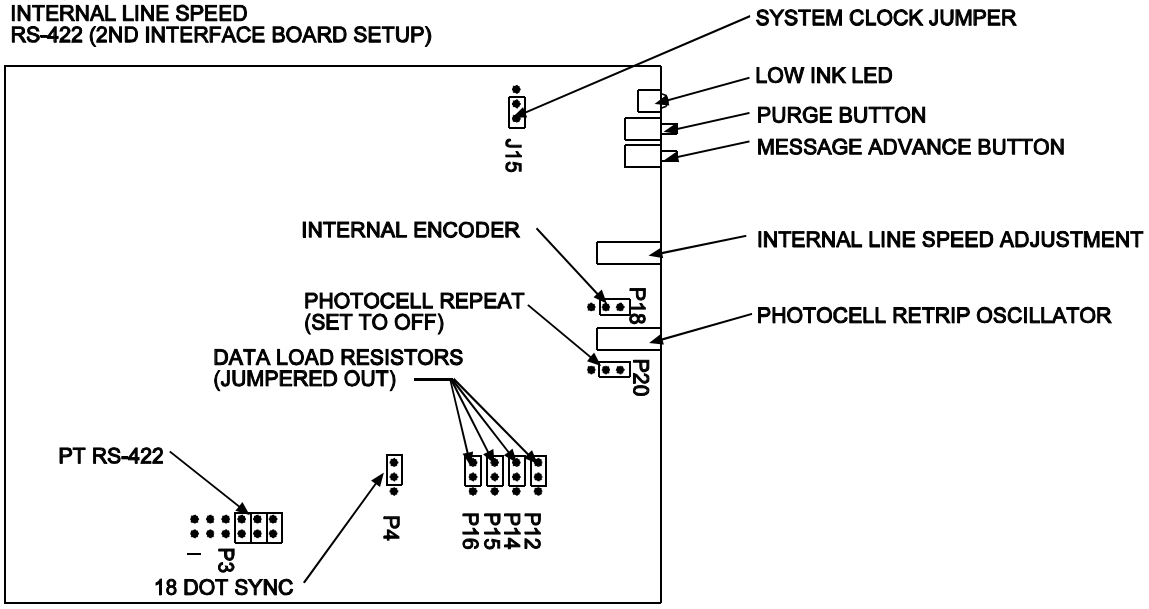
5700-567 INTERFACE BOARD
DEFAULT SETTINGS FOR
9 DOT HEAD
EXTERNAL ENCODER
RS-422 (2ND INTERFACE BOARD SETUP)



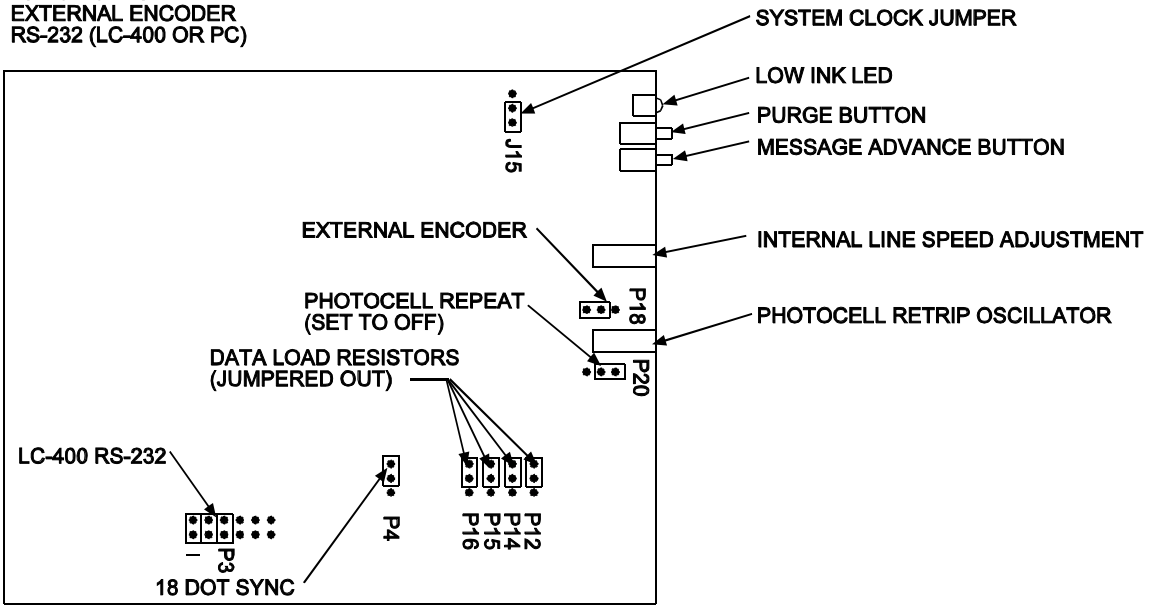
5700-567 INTERFACE BOARD
DEFAULT SETTINGS FOR
18 DOT SYNC
INTERNAL LINE SPEED
RS-232 (LC-400 OR PC)

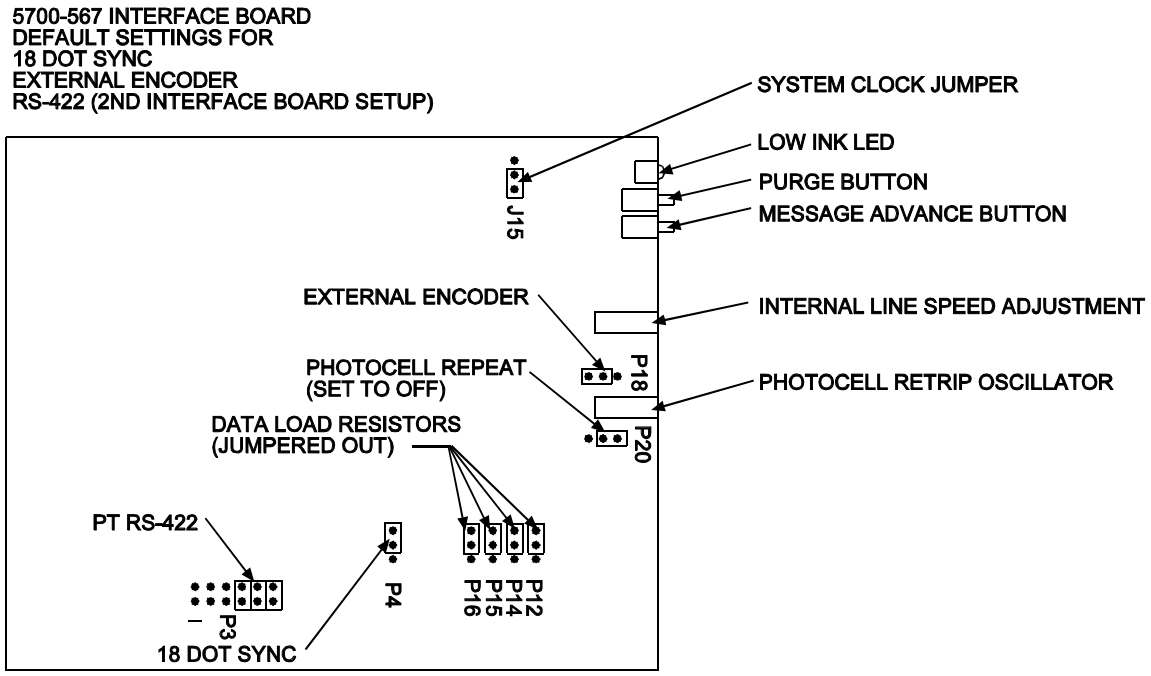


5700-567 INTERFACE BOARD
DEFAULT SETTINGS FOR
18 DOT SYNC
INTERNAL LINE SPEED
RS-422 (2ND INTERFACE BOARD SETUP)

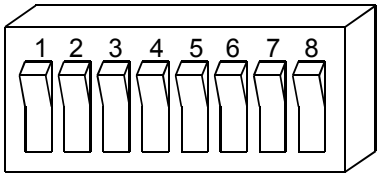


5700-567 INTERFACE BOARD
DEFAULT SETTINGS FOR
18 DOT SYNC
EXTERNAL ENCODER
RS-232 (LC-400 OR PC)





Setting DIP Switches on the Logic Boards



The system uses dual in-line package (DIP) switches to set the printhead addresses and to add or remove certain features. These eight switches are on the Controller logic boards.

Each pair of logic boards (with an attached interface board) can power up to two 9-dot printheads or one 18-dot printhead. The controller can house as many as two sets of boards; thus controlling up to four 9-dot printheads or two 18-dot heads. Each logic board contains a block of eight DIP switches that perform functions described in the table below.

DIP switch settings 1-4 can be changed when the power is ON. Always turn the power OFF when changing DIP switch settings 5-8.

Table 4: DIP Switch Functions

Switch #	Function
1	If ON, a test message will print when the system is running, even without sending a message to print. Turn OFF for normal operation.
2	In the SA99 system, turn ON if printing is to be on a continuous, unbroken surface. Turn OFF to print once per product.
3	OFF to identify the lower half of an 18-dot printhead. ON when configured for 18-dot.
4	Sets special options. Always keep this OFF during normal operation. More information on setting special options is found later in this section.
5-8	Set these switches to the proper printhead addresses as detailed below.

NOTE: Some logic boards label the DIP switches OPEN or CLOSED, rather than OFF or ON. In this case, OPEN is the same as OFF and CLOSED is the same as ON.

Setting Printhead Addresses

For a single head stand-alone system, set switches 5-7 to ON and 8 to OFF. For a multiple head system, assign each printhead controller logic board, with its respective printhead, a letter from A through O. This is the "Printhead Address". Do not duplicate addresses.

Determine the lettering scheme by assigning letters to all the logic boards in your system beginning with the letter A. Mark each logic board visibly with its address letter or number.

Next, set the last four DIP switches (5-8) on each labeled logic board to correspond to its assigned letter or number according to the tables below.

Table 5: Printhead Addresses for the PC-Based Controller

SW	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
5	off	off	off	off	off	off	off	off	ON	ON	ON	ON	ON	ON	ON	ON
6	off	off	off	off	ON	ON	ON	ON	off	off	off	off	ON	ON	ON	ON
7	off	off	ON	ON	off	off	ON	ON	off	off	ON	ON	off	off	ON	ON
8	off	ON	off	ON	off	ON	off	ON	off	ON	off	ON	off	ON	off	ON

Table 6: Printhead Addresses for the Stand-Alone Controller

SW	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	off	off	off	off	off	off	off	ON	ON	ON	ON	ON	ON	ON	ON
6	off	off	off	ON	ON	ON	ON	off	off	off	off	ON	ON	ON	ON
7	of	ON	ON	off	off	ON	ON	off	off	ON	ON	off	off	ON	ON
8	ON	off	ON	off	ON	off	ON	off	ON	off	ON	off	ON	off	ON

Setting the Fixed Speed Reporter

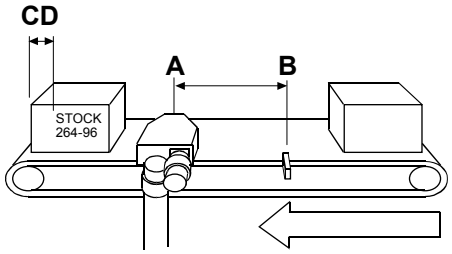
The fixed speed reporter approximates the speed of the conveyor line and sends a constant speed signal to the controller. The operator must properly set a suitable approximate print speed to send to the controller because the fixed speed reporter does not make contact with the conveyor.

1. Make sure that jumper P18 is in the front position.
2. Run a print sample.
3. If the message appears elongated, use a slotted tip screwdriver and turn the potentiometer for the fixed speed reporter clockwise several turns. This increases both the line speed being reported to the controller and the rate the dots are printed. The net result is a compressed image.
4. Print another sample and adjust as necessary.
5. Continue this process until the print quality is acceptable.
6. If the message appears too compressed, turn the potentiometer counterclockwise. This decreases the rate at which the dots are printed, and elongates the image.
7. Print another sample and adjust as necessary. Continue this process until print quality is acceptable.

NOTE: The maximum line speed of the fixed speed reporter is 300 feet per minute.

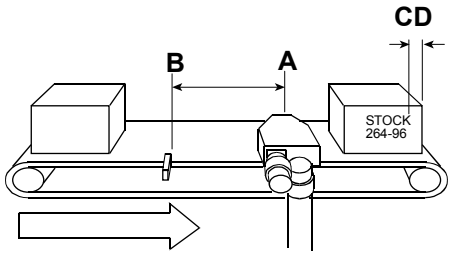
Calculating the Print Indentation

Print Indentation, or Start Print Delay, is the distance from the leading edge of the product to the start of printing. This will be the distance to the start of the message for right-to-left printing, and to the end of the message for left-to-right printing.



Two distances must be taken into account before setting the print indentation:

1. The distance between the photosensor and the nozzle array of the printhead (A to B in the figure at right).
2. The distance between the leading edge of the target item and the point on the item where the message *will begin printing* (C to D). The leading edge depends on the direction the conveyor is moving.
3. Step 1 + Step 2 = Print Indentation.



You will need to calculate the print indentation for each printhead.

Setting the Indentation for SA99 and PC-Based Systems

The Start Print Delay adjustment for the SA99 system is set with three rotary thumbwheel switches on each logic board in the controller. These switches, from top to bottom, are calibrated in 10", 1" and 0.1" increments.

1. Locate the three rotary thumbwheels on the logic board.
2. Turn the wheels until the appropriate numbers are showing. To create a print indentation of 24.5", set the thumbwheels as shown at left.

Remember to set the Start Print Delay for each logic board.

Selecting Indentation for the SA99 Message Select

Enter the message indentation for the SA99 Message Select system through the LC/400 hand-held terminal. Set Indentation appears under the Utility menu.

1. Turn on the controller and when the LCD asks for a new printhead, type the printhead letter address for the appropriate printhead.
2. Scroll through menus and select the Utility menu option.
3. Scroll through the Utility menu functions to the Set Indentation screen. Answer yes by pressing **Y** and the screen will display the current indentation screen.
4. Type in the new indentation value. Remember, the value displayed represents hundredths of an inch: 1200 = 12 inches, and 2400 = 24 inches.
5. The LCD will flash the new indentation value and then ask if you want to print in continuous (web) mode. Press **SP** for NO if you want to print single messages on individual items.

Continuous Printing (SA99 or PC System)

To print on a continuous, unbroken surface like a roll of fabric or paper, set the Start Print Delay to print the same message continuously at regular intervals.

1. Open the hinged front door of the controller/IDS.
2. Turn on DIP switch #2.
3. Set the thumbwheels to the desired distance between printed messages.
4. Turn the RUN/STOP switch to RUN.
5. Start the conveyor.

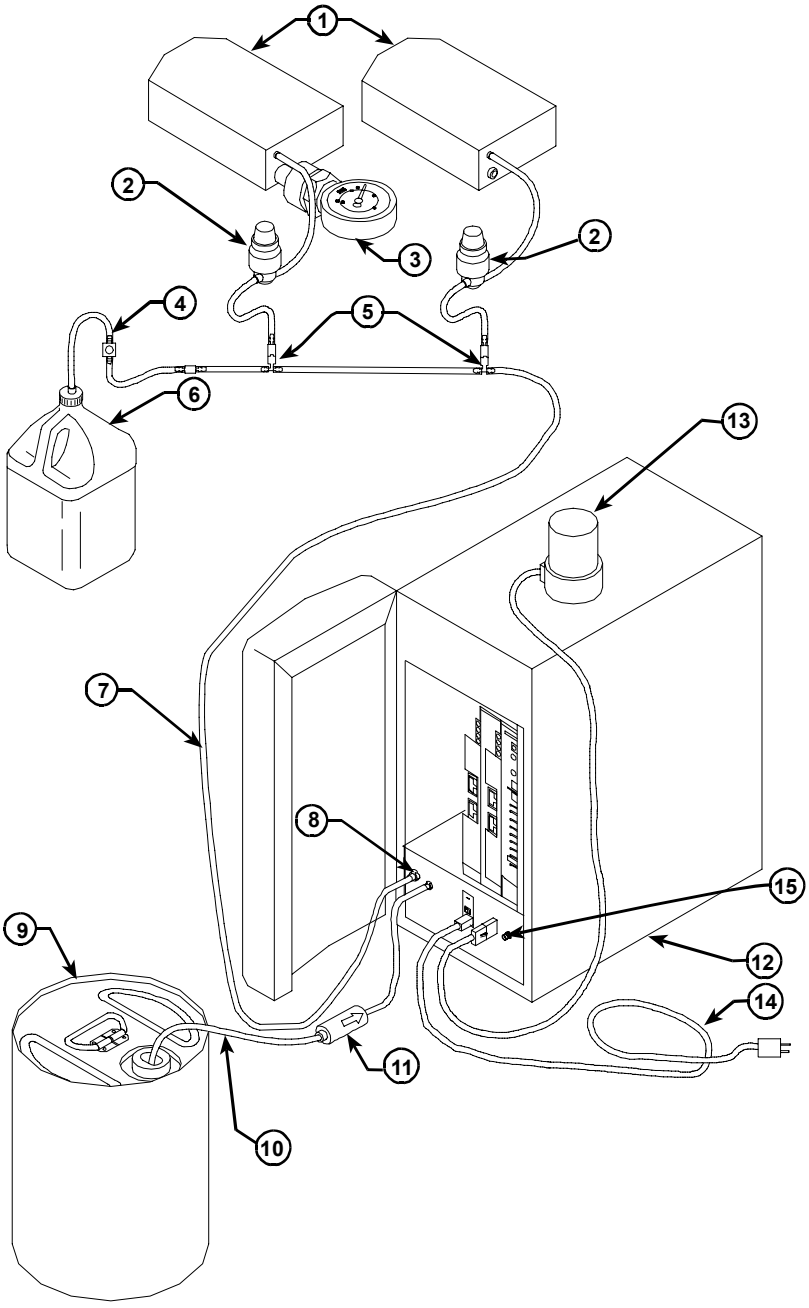
If using an SA99 Message Select system, activate the continuous (web) printing mode by selecting YES in step 5 of the previous section.

NOTE: An SA99 or PC system is adequate if the distance between prints in web mode is equal to the repeat distance. If the distance from the start of print to the leading edge of the product cannot equal the repeat distance, an SA99 Message Select system is required.

5.12 Configuring the IDS

The figure at right illustrates the plumbing of a multiple printhead system.

1. Printhead
2. Ink regulator
3. Pressure gauge
4. On/Off valve
5. T connector
6. Effluent bottle
7. 1/4" ink line
8. 1/4" quick disconnect
9. Ink container
10. 1/8" ink line
11. Ink filter
12. Controller/IDS
13. Ink out beacon
14. Power cord
15. Prime switch



Ink Line Connections

Connect ink lines after carefully installing the printheads, bracketry and ink regulators.

CAUTION: Wear safety goggles when working with industrial inks or solutions!

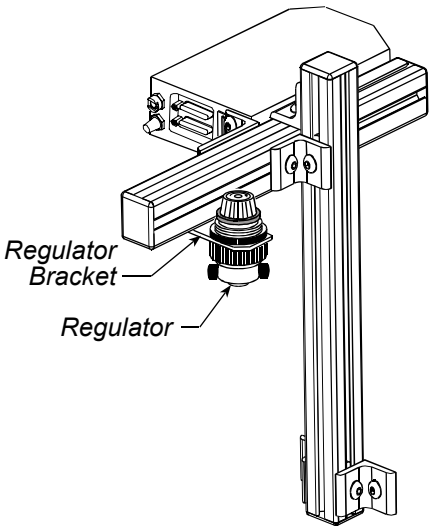
The IDS ships with the following parts:

- 20 feet of 1/4" tubing with a male elbow in one end (for the IDS) and a 1/4" male quick-disconnect in the other.
- Ink filter assembly comprised of 1/8" tubing, a filter and a 1/8" male quick disconnect at each end.
- Ink out beacon
- Power cord
- Spare parts kit documentation

Attaching Ink Regulators

Attach a single T-nut loosely to the bottom side of the regulator bracket.

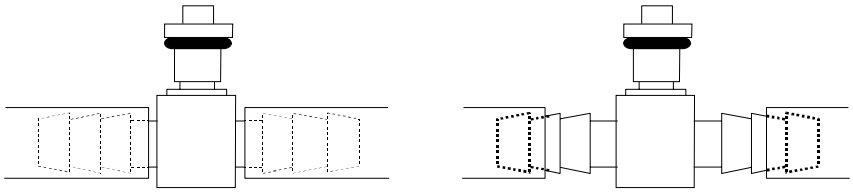
Slide the regulator bracket and T-nut into the slotted bar and tighten into place.



Plumbing the System

Obtain a pair of diagonal cutters to cut the cable ties and tubing

1. The IDS may be located up to 100 feet away from the printheads. Refer to Appendix E, "IDS Performance", to ensure that the vertical distance between the IDS and the printheads allows for adequate ink pressure.
2. Be sure to slide the tubing completely over the exposed barbs on the fittings to prevent ink line leaks while under pressure.



3. Construct a spine from the 1/4" tubing and the T connectors, one connector for each regulator. Plan to position each regulator conveniently close to the printhead it will supply.
4. To connect the IDS to the first printhead, start at the end of the tubing fitted with the elbow connector. Cut the tubing and insert the barbed end of a T connector.
5. Reconnect the tubing to the other barb on the T connector and route the tubing to the next regulator.
6. Cut the tubing and insert the barbed end of a T connector for the second regulator.
7. Repeat the previous steps until there is a T connector in the supply line for each regulator. Connect the male quick disconnect of the T connector to the female quick disconnect of the regulator.
8. Attach the cut end of the remaining 1/4" tubing to the last printhead T connector.
9. Cut the tubing off about six inches beyond the last T connector and insert the male quick disconnect. Connect to the female quick disconnect on the tube from the effluent bottle.
10. Connect the male elbow in the 1/4" tubing to the female quick disconnect marked OUT on the IDS.

Connecting the Printheads

Connect the ink line with the male fitting from each regulator to the female quick disconnect on its printhead. Listen for a click when you push the connector into the fitting. The thumb tab on the coupling will be in its out position when successfully attached. Test the ink line's security by gently tugging on it to ensure connection.

Connecting the Beacon to the IDS

Set the Ink Out beacon where it can be seen by floor personnel. Connect the beacon to the IDS front panel using the attached cable with the two-pin connector. The beacon will flash when the ink pail is empty or an error condition exists.

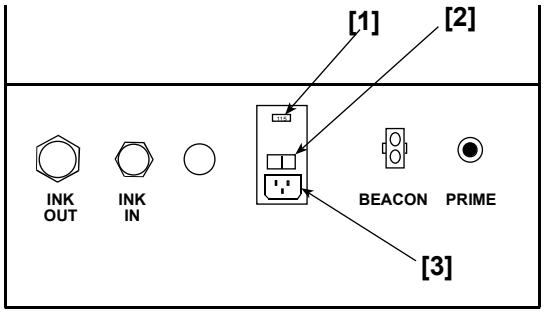
Connecting the Ink Supply

CAUTION: Wear safety goggles whenever working with ink or ink supply lines. Check with your supervisor for additional safety directives.

1. Place a pail of Diagraph ink on the floor near the IDS.
2. Remove the plastic cap and tube assembly attached to the side of the pail. The cap is designed to remove the maximum amount of ink from the pail. Do NOT cut it or reposition the weight on its end.
3. Unscrew the plastic shipping cap and dispose of it.
4. Insert the tube from the cap and tube assembly into the pail and screw the cap on tightly.
5. Connect the 1/8" ink supply line from the IDS to the female quick disconnect in the ink cap. Make sure the couplings snap into place.

Connecting Power to the Controller/IDS

Be sure that the ON/OFF switch **[2]** is set to OFF (0).



[1] Voltage Indicator

[2] ON/OFF Switch

[3] Power Entry Module

Check the window **[1]** at the top of the power module for the correct voltage setting. Plug the power cord from the junction box into the power entry module input **[3]**.

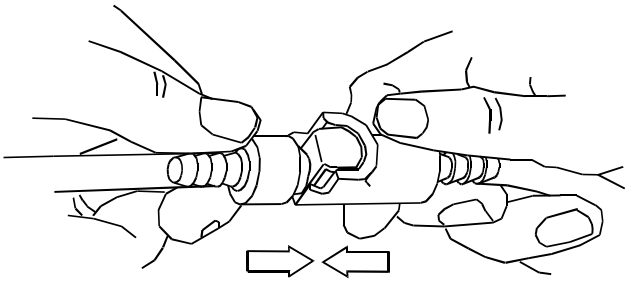
Priming

CAUTION: Do not run pressurized ink before all ink line connections are made.

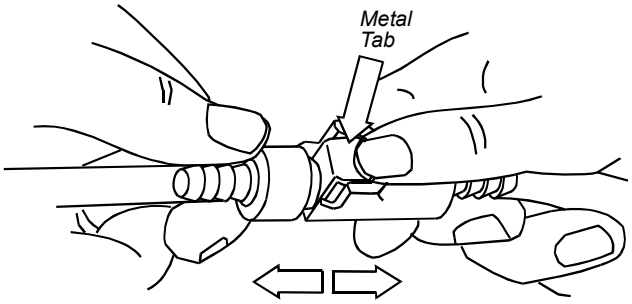
Priming is a manual procedure that draws ink from the pails and fills the system's ink lines. This is necessary for all new installations or whenever the system has run out of ink completely.

1. Before beginning, make sure the controller is off.
2. Check all ink line fittings again to ensure they are intact so no ink will leak.
3. Turn the ON/OFF switch to ON. The power LED illuminates and the Ink Out beacon flashes, indicating that the system is out of ink.

4. Open the shutoff valve in the ink tubing to the effluent bottle by pushing the connectors together.
5. For the next three steps, position yourself so that you can reach both the Prime button and the in-line shutoff valve while keeping an eye on the Ink Out beacon.
6. Press and hold the Prime button, which turns the pump on. After 5 seconds, close the shutoff valve by depressing the metal tab on the valve, while continuing to hold the Prime button.
7. Release the Prime button when the beacon stops flashing. The system will continue to pressurize until the accumulator becomes full of ink.



OPEN SHUTOFF VALVE



CLOSE SHUTOFF VALVE

NOTE: If manual priming exceeds 30 seconds, the pump will shut off, the power LED will flash and the beacon will illuminate, indicating an error condition.

8. Optional: If there is air in the lines at the effluent bottle, exhaust by quickly opening and closing the shutoff valve.
9. If the system failed to prime, see Section 8, Troubleshooting.
10. If the beacon continues to flash, check for an ink leak. If a leak is a discovered, turn off the controller, disconnect the ink line from the primary ink pail and fix the leak.
11. If there is no leak but the beacon continues to flash, see *Section 8, Troubleshooting*.

Checking Ink Pressure

Variations in ink pressure produce different dot sizes; the higher the pressure, the larger the dot.

NOTE: One should not adjust dot size by adjusting ink pressure. Over-pressurizing a printhead can result in leakage, or cause ink to shoot across the conveyor. Under-pressurizing can cause ink to drip from the front plate while printing.

Connect the pressure gauge with its female quick-disconnect to the effluent port on the printhead. The needle on the gauge will reflect the ink pressure at the printhead.

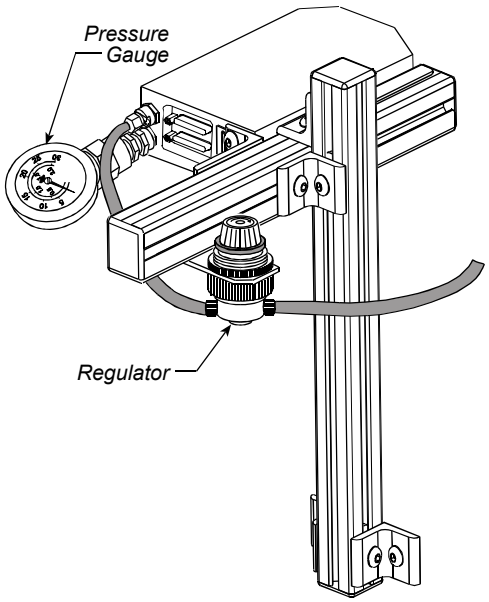
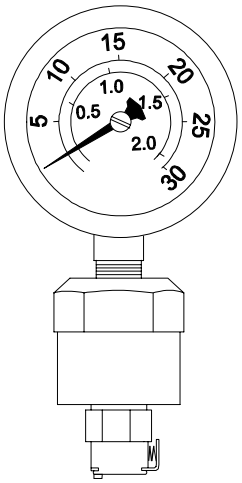


Table 7 shows the target ink pressure for various printheads.

Table 7: Printhead Pressure

Printhead	PSIG (±0.5)
1/2"	5
7/8"	6
1"	8
2"	8



INK PRESSURE GAUGE

Observe the following precautions while using and cleaning the ink pressure gauge:

1. Do not probe into the pressure gauge with objects when cleaning. Use the appropriate conditioner and an ink acid brush (1619-080).
2. Pressure measurements are relative to the height from which they are measured. When measuring printhead pressure, the gauge must be at the same height as the printhead. Read the gauge either vertically or horizontally as long as the height does not change.
3. Do not leave the gauge hanging from the printhead effluent connection for very long. Its weight will fatigue the fitting, eventually breaking it off, which will allow pressurized ink to flow freely from the printhead.
4. The gauge should be calibrated periodically for accuracy. This should be done at least once per year, or whenever it has been dropped.
5. If the ink pressure at the printhead is not within the target range, follow the steps below.

Setting Ink Pressure

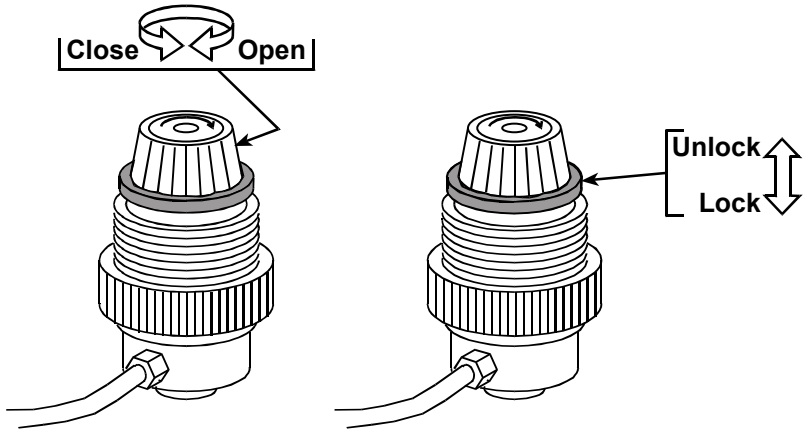
NOTE: The ink regulator comes preset from the factory. Check your ink pressure with the ink pressure gauge (5700-743) before making any adjustments.

Lowering the ink pressure to alleviate printhead seepage will result in poor startup, dynamic ink leakage and more frequent missing dots. The I.V. design relies on the equilibrium of ink pressure, pre-load and pulse width for optimum printing.

The orifice size and membrane excursion areas have been specifically tuned to work with the ink pressure specified for the printhead. When operating correctly, all ink will jet from the orifices and leave only a moist seal of the membrane against the orifice. Lowering the pressure reduces the dot velocity and does not allow all of the ink to break free of the front plate. The ink left behind runs down the front plate and drips off the bottom of the printhead.

Lowering the ink pressure also reduces the amount of ink that reaches the substrate. To compensate for the lighter mark, the technician may increase the pulse width to obtain an acceptable size dot. By doing so, the pulse width can exceed the maximum recommended by specification and significantly lower the life expectancy of the solenoid, especially in high line speed applications.

1. Connect the ink pressure gauge to the printhead ink exit port.
2. Monitor ink pressure while printing. Note that the pressure drops by as much as 0.75 PSIG (usually less) during the print cycle. Nominal pressure should be centered within the deflection range while printing.
3. If pressure is low, lift the red locking ring on the regulator and rotate the knob clockwise until the nominal printhead pressure is centered within the deflection of the gauge while printing.



4. If the pressure is high (or was adjusted above the specs in step 3), rotate the knob counter-clockwise and purge heads until pressure is below 1 PSIG. Follow step 3 above. Press the locking ring down when finished.
5. Check pressure 15 minutes after setting it. The pressure should be within the same range +/- 0.5 PSIG. If not, see *Section 7, Maintenance*, for the Ink Regulator Maintenance procedure.

Final Installation Checklist

1. Record all serial numbers and revision levels below for future reference.

	MODEL #	SERIAL #	REV. LEVEL#
Interface Board 1			
Interface Board 2			
Logic Board 1			
Logic Board 2			
Logic Board 3			
Logic Board 4			
Power Supply			
Printhead 1			
Printhead 2			
Printhead 3			
Printhead 4			
Firmware Version			
Software Version			
Controller			
LC/400 Terminal			
Portable Terminal			
PC Base			

2. Program the controller and/or PC with custom software if required. Load any special forms or logos.
3. Test print samples. Verify that the system downloads information correctly, and that print quality is consistent.
4. Confirm the type of barcodes to be printed. Print and verify the barcodes with RJS Model 2 Verifier.
5. Remove the inlet ink line while the system is ON to verify that the low ink indicators are working on the interface and logic boards, and the ink out beacon is working.
6. Record the jumper settings on the interface board, and the DIP switches on logic boards.

Interface Board 1 Jumpers (Circle Connections)

• • P3	• • • P12	•	•
• •	• • • P14		
• • I	• • • P15	• • • J15	
	• • • P16		

Interface Board 2 Jumpers

• •	P4	P18	P20
• •	• • •	•	•
• •		•	•
• • P3	• • • P12	•	•
• •	• • • P14		
• • I	• • • P15	• • • J15	
	• • • P16		

Logic Board 1 DIP Switches (Check Boxes)

1	2	3	4	5	6	7	8

NONE

Logic Board 2 DIP Switches

1	2	3	4	5	6	7	8

NONE

Logic Board 3 DIP Switches

1	2	3	4	5	6	7	8

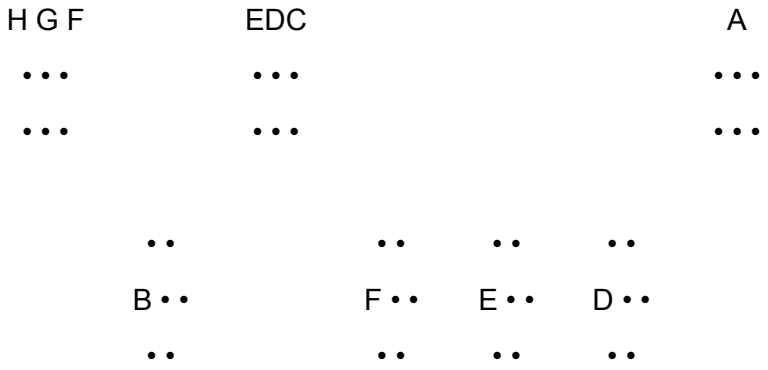
NONE

Logic Board 4 DIP Switches

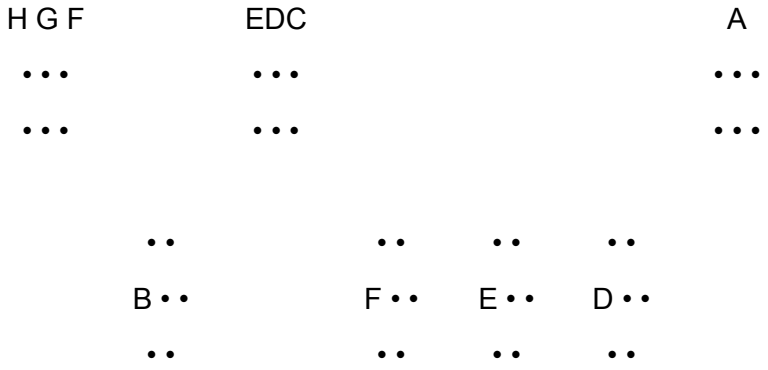
1	2	3	4	5	6	7	8

NONE

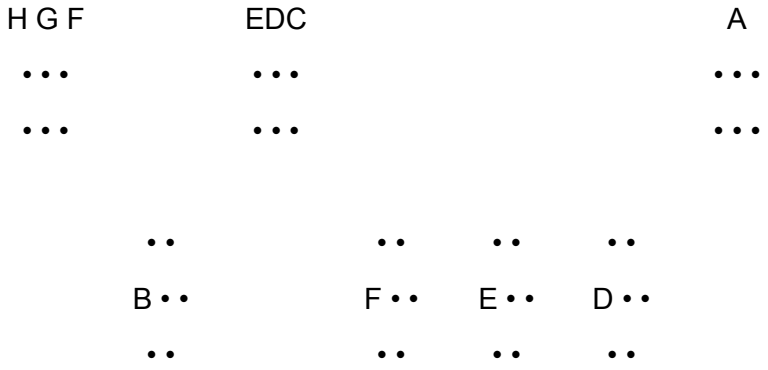
Logic Board 1 Jumpers (Circle Connections)



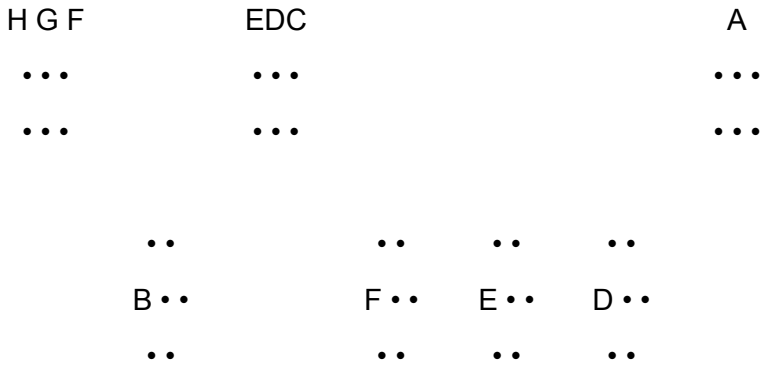
Logic Board 2 Jumpers



Logic Board 3 Jumpers



Logic Board 4 Jumpers



Comments:

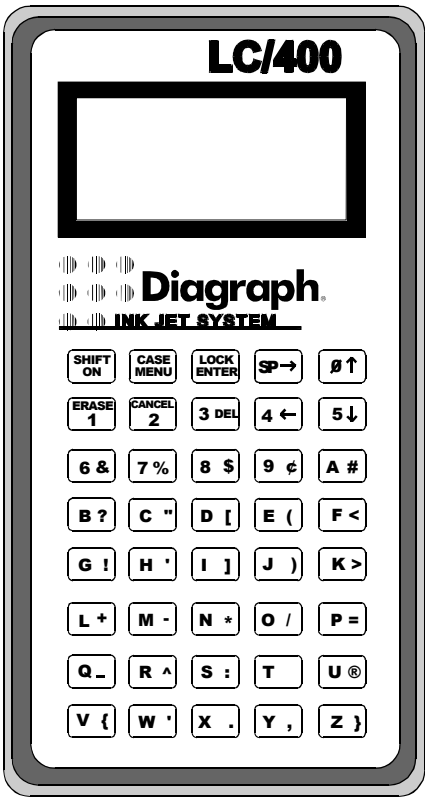
Final Test Tech: Date:

Quality Control: Date:

Section 6: LC/400 Hand-Held Terminal

NOTE: PC-Based Users: Refer to the IVpro User's Manual (5701-038) for detailed instructions on printing with a computer-based system. See also *Appendix G, Host Interface Guide*.

The LC/400 is a hand-held terminal designed for use in industrial environments. It has a four-line by 16-character text LCD (Liquid Crystal Display). The small thumbwheel on the right side of the unit adjusts the screen contrast.



The LC/400 communicates with the printhead controller through a DB-15 connector that is also its power source. Without a connection to the controller, the LC/400 is inoperable. Store the LC/400 in the holster on the side of the controller when not in use.

The examples in this section use Printhead A of a multi-head Stand Alone system. (Where applicable, SA99 Message Select examples are given.)

6.1 LC/400 Keypad

You cannot damage the system by pressing the wrong key on the LC/400. The LC/400 DOES NOT control the printheads. The LC/400 tells the Controller which message to print. Feel free to experiment because the system takes adequate measures to verify the accuracy of any message that goes to the Controller.

The LC/400 has a touch-sensitive membrane keypad printed in blue, black and white. The black printed keys are numbers and letters. The blue keys are functions and symbols. (Press the SHIFT key, then press the appropriate function key to access.)

NOTE: Do not hold SHIFT down while pressing a function key. Press SHIFT and then press the appropriate function key.

Substitute LCD Characters

The LC/400 does not display the ® and the ¢ signs properly in the display window. When you press either of these keys a substitute symbol appears in the display. The ® substitute character is ; and the Cent substitute character is \. This also applies to custom-designed special characters and logos that are normally assigned to a lower-case character key.

Even though the display window shows a substitute character, the correct character will print out in the message.

Function Keys

CASE MENU — Press this key to return to the initial screen on the system's Main Menu. When a system has more than one printhead, use this key to get to the menu to access the other printheads in the system. Pressing it from anywhere in the menu yields the prompt "Keyboard now on head A. New head?"

SP→ — Press the SP key to enter spaces between words (as on a typewriter). When responding to a menu prompt, press the SP KEY to answer "no" (spelled out SPACE=no).

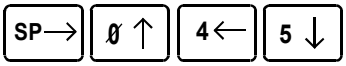
Y , — This alphabet key is also a Function key. Press the "Y" key to answer "yes" to a menu question.

V { Z } — The braces are special function keys at the bottom of the keyboard. They are used to add autocodes to any message, and do not print. The autocode table, found later in this section, explains other automatic codes.

Shift Functions

SHIFT ON — To enter a lower-case character one time in your label, press SHIFT, CASE, then the appropriate character.

CASE MENU — Press SHIFT then any of these keys to move through message lines, information statements (in the Printhead Status Function) or through several of the functions available in the Utility Menu.



LOCK ENTER — To change the case of a letter key, press SHIFT then LOCK. Locked mode means that all letters in the messages will appear in the display window in their capitalized form. The printhead will always print in capital letters although lower case fonts are available upon request. The Locked mode does not affect those upper-case characters selected by non-alphabetical character keys such as #, & and so forth. It is best to leave the locked mode engaged to avoid confusion.

3 DEL — Press SHIFT then DEL to delete the character immediately to the left of the cursor. The arrow will then move back to that position.

ERASE 1 — Press SHIFT then ERASE to erase the entire message.

LOCK ENTER — Press ENTER to save a message to the Printhead Controller memory or to enter a value into a function in the Utility Menu.

CANCEL 2 — In the Message Editing Function, press SHIFT then CANCEL to cancel the entire editing session and return the last message saved to the display window. In the Utility Menu, use CANCEL to move to the next function.

6.2 LC/400 Menu Options

The Series 1 system has a Main Menu and a Utility Menu. The Main Menu offers five choices:

1. Printhead Selection: *Keyboard now on head A. New?*
2. Message Routing: *Select msg to print?*
3. Message Editing: *Write or review message?*
4. Printhead Status: *Show printhead status?*
5. Utility Menu: *Utility menu?*

The Utility Menu has ten functions:

1. Change item number?
2. Set character width?
3. Set character spacing?
4. Set font?
5. Set indentation? (Available in the SA99 Select system only.)
6. Set time?
7. Set date?
8. Reset printhead?
9. Purge valves?
10. Change pallet count?

Additional special features can add functions to these menus.

The five Main Menu choices, identified by their respective prompts, appear in the LCD.

To use the system, simply do what the system requests. The system asks for an answer of "yes" or "no", a number, or a message.

The following section details the functions that are available. The directions and examples are for multiple printhead systems.

6.3 Selecting a Printhead

After turning on the Controller/IDS, you can begin to enter messages into the system with the LC/400. If the system has two printheads "daisy-chained" together, the LC/400 can communicate with both Controller logic boards (which then communicate with both printheads) in the system.

1. Press MENU (it may be necessary to press it more than once). The display shows:
2. Enter the letter of the appropriate printhead.
3. Label all printheads and controller boards with letters from A-O. (See "Setting Printhead Addresses" in Section 5 more information.) The system will automatically advance to the next function in the Main Menu, Message Routing.

Although it is possible to scroll through the various functions using the up and down arrows, the ONLY way to access the function that changes the printheads is by pressing MENU.

6.4 Selecting a Message to Print

This function enables you to send any stored message to a printhead. Do not use this function until you have created several messages.

For the initial startup, answer no by pressing SP when the LCD prompts "Select msg to print".

Advance to the "Write or Review Message" function (see below). Return to this function when you have stored several messages in the controller.

Press Y to answer yes when the LCD prompts "Selecting msg to print". Three choices of action are possible:

1. Press ENTER to print the message number shown on the LCD.
2. Press the up and down arrows to view all the messages in the system one at a time, and press ENTER when the desired message appears on the LCD.
3. Type in the number of the message to print and press ENTER.

The system verifies that the message was sent successfully and then advances to the next function, Write or Review Message.

With the SA99 Message Select system, the print message is selected using the thumbwheel switches. Simple dial in the message number on the printhead's corresponding logic board.

6.5 Writing and Saving a Message

Each logic board on the PHC can store as many as 99 messages. Each message line provides room for up to 40 characters, including spaces between words. Follow these steps to create a message:

1. Press Y for yes when the LCD prompts "Write or review msg?"
2. The LCD will request a new message number. Press SP to select the first available blank message line or type the message number desired and press ENTER.

As an exercise, type in the test message **DIAGRAPH SERIES 1 SYSTEM**. If you make a mistake, use the arrow keys to move the cursor to the immediate right of the mistake and press DEL. When done, press ENTER to save the message to the controller's memory. After saving, you will get a chance to change the print values.

The expression "print values" refers to the parameters that affect the appearance of the characters and messages printed by the Series 1 system: Font, character width and char-

acter spacing. Font is the type style in which the characters will appear. Character width is the measurement from dot column to dot column in 1/100s of an inch. Character spacing, the amount of space between characters, in measured in empty dot columns.

For every print value, there is a default value that the system uses in printing unless you set an alternate value. The default font is Font #1, a 9-dot high, bold font. The default character width is 0.08" between dot columns. Default character spacing is three dot columns.

Changing Factory Defaults

The prompt "Change print values?" adjusts the factory-set values for writing or editing a message. For now, press SP to move past these prompts. (See "Utility Menu Functions" later in this section for more information on these prompts.) To write or review other messages, scroll through the message lines using the up and down arrows.

6.6 Editing a Message

You will now change **DIAGRAPH SERIES 1 SYSTEM** to **DIAGRAPH SERIES 1 INK JET SYSTEM** with appended date and time autocodes.

1. Press MENU to return to the top of the Main Menu and then scroll through the functions until the "Write or review msg" prompt appears.
2. Press Y to access edit function.
3. Type the message number to edit and press ENTER. For this example, use the right arrow to move the cursor to highlight the initial **S** in **SYSTEM** and type **INK JET** followed by a space. Use DEL to correct errors. Enter the autocodes for time {T} and date {D} at the end of the message. Be sure to insert a space between the autocodes.
4. Press ENTER. The LCD will ask if you want to change values.
5. As in the previous example, accept the factory-set values by pressing SP to answer no and complete the edit.

After saving, the LCD returns to the edited message. After creating or editing a message line, use the scroll keys to review the other message lines, or press MENU to return to the top of the Main Menu. From there, proceed to other functions by pressing SP.

6.7 Autocodes

Autocodes are codes used to print various configurations of time, date, numeric sequence and font selection. Place all autocodes within the braces {} found in the lower corners of the LC/400 keyboard. Autocodes are not case sensitive.

Some autocodes print their messages in familiar forms such as the date as a six-digit figure or the time on a twenty-four hour clock. Other autocodes print their messages in code with the month as a single letter (A through L) or the hour as two digits (00-23). This allows you to print more information in the same amount of space. Used properly, these codes can be a powerful tool for tracking production and inventory.

While it is possible to enter more than one autocode in the same set of braces, it is best to leave a space between them to save confusion. For example, {DN} will print 03/25/96748, while {D N} will print 03/25/96 748.

To enter a symbol that is not one of the autocodes, for example a # symbol, enter it before, between or after the commands in the braces. {D} #{N} will print 03/25/96 #748. Again, leave a space so that the characters do not run together.

Autocode Formats

Date Codes: Autocodes offer eight different formats for printing the date:

D Full conventional date: six digits plus slashes (month/day/year: 01/01/00)

J Julian Date: the numeric day of the year. Three digits, 001-366 (001 = January 1)

M Month only. Two digits, 01-12.

A Day of the month only. Two digits, 01-31.

I Dayof the year as two letters, AA-OB

L Month only as a single letter, A-L

B Day of the month as a single character: 1-9 signifies the first through the ninth and A-V is the tenth through the thirty-first.

Y Year as two digits: 99

Time Codes: Autocodes offer four different formats for printing time:

T Time as reported by a 24-hour clock, four digits plus colon: 00:00

H Hour only, two digit: 00-23

G Hour as a single letter: A-X (the day starts at midnight)

Q Time in 15-minute intervals as two numbers, 00-95

Font Selection: Autocodes offer six different fonts: {F#} where # is 1-6

1 Nine-dot tall bold, proportional

2 Nine-dot tall single, proportional

3 Seven-dot tall single, proportional

4 Seven-dot tall single, fixed width

5 Top half, 18-dot tall proportional

6 Bottom half, 18-dot tall proportional

Number Sequence: Autocodes offer two ways to count items:

N Number sequence from 1 to 999999

P Pallet count

Using the Number Sequence Code

Use this autocode to print sequential numbers from 1 to 999999 or any subset with a smaller upper limit. When the counter reaches the top of the sequence, it automatically resets and starts again with 1. The Item Counter runs whenever the controller is turned on.

1. Reset the Item Counter (change Item Number function under the Utility Menu) before beginning with a new sequence.
2. Check the TOTAL of the Item Counter by pressing Y at the "Check Printhead Status?" prompt. The LCD will then display a status screen. At the beginning of the second line of this screen, you will see "Total=" and a number. That number is the number of the next item to pass in front of the photosensor.
3. To reset the Item Counter, use the Change Item Number function in the Utility Menu. The Item Counter will always reset and start printing with 1, so it makes sense to start with 1 for a consistent sequence.

Creating an Upper Limit Sequence

To define the upper limit, choose the maximum number of items you want to pass in front of the photocell before the counter resets. Enter this number immediately after the N inside the braces ({}). {N10000} would run a sequence from 00001 to 10000; {N99} would run from 01 to 99.

When you set an upper limit inside the braces, the system will print zeros for unfilled spaces. For example, if you set your upper limit at 999 {N999}, the label for the ninth item will print as "009" and the label for the ninety-ninth as "099". The basic {N} command does not include these zeros and the numbers appear as 1, 2, 3..., 454, 455, and so on.

While {N99} will print 01 through 99 and then restart the counter at 01, {N00} is a special case that will print 00 through 99, then 00, 01, etc. Print 0 to 9, 00 to 99, and so on by entering the zeros (0, 00, 000, 0000) as the upper limit. However, use the Change Item Number Function to make the first sequence start at 0.

A 40-character message is the limit on the LC/400 screen. However, the autocode commands can make the printed message run longer. With these commands, the actual length of the message can expand to as many as 60 characters. The message "Product ID#:" with a time, date and sequence from 1 to 999999 would read "Product ID#: {T D N}" on the terminal and would be 20 characters long.

When printed, though, the message would be 32 characters long and read: "Product ID#: 15:40 03/25/93 1079," 32 characters long. To see the message, scroll the Current Message line of the Show Printhead Status Function using the left and right arrow keys.

Using the Pallet Count Code

Pallet count coding splits the one-to-six-digit item number into two sections, pallet count and item count. The pallet count increases by one every time the item count reaches the pre-set limit. You are telling the Controller that each pallet will contain a certain number of items; after reaching that number, start a new pallet.

The basic command to print a pallet count is {P}. Follow the "P" with a one-to-five digit number that specifies the number of units per pallet {P25}. In this case, the target item prints with a pallet number of "1" until 25 items are printed. Item 26 will print with a pallet count of "2".

Use code {N} to include an item count in the Pallet Count Code. When used in a Pallet Count Code, this will print the pallet count and the item number within that pallet. When using both of these codes, follow each by the same limit value {P25N25}.

The pallet count and the item count together can never be longer than six digits. The item count limit determines how many digits can be in each count. For example, {P25N25} has the unit count of the pallet set at two digits (upper limit set to 25) and the pallet count set up to four digits (possible upper limit 9999).

Note that the upper limit set in the pallet code is the number of units within the pallet, not the number of pallets to be marked. The number of items within the pallet sets the benchmark for the pallet count. Setting the pallet count at 25 results in pallet 1 containing the first 25 items, pallet 2 containing the next 25 items and so on.

When you reset the system, it starts at pallet 1, item 1. To start at pallet 1, item 1 or any other value, use the "Change Item Number" function explained later in this section.

Within the "Change Item Number" function, the pallet count is the first part of the number shown and the item count is the last part. For example, if the code currently in use is {P25N25} and the pallet number currently printing is 16, item 3; the item number shown will be 1603. In the same example, to reset both the pallet and item counts to 1, set the item number at 101.

Font Selection Code (Using 9-dot Fonts)

Each Controller has the capacity to print several different fonts. You can select any font from the options available for use in each message. If you do not designate a specific font, the system uses the default font of F1 (a 9-dot tall bold font). You can instruct the Controller logic boards to change fonts within a message by including the appropriate font code within a pair of braces.

The font selection code is {Fn} where "n" is the number of the code corresponding to the font desired. For example, to print a message using fonts 2 and 3, enter the following:

DIAGRAPH SERIES 1 {F2} INK JET {F3} SYSTEM

The message begins in the font selected in the "Change print values" function of the utility menu, so the printhead would print "DIAGRAPH SERIES 1" in font 1. "INK JET" would be in font 2. "SYSTEM" would appear in font 3.

The message will come out the same whether the printhead is printing right-to-left or left-to-right. The new font applies to the text following the {Fn} code as you read the message, regardless of the printing sequence.

Font Selection Code (Using 18-dot Fonts)

The system can print an 18-dot tall font using either an 18-dot printhead or two 9-dot printheads. The system requires two separate fonts to do this: the upper half of an 18-dot proportional font (font number 5) and the lower half of an 18-dot proportional font (number 6).

To accomplish this send two messages, with exactly the same text, from the controller to the 18-dot printhead or to the two 9-dot printheads. Both printheads must have the same character width and spacing. The first printhead prints the upper half or top nine dots of the font and the other printhead prints the lower half or bottom nine dots of the font. You can also include standard autocodes in your message.

Mixing 18-dot characters within a message:

You can mix 9-dot and 18-dot characters within a message, if you follow a few simple guidelines.

When printing either 7-dot-high or 9-dot-high text on the same message line as 18-dot-high text, use a fixed-width font to print the 7-dot or 9-dot text.

Special cases include, printing the 7- or 9-dot text to the left of the 18-dot text when printing left to right or printing the 7- or 9-dot text to the right of the 18-dot text when printing right to left. Both printheads must use the same fixed-width font and they must print the same number of characters before the 18-dot text. Codes enclosed in braces producing a fixed number of characters are allowed.

Once the system prints all of the 18-dot tall text in a message, the rest of the message can print using proportional fonts. When printing two lines of text followed by one line of 18-dot tall text, do not use the 9-dot fonts because there will be no space between the two lines. Instead, use two 7-dot fixed-width fonts to leave a space between the two lines of text. Use the 9-dot fixed-width font only if one line of 9-dot tall text is being printed. In such a case, send a message containing all spaces in the same 9-dot fixed-width font to the other section of the 18-dot printhead. The key is that both 9-dot sections of the 18-dot printhead must have the same number of characters (including spaces) in their message lines.

Printing 18-dot time and date codes may be a bit more complicated, as it is difficult to synchronize the clocks in the two Logic boards. Although the clocks are quite accurate, they can run slightly slow or fast, so the time may not be exactly the same for the two printheads.

NOTE: For PC-based systems, additional autocodes are available. Information on these is available with the IVpro software that ships with the PC-based system.

The Variable Field Prompt

This autocode, entered as {Z}, prompts the operator to input variable data before a message prints. The prompt has a maximum character length of 30, including the Z. (Example: {Z Enter Part Number})

The Weight Code

Use this code to insert any value into your message via the serial port from an external device, such as a scanner or a scale. There are two variations of this autocode:

- **RW**: Inserts external data read through a COM port into a message
- **RL**: Inserts external data read through a COM port into a message

Example: <STX>RW<data><CR> or <STX>RL<data><CR>

These autocodes only read data preceded by "RW" or "RL". Be sure to turn ON the External Data option under the Print Menu and select the correct COM port under the Setup Menu.

Special Expiration Date Code {K}

This autocode shows the expiration date in the following format:

{K 01 2002 08 2}

- K = autocode
- 01 = month
- 2002 = year
- 08 = number of years in the cycle
- 2 = sets digit limits in month

6.8 Checking Printhead Status

The Printhead Status Function provides information on the operational status of each printhead. This function shows three reporting screens: the Summary screen, the Current Status screen and the Current Message screen.

1. Access this function by pressing SHIFT followed by the up arrow until the LCD prompts "Show printhead status?"
2. Press Y to answer yes.

The first line of the summary screen shows the number of messages printed per minute (calculated every 15 seconds as a running average).

The second line is the total number of items printed since the current message began printing. The second section of the line reads "All OK" when the system is operating properly. This section also provides warnings for conditions that require attention and could show "WARNING" or "ERROR". The Current Status screen explains the conditions indicated.

Press the down arrow to move to the Current Status screen.

Status Messages

The Current Status screen shows the message number currently being printed, the font used and the status of the printhead. The letter of the printhead precedes the message. Some status messages are error or warning conditions, while others are merely informational.

Line stopped indicates that the controller is no longer receiving speed information from the encoder.

Purging indicates that the valves are currently purging on a command from the operator. A burst of ink or conditioner is being ejected through all orifices.

Printing indicates that the printhead is currently printing a message.

Bad msg indicates that there is no message stored on the message line selected for this printhead, or that the stored message contains a bad autocode.

Standing by indicates that the printhead is not currently printing, but is ready to print. This report can also appear with *Line stopped*, meaning that although the line has stopped, the printhead is standing by ready to print.

Error time (and item number): After any error message, the LCD window shows the time of day the error occurred and the item count at the time of the error. Compare the number on the current status line to the "Total" number on the Summary line to show how many items have passed since the error occurred.

Msg advanced means that the Message Advance button on the controller has been pressed.

If the current status line indicates more than one of these conditions at the same time, you will see that the message extends beyond the 40-character limit of the display window. If so, a small arrow indicates the direction (right or left) in which the message continues. Use the appropriate arrow key on the keyboard to move in the direction of the arrow. Notice that the cursor will move not from one character to the next, but from one status entry to the next.

Press the down arrow to move to the third Printhead Status information screen, the Current Message screen. The message currently being printed will appear in the display window. Scroll the Current Message line (Show Printhead Status) to the left and right to accommodate any added length message. Using the arrow keys, you can scroll horizontally to read the entire message as it appears when printed. You will not see this message if the printhead is disabled or not being used.

When you have finished reviewing the Printhead Status screens, press the MENU key. This key releases the Printhead Status function and returns you to the Main Menu.

6.9 The Utility Menu

Press SP to scan the various functions, which appear as questions:

- Change item number?
- Set character width?
- Set character spacing?
- Set font?
- Set indentation?
- Set time?
- Set date?
- Reset printhead?
- Purge valves?
- Change pallet count?

Set Indentation is available on the SA99 Message Select system only. On the SA99 model, use the thumbwheel switches on the logic boards to set the indentation. The SA-99 Message Select reserves the thumbwheel switches for selecting messages to print.

Enter a function by pressing Y on the keyboard to answer Yes. Once you access a function, use the up and down arrows to advance to the next or previous function. However, in the case of the "print value" functions (*Set character width?* and *Set character spacing?*), use the arrow keys to scroll through the print values of all stored messages. Press CANCEL twice to reach the next function in the menu. Pressing MENU will always advance you to the first prompt in the Main Menu.

Change Item Number

This function resets sequential numbering in labels to any number (up to 999999). Access this function by pressing the SHIFT key followed by the up arrow key until the display prompts for the Utility Menu. Answer yes and *Change Item Number?* will appear. Press Y and the LCD will show *Next item # now=1. New #?* Type a new number and press ENTER. This number becomes the next number that will print. The LCD will flash this new number and advance to the next function in the Utility Menu.

Set Character Width

The character width is preset at 8 (.08 inch from the beginning of one dot column to the beginning of the next dot column). This setting produces an attractive, well-proportioned character. Use this function if you need condensed or elongated characters.

To set character width, increase or decrease the width of the dot columns in one-hundredth-of-an-inch increments. The available range is from.02 inches per column to.25 inches per column.

The LCD will prompt *A: Set character width? Y=yes SPACE=no.* Press Y and LCD will ask for a message number from 1 to 99. Type a number and press ENTER. The LCD will show the printhead letter, the message number and the current column width setting.

If you have not changed column width, the preset value of 8 will appear. Type in a new column width and press ENTER. The system will automatically enter the decimal point.

WARNING: Do not set the value of the minimum character width less than the value that will cause the printhead frequency to exceed 1000 Hz. (See *Appendix F: Maximum dpi Calculation for a Given Line Speed.)*

If you are changing the column width of the message currently printing, the LCD will remind you that the designated message is being printed. This reminder appears because changing the column width now will alter the appearance of the message currently printing.

To cancel the command, press SP. The system will return to the "Column width now=W" prompt to provide another opportunity to change widths.

Use the arrow keys to view the Character Width settings for the other message lines. If a message line is empty "No message number M" will appear. Press CANCEL to advance to the next function on the Utility Menu, *Set character spacing?* Keep in mind that if you enter a value less than 2 or greater than 26, a reminder screen will appear.

Set Character Spacing

Character spacing is the amount of blank space between individual characters measured in dot columns. The pre-set character spacing value is three empty dot columns. To change character spacing, use this function. The available range is 0-19 dot columns.

After pressing CANCEL, the LCD will prompt *A: Set character spacing?* Y=yes. SPACE=no. Press Y and the LCD will ask for a message number from 1 to 99. Type in the message number, and the LCD will display the printhead, the message number and the current character (abbreviated "char") spacing. If you have not changed the column spacing, the default value of 3 columns will appear.

Enter the new character spacing value from 0 to 19. For example, if you type 2 and press ENTER, the LCD will flash and display *spacing now=2cols.*

If you are changing the character spacing of the message currently printing, the LCD will remind you that the designated message is being printed. This is because changing the character spacing now will alter the appearance of the message currently printing. To cancel the command, press SP. The system will return to the *Character spacing now*= prompt to provide another opportunity to change the spacing.

to continue with the new spacing of 2, press Y and the LCD will show *char spacing now=2cols.* This screen also allows access to other messages in the logic board for this printhead. Use the scroll keys to view the Character Spacing settings for the other message lines.

Press SHIFT then CANCEL to advance to the next function on the Utility Menu.

Font Choices

Table 6 shows the six fonts available on the Series 1 System.

Table 8: Series 1 Fonts

Font No.	Description	Use
1	9-dot BOLD	Proportional font closes up unused space around smaller characters.
2	9-dot Single	Proportional font closes up unused space around smaller characters.

Table 8: Series 1 Fonts

Font No.	Description	Use
3	7-dot Single	Proportional font closes up unused space around smaller characters.
4	7-dot Fixed Width	Used primarily for messages that mix 7-dot characters with 18-dot characters. Produces a 7-dot tall, single dot character with fixed characters at 5 columns wide.
5	18-dot Upper	Forms the upper 9 dots of an 18-dot proportional character. **Must be used with Font 6.**
6	18-dot Lower	Forms the lower 9 dots of an 18-dot proportional character. **Must be used with Font 5.**

"Fixed Width" refers to a font in which each character occupies the same amount of horizontal space. A narrow character such as I occupies the same amount of space as a wider character such as W. In contrast, a proportional font allots only as much horizontal space as is dictated by the shape of each character; an I occupies far less horizontal space than a W.

Selecting a Font

Scroll through the Utility to *Set a Font?* Press Y for yes and the LCD will prompt for a message number from 1-99. Type the number and press ENTER. The LCD will display the printhead, the message number and the number of the current font. (If a font has not been designated, the preset value of 1 will be displayed.

Type the desired font number and press ENTER. If the chosen message is currently printing, the LCD will remind you that you are making a change midstream. If press Y the next carton will reflect the change. To cancel the change, press SP and the system will return to the screen that reports the current font number.

If Y was pressed, or if the message chosen was not printing, the LCD will show the newly assigned font on screen.

Use the arrow keys to view the font settings of the other messages stored on the logic board, or press CANCEL to move to the next Utility Menu function.

Set Time

To reset the logic board's internal clock, scroll to *Set time?* and press Y; the LCD will display the current time and prompt for entry of a new one. Type a new time such as 1000 (colon is automatically inserted) and press ENTER. The LCD will briefly show the new setting and then advance to the *Set date?* function.

Set Date

At the *Set date?* prompt, answer Y and the current date will be displayed. Type the new date. (For June 15, 2002, type 061502; slashes are inserted automatically.) The LCD will briefly flash the new date and then advance to the *Reset printhead?* function.

Reset Printhead

This is a service function that restarts a printhead disconnected by a communication error. At the *Reset printhead?* prompt, press Y, then Y again to confirm, or SP for no. The system will advance to the *Purge valves?* function.

Purge Valves

The difference between purging through this menu and pressing the Purge button on the logic board is that this function purges only the designated printhead; the logic board button will simultaneously purge all the heads connected to that board, provided each head's Stop/Run switch is turned ON.

At the *Purge valves?* prompt, press Y, then Y again to confirm. Be sure to hold an absorbent cloth against the faceplate of the printhead to soak up the ink. While purging, the LCD will report "Purging Valves". When finished, it will ask if you want to purge again. Press Y to purge again, or SP to advance to the *Change pallet count?* function.

Change Pallet Count

This function allows you to change the pallet count value if you need to remove a pallet for some reason. For example, if you are currently printing items with pallet number five on them and you notice a quality problem with all the items on that pallet, you can restart the current pallet at number five even though six is the next sequential pallet number.

At *Change pallet count?*, press Y. The LCD will display the current pallet and prompt for a new value. Type the new number and press ENTER.

Set Indentation (SA99 Select System Only)

This function appears only in systems with SA99 Message Select boards installed.

At *Set indentation?*, press Y to set the start indentation, or the distance from the edge of the product to the start of the printed message. The current indentation is displayed in hundredths of inches, without the decimal point (455=4.55"). Enter a new value and press ENTER.

The LCD reports your new indentation value and asks, *Continuous (web) print?* To print once per product, press SP for no. The LCD will confirm your choice (*Continuous (web) print is OFF*) and exit to the *Set time?* function.

To print in web mode, press Y. The LCD will confirm your choice and show the current message's repeat distance, or the distance between the first character of one message to the first character of the next message. For example, a message that is 6 inches long, printing in web mode with a repeat distance of 14 inches, will have 8 inches of open space between messages.

To ensure that all message lines begin printing at the same time on a printstation with multiple printheads, set all heads on the printstation to the same repeat distance.

To change the repeat distance, enter the new value without a decimal and press ENTER. The LCD will flash confirmation of the new value and exit to the *Set time?* function.

6.10 Special Options

With the development of new system capabilities, new versions of firmware are released with these features available to all customers. Before you begin configuring the setup, decide which capabilities you want. Once this is decided, calculate the Total Option Value to tell the software which options to enable. Use DIP Switch 4 on the Printhead Controller Logic Board to enter the calculated value for the OPTION VALUE. After entering the Total Option Value, no changes are necessary unless different options are needed.

The following chart shows the eight special options available, and at what level the capabilities were introduced. Any level at or above the noted version will have the capability available. For example, to use Capability Number Sixteen for Thumbwheel Message Selection Active, use firmware version V3.5 or above.

When ordering new firmware, be sure to get the latest version available. Note that Versions 3.3 and up use delays entered through the keyboard rather than the thumbwheel switches, so if thumbwheel delays are necessary, you need to order the latest version below V3.3. If

higher level capabilities are not desired, you do not need to enable them (If using custom firmware, be sure it has the required capabilities for your needs.).

Table 9: Special Options

Firmware Version	Special Option	Option Value
3.2	European/Canadian Date	1
3.2	One Consecutive Count	2
3.2	Disable Message Advance	4
3.4	Individual Message Counts	8
3.5	Thumbwheel Message Selection Active	16
3.6	Reset Count to 1 at Power Up or Hardware Reset	32
3.63 3.22	Mirror-image Print or Lower Half of 18-dot Printhead	64
3.67	Enables Bar Code Printing	128
Sum of Desired Option Values = TOTAL OPTION VALUE		

Setting the Option Value is a four-step process:

1. Decide which options you want (and what your firmware can support).
2. Calculate the Total Option Value by adding the individual Option Values of selected options. (This tells the software which functions to enable.)
3. Set DIP Switch #4 on each logic board.
4. Enter the appropriate Option Value via the LC/400.

European/Canadian Date

Leave this option OFF to use American dating (MM/DD/YY). Turn ON to select Canadian/ European dating (DD/MM/YY).

One Consecutive Count

Turn ON to maintain a consecutive count even after changing messages. Leave OFF to have the count reset each time a new message is selected.

Disable Message Advance

Turning this option ON prevents accidental message changes by disabling the message advance button located on the interface board inside the Controller/IDS.

Individual Message Counts

This option keeps individual message counts. Turn on to keep a separate count for each message. The count is preserved even when the system power is off.

Thumbwheel Message Selection Active

This allows for message selection with the thumbwheel switches located on the logic boards inside the controller, bypassing the LC/400.

Reset Count to 1 at Power Up or Hardware Reset

This option allows the user to reset the count to 1 by turning on the power or pressing the logic board reset button.

Mirror-Image Print or Lower Half of 1-inch 18-dot Printhead

This option enables printing a mirror-image font, and must be on to enable normal printing with the lower half of the 1-inch 18-dot printhead.

Relationship of Special Item Number Options

Special options 2, 8 and 32 affect the item number. Note that when option 8 is ON, it disables options 2 and 32. The table below shows how these three special options can be used together for special applications.

Table 10: Special Item Number Options

Special Option 8 Ind. Count	Special Option 32 Reset Count to 1	Special Option 2 Consecutive Count	Result
OFF	OFF	OFF	One count, remembered even when power is OFF. Resets to 1 when message changes.
OFF	OFF	ON	One count, remembered even when power is OFF. Does not reset when message changes.
OFF	ON	OFF	One count, resets to 1 when power is OFF. Resets to one when message changes.
OFF	ON	ON	One count, resets to 1 when power is OFF. Does not reset when message changes.
ON	ON or OFF	ON or OFF	Individual Message Counts remembered even when power is OFF. Reverts to Message Count for new message when message changes.

Entering the Total Option Value

After deciding which special options are needed for your application, add up the individual option values to get the Total Option Value. Use the following procedure to set this value for a **single printhead system**:

1. Turn the controller/IDS OFF.
2. Push DIP Switch 4 to the ON (Closed) position.
3. Turn the controller/IDS ON. When the introductory screen appears, push any key.
4. At the LCD prompt (*option* = #), enter the Total Option Value and press ENTER. The screen will display the new option value.
5. Turn the controller off. Push DIP Switch 4 to OFF.
6. Turn the controller ON to resume normal operation.

NOTE: Each printhead logic board has its own Option Value. Use the following procedure for a **multiple head system**:

1. Turn off all controllers.
2. Push DIP Switch 4 to ON for each logic board in the system.
3. Turn all controllers ON.
4. Press MENU to display: *Keyboard now on head A. New head?*
5. Enter the letter for the new head address, and press ENTER.
6. Press the left arrow key to display the *option* = # prompt. Enter the desired Option Value and press ENTER. The screen will display the new value.
7. Repeat this for each head in the system.
8. Turn off all controllers.
9. Turn DIP Switch 4 OFF on every logic board.
10. Turn the controllers ON to resume normal operation.

Determining Which Options Are Already Set

If you want to add a special option without losing any of the special options already set, you must first determine which options have been turned on. This can be done as follows:

1. Determine the highest Option Value that is lower than the Total Option Value shown on the LCD; this option value is among those set. (For example, if the Total Option Value is 73, 64 is one of the values selected.)
2. Subtract this option value from the total.
3. Repeat steps 1 and 2 until the result equals 0. Any values that were subtracted were for options that were ON. Any other options were OFF.

EXAMPLE: You wish to add Option 2.

- The Total Option Value is shown as 77. The highest Option Value lower than this is 64*. Subtract this from 77.
- 77 - 64 = 13. The highest Option Value lower than this is 8*. Subtract this from 13.
- 13- 8 = 5. The highest Option Value lower than this is 4*. Subtract it.
- 5 - 4 - 1*. Subtract it.

  *All the values that were subtracted represent options currently turned ON in your configuration. You now know that Option 2 is not one of them. In order to add it, just add 2 to the number shown, and enter a new Total Option Value of 79.

Section 7: Maintenance

The following maintenance procedures are recommended for clean and efficient operation.

7.1 Controller Maintenance

Daily Start Up

Be sure no cables or electrical cords are tangled or damaged before operation.

Daily Shutdown

Turn off electrical power to system.

Intermittent (As Required)

1. Be sure the photosensor is clean and free of debris.
2. Be sure the O-rings (1900-001) on the encoder wheel are present and not worn.
3. Be sure the nuts and bolts holding the bracketry in place remain tight.
4. Equipment may be cleaned utilizing the appropriate conditioner for the ink in use.

Annually

Replace encoder O-rings.

7.2 Printhead Maintenance

Wear safety goggles when working with industrial inks or solutions.

Overnight Shutdown

Shut off all power to the system.

Overnight Startup

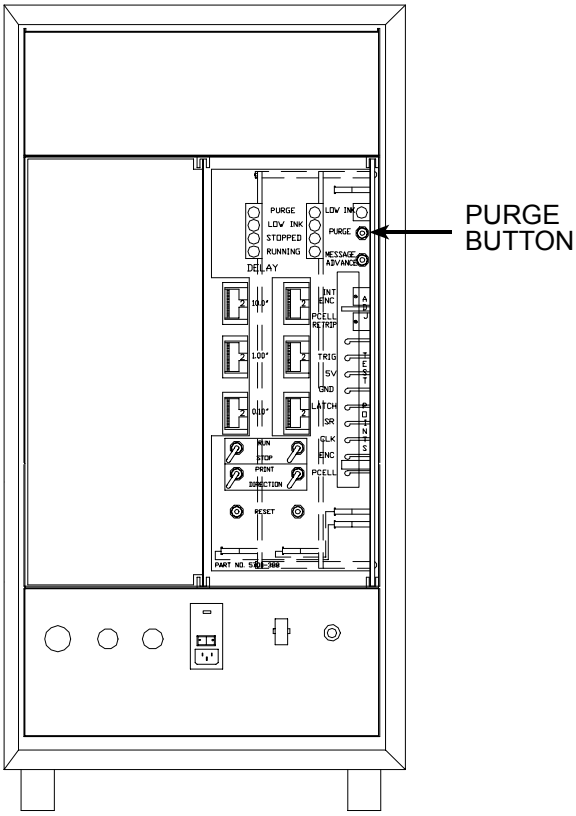
- Clean the printhead faceplates.

  Spray conditioner on a lint-free wipe and wipe the faceplate in a circular motion to remove ink that has leaked from the orifices overnight.

- Purge with ink.

  To prevent printhead clogging, purge the printheads by pressing the Purge button on the printhead controller.

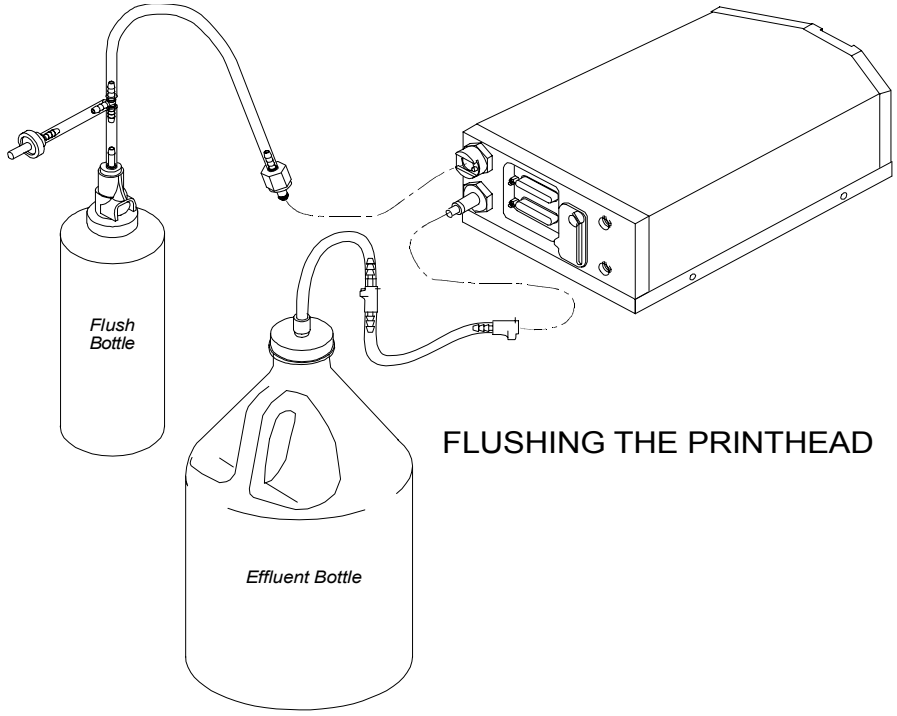
CAUTION: Pushing the Purge button causes all printheads to purge simultaneously, so be prepared to catch the ink.



Shutdowns of Seven Days or Longer

Flush and thoroughly purge the printhead(s) as follows:

1. Begin with the last printhead in the system (the one just before the effluent bottle). To prevent ink drips, enclose the couplings in a clean cloth when changing connections. Have a cloth handy to wipe up any ink spills.
2. Disconnect the ink line from the female quick disconnect (upper fitting) on the back of the printhead, and attach the Flush Bottle assembly (1902-694).



FLUSHING THE PRINTHEAD

3. Close the shutoff valve and disconnect the effluent bottle assembly from the male quick disconnect that terminates the ink-feed line to the printheads.
4. Attach the effluent bottle to the effluent port's male quick disconnect (the lower fitting) on the back of the printhead, and open the shutoff valve.
5. Squeeze the flush bottle to force conditioner through the printhead. Note the color of the liquid in the waste line, and continue flushing until it runs clear.
6. Close the shutoff valve and disconnect the effluent bottle and flush bottle assemblies.
7. Re-attach the ink line to the printhead.
8. Repeat steps 2 through 7 for each printhead in the system. (When starting up again, you will need to purge each printhead until ink is again flowing to the orifices.)

NOTE: Store the effluent bottle where it cannot be knocked over, punctured or damaged.

When the effluent bottle is full, dispose of the waste in accordance with local, state and federal regulations.

If You Purchased Spare Printheads

Diagraph recommends that spare printheads be circulated into operation on a regular basis. Rotate the printheads every couple of months to keep them performing up to expectations. Rotating spare printheads prevents hardening of the internal printhead components, making startup much easier. Before returning a spare printhead to the shelf, be sure to thoroughly flush it with conditioner.

7.3 Ink Delivery System Maintenance

Daily Startup

Be sure ink lines are undamaged and free of entanglement in equipment before operation.

Daily Shutdown

Turn off electrical power to system.

Intermittent (As Required)

When disconnecting ink lines, spray the quick disconnects with the appropriate conditioner to prevent them from sticking open.

If the system ink pressure does not build up, and the pump will not run automatically, follow the steps below:

1. Be sure there is ink in the container.
2. If there is no ink, replace the ink container with a fresh one.
3. If there is ink, connect an effluent bottle to the end of the ink line near the printheads and close the shutoff valve.
4. Press and hold the prime button located on the front of the controller/IDS.
5. Your should hear the pump running. Now open the shutoff valve and disconnect the effluent bottle. Hold the prime button until pressure builds up to normal, then release it.

Annually

Replace the ink filter assembly (5700-026).

CAUTION: To prevent electric shock, turn power OFF at the source.

1. Open the front door of the controller and unplug the power cable.
2. Disconnect the old filter assembly at its quick disconnects.
3. Discard the old filter in accordance with plant safety specifications.
4. Connect the new filter by pushing the ink lines into the quick disconnects. Be sure the arrow on the filter is facing toward the front of the IDS.

CAUTION: Ink is under pressure within the ink delivery system and ink lines; be sure to bleed the pressure from the system prior to removing any components.

General Notes On IDS Maintenance

When removing components, it is easiest to cut the attached ink line in the center, and remove the tube from the barb after the component is removed.

When cutting ink lines within the IDS, it is recommended to place towels on the IDS bottom plate to soak up any residual ink that comes out of the line.

Any ink line that is cut in order to remove a component must be replaced; do not attempt to reuse tubing that has been removed from the IDS.

REMOVING INK LINES FROM BARBED FITTINGS: From the top of the fitting, pinch the tubing away from the barb with diagonal cutters, then cut. Any nick or scratch on the barb will result in leakage. (In most cases it is easier to replace the barbed fittings rather than take a chance that the old fittings will leak due to damage to the barb.)

Be sure that tubing is cut square prior to inserting the barb. Failure to insert the barb fully into tubing can result in leakage or failure of the barb-to-tube connection.

After repairs are complete, operate the IDS and check for leaks prior to returning system to service.

7.4 Diagnosis and Repair of Contaminated Ink Delivery Systems

The ink delivery system in your Series 1 controller was shipped for use with either Diagraph TWP (waterbased) or TSO (solvent-based) inks. Do not attempt to switch from one type to another. Introduction of TSO ink or conditioner to a system that has been running TWP will create a granular gel-like substance similar to toothpaste. The degree of contamination caused will depend on the amount of fluid mixed and how much time it has been in the system.

This procedure covers the diagnosis and repair of system components that are contaminated or suspected to be contaminated.

TOOLS AND SUPPLIES REQUIRED:

- Effluent Bottle (5700-994)
- Ink Pressure Gauge (5700-743)
- Flat head screwdriver
- Solenoid Adjustment Tool (1901-388)
- Broach
- Conditioner

First, remove the contaminated ink container and replace it with the proper conditioner, then proceed as follows:

1. Disconnect ink regulators from the ink lines.
2. Open shutoff valve to effluent bottle.
3. Flush conditioner through IDS and ink lines until it runs fairly clear.
4. Disconnect effluent bottle from end of ink line.
5. It is recommended that you change ink lines at this point.
6. Connect first printhead regulator to ink line.
7. Connect effluent bottle to ink exit port on first printhead.
8. Flush conditioner through printhead until it runs fairly clear.
9. Disconnect effluent bottle from printhead, and purge printhead 4 or 5 times.
10. Repeat steps 6 through 9 for each additional printhead.

Ink Regulator Maintenance

If print dot size is fluctuating, check the printhead pressure. If the dot size fluctuations can be correlated to changes in ink pressure, the ink regulator may be in need of service. Dot diameters will decrease if the regulator input pressure is less than 2.0 PSIG greater than the printhead pressure. Prior to performing regulator maintenance, check that the ink regulator input pressure is at least 2.0 PSIG greater than printhead pressure. This can be checked by plugging the ink pressure gauge into the male quick disconnect located in the ink line below the regulator.

Decreases in pressure can also be caused by obstructions in the valve seat of the ink regulator. Obstructions in the valve seat may cause the pressure to creep up over a 15-minute time period. For example, the pressure is set at 6 PSIG, and 15 minutes later it has increased to 7 PSIG.

The following maintenance procedure can remove obstructions from the valve seat area of the ink regulator, restoring normal operation. (Ink may be used, but conditioner is recommended for this procedure.)

1. Unplug the ink regulator from the printhead.
2. Plug the regulator output into the effluent bottle.
3. Rotate the pressure adjustment clockwise until it stops, then counter-clockwise until it stops. Repeat six to twelve times.

NOTE: Monitor the fluid level in the effluent bottle to ensure that it does not overflow during this procedure.

4. Turn the ink regulator off (completely counter-clockwise) and connect it to the printhead.
5. Connect the pressure gauge to the printhead ink exit port.
6. Turn the regulator up to the specified pressure.
7. Monitor ink pressure while printing. Note that the pressure can drop by as much as 0.75 PSIG (usually less) during the print cycle.
8. Increase the ink pressure such that the nominal printhead pressure is centered within the deflection of the gauge while printing.
9. Check pressure 15 minutes after setting it. The pressure should be within the same range ± 0.5 PSIG. If not, repeat the procedure. If the regulator exhibits pressure changes after performing this procedure two times, the regulator should be replaced.

7.5 Printhead Failure and Flushing

Printhead failure appears as orifice seeping or leakage from contaminant that is trapped between the membrane and the post. This contaminant block creates a path for ink seepage. If the contaminant escapes this area, it usually clogs an orifice, and causes off-target printing or obstructs the orifice completely. When printhead failure is observed, flush the system as follows:

1. Plug the effluent bottle into the fluid exit port of the printhead and allow ink to flow for about two minutes while purging the printhead. Unplug the bottle to stop the flow.
2. Purge the printhead 3 to 5 times.
3. Pour some conditioner on a clean cloth and wipe off the front plate.

If seepage or leakage is observed, the printhead pre-load may need to be adjusted. Preload adjustment may necessitate pulse width adjustment to achieve the required dot diameter.

CAUTION: Improper pre-load adjustment can damage the printhead and void the warranty.

Preload Adjustment

For the IV Printhead Preload Adjustment procedure, see *Section 8, Troubleshooting*.

Pulse Width Adjustment

For the Printhead Pulse Width Adjustment procedure, see *Section 8, Troubleshooting*.

Broaching the Orifice

If a printhead orifice is clogged or obstructed, the appropriate orifice should be broached. For the broaching procedure, see *Section 8, Troubleshooting*.

7.6 Changing Ink Containers

The IDS delivers ink over long distances to multiple printheads (up to 100 feet in a horizontal run). It provides a reservoir of ink for continuous printing even when the ink pail is empty. The following procedure explains how to change ink while the system continues to print. Determine if your ink is porous or non-porous and REPLACE WITH THE SAME KIND OF INK. Changing ink types from any one color to another without first flushing the system with conditioner can damage the ink jet system.

CAUTION: NEVER USE PIGMENTED INK IN THE IDS. The IDS is not designed to operate with pigment particles. Use of pigmented ink will permanently clog the IDS.

When the beacon begins flashing, the system will continue to print, as the accumulator contains enough ink for a few more minutes of operation. The amount of print time remaining is dependent on the number of printheads and the message being printed, so the operator may have anywhere from five to 30 minutes to change the ink container. If timely action is not taken, printed dots will begin to diminish in size until they disappear altogether.

Allowing the system to run when the beacon is flashing without swapping in a new pail of ink will not pump more ink out of the old pail. When the beacon starts to flash, the IDS has stopped pumping ink from the pail because it is empty.

CAUTION: Wear eye protection and use appropriate safety equipment when changing pails of ink.

1. Disconnect the 1/8 inch ink supply line from the IDS to the female coupling in the ink pail cap. Dispose of the empty ink container in accordance with local, state and federal regulations.
2. Place a new five-gallon plastic pail of Diagraph ink on the floor near the IDS.
3. Remove the plastic cap and tube assembly attached to the side of the pail. The cap is designed to remove the maximum amount of ink from the pail. DO NOT cut it or reposition the weight on the end.
4. Unscrew the plastic shipping cap and dispose of it.
5. Insert the tube from the cap and tube assembly into the pail and screw the cap on tightly.
6. Connect the 1/8 inch ink supply line from the IDS to the female quick disconnect in the ink cap. Make sure that the couplings snap into place.
7. Push and hold the prime button until the beacon goes off (15 seconds or less).

Section 8: Troubleshooting

The Series 1 Ink Jet System incorporates advanced designs, both in hardware and in software. However, if the system ever fails to perform properly, some built-in indicators will help in troubleshooting. This section will help minimize system downtime and explain some of the diagnostic features built into the system.

8.1 Troubleshooting Notes

Most problems with the **controller** are related to operator error or incorrect configuration, particularly at installation or when a board has been replaced. The most common configuration errors are incorrect setting of the interface board communication jumpers and incorrect (or duplicate) logic board address settings.

Most hardware problems in the Series 1 controller are due to cabling, and are manifested in the lack of 5 and 15VDC power supply outputs. If the 5VDC output has faulted, the logic board LEDs will not light; a 15VDC output fault is seen as a No Print failure, and the LED on the back of the photosensor will not light when tripped. Because the controller uses a quad output power supply, a fault in one output can cause other outputs to shut off. The best method of troubleshooting involves removing the loads from the system, and checking the output voltage. If the output appears good, apply loads one at a time until the fault reappears.

Board problems are generally isolated to the logic boards. Interface board failure is very rare, and should be suspected last in the event of a controller failure.

Most **ink system** problems involve kinked or crushed ink lines, or leaks (internal and external). If there are no apparent leaks, and the ink system will not supply sufficient pressure at the output, the pump is the most likely suspect. The accumulator rarely fails, so all other suspect components should be checked first.

Electronic failures in the **printhead** will normally open the printhead fuse, which will open the 15VDC line to the driver board and the daisy chain output connector. Mechanical problems generally show up as leakage or print quality issues, but distance from the substrate and solenoid pulse width also affect overall print quality.

Interface Board Terminology

LEDs

[A] LOW INK: Indicates a low pressure condition (under 13psi) in the accumulator.

SWITCHES

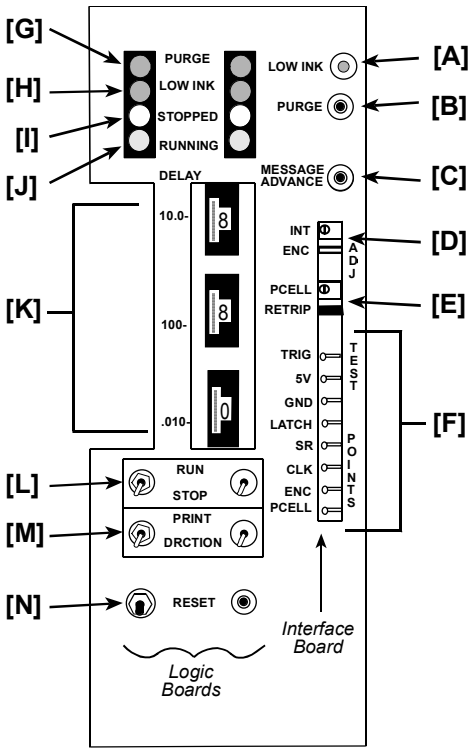
[B] PURGE switch, momentary: Pressing this switch cycles all of the valves in the printhead at 300Hz for 5 seconds and expels ink out through the faceplate.

[C] MESSAGE ADVANCE

POTENTIOMETER ADJUSTMENTS

[D] INT ENC ADJ (internal fixed speed reporter adjustment): Jumper selectable (P18) between an external variable speed encoder or an internal fixed speed reporter. The internal reporter provides fixed line speed data, up to 300 feet per minute, via an adjustable potentiometer (R22).

[E] PCELL RETRIP ADJ (photocell retrip adjustment): Jumper selectable between an external photosensor or an internal simulated photosensor signal. The external photosensor indicates the



presence of a target item. The internal photosensor provides simulated target item rates for repetitive printing.

[F] TEST POINTS

- •TRIG: Digital trigger print signal pulses when either logic board has data to print.
- •5V: Power supply 5VDC referenced to GND
- •GND: Power supply DC ground
- •LATCH: Digital data latch signal used to fire printhead solenoids
- •SR: Digital serial print data signal
- •CLK: Digital serial clock signal (18 clock pulses to transfer print data to heads)
- •ENC: Digital encoder signal
- •PCELL: Digital photocell signal (0Volts when photocell is tripped)

Logic Board Terminology

LEDs

[G] PURGE: Red; flashes alternately with the LOW INK LED when the purge switch is pressed, causing printhead solenoids to cycle at 300Hz.

[H] LOW INK: Red; indicates a low pressure condition (less than 13 psi) within the accumulator due to an empty ink pail, the beacon not being plugged in or the beacon bulb being burned out.

[I] STOPPED: Yellow; indicates the line speed is zero, or the encoder signal has been lost.

[J] RUNNING: Green; indicates the encoder signal is present and the line is running.

When the system is first turned on, or after pressing the reset button on the controller, these LEDs will illuminate in sequence as a self-diagnostic check. After successfully completing the check, the controller will illuminate the appropriate LEDs for system status.

If three or more LEDs are illuminated, reset the printhead controller. If three or more status LEDs remain illuminated, it probably signifies a board failure.

NOTE: Severe electrical noise and static can cause logic board lock-ups and erroneous LED indications. If the logic board is locked up or has erroneous LED indications, press the reset button (or cycle power) to clear. If the problem repeats, locate the source of the electrical noise or static and eliminate it.

SWITCHES

[K] DELAY: Thumb wheel switches used on an SA99 system to set the Start Print Delay, or the distance from the leading edge of the product to the start of printing.

[L] RUN/STOP:

[M] PRINT DIRECTION: Set to the direction in which the conveyor is moving.

[N] RESET: Momentary; pressing this switch will reset the logic board processor, clearing registers and memory.

Self-Diagnostic Test

As stated above, after the system is turned on or the reset button is pushed, the logic board performs a self-diagnostic test. The sequence of the test, and the corresponding indicator lights, are described below:

- GREEN/YELLOW/RED/RED: The firmware first initializes all of the LSI hardware to a state which turns on all four LEDs. The program delays for one half second to allow the operator to see the LEDs.
- OFF/YELLOW/RED/RED: RAM test. The green LED remains off for the remainder of the self-diagnostic test.
- OFF/OFF/RED/RED: First ROM (firmware) checksum test.
- OFF/OFF/OFF/RED: Checksum of remaining ROM tested.
- OFF/YELLOW/RED/OFF: RAM and serial I/O are initialized and the interrupts enabled. Normally, this pattern is set for too short a time to see. However, if there is a problem caused by enabling the interrupts, this pattern will remain set.
- OFF/YELLOW/OFF/RED: The clock timer chip interrupts are tested. This checks the interrupt structure as well as the CTCs.
- OFF/YELLOW/OFF/OFF: Yellow LED remains lit until the encoder check changes the display to green (if the encoder is running).

NOTE: The logic board may fail the diagnostic test if the photosensor trips multiple times during the test. If the test fails, stop the line and press reset to re-run the test. Additionally, the board may pass diagnostics under these conditions, but fail to print; pressing the purge button will return the system to normal operation after the purge cycle is complete.

Normal Operational LED Indications

- OFF/YELLOW/OFF/OFF: Encoder signal not present.
- GREEN/OFF/OFF/OFF: The green LED lights whenever a line speed signal is present.
- X/X/FLASHING RED/OFF: Indicates ink out signal is received from IDS. This may be caused by ink out, or the beacon is unplugged or bulb is burned out.
- X/X/FLASHING RED/FLASHING RED: A purge cycle is in process.

NOTE: X indicates normal indication for encoder status (green=running, yellow=stopped).

Any other indications during normal operation indicate a logic board problem. Severe electrical noise and static can cause logic board lock-ups and erroneous LED indications. If the logic board has erroneous LED indications (or is locked up), press the reset button (or cycle power) to clear.

8.2 Troubleshooting Tests

These tests assume that the system was functional and it has failed to print, although they can be used to verify operation after components have been replaced.

System Operations Test

This will test communication and print functionality.

1. Send a message to the controller.
2. Place cloth in print of printheads. (Cloth should remain in front of printheads for duration of test.)
3. With line running, trip photosensor.
4. Check for ink on cloth.

NOTE: If test is being run away from conveyor, or conveyor cannot be run during test, the internal fixed speed reporter (jumpered in on interface board) can be used.

Interface Jumper Check

This check will determine if interface board jumpers are set correctly. Front and rear positions are from front panel.

1. Line speed select jumper (P18) should be firmly on rear two pins for encoder.
2. Photosensor re-trip jumper (P20) should be firmly on front two pins (photocell re-trip off).

If the line speed jumper is set for internal line speed (front two pins), logic board green LEDs will be illuminated with the conveyor stopped.

NOTE: The positions for the remaining interface board jumpers are shown in *Section 5, Installation.*

Logic Board Settings Check

The logic board DIP switches are located behind the LED status indicators.

Switches 4-8 set the logic board address for successful communication. Address switches are only read by the logic board during a reset (power-up, or use of the reset switch).

Purge Test

This test will determine if the printheads are functional

1. Place cloth in front of printhead front plate.
2. Press interface board purge button.
3. Listen for solenoid buzz.
4. Check for ink on cloth.

NOTE: An encoder signal is not required for the purge function.

If solenoids buzz and ink dots appear on cloth, the printhead is functional.

If solenoids buzz but no ink dots appear, printhead is clogged or there is an ink supply problem.

If solenoids do not buzz, there may be a cable, printhead or controller electronics failure.

Print Test

This test will determine if the printheads are printing.

1. Place cloth in front of printhead front plate.
2. Initiate print cycle by tripping photosensor.
3. Check for ink on cloth.

NOTE: Encoder signal (green LED) must be present in order to print.

Printed dots on cloth indicate that system is printing; delay may be set incorrectly, or photosensor is not sensing product correctly.

No ink on cloth indicates that the system is not printing.

Photosensor Test

This test will determine if the photosensor is operating normally.

1. Place object in front of photosensor and check that red LED on photosensor illuminates.
2. Connect voltmeter between interface board test points TP8 (photosensor signal) and TP3 (ground).
3. Voltage should be 5VDC when photosensor is not tripped, and less than 0.6VDC when tripped.

NOTE: If the red LED on the photosensor fails to illuminate when an object is placed in front of (but not touching) it, it indicates that the photosensor is disconnected, or the 15VDC power supply or photosensor has failed.

Photosensor Sensitivity Test

This test will determine if the photosensor sensitivity is adjusted correctly for the application.

1. Place object approximately ¼ inch in front of photosensor; photosensor should sense object.
2. Place object near the center of the guide rails; photosensor should sense object.
3. Place object on far guide rail; photosensor should not sense object.
4. Check that objects on the far side of conveyor do not trip the photosensor.
5. Check that color differences in product do not cause multiple photosensor trips at the furthest sensing distance.

NOTE: Test object should be a sample of the actual product. For photosensor sensitivity adjustment procedure, see *Section 5, Installation*.

Encoder Functional Testing

If you have print quality problems that point to variations in encoder performance or location with a Series 1 Ink Jet System, this procedure will help you verify proper encoder function.

You will need a tachometer (or tape measure and stop watch) and an oscilloscope.

All measurements depend on an accurate measurement of the line speed.

If you do not have a tachometer, you can determine line speed with a stopwatch and tape measure. Measure a known length (the longer the better) and place a mark at the beginning and at the end of the measurement. Then use your stopwatch to time the passage of the leading edge of the product from the first to last mark. Take three readings and average.

For example:You measure a 25 foot distance that passes from the leading edge mark to end mark in 33 seconds = 25ft./33 sec. = 0.76 ft./sec.

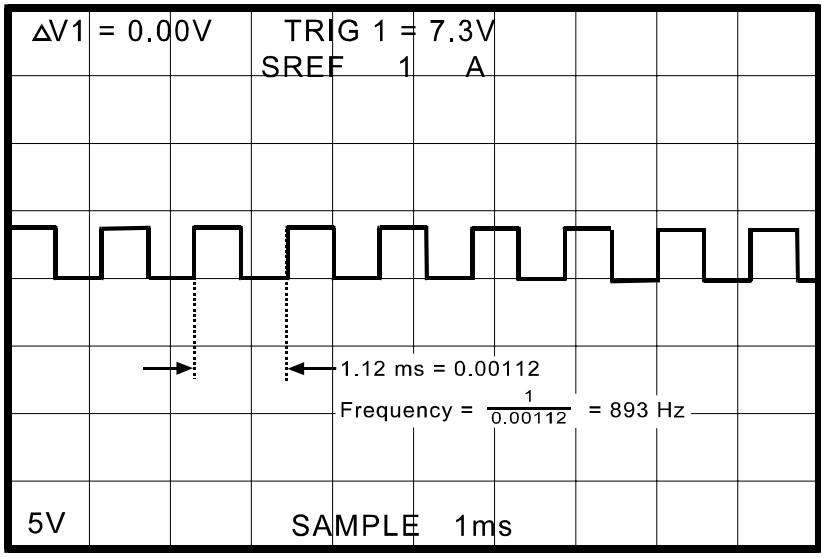
Multiply by 12 to convert to in./sec. = 0.76ft./sec. x 12 = 9.09 inches per second.

Remember this number. Now you'll need to get out your oscilloscope and make some measurements on the system you wish to test. Set the vertical resolution of the scope to 5 volts per division and set the horizontal resolution to 1 millisecond.

MEASUREMENTS:

Connect the scope ground to TP3 on the interface board. Connect the voltage probe to TP7.

You will see 5-volt square waves as in the figure below. These waves generally compress and expand across the width of the display at regular, rhythmic intervals. If you see them compress sporadically, the encoder is not tracking consistently. For example, when it "bumps" over a seam in the conveyor belt, a momentary compression of the waveform on the display will occur. If you question the difference between rhythmic and intermittent sporadic appearance of the 5-volt square waves, and your conveyor has no seam, tape a small object, such as a washer or nut, onto the conveyor belt such that it will be hit by the encoder wheel and observe the difference it makes in the waveform appearance.



When satisfied that the encoder is tracking normally, calculate the encoder frequency as follows:

Measure the time from the leading edge of one of the 5-volt square waves to the leading edge of the one next to it.

Divide 1 by the time you measured. For example, if you had one square between the leading edges of the 5 volt square waves, and your horizontal sweep is set to 1.0 milliseconds, 1/.001 = 1000HZ.

From our previous example, we know we're moving at 9.09 inches per second, using a 100 d.p.i. encoder. Multiplying the 9.09 by the 100 d.p.i. expected; we get 909.09HZ.

Referring to the scope screen (see figure above), since we're set to a 1.0-millisecond horizontal sweep, we measure 1.12 squares between the leading edges of the 5 volt square waves. Our calculation is as follows: 1/.00112 = 893HZ.

To sum up the process for checking encoder accuracy:

Determine the line speed in inches per second (accomplished by dividing speed in feet per minute by 5 or multiplying feet per second by 12).

Determine encoder resolution (100 d.p.i. for the 5700-731 Series 1 encoder).

Multiply the encoder resolution by the line speed in inches per second to determine what the frequency should be.

Measure the actual frequency with a scope and compare it to the expected value.

These two numbers will not agree exactly, but should be within plus or minus 1%.

Most of the time, encoder tracking problems are due to tracking on irregular surfaces. These problems are characterized by rapid, inconsistent, jerking movements of the 5-volt square waves on the scope. The remainder of encoder tracking problems are usually due to the wheel contacting a drive wheel or other surface and not the belt. In these cases, the 5-volt square wave motion may be uniform, but the measured frequency will not agree with the expected value you calculate.

A failed disk within the encoder will generally appear as large and erratic pulse width differences from one encoder pulse to the next, or no output from the encoder.

Printhead Ink Pressure Test

This test will determine if the printhead pressure is correct.

1. Connect ink pressure gauge (5700-743) to the ink out port on the rear of the printhead.
2. While printing (not purging), check the pressure; note that pressure can vary by as much as 0.75 PSIG while printing. Ink pressure gauge must be level with the printhead.
3. Pressure should be such that nominal printhead pressure is centered within the deflection of the gauge

If pressure is not correct, reset it according to the procedure in *Section 5, Installation*.

Ink Regulator Input Pressure Test

This test will determine if the regulator input pressure is within operational range.

1. Connect ink pressure gauge to end of ink line where effluent line is normally attached.
2. Check that pressure does not fall below 8 PSIG at any time.

NOTE: Lowest pressure should be just prior to when the pump turns on.

Ink Delivery System Output Pressure Test

This test will determine if the IDS output is sufficient for operation.

This test requires the construction of a gauge adapter consisting of three fittings (one 5700-209, one 5700-509, and one 5700-561) and about two feet of 1300-875, ¼ inch tubing. Cut tube in half and attach a piece of tube to each barbed end of the 5700-509. Attach the other two fittings to the open ends of the tube.

1. Disconnect output ink line from controller.
2. Connect gauge to the quick disconnect on the gauge adapter assembly.
3. Connect gauge adapter assembly to the controller ink output.
4. Connect printhead ink supply line (removed from controller in step 1) to gauge adapter assembly.
5. Monitor pump on and off pressure:

   PUMP ON: 12.5 to 18.0 PSIG

   PUMP OFF: 16.5 to 26.0 PSIG

The minimum range between ON and OFF pressure is 4.0 PSIG.

Power Supply Functional Test

This test will determine if the power supply and cabling are functional.

1. If the red LED on the photosensor illuminates when an object is placed in front of it, the 15VDC supply is functional.
2. If any LEDs on the logic board are illuminated, the 5VDC power supply is functional. The 5VDC output can also be read with a voltmeter between interface board test points TP2 (+5VDC) and TP3 (ground).

NOTE: The 5 and 15VDC power supply is a dual output supply; a fault on one output may cause both outputs to fail.

8.3 Controller Power Supply Troubleshooting

The controller contains a quad output power supply (only 5VDC and 15VDC are used) to provide operational voltage to the interface and logic boards, printheads, photosensor and encoder. The 5VDC output can be measured between interface board test points TP2

(+5VDC) and TP3 (ground). The 15VDC output can be measured at the power supply output connector. Note that a fault in either output circuit can cause the other output to fail.

- 5VDC LOADS:

  Interface board

  Logic board

  Encoder

- 15VDC LOADS:

  Printheads

  Photosensor

In the event of power supply output loss:

1. Measure the AC input to the power supply. If the AC input voltage is between 100 and 250VAC, the supply should function normally. If the AC input to the supply is less than 100VAC, check the AC outlet voltage supplying the system, and the internal AC wiring inside the controller. If the supply AC input voltage is zero, check the fuse in the power entry module, and the controller internal AC wiring. If the AC input voltage is within the supplies operational range, go to step 2.
2. Disconnect the photosensor, encoder and printheads from rear of interface board, and measure power supply output voltages. If the voltages return to normal levels, reconnect the external devices one at a time while monitoring the power supply output. The device that is plugged in when the supply output fails has probably failed and should be replaced. If the power supply outputs do not return to normal levels with the external devices removed, go to step 3.
3. Remove the power connections from the logic boards (three wire cables from the interface board to the logic boards), and check supply output voltages. If the outputs are normal, connect the power cables to the logic board one at a time. The board that is plugged in when the outputs fail has probably failed and should be replaced. If the supply output has not returned to normal, replace the power supply. If the power supply output voltage has not returned to normal after replacing the power supply, the interface board or power supply output cabling may have failed.

NOTE: The controller uses a switching power supply that requires a minimum load to operate. Measuring the power supply outputs with the output cabling removed will not, in most cases, result in a valid measurement.

If the power supply output appears to be intermittent, it is generally a cabling problem. To trace an intermittent problem, follow the above steps and jiggle the connectors and cables after installing.

In rare instances, switching power supplies can exhibit a failure mode where the maximum current output is a fraction of the rated output capability. If, after replacing the suspected failed system component, the output voltage does not return to the nominal, the power supply may be exhibiting this failure mode.

8.4 Printhead Power Troubleshooting

The 15VDC power supply output powers the photosensor and the printheads. The 15VDC input is fused on the printhead driver board, then routed to the driver board circuitry and the output connector. An electrical fault in the printhead will open the fuse, and the 15VDC will not be available at the output connector.

1. Manually trip the photocell. If the red LED on the rear of the photosensor housing illuminates, it indicates that the 15VDC power supply is functional. If the red LED does not

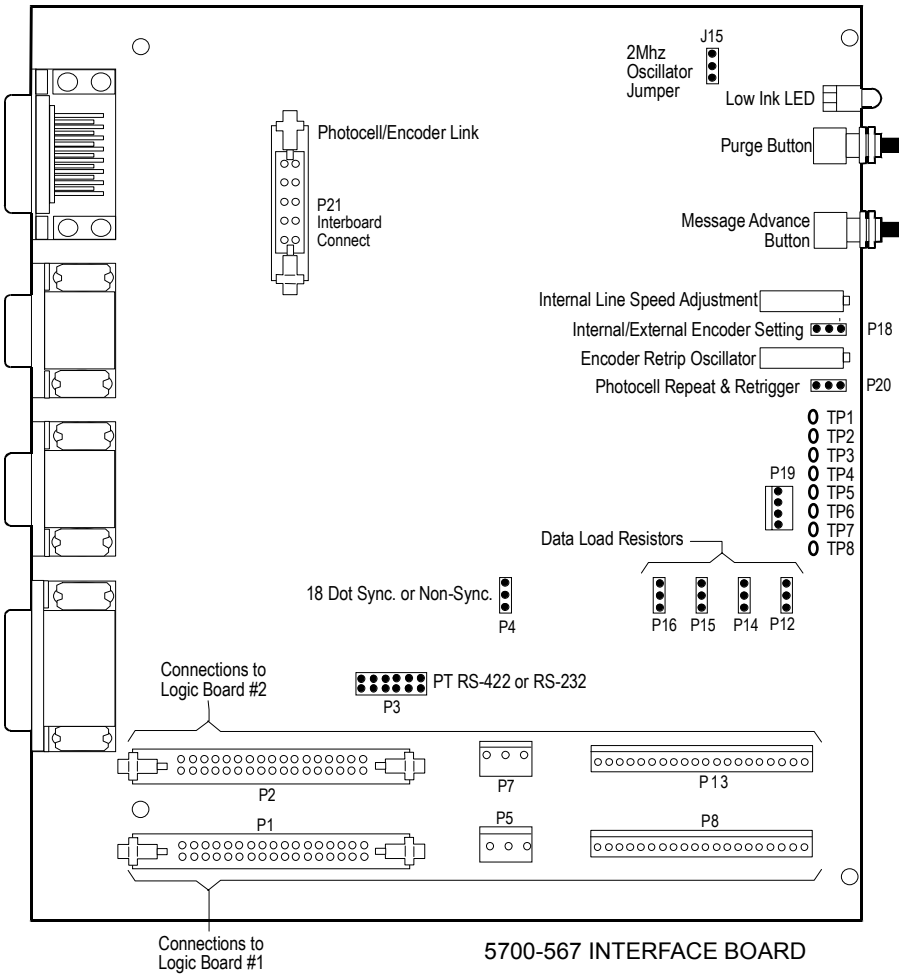
illuminate, it indicates a fault in the 15VDC power supply output. (See preceding section on power supply troubleshooting).

2. Place a towel in front of the printheads, press interface board purge button and check for the following conditions:

- Ink on both towels; both printheads performed a normal purge.
- Ink on the towel in front of the first printhead; first printhead performed a normal purge, second printhead failed to purge. Suspect cable from first to second printhead or second printhead failure.
- No ink on either towel; both printheads failed to perform a normal purge. Suspect cable from controller to first printhead or first printhead failure.

8.5 Troubleshooting with a Logic Probe

Most electronic problems on the Series 1 controller can easily be traced by checking the test points (TP1 through TP8) on the front of the interface board with a logic probe. A WAVETEK LP10A, 17Mhz logic probe (or equivalent), available from most electronic suppliers for under thirty dollars, can be used for these tests. An oscilloscope (if available) can also be used for this test.



USING THE PROBE:

1. Connect the black clip to the ground test point (TP3).
2. Connect the red clip to +5VDC (TP2).
3. Set pulse/memory switch to pulse.
4. Set logic type to TTL.
5. Touch probe tip to desired test point.

See logic probe instructions for indications.

THE FOLLOWING TESTS WERE DONE IN TWO MODES, STATIC/no print and PURGE. The data indications will be the same for both PURGE and normal printing.

TP1 -- TRIGGER	Outputs a pulse when either logic board has data to print
STATIC	LOW
PURGE	LOW with PULSES
TP2 -- +5VDC	Always HIGH
TP3 -- GROUND	Always LOW
TP4 -- LATCHOUT	Signal that fires printhead solenoids
STATIC	LOW
PURGE	LOW with PULSES
TP5 -- SROUT	Serial print data output
STATIC	LOW
PURGE	LOW with PULSES
TP6 -- CLOCKOUT	Print data clock
STATIC	LOW
PURGE	LOW with PULSES
TP7 -- ENCODER	LOW with PULSES on encoder ticks
TP8 -- PHOTOSENSOR	Normally HIGH ... LOW on photosensor trip

The TRIGGER signal starts the CLOCKOUT, LATCHOUT and SROUT signals. If TRIGGER is present, and any printhead signal is absent, replace the interface board. If any of the printhead signals (LATCHOUT, SROUT, CLOCKOUT) are missing, the printheads will not print.

When the TRIGGER signal is not present, the logic boards are not outputting print data. This indicates mis-configured or failed logic boards.

8.6 Solutions to Common Problems

The System Will Not Turn On

- Properly connect the power cord to a 120/240VAC outlet.
- Turn the black toggle switch on the front of the controller ON.
- Check the power entry module fuse.

The System Will Not Print

- Make sure the system is getting power.
- Check the encoder for a proper connection. Be sure the encoder wheel is making contact with the conveyor. Check for the green LED.
- Make sure the photosensor is being triggered properly.
- Make sure you have correctly sent a message to print.
- Make sure the system is getting ink.
- Clean the frontplates of all printheads and purge.

Print Quality is Poor

- Make sure the direction switch for each logic board is set to match the conveyor's direction.
- Check the encoder for a proper connection. Be sure the encoder wheel is making contact with the conveyor.
- Check ink lines for leaks.
- Check ink pressure at the printheads.
- Adjust individual dot sizes from the rear of the printhead.
- Flush all printheads with conditioner.

8.7 Troubleshooting the IDS

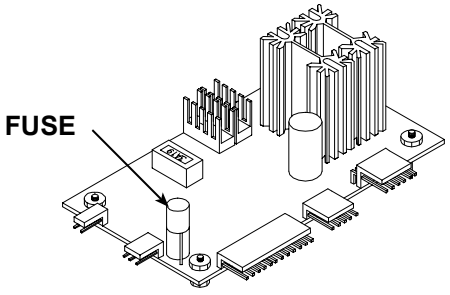
CAUTION: Be sure to wear the appropriate safety equipment as prescribed by your supervisor when troubleshooting or operating this equipment.

Error Conditions

When the IDS encounters an error condition, it will respond by turning off the pump, flashing the status LED and illuminating the ink out beacon.

The following error conditions produce error reporting:

- The fuse for the fan has blown. Note its location in the illustration at right.
- The accumulator failed to reach the minimum pressure position within approximately 30 seconds after the Prime button was pushed.
- The accumulator remains between the medium and maximum pressure points for approximately 40 seconds during a pump on condition.



For continued, satisfactory performance of the IDS, take prompt action when you become aware of error reporting.

Note that you cannot eliminate the error without turning the power switch from ON to OFF to ON again.

Indication Signals

The table below identifies the signal combinations for the status LED on the front panel and the ink out beacon, and explains what these combined signals mean.

Table 11: Indication Signals

LED	BEACON	INDICATION	ACTION
OFF	OFF	System is OFF.	System is OFF. Power on to begin operation.
ON	Flashing	Controller is ON and ink container is empty.	Verify that the ink container is empty and replace it with a full one of the same kind of ink.
ON	OFF	Controller is ON and the ink accumulator is pressurized.	None. The controller is working to its specifications.
Flashing	Flashing	Error Condition	See below for diagnoses and remedies.

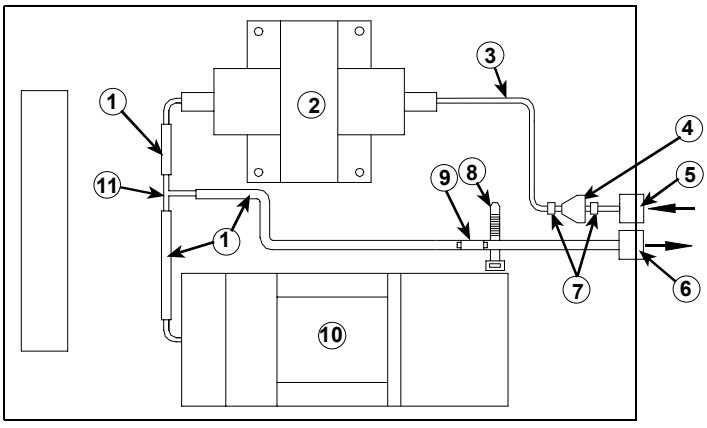
8.8 Problems and Remedies

Table 12: Problems and Remedies

Problem Type	Problem	Possible Causes	Corrective Actions
Fan	The fan has stopped.	A blown micro-fuse on the controller board. (5700-873)	Unplug the controller, remove the cover and replace the micro-fuse on the controller board if it reads >1.0 on an ohmmeter.
		The fan motor has burned out.	Order a replacement fan assembly (5700-076).

Table 12: Problems and Remedies (Continued)

Problem Type	Problem	Possible Causes	Corrective Actions
Leak 	Ink leaks from the couplings mounted in the IDS. **WARNING:** *It is unsafe to operate the controller with ink leaking.*	Broken or worn fittings.	• Turn unit OFF and unplug power cord. • Disconnect the ink inlet at the unit. • Connect the effluent bottle to the printhead ink line to depressurize the system. • Disconnect the effluent bottle when ink stops flowing. • Loosen the cover screws and remove controller cover. • If internal leakage is observed, see below. • If source of ink leaks is apparent, replace the affected components. • If source of leaks is not apparent, check to see if the input or output quick disconnects need replacing. • If the source of leaks cannot be found, contact Diagraph for exchange or replacement.
Leak	Ink is leaking from inside the IDS.	Internal damage.	• Turn the unit OFF and unplug it from the wall. • Disconnect the ink inlet at the unit. • Connect the effluent bottle to the printhead ink line to depressurize the system; disconnect the effluent bottle when ink stops flowing. • Disconnect the ink output to the printheads from the unit. • If the source of leaks is apparent, replace the affected components. All components identified at left are replaceable. • If the source of leaks cannot be found, contact Diagraph for exchange or replacement.



1 1301-875 1/4” Tubing
2 5700-966 Pump Assembly
3 1301-468 1/8” Tubing
4 1902-307 Check Valve
5 1900-758 1/8” Quick Disconnect
6 5700-561 1/4” Quick Disconnect
7 1301-441 Clamps
8 5700-181 Tie Wrap
9 5700-738 Check Valve
10 5700-962 Accumulator
11 5700-562 1/4” Tee Assembly

Table 12: Problems and Remedies (Continued)

Problem Type	Problem	Possible Causes	Corrective Actions
	Ink container is leaking.	Container was punctured during shipping or handling.	Contain seepage using the appropriate spill hazard kit as prescribed. Review the ink's MSDS and dispose of in accordance with local, state and federal regulations. Order replacement ink.
	Regulator is leaking.	• Body or fittings are loosened. • Broken component.	• Disconnect the ink outlet to printheads from the unit. • Connect the effluent bottle to the printhead ink lines to depressurize the system. Disconnect the effluent bottle when no more ink is flowing. • Disconnect the regulator from the printhead and the ink line. • Examine the regulator to see if the body coupling is tight. If not, tighten by hand. • Determine if any cracking or the body or loose fittings are responsible. • If any physical damage is observed, order a replacement. • If the tubing fitting is leaking, remove the tube and clean the fittings with conditioner. Use a pair of diagonal cutters to remove about an inch of tubing. Be sure to make a good square cut. • Reconnect the tubing and be sure all components are dry and clean before reassembling. Fittings should be hand tightened. Perform ink regulator maintenance procedure before resuming operation.

Table 12: Problems and Remedies (Continued)

<table>
<tr><th>Problem Type</th><th>Problem</th><th>Possible Causes</th><th>Corrective Actions</th></tr>
<tr><td>Light</td><td>Beacon not illuminated when the LED is flashing.</td><td>Beacon lamp is burned out.</td><td>Check the cable between the beacon and the unit. Make sure there is a secure connection and there are no damaged connectors.
Replace the lamp in the beacon. Note that the red plastic dome of the beacon is friction-fitted and VERY difficult to remove.</td></tr>
<tr><td>Light</td><td>Beacon is flashing but LED is not illuminated.</td><td>LED is burned out.</td><td>Unplug the controller and replace the LED assembly (5700-077) from the Spare Parts kit.</td></tr>
<tr><td></td><td>No lights (beacon or LED).</td><td>Unit is unplugged.</td><td>Check the power cord and make sure the wall outlet is live. Plug the power cord into the wall and firmly press into the power entry module.</td></tr>
<tr><td></td><td></td><td>Blown fuse in the power entry module.</td><td>Unplug the controller, check the fuses and replace.</td></tr>
<tr><td>Operation</td><td>Unexpected shutdown</td><td>Slow ink leak (external)</td><td>Determine source of ink leakage and refer to the appropriate troubleshooting procedure for corrective action.</td></tr>
<tr><td></td><td></td><td>Low line voltage</td><td>Check line voltage at outlet. Voltage should not be <100VAC.</td></tr>
<tr><td></td><td>Dot sizes too small; unable to achieve required ink pressure.</td><td>Too many printheads</td><td>Do not exceed the maximum number of printheads per the table below:
<table><tr><th>Size</th><th>Maximum #</th></tr><tr><td>1/2"</td><td>12</td></tr><tr><td>7/8"</td><td>8</td></tr><tr><td>2"</td><td>4</td></tr></table>When mixing printhead sizes, one 7/8" head is equal to two 1/2" heads or one 2" head.</td></tr>
<tr><td></td><td></td><td></td><td>Check the ink line for sharp bends. make sure no objects are setting on the line or pinching it.</td></tr>
<tr><td>Pump</td><td>Ink pail will not empty.</td><td>Ink cap installed incorrectly</td><td>Repeat installation procedure.</td></tr>
</table>

Table 12: Problems and Remedies (Continued)

Problem Type	Problem	Possible Causes	Corrective Actions
	Dot sizes too small, unable to achieve required ink pressure.	Ink flow path obstructed	Check the ink line for sharp bends. Make sure no objects are setting on the line or pinching it.
	Pump does not cycle on.	Pump is defective.	• Set ON/OFF switch to OFF and unplug unit from wall. • Disconnect ink input from container at unit. • Connect effluent bottle to printhead line to depressurize ink supply; disconnect when ink stops flowing. • Disconnect ink output to printheads at unit. • Loosen cover screws and remove controller cover. • Follow the pump replacement instructions later in this section.
Priming	The prime button does not respond after holding it more than 30 seconds.	A time-out has probably occurred on the controller.	Reset the prime button by switching the mode switch from ON to OFF and back to ON. The prime button should again be active.
		Possible punctured or disconnected ink line	Unplug the controller and disconnect the ink out tube. Check immediately for the ink leak location. Repair the break and reconnect power. Reset the prime button as above.
		Flow path obstructed	Check the ink line for sharp bends. Make sure no objects are setting on the line or pinching it.

8.9 Print Quality Troubleshooting

How to Use this Section:

1. Look at the problem characters on your substrate and compare them with the figure below to diagnose the exact name for the problem.
2. Refer to Table 13, "Print Quality Definitions", to verify that you classified the problem correctly.
3. Refer to Table 14 to identify possible causes for your printing problem.
4. See subsequent pages for solutions to various print quality problems.

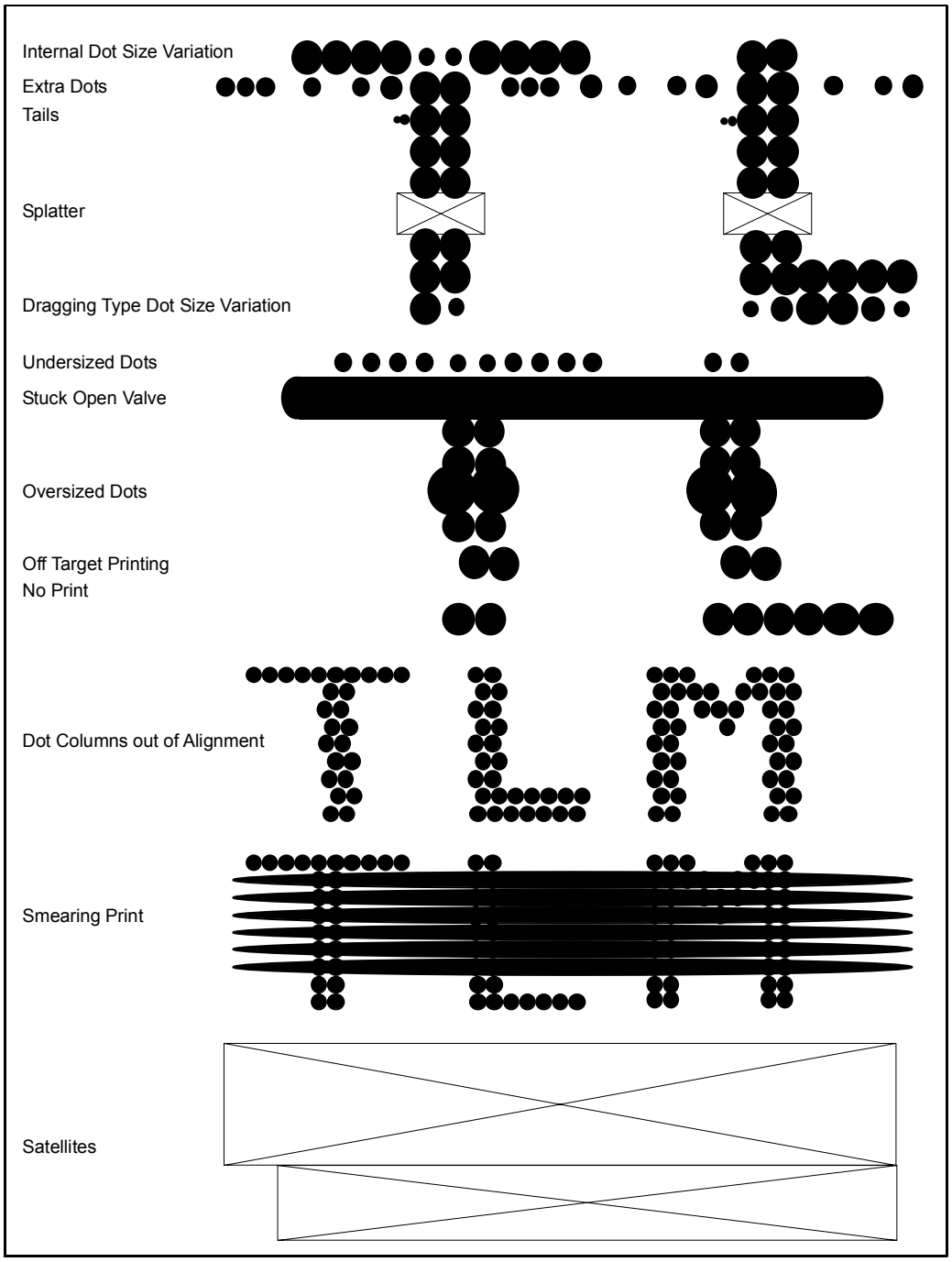


Table 13: Print Quality Definitions

Internal dot size variation	The system prints dots that are different in size at the intersection of a dot column and a dot row.
Extra dots	The system continues to print dots outside the designated dot columns.
Tails	Dots with small trails of ink, usually a "tear drop" shape instead of a round dot.

Table 13: Print Quality Definitions (Continued)

Splatter	Dots with a fuzzy edge like the pattern created by the impact of a water balloon.
Dragging type dot size variation	The system prints smaller than average dot sizes at the beginning of print only.
Undersized dot	Dots that are smaller than normal.
Stuck open valve	The valve seal fails, allowing ink to stream from the orifice.
Oversized dot	Dots that are larger than normal.
Off target printing	One or more dots do not print in the expected location in the character.
No print, or missing dots	The valve prints nothing.
Dot columns out of alignment	The dot columns line up in a zigzag pattern.
Smearing print	The valve smears the dots together, forming a line.
Tails, splatter, off-target print	This combination of print quality defects means the printhead is too far away from the product.
Message broken	A message that is broken into two or more pieces, usually from the encoder slipping.
Dynamic seepage*	Ink leakage from orifices, only during printing.
Static seepage*	Ink leakage from orifices, only when not printing.
*Seepage is defined as ink running down the front plate from one orifice far enough to connect to an adjacent orifice.	

8.10 Print Problem Causes

The number one cause of poor print quality is distance to the substrate. The printhead must be within 1/8" of the product to be printed.

The IV printhead works well when the pulse width, pressure and preload adjustments are all balanced properly. Too little or too much of any one will result in deteriorating print quality and shortened printhead life.

Troubleshooting the printhead must be conducted in this order:

1. Check the distance to the product.
2. Check the ink pressure.
3. Check the pulse width.
4. Check the preload.

If ink pressure variation continues, perform the ink regulator maintenance procedure.

Table 14: Print Problem Causes

Internal dot size variation	• Low ink pressure (slight variation is normal)
Extra dots	• High ink pressure • Pulse width set too high • Incorrect pre-load
Tails or satellites	• Printhead too far from the target • Pulse width set too high • Incorrect pre-load
Splatter	• Printheads too far from the target • Pulse width set too high • Orifice damaged by broaching
Undersized dot	• Low ink pressure • Pulse width set too low • Incorrect pre-load
Stuck open valve	• High ink pressure • Pulse width set too high • Incorrect pre-load
Oversized dot	• High ink pressure
Off-target printing	• Printhead too far from target • Low ink pressure
No print or missing dots	• Low ink pressure • Pulse width set too low • Printhead failure • Controller or cabling failure • Solenoid failure • Clogged orifice • Membrane internal ink leakage due to broach puncture
Dot columns out of alignment	• Encoder O-rings worn
Smearing print	• Printhead too close to target • Make sure you are using the correct ink for your • application.
Message is broken	• Photosensor is triggering multiple times per box. • Loose cable connections
Garbled printing	• System improperly grounded • Excessive line noise

Table 14: Print Problem Causes (Continued)

Dynamic seepage	• Pulse width set too low • Low ink pressure • Pre-load too low
Static seepage	• High ink pressure • Pre-load too low

NOTE: Pre-load adjustment should only be performed after all other causes have been eliminated.

Setting Ink Pressure

See *Section 5, Installation.*

Ink Regulator Maintenance Procedure

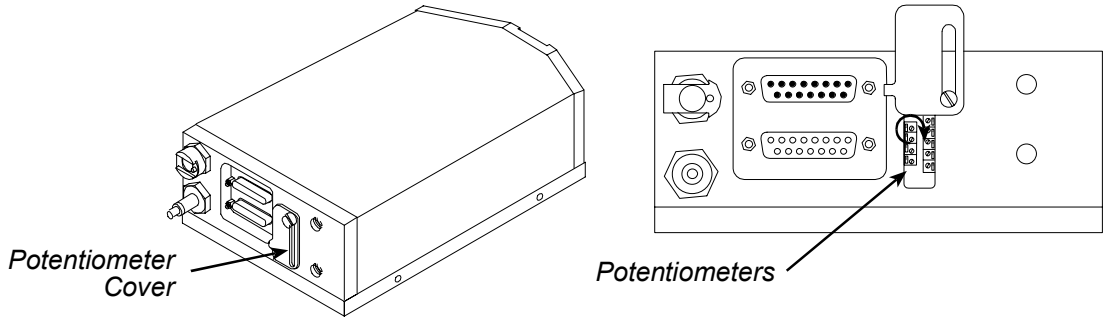
If dot size is fluctuating, check the printhead pressure. If the fluctuations can be correlated to changes in ink pressure, the ink regulator may be in need of service. See *Section, 7, Maintenance.*

Printhead Pulse Width Adjustment

When a printhead solenoid is on, the piston pulls away from the membrane, ink pressure moves the membrane away from the orifice, and ink is expelled through the orifice to form a dot. When the solenoid turns off, the piston moves forward, which in turn pushes the membrane forward to seal the orifice. Solenoid pulse width controls the amount of time that ink is ejected from the orifice by pulling the piston back farther (for large dots) or not as far (for small dots). If printed dots are over or undersized, pulse width adjustment may be required.

NOTE: Never adjust pulse width without first ensuring that ink pressure is correct.

1. Check printhead pressure per procedure. Adjust if necessary and recheck print quality.
2. Open pulse width adjustment access cover at the rear of the printhead housing.



3. Adjust pulse widths by turning potentiometers as required: Turn clockwise to increase pulse width, or counter-clockwise to decrease pulse width.
4. Check print quality; repeat step 3 as required. If dot size cannot be adjusted for acceptable print quality, a pre-load adjustment may be required.

Cleaning the Front Plate of a Clogged Printhead

If dots are missing from the print, the printhead front plate may have dried ink or debris covering the orifices. The front plate is made from graphite and can be damaged; do not attempt to scrape dried ink or debris from front plate. To clean the front plate:

1. Wipe the front plate with a conditioner-wetted towel (towel should be very wet).
2. A squeeze bottle of conditioner can be used to flush the front plate off.
3. Purge the printhead; check if missing dots are purging.
4. Wipe the front plate with a conditioner-wetted towel and inspect front plate. (There should be no dried ink or debris on front plate).
5. Repeat steps 1 through 3 until front plate is clean. If cleaning the front plate and purging do not clear the clogged orifice, follow the orifice broaching procedure.

Broaching the Orifice

If a printhead orifice is clogged or obstructed and wiping the front plate and purging will not clear it, the appropriate orifice should be broached.

CAUTION: Failure to follow the broaching instructions can result in damage to the printhead.

1. Wipe front plate with conditioner-wetted towel.
2. Insert the broach into the orifice. Do not insert further than 1/10 inch.

CAUTION: Inserting the broach in the orifice deeper than 1/10 inch can puncture the membrane and cause a slow leak which will manifest itself as a no print failure several weeks later, and void the printhead warranty.

3. Remove broach from orifice.
4. Purge printhead.
5. Repeat 3 or 4 times.
6. If the clog or obstruction cannot be broached away, replace printhead.

Printhead Pre-Load Adjustment

Pre-load adjustment is sometimes required, as printhead components wear over time.

Pre-load adjustment may be required under the following conditions:

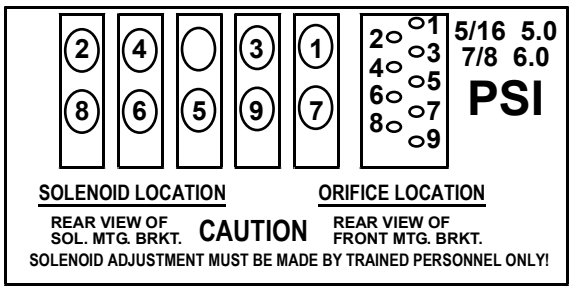
- Excessive or constant **ink leakage**
- Poor print quality in the form of **tails, extra dots, splattering**, or a stuck open valve.
- **Undersized dots** (not correctable by pulse width adjustment) and purge die out (rarely) are indications of over pre-loading.

NOTE: If a valve is under pre-loaded, increasing the pre-load can correct the print problem. If the valve is over pre-loaded, the membrane or solenoid wire may be damaged to the point where the printhead will have to be replaced. Damage caused by too much pre-load will void the printhead warranty.

The following is the proper procedure for adjusting I.V. printhead pre-load with the 1902-855 solenoid adjustment tool. This procedure is easiest to perform on a bench away from the line. When replacing a printhead, always install the new regulator supplied with the printhead, and adjust pressure to the correct value.

CAUTION: Failure to follow these instructions can result in damage to the printhead. Making adjustments with a tool other than the solenoid adjustment tool may damage the solenoid bushings.

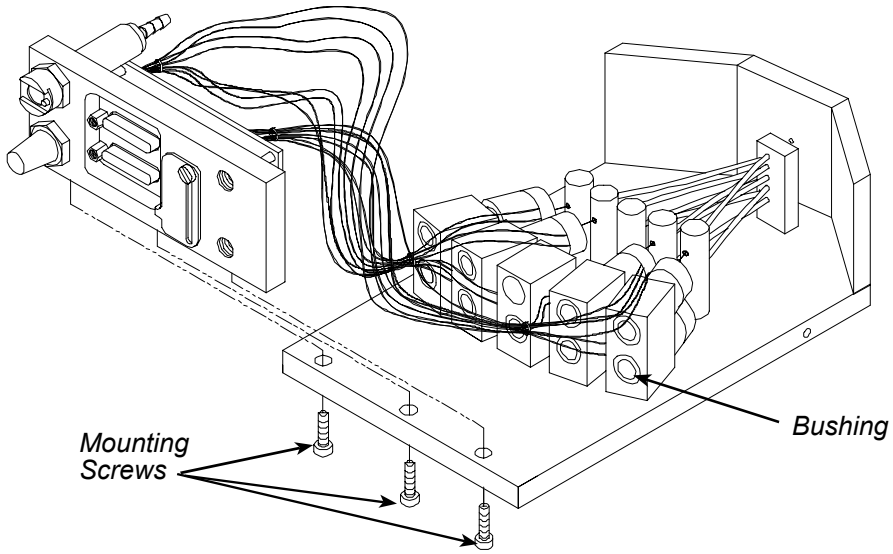
1. Make sure ink pressure is correct prior to making any adjustments.
2. Remove printhead cover. A label inside of the printhead cover indicates which bushings and potentiometers to adjust for each orifice.
3. Remove the rear frame plate by removing the three mounting screws.



PRINTHEAD COVER LABEL

CAUTION: Be careful to support the printhead since it is only connected by the solenoid wires to the driver board after the screws are removed. Allowing the printhead to hang by the solenoid wires can damage the solenoids or driver board. Also, be careful not to allow the driver board to come into contact with any metal items that might cause an electrical short.

4. Lift the rear frame plate/driver board assembly out of the way to provide access for preload adjustment. Handle the assembly by the rear frame plate.



5. Locate the row of bushings inside the printhead. The left side of the printhead cover label shows the layout of the bushings. The numbers inside the circles (bushings) correspond to the printhead orifices that they control.
6. Rotate the bushing counter-clockwise with the solenoid adjustment tool until ink streams from the orifice. Ink will shoot out about three feet. Using a tool other than the solenoid adjustment tool may damage the solenoid bushings.
7. Rotate the bushing clockwise until you see the ink stream deflect slightly.
8. From this point, keep track of exactly how far the bushing is rotated (clockwise) to seal the orifice.

CAUTION: Do not rotate the bushing more than one full turn clockwise from this position, or the membrane or solenoid may be damaged, voiding the warranty.

9. Rotate the bushing clockwise until ink seepage completely stops.
10. Wipe the front plate with a clean, conditioner-wetted cloth. Purge the printhead and wipe again. Observe the printhead for 15 minutes; if ink seeps from the orifice, repeat steps 8 through 10.
11. Rotate the bushing 1/8 of a turn, past the point where seepage stops. Do not exceed one full turn.
12. Install printhead in cover and check for seepage. If seepage occurs, remove printhead from cover and tighten bushing 1/8 turn. Do not exceed the one full turn limit.

NOTE: If the one full turn limit is reached and the seepage has not stopped, replace the printhead and return it to Diagraph for repair.

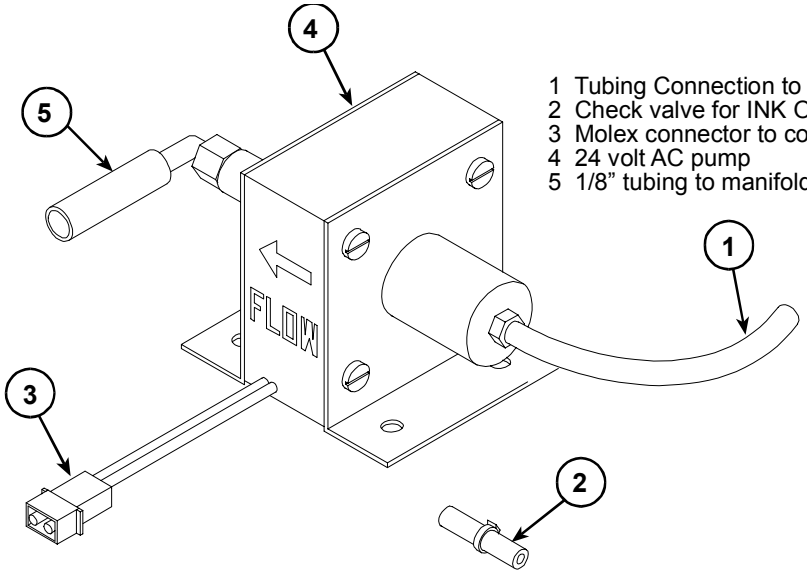
8.11 Replacing the Pump

Tools and Materials

- Replacement pump kit (5700-966)
- Effluent bottle
- Disposable dry wipes
- TFE tape or pipe joint compound
- 3/8" socket wrench
- Xacto knife

CAUTION: Always wear safety goggles when working with pressurized liquid systems.

Open the controller pump replacement kit and identify all components. If there are missing or damaged parts, contact the Diagraph ServiceLine at 1-800-526-2531.



1 Tubing Connection to INK IN port
2 Check valve for INK OUT port
3 Molex connector to controller board
4 24 volt AC pump
5 1/8” tubing to manifold elbow

Removing the Faulty Pump

1. Unplug the controller power cord.
2. Connect the effluent bottle to the Ink Out port and wait for the accumulator to depressurize.
3. Remove the controller cover.
4. Disconnect the two-pin Molex connector to the pump.
5. Remove the four nuts holding the pump to the base, and set them aside.
6. Fold a dry wipe and place it under the 1/8" fitting on the input side of the pump.
7. Using diagonal cutters, cut the 1/8" tubing connected to the input side of the pump.
8. Press the wipe around the severed tubing to absorb any ink.
9. Roll a fresh wipe and place it under the elbow fitting on the output side of the pump.
10. Position the controller so that the electrical compartment is closest to you. This will allow you to closely observe the next step and to gain leverage for cutting tubing.
11. Using the Xacto knife, cut the tubing between the elbow fitting on the output side of the pump and the elbow fitting on the accumulator.
12. Press the wipe around the cut to absorb leaking ink.
13. Remove the pump from the housing and clean up any ink drips.
14. Use the diagonal cutters to carefully nibble away the tubing that remains on the manifold elbow fitting. Take care not to cut or scar the fitting. Clean with a wipe when complete.
15. Using the diagonal cutters, carefully pinch and pull the 1/8" tubing from the fitting on the INK IN port. Take care not to cut or scar the fitting. Clean with wipe when complete.

Installing the New Pump

1. Place the new pump in position.
2. Use TFE tape or pipe joint compound on the threads of the elbow on the accumulator and slide on the tubing from the output side of the pump.
3. Use the tape or joint compound on the threads of the male fitting on the purge switch and slide on the tubing from the input side of the pump.
4. Connect the two pin Molex connector to the pump.
5. Secure the pump to the housing with the nuts set aside when the old pump was removed.
6. Reconnect ink lines and the effluent bottle.
7. Turn on system power.
8. Press the prime button; you should hear the pump start. If it does not, unplug the power cord and check the Molex connector to the pump.
9. Hold the prime button until the air evacuates the line and ink runs into the effluent bottle.
10. Release the prime button and disconnect the effluent bottle.
11. Press the prime button until the system comes up to pressure.
12. Replace the system cover.

Appendix A: System Specifications

Description

The Series 1 Controller incorporates the Telemark logic board with a modified (connector only) encoder and photosensor. It controls I.V. printheads and houses an ink delivery system (IDS).

The following features provide increased capability and versatility:

- Interface board that converts parallel data to serial data
- Split line configuration: Dual encoder and photosensor inputs
- Daisy chain up to two 9-dot printheads
- Internal fixed speed reporter or variable speed reporter
- Hand-held terminal interface
- External interface
  - •Low ink alarm
  - •Message advance
- Stainless steel enclosure (EMI, RFI)
- Reduced cabling (internal and external)
- Improved appearance (internal and external)
- Integrated electronics and ink system
- Easily upgradeable 1-4 head controller; for customers who want to go beyond four printheads, the data line can be connected to additional Series 1 controllers.

Controller/IDS

Table 15: Controller/IDS Specifications

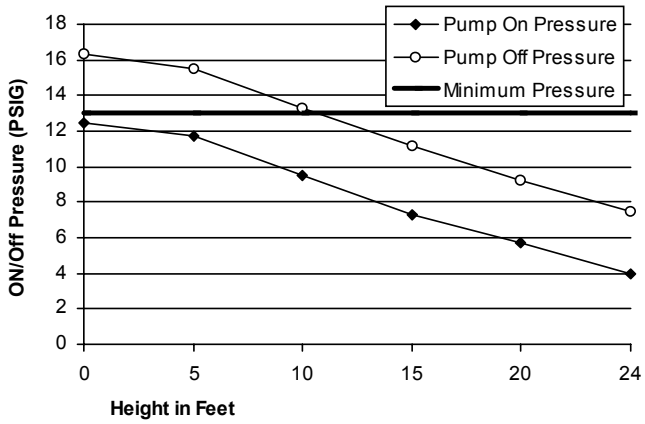
	STAND-ALONE	PC-BASED
Input Device	LC/400 Hand Held Terminal	IBM Compatible PC
Communication	RS-232 to Terminal RS-422 Controller to Controller	RS-232 or RS-422 to PC RS-422 Controller to Controller
External Sources	N/A	Scale, Scanner or other RS-232 interface device
Autocodes	Standard: Date, time, Julian/ Gregorian date, sequential numbering, pallet count. Special Software: Complete library of custom and special autocodes available.	Standard Special
Message Storage	99 40-character messages	Number of 149-character messages limited only by PC storage space
Printheads per Input Device	Up to 15; 4 per controller, 15 networked	Up to 16; 4 per controller, 16 networked

Table 15: Controller/IDS Specifications (Continued)

	STAND-ALONE	PC-BASED
Font Capabilities	9-dot single and bold, 7-dot proportional and fixed width. 18-dot upper and lowercase, special fonts or logos available upon request.	Full ASCII character set, single, bold, extra bold, condensed, expanded, inverted, reversed, 18-, 9-, 7- and 5-dot tall matrices, multiple sizes and fonts on the same line.
IDS Efficiency	99.9%; less than 1 oz. remains in the pail after use.	
Dimensions (Overall)	19.125" x 8.25" x 17.75" (486mm x 210mm x 451mm)	
Weight	35.4 lb. (16.6kg)	
Case Material	Industrial grade stainless steel with fully gasketed plastic front cover.	
Electrical	115/230VAC; 50/60Hz: 5700-969 100/200VAC; 50/60Hz: 5700-801	
Temperature	Operating: 40°F to 100°F (4.4°C to 37.8°C)	
Fluid Connections	1/8" female quick disconnect for ink inlet 1/4" female quick disconnect for ink outlet	
Manual Controls (Front Panel)	ON/OFF SWITCH VOLTAGE/FUSE SELECTOR: Voltage Selection PUMP PRIME BUTTON: Override auto shutoff	
Enclosure	Industrial grade stainless steel	
Ink Accumulator Capacity	1.4 oz. (40ml) ink available for printing	
Fuses	System: 2 MDL-2 250V, 2A Fan: 1 125V, 315mA	

Table 16: Printhead Supply Capacities

IV Printhead Size	Maximum # Printheads
1/2"	12
7/8"	8
2"	4
Barcode	4



Photosensor

Series 1 applications use the Allen-Bradley 42SRP-6002, diffuse type photosensor. This type of photosensor detects LED radiation scattered back from a diffuse reflective surface. It is designed for use in applications where reflectors or emitters cannot be mounted.

Table 17: Photosensor Specifications

Voltage Supply	10-30VDC
Supply Current	30mA
Output Energized	Light
Output Type	NPN and PNP
Output Rating	200mA
Response Time	1ms
Operating Distance with White Paper	2:1 Margin: 32" (81cm)
Reverse Polarity Protection	Yes
Transmitting LED	Infrared 880nm
Field of View	7.5
Ambient Temperature	-40°F to 150°F

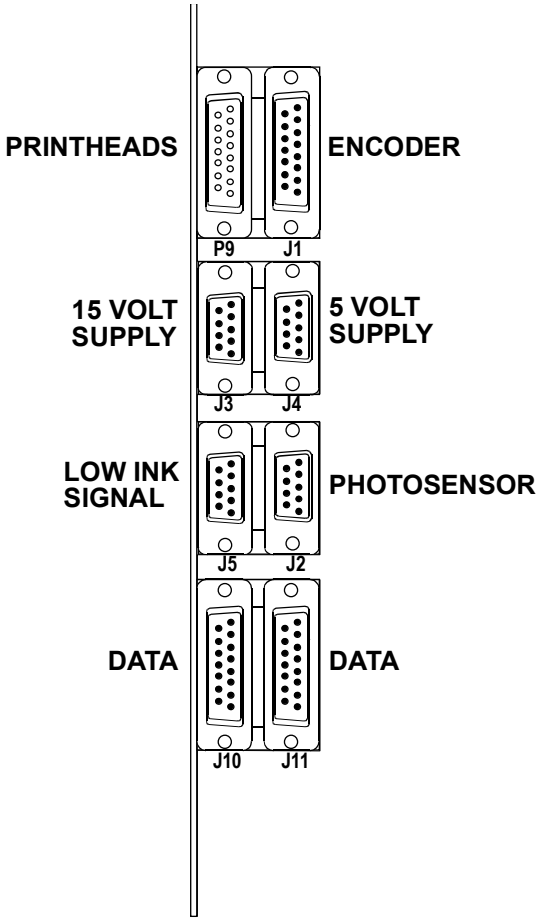
Appendix B: Theory of Operation

The Series 1 controller prints text onto products as they pass through a print station via a conveyor. The conveyor speed is monitored using a variable speed encoder and products are detected using a photosensor. The text to be printed is defined as a message and is sent to the controller from a PC or hand-held terminal.

Controller/IDS Features

The following components are contained within the Series 1 controller/IDS:

Interface Board (5700-567)



The Logic boards supply parallel print data to the Interface board print data set-up and data shift circuits. If either logic board has data to print, the print set-up circuit generates RCLOCK, which loads the parallel print data from both Logic boards into the shift circuit, and generates a TRIGGER signal that initiates the print cycle. The timing circuit provides CLOCKOUT to the shift and data conversion circuits; it also generates the LATCHOUT pulse to fire the printhead solenoids after 18 CLOCKOUT pulses. The data shift circuit converts the parallel print data into serial data SROUT. CLOCKOUT, LATCHOUT and SROUT are supplied to the differential converter to supply the proper printhead data format at the printhead connector.

Printhead power (15VDC) is also output on the printhead connector. The encoder input is fed to the logic boards and an 18 dot sync circuit; a jumper selectable internal line speed oscillator is located on the board for fixed speed applications. The photocell operates on 15VDC and the input signal is opto-isolated. The encoder, photocell and low ink signals are available on the inter-board connector (P21).

Terminal data can be RS-232 or RS-422 (jumper selectable). RS-422 is fed straight through to the logic boards, while RS-232 data is converted to RS-422 for use by the logic boards. The reset circuit provides a one-second pulse (/RES) to clear all counters and registers at power-up. "Message Advance" and "Purge" push buttons are also located on the interface board.

Logic Board (5701-061)

The Logic boards operate independently, and each controls one 9-dot printhead.

The Logic boards receive RS-422 data from the terminal through the Interface board. When the photosensor is active, the Logic board counts the encoder ticks for the delay, and begins to send the parallel print data to the Interface board. The message is assembled one character at a time from the selected font, and sent one column at a time in two sections (odd and even columns) to the interface board. (Note that because of the dual column printhead, the odd and even column data can not be sent simultaneously.)

The Logic board address and some options are set by the DIP switches located on the Logic board; LEDs provide board status information.

Ink Delivery System

A microprocessor based IDS controller board assembly (5700-749V11) controls the process of pumping ink via a 24VAC pump. Ink is pumped from an external container into a spring-loaded accumulator, which pressurizes the output of the IDS. The microprocessor determines the relative position of the accumulator rod to establish the operating pressure range. The microprocessor uses the three accumulator rod sensor points, detected by the infrared emitters and detectors located on the sensor board (5700-750), to establish the ink out, pump ON and pump OFF pressure points as follows:

1) The system is out of ink if the accumulator rod does not break the infrared beam of the ink out (minimum) position. The microprocessor will illuminate the ink out beacon and wait for the system to be manually primed. The accumulator rod will pass through the minimum pressure point once the system has been successfully primed. The microprocessor will then ignore the manual prime switch, begin automatic control and activate the pump. A firmware time-out exists during the manual priming process. An error will be generated (power ON LED will begin flashing) if the accumulator rod does not reach the ink out (minimum) position. (See *Section 7, Troubleshooting*.)

2) The pump will remain ON until the accumulator rod passes through the infrared beam of the pump OFF (maximum) position, whereupon the microprocessor will turn the pump OFF.

3) The accumulator pressure will slowly decrease while the system is printing. The pump will remain OFF until the accumulator rod passes through the infrared beam of the pump ON (medium) position. The microprocessor will then activate the pump, increasing pressure. The pump will remain ON until the accumulator rod passes through the infrared beam of the pump OFF (maximum) position, whereupon the microprocessor will turn the pump OFF.

A firmware time-out exists during the pump ON cycle. The pump will be turned OFF and an error will be generated (power ON LED begins flashing) if it takes more than 45 seconds for the accumulator rod to move from the medium (pump ON) to the maximum (pump OFF) position. (See *Section 7, Troubleshooting*.)

The beacon will illuminate when accumulator pressure falls below the ink out position. The resistance of the beacon is monitored by the microprocessor and an error is generated if the bulb is burned out or if the beacon is not connected. (See *Section 7, Troubleshooting*.)

Power Supplies

A quad output switching power supply (5700-091) is mounted on the top of the controller assembly. Only two output voltages are used, 5VDC and 15VDC. 5VDC is supplied to the interface board, logic board and encoder. 15VDC is supplied to the printheads and the photosensor.

The Ink Delivery System is powered by a 24VAC step down transformer (5700-963) located on top of the controller assembly. 24VAC is supplied to the IDS controller board, pump and the beacon.

Printheads

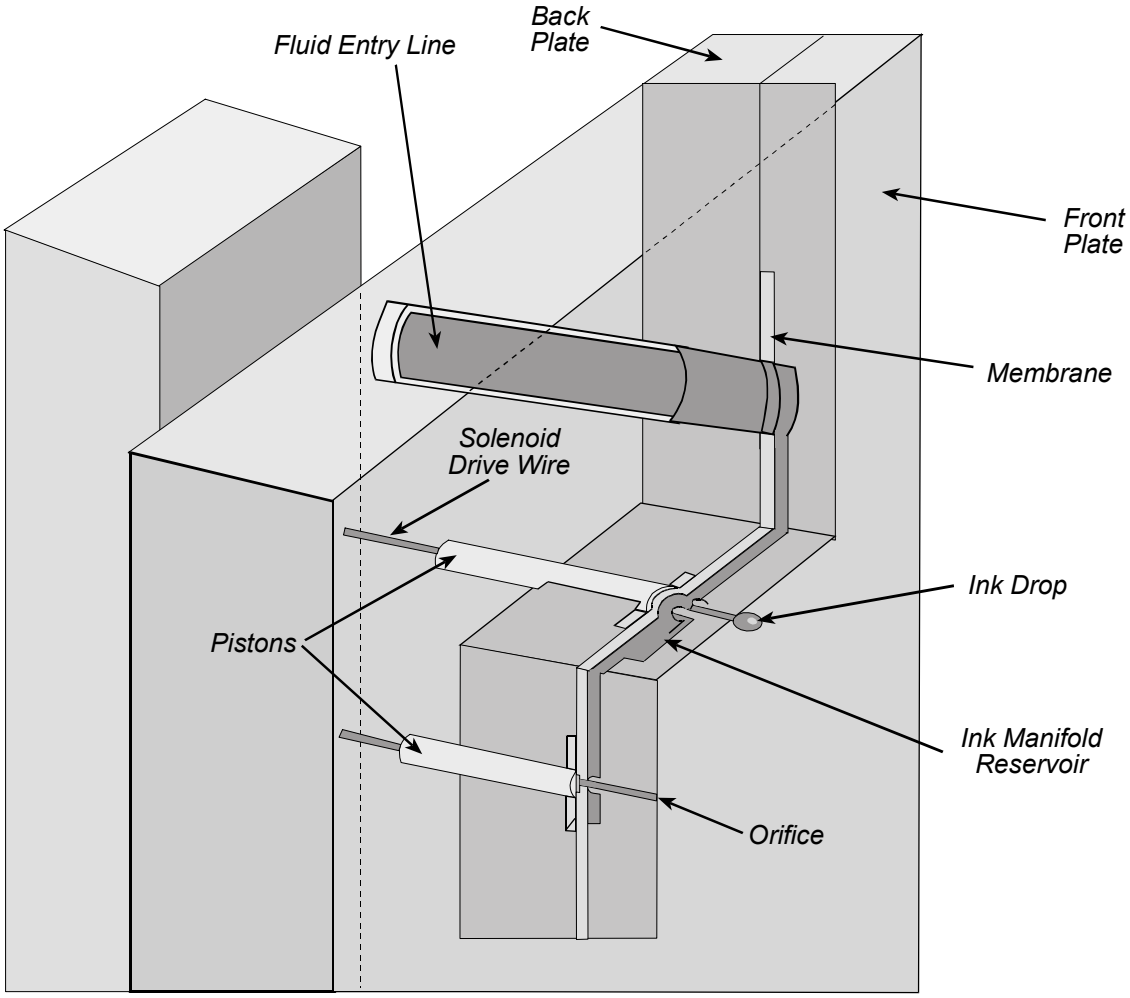
The only source of power for the printheads is the 15VDC received from the interface board. The 15VDC is protected by a 4A fuse soldered onto the driver board. This fuse is not considered a replaceable part. The 15VDC is daisy chained to the second printhead. Thus, the second printhead will not have power if the fuse is blown on the first printhead, though the first printhead may still have power if the fuse in the second printhead is blown.

The interface board transmits 18 dots of differential serial data to the first driver board (located inside the rear of the housing). The CLOCK signal shifts the first 9 dots through the first driver board to the second printhead while the second 9 dots are shifted into the first printhead. The LATCH signal is provided to both printheads. Once the CLOCK signal has shifted all 18 dots of print data into the printheads, the LATCH signal is generated to activate the selected printhead solenoids, and a message is printed.

The printhead driver board receives clock, data and latch signals from the interface board and converts them to separate 15-volt pulses of between 250 and 450 milliseconds in

length for each solenoid. When the solenoid receives the pulse, the coil magnetizes, pulling the drive wire connected to the piston back about 0.003". Ink pressure forces the membrane off the seal, allowing ink to escape through the orifice. The entire process takes about one millisecond. Adjustment of the dot size is accomplished via the potentiometers on the back of the driver board, sometimes called the "pulse width" adjustment.

Inside each solenoid is a leaf spring that holds the piston against the membrane with about 0.06 pounds of force. This sealing force is called preload. While the preload may sometimes require adjustment after long use, too much preload will damage the membrane seal or even bend the solenoid drive wire, either of which will make the printhead inoperable and void the printhead warranty.



Ink pressure set at the printhead's recommended PSIG provides the necessary force for the ink drops to escape the orifice and travel the distance to the box. The distance to the box should be about 1/8". Print quality is inversely proportional to the distance to the box.

IV printheads work well when the pulse width, pressure and preload adjustments are all balanced properly. Too much or too little of any one will result in deteriorating print quality and shortened printhead life.

Ink Regulator

The ink regulator (supplied with the printhead) regulates the ink pressure to the printhead. The ink regulator is directional, and so should always be connected to the top printhead fitting, the female quick disconnect.

The ink regulator operates by balancing a valve sealing an orifice and reinforced EPDM diaphragm between a stainless steel spring in the bottom, and a non-wetted spring in contact with the adjustment knob on top.

When ink pressure into the middle chamber of the regulator exceeds the ink pressure in the outer chamber, ink flows through the orifice. The diaphragm stretches as pressurized ink fills the outer chamber, until the stem mounted to the middle of it lifts off the valve, allowing the bottom spring to seal it up against the orifice.

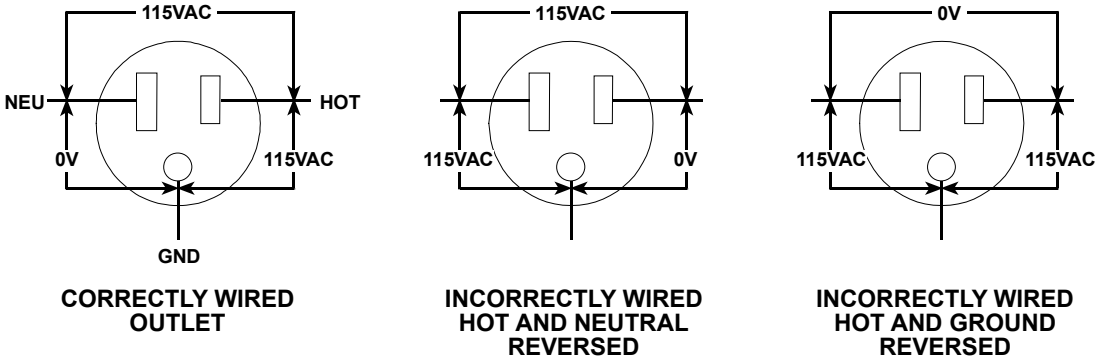
The output pressure is produced by the stretched diaphragm. As ink is used by the printhead, the diaphragm relaxes, the stem pushes the valve seat away from the orifice seal, and ink flows back into the outer chamber until pressure is restored by the tension on the diaphragm.

The stroke length of the valve is a function of how far down the valve stem is allowed to push it during recharging. That stroke length is controlled by setting the knob. Clockwise rotation of the knob compresses the top spring, increasing the stroke length and thus the ink pressure output. When fully counterclockwise, the diaphragm stem is no longer in contact with the valve seat and no ink will flow through the ink regulator once the ink remaining in the outer chamber (normally about 2 ml) is exhausted.

The ink pressure gauge (5700-743) is used to indicate ink pressure, and must be used when making pressure adjustments to the system to maintain print quality.

Appendix C: Testing an Electrical Outlet

An outlet tester is the preferred method of checking an electrical outlet, although a voltmeter can also be used.



Background Information About AC Wiring

Equipment running at 115VAC must have one hot wire and one neutral wire. Additionally, a separate ground wire runs to non-current carrying parts of most loads.

Table 18: The Wires in an AC Outlet (115VAC)

WIRE	DESCRIPTION	FUNCTION
LINE	Usually black. Cannot be white or green.	Carries the voltage load to the equipment.
NEUTRAL	White or natural gray.	Grounded at the service equipment* only. Serves as the return for 115 volts.
GROUND	Bare, green or green with yellow stripes; may be metal armor or metal conduit.	Grounded at the service equipment* and every metal box or cabinet. Runs to non-current, carrying parts of most loads.

*The service equipment is defined as “the equipment used to disconnect the entire building and over-current device to protect the entire installation, but not the branch circuits individually.”

At the service equipment, a single ground wire connects both the neutral and ground to earth. The NEC calls this wire the “ground electrode conductor.”

Appendix D: Electrostatic Discharge

What is ESD?

Electrostatic Discharge (ESD) is a triboelectric charge generated by separating or rubbing together two non-conductive materials.

What causes ESD?

Friction can cause ESD. Friction can be generated by walking across a floor, removing tape from a tape dispenser, pulling a work order from a plastic sleeve, rolling the wheels of a push-cart across the floor, sitting on a foam cushion such as a stool or blowing air across a nonconductive surface.

Table 19: Causes of Electrostatic Discharge

Source	70-90% Relative Humidity Volts	10-20% Relative Humidity Volts
Walking across a carpet	1,500	35,000
Working at a bench	100	12,000
Sitting on a foam cushion	600	20,000
Removing plastic bag from bench	12,000	20,000
Removing work order from plastic sleeve	600	7,000

ESD at the print station can be caused by the product rubbing against ungrounded guide rails, conveyor belt static voltage build-up, or a residual static charge on the product from earlier processing.

Generally, ESD problems are more prevalent in the winter months. Heated air has a much lower relative humidity than the cold air had prior to heating. In many instances ESD problems appear in the fall when the outside temperature drops, and go away in the spring when the outside temperature begins to rise.

What Are the Effects of ESD?

Unexplainable system resets, controller lockups, and multiple prints on the product can be signs of static discharge to the system. When static electricity is discharged to an electronic circuit (components or printed circuit boards), permanent damage may also occur. This damage may be in the form of reduced functionality, reduced life, or complete non-functionality.

The static charge does not have to be noticeable to the human touch in order to cause problems in an electronic system. A human being does not start to feel the effects of static electricity until the voltage reaches or exceeds 4000 volts. Voltage as small as 100 volts can cause problems with some sensitive electronic components.

What Prevents ESD?

Prevention begins with training and knowledge. The use of wrist straps, heel straps, workbench mats, floor mats, and monitoring systems for electronic devices will drastically reduce the ill effects of ESD when handling circuit boards. Anytime you handle electronic components or printed circuit boards, ESD wrist straps should be used.

If static discharge is suspected of causing controller problems at the print station, check the grounding of the conveyor and print station components. Nonconductive or ungrounded guide rails are the most common cause of static discharge. Ionized air blowers and static dissipating material have proven effective in eliminating many static problems.

Appendix E: IDS Performance

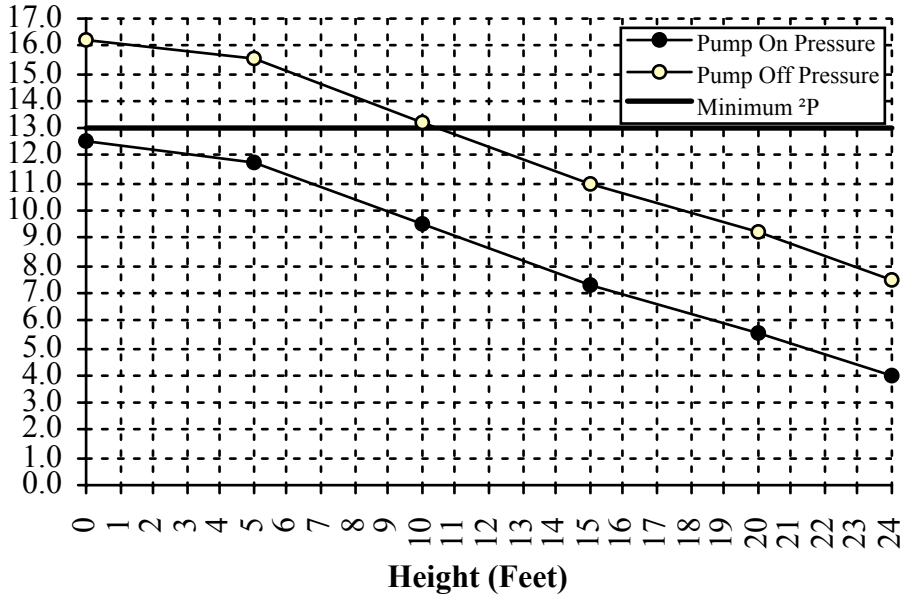
The information in this section will be useful in new system installations and for trouble-shooting installed systems that have suspected pressure problems.

What follows is a controlled measurement of Series-1 ink delivery system performance. TWP conditioner pressure versus flow at various vertical and horizontal distances was measured. The results may be used for all TWP ink types.

The ink delivery system must switch on between 12.5 and 14.0 PSIG, and off between 16.5 and 19 PSIG, while having a minimum on/off differential of 4.0 PSIG. Switching on and off within these pressure limits and running at a 50% or less pump duty cycle provides for adequate ink flow to support the maximum number of printheads (four 9-dot printheads) while minimizing pump wear.

Vertical Height Measurements

For the following measurements, the system was set up with a 20% pump duty cycle, producing about a 100 milliliter per minute flow rate. The pressure at which the ink pump switched on and off was measured at the fluid output of the indicated height in feet.

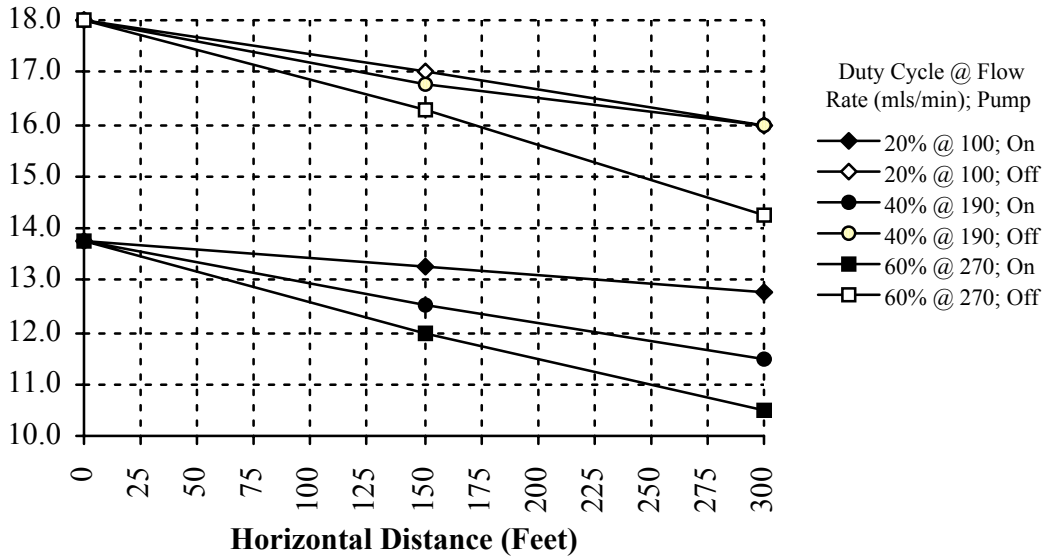


There must be a minimum of 2PSIG difference between the lowest ink pressure from the Series-1 controller and the ink regulator output, to guarantee adequate pressure control to the printhead. Therefore, finding the required printhead pressure on the chart above, and adding 2 PSI to it, determines the maximum height (in feet) above the ink container that the printheads may be located. For example, a 6.0 PSIG printhead cannot exceed 13.5 feet in height above the container.

The pressure drop of any upward run of ink is canceled by a downward drop of equal length. For example, an upward run of 24 feet of ink line matched by a downward run of 24 feet of ink line, has an on and off pressure equal to that of zero feet. If the line goes up 24 feet and down 19 feet, then the pressure will be equal to a 5-foot height differential. Also, be careful to fill the tube with fluid, evacuating all of the air, prior to running the tube between the ink supply and the printheads. If air is left in the line, it will decrease the flow rate, though it will not affect the pressure.

Horizontal Distance Measurements

For the following measurements, the system was set up at 20, 40 and 60% pump duty cycles, producing flow rates of 100, 190 and 270 milliliters per minute, respectively. The pressure at which the pump turned on and off was measured at the fluid output of the indicated distance in feet from the controller (at a height of 3 feet above the ink container).



As indicated on the chart above, the pressure loss over a substantial horizontal length of tubing is considerably less than that of even a short vertical length. Once again, a 2.0 PSIG pressure differential is required between the ink regulator input and output. As indicated by the graph, the Series-1 ink delivery system can support ink line lengths of up to 300 feet.

NOTE: Always be extremely careful to follow any local codes covering the installation of pressurized liquid lines. Additionally, avoid potential entanglement in other equipment.

Appendix F: Maximum dpi Calculation

The maximum line speed of an I.V. printhead is limited by the maximum frequency of the solenoid, which is 1000 Hz. The following steps will determine the operating frequency of the solenoids in the application. The attached graph can also be used to determine the maximum print resolution for a given line speed.

1. Determine the values for:

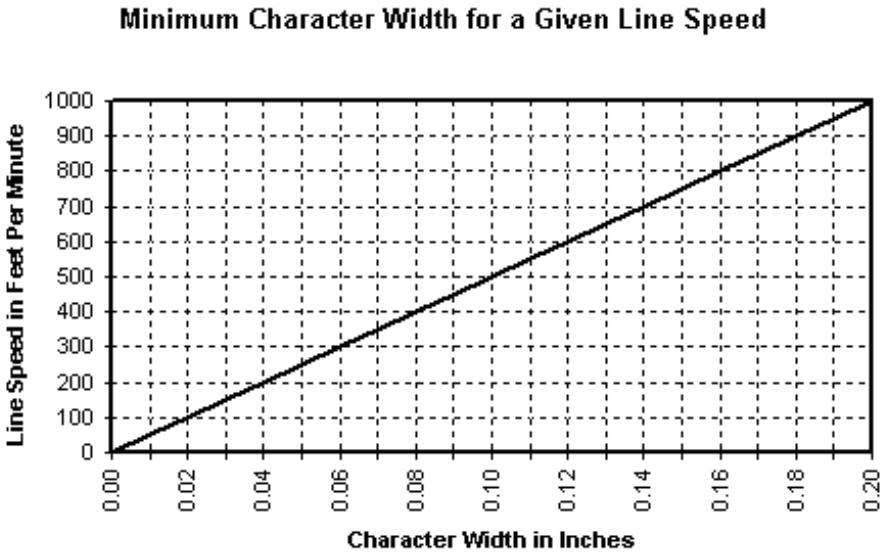
- Line speed in feet per minute: If a tachometer is not available, the line speed can be estimated by measuring the conveyor belt and using a stop watch to time one complete revolution of the belt. For example, a 20-foot, 7-inch conveyor belt takes 34 seconds to make a complete revolution. Divide 60 seconds by the number of seconds per revolution (34 in this case). Multiply the resulting number by the length of the belt (21 feet in this example; always round up to the next foot for this calculation). The answer is 37 feet per minute (60/34 x 21 = 37).
- Character Width in inches: In the Series 1, character width is selected through the software. This setting is measured in 0.01-inch increments; a setting of 4 means that the distance between the center of one dot column and the center of the next dot column is 0.04 inches. The character width must be set between 2 and 25.

2. The operating frequency of the solenoids can be determined with these two parameters by following the next two steps:

- Determine the line speed in inches per second. Divide the line speed in feet per minute by 5 to get inches per second. A line speed of 200 feet per minute is equal to 40 inches per second (200/5 = 40).
- Multiply the number of inches per second by the dpi setting to determine the solenoid operating frequency in Hz (cycles per second). Printing at 25 dpi, at a line speed of 40 inches per second, would result in a frequency of 1000 Hz (40 x 25 = 1000).

The operating frequency of an I.V. printhead must be less than or equal to 1000 Hz. If it exceeds 1000 Hz, the printhead will have reliability and print quality problems. In such a case, the best solution is to decrease the print resolution, which will decrease the operating frequency.

To determine the maximum print resolution for a given conveyor, divide 1000 by the conveyor speed in inches per second. Using the previous example, 1000 divided by 40 inches per second equals 25 dpi maximum print resolution. Even if a higher resolution is desired, the I.V. print head is not capable of it without encountering performance and reliability problems.



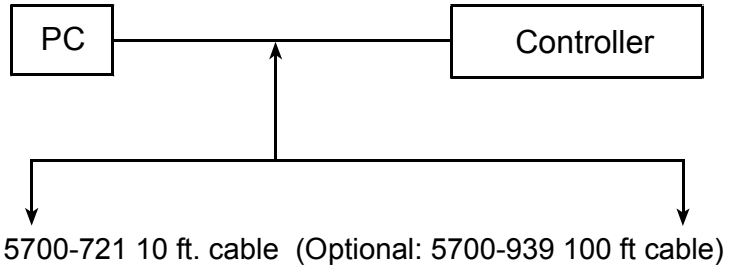
Appendix G: Host Interface Guide

This appendix applies only to PC-based systems.

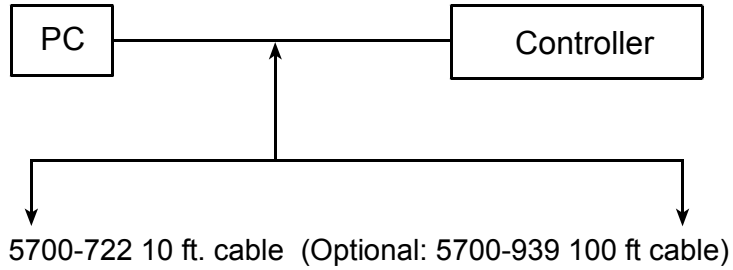
Defining the Interface

The Series 1 controller communicates to a PC or other host device through either RS-232 or RS-422 serial communications. There are three interface options shown below:

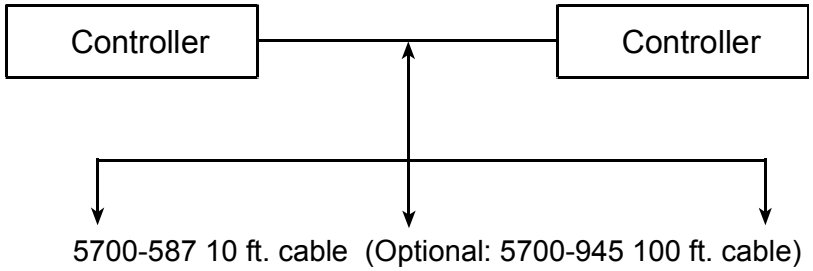
Option 1: PC (9-pin RS-232) to Controller



Option 2: PC (25-pin RS-232) to Controller



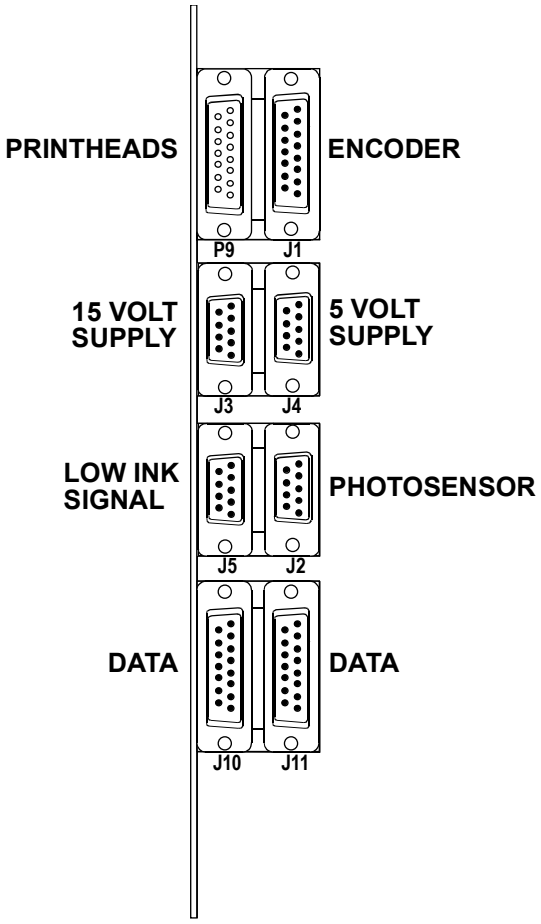
Option 3: Controller to Controller



The Connection

The Series 1 Controller houses an interface board and one or two logic boards. The interface board enables the logic board(s) to communicate with the host through physical connections and if necessary, by serial standard conversion. When the interface board receives an RS-232 connection, it converts the RS-232 signal to RS-422 for communication with the logic boards.

The interface board has two data ports that provide the same functionality at either connection. These ports enable loop communications for up to 16 logic boards in multi-drop configurations by cross-connecting interface boards.



Connection Functionality

The serial ports operate with four signals and a ground:

- Data In (RX)
- Data Out (TX)
- Request to Send (RTS)
- Clear to Send (CTS)

RX and CTS are input signals to the logic board while TX and RTS are outputs from the logic board.

Table 20: J10 and J11 Pinouts

Pin #	Function	Pin #	Function	Pin #	Function
1	Ground	6	232RX	11	TXD-
2	RXD+	7	232TX	12	RTS-
3	TXD+	8	232CTS	13	CTS-
4	RTS+	9	+VCC (+5VDC)	14	232DTR
5	CTS+	10	RXD-	15	+VDD (+15VDC)

The host sends the CTS (high) when it is ready to receive data from the logic boards. The CTS is normally high, since input is minimal and buffer storage is not usually a problem.

The logic boards send the RTS when they are ready to receive data from the host. The RTS is very important for proper communication with the logic boards; using the RTS to enable and disable the host transmitter is highly recommended.

In a multi-drop configuration, the transmitters for each logic board are disabled and therefore, effectively disconnected from the circuit. Sending data to the host from the logic board enables the logic board transmitter.

Protocol

The default setting is 9600 baud, 8 data bits, 1 stop bit, even parity; set by DIP switch 4 and the baud rate jumpers on the logic board.

Table 21: Baud Rate Settings

Baud Rate Jumpers	DIP Switch 4 ON CRC ON	DIP Switch 4 OFF CRC OFF
C	9600	38400
D	4800	19200
E*	2400	9600
F	1200	4800
G	600	2400
H	300	1200
*Default Setting		

DEFAULT SETTING

H	G	F	E	D	C
O	O	O	O	O	O
O	O	O	O	O	O

DIP switch 4 also determines the need for a cyclical redundancy checksum (CRC). An OFF setting indicates the signal is even parity without a CRC. If it is ON, the signal has no parity and a two-byte CRC must follow each message.

CRC Calculation Program

The following code is written in C:

/*CRCO

Factor a new character into the running CRC value .2

From 'EDN' magazine 6/4/79 page 84.

Based on the CCITT standard polynomial:

X ^ 16 + X ^ 15 + X ^ 13 + X ^ 7 + X ^ 4 + X ^ 2 + X + 1

The algorithm is:

1. Shift CRC word left one bit (i.e., double it), saving carry in Q-bit.
2. Add new character to low byte of CRC only, ignoring carry.
3. If Q-bit not zero, then EXCLUSIVE OR the CRC word with hex A097. The Q-bit represents Xö16, the hex value A097 is the rest of the above polynomial.

The CRC word is kept as two bytes and should be initialized to 0, before the first call to this routine.

*/

```
char crclow, crchigh:


crc0 (newchar)
```

```
char newchar;
{
      char qbit:,

/* Set Q bit true if left shift will produce carry out of high CRC byte */
   qbit = crchigh > 127;

/* Shift CRC word left one bit (i.e. double it) */
   crchigh += crchigh;              /* Add high CRC byte to itself */
   if (crclow > 127) crchigh += 1; /* Add carry from low CRC byte */
   crclow += crclow;                /* Add low CRC byte to itself 8?

/* Add new character to low byte of CRC only, ignoring carry. */ crclow += newchar;

/* If Q-bit not zero, then EXCLUSIVE OR the CRC word with hex A097. */
   If (qbit) {
                  crchigh ^= 0xA0;
                  crclow ^= 0x97;
     }
}
```

Syntax

Logic boards only respond to requests from the host-they transmit nothing without a request. All communication between the host and the logic board(s) share the format shown in the table below:

Pseudo-code	STX ØxØ2h	Logic Board #	Byte Count	Command Byte	Message/ Data	Optional CRC
Bytes	1	1	1	1	Variable	2

STX: Start text character, hex Ø2

Logic Board # Address number of the logic board. DIP switches 5 through 8 set the binary address (0-Ah) of each logic board (see *Section 5, Installation,* for address number combinations). FFh is a global address and will transmit a message to all logic boards in a multi-board system. All logic boards will react to the message but not return a response.

Byte Count: Length, in bytes, of the message portion of the transmission that begins immediately after the byte count byte. The CRC, if implemented, is not included.

NOTE: If the message (command plus parameters) is greater than the byte count value, the logic board will ignore the additional bytes after the specified byte count. If the message is smaller than the byte count value, the logic board will hang while waiting for more characters until a time-out occurs. In either case, if a CRC is part of the transmission, the entire message will be ignored since the CRC will not match the count.

Command Byte: Actual desired action.

Message/Data: Requisite data for the designated command.

Information Exchange

The basic exchange of information consists of the host requesting or sending information followed by the logic board's response. There are four possible logic board responses:

1. **ACK** acknowledge, (06h)
2. **NAK** negative acknowledge, (06h)
3. **S** status, (53h) followed by ten bytes of status information
4. **P** parameter, (50h) followed by four bytes of configuration information

Every message from the host must receive a positive acknowledgment from the logic board. The sole exception is the FFh global address to all logic boards. In the case of a status request or parameter request, sending the status or parameter message acknowledges receipt of the request. For all other messages, the logic board sends an acknowledge (ACK 06h) message, if it received the message from the host. If the logic board does not respond within 50 milliseconds, the host should re-transmit. If repeated transmissions fail, the host should use Reset to reset the logic board. The ACK indicates the logic board received the request and will process the request.

NOTE: Once the host begins transmitting to a logic board, it must transmit each byte within 200 milliseconds of the previous byte or the logic board will have a time-out, assume that part of the message is missing, and discard the entire message.

Message Example

Send the message "ABC" to logic board one (address Øh) to print on every box. The default is 9600, 8, 1, e (no CRC).

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	04	45 41 42 43	N/A
Decimal	2	0	4	69 65 66 67	N/A

Response from the logic board:

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	06	N/A
Decimal	2	0	1	6	N/A

Printing from Keyboard via DOS

The following procedure sends a command to the controller, address 2, to print ABC.

From the DOS prompt type:

MODE COM1 : 96, E, 8, 1 <ENTER> (substitute proper COM port if COM1 is not correct)

COPY CON COM1 <ENTER>

Complete the following keystrokes:

Press CTRL+B

Release the CTRL+key

Press CTRL+A

Release the CTRL+key

Press CTRL+D

Release the CTRL+key

Type EABC

Press CTRL+Z <ENTER>

The screen should display:

^B^A^DEABC^Z

With the proper connections from the PC to the controller, you should now be able to print the letters ABC on printheads 2, 3, 5, 6, 8, 12, 13, 15 and 16.

Logic Board Configuration

The logic board powers up lacking a print message, but is otherwise ready to print. It will print using the default font (9-dot bold), and the default character width/spacing (currently .08" and 3 dot columns, respectively). The sequence number is initialized to 1. Time and date are not initialized, they must be sent to the logic board before being used in a message.

When the logic board is initialized, it will show Ready status. This indicates that it is ready to receive a print string from the host. The message may be up to 149 characters long and it may include autocodes (enclosed by braces { }) for time, date and sequence number. If you use autocodes, the message after insertion of the variable information must still be no more than 149 characters long.

After sending the message, the logic board is ready to print and waiting for a box. Sending a new message to the logic board before it has started to print, will overwrite the old message.

To change character width and spacing anytime, use the set spacing command. To change the font, clear any font already loaded into the logic board (not the default font) by setting the first data character in the first font message to FF (hex).

CAUTION: It is possible to manually reset a logic board while it is in operation. This will cause the logic board to stop communicating with the host for 2.8 seconds and lose all its configuration data.

Messages from Host to Logic Board

Function	Hex	Decimal	Symbol	Page
Reset	14	20	DC4	8
Disable	13	19	DC3	9
Status request	05	5	ENQ	10
Parameter request	12	18	DC2	11
Print once	11	17	DC1	12
Print every box	45	69	E	13
Set spacing	53	83	S	14
Set time/date	54	84	T	15
Set sequence #	4E	78	N	16
ACK previous	41	65	A	17
Font download	46	70	F	18

Reset: DC4 (hex 14 or dec 20)

This message tells a logic board to perform a software (fast) reset without executing diagnostics. This operation takes 65 milliseconds and the logic board will not respond to any message during this time. A fast reset will not reset your date, counts, or date format (European date set in spacing command).

Code from host to logic board in hex to reset logic board 1 (02 00 01 14):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	14	N/A

Response code from logic board to host in hex (02 00 01 06):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	06	N/A

Disable: DC3 (hex 13 or dec 19)

This message used when printing, causes the logic board to become inactive. It will print the next photocell trigger only, then stop printing. Any Status requests after a disable, returns an idle status. Print will resume on a new print command.

Code from host to logic board in hex to reset logic board 1 (02 00 01 13):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	13	N/A

Response code from logic board to host in hex (02 00 01 06):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	06	N/A

Status request: ENQ (hex 05 or dec 5)

This message tells the logic board to respond with a status message.

Code from host to logic board in hex to reset logic board 1 (02 00 01 05):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	05	N/A

Response code from logic board to host in hex (02 00 0B 53 41 14 00 00 30 30 30 30 30 31):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	0B	53 4114 00 00 30 30 30 30 30 31	N/A

This is the response from a logic board just powered up with only power and communications connected.

The 53 or (S) is the return byte indicating a status return.

The 41 and 14 are the status bytes.

The 00 and 00 are the 2 byte return for line speed.

The 30 30 30 30 30 31 or (000001) is the sequence count.

For a full description of the status return, review the section on messages from the logic board to the host.

Parameter request: DC2 (hex 12 or dec 18)

This message tells a logic board to send the host its operating parameters, in a parameter message.

Code from host to logic board in hex to reset logic board 1 (02 00 01 12):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	12	N/A

Response code from logic board to host in hex (02 00 05 50 38 04 03 08):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	05	02 00 05 50 38 04 03 08	N/A

NOTE: The four bytes 38 04 03 08 = 0434 binary value of indent rotary switches (decimal value = 10.8"). Bytes 03 08 = character space and character width.

Print message once: DC1 (hex 11 or dec 17) followed by text.

Use this message to only print on the next box. A new DC1 message is needed for each box. The text may include autocode fields, such as time, date and sequence number. When the message prints, the logic board will insert the correct values for the autocodes.

If the first byte of the text is the control character, BEL (hex 07), the logic board will repeat the previous text, updating any appropriate autocode fields.

Code from host to logic board in hex to reset logic board 1 (02 00 02 11 41):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	02	11 41	N/A

Response code from logic board to host in hex (02 00 01 06):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	06	N/A

This will cause the logic board to print the letter "A" on the next box only. "A" is hex 41.

Print every box: E (hex 45 or dec 69) followed by text.

Use this message, similar to the DC1 message, to print on boxes. However, the logic board will print the text on every box without further commands from the host. If the text includes autocode fields such as, time, date, and sequence number, the logic board will insert the correct values for each box printed.

Code from host to logic board in hex to reset logic board 1 (02 00 02 45 41):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	02	45 41	N/A

Response code from logic board to host in hex (02 00 01 06):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	06	N/A

This will cause the logic board to print the letter "A" on all boxes without any further actions from the host. "A" is hex 41.

Set spacing: S (hex 53 or dec 83) with spacing parameters.

Use this message to set the number of blank column spaces between two printing characters and determine the width of the characters. It also sets the a flag for the European date format.

Spacing is a byte value of the number of blank dot columns between characters.The default is currently 3 (decimal).

Width is a byte value of the distance between dot columns in.01 inch units. The default width is currently.08 inches or 8 (decimal).

Options byte 1 and 2 are byte values that allow the host to set special options in the logic board. By setting bit 0 in Option 1, the logic board will use the European form for printing variable date fields. The remaining 15 bits are reserved for future use. To guarantee compatibility with future logic board versions, all should be zero.

Code from host to logic board in hex to reset logic board 1 (02 00 05 53 09 04 01 00):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	05	53 04 09 01 00	N/A

Response code from logic board to host in hex (02 00 01 06):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	06	N/A

The above message will set the column width of a printing character to.09, the dot columns between characters to 4 and the date autocodes to the European date format.

Set time /date: T (hex 54 or dec 84) H1 H2 M1 M2 J1 J2 J3 Y1 Y2

The host sends this message to set the current time and date in the logic board. All values are ASCII digits, high- order digits first.

H1 and H2 are the hour of the day (00 to 23), M1 and M2 represent the minutes (00 to 59). Seconds are set to zero, upon receipt of this message. J1, J2, and J3 are the Julian dates (the day of the year from 001 to 366 (leap year)). Y1 and Y2 are the last two digits of the year.

It is recommended that this message be sent to ALL logic boards simultaneously (using hex FF for the logic board ID #) to guarantee that all the logic boards on one line are properly synchronized.

NOTE: Remember that if you use address FF and no response comes back from any of the Controllers, you must poll for ACK.

Code from host to logic board 1 in hex (02 00 0A 54 31 30 33 30 30 30 31 39 35):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	0A	54 31 30 33 30 30 30 31 39 35	N/A

Response code from logic board to host in hex (02 00 01 06):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	06	N/A

The above message sets the time and date to 10:30 am Jan1, 1995.

Set sequence #: N (hex 4E or dec 78) N1 N2 N3 N4 N5 N6

The host sends this message to set the current box sequence number used in printing the sequence number variable field. N1 through N6 are six ASCII digits, with the most significant digit first. The logic board increments this value by one after printing each box.

Code from host to logic board 1 in hex (02 00 07 4E 30 30 30 30 30 31):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	07	4E 30 30 30 30 30 31	N/A

Response code from logic board to host in hex (02 00 01 06):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	06	N/A

This will set the sequence count to 000001 so the next box to print will be "1" if using the {N} sequence count autocode. Setting the sequence to 000000, will print a "0" on the next box.

Acknowledge previous: A (hex 41 or dec 65)

The logic boards will not directly acknowledge a message sent to ALL logic boards simultaneously (using hex FF for the logic board ID#), because their replies might conflict on the shared RS-232 data line. After sending an ALL logic boards message, the host should query each logic board individually using the "acknowledge previous" message. If the logic board received an ALL logic boards message, which it has not yet acknowledged, it will respond with an ACK (hex 6). Otherwise, it will return a NAK (hex 15).

Code from host to logic board 1 in hex (02 00 01 41):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	41	N/A

Response code from logic board to host in hex (02 00 01 06):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	06	N/A

The above message will have a response of NAK (15 hex) if a previous message with the address FF was not received.

Font message F: (hex 46 or dec 70) [Reset Font] [Character definitions]

A font defines the character set used when printing messages. The ROM on the logic board contains a standard font. To print using another font, you must first download the font to the logic board via a series of font messages. Any characters not updated by a font message will continue to use the previous font definition.

Font messages share a common format. The first byte is the letter F (hex 46 or dec 70) followed by an optional "reset font" byte (hex FF or dec 255) and as many character definitions as will fit into the remainder of the message. The data portion of the message must be no longer than 100 (decimal) bytes. If the "reset font" byte is present, the logic board will return to the standard font defined in the on-board ROM, before the processing and char-

acter definitions. A font message, with only a "reset font" byte will restore the standard font. A hardware or software logic board reset also causes the logic board to return to the standard font defined.

A character definition consists of the ASCII code for the character, followed by two bytes of information for each column in the character. These bytes define which rows in that column of the character, will fire an ink dot, or will not fire leaving a white space. A set bit represents an ink dot. The rows are numbered from the top; the columns are ordered from left to right. Included in the two bytes is an end- of-character bit, which marks the last column in a character definition.

The two column definition bytes are defined below:

Byte 1:

MSBLSB

0 - 0 - Row 1 - Row 3 - Row 5 - Row 7 - Row 9 - 0

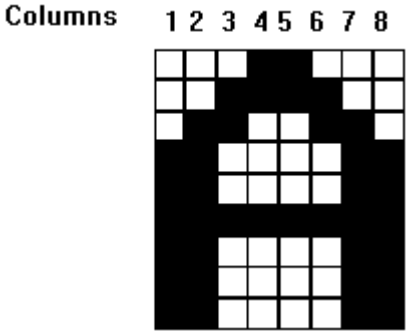
Byte 2:

MSBLSB

EOC - 0 - Row 2 - Row 4 - Row 6 - Row 8 - 0 - 0

The EOC is 0, except for the last byte of the character definition.

See the example font download below. (NOTE: Column 8 would have been 0E, 1C; however, the last column must have the MSB bit set making 1C + MSB = 9C.



Column	Description	
	Byte 1	Byte 2
1	0E	1C
2	1E	1C
3	10	28
4	20	28
5	20	28
6	10	28
7	1E	1C
8	0E	9C

Description of column 1

Row #					1	2	3	4	5	6	7	8	9			
Column 1					0	0	0	1	1	1	1	1	1			
Byte 1	0		0		0		0		1		1		1		0	
Byte 2		0		0		0		1		1		1		0		0

Byte 1 = 00001110 = 0E

Byte 2 = 00011100 = 1C

Code from host to logic board in hex to send this font to logic board 1 (02 00 12 46 42 0E 1C 1E 1C 10 28 20 28 20 28 10 28 1E 1C 0E 9C):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	12	46 42 0E 1C 1E 1C 10 28 20 28 20 28 10 28 1E 1C 0E 9C	N/A

Response code from logic board to host in hex (02 00 01 06):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	06	N/A

This will download the "A" font created above to the letter "B" (42h).

Additional Messages from Host to Logic Board

Function	Hex	Decimal	Symbol	Page
Acknowledge	06	6	ACK	21
Non-acknowledge	15	21	NACK	21
Status	53	83	S	22
Parameters	50	80	P	24

Acknowledge: ACK (hex 06 or dec 06)

The logic board sends this command to acknowledge correct reception of a message, which requires no other response such as, a reset or disable message.

Non-acknowledge: NAK (hex 15 or dec 21)

The logic board sends this message in response to an "acknowledge previous" request from the host, if it has not received a message addressed to ALL logic boards (logic board ID# = hex FF or dec 255), or if it has already acknowledged the last such message.

Code from host to logic board in hex to reset logic board 1 (02 00 01 14):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	14	N/A

Response code from logic board to host in hex (02 00 01 06):

Pseudo-code	STX (ØxØ2h	Logic Board #	Byte Count	Command byte and parameters	Optional CRC
Hex	02	00	01	06	N/A

Status message: S (hex 53 or dec 83) Status 1, Status 2, Line speed, Sequence #.

A logic board sends this message in response to a status request. It consists of the character S, followed by ten bytes of information in the following format:

Status byte 1:

Error - Warning - Idle - Button - Prt every - Print - Dwnfnt - Ready

Error set if a condition exists which will prevent printing.

Warning set if a condition exists which requires operator action to avoid becoming an error.

Idle set if logic board is in idle status (disabled).

Button set if the message advance button on the logic board has been pressed since status was last sent.

Prt every set if the logic board is configured to print the same message on every box.

Print set if the logic board is currently indenting or printing on a box.

Dwnfnt set if the font printing is a downloaded font. Cleared if the font printing is the resident font from ROM.

Ready set if the logic board requires a new message to be loaded. This bit is set after a print is initiated unless "print every box" is in effect.

Status byte 2:

Low Ink - Spare - Indenting - Line Stop - Purge - Time - Bad Msg - Box

Low ink set if the ink reservoir needs filling. If this bit is set, the WARNING bit in status byte 1 will also be set.

Indenting set if the logic board is currently indenting a box in preparation for printing.

Line Stop set if pulses are not received from the encoder within a designated amount of time. If this bit is set, the WARNING bit in status style byte 1 will also be set.

Purge set if the logic board is currently purging.

Time set if the host has not set the time and date since the logic board's last full reset (power on or reset button pressed). Printing a message that contains variable data with this bit set will result in the fields printing with questions marks (?) instead of numerals. The logic board will retain the time, date, and sequence number through a fast reset sequence (i.e., one initiated by the host if the logic board is still operational). It is recommended that the host always send the time and date at system initialization. This bit then indicates when a logic board has gone through a full reset sequence.

Bad msg set if a box has been detected and the logic board cannot print because the host has sent no text message, or the host has sent text containing a syntax error, such as a bad variable field specification. Note that the text will not be interpreted until a box is detected, so this bit will not be set until then. If this bit is set, the ERROR bit in status byte 1 will also be set.

Box detect set if a box has been detected but indenting or printing has not yet begun.

Line speed: Number of containers printed in the last 60 seconds (two-byte binary value, updated every 15 seconds).

Sequence number: Sequence number of the container to be printed after the NEXT box detect. This command generates six ASCII digits (most significant first), incremented after the message for each container, following the box detect.

Parameter message: P (hex 50) followed by three parameters:

Delay switch setting: current setting of the print delay (indentation) thumbwheel switches in 0.01 inch units (2-byte binary).

Character spacing: number of blank dot columns between adjacent characters (1-byte binary).

Character width: distance between print dot columns in 0.01 inch units (1-byte binary).

NOTE: Whenever a two byte binary value is transmitted, the low order (least significant) byte is sent first, followed by the higher byte order.

Appendix H: Font Samples

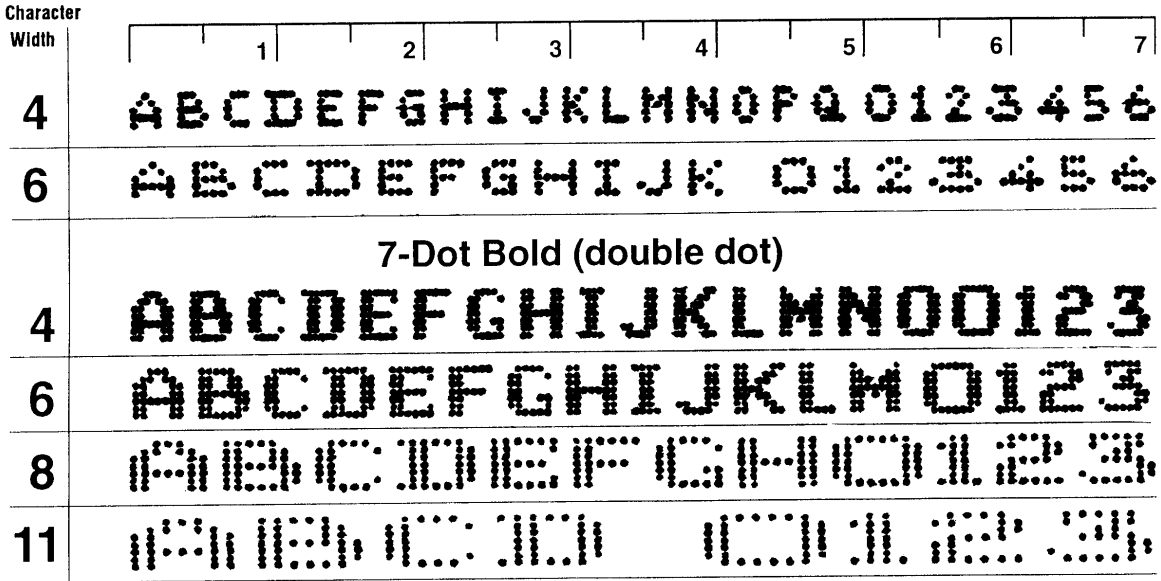
Diagraph.
INK JET SYSTEM

I.V./900 Series
5/16"-1/2" Printhead Sample Chart

The 5/16"-1/2" printhead can produce single lines of 7-dot tall, 5/16" characters or 9-dot tall, 1/2" characters. Character appearance is affected by weight and width. The "Character Weights" available are single dot, bold (double dot) and extra bold (triple dot). The "Character Width" is the amount of space between dot columns and is measured in hundredths of an inch. For example, a Character Width of 8 means there are .08 of an inch between dot columns.

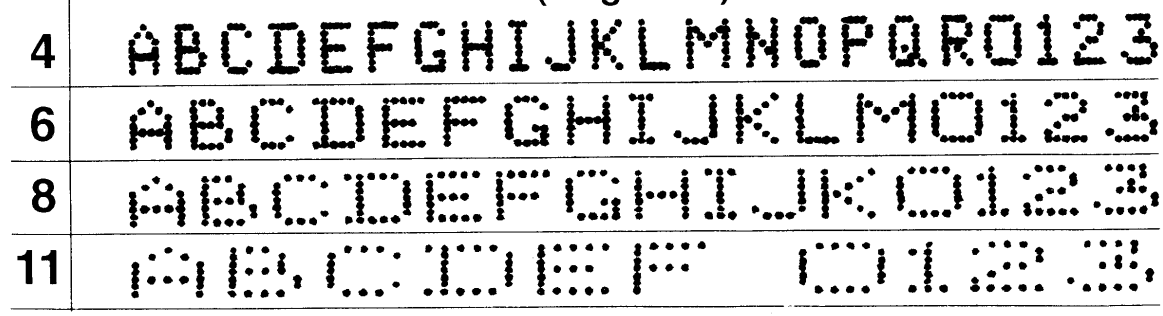
Width: Distance between columns

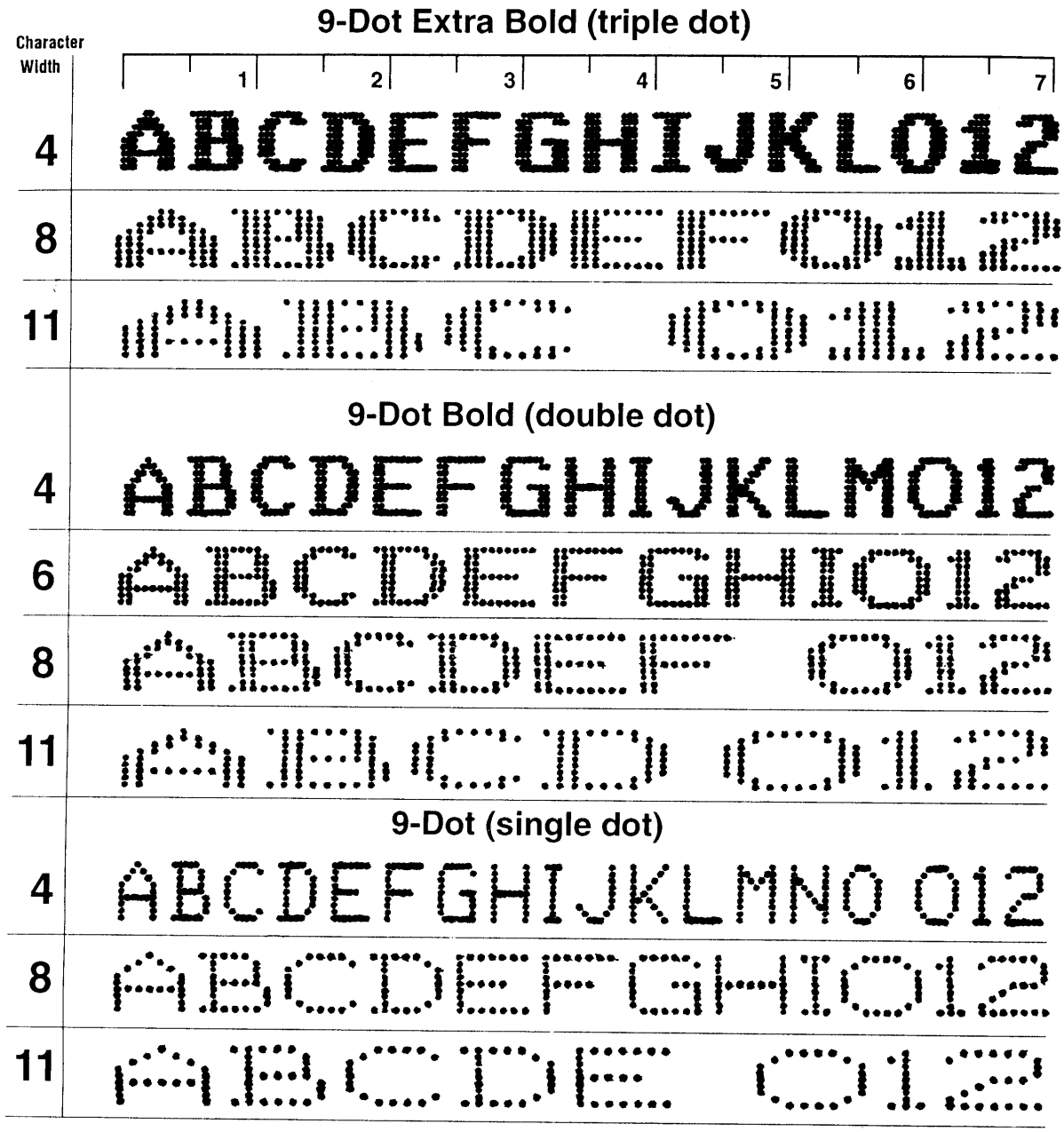
5-Dot (single dot)



7-Dot Bold (double dot)

7-Dot (single dot)





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Stock No. 5802-101 Form No. C-9504-5 Printed in U.S.A.

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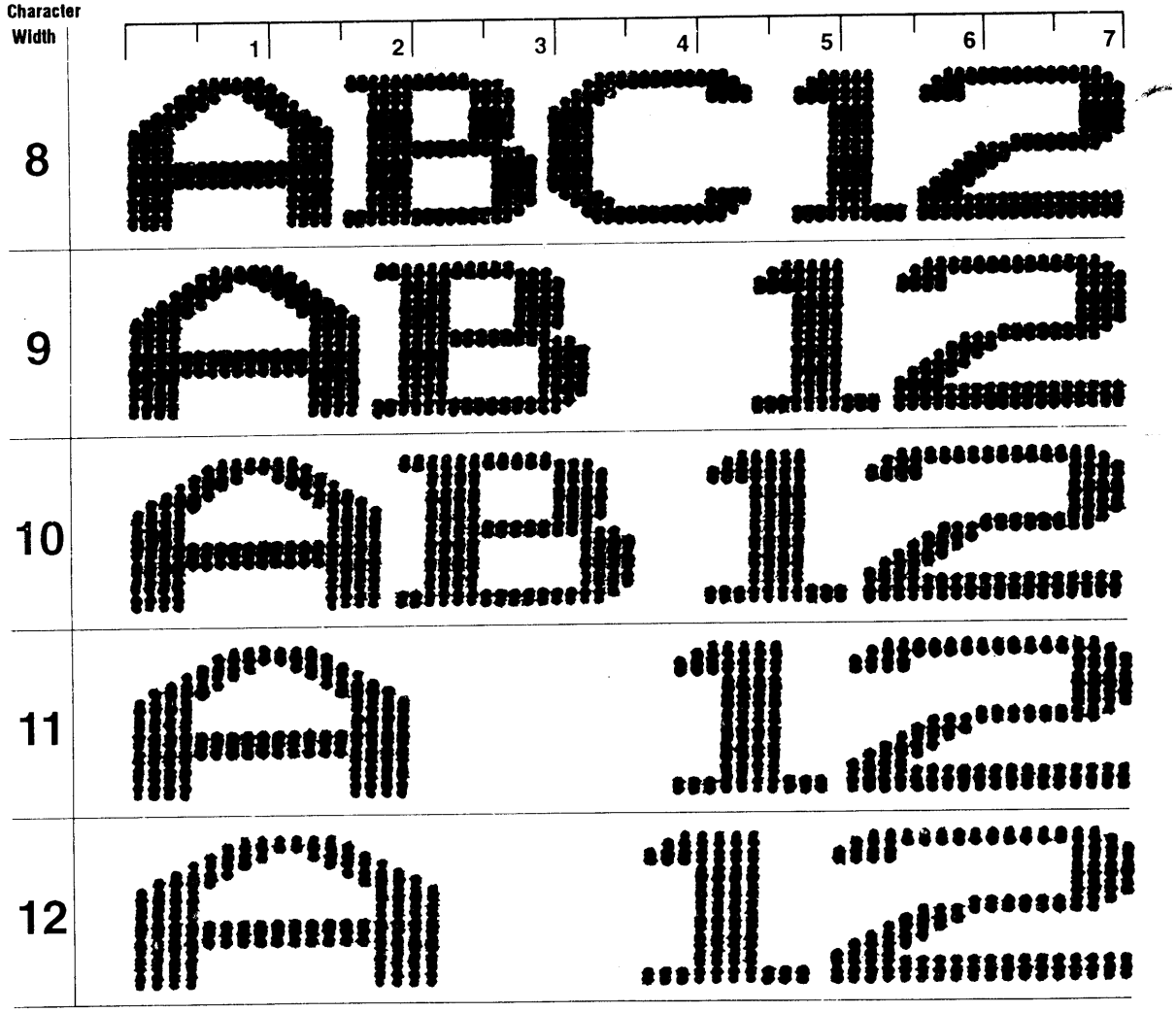
INK JET SYSTEM

I.V./1800 Series
3/8"-1" Printhead Sample Chart

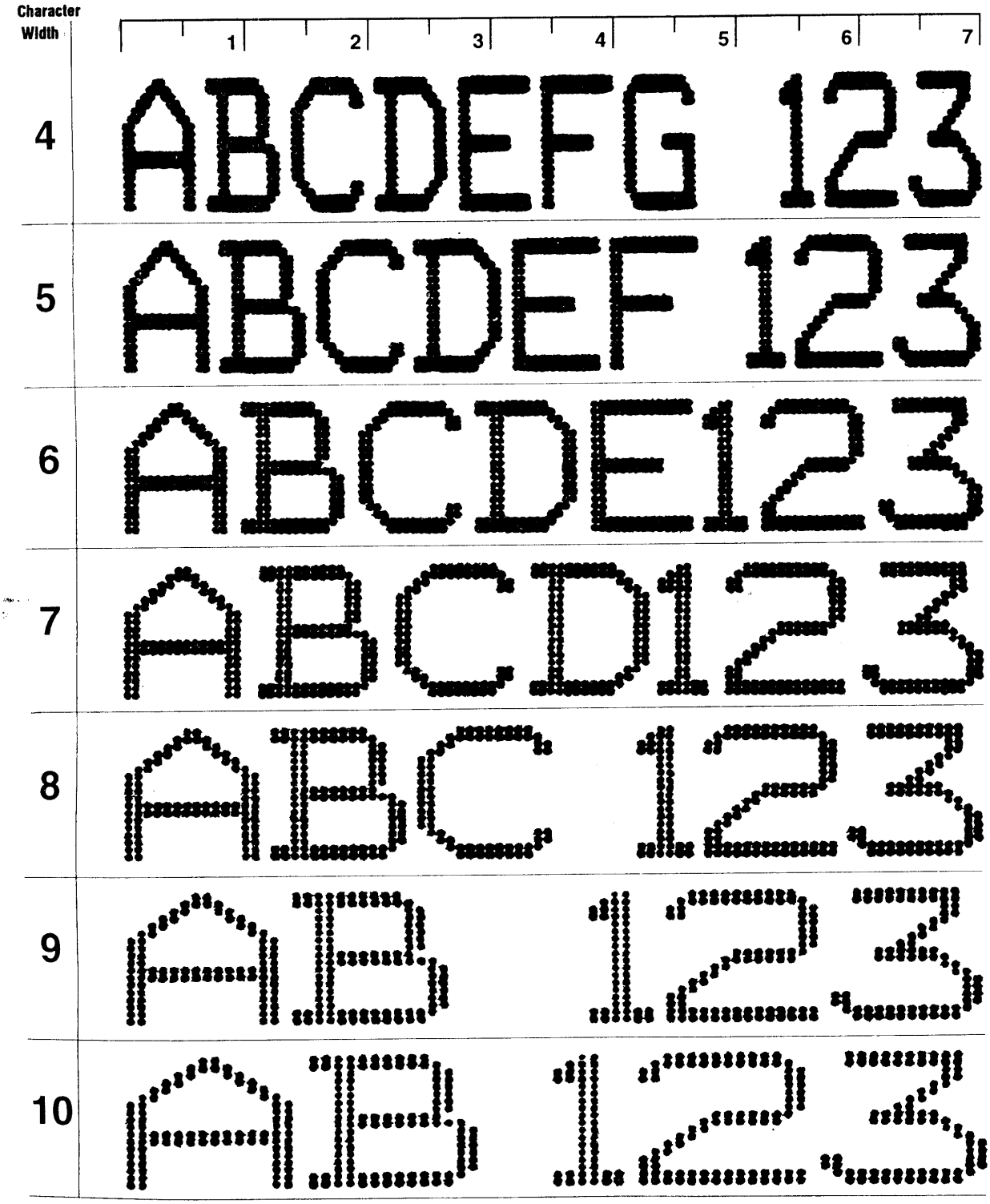
The 3/8"-1" printhead can produce a single line of 18-dot tall, 1" characters as well as, one or two lines of either 9-dot tall, 1/2" or 7-dot tall, 3/8" characters. Character appearance is affected by weight and width. The "Character Weights" available are single dot, bold (double dot) and extra bold (triple dot). The "Character Width" is the amount of space between dot columns and is measured in hundredths of an inch. For example, a Character Width of 8 means there are .08 of an inch between dot columns.

Width: Distance between columns

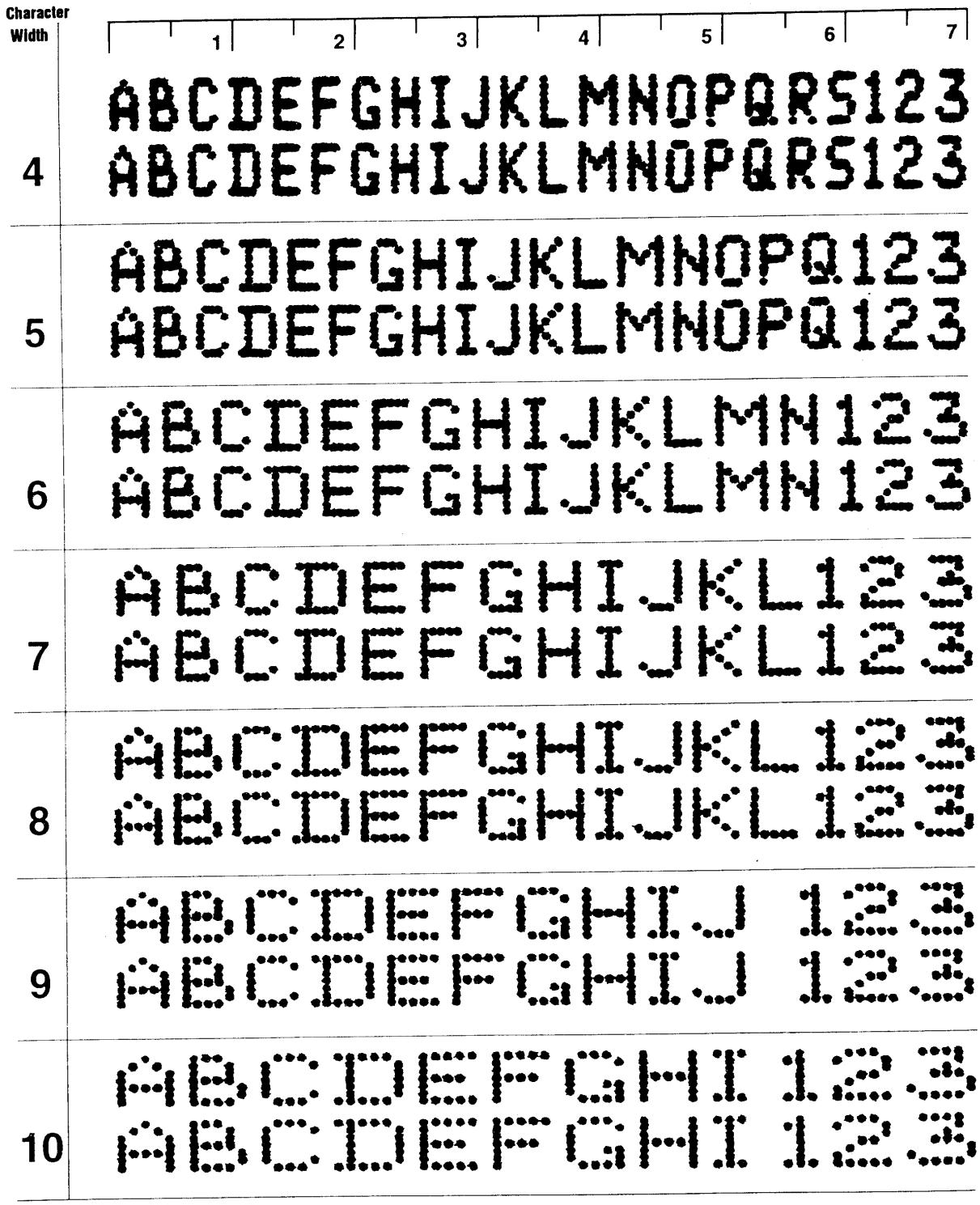
18-Dot Extra Bold



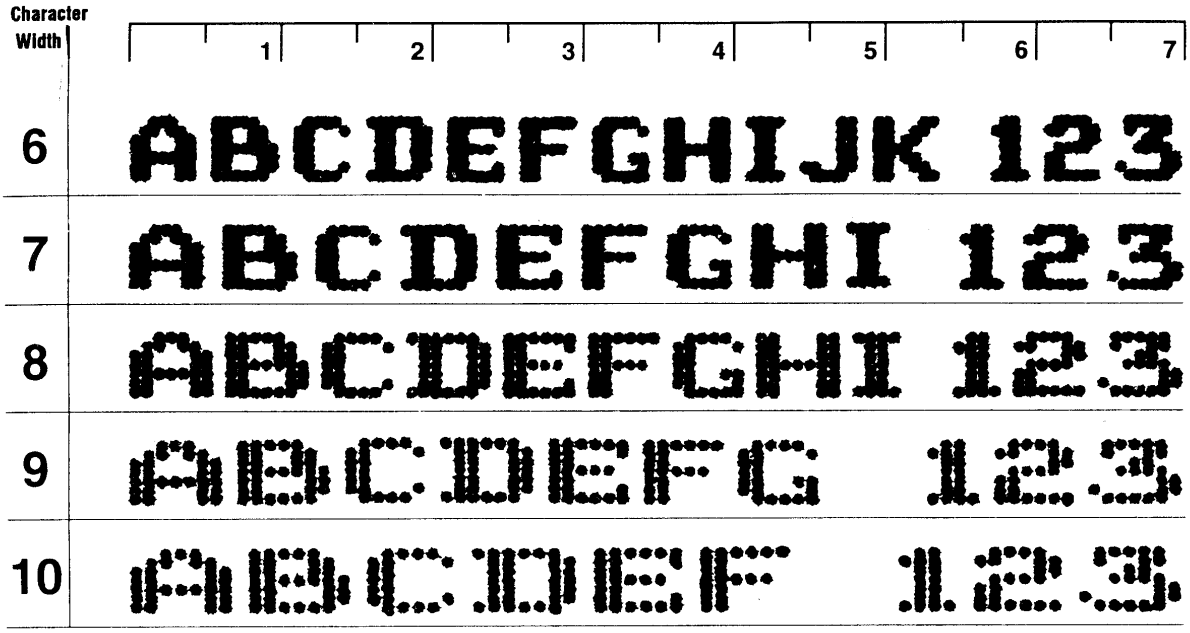
18-Dot Bold (double dot)



7-Dot (single dot)



7-Dot Bold (double dot)



Logo Samples

Diagraph

IMAGEBOND

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Diagraph CORPORATION

Stock No. 5801-994 Form No.C-9302-1 Printed U.S.A.

Appendix I: Glossary of Terms

Accumulator - Housed within the IDS, the accumulator stores ink for delivery to the printheads.

Autocode - A custom code entered into a message to print a variable such as date, time, pallet count or plant location.

Bracketry - Mounting hardware for ink jet system components.

Broken Message - A message that is broken into two or more pieces, usually from the encoder slipping.

Check Valve - A valve that allows air or liquid to flow in only one direction.

Columns Out of Alignment - Dot columns line up in a zigzag pattern.

COM - Abbreviation for a serial communications port on a computer. Usually expressed as "COM port" or associated with a number, "COM 1" or "COM 2".

Conditioner - A non-pigmented ink solvent designed for flushing and cleaning printheads and ink line components.

Controller - The heart of the ink jet system, this unit gathers information from the computer, the photosensor and the encoder, and facilitates the printing of messages by the printheads.

DIP Switches - A collection of small switches used to select options on a circuit board.

Dragging Type Dot Size Variation - Dots smaller than average, at the beginning of print only.

Dynamic Seepage - Ink seepage from orifices only during printing.

Encoder - This device gathers line speed information via a wheel rolling against a conveyor belt. The controller uses this information to determine when to send print signals to the printheads.

ESD - Electrostatic Discharge is a charge generated by separating or rubbing together two non-conductive materials. ESD can result in print problems or even damage to the ink jet system.

ESD Protection - Wrist straps, floor mats and other devices should be used when handling electronic components to minimize ESD.

Ethernet Port Server - A communications standard; connects asynchronous serial ports to an unshielded twisted pair (UTP) 10BASE-T ethernet connection at a baud rate of 230 Kbps.

Extra Dots - These are dots printed outside the designated dot columns.

Font - A complete set of characters - alphabetic, numeric and punctuation - in one typeface. The font used in this glossary is Arial.

IDS - The Ink Delivery System consists of a number of components working together to transfer ink from the ink pail to the printed product.

Ink Filter - A 100-micron filter located in the ink line to remove any impurities from the ink before it reaches the printhead.

Ink Regulator - This component is located in the ink line close to the printhead and, in conjunction with the ink pressure gauge, can be adjusted to regulate ink pressure to the printhead.

Interface Board - The interface board provides the interface between the logic boards and such external devices as the terminal, photosensor, encoder, printheads, etc.

Internal Dot Size Variation - Dots are different in size at the intersection of a dot column and a dot row.

Jumper - A small plug or wire that alters a hardware configuration by connecting different points in an electronic circuit.

LED - Light Emitting Diode. There are several LEDs in the Series 1 system, and they either illuminate or extinguish to indicate various operating conditions.

Logic Board - The logic boards control all printing and communication functions. Each logic board operates independently and controls one nine-dot printhead.

MSDS - A Material Safety Data Sheet contains federally mandated safety, environmental and disposal information about an ink or other potentially hazardous material.

NEMA - National Electrical Manufacturers Association, a trade organization that sets performance standards for the electrical industry.

Off Target Printing - One or more dots not printed in the expected location in the character.

Photosensor -- A device that emits a beam of light, and sends a print signal to

the controller when light is reflected back to it by a product passing on a conveyor.

Potentiometer - A variable voltage resistor that can be adjusted with a small screwdriver to effect voltage changes in printhead solenoids.

Pressure Gauge - This can be attached to the ink line and used to measure ink pressure, aiding the operator in making adjustments to improve print quality.

Print Indentation -The sum of two measurements: The distance from the photosensor to the center of the printhead, plus the distance from the leading edge of the product to the start of printing.

Printhead -- A solenoid-activated mechanism that propels ink droplets onto a moving surface.

Printstation - One or more printheads set up to mark a given product in a specified location.

psi - Pounds per Square Inch, a measure of pressure.

Pulse Width - The amount of time a printhead solenoid is on, one of the factors controlling the size of a printed dot.

RS-232 - Serial communication standard employed by personal computers. It defines three types of connection (electrical, functional and mechanical) usually used with 25-pin D-shaped connectors.

RS-422 - Serial communication standard which allows transmissions over long distances at high speeds.

Reference Drawings

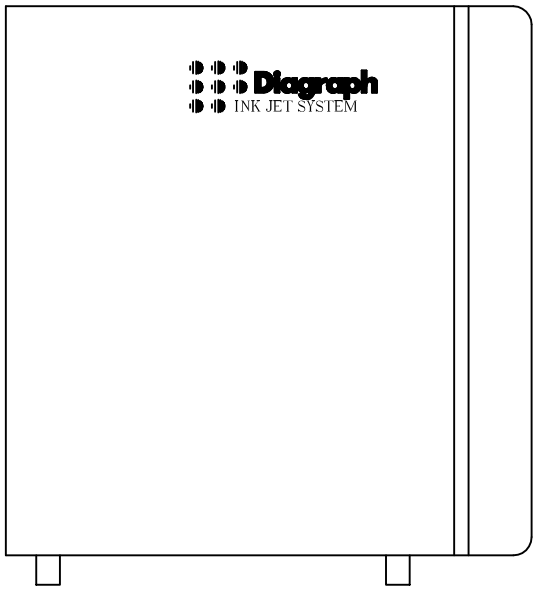
The following pages contain three categories of drawings, with each category arranged in numerical order.

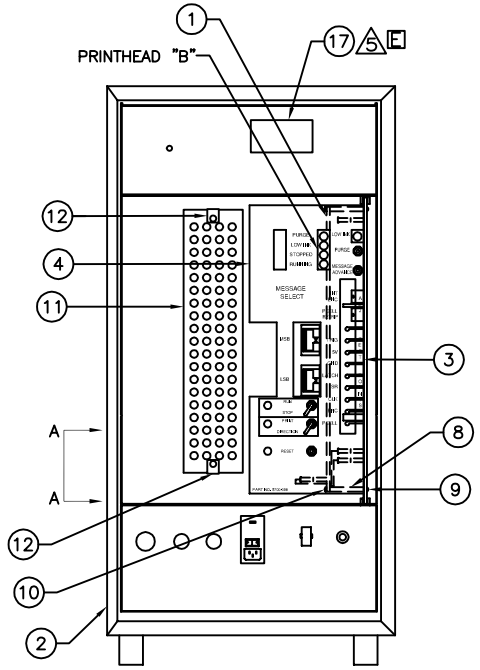
Controller Drawings

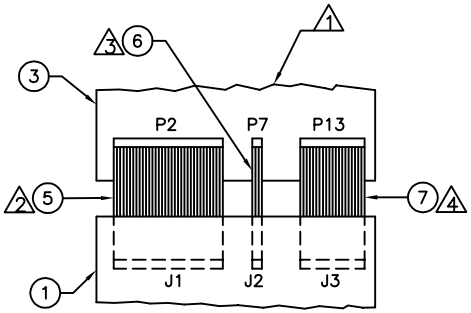
Eleven Series 1 controller options.

NOTES:

1. INSTALL CABLES AND ASSEMBLE BOARDS ONTO STANDOFFS BEFORE INSTALLING INTO CARD CAGE.
2. CONNECT (ITEM 5) BETWEEN P2 OF (ITEM 3) AND J1 OF (ITEM 1).
3. CONNECT (ITEM 6) BETWEEN P7 OF (ITEM 3) AND J2 OF (ITEM 1).
4. CONNECT (ITEM 7) BETWEEN P13 OF (ITEM 3) AND J3 OF (ITEM 1).
5. FORMAT ONE LABEL (ITEM 17) AND PLACE ONTO CONTROLLER. [E]
6. FORMAT THREE LABELS (ITEM 17) AND PLACE ONTO TOP, ONE END AND ONE SIDE OF SHIPPING BOX (ITEM 14). [E]
7. THIS DOCUMENT IS USED TO ASSEMBLE BOTH THE POROUS AND NON–POROUS CONTROLLERS. LABEL THE CONTROLLER AS POROUS OR NON–POROUS BY ADDING P FOR POROUS OR NP FOR NON–POROUS TO THE END OF THE DWG. NO. [E]
8. CAUTION: "NP" DESIGNATED UNITS ARE COMPATIBLE WITH NON–POROUS INKS ONLY. DO NOT USE POROUS INKS IN THESE UNITS. "P" DESIGNATED UNITS ARE COMPATIBLE WITH POROUS INKS ONLY. DO NOT USE NON–POROUS INKS IN THESE UNITS. [E]







DETAIL A–A

ITEM	PART NO.	DESCRIPTION	QTY	
17	5802–804	LABEL,MODEL & S/N,CE VERSION	4	E
16	5802–657	USER'S MANUAL	1	
15	8901–084	FOAM PACKING	1	
14	8901–083	SHIPPING BOX	1	
13	5700–756	DC1 CABLE ASS'Y	1	B
12	1199–241	NUT, #6–32 CLIP–ON	2	
11	5700–683	BLOCK OFF SCREEN, SERIES I	1	
10	1900–573	NUT, HEX NYLON #6–32	4	
9	5241–305	SCREW, #6–32 X 3/8 BUT HD	4	
8	5700–617	6–32 X 1.00 STANDOFF M–F	4	
7	5700–603	LOGIC TO INTR., 20 PIN CABLE	1	
6	5700–602	LOGIC TO INTER., 3 PIN CABLE	1	
5	5700–601	LOGIC TO INTR., 34 PIN CABLE	1	
4	5700–389	SWITCHPLATE, SERIES 1 SA99MS	1	D
3	5700–567AS	TM PLUS INTERFACE BOARD	1	
2	5700–801	SERIES I INK DELIVERY	1	
1	1902–714	PCB,LOGIC 3.5 SA99MS	1	

CNTRL, SA99MS SINGLE HEAD
5700802, REV E

NOTES:

1. INSTALL CABLES AND ASSEMBLE BOARDS ONTO STANDOFFS BEFORE INSTALLING INTO CARD CAGE.
2. CONNECT (ITEM 5) BETWEEN P2 OF (ITEM 3) AND J1 OF (ITEM 1).
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6. CONNECT (ITEM 6) BETWEEN P5 OF (ITEM 3) AND J2 OF (ITEM 1).
7. CONNECT (ITEM 7) BETWEEN P8 OF (ITEM 3) AND J3 OF (ITEM 1).
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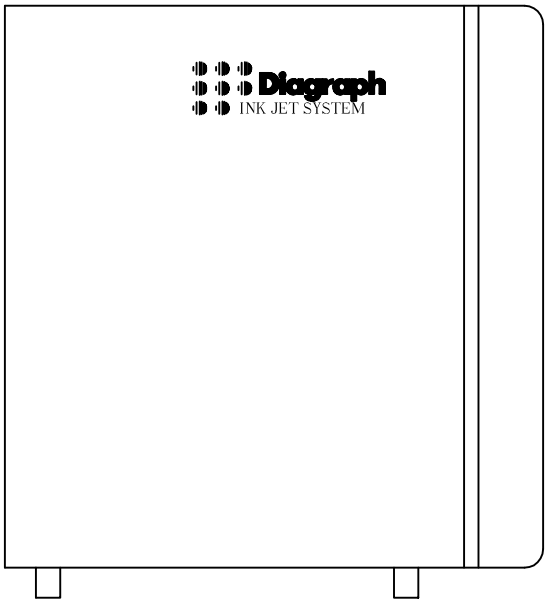

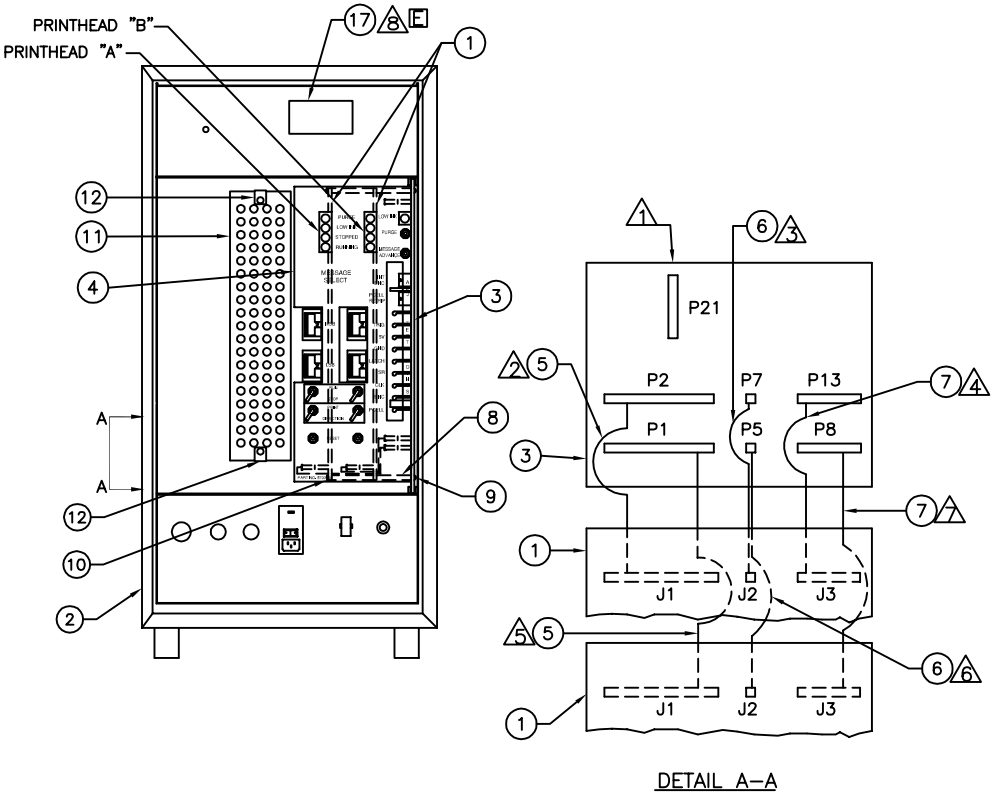

ITEM	PART NO.	DESCRIPTION	QTY	
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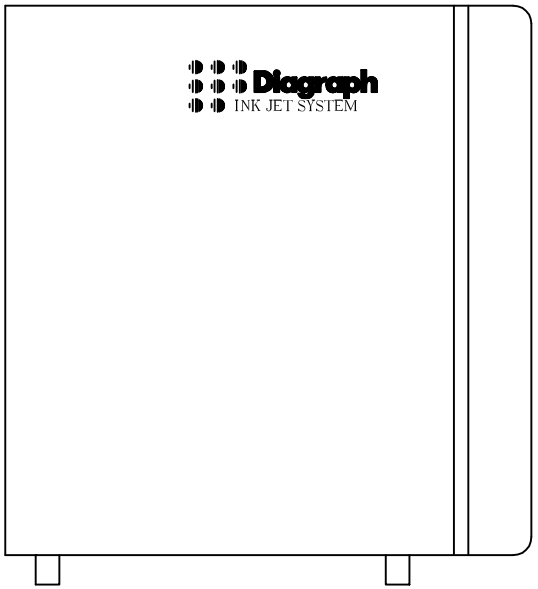
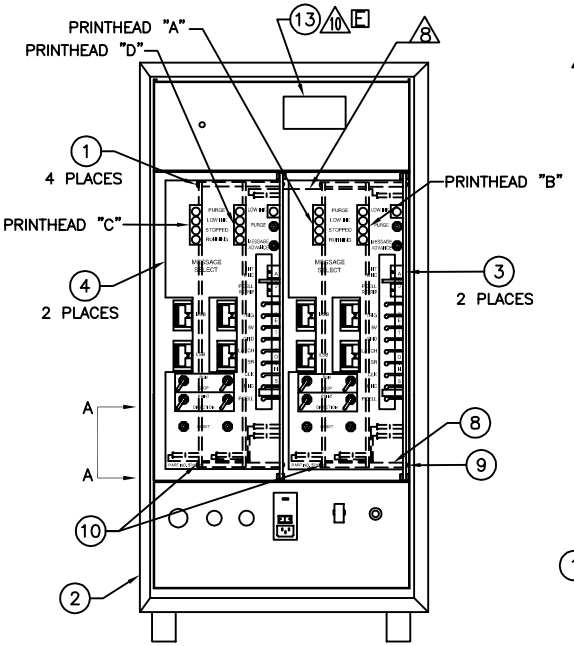
16	5802-657	USER'S MANUAL	1	
15	8901-084	FOAM PACKING	1	
14	8901-083	SHIPPING BOX	1	
13	5700-756	DC1 CABLE ASS'Y	1	B
12	1199-241	NUT, #6-32 CLIP-ON	2	
11	5700-683	BLOCK OFF SCREEN, SERIES I	1	
10	1900-573	NUT, HEX NYLON #6-32	4	
9	5241-305	SCREW, #6-32 X 3/8 BUT HD	4	
8	5700-617	6-32 X 1.00 STANDOFF M-F	8	
7	5700-603	LOGIC TO INTER., 20 PIN CABLE	2	
6	5700-602	LOGIC TO INTER., 3 PIN CABLE	2	
5	5700-601	LOGIC TO INTER., 34 PIN CABLE	2	
4	5700-389	SWITHPLATE, SERIES 1 SA99MS	1	D
3	5700-567AS	TM PLUS INTERFACE BOARD	1	
2	5700-801	SERIES I INK DELIVERY	1	
1	1902-714	PCB LOGIC,3.5 SA99MS	2	

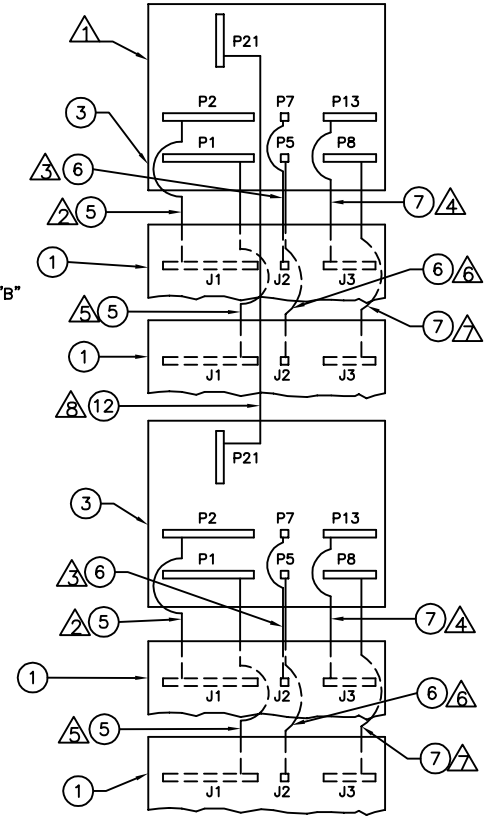
CNTRL, SA99MS DUAL HEAD
5700803, REV E

NOTES:

1. INSTALL CABLES AND ASSEMBLE BOARDS ONTO STANDOFFS BEFORE INSTALLING INTO CARD CAGE.
2. CONNECT (ITEM 5) BETWEEN P2 OF (ITEM 3) AND J1 OF (ITEM 1).
3. CONNECT (ITEM 6) BETWEEN P7 OF (ITEM 3) AND J2 OF (ITEM 1).
4. CONNECT (ITEM 7) BETWEEN P13 OF (ITEM 3) AND J3 OF (ITEM 1).
5. CONNECT (ITEM 5) BETWEEN P1 OF (ITEM 3) AND J1 OF (ITEM 1).
6. CONNECT (ITEM 6) BETWEEN P5 OF (ITEM 3) AND J2 OF (ITEM 1).
7. CONNECT (ITEM 7) BETWEEN P8 OF (ITEM 3) AND J3 OF (ITEM 1).
8. CONNECT (ITEM 12) BETWEEN P21 OF BOTH LOGIC BOARDS (ITEM 3).
9. INSTALL BOARD ASSEMBLY INTO CARD CAGE AND CONNECT DATA CABLE (ITEM 11) BETWEEN THE DATA PORTS OF BOARDS "B" AND "D".
10. [E] FORMAT ONE LABEL (ITEM 13) AND PLACE ONTO CONTROLLER.
11. [E] FORMAT THREE LABELS (ITEM 13) AND PLACE ONTO TOP, ONE END AND ONE SIDE OF SHIPPING BOX (ITEM 15).
12. [E] THIS DOCUMENT IS USED TO ASSEMBLE BOTH THE POROUS AND NON-POROUS CONTROLLERS. LABEL THE CONTROLLER AS POROUS OR NON-POROUS BY ADDING P FOR POROUS OR NP FOR NON-POROUS TO THE END OF THE DWG. NO.
13. [E] CAUTION: "NP" DESIGNATED UNITS ARE COMPATIBLE WITH NON-POROUS INKS ONLY. DO NOT USE POROUS INKS IN THESE UNITS. "P" DESIGNATED UNITS ARE COMPATIBLE WITH POROUS INKS ONLY. DO NOT USE NON-POROUS INKS IN THESE UNITS.







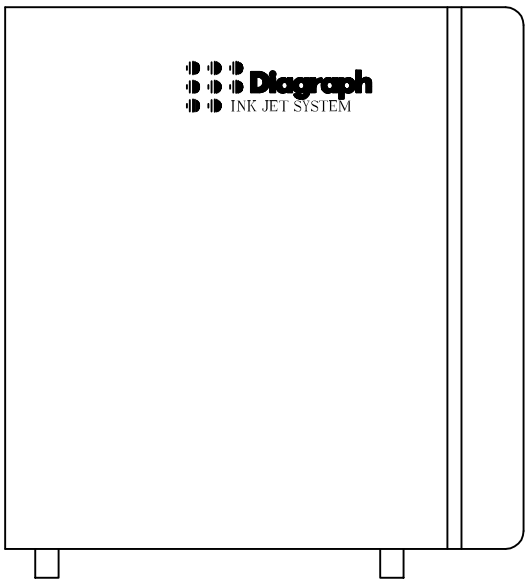
DETAIL A-A

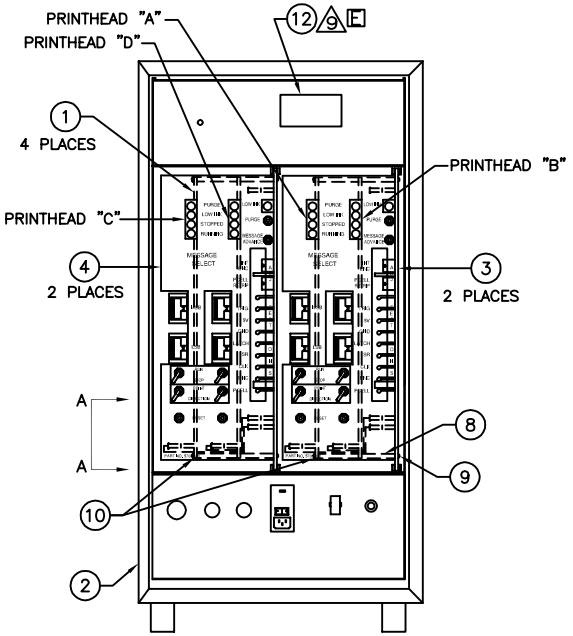
ITEM	PART NO.	DESCRIPTION	QTY	
17	5802-657	USER'S MANUAL	1	
16	8901-084	FOAM PACKING	1	
15	8901-083	SHIPPING BOX	1	
14	5700-757	DC2 CABLE ASS'Y	1	[B]
13	5802-804	LABEL,MODEL & S/N,CE VERSION	4	[E]
12	5700-705	CABLE ASSY, SERIES I, P21 TO P21	1	
11	5700-586	CABLE, INTER. TO INTER., 9"	1	
10	1900-573	NUT, HEX NYLON #6-32	8	
9	5241-305	SCREW, #6-32 X 3/8 BUT HD	8	
8	5700-617	6-32 X 1.00 STANDOFF M-F	16	
7	5700-603	LOGIC TO INTER., 20 PIN CABLE	4	
6	5700-602	LOGIC TO INTER., 3 PIN CABLE	4	
5	5700-601	LOGIC TO INTER., 34 PIN CABLE	4	
4	5700-389	SWITCHPLATE, SERIES 1 SA99MS	2	[D]
3	5700-567AS	TM PLUS INTERFACE BOARD	2	
2	5700-801	SERIES I INK DELIVERY	1	
1	1902-714	PCB LOGIC,3.5 SA99MS	4	

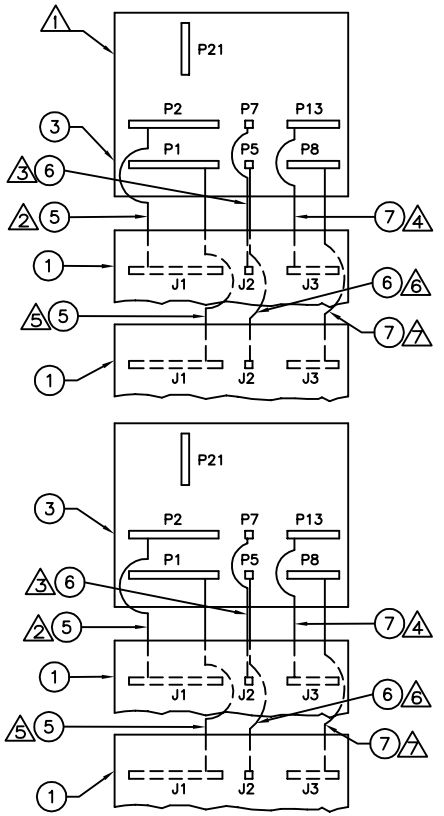
CNTRL, SA99MS QUAD HEAD
5700805, REV E

NOTES:

1. INSTALL CABLES AND ASSEMBLE BOARDS ONTO STANDOFFS BEFORE INSTALLING INTO CARD CAGE.
2. CONNECT (ITEM 5) BETWEEN P2 OF (ITEM 3) AND J1 OF (ITEM 1).
3. CONNECT (ITEM 6) BETWEEN P7 OF (ITEM 3) AND J2 OF (ITEM 1).
4. CONNECT (ITEM 7) BETWEEN P13 OF (ITEM 3) AND J3 OF (ITEM 1).
5. CONNECT (ITEM 5) BETWEEN P1 OF (ITEM 3) AND J1 OF (ITEM 1).
6. CONNECT (ITEM 6) BETWEEN P5 OF (ITEM 3) AND J2 OF (ITEM 1).
7. CONNECT (ITEM 7) BETWEEN P8 OF (ITEM 3) AND J3 OF (ITEM 1).
8. INSTALL BOARD ASSEMBLY INTO CARD CAGE AND CONNECT DATA CABLE (ITEM 11) BETWEEN THE DATA PORTS OF BOARDS "B" AND "D".
9. [E] FORMAT ONE LABEL (ITEM 12) AND PLACE ONTO CONTROLLER.
10. [E] FORMAT THREE LABELS (ITEM 12) AND PLACE ONTO TOP, ONE END AND ONE SIDE OF SHIPPING BOX (ITEM 14).
11. [E] THIS DOCUMENT IS USED TO ASSEMBLE BOTH THE POROUS AND NON-POROUS CONTROLLERS. LABEL THE CONTROLLER AS POROUS OR NON-POROUS BY ADDING P FOR POROUS OR NP FOR NON-POROUS TO THE END OF THE DWG. NO.
12. [E] CAUTION: "NP" DESIGNATED UNITS ARE COMPATIBLE WITH NON-POROUS INKS ONLY. DO NOT USE POROUS INKS IN THESE UNITS. "P" DESIGNATED UNITS ARE COMPATIBLE WITH POROUS INKS ONLY. DO NOT USE NON-POROUS INKS IN THESE UNITS.







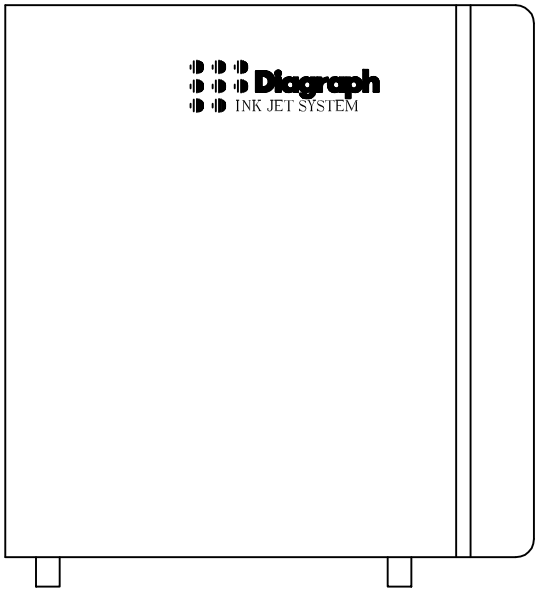
DETAIL A-A

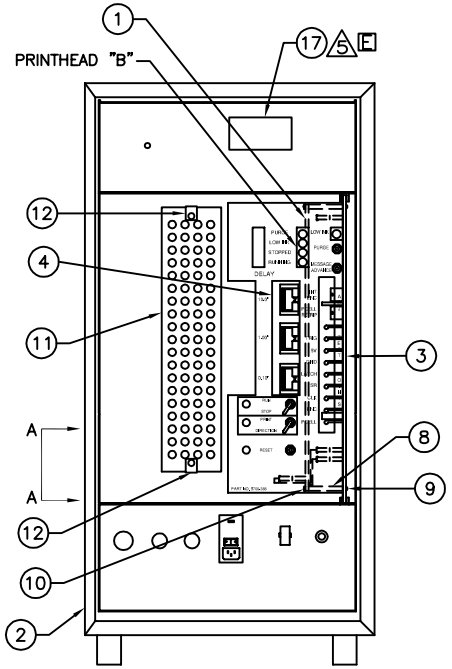
ITEM	PART NO.	DESCRIPTION	QTY	
16	5802-657	USER'S MANUAL	1	
15	8901-084	FOAM PACKING	1	
14	8901-083	SHIPPING BOX	1	
13	5700-757	DC2 CABLE ASS'Y	1	[B]
12	5802-804	LABEL,MODEL & S/N,CE VERSION	4	[E]
11	5700-586	CABLE, INTER. TO INTER., 9"	1	
10	1900-573	NUT, HEX NYLON #6-32	8	
9	5241-305	SCREW, #6-32 X 3/8 BUT HD	8	
8	5700-617	6-32 X 1.00 STANDOFF M-F	16	
7	5700-603	LOGIC TO INTER., 20 PIN CABLE	4	
6	5700-602	LOGIC TO INTER., 3 PIN CABLE	4	
5	5700-601	LOGIC TO INTER., 34 PIN CABLE	4	
4	5700-389	SWITHPLATE, SERIES 1 SA99MS	2	[D]
3	5700-567AS	TM PLUS INTERFACE BOARD	2	
2	5700-801	SERIES I INK DELIVERY	1	
1	1902-714	PCB LOGIC,3.5 SA99MS	4	

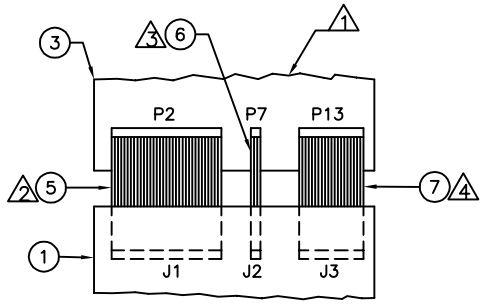
CNTRL, SA99MS QUAD HEAD, MULTI-TASKING, 5700807 REV E

NOTES:

1. INSTALL CABLES AND ASSEMBLE BOARDS ONTO STANDOFFS BEFORE INSTALLING INTO CARD CAGE.
2. CONNECT (ITEM 5) BETWEEN P2 OF (ITEM 3) AND J1 OF (ITEM 1).
3. CONNECT (ITEM 6) BETWEEN P7 OF (ITEM 3) AND J2 OF (ITEM 1).
4. CONNECT (ITEM 7) BETWEEN P13 OF (ITEM 3) AND J3 OF (ITEM 1).
5. [E] FORMAT ONE LABEL (ITEM 17) AND PLACE ONTO CONTROLLER.
6. [E] FORMAT THREE LABELS (ITEM 17) AND PLACE ONTO TOP, ONE END AND ONE SIDE OF SHIPPING BOX (ITEM 14).
7. [E] THIS DOCUMENT IS USED TO ASSEMBLE BOTH THE POROUS AND NON-POROUS CONTROLLERS. LABEL THE CONTROLLER AS POROUS OR NON-POROUS BY ADDING P FOR POROUS OR NP FOR NON-POROUS TO THE END OF THE DWG. NO.
8. [E] CAUTION: "NP" DESIGNATED UNITS ARE COMPATIBLE WITH NON-POROUS INKS ONLY. DO NOT USE POROUS INKS IN THESE UNITS. "P" DESIGNATED UNITS ARE COMPATIBLE WITH POROUS INKS ONLY. DO NOT USE NON-POROUS INKS IN THESE UNITS.







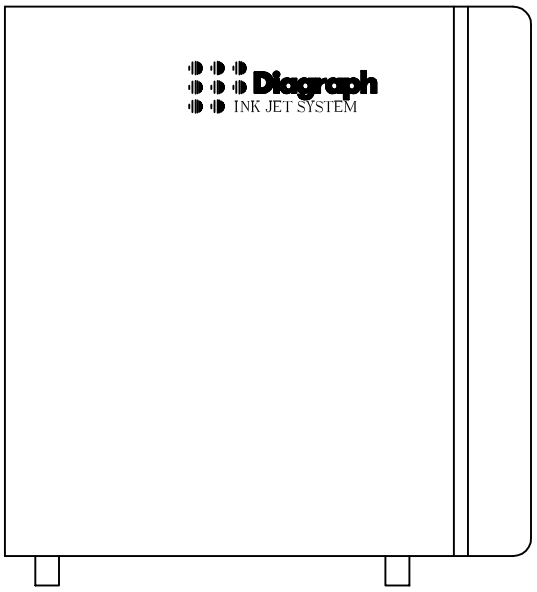
DETAIL A-A

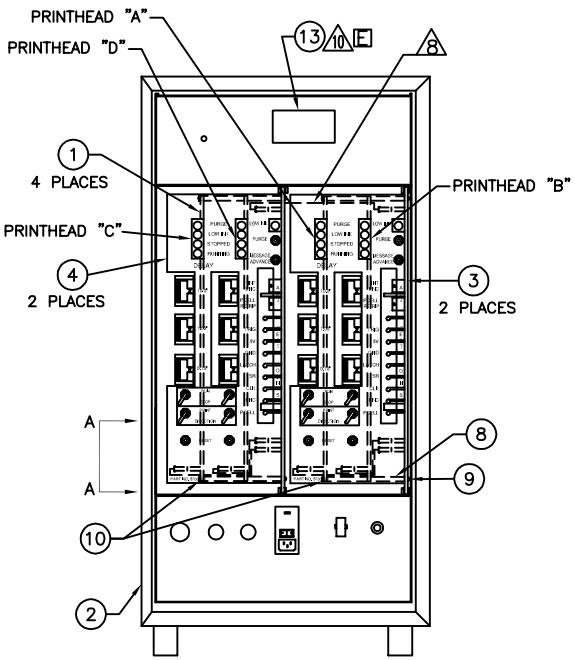
ITEM	PART NO.	DESCRIPTION	QTY	
17	5802-804	LABEL,MODEL & S/N,CE VERSION	4	[E]
16	5802-657	USER'S MANUAL	1	
15	8901-084	FOAM PACKING	1	
14	8901-083	SHIPPING BOX	1	
13	5700-756	DC1 CABLE ASS'Y	1	[B]
12	1199-241	NUT, #6-32 CLIP-ON	2	
11	5700-683	BLOCK OFF SCREEN, SERIES I	1	
10	1900-573	NUT, HEX NYLON #6-32	4	
9	5241-305	SCREW, #6-32 X 3/8 BUT HD	4	
8	5700-617	6-32 X 1.00 STANDOFF M-F	4	
7	5700-603	LOGIC TO INTR., 20 PIN CABLE	1	
6	5700-602	LOGIC TO INTER., 3 PIN CABLE	1	
5	5700-601	LOGIC TO INTR., 34 PIN CABLE	1	
4	5700-388	SWITCHPLATE, SERIES 1	1	[D]
3	5700-567AS	TM PLUS INTERFACE BOARD	1	
2	5700-801	SERIES I INK DELIVERY	1	
1	1902-799	PCB,LOGIC 3.5	1	

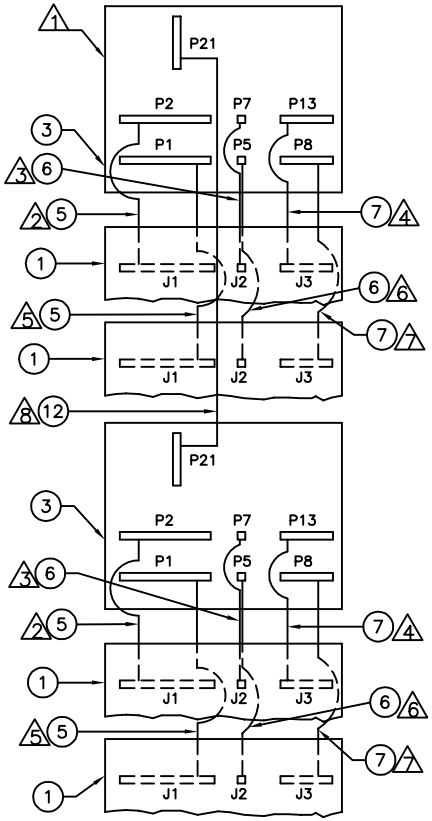
CNTRL, PC-BASED, SINGLE HEAD
5700808, REV E

NOTES:

1. INSTALL CABLES AND ASSEMBLE BOARDS ONTO STANDOFFS BEFORE INSTALLING INTO CARD CAGE.
2. CONNECT (ITEM 5) BETWEEN P2 OF (ITEM 3) AND J1 OF (ITEM 1).
3. CONNECT (ITEM 6) BETWEEN P7 OF (ITEM 3) AND J2 OF (ITEM 1).
4. CONNECT (ITEM 7) BETWEEN P13 OF (ITEM 3) AND J3 OF (ITEM 1).
5. CONNECT (ITEM 5) BETWEEN P1 OF (ITEM 3) AND J1 OF (ITEM 1).
6. CONNECT (ITEM 6) BETWEEN P5 OF (ITEM 3) AND J2 OF (ITEM 1).
7. CONNECT (ITEM 7) BETWEEN P8 OF (ITEM 3) AND J3 OF (ITEM 1).
8. CONNECT (ITEM 12) BETWEEN P21 OF BOTH LOGIC BOARDS (ITEM 3).
9. INSTALL BOARD ASSEMBLY INTO CARD CAGE AND CONNECT DATA CABLE (ITEM 11) BETWEEN THE DATA PORTS OF BOARDS "B" AND "D".
10. [E] FORMAT ONE LABEL (ITEM 13) AND PLACE ONTO CONTROLLER.
11. [E] FORMAT THREE LABELS (ITEM 13) AND PLACE ONTO TOP, ONE END AND ONE SIDE OF SHIPPING BOX (ITEM 15).
12. [E] THIS DOCUMENT IS USED TO ASSEMBLE BOTH THE POROUS AND NON-POROUS CONTROLLERS. LABEL THE CONTROLLER AS POROUS OR NON-POROUS BY ADDING P FOR POROUS OR NP FOR NON-POROUS TO THE END OF THE DWG. NO.
13. [E] CAUTION: "NP" DESIGNATED UNITS ARE COMPATIBLE WITH NON-POROUS INKS ONLY. DO NOT USE POROUS INKS IN THESE UNITS. "P" DESIGNATED UNITS ARE COMPATIBLE WITH POROUS INKS ONLY. DO NOT USE NON-POROUS INKS IN THESE UNITS.







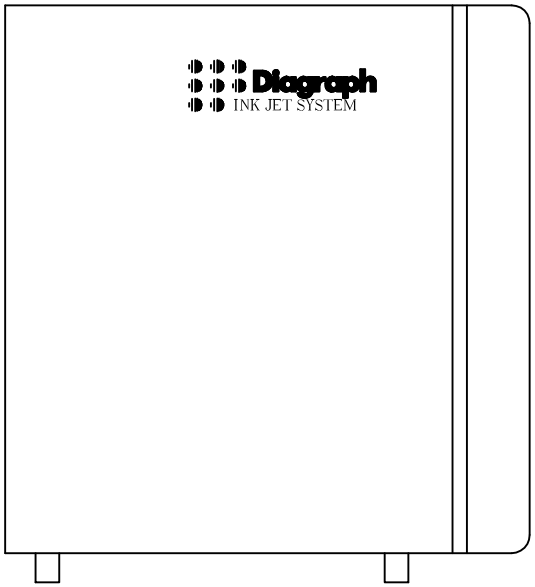
DETAIL A-A

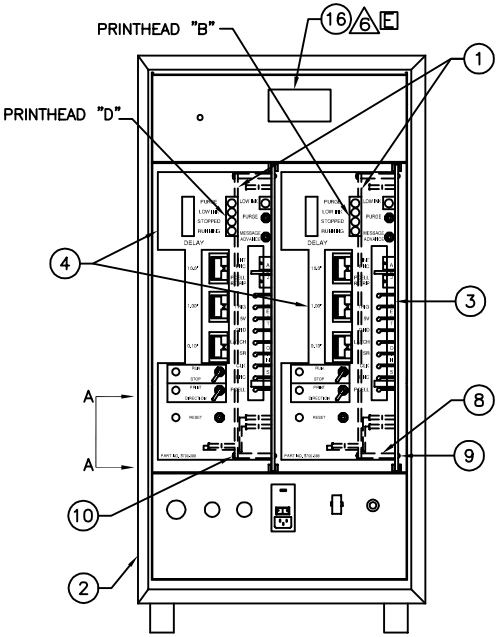
ITEM	PART NO.	DESCRIPTION	QTY	
17	5802-657	USER'S MANUAL	1	
16	8901-084	FOAM PACKING	1	
15	8901-083	SHIPPING BOX	1	
14	5700-757	DC2 CABLE ASS'Y	1	[B]
13	5802-804	LABEL,MODEL & S/N,CE VERSION	4	[E]
12	5700-705	CABLE ASSY, SERIES I, P21 TO P21	1	
11	5700-586	CABLE, INTER. TO INTER., 9"	1	
10	1900-573	NUT, HEX NYLON #6-32	8	
9	5241-305	SCREW, #6-32 X 3/8 BUT HD	8	
8	5700-617	6-32 X 1.00 STANDOFF M-F	16	
7	5700-603	LOGIC TO INTER., 20 PIN CABLE	4	
6	5700-602	LOGIC TO INTER., 3 PIN CABLE	4	
5	5700-601	LOGIC TO INTER., 34 PIN CABLE	4	
4	5700-388	SWITCHPLATE, SERIES 1	2	[D]
3	5700-567AS	TM PLUS INTERFACE BOARD	2	
2	5700-801	SERIES I INK DELIVERY	1	
1	1902-799	PCB LOGIC,3.5	4	

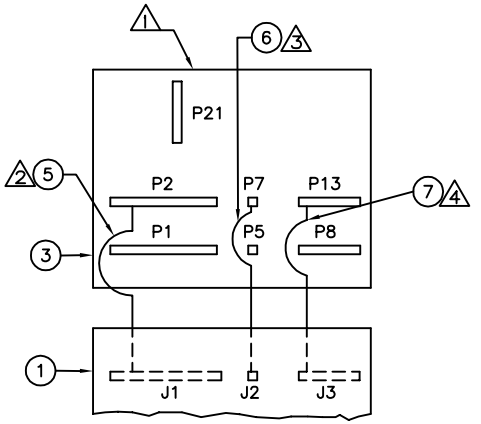
CNTRL, PC-BASED, QUAD HEAD
5700811, REV E

NOTES:

1. INSTALL CABLES AND ASSEMBLE BOARDS ONTO STANDOFFS BEFORE INSTALLING INTO CARD CAGE.
2. CONNECT (ITEM 5) BETWEEN P2 OF (ITEM 3) AND J1 OF (ITEM 1).
3. CONNECT (ITEM 6) BETWEEN P7 OF (ITEM 3) AND J2 OF (ITEM 1).
4. CONNECT (ITEM 7) BETWEEN P13 OF (ITEM 3) AND J3 OF (ITEM 1).
5. INSTALL BOARD ASSEMBLY INTO CARD CAGE AND CONNECT DATA CABLE (ITEM 11) BETWEEN THE DATA PORTS OF BOARDS "B" AND "D".
6. FORMAT ONE LABEL (ITEM 16) AND PLACE ONTO CONTROLLER. [E]
7. FORMAT THREE LABELS (ITEM 16) AND PLACE ONTO TOP, ONE END AND ONE SIDE OF SHIPPING BOX (ITEM 13). [E]
8. THIS DOCUMENT IS USED TO ASSEMBLE BOTH THE POROUS AND NON-POROUS CONTROLLERS. LABEL THE CONTROLLER AS POROUS OR NON-POROUS BY ADDING P FOR POROUS OR NP FOR NON-POROUS TO THE END OF THE DWG. NO. [E]
9. CAUTION: "NP" DESIGNATED UNITS ARE COMPATIBLE WITH NON-POROUS INKS ONLY. DO NOT USE POROUS INKS IN THESE UNITS. "P" DESIGNATED UNITS ARE COMPATIBLE WITH POROUS INKS ONLY. DO NOT USE NON-POROUS INKS IN THESE UNITS. [E]







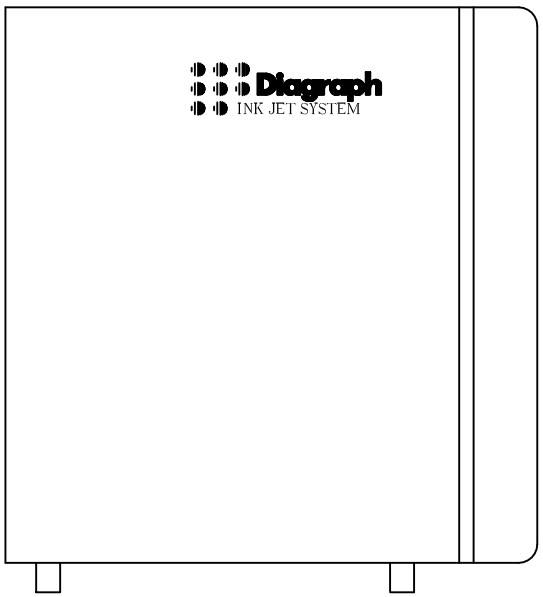
DETAIL A-A

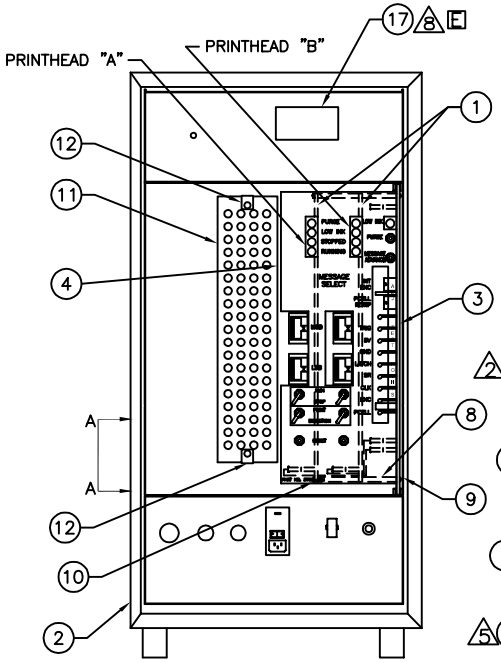
ITEM	PART NO.	DESCRIPTION	QTY	
16	5802-804	LABEL,MODEL & S/N,CE VERSION	4	E
15	5802-657	USER'S MANUAL	1	
14	8901-084	FOAM PACKING	1	
13	8901-083	SHIPPING BOX	1	
12	5700-757	DC2 CABLE ASS'Y	1	B
11	5700-586	CABLE I/F TO I/F, 9"	1	
10	1900-573	NUT, HEX NYLON #6-32	8	
9	5241-305	SCREW, #6-32 X 3/8 BUT HD	8	
8	5700-617	6-32 X 1.00 STANDOFF M-F	8	
7	5700-603	LOGIC TO INTER., 20 PIN CABLE	2	
6	5700-602	LOGIC TO INTER., 3 PIN CABLE	2	
5	5700-601	LOGIC TO INTER., 34 PIN CABLE	2	
4	5700-388	SWITCHPLATE, SERIES 1	2	D
3	5700-567AS	TM PLUS INTERFACE BOARD	2	
2	5700-801	SERIES I INK DELIVERY	1	
1	1902-799	PCB LOGIC,3.5	2	

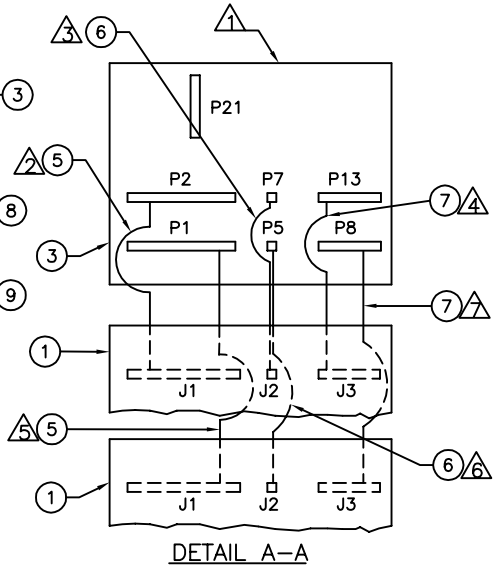
CNTRL, PC-BASED QUAD HEAD,
MULTI-TASKING, 5700812, REV E

NOTES:

1. INSTALL CABLES AND ASSEMBLE BOARDS ONTO STANDOFFS BEFORE INSTALLING INTO CARD CAGE.
2. CONNECT (ITEM 5) BETWEEN P2 OF (ITEM 3) AND J1 OF (ITEM 1).
3. CONNECT (ITEM 6) BETWEEN P7 OF (ITEM 3) AND J2 OF (ITEM 1).
4. CONNECT (ITEM 7) BETWEEN P13 OF (ITEM 3) AND J3 OF (ITEM 1).
5. CONNECT (ITEM 5) BETWEEN P1 OF (ITEM 3) AND J1 OF (ITEM 1).
6. CONNECT (ITEM 6) BETWEEN P5 OF (ITEM 3) AND J2 OF (ITEM 1).
7. CONNECT (ITEM 7) BETWEEN P8 OF (ITEM 3) AND J3 OF (ITEM 1).
8. [E] FORMAT ONE LABEL (ITEM 17) AND PLACE ONTO CONTROLLER.
9. [E] FORMAT THREE LABELS (ITEM 17) AND PLACE ONTO TOP, ONE END AND ONE SIDE OF SHIPPING BOX (ITEM 14).
10. [E] THIS DOCUMENT IS USED TO ASSEMBLE BOTH THE POROUS AND NON-POROUS CONTROLLERS. LABEL THE CONTROLLER AS POROUS OR NON-POROUS BY ADDING P FOR POROUS OR NP FOR NON-POROUS TO THE END OF THE DWG. NO.
11. [E] CAUTION: "NP" DESIGNATED UNITS ARE COMPATIBLE WITH NON-POROUS INKS ONLY. DO NOT USE POROUS INKS IN THESE UNITS. "P" DESIGNATED UNITS ARE COMPATIBLE WITH POROUS INKS ONLY. DO NOT USE NON-POROUS INKS IN THESE UNITS.







DETAIL A-A

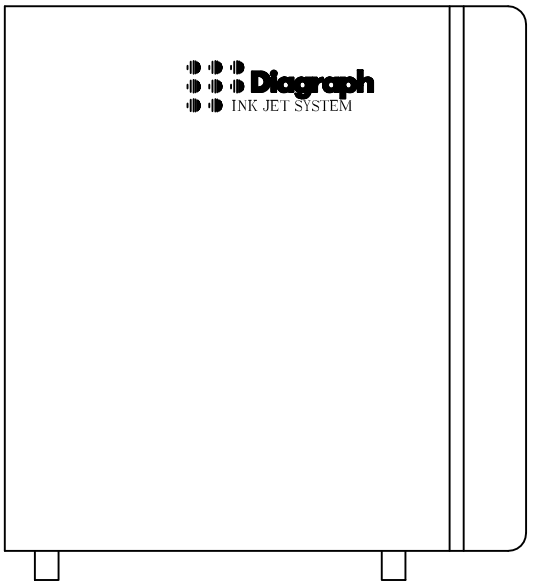
ITEM	PART NO.	DESCRIPTION	QTY	
17	5802-804	LABEL,MODEL & S/N,CE VERSION	4	[E]
16	5802-657	USER'S MANUAL	1	
15	8901-084	FOAM PACKING	1	
14	8901-083	SHIPPING BOX	1	
13	5700-756	DC1 CABLE ASS'Y	1	[B]
12	1199-241	NUT, #6-32 CLIP-ON	2	
11	5700-683	BLOCK OFF SCREEN, SERIES I	1	
10	1900-573	NUT, HEX NYLON #6-32	4	
9	5241-305	SCREW, #6-32 X 3/8 BUT HD	4	
8	5700-617	6-32 X 1.00 STANDOFF M-F	8	
7	5700-603	LOGIC TO INTER., 20 PIN CABLE	2	
6	5700-602	LOGIC TO INTER., 3 PIN CABLE	2	
5	5700-601	LOGIC TO INTER., 34 PIN CABLE	2	
4	5700-389	SWITHPLATE, SERIES 1 SA99MS	1	[D]
3	5700-567AS	TM PLUS INTERFACE BOARD	1	
2	5700-969	SERIES I INK DELIVERY	1	
1	1901-298	PCB LOGIC,3.5 SA99MS	2	

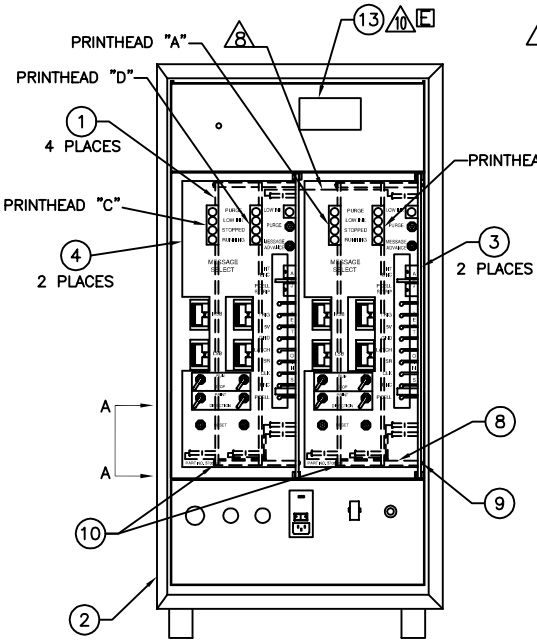
CNTRL, SA99MS DUAL HEAD

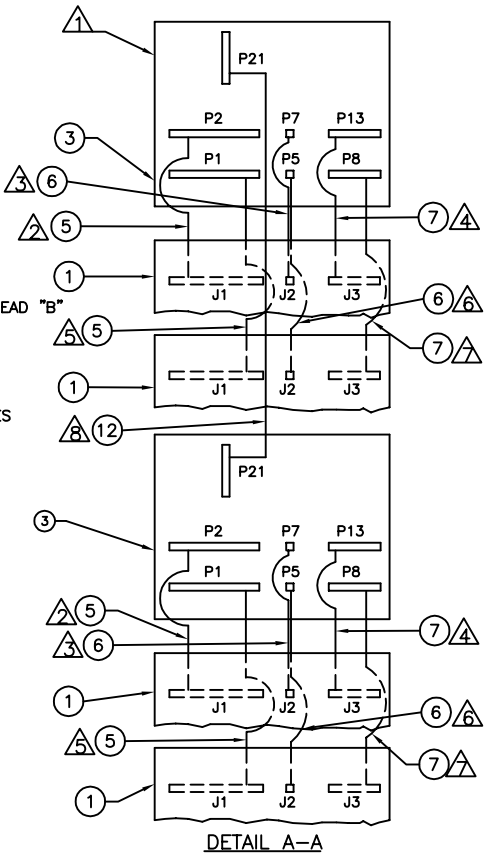
5700996, REV E

NOTES:

1. INSTALL CABLES AND ASSEMBLE BOARDS ONTO STANDOFFS BEFORE INSTALLING INTO CARD CAGE.
2. CONNECT (ITEM 5) BETWEEN P2 OF (ITEM 3) AND J1 OF (ITEM 1).
3. CONNECT (ITEM 6) BETWEEN P7 OF (ITEM 3) AND J2 OF (ITEM 1).
4. CONNECT (ITEM 7) BETWEEN P13 OF (ITEM 3) AND J3 OF (ITEM 1).
5. CONNECT (ITEM 5) BETWEEN P1 OF (ITEM 3) AND J1 OF (ITEM 1).
6. CONNECT (ITEM 6) BETWEEN P5 OF (ITEM 3) AND J2 OF (ITEM 1).
7. CONNECT (ITEM 7) BETWEEN P8 OF (ITEM 3) AND J3 OF (ITEM 1).
8. CONNECT (ITEM 12) BETWEEN P21 OF BOTH LOGIC BOARDS (ITEM 3).
9. INSTALL BOARD ASSEMBLY INTO CARD CAGE AND CONNECT DATA CABLE (ITEM 11) BETWEEN THE DATA PORTS OF BOARDS "B" AND "D".
10. FORMAT ONE LABEL (ITEM 13) AND PLACE ONTO CONTROLLER. [E]
11. FORMAT THREE LABELS (ITEM 13) AND PLACE ONTO TOP, ONE END AND ONE SIDE OF SHIPPING BOX (ITEM 15). [E]
12. THIS DOCUMENT IS USED TO ASSEMBLE BOTH THE POROUS AND NON-POROUS CONTROLLERS. LABEL THE CONTROLLER AS POROUS OR NON-POROUS BY ADDING P FOR POROUS OR NP FOR NON-POROUS TO THE END OF THE DWG. NO. [E]
13. CAUTION: "NP" DESIGNATED UNITS ARE COMPATIBLE WITH NON-POROUS INKS ONLY. DO NOT USE POROUS INKS IN THESE UNITS. "P" DESIGNATED UNITS ARE COMPATIBLE WITH POROUS INKS ONLY. DO NOT USE NON-POROUS INKS IN THESE UNITS. [E]







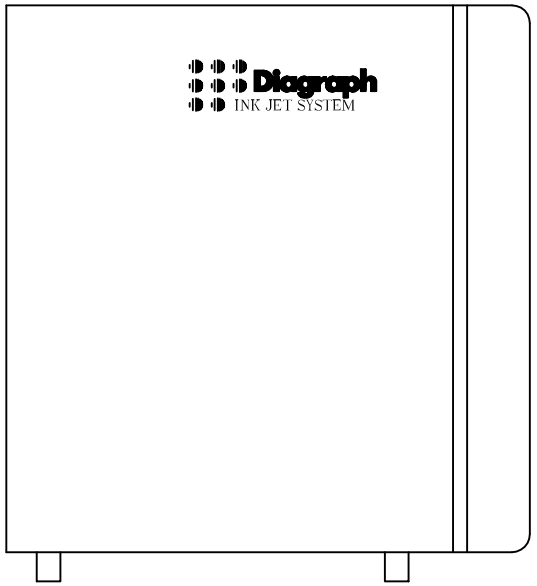
DETAIL A-A

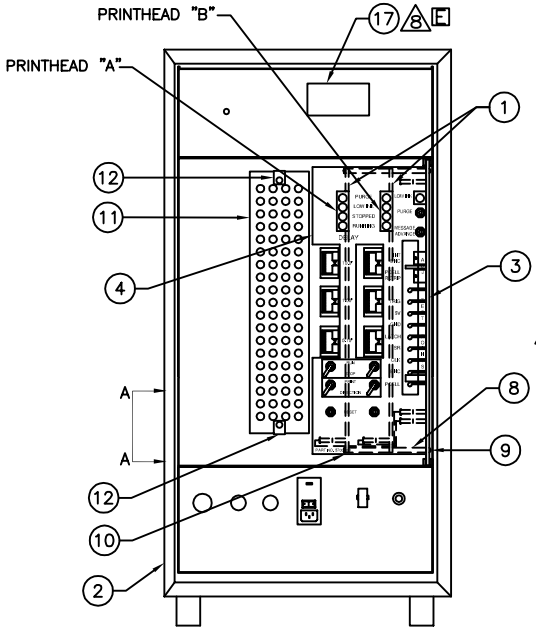
ITEM	PART NO.	DESCRIPTION	QTY	
17	5802-657	USER'S MANUAL	1	
16	8901-084	FOAM PACKING	1	
15	8901-083	SHIPPING BOX	1	
14	5700-757	DC2 CABLE ASS'Y	1	[B]
13	5802-804	LABEL,MODEL & S/N,CE VERSION	4	[E]
12	5700-705	CABLE ASSY, SERIES I, P21 TO P21	1	
11	5700-586	CABLE, INTER. TO INTER., 9"	1	
10	1900-573	NUT, HEX NYLON #6-32	8	
9	5241-305	SCREW, #6-32 X 3/8 BUT HD	8	
8	5700-617	6-32 X 1.00 STANDOFF M-F	16	
7	5700-603	LOGIC TO INTER., 20 PIN CABLE	4	
6	5700-602	LOGIC TO INTER., 3 PIN CABLE	4	
5	5700-601	LOGIC TO INTER., 34 PIN CABLE	4	
4	5700-389	SWITCHPLATE, SERIES 1 SA99MS	2	[D]
3	5700-567AS	TM PLUS INTERFACE BOARD	2	
2	5700-969	SERIES I INK DELIVERY	1	
1	1901-298	PCB LOGIC,3.5 SA99MS	4	

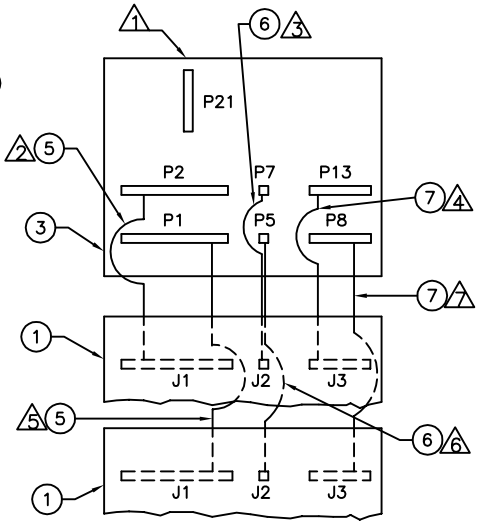
CNTRL, SA99MS QUAD HEAD
5700998, REV E

NOTES:

1. INSTALL CABLES AND ASSEMBLE BOARDS ONTO STANDOFFS BEFORE INSTALLING INTO CARD CAGE.
2. CONNECT (ITEM 5) BETWEEN P2 OF (ITEM 3) AND J1 OF (ITEM 1).
3. CONNECT (ITEM 6) BETWEEN P7 OF (ITEM 3) AND J2 OF (ITEM 1).
4. CONNECT (ITEM 7) BETWEEN P13 OF (ITEM 3) AND J3 OF (ITEM 1).
5. CONNECT (ITEM 5) BETWEEN P1 OF (ITEM 3) AND J1 OF (ITEM 1).
6. CONNECT (ITEM 6) BETWEEN P5 OF (ITEM 3) AND J2 OF (ITEM 1).
7. CONNECT (ITEM 7) BETWEEN P8 OF (ITEM 3) AND J3 OF (ITEM 1).
8. [E] FORMAT ONE LABEL (ITEM 17) AND PLACE ONTO CONTROLLER.
9. [E] FORMAT THREE LABELS (ITEM 17) AND PLACE ONTO TOP, ONE END AND ONE SIDE OF SHIPPING BOX (ITEM 14).
10. [E] THIS DOCUMENT IS USED TO ASSEMBLE BOTH THE POROUS AND NON-POROUS CONTROLLERS. LABEL THE CONTROLLER AS POROUS OR NON-POROUS BY ADDING P FOR POROUS OR NP FOR NON-POROUS TO THE END OF THE DWG. NO.
11. [E] CAUTION: "NP" DESIGNATED UNITS ARE COMPATIBLE WITH NON-POROUS INKS ONLY. DO NOT USE POROUS INKS IN THESE UNITS. "P" DESIGNATED UNITS ARE COMPATIBLE WITH POROUS INKS ONLY. DO NOT USE NON-POROUS INKS IN THESE UNITS.







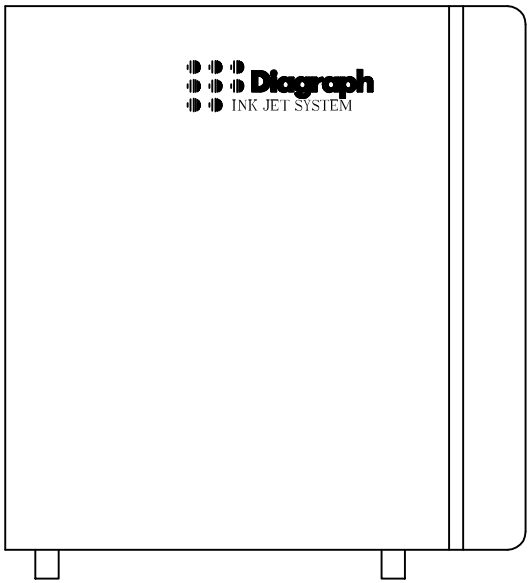
DETAIL A-A

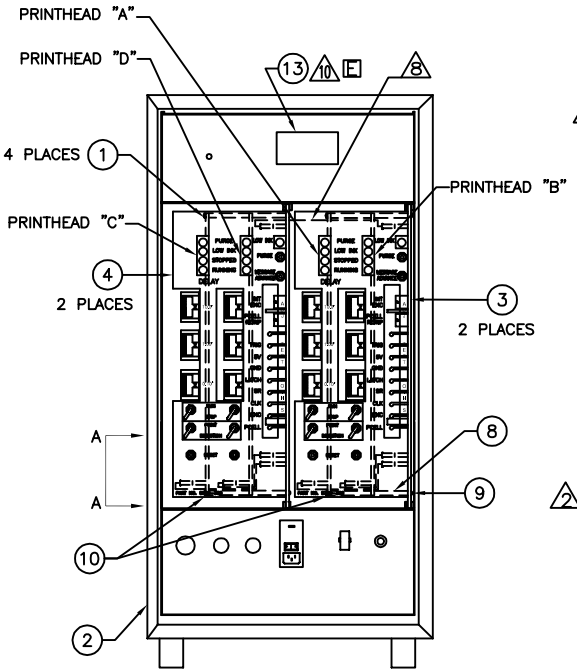
ITEM	PART NO.	DESCRIPTION	QTY	
17	5802-804	LABEL,MODEL & S/N,CE VERSION	4	E
16	5802-657	USER'S MANUAL	1	
15	8901-084	FOAM PACKING	1	
14	8901-083	SHIPPING BOX	1	
13	5700-756	DC1 CABLE ASS'Y	1	B
12	1199-241	NUT, #6-32 CLIP-ON	2	
11	5700-683	BLOCK OFF SCREEN, SERIES I	1	
10	1900-573	NUT, HEX NYLON #6-32	4	
9	5241-305	SCREW, #6-32 X 3/8 BUT HD	4	
8	5700-617	6-32 X 1.00 STANDOFF M-F	8	
7	5700-603	LOGIC TO INTER., 20 PIN CABLE	2	
6	5700-602	LOGIC TO INTER., 3 PIN CABLE	2	
5	5700-601	LOGIC TO INTER., 34 PIN CABLE	2	
4	5700-388	SWITHPLATE, SERIES 1	1	D
3	5700-567AS	TM PLUS INTERFACE BOARD	1	
2	5700-969	SERIES I INK DELIVERY	1	
1	1902-782	PCB LOGIC,3.5	2	

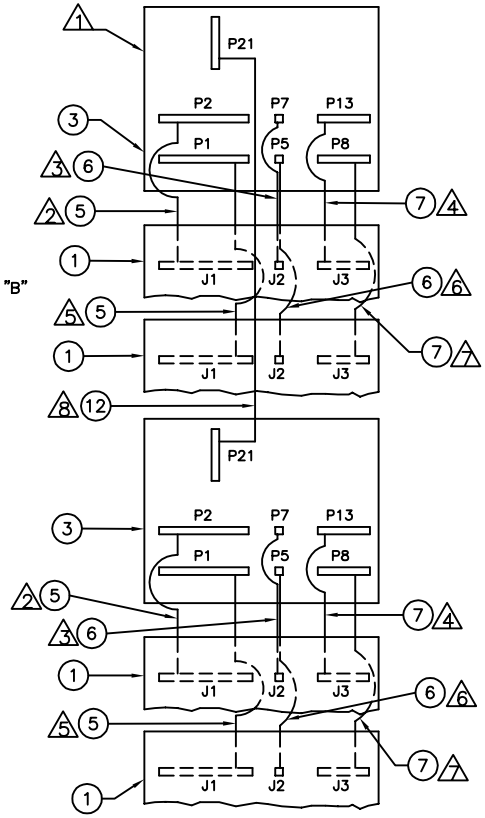
CNTRL, PC BASED DUAL HEAD
5701002, REV C

NOTES:

1. INSTALL CABLES AND ASSEMBLE BOARDS ONTO STANDOFFS BEFORE INSTALLING INTO CARD CAGE.
2. CONNECT (ITEM 5) BETWEEN P2 OF (ITEM 3) AND J1 OF (ITEM 1).
3. CONNECT (ITEM 6) BETWEEN P7 OF (ITEM 3) AND J2 OF (ITEM 1).
4. CONNECT (ITEM 7) BETWEEN P13 OF (ITEM 3) AND J3 OF (ITEM 1).
5. CONNECT (ITEM 5) BETWEEN P1 OF (ITEM 3) AND J1 OF (ITEM 1).
6. CONNECT (ITEM 6) BETWEEN P5 OF (ITEM 3) AND J2 OF (ITEM 1).
7. CONNECT (ITEM 7) BETWEEN P8 OF (ITEM 3) AND J3 OF (ITEM 1).
8. CONNECT (ITEM 12) BETWEEN P21 OF BOTH LOGIC BOARDS (ITEM 3).
9. INSTALL BOARD ASSEMBLY INTO CARD CAGE AND CONNECT DATA CABLE (ITEM 11) BETWEEN THE DATA PORTS OF BOARDS "B" AND "D".
10. [E] FORMAT ONE LABEL (ITEM 13) AND PLACE ONTO CONTROLLER.
11. [E] FORMAT THREE LABELS (ITEM 13) AND PLACE ONTO TOP, ONE END AND ONE SIDE OF SHIPPING BOX (ITEM 15).
12. [E] THIS DOCUMENT IS USED TO ASSEMBLE BOTH THE POROUS AND NON-POROUS CONTROLLERS. LABEL THE CONTROLLER AS POROUS OR NON-POROUS BY ADDING P FOR POROUS OR NP FOR NON-POROUS TO THE END OF THE DWG. NO.
13. [E] CAUTION: "NP" DESIGNATED UNITS ARE COMPATIBLE WITH NON-POROUS INKS ONLY. DO NOT USE POROUS INKS IN THESE UNITS. "P" DESIGNATED UNITS ARE COMPATIBLE WITH POROUS INKS ONLY. DO NOT USE NON-POROUS INKS IN THESE UNITS.







DETAIL A-A

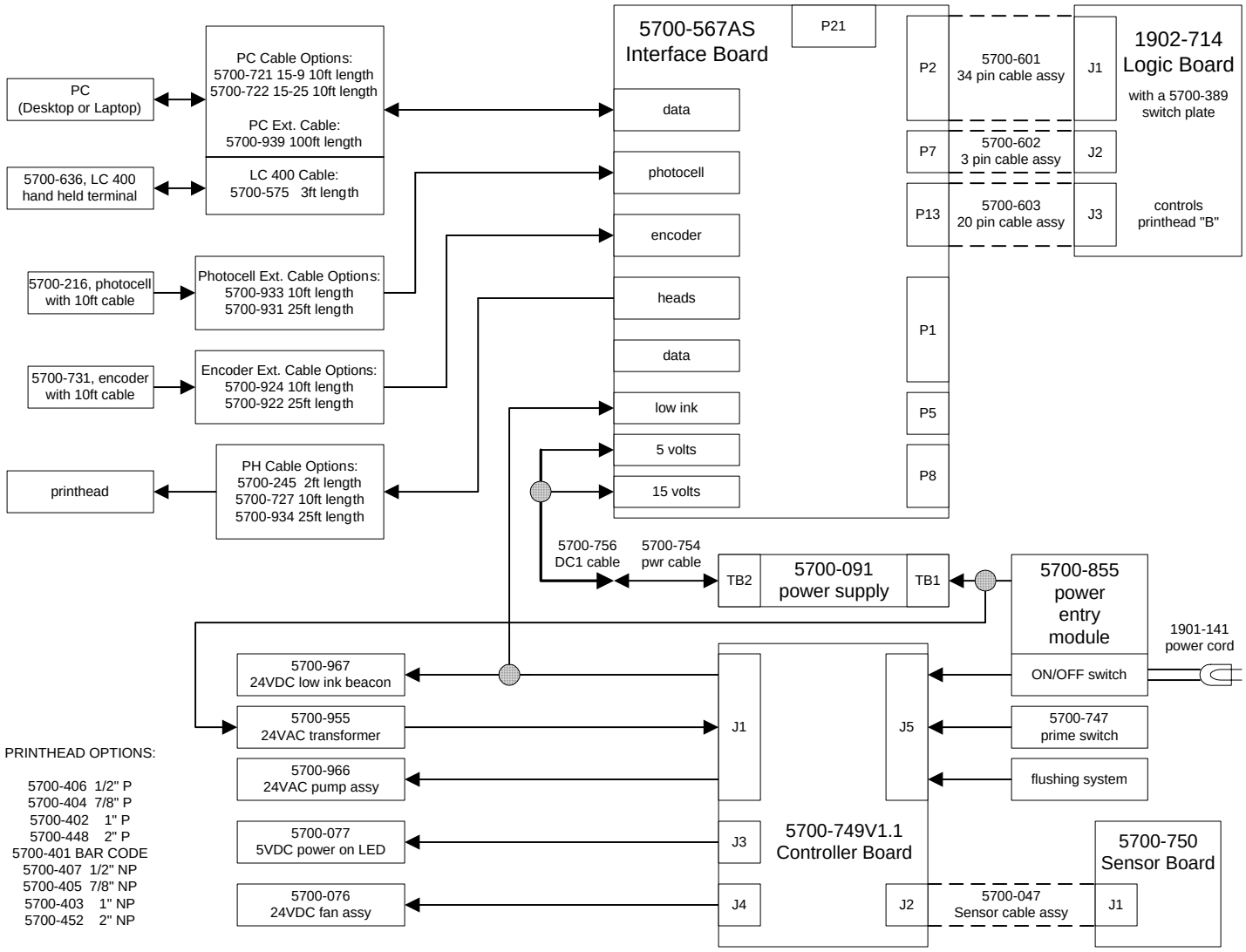
ITEM	PART NO.	DESCRIPTION	QTY	
17	5802-657	USER'S MANUAL	1	
16	8901-084	FOAM PACKING	1	
15	8901-083	SHIPPING BOX	1	
14	5700-757	DC2 CABLE ASS'Y	1	[B]
13	5802-804	LABEL,MODEL & S/N,CE VERSION	4	[E]
12	5700-705	CABLE ASSY, SERIES I, P21 TO P21	1	
11	5700-586	CABLE, INTER. TO INTER., 9"	1	
10	1900-573	NUT, HEX NYLON #6-32	8	
9	5241-305	SCREW, #6-32 X 3/8 BUT HD	8	
8	5700-617	6-32 X 1.00 STANDOFF M-F	16	
7	5700-603	LOGIC TO INTER., 20 PIN CABLE	4	
6	5700-602	LOGIC TO INTER., 3 PIN CABLE	4	
5	5700-601	LOGIC TO INTER., 34 PIN CABLE	4	
4	5700-388	SWITCHPLATE, SERIES 1	2	[D]
3	5700-567AS	TM PLUS INTERFACE BOARD	2	
2	5700-969	SERIES I INK DELIVERY	1	
1	1902-782	PCB LOGIC,3.5	4	

CNTRL, PC BASED QUAD HEAD
5701004, REV C

Controller Block Diagrams

Block diagrams of the 11 controller options.

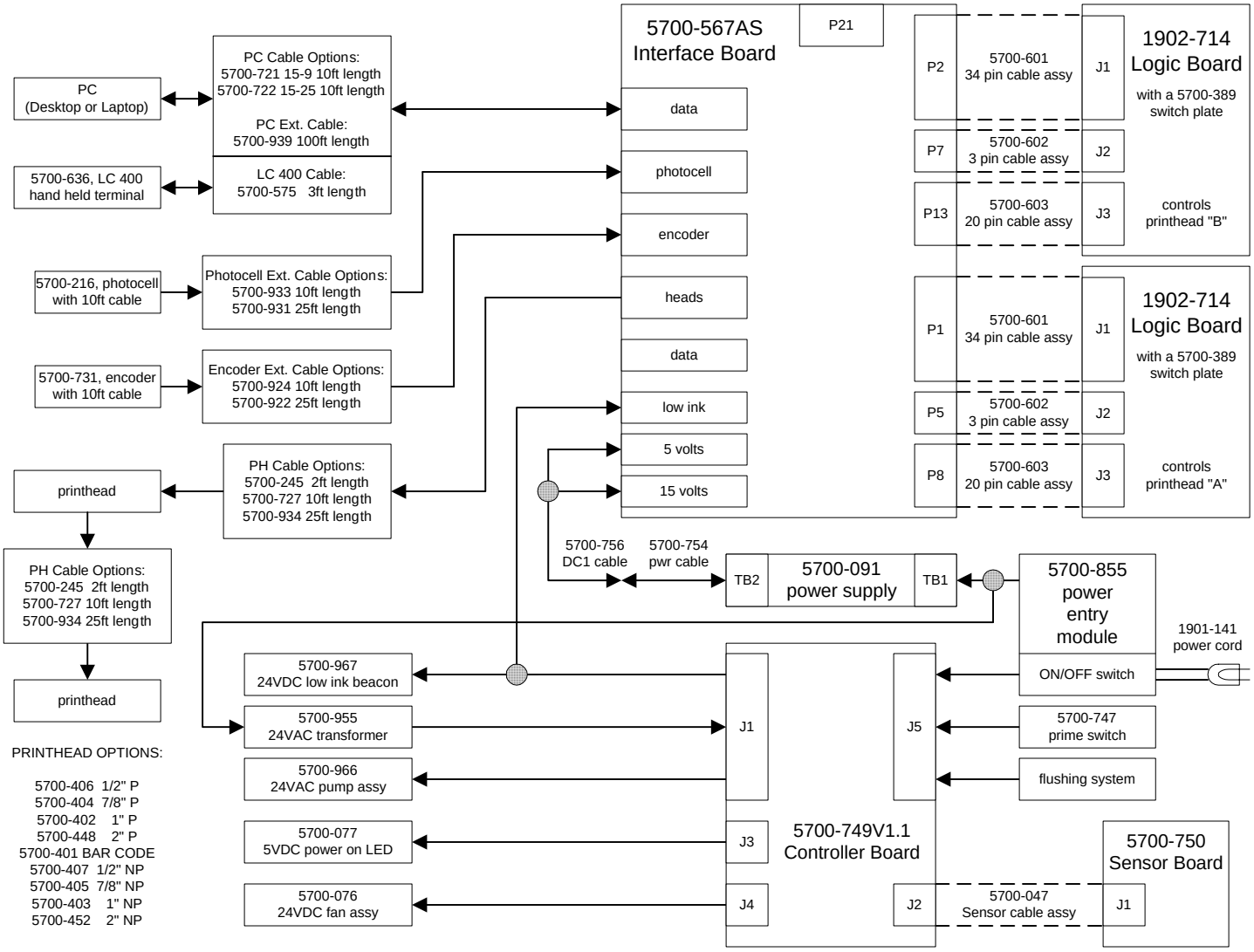
5700-802
Japanese Single Head SA-99MS Controller



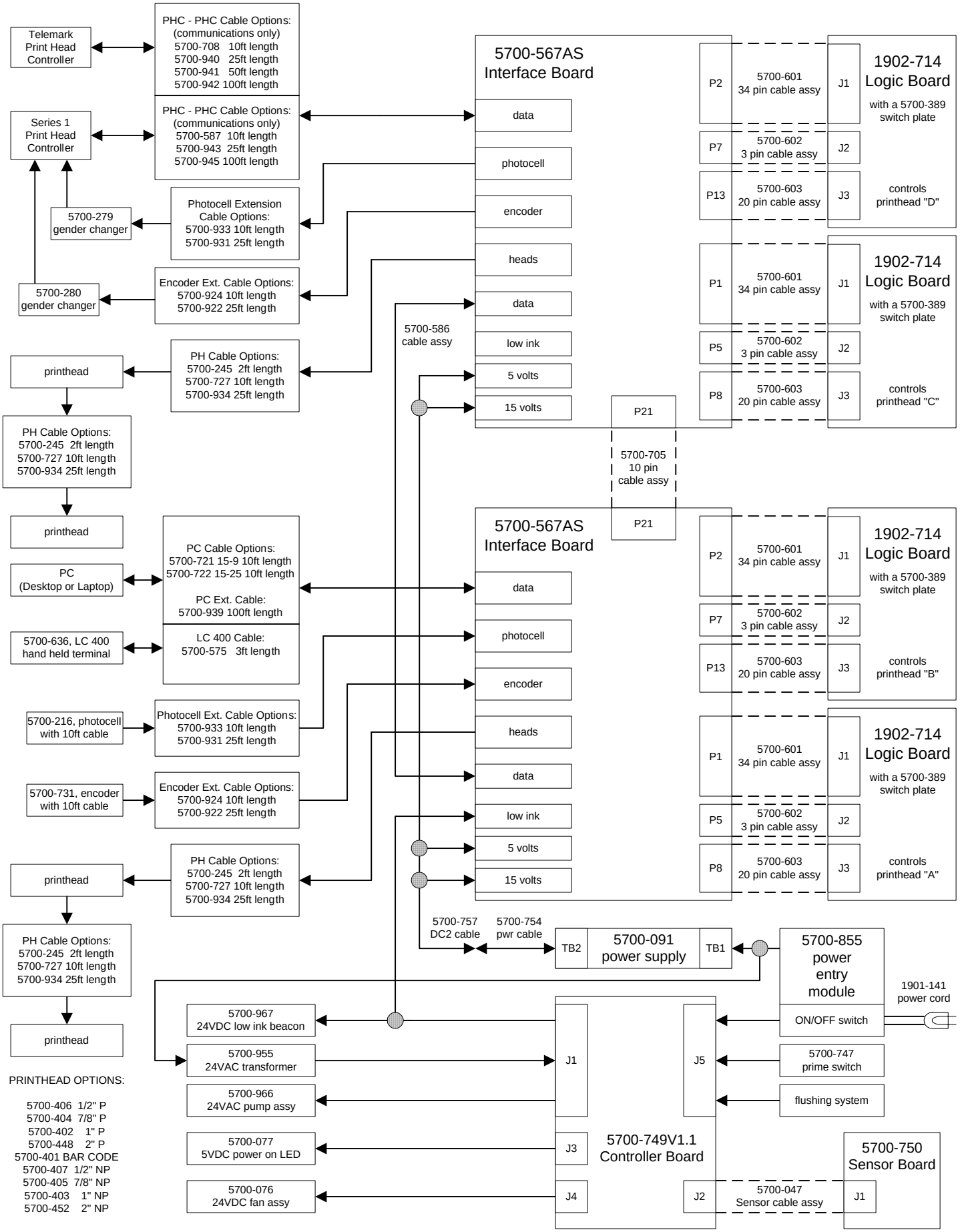
PRINTHEAD OPTIONS:

5700-406 1/2" P
5700-404 7/8" P
5700-402 1" P
5700-448 2" P
5700-401 BAR CODE
5700-407 1/2" NP
5700-405 7/8" NP
5700-403 1" NP
5700-452 2" NP

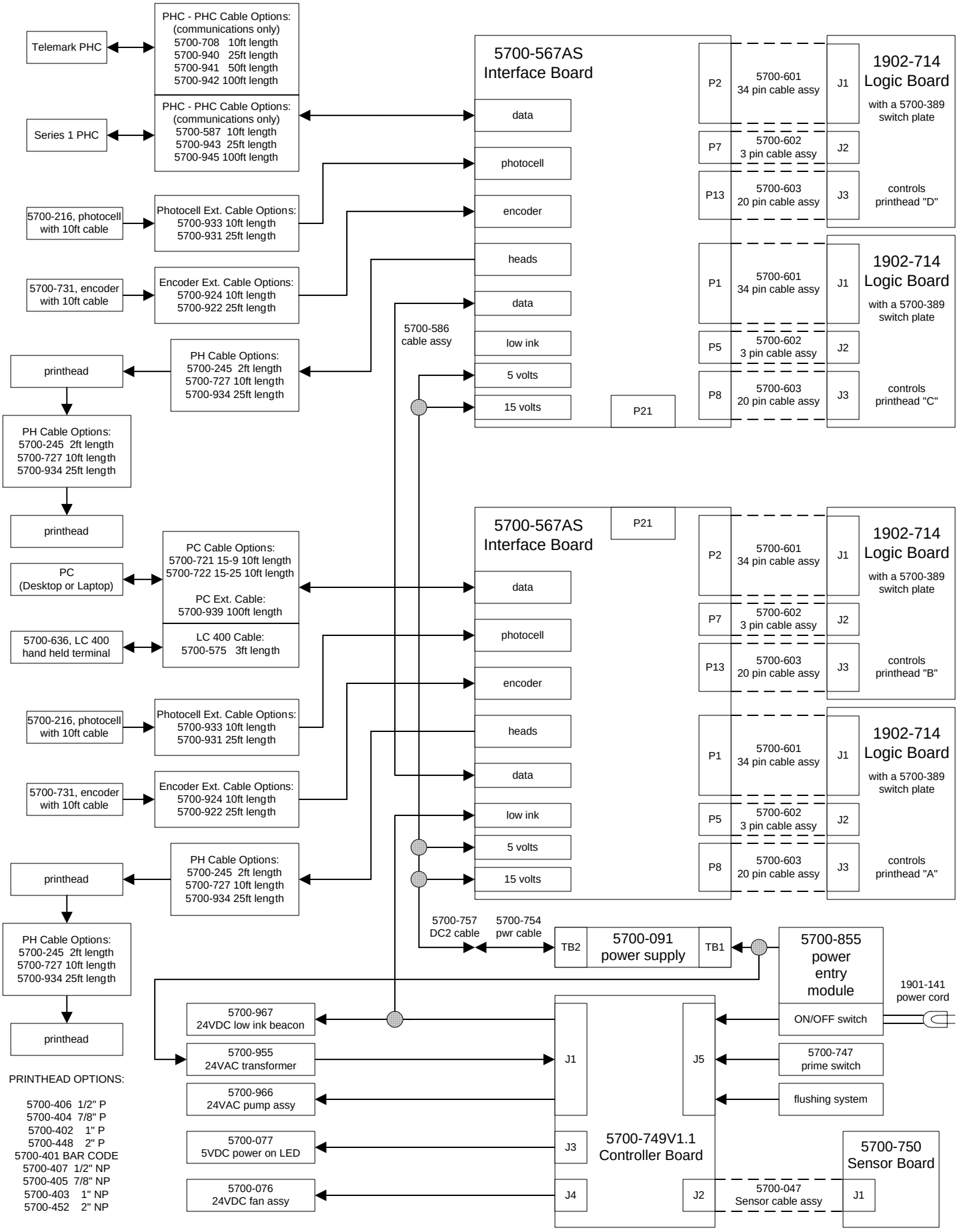
5700-803
Japanese Dual Head SA-99MS Controller



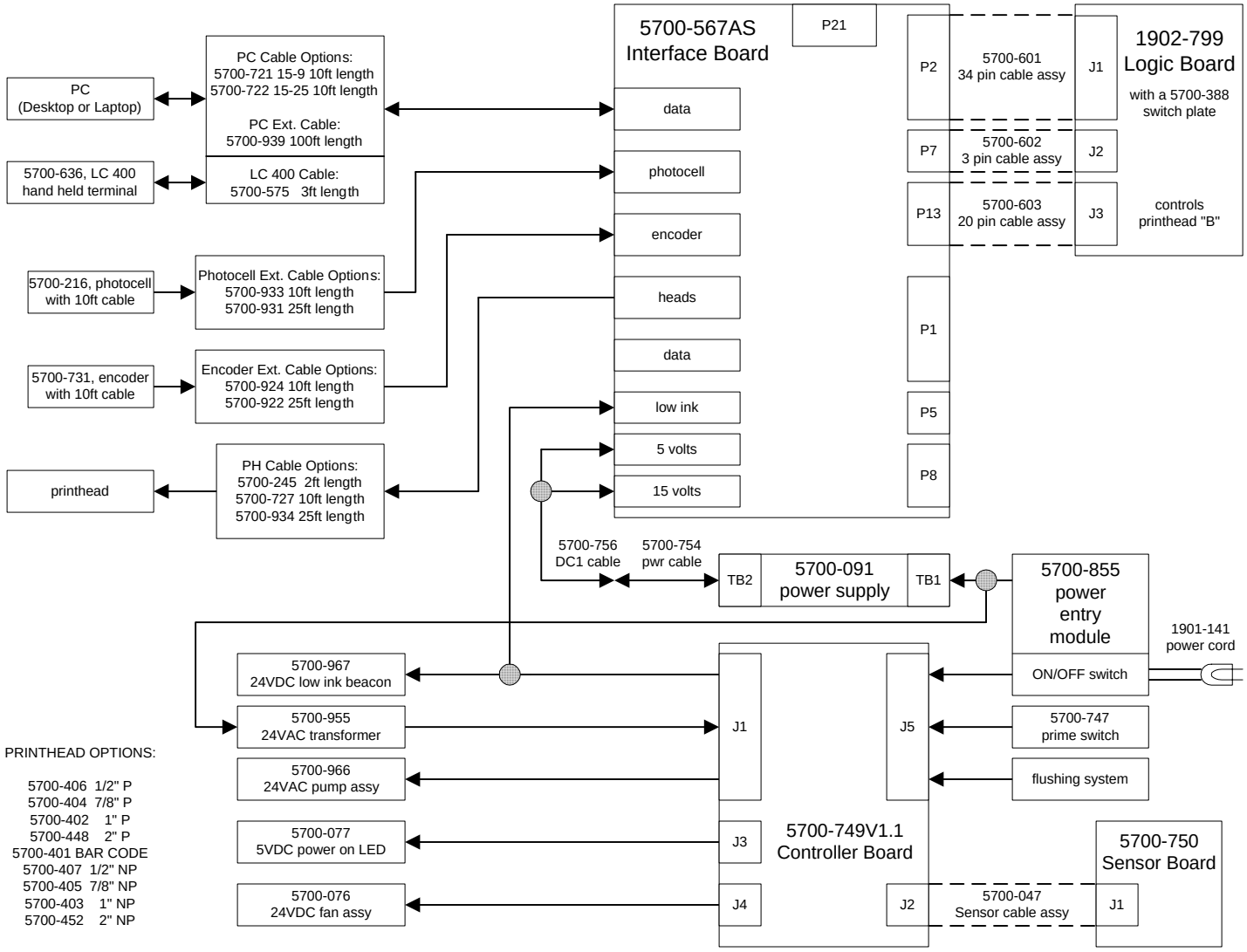
5700-805
Japanese Quad Head SA-99MS Controller



5700-807
Japanese Quad Head SA-99MS Multi-tasking Controller



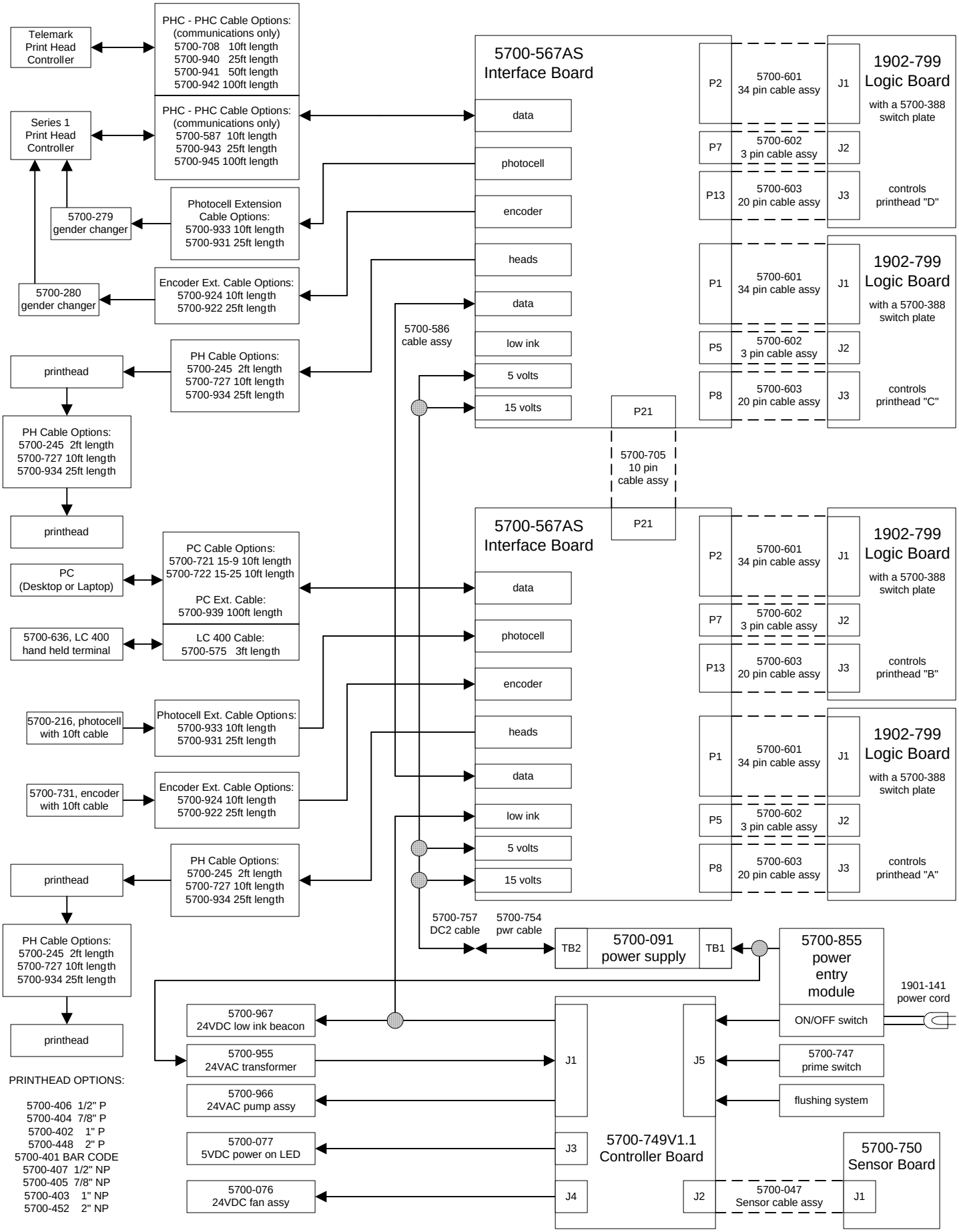
5700-808
Japanese Single Head PC-Based Controller



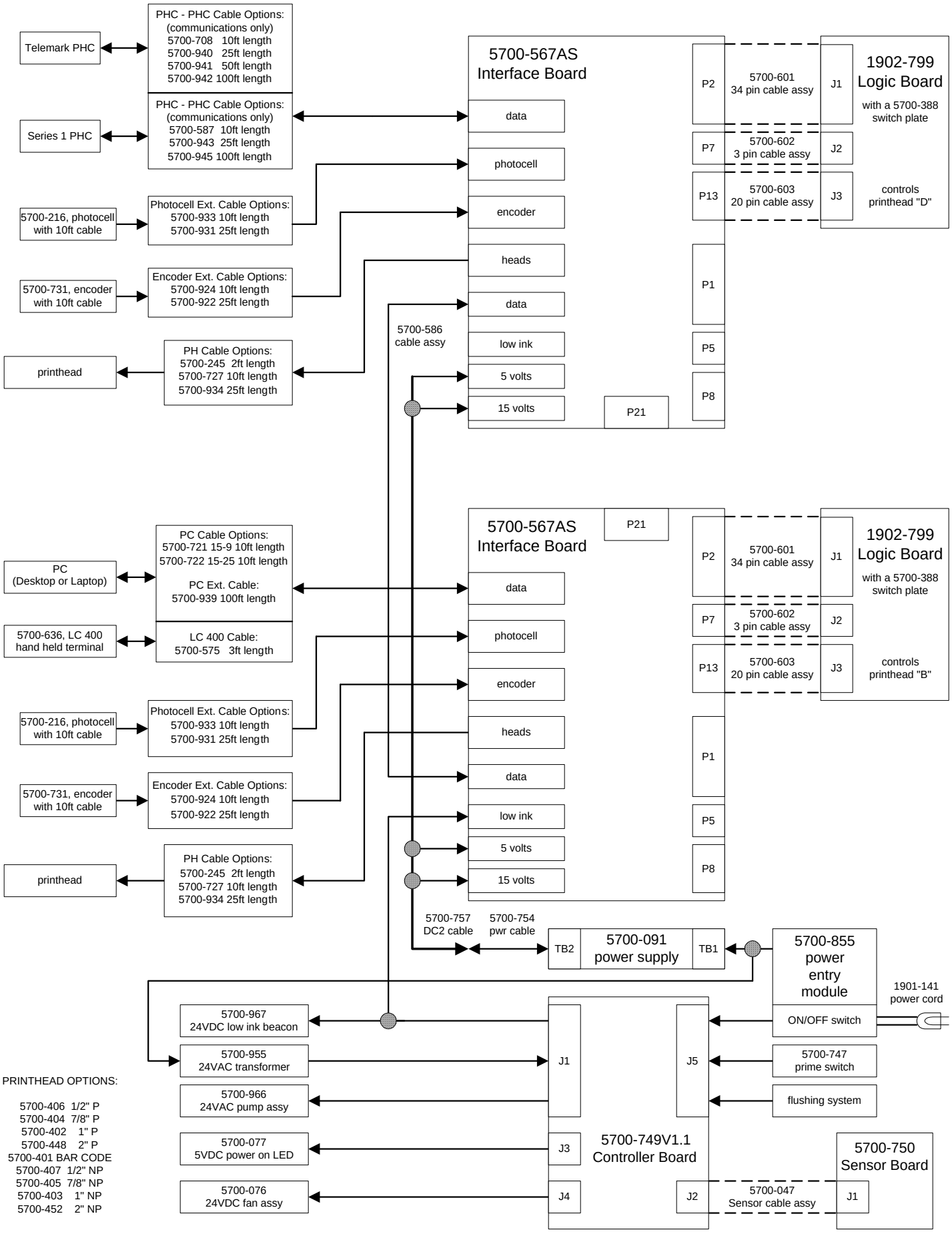
PRINTHEAD OPTIONS:

5700-406 1/2" P
5700-404 7/8" P
5700-402 1" P
5700-448 2" P
5700-401 BAR CODE
5700-407 1/2" NP
5700-405 7/8" NP
5700-403 1" NP
5700-452 2" NP

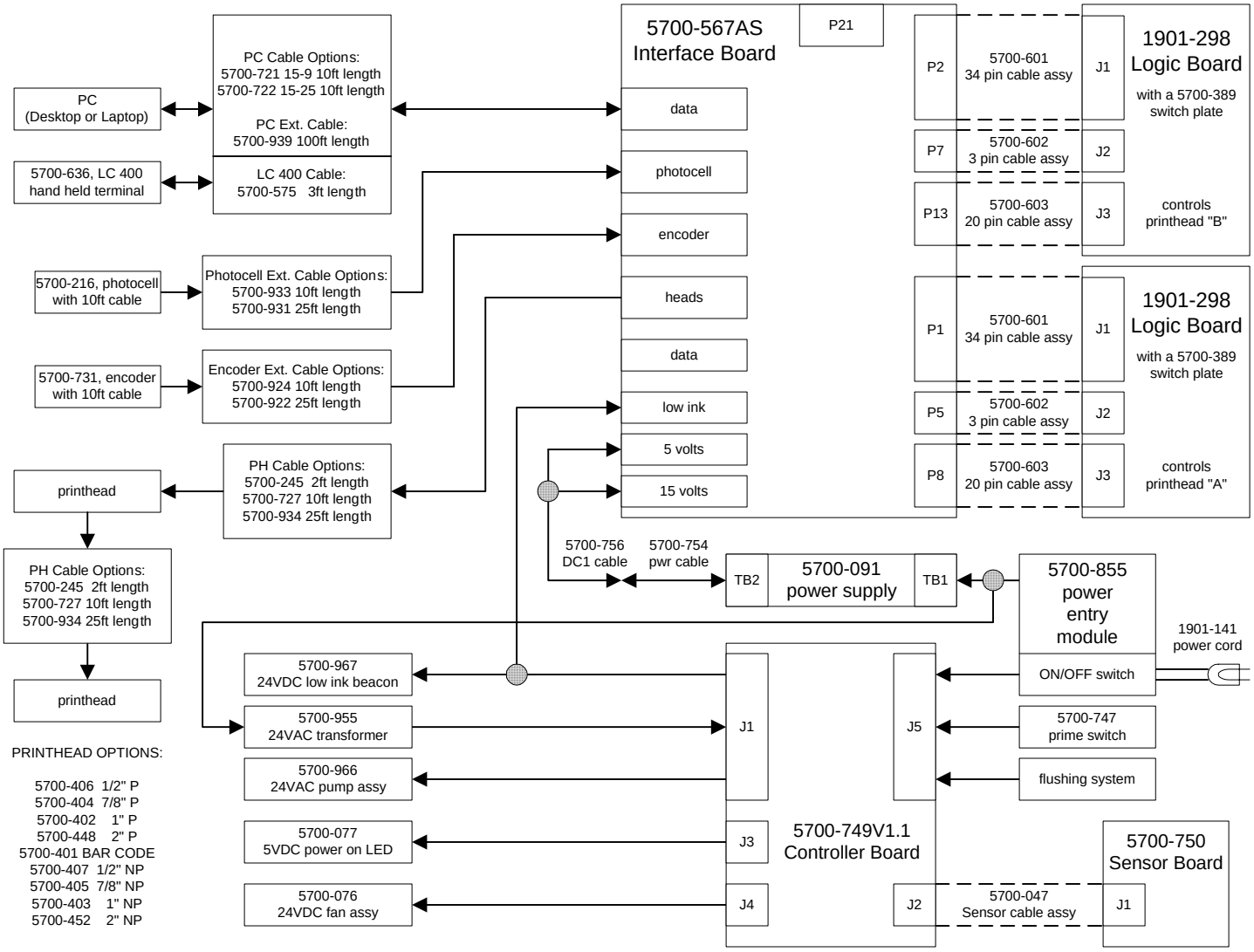
5700-811
Japanese Quad Head PC-Based Controller



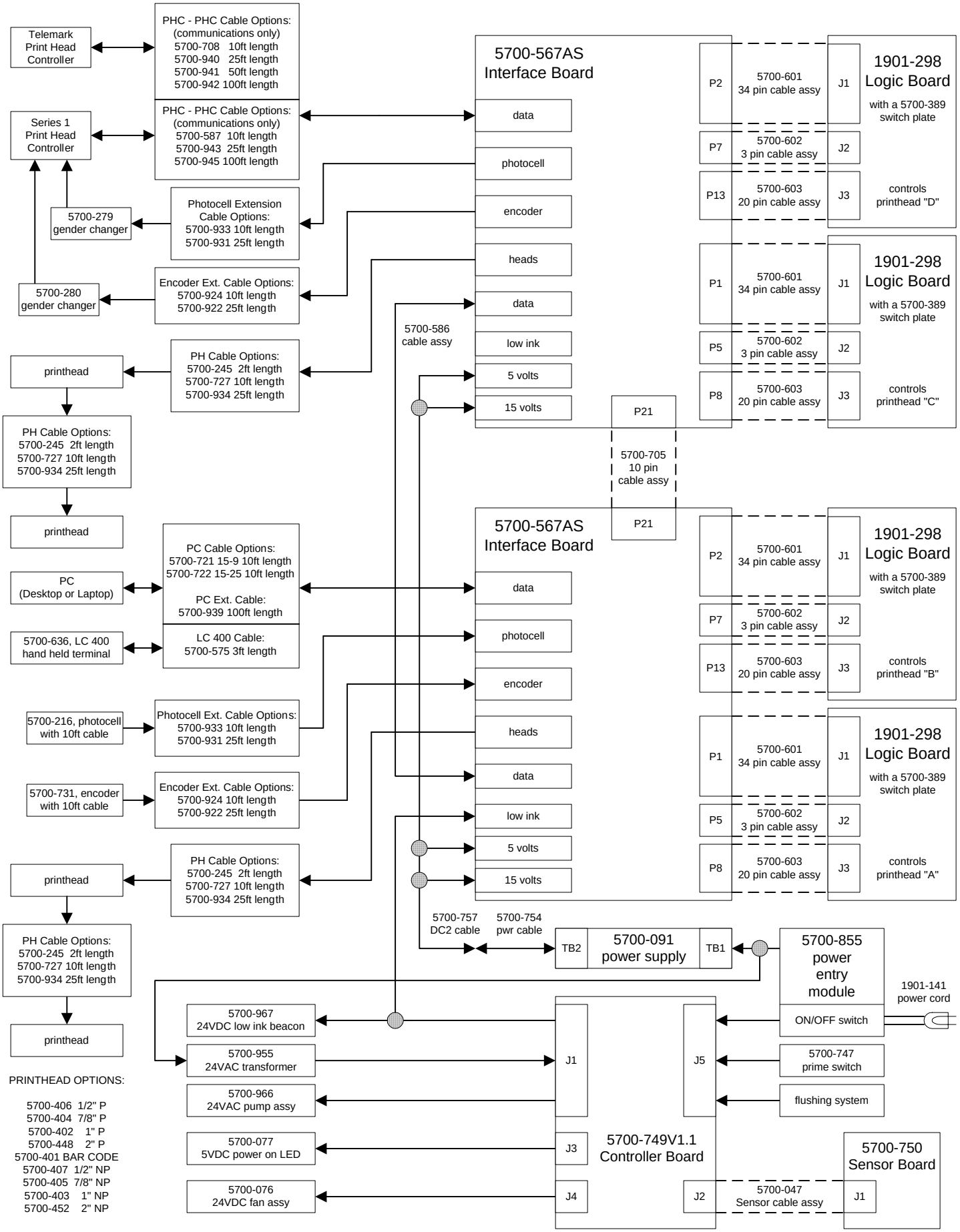
5700-812
Japanese Dual Head PC-Based Multi-tasking Controller



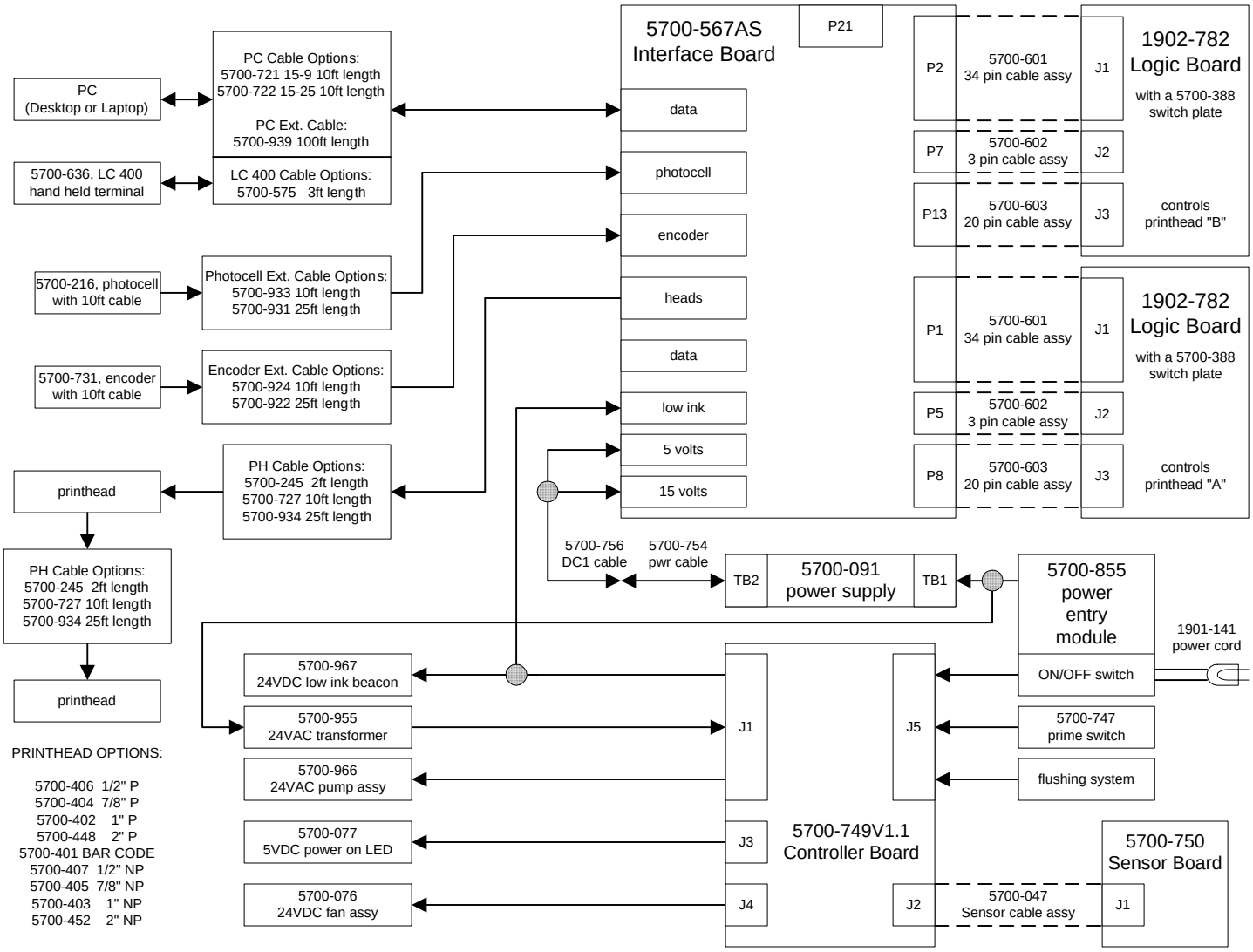
5700-996
Dual Head SA-99MS Controller



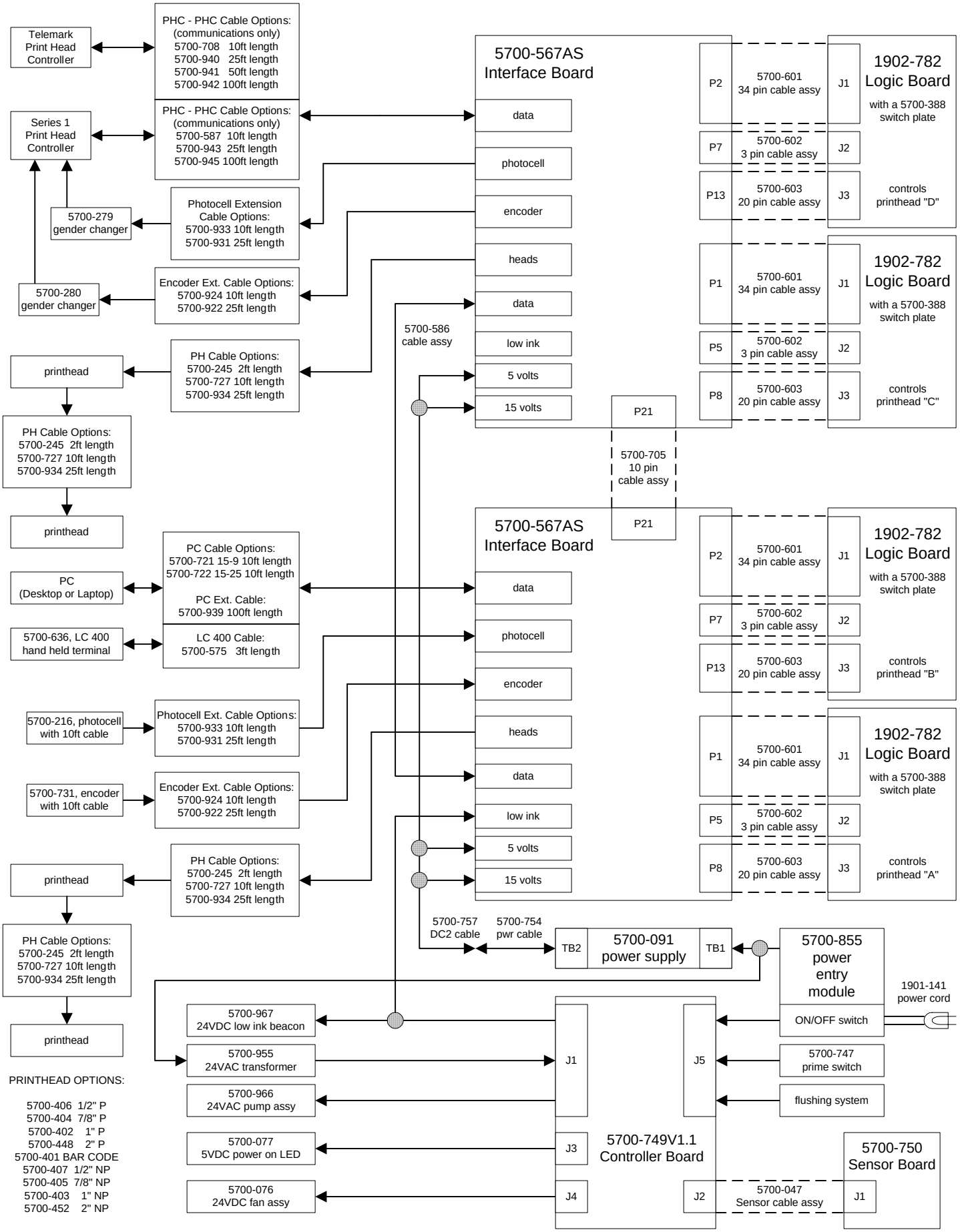
5700-998
Quad Head SA-99MS Controller



5701-002
Dual Head PC-Based Controller



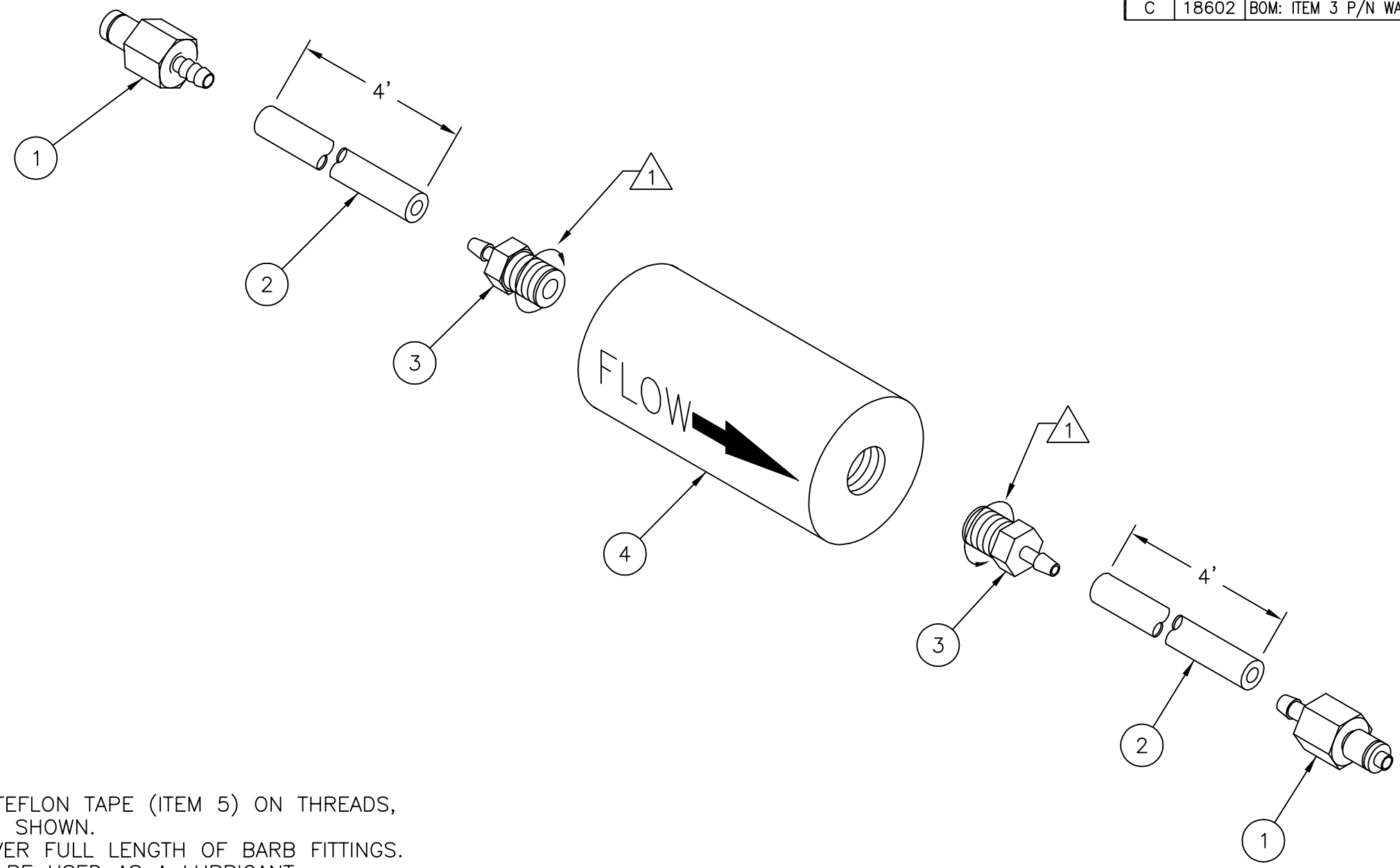
5701-004
Quad Head PC-Based Controller



Component Assembly Drawings

Pictorials and assembly instructions for various Series 1 components.

REVISIONS						
REV	ECN	DESCRIPTION	DATE	APPROVED		
A	16292	NEW DRAWING	11/03/95	JG		
B	18290	BOM: ITEM 2 QTY WAS 5'	10-15-01	BR	BG	
C	18602	BOM: ITEM 3 P/N WAS 5700-160.	4-25-02	BR	BG	



NOTES:

1. USE 2-3 LAYERS OF TEFLON TAPE (ITEM 5) ON THREADS, WRAPPED IN DIRECTION SHOWN.
2. INSTALL TUBING TO COVER FULL LENGTH OF BARB FITTINGS. TSO CONDITIONER MAY BE USED AS A LUBRICANT.

ITEM	PART NO.	DESCRIPTION	QTY
5	1301-877	TAPE, TEFLON	AR
4	5700-715	FILTER,INK,100 MICRON	1
3	5361-310	FITTING,STRAIGHT,1/8"BARB,1/8"NPT	2
2	1301-468	TUBING,.25 OD	8'
1	1900-757	VALVE,QD,INLINE,1/8",MALE	2

NEXT ASSY | MODEL

UNLESS OTHERWISE SPECIFIED:
- ALL DIMENSIONS ARE SHOWN IN INCHES.
- ALL DIMENSIONS APPLY AFTER FINISH.
- REMOVE BURRS.

TOLERANCES:
- LINEAR 2PL (.XX) ±.015
- 3PL (.XXX) ±.005
- HOLE DIAMETERS ±.005
- ANGULAR ±°1
- MACHINE SURFACE 125

MAT'L SPEC

FILE NAME 5760-026.DWG

DWN	L. PATE	11/3/95
APP	MIKE KOLVE	11/3/95
APP	C.JOHNSTON	12/14/95

ASSY PROC

INSP PROC

CAGE CODE

Diagraph CORPORATION

IDS FILTER ASSEMBLY

SIZE	DWG NO	REV
B	5700-026	C

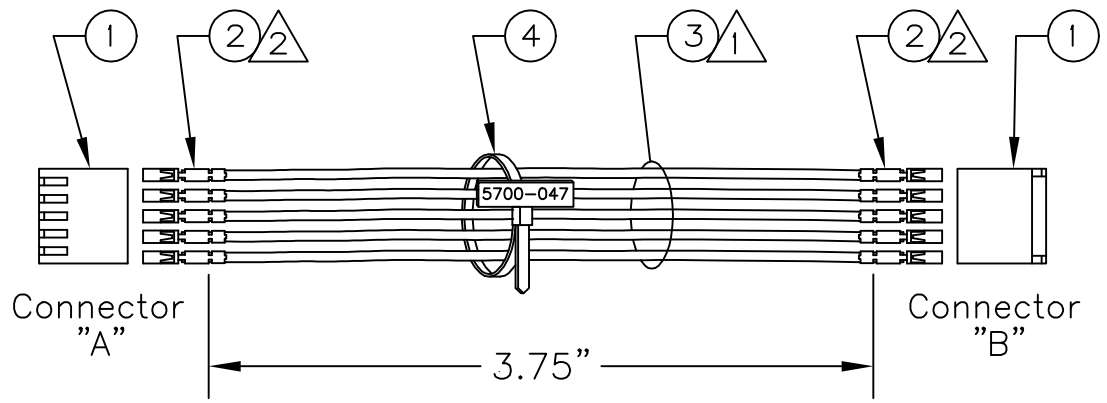
SCALE: NONE SHEET 1 OF 1

NOTES:

1. CUT THE WIRE (ITEM 3) INTO FIVE EQUAL LENGTHS AND STRIP ALL ENDS 5/16" FOR CRIMPING.
2. CRIMP THE CONNECTOR RECEPTACLES (ITEM 2) ONTO THE WIRE ENDS, USING THE PRO-CRIMPER II HAND TOOL ASS'Y 58517-1 WITH DIE ASS'Y 58517-2 FOR INSERTION INTO BOTH CONNECTORS (ITEM 1).

REVISIONS						
REV	ECN	DESCRIPTION	DATE	APPROVED		
A	16292	NEW DRAWING	11/06/95			

PINOUT	
"A"	"B"
1	1
2	2
3	3
4	4
5	5



ITEM	PART NO.	DESCRIPTION	QTY
4	1301-547	TIE WRAP CABLE MARKING TAB	1
3	1300-688	WIRE, 24 GAUGE RED	19"
2	6105-270	CONN., RECEPTACLE AMP 770666-1	10
1	5700-768	CONNECTOR, CABLE AMP 770602-5	2

NEXT ASSY	MODEL
5700-053	SERIES 1

UNLESS OTHERWISE SPECIFIED:
- ALL DIMENSIONS ARE SHOWN IN INCHES.
- ALL DIMENSIONS APPLY AFTER FINISH.
- REMOVE BURRS.

TOLERANCES:
- LINEAR 2PL (.XX) ±.015
- LINEAR 3PL (.XXX) ±.005
- HOLE DIAMETERS ±.005
- ANGULAR ±°1
- MACHINE SURFACE 125

MAT'L SPEC

FILE NAME 5700-047.DWG

DWN

APP

APP

ASSY PROC

INSP PROC

CAGE CODE XXXXX

Diagraph CORPORATION

CABLE, ASS'Y SENSOR, SERIES 1

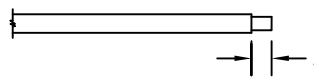
SIZE	DWG NO	REV
B	5700-047	A

SCALE: N/A SHEET 1 OF 1

DWG NO 5700-047 SH 1

NOTES:

1. INSTALL PINS AT LOCATIONS 3 AND 7 FOR KEYING PURPOSES.
2. STRIP LENGTHS: 5/16"



C 3. PLACE TIE WRAP CABLE MARKING TAB (ITEM 24) AROUND ALL THE WIRES AFTER ALL THE CONNECTIONS HAVE BEEN MADE, EXCLUDING THE GREEN/YELLOW WIRE (ITEM 13). WRITE 5700-054 ON THE TAB.

ITEM	PART NO.	DESCRIPTION	QTY	
24	1301-547	TIE WRAP CABLE MARKING TAB	1	
23	5700-546	SOCKET AMP, 641300-1	24	B
22	1900-511	24AWG BLACK WIRE	19"	B
21	1300-688	24AWG RED WIRE	19"	B
20	1300-685	24AWG YELLOW WIRE	10"	
19	1300-686	24AWG WHITE WIRE	10"	
18	5700-105	18AWG BLUE WIRE	5"	C
17	1901-142	18AWG BLACK WIRE	35"	B C
16	6105-329	RECEPTACLE SL156	3	
15	5700-515	18AWG ORANGE WIRE	5"	C
14	1901-144	18AWG WHITE WIRE	30"	B C
13	5700-103	18AWG GREEN/YELLOW WIRE	3"	C
12	2460-385	PIN CONTACT, 16-02-0114	6	B
11	1199-206	RING LUG	1	
10				
9	5700-604	DB-9 BACKSHELL	1	
8	5700-542	JACKSCREWS	2	
7	1900-564	DB CONNECTOR PINS	4	
6	2800-433	DB-9M CONNECTOR	1	
5	5700-184	7F CONNECTOR AMP,770849-7	1	
4	5700-292	3 POS. MALE CONN. 70107-0002	1	
3	5700-291	2 POS. MALE CONN. 70107-0001	2	B
2	5700-084	9F CONNECTOR AMP,1-640521-0	1	
1	5700-088	20F CONNECTOR AMP,1-640524-0	1	

C

ITEM 2 PIN	ITEM 1 PIN	WIRE LENGTH	WIRE COLOR
1	1	5"	18AWG BLK
2	2	5"	18AWG BLK
3	3	5"	18AWG WHT
4	4	5"	18AWG WHT
5	5	5"	18AWG ORANGE
6	6	5"	18AWG BLUE
7	N\C	–	–
8	8	5"	18AWG BLK
9	N\C	–	–

ITEM 3 PIN	ITEM 1 PIN	WIRE LENGTH	WIRE COLOR
1	10	15"	24AWG RED
2	11	15"	24AWG BLK

ITEM 3 PIN	ITEM 1 PIN	WIRE LENGTH	WIRE COLOR
1	17	2"	24AWG RED
2	18	2"	24AWG BLK

C

ITEM 4 PIN	ITEM 1 PIN	WIRE LENGTH	WIRE COLOR
1	12	3"	24AWG RED
2	N\C	–	–
3	13	3"	24AWG BLK

C

ITEM 5 PIN	ITEM 1 PIN	ITEM 11 PIN	WIRE LENGTH	WIRE COLOR
1	N\C	N\C	–	–
2	16	N\C	20"	18AWG BLK
3	N\C	N\C	–	–
4	15	N\C	20"	18AWG WHT
5	N\C	N\C	–	–
6	N\C	LUG	3"	18AWG GRN/YLW
7	N\C	N\C	–	–

C

ITEM 6 PIN	ITEM 1 PIN	WIRE LENGTH	WIRE COLOR
1	N\C	–	–
2	N\C	–	–
3	N\C	–	KEY
4	N\C	–	–
5	19	10"	24AWG WHT
6	20	10"	24AWG YLW
7	N\C	–	KEY
8	N\C	–	–
9	N\C	–	–

REVISIONS

REV	ECN	DESCRIPTION	DATE	APPROVED		
A	16292	NEW DRAWING	11/16/95	JG	MK	CJ
B	16461	QTY # 3 WAS 1, QTY #12 WAS 4. QTY #4 WAS 15", QTY #17 WAS 10" QTY #21 & #22 WERE 17". QTY #23 WAS 21.	2/23/96	MK	JG	
C	17703	ITEMS 13, 14, 15, 17, & 18 WERE 5700-660, 5700-659, 5700-644, 5700-661, & 5700-643 ALL THOSE ITEMS WERE 20AWG. ITEMS 13 & 15 WERE ONLY GREEN WIRE & YELLOW WIRE. IN CHART ITEM 4 WIRE LENGTH WAS 2". REVISED NOTE 3. PICTORIAL OF BUSHING WAS BACKWARDS				

CONFIDENTIAL

THIS DOCUMENT CONTAINS CONFIDENTIAL INFORMATION OF DIAGRAPH CORP. AND IS NOT TO BE COPIED, USED OR DISCLOSED TO OTHERS WITHOUT THE EXPRESS WRITTEN CONSENT OF DIAGRAPH CORP.

NEXT ASSY	MODEL

UNLESS OTHERWISE SPECIFIED:
- ALL DIMENSIONS ARE SHOWN IN INCHES.
- ALL DIMENSIONS APPLY AFTER FINISH.
- REMOVE BURRS.

TOLERANCES:
- LINEAR 2PL (.XX) ±.015
- 3PL (.XXX) ±.005
- HOLE DIAMETERS ±.005
- ANGULAR ±°1
- MACHINE SURFACE 125

MAT'L SPEC

FILE NAME 5700-054.DWG

DWN	L. PATE	12/07/95
APP	M. KOLVE	12/07/95
APP	CJ	12/07/95

ASSY PROC

INSP PROC

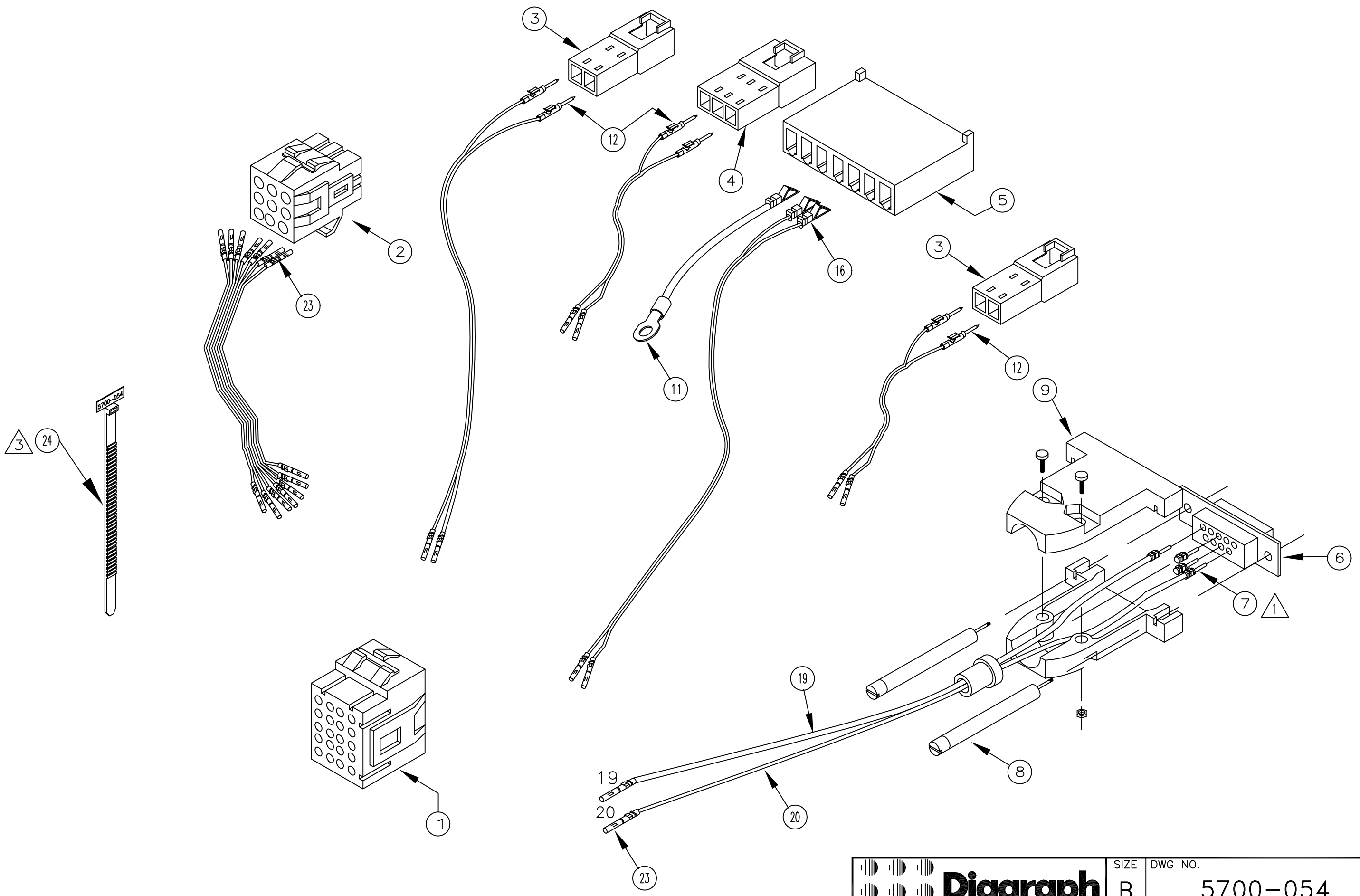
CAGE CODE

Diagraph CORPORATION

SERIES POWER WIRING ASSY.

SIZE	DWG NO	REV
B	5700-054	C

SCALE: N/A SHEET 1 OF 2

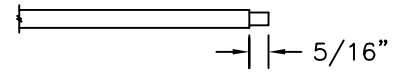


Diagraph CORPORATION

SIZE	DWG NO.	REV
B	5700-054	C
SCALE: N/A	SHEET 2 OF 2	

NOTES:

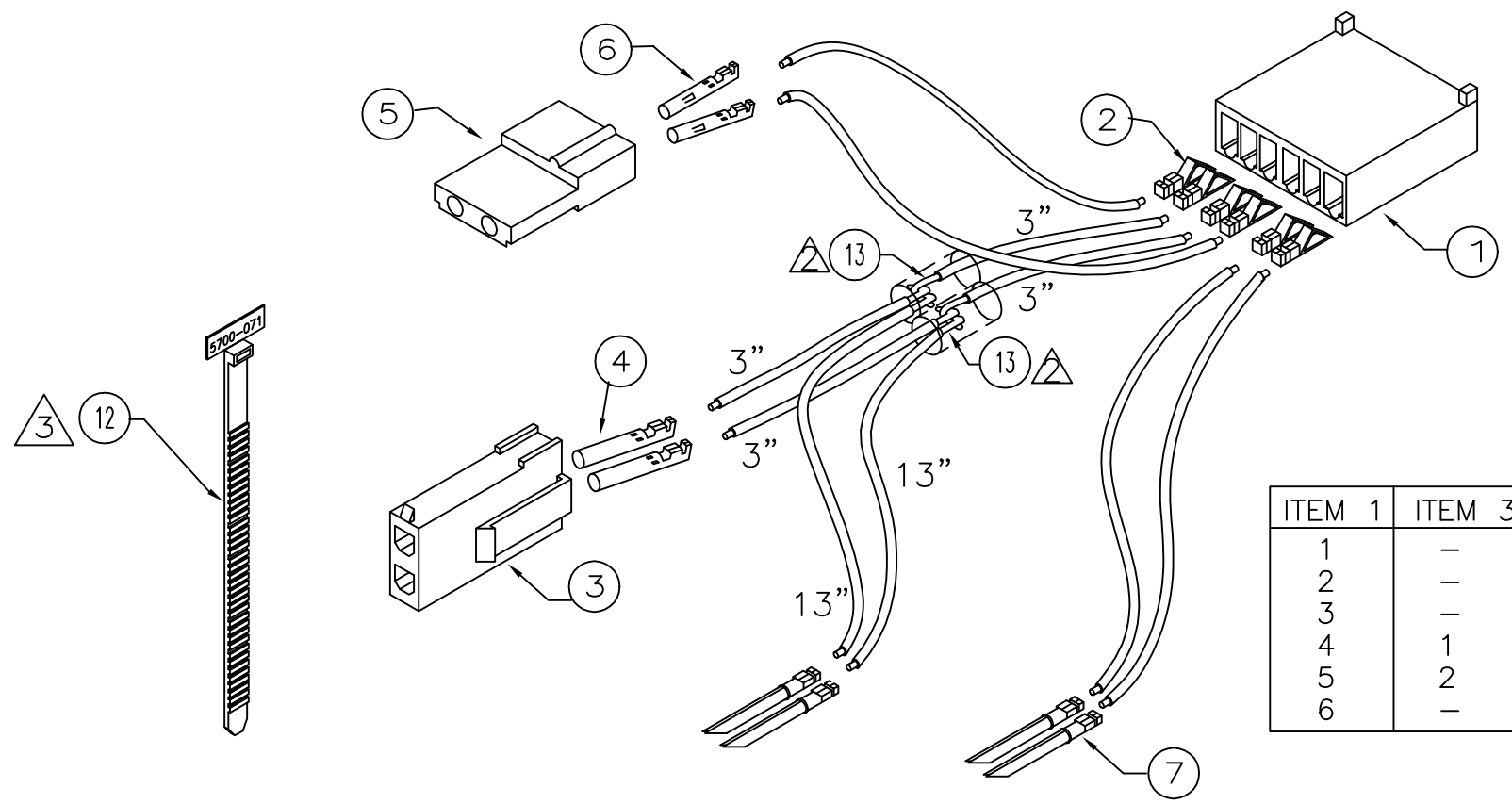
1. STRIP LENGTHS: 5/16"

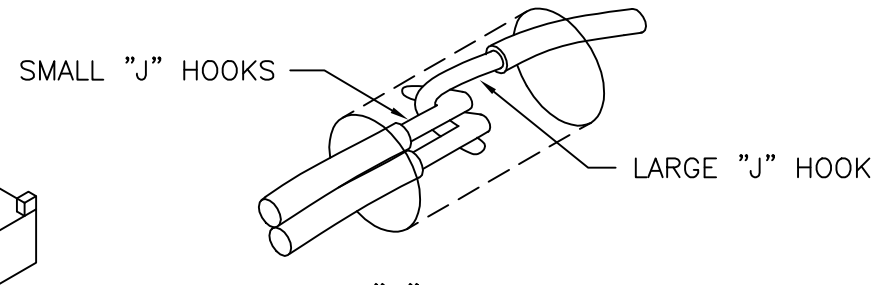


2. CLAMP "J" HOOKS TOGETHER AND SOLDER. ALLOW 1/2" ON MAIN WIRE AND 1/4" ON SECONDARY WIRES FOR HOOKS. SHRINK 1" OF TUBING OVER CONNECTIONS. DETAIL SHOWN: "A".

3. PLACE TIE WRAP (ITEM 12) AROUND ALL THE WIRES AFTER ALL THE CONNECTIONS HAVE BEEN MADE. WRITE 5700-071 ON THE TAB.

REVISIONS						
REV	ECN	DESCRIPTION	DATE	APPROVED		
A	16292	NEW DRAWING	12/06/95	JG	MK	CJ
B	16461	ITEMS 8 & 11 WERE: 17" & 2" RESPECTIVELY	02-27-96			





DETAIL "A"

ITEM 1	ITEM 3	ITEM 5	ITEM 7	WIRE COLOR	WIRE LENGTH	
1	–	–	PIN	WHITE	15"	
2	–	–	PIN	BLACK	15"	
3	–	1	–	BLACK	4"	B
4	1	–	PIN	WHITE	19"	
5	2	–	PIN	YELLOW	19"	
6	–	2	–	GREEN	4"	B

ITEM	PART NO.	DESCRIPTION	QTY
13	1902-764	SHRINK TUBING	2"
12	1301-547	TIE WRAP CABLE MARKING TAB	1
11	5700-660	20AWG GREEN WIRE	4"
10	5700-644	20AWG YELLOW WIRE	19"
9	5700-659	20AWG WHITE WIRE	34"
8	5700-661	20AWG BLACK WIRE	19"
7	5700-545	J1 PINS AMP,640545-1	4
6	1199-159	SOCKETS	2
5	1199-157	2 POSITION CONNECTOR	1
4	5700-276	SOCKETS	2
3	5700-270	2 POSITION CONNECTOR	1
2	6105-329	RECEPTACLES SL-156	6
1	5700-774	6 POSITION HOUSING MTA-156	1

5700-053	
NEXT ASSY	MODEL

UNLESS OTHERWISE SPECIFIED:

ALL DIMENSIONS ARE SHOWN IN INCHES.

ALL DIMENSIONS APPLY AFTER FINISH.

REMOVE BURRS.

TOLERANCES:

LINEAR	2PL (.XX)	±.015
	3PL (.XXX)	±.005
HOLE DIAMETERS		±.005
ANGULAR		±°1
MACHINE SURFACE		125

MAT'L SPEC

FILE NAME 5700-071.DWG

DWN	LP	12-08-95
APP	MK	12-08-95
APP	CJ	12-08-95

ASSY PROC

INSP PROC

CAGE CODE XXXXX

Diagraph CORPORATION

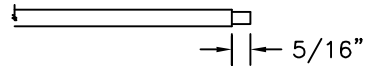
SERIES 1 IDS1 CABLE ASSY

SIZE	DWG NO	REV
B	5700-071	B

SCALE: 1/1 SHEET 1 OF 1

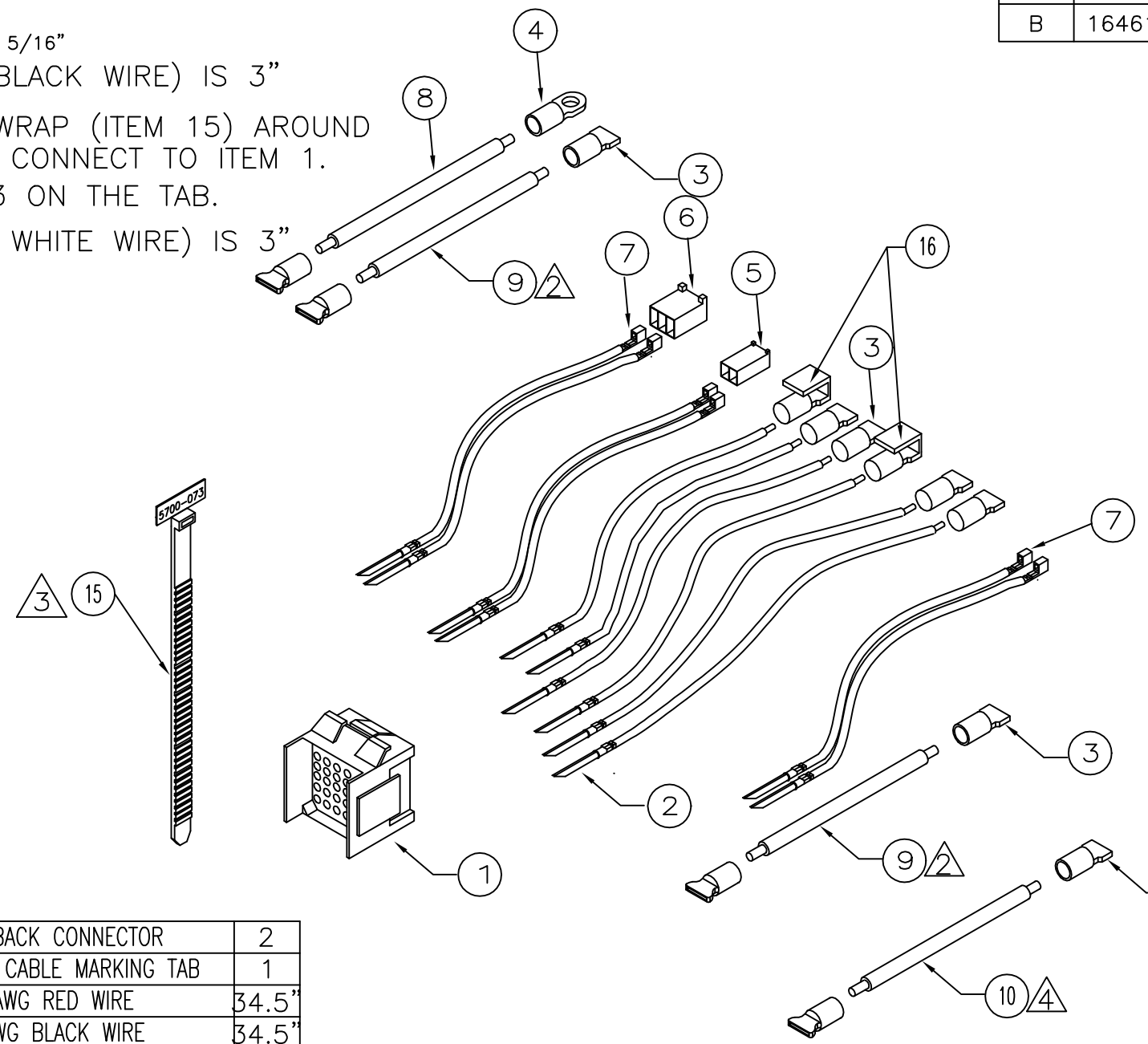
DWG NO 5700-071 SH 1

NOTES:
1. STRIP LENGTHS: 5/16"



2. ITEM 9 (20AWG BLACK WIRE) IS 3"
3. PLACE THE TIE WRAP (ITEM 15) AROUND ALL WIRES THAT CONNECT TO ITEM 1. WRITE 5700-073 ON THE TAB.
4. ITEM 10 (20AWG WHITE WIRE) IS 3"

REVISIONS						
REV	ECN	DESCRIPTION	DATE	APPROVED		
A	16292	NEW DRAWING	11/16/95	JG	MK	CJ
B	16461	ITEM # 7 WAS: 4/ ITEM # 13 & 14 WERE: 21"	02-21-96			



ITEM 7	ITEM 1	ITEM 16	ITEM 3	ITEM 6	ITEM 5	WIRE COLOR	WIRE LENGTH
–	1	–	–	–	–	–	–
–	2	–	–	–	–	–	–
–	3	–	–	–	–	–	–
–	4	PB LUG	–	–	–	WHITE 20AWG	13.5"
–	5	–	LUG	–	–	YELLOW 20AWG	13.5"
–	6	–	LUG	–	–	BLUE 20AWG	13.5"
–	7	–	–	–	–	–	–
–	8	PB LUG	–	–	–	BLACK 20AWG	13.5"
–	9	–	–	–	–	–	–
–	10	–	–	–	1	RED 24AWG	11"
–	11	–	–	–	2	BLACK 24AWG	11"
–	12	–	–	1	–	RED 24AWG	10"
–	13	–	–	3	–	BLACK 24AWG	10"
–	14	–	–	–	–	–	–
–	15	–	LUG	–	–	WHITE 20AWG	13.5"
–	16	–	LUG	–	–	BLACK 20AWG	13.5"
PIN	17	–	–	–	–	RED 24AWG	13.5"
PIN	18	–	–	–	–	BLACK 24AWG	13.5"
–	19	–	–	–	–	–	–
–	20	–	–	–	–	–	–

ITEM	PART NO.	DESCRIPTION	QTY
16	5700-863	PIGGYBACK CONNECTOR	2
15	1301-547	TIE WRAP CABLE MARKING TAB	1
14	1300-688	24AWG RED WIRE	34.5"
13	1900-511	24AWG BLACK WIRE	34.5"
12	5700-643	20AWG BLUE WIRE	13.5"
11	5700-644	20AWG YELLOW WIRE	13.5"
10	5700-659	20AWG WHITE WIRE	30"
9	5700-661	20AWG BLACK WIRE	33"
8	5700-660	20AWG GREEN WIRE	3"
7	6105-270	RECEPTACLES CST-100	6
6	5700-766	3 POSITION HOUSING MTA-100	1
5	6105-268	2 POSITION HOUSING MTA-100	1
4	1199-206	RING LUG	1
3	1199-219	SMALL SPADE LUG	11
2	5700-545	J1 PINS AMP,640545-1	12
1	5700-086	J1 CONNECTOR AMP,1-640514-0	1

5700-801	
5700-053	
NEXT ASSY	MODEL

UNLESS OTHERWISE SPECIFIED:
- ALL DIMENSIONS ARE SHOWN IN INCHES.
- ALL DIMENSIONS APPLY AFTER FINISH.
- REMOVE BURRS.

TOLERANCES:
- LINEAR 2PL (.XX) ±.015
- LINEAR 3PL (.XXX) ±.005
- HOLE DIAMETERS ±.005
- ANGULAR ±°1
- MACHINE SURFACE 125√

MAT'L SPEC

FILE NAME 5700-073.DWG

DWN LP	01-03-96
APP MK	01-03-96
APP CJ	01-03-96

ASSY PROC

INSP PROC

CAGE CODE XXXXX

Diagraph CORPORATION

SERIES 1 IDS2 CABLE ASSY

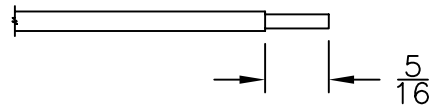
SIZE	DWG NO	REV
B	5700-073	B

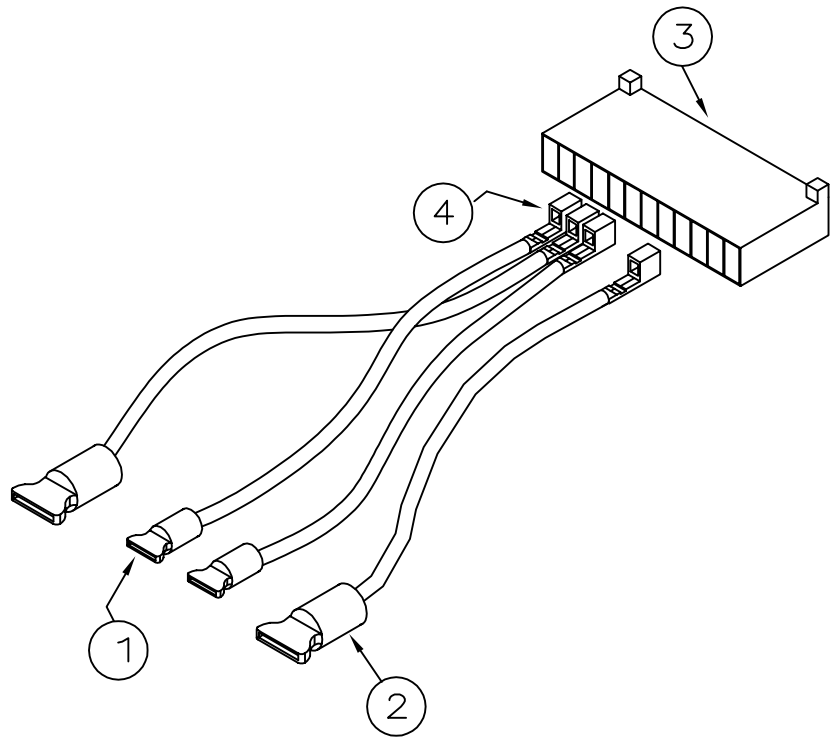
SCALE: N/A SHEET 1 OF 1

DWG NO 5700-073 SH 1

REVISIONS						
REV	ECN	DESCRIPTION	DATE	APPROVED		
A	16292	NEW DRAWING	11/16/95	JSG		
B	18588	BOM: REMOVED ITEM 8 P/N 1301-547. NOTES: REMOVED NOTE 2 WAS "PLACE TIE WRAP (ITEM 8) AROUND THE WIRES AND WRITE 5700-074 ON THE TAB."	3/18/02	BR	BG	

NOTES:
1. STRIP LENGTHS: 5/16"





ITEM 3 PIN#	CONNECT TO	WIRE COLOR	WIRE LENGTH
1	–	–	–
2	–	–	–
3	–	–	–
4	–	–	–
5	ITEM 2	YELLOW	7"
6	–	–	–
7	–	–	–
8	ITEM 1	WHITE	6"
9	ITEM 2	BLACK	7"
10	ITEM 1	BLACK	6"
11	–	–	–
12	–	–	–

ITEM	PART NO.	DESCRIPTION	QTY
7	1300-686	24AWG WHITE WIRE	6"
6	1300-685	24AWG YELLOW WIRE	7"
5	1900-511	24AWG BLACK WIRE	13"
4	6105-270	RECEPTACLES CST-100	4
3	5700-771	12 POSITION HOUSING MTA-100	1
2	1199-211	LARGE SPADE LUG	2
1	1199-219	SMALL SPADE LUG	2

NEXT ASSY	MODEL

UNLESS OTHERWISE SPECIFIED:
- ALL DIMENSIONS ARE SHOWN IN INCHES.
- ALL DIMENSIONS APPLY AFTER FINISH.
- REMOVE BURRS.

TOLERANCES:

LINEAR	2PL (.XX)	±.015
	3PL (.XXX)	±.005
HOLE DIAMETERS		±.005
ANGULAR		±°1
MACHINE SURFACE		125

MAT'L SPEC

FILE NAME 5700-074.DWG

DWN	L. PATE	12/14/95
APP	MIKE KOLVE	11/21/95
APP	C. JOHNSTON	12/14/95

ASSY PROC

INSP PROC

CAGE CODE

Diagraph CORPORATION

SERIES 1 IDS3 CABLE ASSY

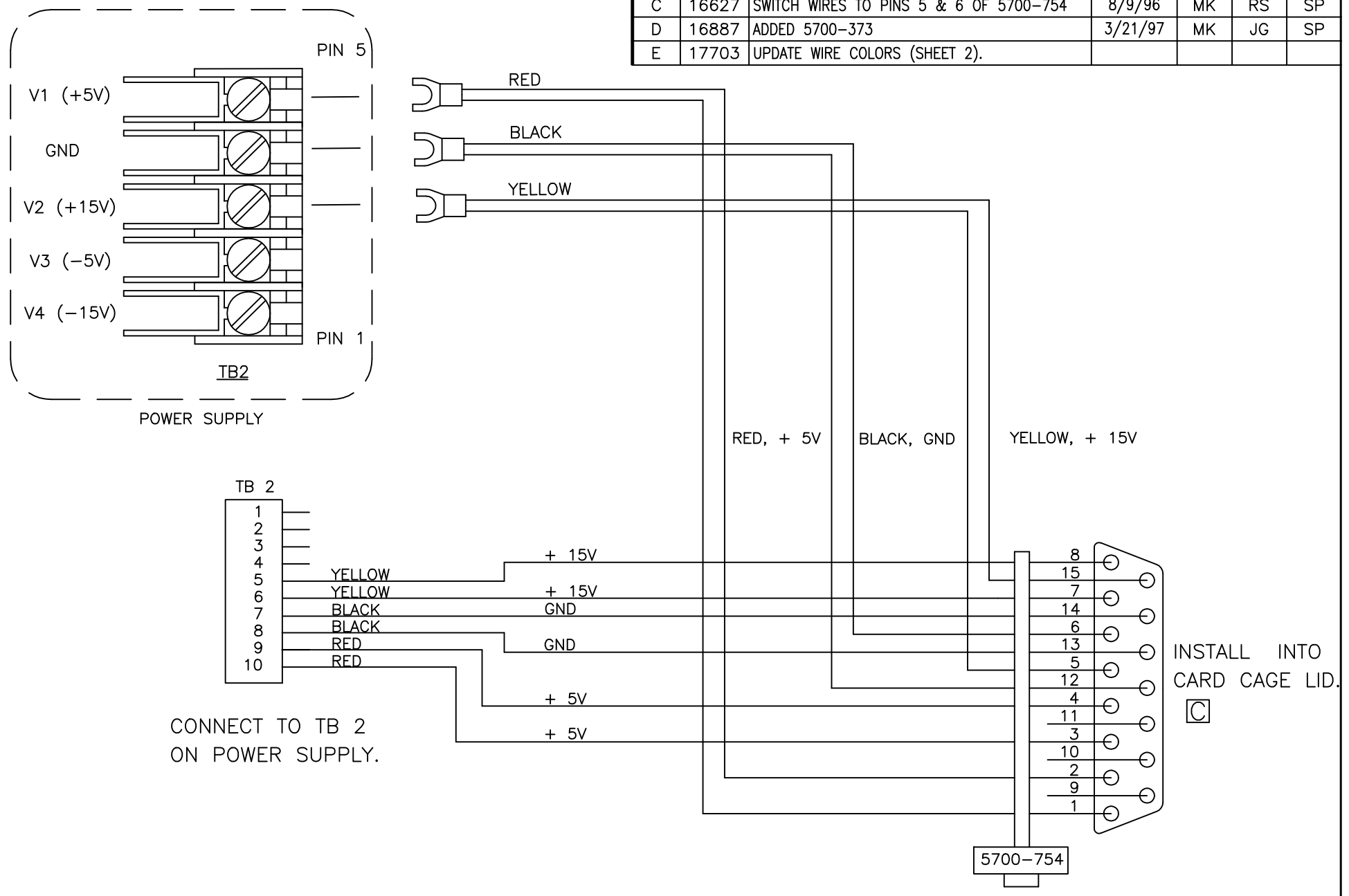
SIZE	DWG NO	REV
B	5700-074	B

SCALE: NONE SHEET 1 OF 1

NOTES:

1. MOUNT POWER SUPPLY TO CARD CAGE LID. CONNECT SAFETY GROUND RING LUG MOUNT POWER SUPPLY TO CARD CAGE LID. CONNECT SAFTEY GROUND RING LUG TO STUD ON CARD LID. SECURE USING 8–32 LOCK NUT (ITEM 14).
2. ROUTE WIRING THROUGH THE 1/2" NYLON CABLE CLAMP (ITEM 19) AND FASTEN TO CARD CAGE LID. PLACE 4 TIE WRAPS (ITEM 20) AROUND WIRE BUNDLE USING 2 TIE WRAPS ON EACH SIDE OF THE CABLE CLAMP.

REVISIONS						
REV	ECN	DESCRIPTION	DATE	APPROVED		
A	16292	NEW DRAWING	11/27/95	JG		
B	16461	ADDED 5700–754	2/23/96	MK	JG	CJ
C	16627	SWITCH WIRES TO PINS 5 & 6 OF 5700–754	8/9/96	MK	RS	SP
D	16887	ADDED 5700–373	3/21/97	MK	JG	SP
E	17703	UPDATE WIRE COLORS (SHEET 2).				



ITEM	PART NO.	DESCRIPTION	QTY	
23	5700–373	TRANSFORMER TRAY	1	D
22	5700–242	SCREW LOCK KIT	1	B
21	5700–754	PS CABLE ASS'Y	1	B
20	5700–181	TIE WRAP	4	
19	5700–304	1/2" NYLON CABLE CLAMP	1	
18	5101–105	SCREW	2	
17	5241–705	SCREW	8	
16	5700–185	FAN GUARD	1	
15	5121–514	8–32X1.25 MACHINE SCREW	4	
14	5309–307	8–32 LOCK NUT	6	
13	5310–008	WASHER	4	
12	5700–003	CARD GUIDE	4	
11	5700–682	CAPTIVE SCREW	4	
10	5321–207	RETAINING E–RING	4	
9	5700–123	CARD CAGE LID	1	
8	5700–146	CARD CAGE	1	
7	5700–054	AC POWER CABLE ASSEMBLY	1	
6	5700–077	LED ASSEMBLY	1	
5	5700–963	XFMR ASSEMBLY	1	
4	5700–076	FAN ASSEMBLY	1	
3	5700–106	POWER SUPPLY COVER	1	
2	5700–091	POWER SUPPLY MAP55–4003	1	
1	5700–177	SHELF	1	

NEXT ASSY | MODEL

UNLESS OTHERWISE SPECIFIED:
- ALL DIMENSIONS ARE SHOWN IN INCHES.
- ALL DIMENSIONS APPLY AFTER FINISH.
- REMOVE BURRS.

TOLERANCES:
- LINEAR 2PL (.XX) ±.015
- 3PL (.XXX) ±.005
- HOLE DIAMETERS ±.005
- ANGULAR ±°1
- MACHINE SURFACE 125

MAT'L SPEC

FILE NAME 5700–075.DWG

DWN	L. PATE	12/7/95
APP	M. KOLVE	12/6/95
APP	C. JOHNSTON	12/7/95

ASSY PROC

INSP PROC

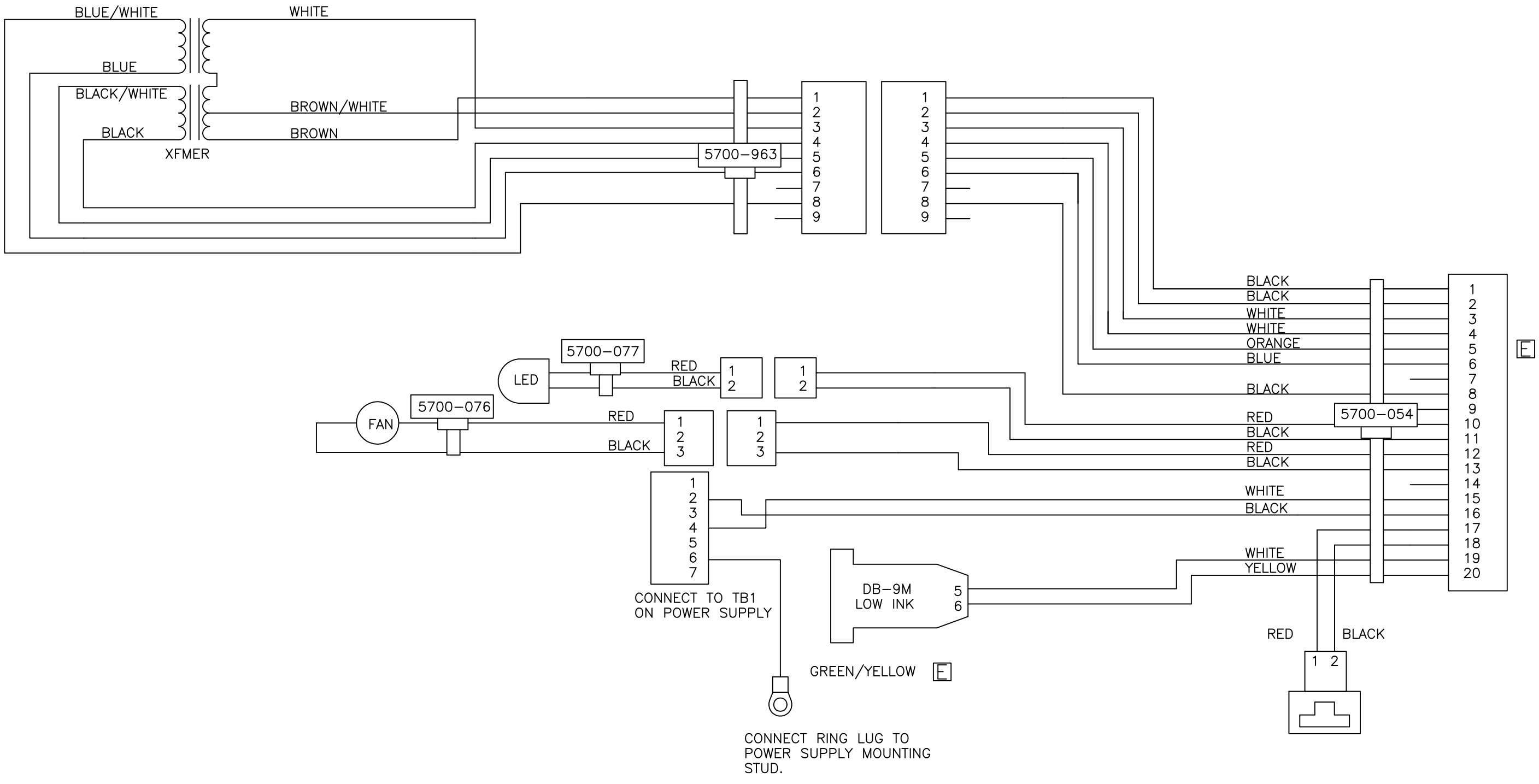
CAGE CODE

Diagraph CORPORATION

SERIES 1 CONTROLLER ASSY.

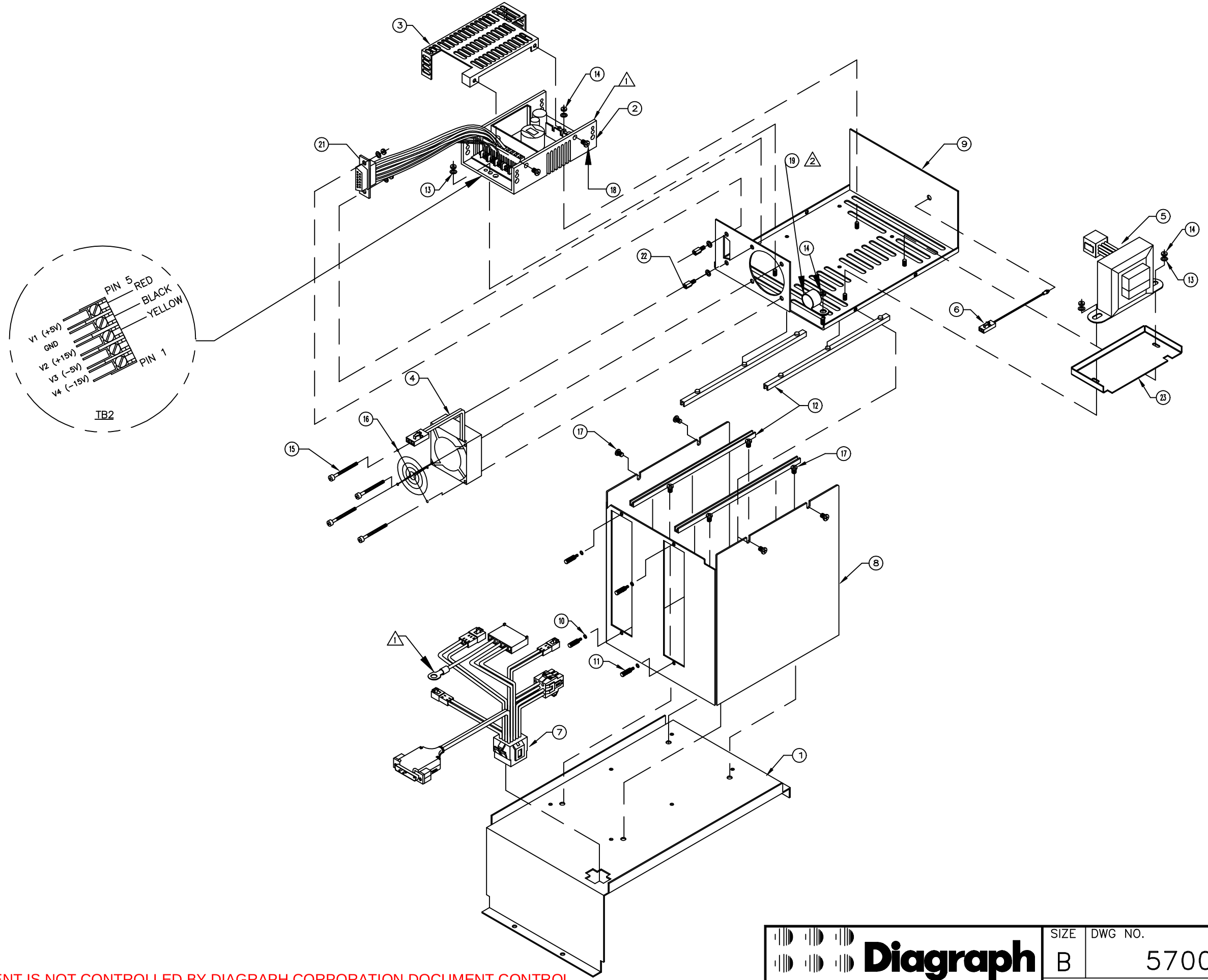
SIZE	DWG NO	REV
B	5700–075	E

SCALE: N/A SHEET 1 OF 3



Diagraph CORPORATION

SIZE	DWG NO.	REV
B	5700–075	E
SCALE: N/A	SHEET 2 OF 3	

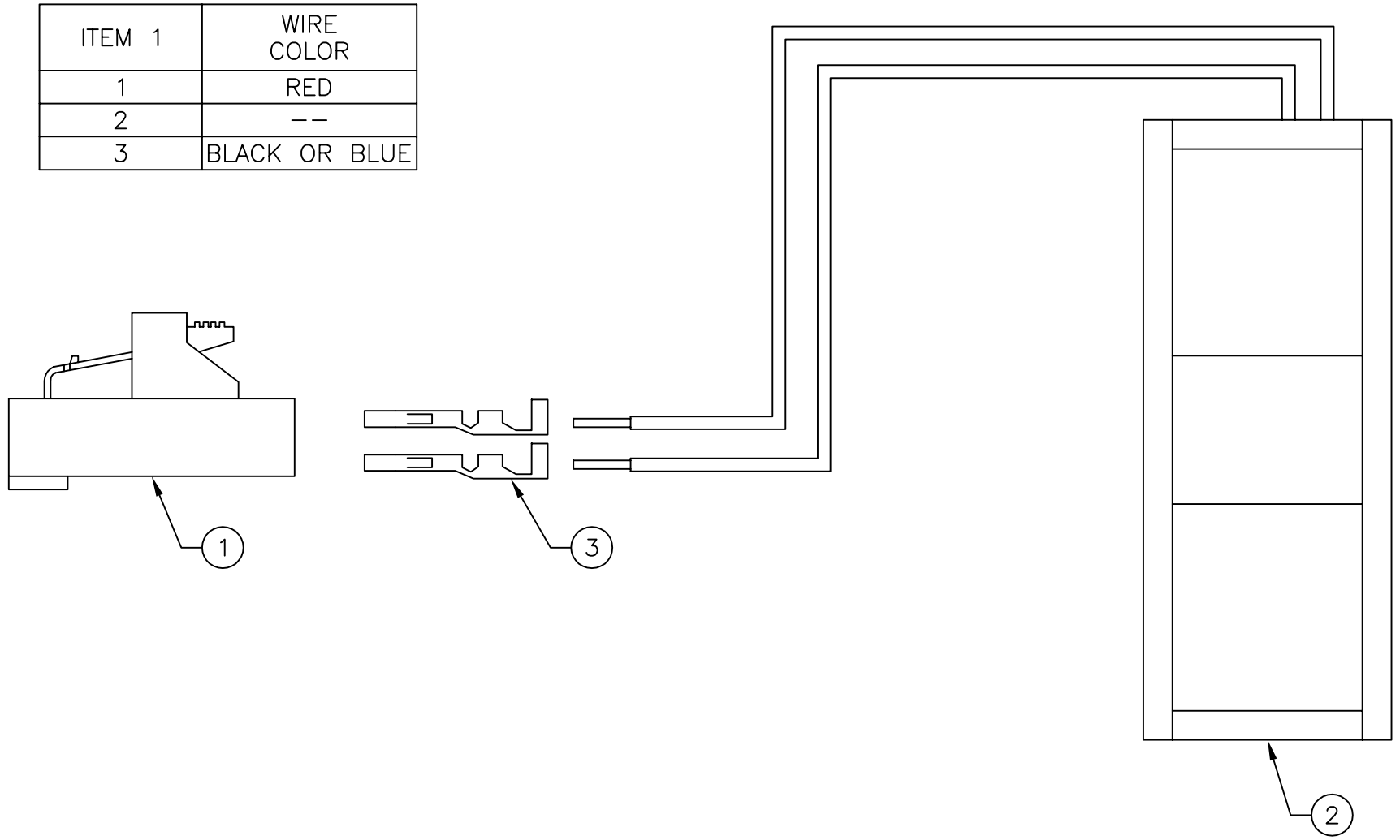


Diagraph CORPORATION

SIZE	DWG NO.	REV
B	5700-075	E
SCALE: N/A	SHEET 3 OF 3	

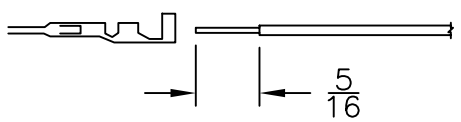
REVISIONS						
REV	ECN	DESCRIPTION	DATE	APPROVED		
A	16292	NEW DRAWING	11/03/95	JG		
B	18586	WIRE TABLE: ADDED "OR BLUE" TO PIN 3	3/15/02	BR	SB	

ITEM 1	WIRE COLOR
1	RED
2	--
3	BLACK OR BLUE



NOTES:

1. STRIP LENGTHS: CONDUCTORS 5/16"



ITEM	PART NO.	DESCRIPTION	QTY
3	2460-376	SOCKET CONTACT	2
2	5700-537	BOXER FAN NMB,2410NL-05W-B50	1
1	2460-375	MOLEX 3 POS. FEMALE HEADER	1

NEXT ASSY | MODEL

UNLESS OTHERWISE SPECIFIED:
- ALL DIMENSIONS ARE SHOWN IN INCHES.
- ALL DIMENSIONS APPLY AFTER FINISH.
- REMOVE BURRS.

TOLERANCES:
- LINEAR 2PL (.XX) ±.015
- LINEAR 3PL (.XXX) ±.005
- HOLE DIAMETERS ±.005
- ANGULAR ±°1
- MACHINE SURFACE 125√

MAT'L SPEC

FILE NAME 5700-076.DWG

DWN	L. Pate	12/14/95
APP	Mike Kolve	11/21/95
APP	C. Johnston	12/14/95

ASSY PROC

INSP PROC

CAGE CODE

Diagraph CORPORATION

SERIES 1 FAN WIRING ASSY.

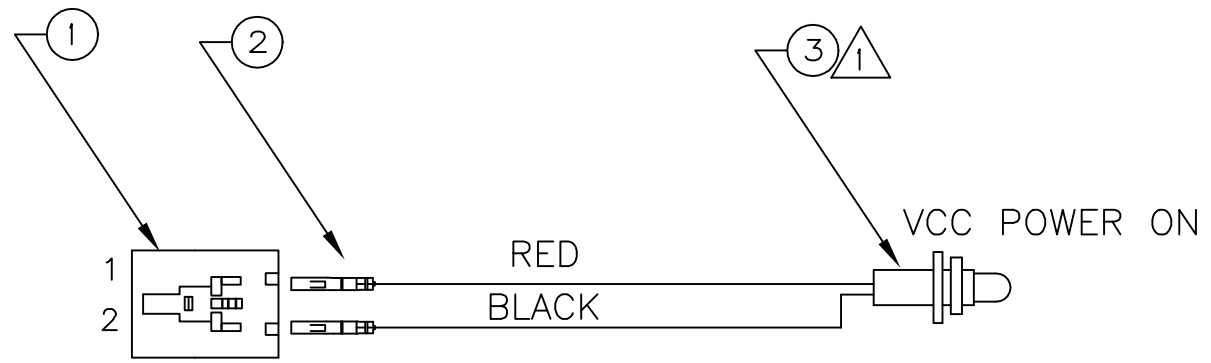
SIZE	DWG NO	REV
B	5700-076	B

SCALE: NONE SHEET 1 OF 1

NOTES:

1. THE VCC POWER ON LED IS VENDOR SUPPLIED WITH 6" OF WIRE.

REVISIONS						
REV	ECN	DESCRIPTION	DATE	APPROVED		
A	16292	NEW DRAWING	11/03/95			



ITEM	PART NO.	DESCRIPTION	QTY
3	5700-746	LED, LUMEX SSI-LXH9SRD-150, PANL	1
2	2460-376	SOCKET CONTACT	2
1	5700-300	MOLEX 2 POS. FEMALE HEADER	1

NEXT ASSY: 5700-075
MODEL:

UNLESS OTHERWISE SPECIFIED:
- ALL DIMENSIONS ARE SHOWN IN INCHES.
- ALL DIMENSIONS APPLY AFTER FINISH.
- REMOVE BURRS.

TOLERANCES:
- LINEAR 2PL (.XX) ±.015
- LINEAR 3PL (.XXX) ±.005
- HOLE DIAMETERS ±.005
- ANGULAR ±°1
- MACHINE SURFACE 125√

MAT'L SPEC

FILE NAME 5700-077.DWG
DWN
APP
APP
ASSY PROC
INSP PROC
CAGE CODE XXXXX

Diagraph CORPORATION

LED ASS'Y PANEL, IDS/SA

SIZE B | DWG NO 5700-077 | REV A
SCALE: N/A SHEET 1 OF 1

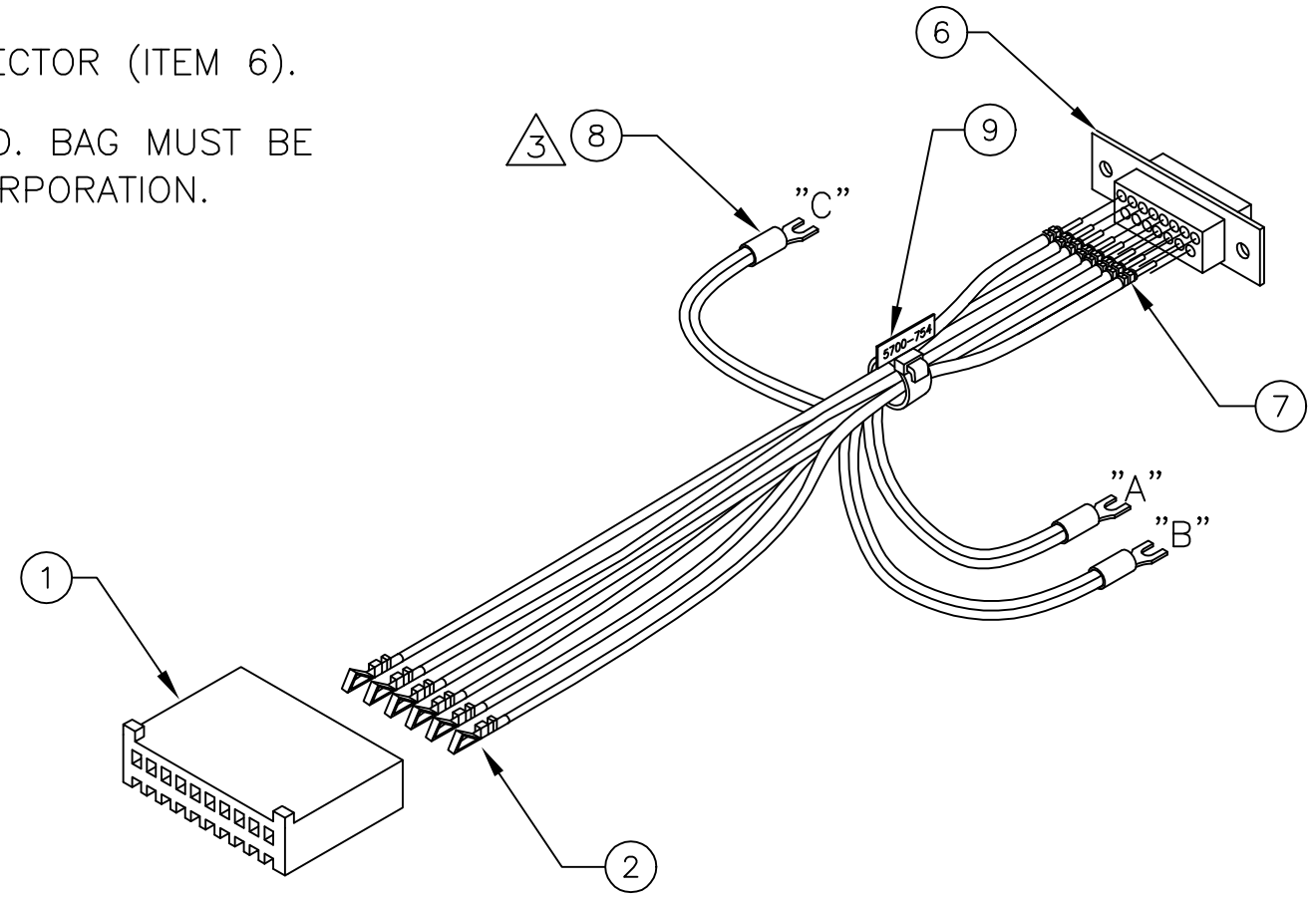
DWG NO 5700-077 SH 1

NOTES:

1. WIRE LENGTH: 4" EACH
2. STRIP LENGTH: 5/16"
3. TWIST WIRE ENDS TOGETHER BEFORE CRIMPING ONTO FORK LUGS.
4. OVERALL FINISHED ASSEMBLY LENGTH: 4" ±.5"
5. PLACE CABLE MARKING TAB (ITEM 9) WITHIN 1" OF CONNECTOR (ITEM 6).
6. CABLE MUST BE PACKAGED IN A PLASTIC BAG AND SEALED. BAG MUST BE LABELED WITH DIAGRAPH PART NUMBER AND DIAGRAPH CORPORATION.

REVISIONS						
REV	ECN	DESCRIPTION	DATE	APPROVED		
A	16454	NEW DRAWING	3/4/96	JG	SP	
B	16627	SWITCH WIRES IN PINS 5 & 6 ON ITEM 6	8/9/96			

PINOUT				
ITEM 1	ITEM 6	ITEM 8	WIRE COLOR	
–	1	LUG B	RED	
–	2	LUG B	RED	
10	3	–	RED	
9	4	–	RED	
–	5	LUG C	YELLOW	B
–	6	LUG A	BLACK	B
6	7	–	YELLOW	
5	8	–	YELLOW	
–	9	–	–	
–	10	–	–	
–	11	–	–	
–	12	LUG A	BLACK	
8	13	–	BLACK	
7	14	–	BLACK	
–	15	LUG C	YELLOW	



ITEM	PART NO.	DESCRIPTION	QTY
9	1301-547	CABLE MARKING TIE WRAP	1
8	1199-104	FORK LUG	3
7	1900-565	SOCKETS FOR DB-15F	12
6	5700-183	DB-15F CONNECTOR	1
5	5700-644	20 AWG YELLOW WIRE	16"
4	1301-880	20 AWG RED WIRE	16"
3	5700-661	20 AWG BLACK WIRE	16"
2	6105-329	SL-156 RECEPTACLES	6
1	5700-107	10 POS HOUSING (1-770849-0)	1

NEXT ASSY | MODEL

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE SHOWN IN INCHES.
ALL DIMENSIONS APPLY AFTER FINISH.
REMOVE BURRS.
TOLERANCES:
LINEAR 2PL (.XX) ±.015
3PL (.XXX) ±.005
HOLE DIAMETERS ±.005
ANGULAR ±°1
MACHINE SURFACE 125/

MAT'L SPEC

FILE NAME 5700-754.DWG

DWN	L. PATE	5/14/96
APP	M. KOLVE	5/13/96
APP	S. PERRMANN	5/15/96

ASSY PROC

INSP PROC

CAGE CODE

Diagraph CORPORATION

PS CABLE ASSEMBLY

SIZE	DWG NO	REV
B	5700-754	A

SCALE: X/X SHEET 1 OF 1

DWG NO 5700-754 SH 1

NOTES:

1. STRIP LENGTH: 5/16"

[C] 2 OVERALL ASSEMBLED LENGTHS:
CONNECTOR "A" TO CONNECTOR "B": 10" ±1/2"
CONNECTOR "A" TO CONNECTOR "C": 10" ±1/2"

3 VERBAGE ON ITEM 10:
LABEL A: 5700-756
LABEL B: 5V
LABEL C: 15V

REVISIONS						
REV	ECN	DESCRIPTION	DATE	APPROVED		
A	16454	NEW DRAWING	5/13/96	MK	SP	
B	17703	PICTORIAL OF BUSHINGS WAS BACKWARDS.	1/14/00	MK	MO	
C	17978	IN NOTE 2, CONNECTOR A WAS 10 1/2".				

PINOUT				
ITEM 7	ITEM 1 (5V)	ITEM 1 (15V)	WIRE COLOR	WIRE LENGTH
1	–	–	–	–
2	–	–	–	–
3	7	–	RED	9.5"
4	8	–	RED	9.5"
5	–	–	–	–
6	–	–	–	–
7	–	6	YELLOW	9.5"
8	–	7	YELLOW	9.5"
9	–	–	–	–
10	–	–	–	–
11	–	–	–	–
12	–	–	–	–
13	5	–	BLACK	9.5"
14	–	1	BLACK	9.5"
15	–	–	–	–

ITEM	PART NO.	DESCRIPTION	QTY
10	1301-547	TIE WRAP LABEL	3
9	5700-542	JACKSCREWS	6
8	5700-222	DB-15 BACKSHELL	1
7	5700-217	DB-15M CONNECTOR	1
6	5700-644	20 AWG YELLOW WIRE	19"
5	1301-880	20 AWG RED WIRE	19"
4	5700-661	20 AWG BLACK WIRE	19"
3	1900-564	PIN CONTACT, MULTIMATE	12
2	5700-604	DB-9 BACKSHELL	2
1	2800-433	DB-9M CONNECTOR	2

NEXT ASSY | MODEL

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE SHOWN IN INCHES.
ALL DIMENSIONS APPLY AFTER FINISH.
REMOVE BURRS.
TOLERANCES:
LINEAR 2PL (.XX) ±.015
3PL (.XXX) ±.005
HOLE DIAMETERS ±.005
ANGULAR ±°1
MACHINE SURFACE 125

MAT'L SPEC

FILE NAME 5700-756.DWG

DWN	L. PATE	5/14/96
APP	M. KOLVE	5/13/96
APP	S. PERMANN	5/15/96

ASSY PROC

INSP PROC

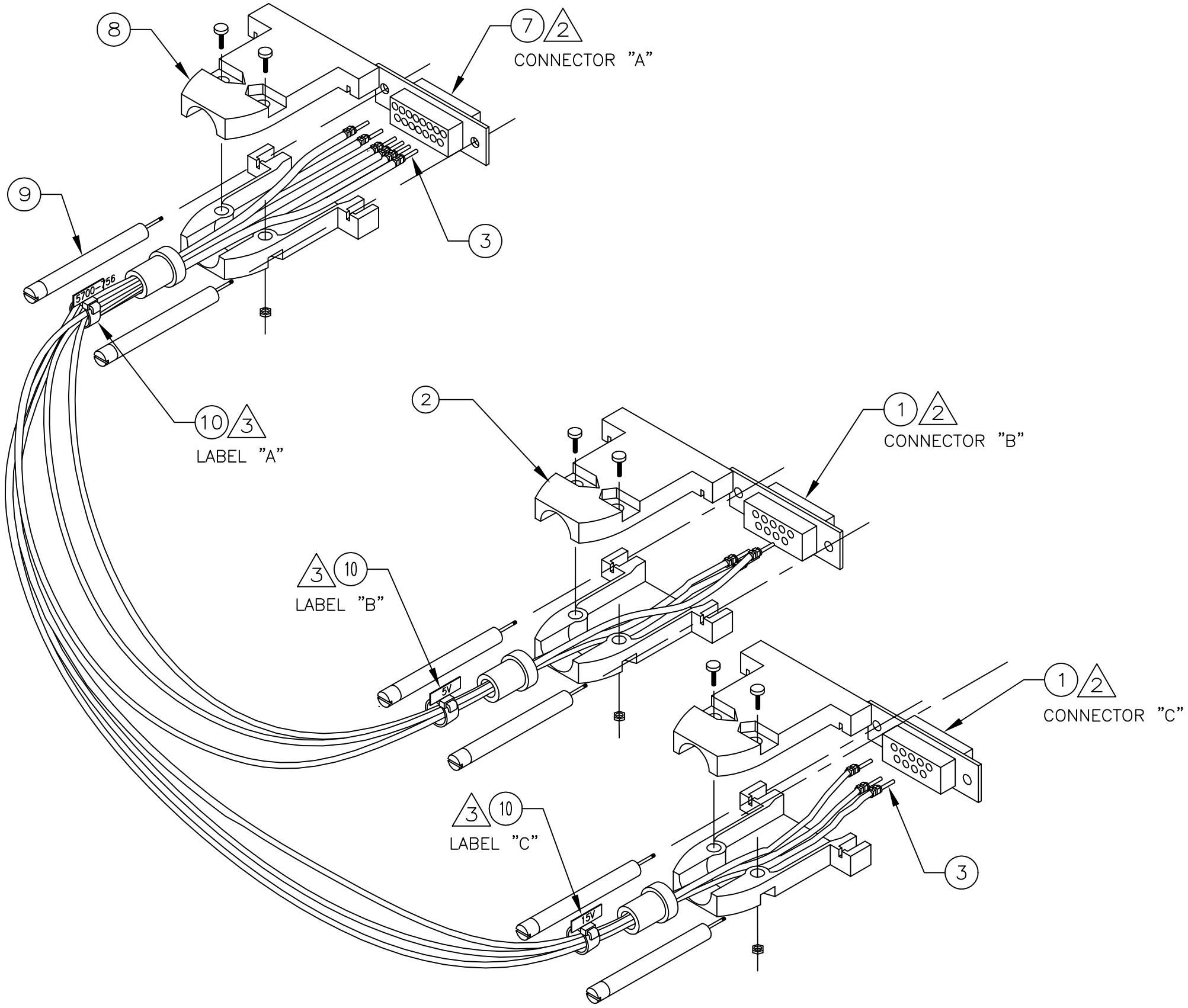
CAGE CODE

Diagraph CORPORATION

DC1 POWER CABLE ASSEMBLY

SIZE	DWG NO	REV
B	5700-756	C

SCALE: N/A SHEET 1 OF 2



Diagraph CORPORATION

SIZE	DWG NO.	REV
B	5700–756	C
SCALE: N/A	SHEET 2 OF 2	

NOTES:

1. STRIP LENGTH: 5/16"
2. OVERALL ASSEMBLED LENGTH:
   CONNECTOR E TO CONNECTOR A OR B, 10" ±.5"
   CONNECTOR E TO CONNECTOR C OR D, 12" ±.5"
3. CABLE MUST BE PACKAGED IN A PLASTIC BAG AND SEALED. BAG MUST BE LABELED WITH DIAGRAPH PART NUMBER AND DIAGRAPH CORPORATION.

REVISIONS						
REV	ECN	DESCRIPTION	DATE	APPROVED		
A	16454	NEW DRAWING	5/13/96	JC		
B	16627	SWITCH WIRES IN PIN 5 & 6 ON ITEM 7.	8/9/96	MK	RS	SP
C	17703	PICTORIAL OF BUSHINGS WAS BACKWARDS.	1/14/00	MK	MO	
D	17978	REMOVE OVERALL ASSEMBLED LENGTHS TABLE. IN NOTE 2, CONNECTOR E TO C OR D WAS 10".				

PINOUT						
ITEM 7	ITEM 1 (5V) A	ITEM 1 (15V) B	ITEM 1 (5V) C	ITEM 1 (15V) D	WIRE COLOR	WIRE LENGTH
1	–	–	7	–	RED	11.5"
2	–	–	8	–	RED	11.5"
3	7	–	–	–	RED	9.5"
4	8	–	–	–	RED	9.5"
5	–	–	–	6	YELLOW	11.5"
6	–	–	–	1	BLACK	11.5"
7	–	6	–	–	YELLOW	9.5"
8	–	7	–	–	YELLOW	9.5"
9	–	–	–	–	–	–
10	–	–	–	–	–	–
11	–	–	–	–	–	–
12	–	–	5	–	BLACK	11.5"
13	5	–	–	–	BLACK	9.5"
14	–	1	–	–	BLACK	9.5"
15	–	–	–	7	YELLOW	11.5"

LABELS	
ITEM 10	VERBAGE
A	5V
B	15V
C	5V
D	15V
E	5700–757

ITEM	PART NO.	DESCRIPTION	QTY
10	1301–547	TIE WRAP LABEL	5
9	5700–542	JACKSCREWS	10
8	5700–222	DB–15 BACKSHELL	1
7	5700–217	DB–15M CONNECTOR	1
6	5700–644	20 AWG YELLOW WIRE	42"
5	1301–880	20 AWG RED WIRE	42"
4	5700–661	20 AWG BLACK WIRE	42"
3	1900–564	PIN CONTACT, MULTIMATE	24
2	5700–604	DB–9 BACKSHELL	4
1	2800–433	DB–9M CONNECTOR	4

NEXT ASSY	MODEL

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE SHOWN IN INCHES.
ALL DIMENSIONS APPLY AFTER FINISH.
REMOVE BURRS.
TOLERANCES:
LINEAR 2PL (.XX) ±.015
3PL (.XXX) ±.005
HOLE DIAMETERS ±.005
ANGULAR ±°1
MACHINE SURFACE 125

MAT'L SPEC

FILE NAME 5700–757.DWG

DWN	L. PATE	5/14/96
APP	M. KOLVE	5/13/96
APP	S. PERMANN	5/15/96

ASSY PROC

INSP PROC

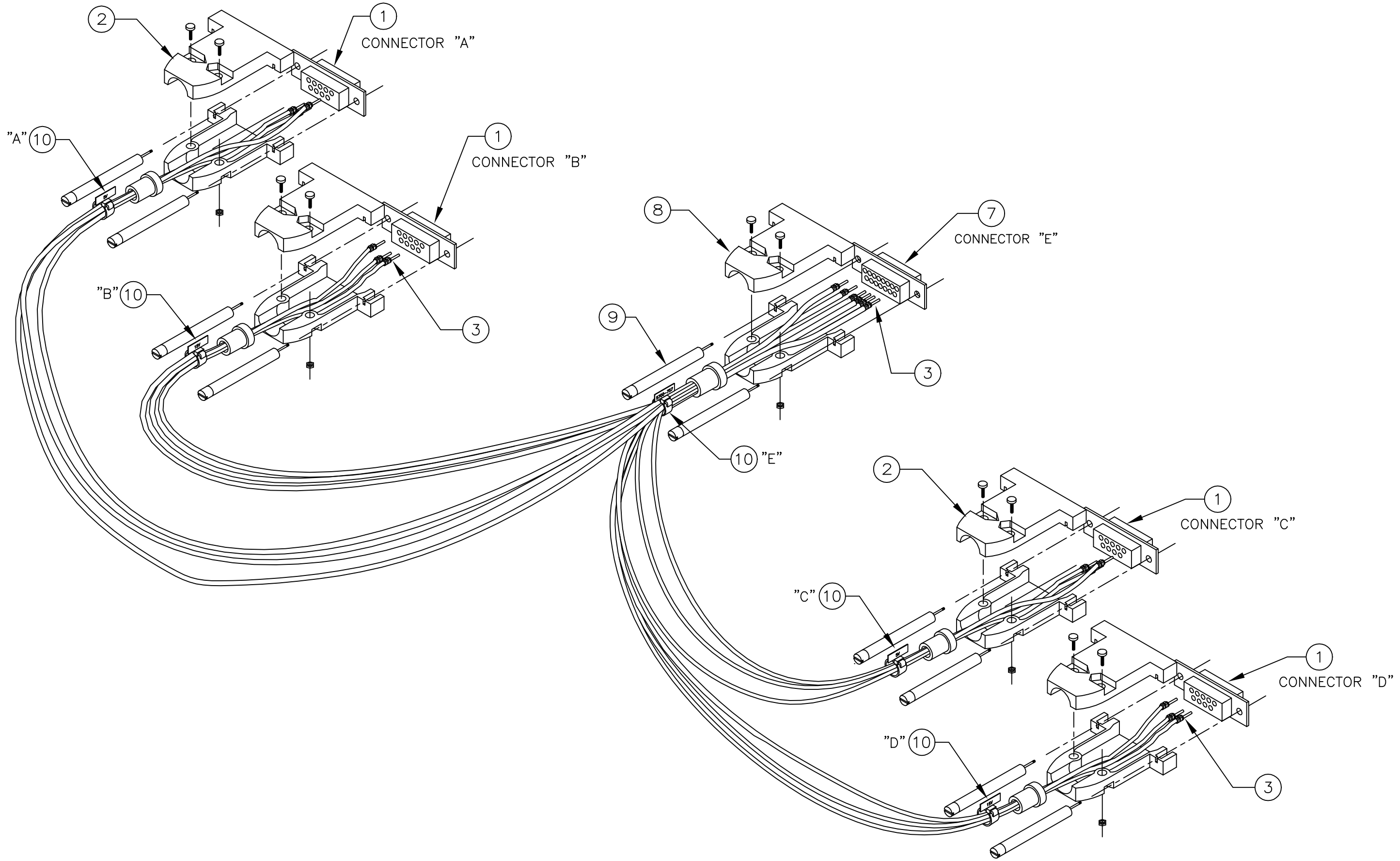
CAGE CODE

Diagraph CORPORATION

DC2 POWER CABLE ASSY.

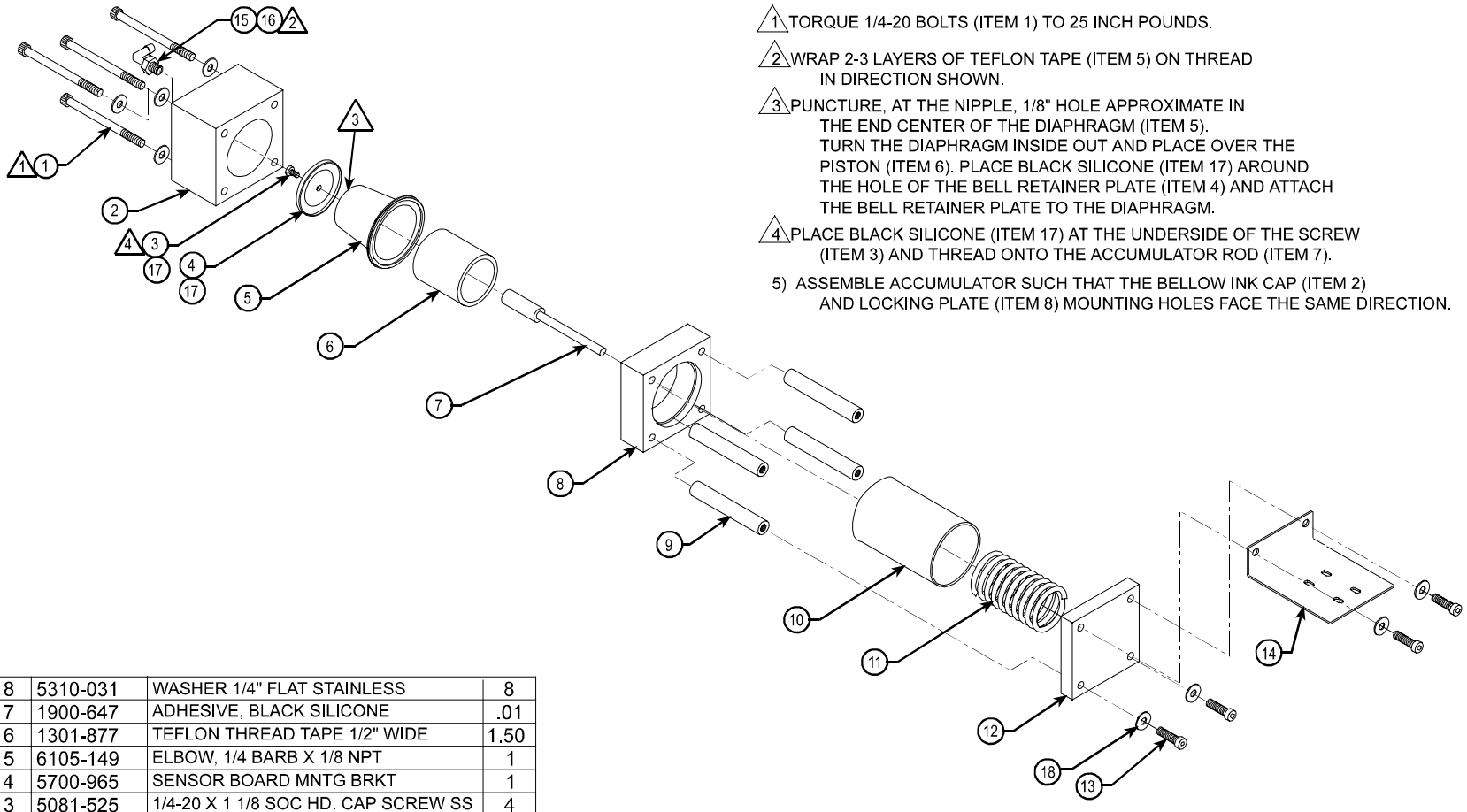
SIZE	DWG NO	REV
B	5700–757	D

SCALE: N/A SHEET 1 OF 2



Diagraph CORPORATION

SIZE	DWG NO.	REV
B	5700–757	D
SCALE: N/A	SHEET 2 OF 2	



NOTES:

1. TORQUE 1/4-20 BOLTS (ITEM 1) TO 25 INCH POUNDS.
2. WRAP 2-3 LAYERS OF TEFLON TAPE (ITEM 5) ON THREAD IN DIRECTION SHOWN.
3. PUNCTURE, AT THE NIPPLE, 1/8" HOLE APPROXIMATE IN THE END CENTER OF THE DIAPHRAGM (ITEM 5). TURN THE DIAPHRAGM INSIDE OUT AND PLACE OVER THE PISTON (ITEM 6). PLACE BLACK SILICONE (ITEM 17) AROUND THE HOLE OF THE BELL RETAINER PLATE (ITEM 4) AND ATTACH THE BELL RETAINER PLATE TO THE DIAPHRAGM.
4. PLACE BLACK SILICONE (ITEM 17) AT THE UNDERSIDE OF THE SCREW (ITEM 3) AND THREAD ONTO THE ACCUMULATOR ROD (ITEM 7).
5) ASSEMBLE ACCUMULATOR SUCH THAT THE BELLOW INK CAP (ITEM 2) AND LOCKING PLATE (ITEM 8) MOUNTING HOLES FACE THE SAME DIRECTION.

ITEM	PART NO.	DESCRIPTION	QTY
18	5310-031	WASHER 1/4" FLAT STAINLESS	8
17	1900-647	ADHESIVE, BLACK SILICONE	.01
16	1301-877	TEFLON THREAD TAPE 1/2" WIDE	1.50
15	6105-149	ELBOW, 1/4 BARB X 1/8 NPT	1
14	5700-965	SENSOR BOARD MNTG BRKT	1
13	5081-525	1/4-20 X 1 1/8 SOC HD. CAP SCREW SS	4
12	5700-905	IDS ACCUMULATOR END CAP	1
11	5701-025	SPRING LOW END	1
10	5700-521	CYLINDER LOW END	1
9	5700-519	ACCUMULATOR CAP RODS LOW END	4
8	5700-523	BELLOW LOCKING PLATE	1
7	5700-904	IDS ACCUMULATOR ROD	1
6	5700-525	PISTION LOW END	1
5	5700-518	DIAPHRAGM LOW END	1
4	5700-526	BELL RETAINER PLT.	1
3	5242-212	10-32 X .75 LG. BUT. HD SCR. SS.	1
2	5700-524	ACCUMULATOR BELLOW INK CAP	1
1	5081-524	1/4-20 X 3.1/2 SOC. HD. CAP SCR. FB	4

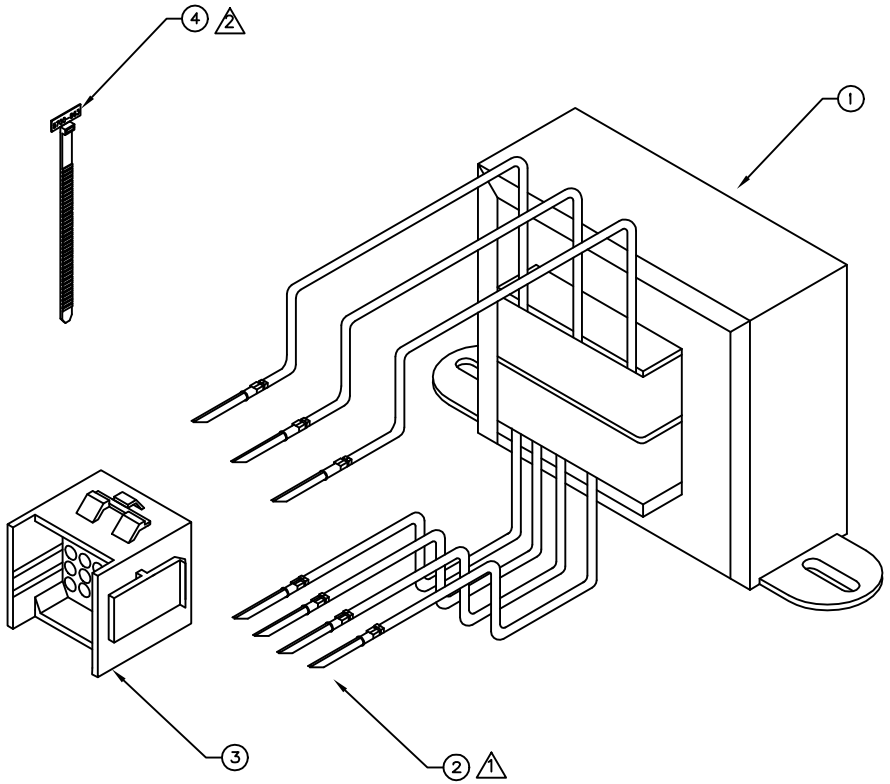
SERIES 1 ACCUMULATOR ASSEMBLY 5700-962, REV C

DWG NO. 5700-963 SH 1

REVISIONS				
REV	ECN	DESCRIPTION	DATE	APPROVED
A	16292	NEW DRAWING	11/03/95	

NOTES:

1. CRIMP PINS DIRECTLY ONTO WIRE ENDS FOR INSERTION INTO THE CONNECTOR (ITEM 3).
2. WRITE 5700-963 ON THE TIE WRAP CABLE MARKING TAB AND SECURE IT AROUND THE WIRES AFTER ASSEMBLY.



WIRE COLOR	PIN OUT
BROWN	1
BROWN/WHITE	2
WHITE	3
BLACK	4
BLACK/WHITE	5
BLUE	6
N/C	7
BLUE/WHITE	8
N/C	9

ITEM	PART NO.	DESCRIPTION	QTY
4	1301-547	TIE WRAP CABLE MARKING TAB	1
3	5700-964	CONNECTOR, MALE (1-640511-0)	1
2	5700-545	CONTACT, AMP MR PIN	7
1	5700-955	TRANSFORMER (ST-6449)	1

NEXT ASSY	MODEL
5700-075	

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE SHOWN IN INCHES.
ALL DIMENSIONS APPLY AFTER FINISH.
REMOVE BURRS.
TOLERANCES:
LINEAR 2PL (.XX) ±.015
3PL (.XXX) ±.005
HOLE DIAMETERS ±.005
ANGULAR ±°1
MACHINE SURFACE 125

MAT'L SPEC

FILE NAME 5700-963.DWG
DWN
APP
APP
ASSY PROC
INSP PROC
CAGE CODE XXXXX

Diagraph CORPORATION

XFMR ASSY

SIZE	DWG. NO.	REV
C	5700-963	A

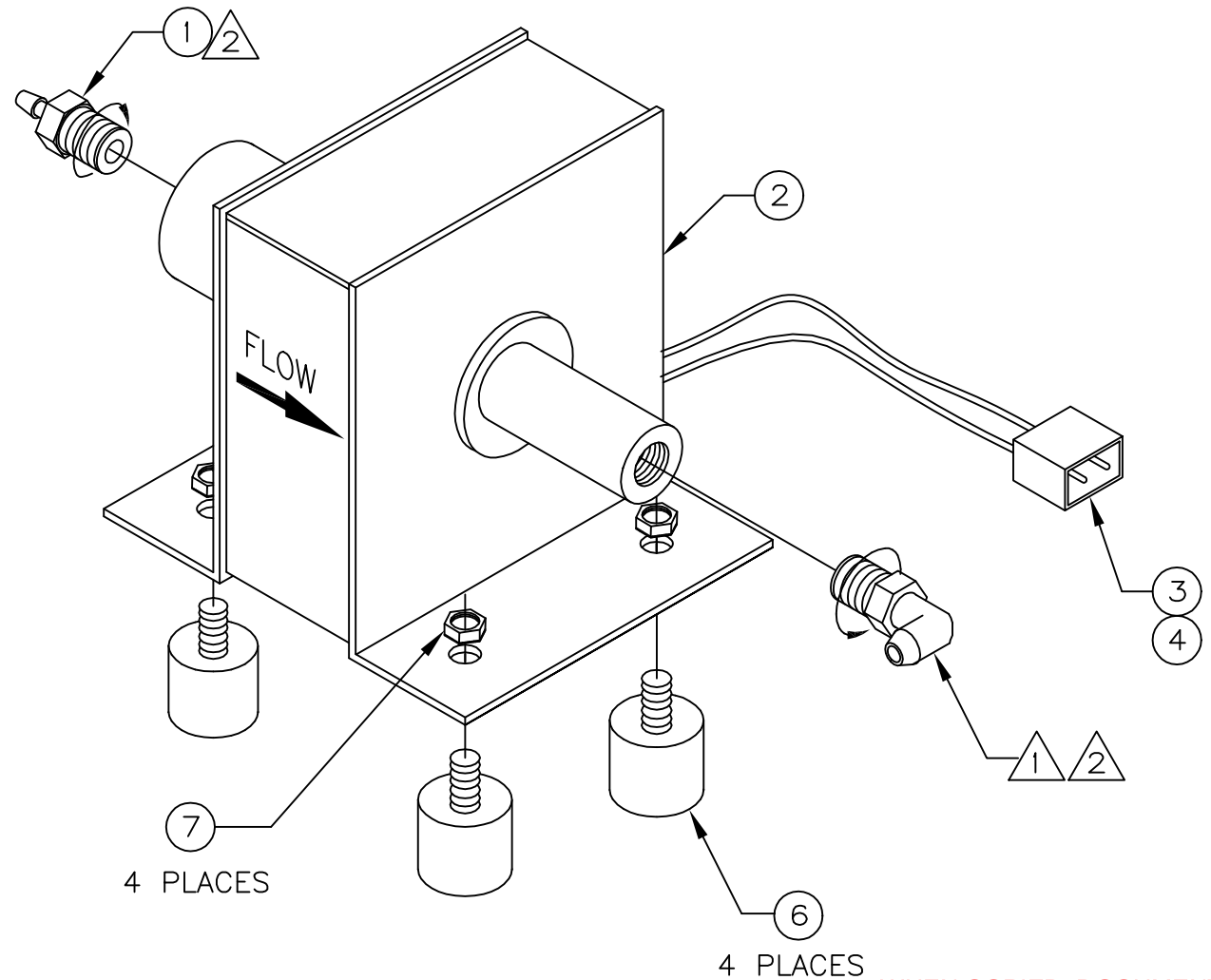
SCALE: 1/1 SHEET 1 OF 1

NOTES:

1. THIS FITTING IS INSTALLED AT THE INPUT SIDE OF THE PUMP. REMOVE FITTING FROM INPUT.

2. USE 2–3 LAYERS OF TEFLON TAPE (ITEM 5) ON THREADS, WRAPPED IN DIRECTION SHOWN.

REVISIONS						
REV	ECN	DESCRIPTION	DATE	APPROVED		
A	16292	NEW DRAWING	11/03/95			



WIRE	PIN
BLACK	1
WHITE	2

ITEM	PART NO.	DESCRIPTION	QTY
7	5309–309	NUT, LOCK 10–32	4
6	1301–702	VIBRATION MOUNT	4
5	1301–877	TEFLON TAPE	AR
4	1199–160	MALE PIN	2
3	1199–158	CONNECTOR, 2 PIN	1
2	5700–098	PUMP, 24 VOLT AC	1
1	5700–160	HOSE BARB, 1/8" NPT	1

NEXT ASSY	MODEL
5700–053	SERIES 1

UNLESS OTHERWISE SPECIFIED:
- ALL DIMENSIONS ARE SHOWN IN INCHES.
- ALL DIMENSIONS APPLY AFTER FINISH.
- REMOVE BURRS.

TOLERANCES:
- LINEAR 2PL (.XX) ±.015
- 3PL (.XXX) ±.005
- HOLE DIAMETERS ±.005
- ANGULAR ±°1
- MACHINE SURFACE 125√

MAT'L SPEC

FILE NAME 5700–966.DWG

DWN

APP

APP

ASSY PROC

INSP PROC

CAGE CODE XXXXX

Diagraph CORPORATION

24 VAC PUMP ASSEMBLY

SIZE	DWG NO	REV
B	5700–966	A

SCALE: 1/1 SHEET 1 OF 1

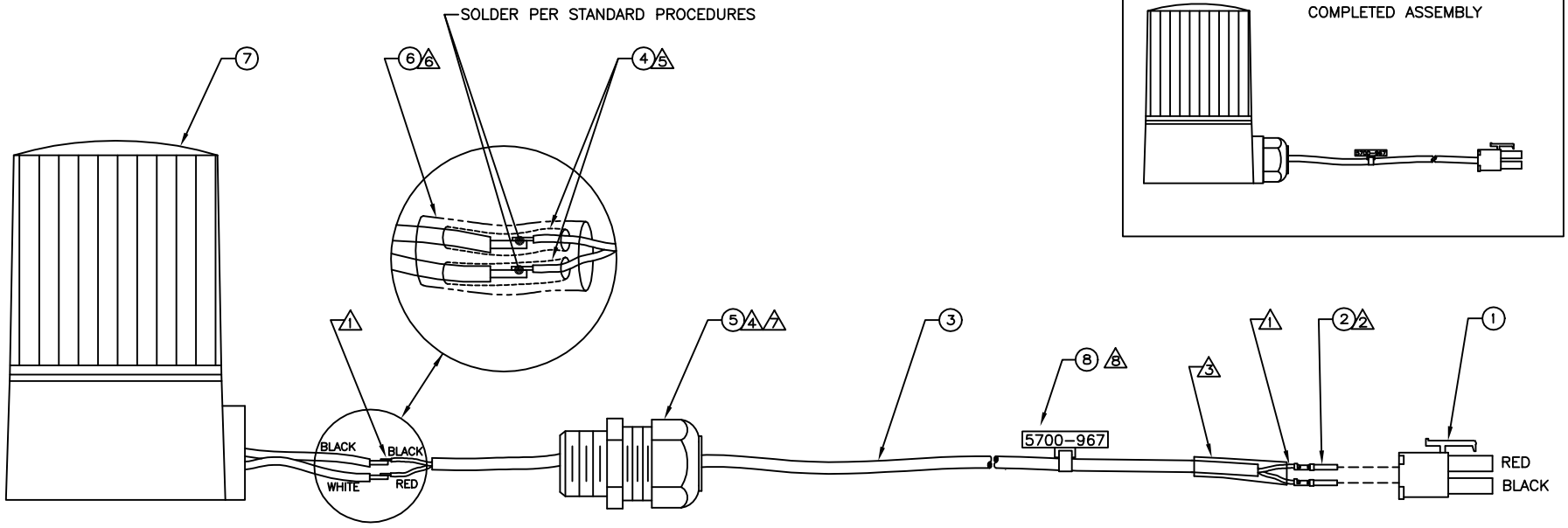
DWG NO 5700–966 SH 1

DWG NO. 5700-967 SH 1

REVISIONS				
REV	ECN	DESCRIPTION	DATE	APPROVED
A	16292	NEW DRAWING	11/03/95	

NOTES:

1. STRIP THE CABLE JACKET 1", AND EACH CONDUCTOR 5/16".
2. CRIMP THE PINS (ITEM 2) ONTO THE WIRE ENDS FOR INSERTION INTO THE CONNECTOR (ITEM 1).
3. HEAT A 1" LENGTH OF SHRINK TUBING (ITEM 6) OVER THE JACKET UP TO THE CONNECTOR (ITEM 1).
4. INSERT CABLE (ITEM 3) THROUGH CABLE GRIP (ITEM 5).
5. HEAT A 1.5" LENGTH OF THE SHRINK TUBING (ITEM 4) OVER THE SOLDER CONNECTION ON EACH CONDUCTOR.
6. HEAT A 3" LENGTH OF SHRINK TUBING (ITEM 6) OVER BOTH CONDUCTORS AND THE JACKET.
7. ATTACH THE CABLE GRIP (ITEM 5) TO THE BEACON (ITEM 7) AND ENSURE THAT THE SHRINK TUBING IS RESTRAINED VIA THE CABLE GRIP.
8. PLACE TIE WRAP CABLE MARKING TAB AROUND THE CABLE (ITEM 3) AND WRITE 5700-967 ON IT.



ITEM	PART NO.	DESCRIPTION	QTY
8	1301-547	TIE WRAP CABLE MARKING TAB	1
7	5700-883	LIGHT, RED 24 VOLT D.C.	1
6	1902-764	TUBING, HEAT SHRINK .25 DIA	4"
5	5700-762	STRAIN RELIEF	1
4	1199-286	TUBING, HEAT SHRINK .125	3"
3	5700-281	CABLE, BELDEN 8205, 20AWG	10'
2	5700-275	PINS	2
1	5700-269	CONNECTOR	1

5700-969	SERIES 1
NEXT ASSY	MODEL

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE SHOWN IN INCHES.
ALL DIMENSIONS APPLY AFTER FINISH.
REMOVE BURRS.
TOLERANCES:
LINEAR 2PL (.XX) ±.015
3PL (.XXX) ±.005
HOLE DIAMETERS ±.005
ANGULAR ±°1
MACHINE SURFACE 125

MAT'L SPEC

FILE NAME 5700-967.DWG
DWN
APP
APP
ASSY PROC
INSP PROC
CAGE CODE XXXXX

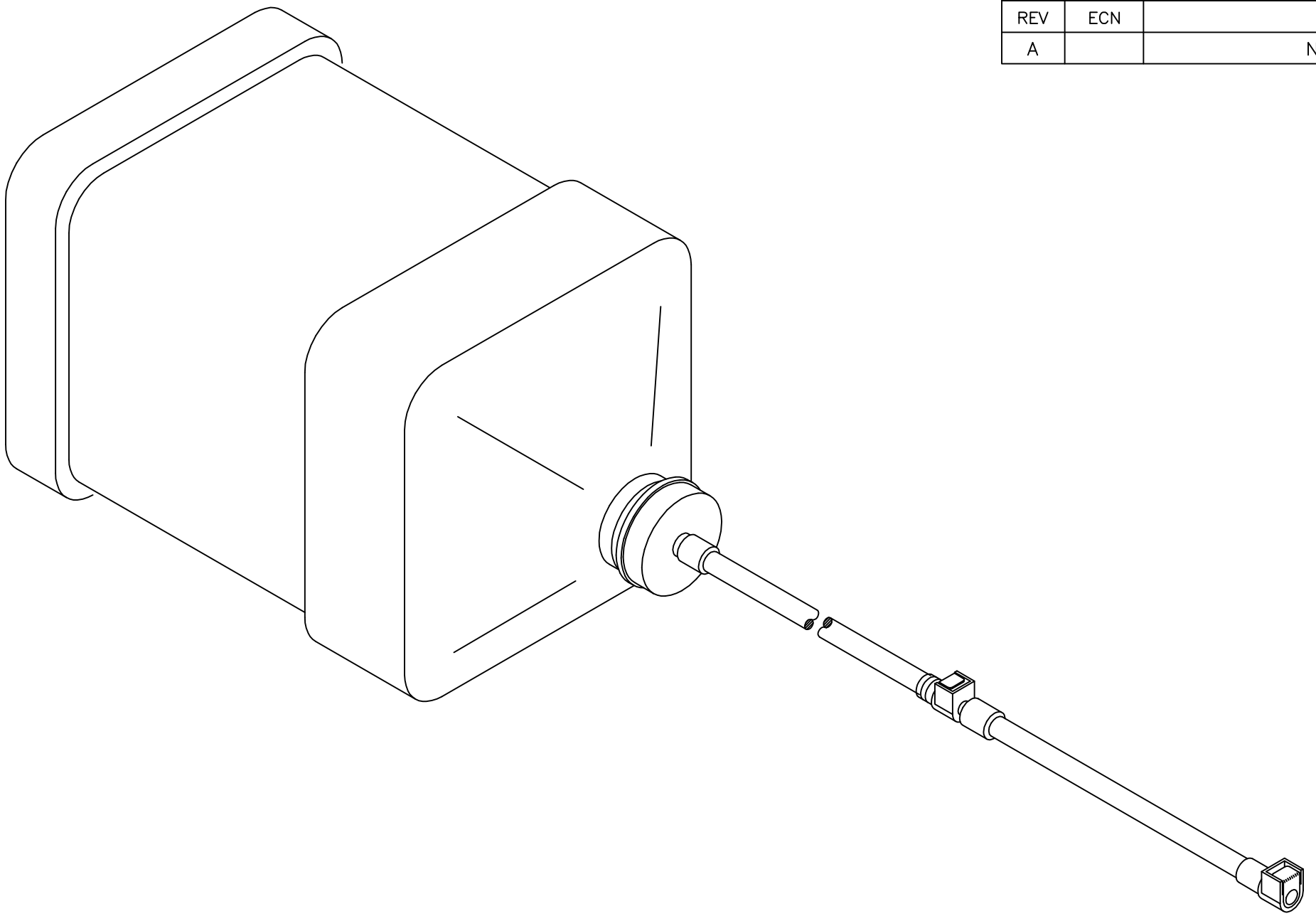
Diagraph CORPORATION

CABLE ASSEMBLY SERIES 1 BEACON

SIZE	DWG. NO.	REV
C	5700-967	A

SCALE: 1/1 SHEET 1 OF 1

REVISIONS						
REV	ECN	DESCRIPTION	DATE	APPROVED		
A		NEW DRAWING	6/26/95			



ITEM	PART NO.	DESCRIPTION	QTY
2	2090-024	DISPOSABLE RUBBER GLOVES (6 PK)	1
1	5700-734	EFFLUENT BOTTLE ASS'Y	1

NEXT ASSY | MODEL

UNLESS OTHERWISE SPECIFIED:
- ALL DIMENSIONS ARE SHOWN IN INCHES.
- ALL DIMENSIONS APPLY AFTER FINISH.
- REMOVE BURRS.

TOLERANCES:
- LINEAR 2PL (.XX) ±.015
- LINEAR 3PL (.XXX) ±.005
- HOLE DIAMETERS ±.005
- ANGULAR ±°1
- MACHINE SURFACE 125

MAT'L SPEC

FILE NAME 5700-994.DWG

DWN | APP | APP

ASSY PROC

INSP PROC

CAGE CODE XXXXX

Diagraph CORPORATION

IDS/SA EFFLUENT KIT

SIZE B | DWG NO 5700-994 | REV A

SCALE: N/A | SHEET 1 OF 1

DWG NO 5700-994 SH 1