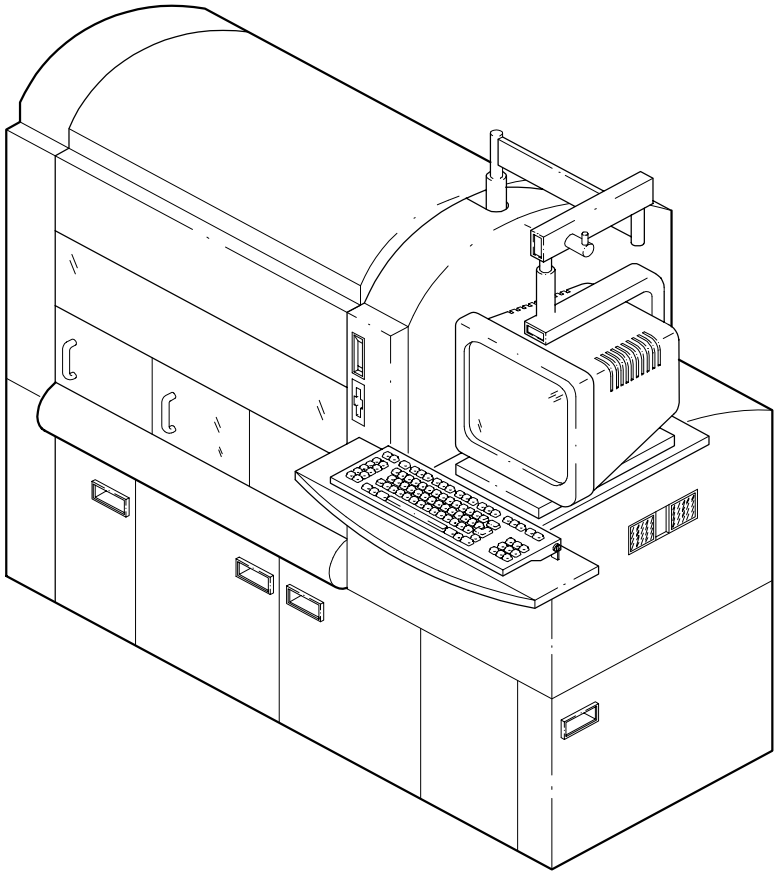
ABBOTT

PRISM®



REFERENCE MANUAL

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55687-101

Master Table of Contents

Section 2. Schematics

Proprietary Information

This ABBOTT PRISM Reference Manual is published by Abbott Laboratories, Diagnostic Division, P.O. Box 152020, Irving, TX 75015, U.S.A. Please direct all inquiries concerning information in this manual to the foregoing address.

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Document Control Number(s)	Revision Date	Sections(s) Revised	Pages Revised and Added

Table i: Revision Status

Revision Log

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Document Control Number(s)	Revision Date	Revision Incorporated By:	Date Incorporated

Table ii: Revision Log

ABBOTT PRISM® System Description

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NOTES

Chemistry Introduction

The ABBOTT PRISM® System is a fully-automated Immunoassay Analyzer which performs high volume sample testing. The System detects the presence of specific antigens and antibodies through the use of Chemiluminescent Immunoassay (ChLIA) Technology.

All the steps of the ChLIA process take place in a *Reaction Tray* designed for the ABBOTT PRISM Instrument. The Reaction Tray consists of 16 reaction cells. Each of these cells have an *incubation well* and a *reaction well.*

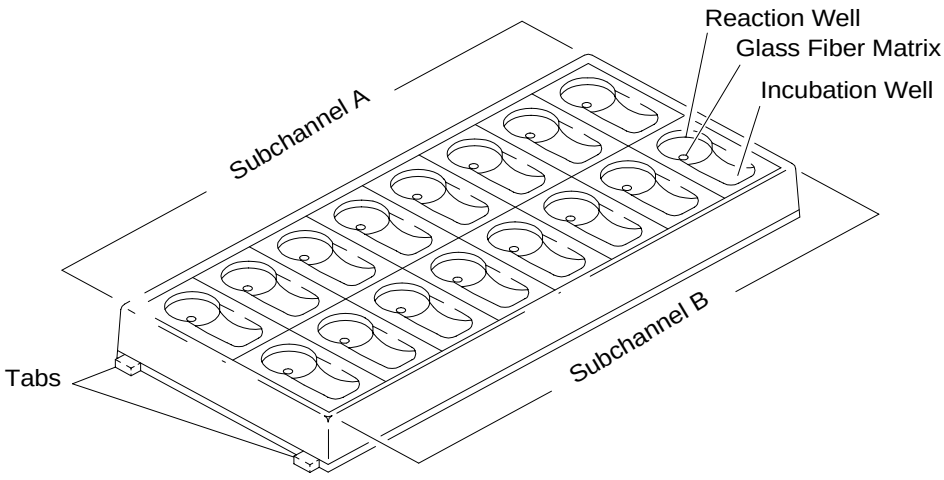


Figure 1-1. Reaction Tray

The Reaction Tray moves through the channel where the ChLIA process is performed. There are 3 different types of channels on the ABBOTT PRISM System:

1. Two-Step Channel (for performing 2-Step Assays)
2. Three-Step Channel (for performing 3-Step Assays)
3. Backup Channel (can be configured to perform 2-Step or 3-Step Assays)

The ABBOTT PRISM Instrument can currently perform the following immunoassays:

Immunoassay	Description	Type of Assay
HBc	Antibody to Hepatitis B Core Antigen	2-Step Competitive/ Blocking
HBsAg	Hepatitis B Surface Antigen	2-Step Sandwich
HCV	Antibody to Hepatitis C Virus	2-Step Sandwich
HTLV I/II	Antibody to Human T-Lymphotropic Virus Type I & II	3-Step Sandwich
HIV 1/2	Antibody to Human Immunodeficiency Virus Type 1 & 2	3-Step Sandwich

Table 1-1.

Immunoassay Theory

The immune systems of persons exposed to foreign substances such as a virus or bacterium, react to the foreign substance by producing specific *antibodies* as protection against the disease-causing agent. The foreign substance that elicits such a response is called an *antigen*. In general, antigens stimulate the production of specific antibodies. These antibodies have the express purpose of combining with antigens and destroying or inactivating the antigens. Antibodies formed in response to the presence of an antigen are highly specific for that antigen. Consequently, an antibody introduced into an environment containing the corresponding antigen, attaches to that antigen (refer to Figure 1-2).

The ABBOTT PRISM System uses analytical tests known as *chemiluminescent immunoassays* to determine the presence of antigens and antibodies in samples.

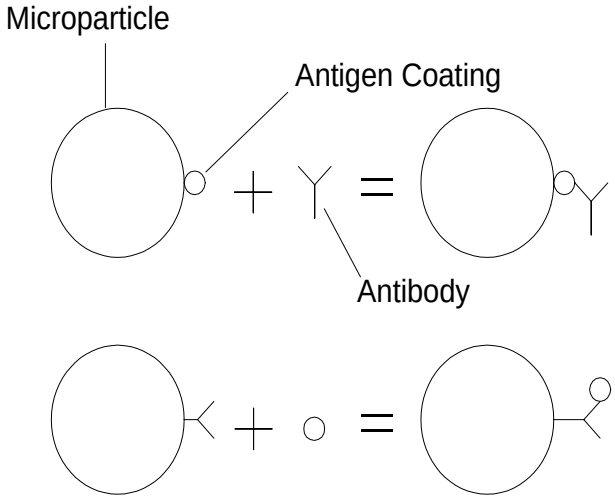


Figure 1-2. Microparticle Binding With Antigen And Antibody

The first line of Figure 1-2 illustrates a microparticle coated with one type of antigen (represented by the smaller circle) binding with a corresponding antibody (represented by the symbol Y). The second line of Figure 1-2 illustrates a microparticle coated with an antibody binding with an antigen.

ChLIA Theory

The ABBOTT PRISM Instrument uses Chemiluminescent Immunoassay (ChLIA) Technology to detect the presence of various *analytes*. To detect the presence of various analytes, known antibodies or antigens (corresponding to that analyte) bound to latex microparticles are added to the sample.

Antigen-Antibody Bonds

During sample processing, microparticles coated with antigens or antibodies (specific to the desired analyte for detection), are dispensed into the incubation well of Reaction Trays along with the samples. During the incubation phase, analytes present in the samples bind to the corresponding antigens/antibodies on the microparticles.

Glass Fiber Matrix

After incubation, the System transfers the sample-microparticle reaction mixture from the incubation well to the reaction well of the Reaction Tray. The microparticles are captured on the glass fiber matrix (matrix) in the reaction well. The matrix is washed to remove materials that are not captured. The microparticles are retained by the glass fibers while the excess reaction mixture flows through the matrix. Further processing will then take place.

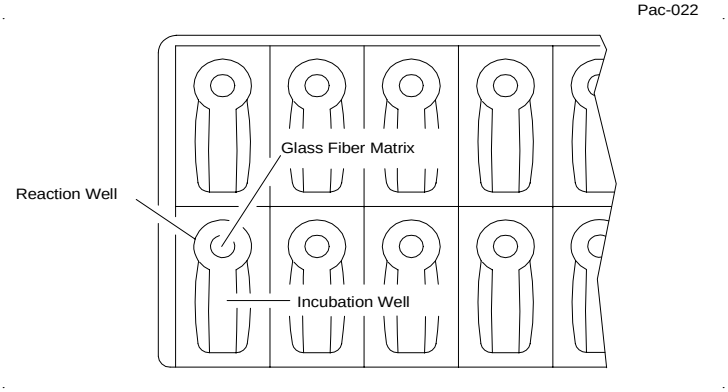


Figure 1-3. Reaction Tray Wells And Glass Fiber Matrix

Chemiluminescent Conjugate

Detection of the reaction mixture on the glass fiber matrix is accomplished with a Chemiluminescent Conjugate. Activator Solution added to the mixture causes a chemiluminescent reaction to occur. Other methods are used to bind the Conjugate to the reaction mixture. The other methods used by the ABBOTT PRISM System are explained later in this chapter.

Analyte Measurement

To measure the amount of analyte present in processed samples, the ABBOTT PRISM System uses an Optical (Reader) Assembly to detect *photons* emitted as a result of a chemiluminescent reaction.

During sample processing, Activator Solution added to the reaction mixture causes the immediate production of photons. The photons are channeled through a *Quartz Light Pipe* and detected by a *Photomultiplier Tube* (refer to Figure 1-4 below). The amount of photons present is proportional to the amount of analyte present in the sample (or inversely proportional in the case of a Competitive/ Blocking Assay).

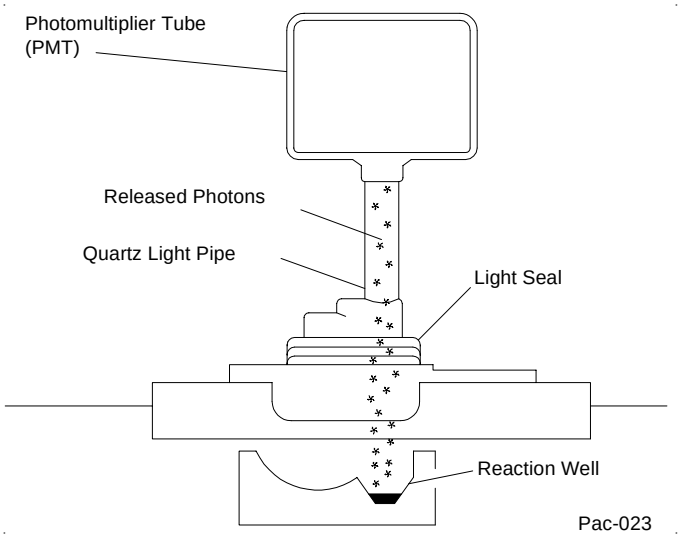


Figure 1-4. Optical (Reader) Assembly

Immunoassay Formats

The ABBOTT PRISM System performs tests in 2-Step and 3-Step immunoassay formats. The immunoassay formats differ in the way that the antigens/antibodies bind to the corresponding antibodies/ antigens. Each type of immunoassay uses latex microparticles coated with antigens/antibodies and Acridinium-Labeled Conjugates. Representative examples of each immunoassay format and the functions that occur at each station on the Immunoassay Channel are shown on the following pages.

Two-Step Antigen Sandwich

The following steps occur during the 2-Step (Antigen) Sandwich immunoassay used to detect the presence of Hepatitis B Surface Antigen:

1. Sample followed by antibody-coated microparticles are pipetted into the incubation well.

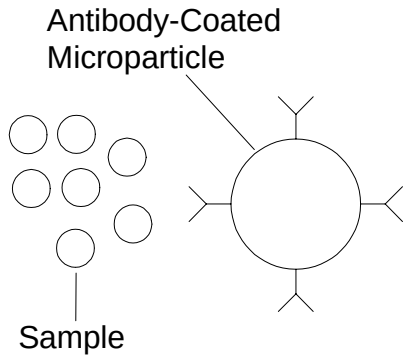


Figure 1-5.

2. During an incubation period, Hepatitis B Surface Antigens present in the sample bind to the anti-HBsAg antibodies on the microparticles.

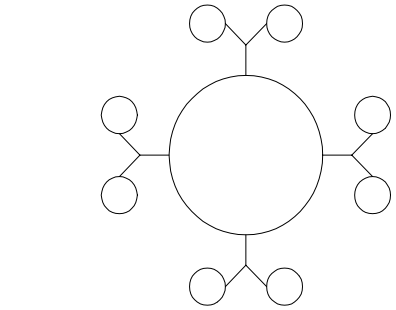


Figure 1-6.

3. After incubation, the System dispenses Transfer Wash Solution to transfer the reaction mixture from the incubation well to the glass fiber matrix in the bottom of the reaction well. Microparticles are captured on the glass fiber matrix while the remaining reaction mixture flows through the matrix into the blotter. The blotter is located in the Reaction Tray below the matrix. The matrix is washed to remove materials that are not captured.

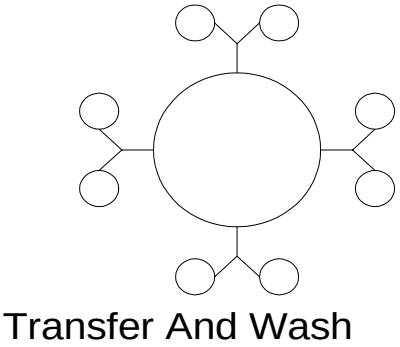


Figure 1-7.

4. After draining, the reaction well is saturated with Acridinium-Labeled Anti-HBsAg Antibody Conjugate.

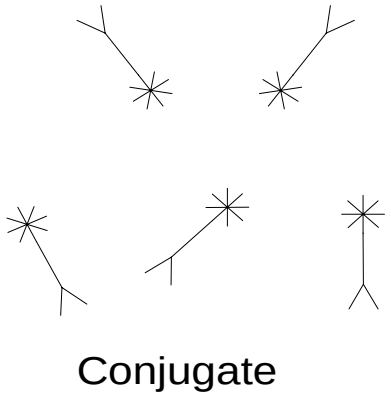


Figure 1-8.

5. During a second incubation period, the Conjugate binds to the antigens of the complex created during the first incubation process, thus forming an antibody/antigen/antibody sandwich.

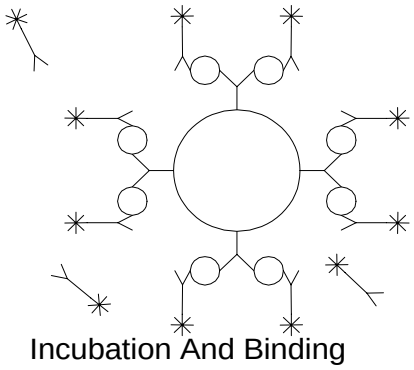


Figure 1-9.

6. Conjugate Wash is added to the reaction well to flush unbound Conjugate through the matrix.

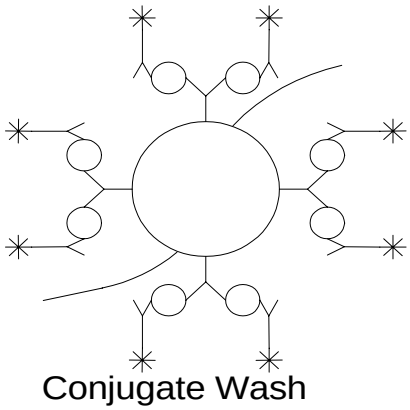


Figure 1-10.

7. The System moves the reaction well to the Optics Station and takes a background read (dark count). Then Activator Solution is added to the matrix, which reacts with the Acridinium-Labeled Conjugate. This reaction results in the production of photons.

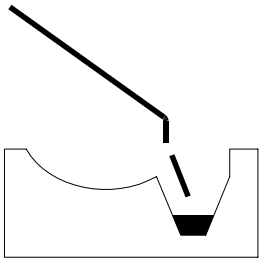


Figure 1-11.

8. A Photomultiplier Tube measures the emission of photons. The amount of photons emitted is proportional to the amount of Hepatitis B Surface Antigen present. For further information, see Analyte Measurement.

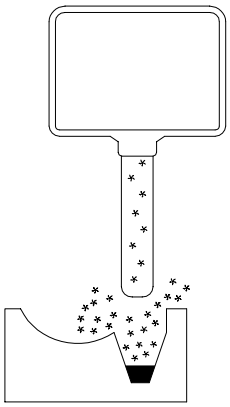


Figure 1-12.

Two-Step Antibody Sandwich

The following steps occur during the 2-Step Antibody Sandwich Immunoassay used to detect the presence of antibody to Hepatitis C Virus:

1. Sample, antigen-coated microparticles, and Specimen Diluent Solution are pipetted into the incubation well.

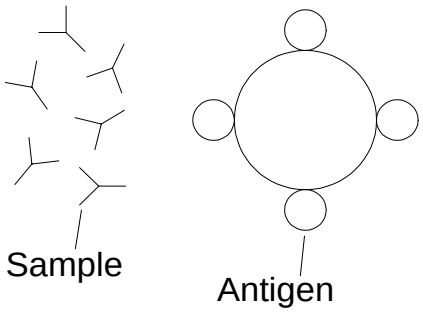


Figure 1-13.

2. During the first incubation period, anti-HCV antibodies present in the sample bind to the HCV antigens on the microparticles.

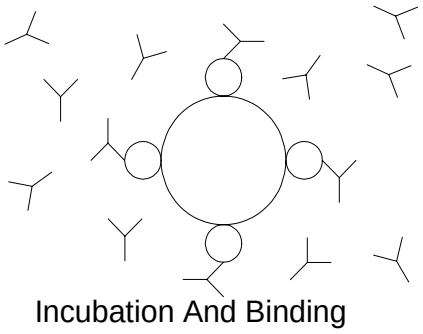
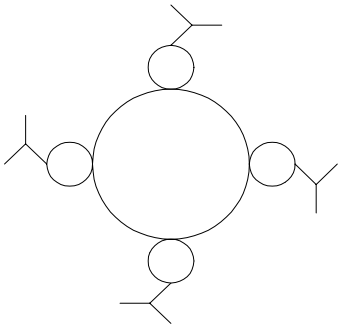


Figure 1-14.

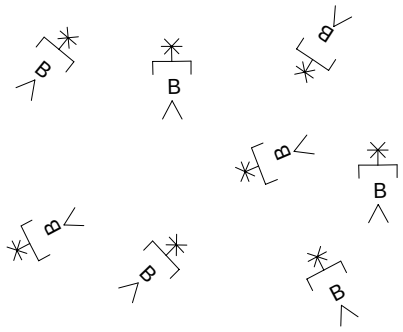
3. After incubation, the System dispenses Transfer Wash Solution to transfer the reaction mixture from the incubation well to the glass fiber matrix at the bottom of the reaction well. Microparticles are captured on the glass fiber matrix while the remaining reaction mixture flows through the matrix into a blotter. The blotter is located in the Reaction Tray below the matrix. The matrix is washed to remove materials that are not captured.



Transfer And Wash

Figure 1-15.

4. After draining, the reaction well is saturated with Acridinium-Labeled Anti-Human Antibody Conjugate. The Conjugate is actually a complex of biotinylated $(Fab')_2$ fragment of antibody directed against human IgG, complexed to an acridinium-labeled anti-biotin antibody.



Antibody Conjugate

Figure 1-16.

5. During a second incubation period, the Conjugate binds to the antibodies of the complex created during the first incubation process, forming an antigen/antibody/antibody sandwich.

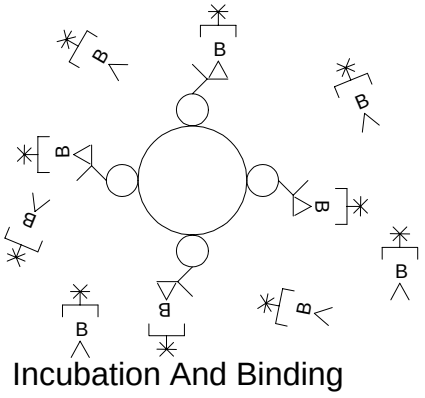


Figure 1-17.

6. Conjugate Wash is added to the reaction well to flush unbound Conjugate through the matrix.

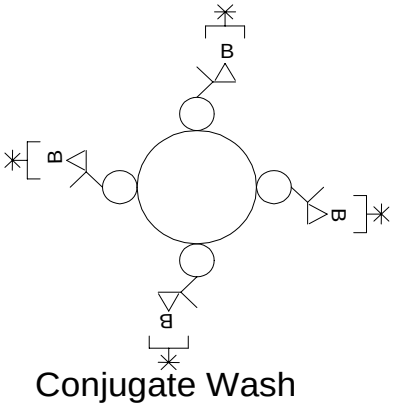


Figure 1-18.

7. The System moves the reaction well to the Optics Station and takes a background read (dark count). Next, Activator Solution is added to the matrix which reacts with the Acridinium-Labeled Conjugate. This reaction results in the production of photons.

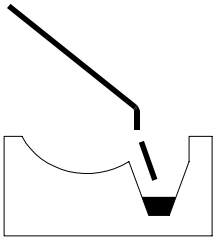


Figure 1-19.

8. A Photomultiplier Tube measures the emission of photons. The amount of photons emitted is proportional to the amount of anti-HCV antibody present. For further information, see Analyte Measurement.

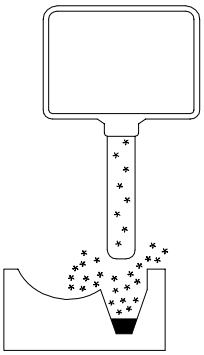


Figure 1-20.

Two-Step Competitive/Blocking

The following steps occur during the 2-Step Competitive/Blocking immunoassay used to detect the presence of antibody to Hepatitis B Core Antigen:

1. Sample followed by an antigen-coated microparticles are pipetted into the incubation well. The microparticles are actually undercoated with human anti-HBc and overcoated with recombinant HBcAg

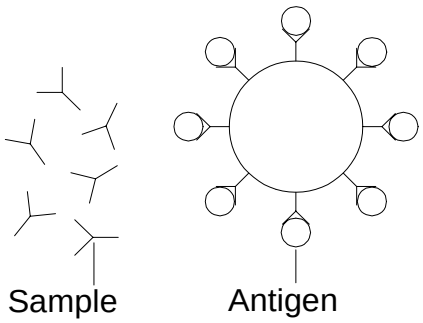
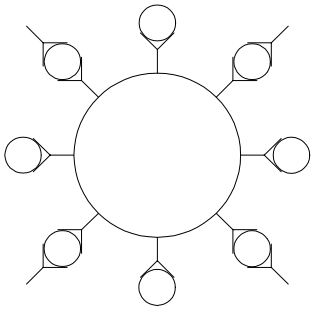


Figure 1-21.

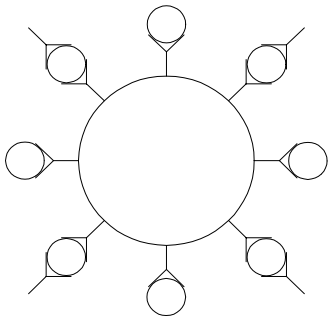
2. During the first incubation period, anti-HBc antibodies present in the sample bind to the HBc antigens on the microparticles.



Incubation And Binding

Figure 1-22.

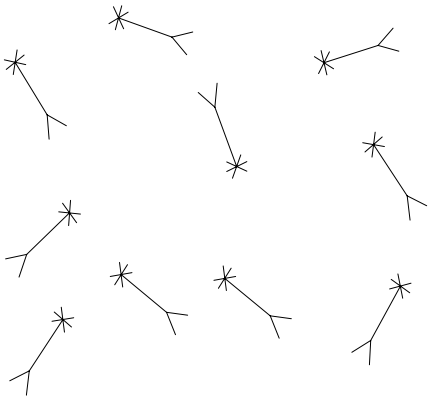
3. After incubation, the System dispenses Transfer Wash Solution to transfer the reaction mixture to the glass fiber matrix. Microparticles are captured on the glass fiber matrix while the remaining reaction mixture flows through the matrix into the blotter. The blotter is located in the bottom of the Reaction Tray, below the matrix. The matrix is washed to remove materials that are not captured.



Transfer and Wash

Figure 1-23.

4. After draining, the reaction well is saturated with Acridinium-Labeled Anti-HBc Antibody Conjugate.



Conjugate

Figure 1-24.

5. During the second incubation period, antibodies in the Conjugate bind to the remaining antigen binding sites on the microparticles. This is the competitive/blocking stage of the immunoassay.

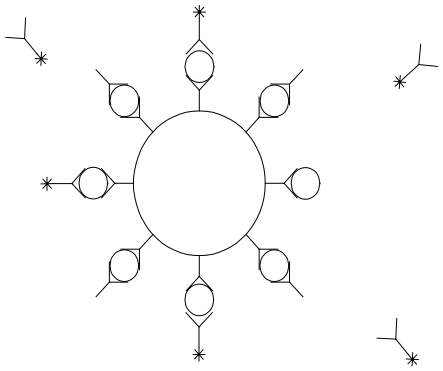


Figure 1-25.

6. Conjugate Wash is added to the reaction well to flush unbound Conjugate through the matrix.

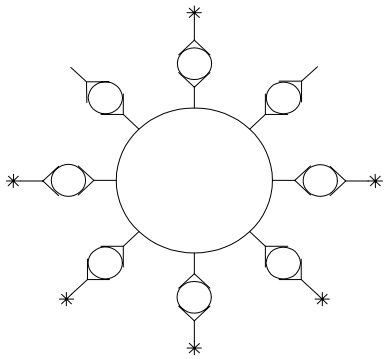
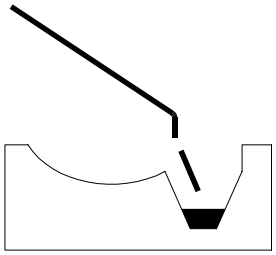


Figure 1-26.

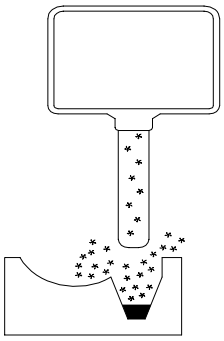
7. The System moves the reaction well to the Optics Station and performs a background read (dark count). Then, Activator Solution is added to the matrix. The Activator Solution reacts with the Acridinium-Labeled Conjugate, resulting in the production of photons.



Activator Solution

Figure 1-27.

8. A Photomultiplier Tube measures the emission of photons. The amount of photons emitted is inversely proportional to the amount of sample anti-HBc antibody present. Since the Conjugate anti-HBc antibodies are labeled with a chemiluminescent compound and sample antibodies do not have chemiluminescent attributes, greater amounts of antibodies in the sample block conjugate binding, therefore, resulting in the production of fewer photons. For further information, see Analyte Measurement.



Light

Figure 1-28.

Three-Step Sandwich

The ABBOTT PRISM System uses the 3-Step Sandwich immunoassay format to detect antibodies to Human T-Cell Lymphotropic Virus (Types I and II) or antibodies to Human Immunodeficiency Virus (Types 1 and 2). This immunoassay consists of the following steps:

1. Sample followed by antigen-coated microparticles are pipetted into the incubation well.

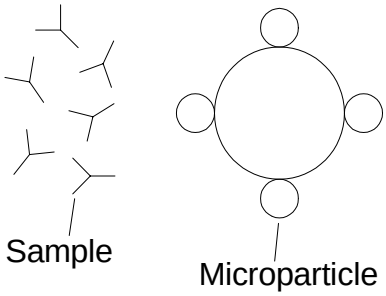


Figure 1-29.

2. During the first incubation period, antibodies in the sample specific to the antigens coated on the microparticles bind to the antigens on the microparticles.

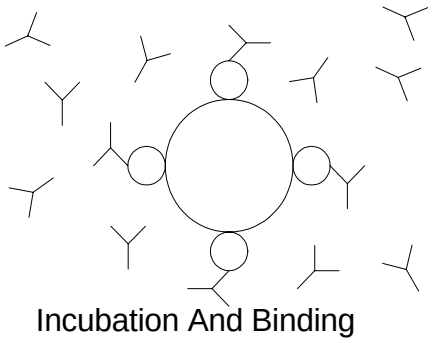
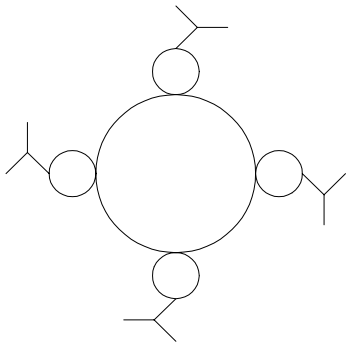


Figure 1-30.

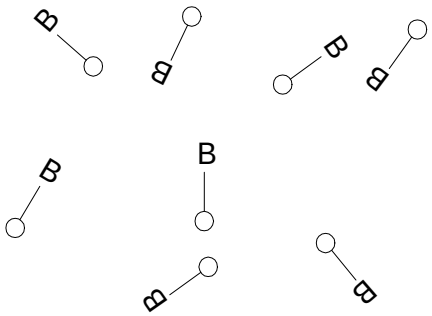
3. After incubation, the System dispenses Transfer Wash Solution to transfer the reaction mixture to the glass fiber matrix. Microparticles are captured on the glass fiber matrix while the remaining reaction mixture flows through the matrix into the blotter. The blotter is located in the Reaction Tray below the matrix. The matrix is washed to remove materials that are not captured.



Transfer And Wash

Figure 1-31.

4. After draining, biotinylated antigens (Probe) are added to the reaction mixture.



Probe

Figure 1-32.

5. During the second incubation period, the antigens of the Probe bind to the sample antibodies of the complex created during the first incubation process. Probe Wash is added to the reaction well to flush unbound Probe through the matrix. The amount of biotinylated antigens bound to the microparticle and captured on the solid phase is directly proportional to the amount of anti-HIV or anti-HTLV antibody in the sample.

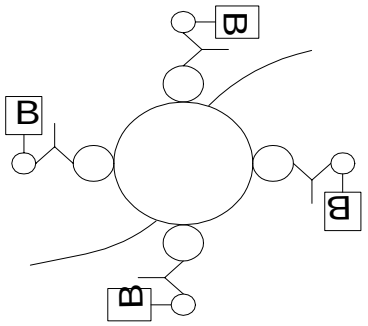


Figure 1-33.

6. After draining, the reaction well is saturated with Acridinium-Labeled Anti-Biotin Conjugate.

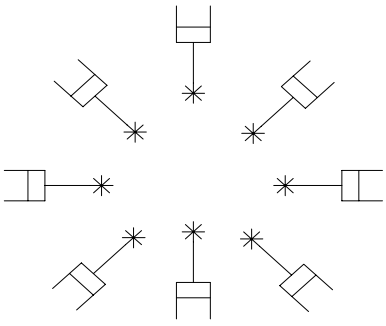


Figure 1-34.

7. During the second incubation period, Conjugate binds to the antigen/antibody/antigen Probe complex that is present. Conjugate Wash is added to the reaction well to flush unbound Conjugate through the matrix.

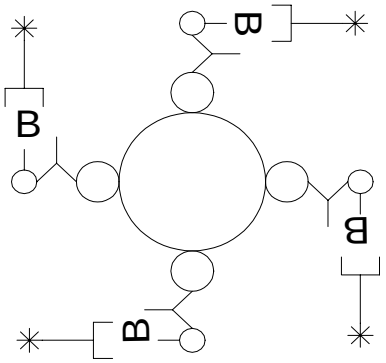


Figure 1-35.

8. The System moves the reaction well to the Optics Station and takes a background read (dark count). Then, Activator Solution is added to the matrix. The Activator Solution reacts with the Acridinium-Labeled Conjugate, resulting in the production of photons.

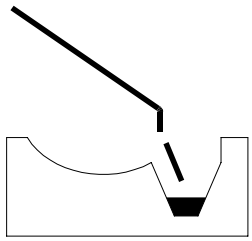
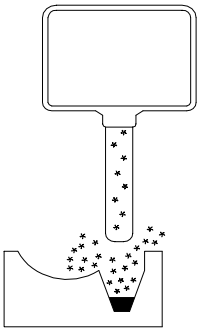


Figure 1-36.

9. A Photomultiplier Tube measures the emission of photons. The amount of photons emitted is directly proportional to the amount of anti-HIV or anti-HTLV antibody bound to the microparticles. For further information, see Analyte Measurement.



Light

Figure 1-37.

Assay Process Functional Sequence

The functions that occur at each station of a 2-Step and 3-Step Immunoassay Channel on the ABBOTT PRISM System are illustrated and described below.

Two-Step Immunoassay

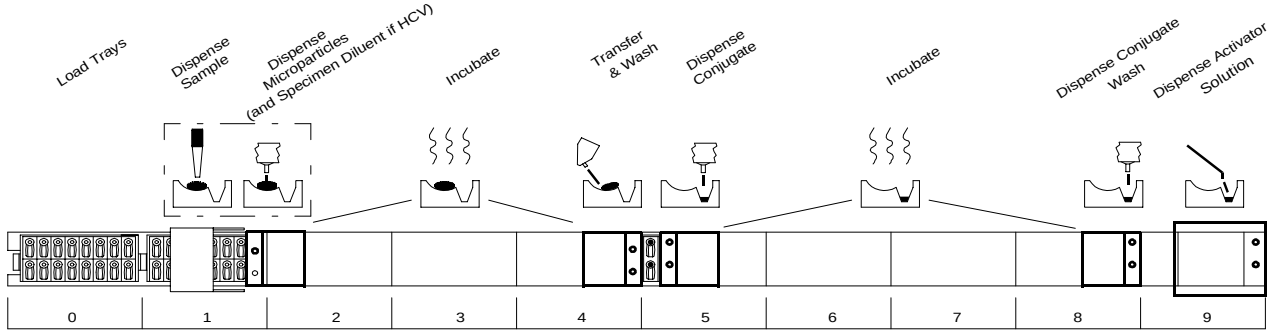


Figure 1-38.

Station(s)	Function(s)
1	Dispenses sample followed by microparticles (and specimen diluent buffer for HCV).
2 & 3	Heats and incubates the tray to allow analyte in the sample to bind to the microparticles.
4	Continues to heat the tray and transfers the mixture to the matrix with dispenses of Transfer Wash.
5	Dispenses Conjugate onto the matrix.
6 & 7	Incubates the tray to allow the Conjugate to bind to open binding sites.
8	Incubates the tray and washes the matrix with Conjugate Wash.
9	Dispenses Activator Solution which reacts with the bound Conjugate to produce photons.

Table 1-2.

Three-Step Immunoassay

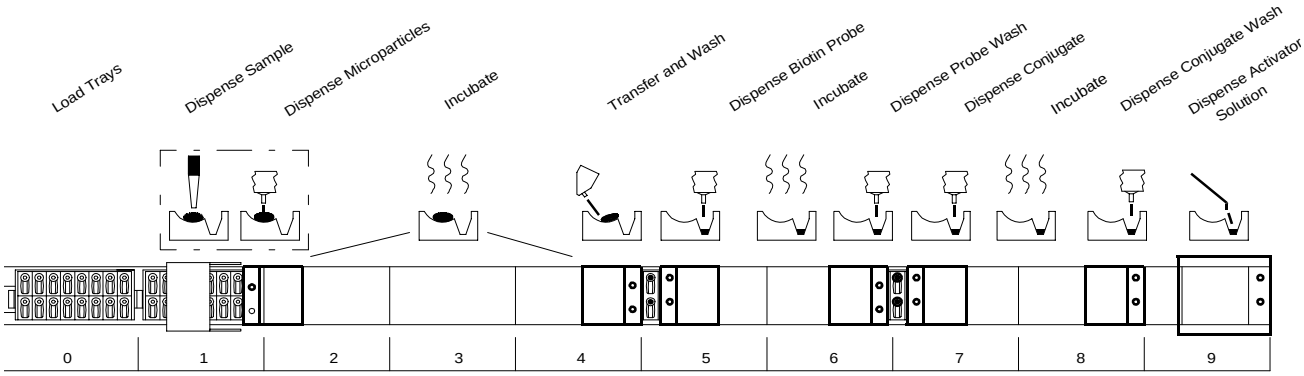


Figure 1-39.

Station(s)	Function(s)
1	Dispenses sample followed by microparticles.
2 & 3	Heats and incubates the tray to allow antibodies in the sample to bind to the antigens on the microparticles.
4	Continues to heat the tray and transfers the mixture to the matrix with dispenses of Transfer Wash.
5	Continues to incubate and dispenses Biotin-Labeled Antigen Probe onto the matrix.
6	Incubates the tray to allow the Biotin-Labeled Antigen Probe to bind to the free arm of the antibody bound to the microparticles. The matrix is washed with Probe Wash to flush unbound Probe through the matrix.
7	Dispenses Conjugate onto the matrix and incubates to allow the Anti-Biotin Conjugate to bind to available Biotinylated Probe sites.
8	Incubates the tray and washes the matrix with Conjugate Wash to flush unbound Conjugate through the matrix.
9	Dispenses Activator Solution which reacts with the bound Conjugate to produce photons.

Table 1-3.

Determination of Results

Samples may be *reactive* (positive) or *non-reactive* (negative) for the antigen/antibody analyte being tested. A reactive result indicates that antigen/antibody is potentially present; a non-reactive result means the antigen/antibody is not present in the sample in a level that is detectable by the assay.

Data Reduction

Assay results are determined by comparing net sample photon counts to a cutoff value derived form the mean net photon counts collected for calibrator materials. The ABBOTT PRISM System performs data reduction calculations in a batch mode after all samples and calibrators have been processed for a particular assay. A “group” may consist of calibrators, controls, and samples followed by a release control. A “batch” consists of calibrators, controls, and samples followed by a final control.

During data reduction the ABBOTT PRISM System performs the following functions:

1. Count Correction for Calibrators, Controls, and Samples

   Dark counts and activated counts are taken for each reaction well. Raw counts are multiplied by a normalization factor to compensate for differences in sensitivities between Photomultiplier Tubes. The System Software verifies dark count values are within an acceptable range and then subtracts the dark counts from the activated counts to produce net counts.

2. Process Calibration Counts

   The System Software verifies net calibrator count values are within an acceptable range and the cutoff is calculated. If the range of observed results is outside expected results on any parameter, data reduction and processing for that assay ceases.

If data reduction cannot be performed, calibrator raw count data can be reviewed for troubleshooting purposes only.

3. Process Specimen Counts

   The System Software verifies specimen count values are within an acceptable range and calculates sample to cutoff (S/CO) values for each sample.

4. Process Release Control Counts

   The System Software verifies release control values are within an acceptable range. If the observed range of results is outside expected results on any parameter, data reduction and processing for that assay ceases.

Interpretation of Sample

Refer to the ***Results*** and ***Interpretation of Results*** sections of the assay-specific package insert.

Functional System Introduction

The ABBOTT PRISM System is a Multichannel Immunoassay Analyzer. A sample is dispensed across all installed channels into disposable Reaction Trays. Each tray is transported through the instrument by the channel. Reagents are added at predetermined stations. The reaction is completed in a temperature controlled environment as the sample progresses through the channel. Counting is then performed to detect the amount of chemiluminescence resulting from the reaction. The Reaction Trays are then dropped into the Reaction Tray Waste Container.

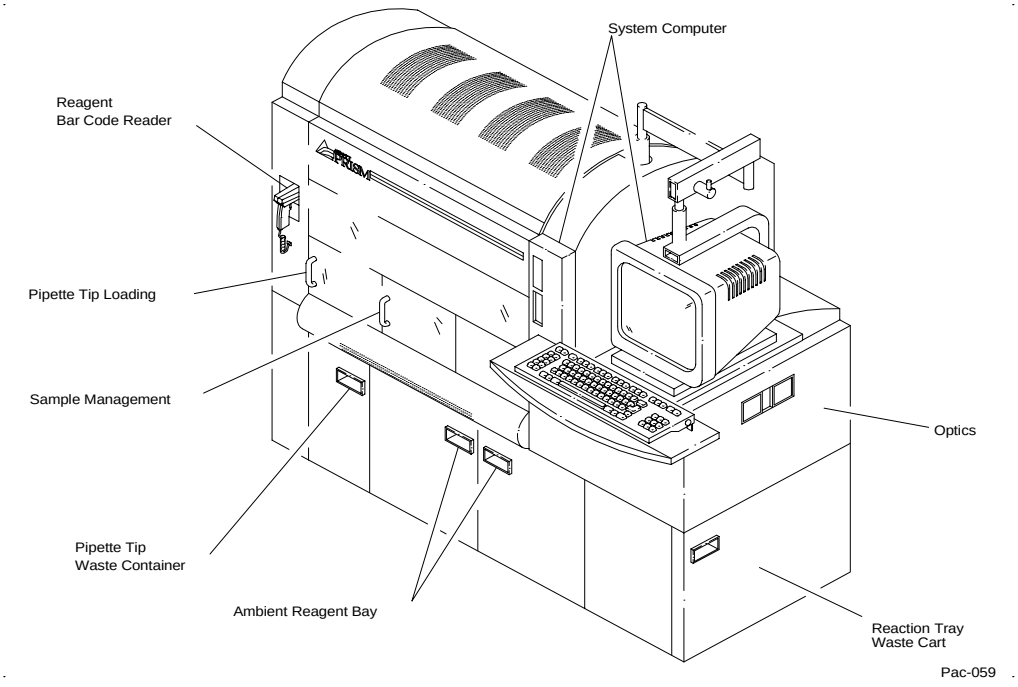


Figure 1-40.

Reagents are maintained on-board the analyzer in the Refrigerator or Ambient Reagent Bay. To prepare the System for an assay run, the operator performs a prime function to transport fresh reagents to the Dispense Heads, and then loads disposables (Reaction Trays

and pipette tips), calibrators, and samples. The System performs a calibration at the beginning of each run and then processes a batch of samples. Results are collected for a sample report after data reduction is completed. At the completion of a run, the System fluidics are cleaned and the waste (Reaction Trays and pipette tips) is removed.

The functions of the instrument can be categorized in 8 functional areas:

1. Control System
2. Tray Transportation
3. Sample Management
4. Fluid Dispense
5. Reagent Incubation
6. Optical Reading
7. Reagent Storage
8. Power System

Control System

The Control System is comprised of 3 major areas:

1. System Computer
2. Bit Bus Interface
3. Software

System Computer

The System Computer provides the following functions:

- Hardware Control
- Data Reduction
- Data Storage
- Report Printing
- Interface To Other Systems
- User Interface

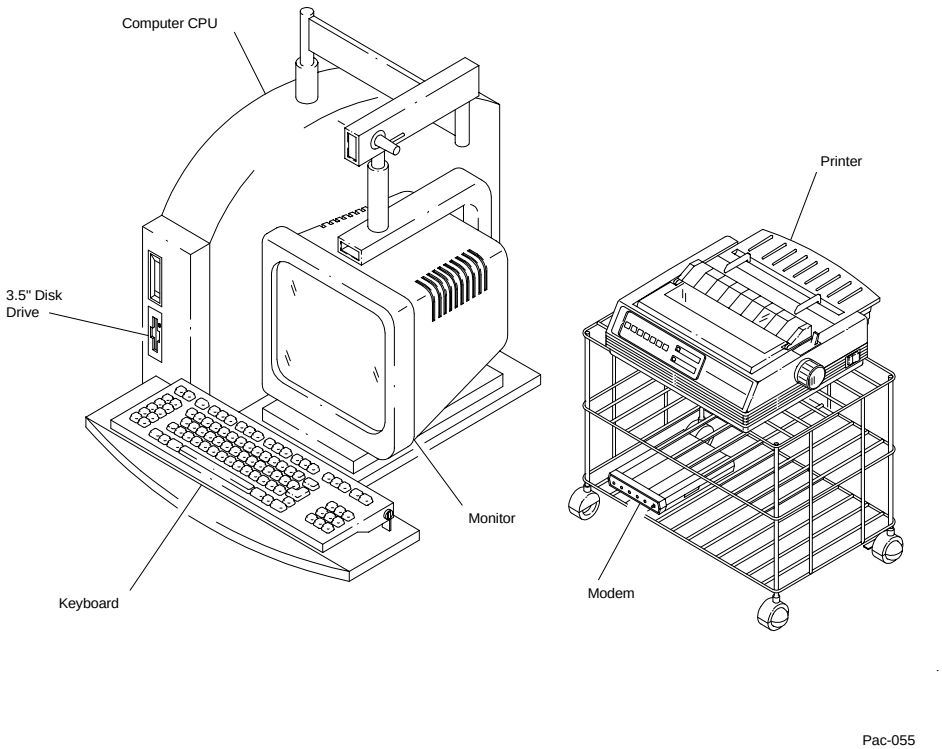


Figure 1-41.

The System Computer is a PC-AT® compatible computer with the following components or equivalent:

- Intel® 486 DX2-66™ Microprocessor
- 24 MB RAM
- 340 MB Hard Disk Drive
- 80 Column Dot Matrix Parallel Port Printer
- Modem
- 14 inch VGA™ Color Monitor
- Keyboard
- 3.5 inch Floppy Disk Drive
- Serial I/O Assembly With 4 Serial Ports
- Audio Board And Speakers

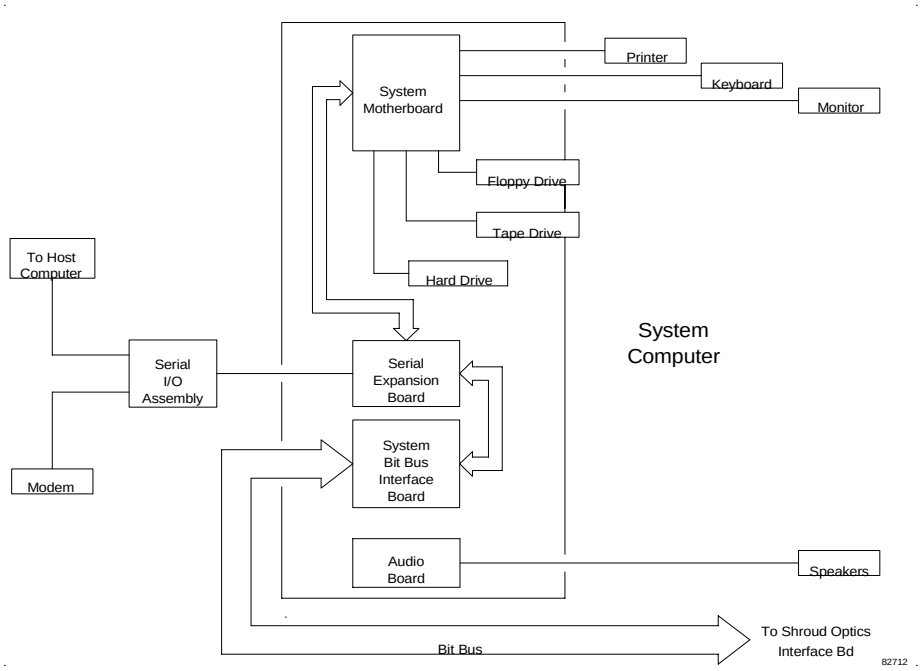


Figure 1-42.

Bit Bus Interface

The System Computer communicates with the ABBOTT PRISM System through a serial bus called a Bit Bus. The Bit Bus provides a message passing interface between tasks at the master node (System Computer) and tasks at multiple slave nodes within the bus. It uses an order/reply message protocol. Tasks on the master node issue orders to tasks on the slave nodes. Tasks on the slave nodes respond with replies. The following are the different slave nodes:

- Channel 1-6 Stepper Controller Bds
- Channel 1-6 Parallel Interface Bds
- Channel 1-6 Optics Assemblies
- System Serial Interface Bd
- System Parallel Interface Bd
- XY Axis Assy
- Z Axis Assy
- Pressure Transducer Bd

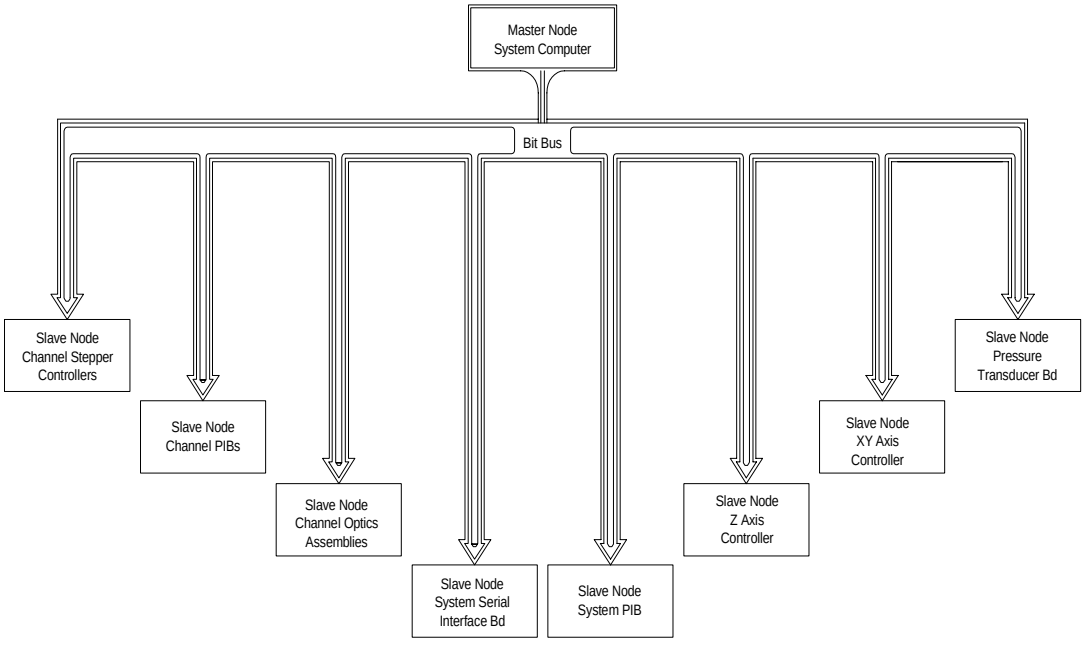


Figure 1-43.

Software

The ABBOTT PRISM System Application Software is comprised of the two following software components:

- Memory Resident Tasks (MRTs)
- Run-Time Loadable Jobs (RTLs)

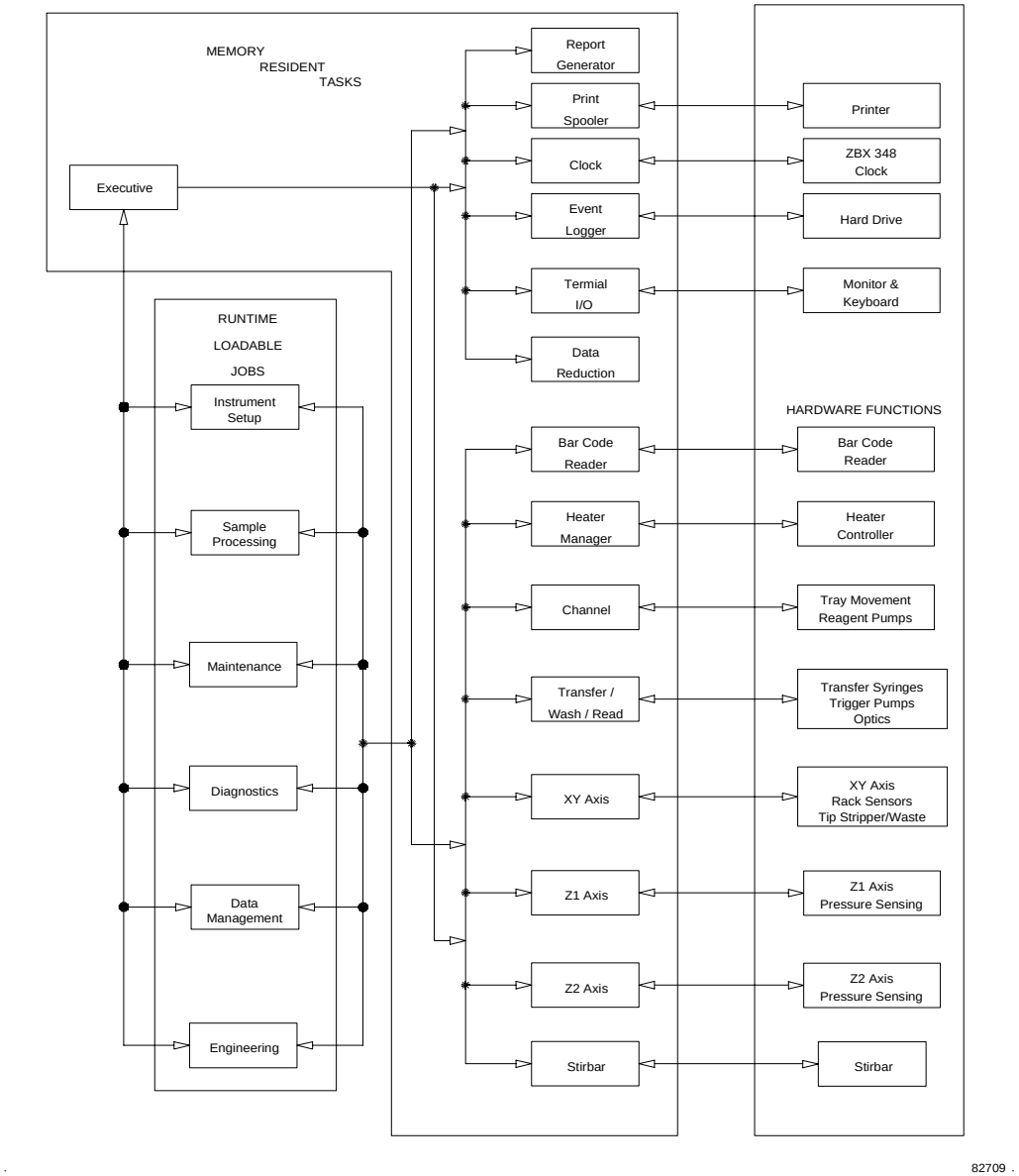


Figure 1-44.

Memory Resident Tasks

Memory Resident Tasks (MRTs) are the core of the software environment. They are loaded and run continually in memory. The MRTs interface with the hardware. They also access services (data reduction, event logger, etc.) needed by other parts of the application. Memory Resident Tasks include the following:

- Initialization - initializes and configures hardware; loads software.
- Application Executive - provides log on services and menu tree control. When a menu selection is chosen, the Application Executive loads the selected RTL.
- Terminal I/O - provides a means of controlling access to the System Monitor and Keyboard.
- Event Logger - records events (errors, failures, job starting, etc.) to the hard disk and alerts the operator.
- Data Reduction - converts raw assay counts for each sample into positive or negative assay results.
- Clock - maintains the time and date.
- Report Generator - creates formatted, operator readable reports from the data reduction task and sends them to the print spooler.
- Heater Manager - sets and monitors Heater Controller temperatures.
- Channel - controls tray positioning in the channel. Controls dispensing of rare reagents into the Reaction Tray.
- Transfer/Wash/Read - controls the read operation and dispensing of Activator and Transfer Wash.
- XY Axis - handles the positioning of the XY Axis. The XY Axis controls sensors for Pipette Tip Racks, Sample Racks, Calibrator Racks, Pipette Tip Waste Container, Pipette Tip Chute, and Waste Cart.
- Z1/Z2 Axis - handles Z Axis positioning and pressure sensing.
- Stirbar - interfaces with the Microparticle Reagent Stirbar.

Run-Time Loadable Jobs

Run-Time Loadable Jobs (RTLs) are loaded into memory by the Executive Task and use the Memory Resident Tasks to access the hardware. The following are the Run-Time Loadable Jobs:

- Instrument Setup - controls tasks required for instrument preparation.
- Sample Processing - also called Continuous Access Sample Processing (CASPR), controls the tasks for processing samples, calibrators, and controls.
- Maintenance - controls the tasks required for normal customer maintenance.
- Component Diagnostics - controls the tasks for running instrument diagnostics.
- Engineering - controls tasks required for more advanced utilities. These utilities are typically accessed by Abbott personnel.
- Data management - controls tasks necessary for the operator to manage the data files.

Tray Transportation

The System performs tray transportation using the following functions:

- Tray Loading
- Tray Movement
- Tray Disposal

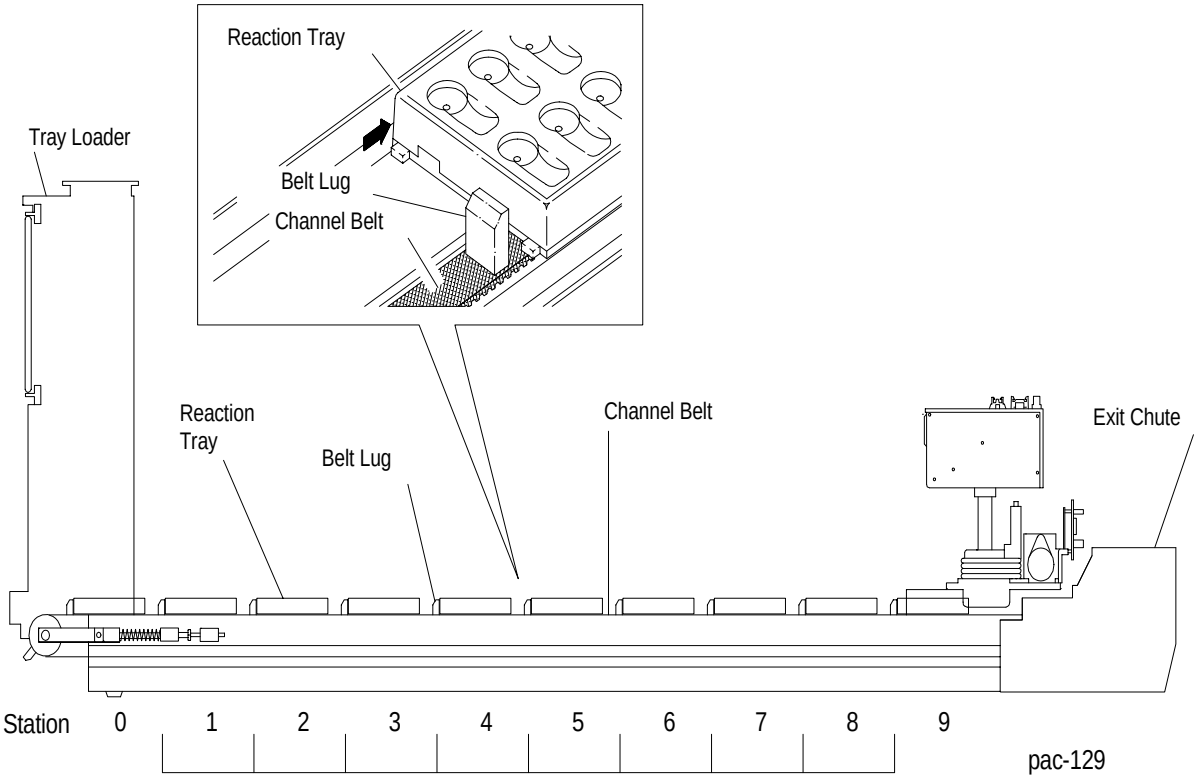


Figure 1-45.

Tray Loading

The System performs the tray loading function using the Tray Loader Assembly and Channel Parallel Interface Bd. The Tray Loader Assembly consists of the Tray Loader Interface Bd, Tray Loader Motor, Tray Loader Motor Sensor, Tray Lift Mechanism, and various other mechanical hardware.

The Tray Loader Assembly automatically feeds the trays into the channel as needed. Each Tray Loader Assembly has the capability of holding 27 Reaction Trays. The Tray Loader Assembly lifts or lowers the trays when requested by the System Computer and returns the status of the lifter mechanism to the System Computer. The commands to move the lifter mechanism and status of the sensors are communicated to and from the System Computer by the Channel Parallel Interface Bds (PIBs) which are connected to the Bit Bus.

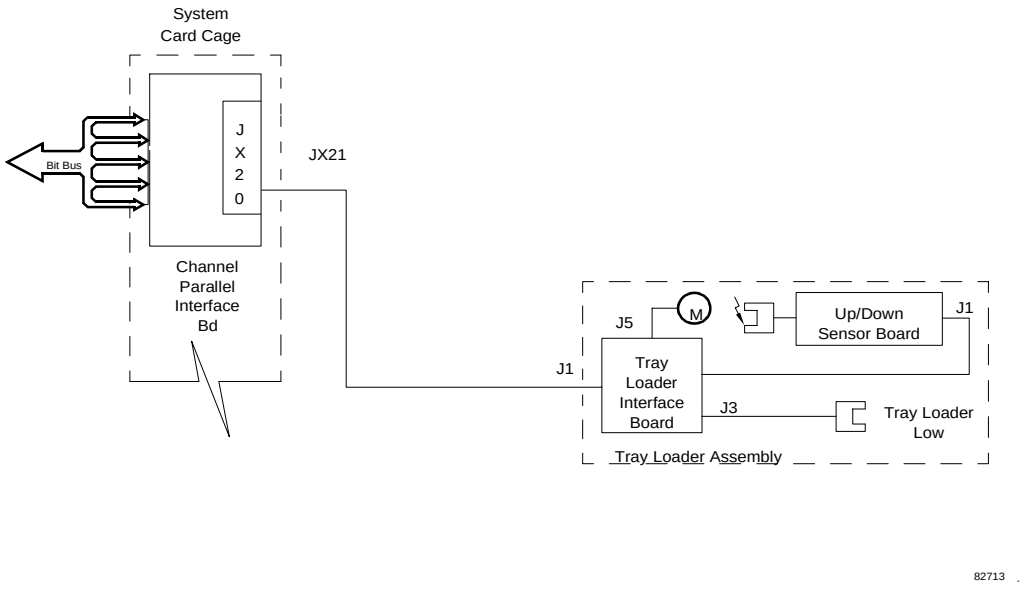


Figure 1-46.

Tray Movement

The System performs the tray movement function using the Channel Stepper Controller Bd and Channel Assy. The Channel Assy consists of the Transport Interface Bd, Transport Motor Assy, Transport Encoder Bd, Tray Ready Sensor, and Transport Belt. The Tray Movement Mechanism controls the movement and positioning of Reaction Trays as they move through the System. The Tray Ready Sensor detects that a tray has been loaded into the channel. The Transport Encoder Bd provides feedback regarding the position of the Reaction Trays as they are indexed through the System. The Channel Stepper Controller Bd drives the Tray Transport Motor when instructed by the System Computer. The Channel Stepper Controller Bd provides sensor status when requested. The Channel Stepper Controller Bd communicates to the System Computer via the Bit Bus.

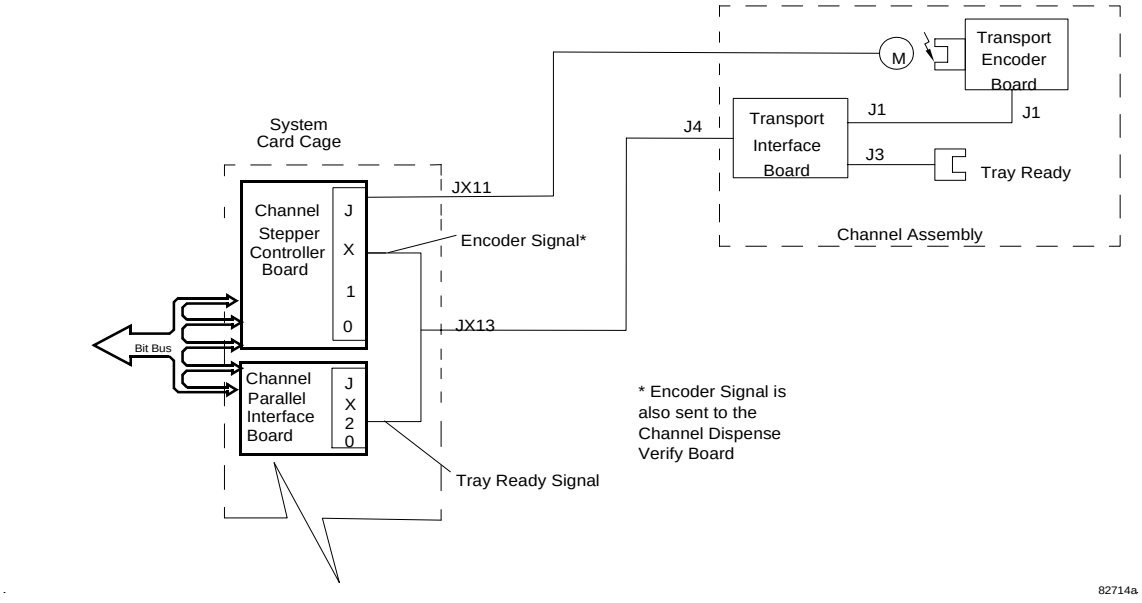


Figure 1-47.

Tray Disposal

The System performs the tray disposal function using the System Parallel Interface Bd, Exit Chute, Waste Cart Sensor, and Waste Cart. The Exit Chute allows the trays to fall reliably into the Waste Cart without sticking, jamming, or spilling biohazardous waste outside the Waste Canister. The Waste Cart contains 2 canisters. The maximum capacity of each canister in the Waste Cart is approximately 100 trays. The presence or absence of a Tray Waste Cart is sensed by the Tray Waste Cart Sensor. The System Parallel Interface Bd communicates the sensor status to the System Computer via the Bit Bus.

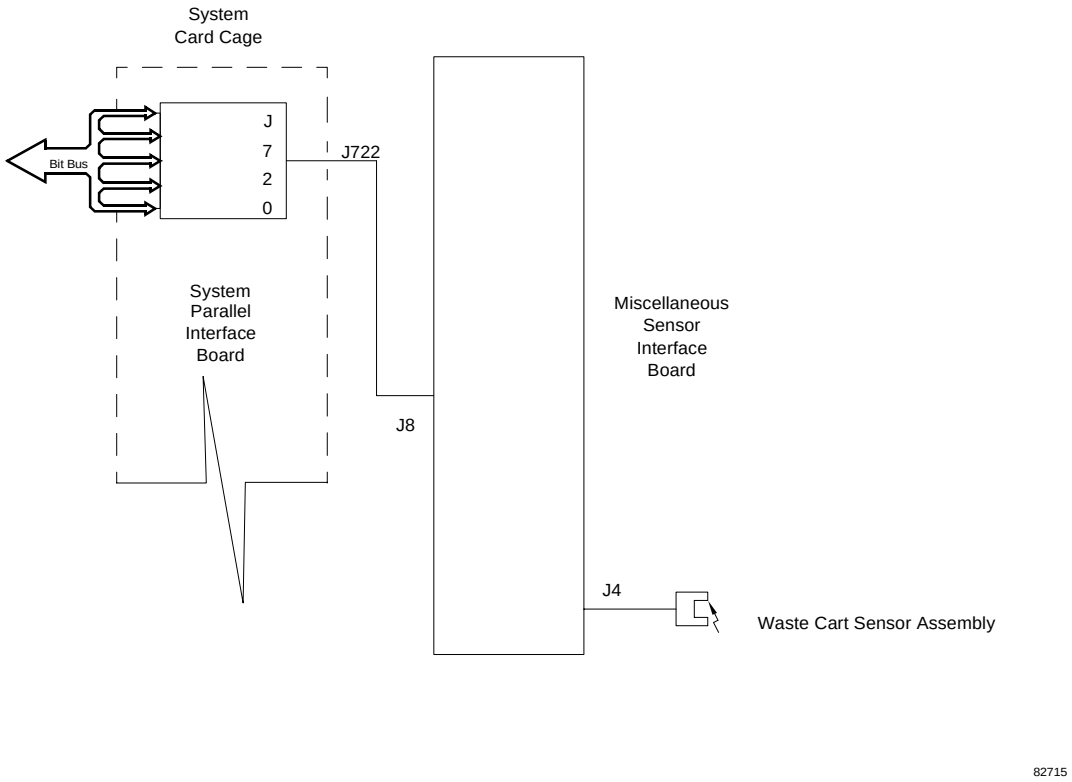


Figure 1-48.

Sample Management

The System performs Sample Management using the following functions:

- Sample Loading
- Sample Movement
- Pressure Sensing

Sample Loading

The operator is prompted to load/position the Tip Racks, Waste, and Pipette Waste Canisters, and check their sensors to verify they are in position. The operator is then prompted to load Control and Sample Racks. When loading the Control and Sample Racks, the System moves the Rack Loader to the correct position. The bar codes are read while a rack is being inserted. The Sample Rack Sensors are read to verify racks have been installed.

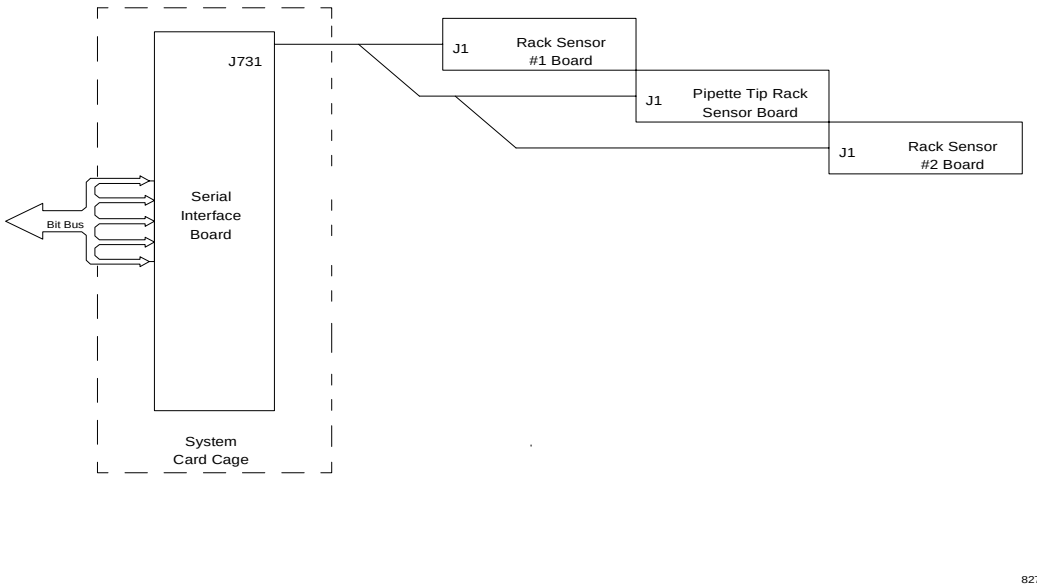


Figure 1-49.

Sample Bar Code Reader

The Sample Bar Code Reader is used to identify samples, controls, and calibrators. The System Computer tells the Serial Interface Bd (via the Bit Bus) to position the Rack Loader at the first available rack position. Once the Bar Code Reader is in position, the operator loads a rack. The Tube Sensor detects that a tube or calibrator bottle is present. The Bar Code Reader Scanner reads the bar code label affixed to the tubes or the calibrator bottles. This information is relayed back to the System Computer via the Bit Bus. A second Bar Code Reader is used for loading reagents. The Hand-Held Bar Code Reader is located at the Tray Loader Assy Cover.

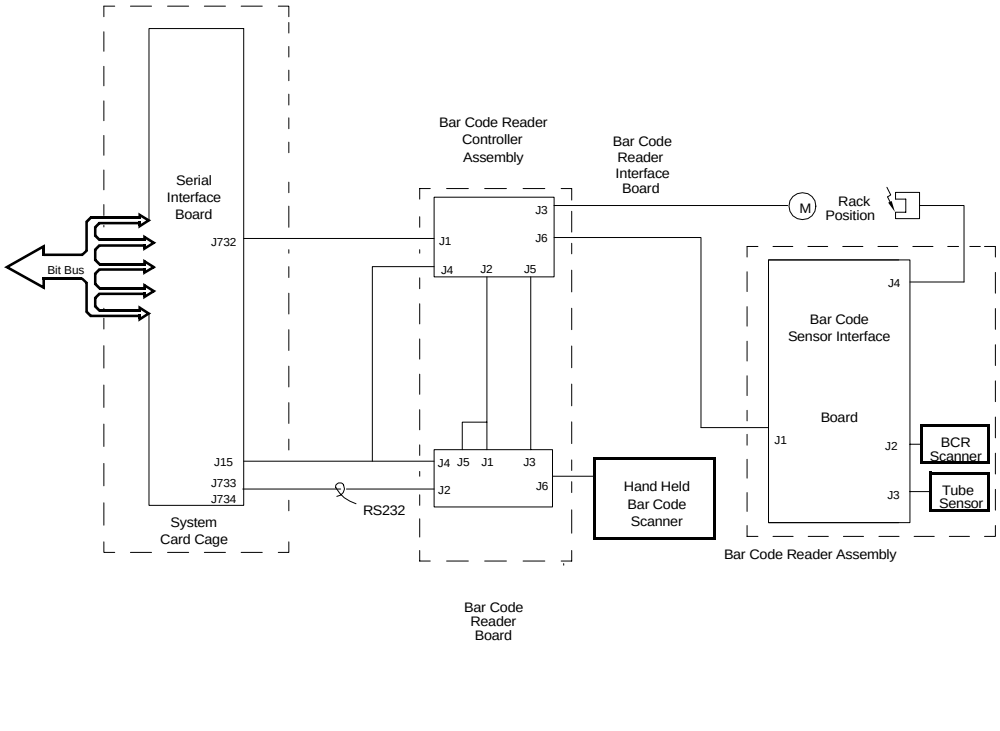


Figure 1-50.

Sample Movement

Once the sample, tips, calibrators, and controls are loaded, the System must get a tip, move the sample, controls, or calibrators from the source to the Reaction Trays, and then dispose of the tip. To accomplish this, the System must:

- Position the pipettor in the XY Axis
- Position the pipettor in the Z Axis
- Pressure Sense during pipetting

XY Positioning

The System performs the XY Positioning Function using the XY Axis Assembly and XY Axis Controller Assembly. The XY Axis Assy consists of the X Axis Motor, Y Axis Motor, X Axis Home Sensor, Y Axis Home Sensor, X Axis Limit Sensor, and Y Axis Limit Sensor. The XY Axis Assy provides positioning in the XY Axis to the Tip Rack, Sample Racks, Control Racks, Channels 1-6 Dispense Areas, and the Tip Remover. The commands to move the XY Axis to a specific position are communicated from the System Computer to the XY Axis Controller via the Bit Bus.

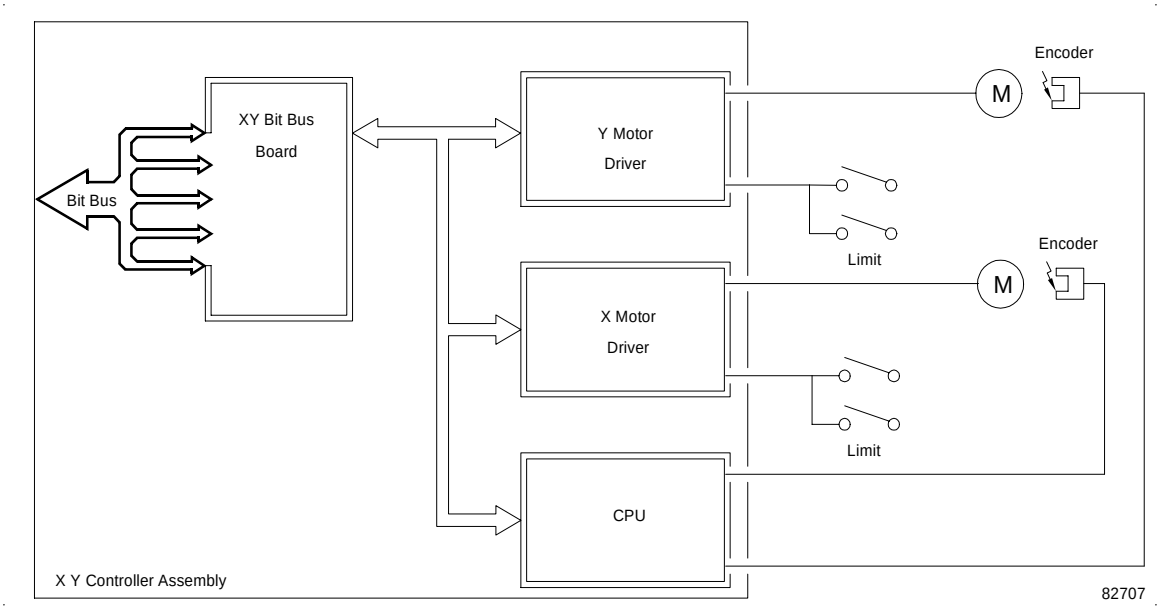


Figure 1-51.

Z Axis Positioning and Pipetting

The System performs Z Axis positioning and pipetting functions using the Z Axis Assembly, Pressure Sense Bd, System Parallel Interface Bd, System Stepper Controller, and Z Axis Interface Bd. The Z Axis Assy contains 2 independently movable mechanisms (Z1 and Z2). Both Z1 and Z2 consist of a Home Sensor, Tip On Sensor, Drive Motor, Syringe Assembly, and Up Sensor. The following description will discuss the operation of only one Z Mechanism, although both Z Mechanisms operate identically.

When the Z Axis is positioned over the Tip Racks, the Z Axis drives the plunger down to a position just above the top of the disposable pipet tip (tip). The plunger is then positioned further down to a point just inside the tip. The status of the Tip On Sensor is read to confirm that the plunger did not hit the side of a tip. Next, the plunger is driven further down into the tip and the Tip On Sensor is read again to verify that there is a tip in place. The plunger is raised to the home position.

The Z Axis is then positioned over the next sample to be aspirated. The pipet tips are lowered to a point just above the tube. The syringe begins to aspirate air while the tips are lowered and the Pressure Sense Bd is monitored. When the tip contacts the surface of the sample, there will be a drop in air pressure in the tip. The syringe and tip are then stopped. The tip will be lowered to just below the surface of the sample. The syringe then aspirates 100 µL of fluid. When the syringe stops, the System takes another transducer reading. After a short settling time, an additional reading is taken. The baseline reading is subtracted from each of the two readings. The 2 differences are compared to an empirically determined an acceptable range. If the pressure differentials are less than expected, the System interprets this as a short sample or a bubble. If the differentials are greater than expected, it is interpreted as either a viscous sample or a clot. The remainder of the fluid required for analysis is then aspirated in 150 µL cycles. For each cycle, the plunger lowers and the syringe aspirates. After settling, a transducer reading is taken and a pressure differential is

determined. If any pressure differentials are outside the acceptable range, the aspiration is aborted and all fluid is returned to the tube. The amount of sample aspirated is the total amount required for all assays plus the initial 100 µL. In addition, 25 µL of air is aspirated after sample aspiration to minimize the possibility of a hanging sample droplet. The plungers are then raised.

After the pipettor moves to the dispense position and the plunger lowers to the dispense point, the System takes a transducer baseline reading. The System takes additional readings as the desired fluid amounts are dispensed. To check the dispense volume, the baseline differentials of the last 3 transducer readings are compared to an empirically determined pressure curve. The plungers are raised between dispenses to the up position (determined by the position of the Z1 or Z2 Up Sensor) to save time. The XY Table positions the pipettor to a point over the Disposable Pipet Tip Remover and lowers the plungers. The plungers are moved into the Tip Stripper. The plungers are then raised to the home position to wipe off the tips.

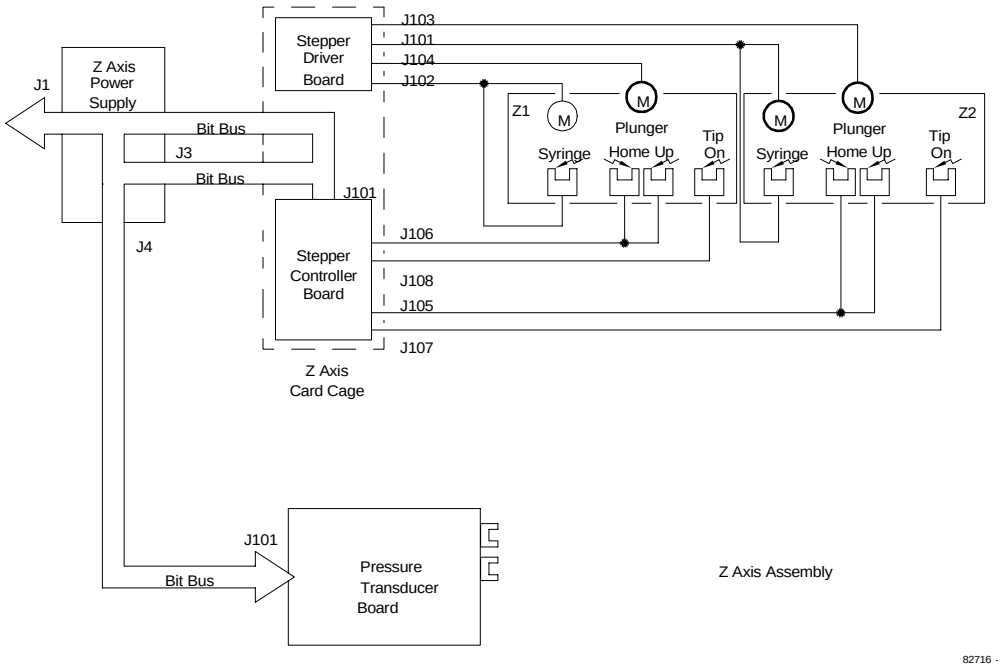


Figure 1-52.

NOTES:

Fluid Dispense

The Fluidics System delivers an accurate amount of reagent to a Reaction Tray as the tray is transported through the channel. The System performs the fluid dispensing using the following functions:

- Reagent Delivery
- Detection of Reagent Delivery

Reagent Delivery

Fluids are delivered by one of the following 3 configurations:

- Type 1 - Reagent Pump With Purge Valve
- Type 2 - Reagent Pump Without Purge Valve
- Type 3 - Syringe Pump With Purge Valve

The following Fluidics Systems (using one of the 3 types of delivery systems) make up the Fluid Dispense Systems:

Reagent	Delivery System
Microparticle	Type 1
Sample Diluent	Type 1
Probe	Type 1
Probe Wash	Type 1
Conjugate	Type 1
Conjugate Wash	Type 1
Activator Solution	Type 2
Sample Diluent (Channel 6 only)	Type 2
Transfer Wash	Type 3

Table 1-4.

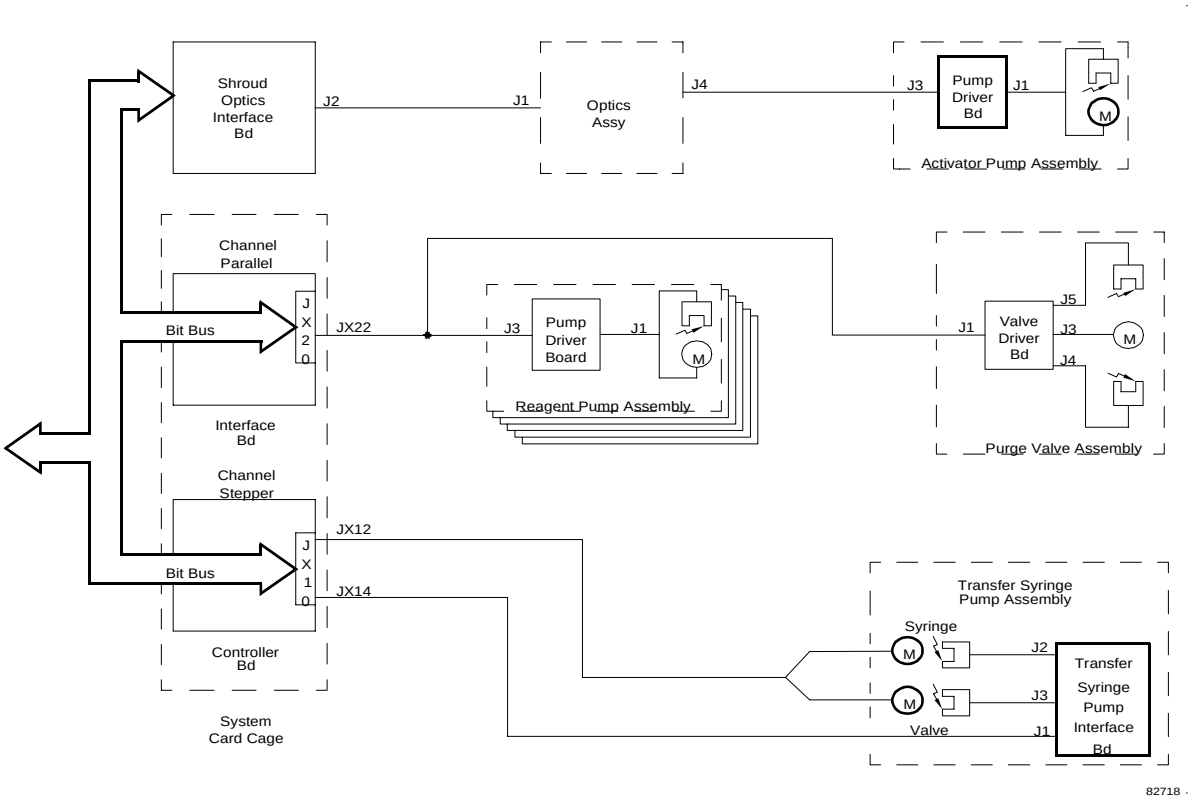

Shroud Optics Interface Bd
J2
J1
Optics Assy
J4
J3
Pump Driver Bd
J1
M
Activator Pump Assembly
Channel Parallel
Bit Bus
J X 2 0
JX22
J3
Pump Driver Board
J1
M
Reagent Pump Assembly
J1
Valve Driver Bd
J5
J3
J4
M
Purge Valve Assembly
Interface Bd
Channel Stepper
Bit Bus
J X 1 0
JX12
JX14
Transfer Syringe Pump Assembly
Syringe
M
J2
M
J3
Valve
J1
Transfer Syringe Pump Interface Bd
Controller Bd
System Card Cage
82718

Figure 1-53.

Type 1

The Reagent Pump with Purge Valve Delivery System has a reagent dispense capability and can also purge reagents from the Dispense System. This reagent purge is accomplished by utilizing the Purge Valve as a switching station. The signals to and from the Purge Valve Assembly, Reagent Pump Assembly, and Dispense Verify Sensor are generated and received by the Channel Parallel Interface Board and communicated to the System Computer via the Bit Bus. The Purge Valve is switched to the desired source (Purge or Reagent Bottle). The Reagent Pump is then driven to deliver the correct amount of fluid to the A and B Wells of the Reagent Tray. The Dispense Verify Sensor output is checked to verify fluid was actually delivered. Dispense Verify is only used on the following reagents:

Microparticles	All Channels
Specimen Diluent	HCV Only
Probe	3-Step Channels
Conjugate	HBsAg only
Conjugate Wash	HBc only
Transfer Wash	All Channels

Table 1-5.

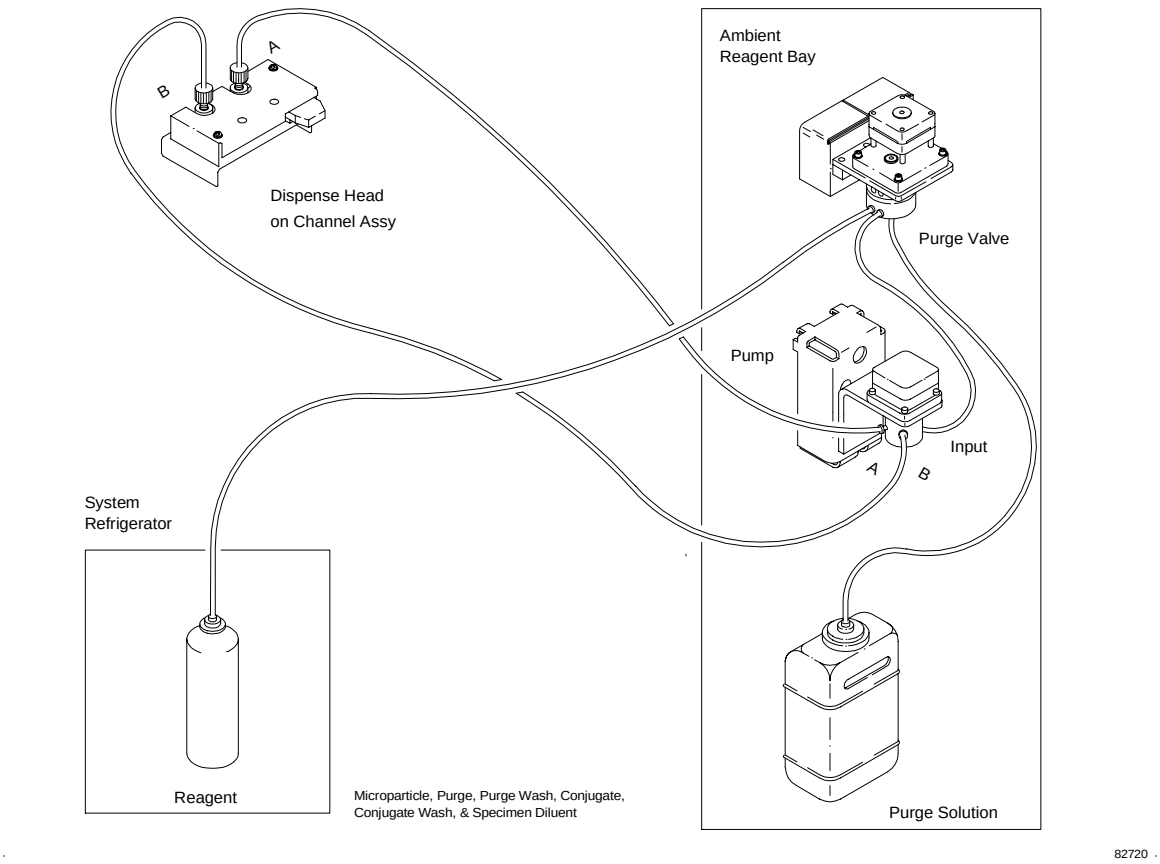

Ambient
Reagent Bay
A
B
Dispense Head
on Channel Assy
Purge Valve
Pump
Input
A
B
System
Refrigerator
Reagent
Microparticle, Purge, Purge Wash, Conjugate,
Conjugate Wash, & Specimen Diluent
Purge Solution
82720

Figure 1-54.

Type 2

The Reagent Pump without Purge Valve Delivery System is used to dispense Activator Solution. The signals to the Reagent Pump Assembly are generated and received by the Channel Parallel Interface Board and communicated to the System Computer via the Bit Bus. The Reagent Pump is driven to deliver the correct amount of fluid to the A and B Wells of the Reagent Tray.

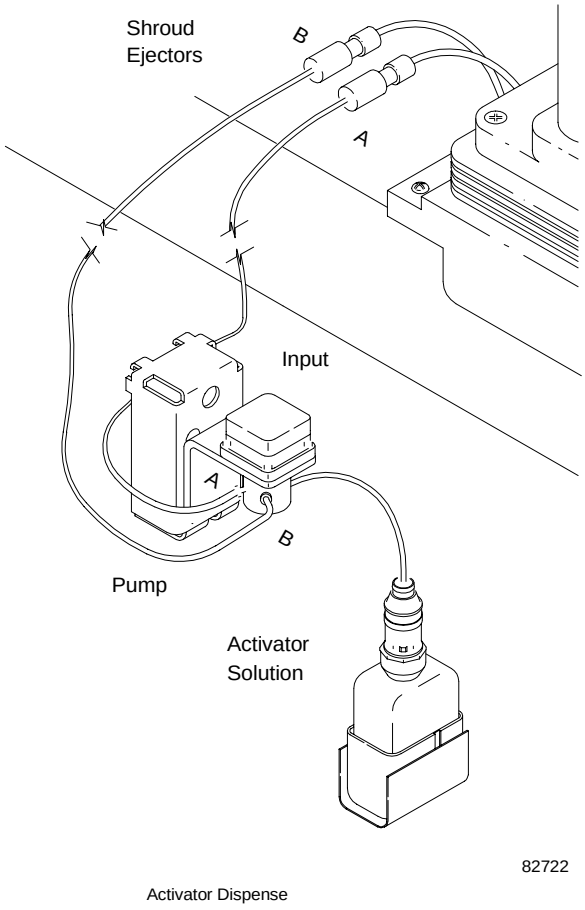


Figure 1-55.

Type 3

The Syringe Pump with Purge Valve Delivery System is used to dispense Transfer Wash. This results in a non-contact transfer of the incubation mixture (microparticles and analyte) from the incubation well to the reaction well. The signals to and from the Purge Valve Assembly, Syringe Pump Assembly, and Drain Time Sensor are generated and received by the Channel Parallel Interface Board and communicated to the System Computer via the Bit Bus. The Purge Valve is switched to the desired source (Purge or Transfer Bottle). The Syringe Valve is switched to the Input Port and then driven in to withdraw fluid. The Syringe Valve is then switched to the A Output Port and the syringe is driven to dispense fluid to the A Well of the Reagent Tray. The Syringe Valve is then switched to the B Output Port and the syringe is driven to dispense to the B Well of the Reagent Tray. The Drain Time Sensor is used to detect how long it takes for the fluid to drain into the matrix of the tray.

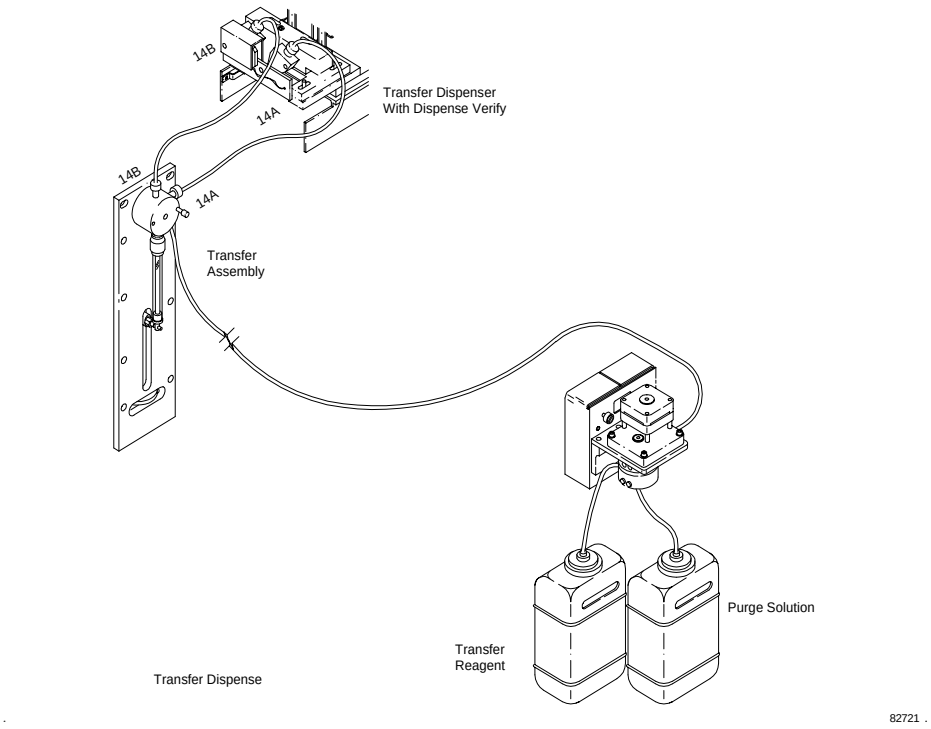


Figure 1-56.

Detection Of Reagent Delivery

As a result of *Design of Experiment* studies, it was determined that the absence of certain reagents has the propensity to result in a false-negative result for that assay. To verify that critical dispenses have occurred, sensors were installed to monitor the dispensing at these dispense stations. The System performs the sensing with the following 2 types of sensing systems:

- Dispense Verify Sensors
- Drain Time Sensors

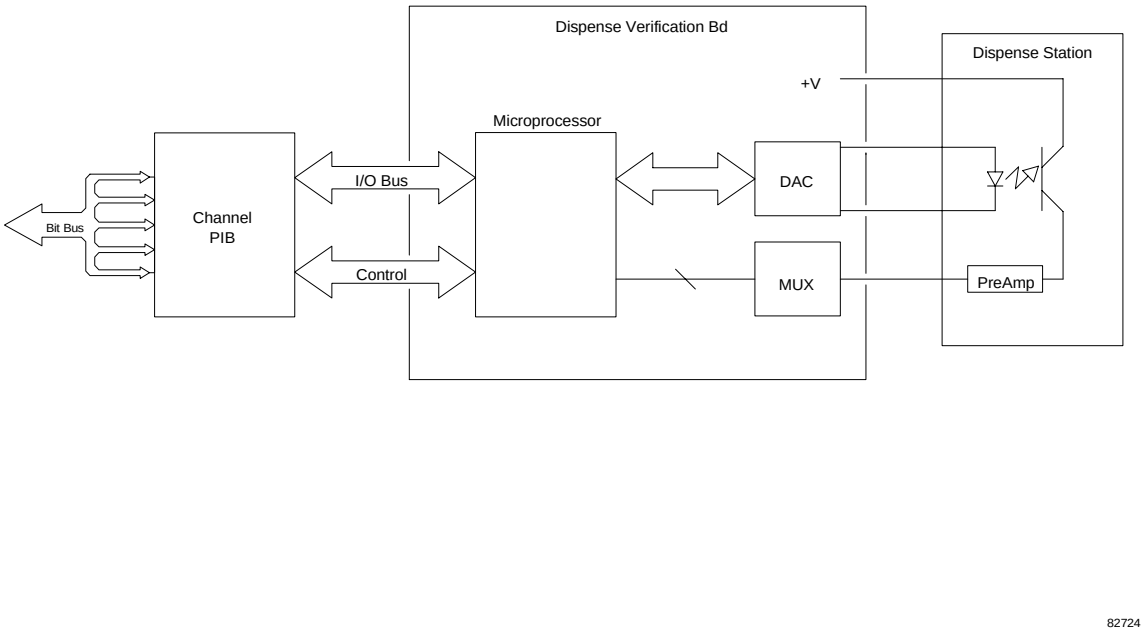


Figure 1-57.

Dispense Verify Sensor

The Dispense Verify Sensor verifies reagent has been dispensed by observing the interval of time over which the dispense stream of reagent interrupts an optical path. The optical path is made up of a Light Emitting Diode (LED) and Phototransistor (PT). Light from the LED illuminates the PT across a path which intersects the dispense stream of fluid from the nozzle. The optical path is sampled repeatedly once the tray is in position. The total interruption time is compared with a range of expected time to determine if a normal dispense has occurred. The signals to and from the LED and PT are generated/received by the Dispense Verify Board. The Dispense Verify Board then sends a status back to the Channel Parallel Interface Board (PIB) which in turn passes this information on to the System Computer via the Bit Bus.

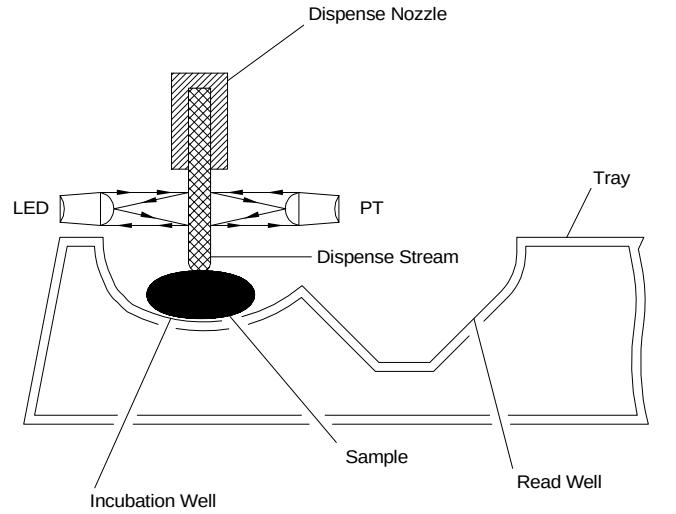


Figure 1-58.

Note: Fluid stream sensing is functionally identical for reagent dispenses into incubation and read wells.

Drain Time Sensor

The Drain Time Sensor verifies reagent has been dispensed by observing the interval of time for the Transfer Wash, analyte, and microparticle mixture to drain when transferred to the reaction well of the tray. The measurement of drain time is accomplished with an LED/PT pair which look at the bottom of the read well. When fluid is dispensed, the reflected signal is attenuated. When the drain process reaches its conclusion, there is a relative increase in reflectance followed by a constant reflectance. These transitions are monitored to determine the start time and end time of dispense. This defines the drain time. The signals to and from the LED and PT are generated and received by the Dispense Verify Board. The Dispense Verify Board then sends a status back to the Channel Parallel Interface Board (PIB) which in turn passes this information to the System Computer via the Bit Bus.

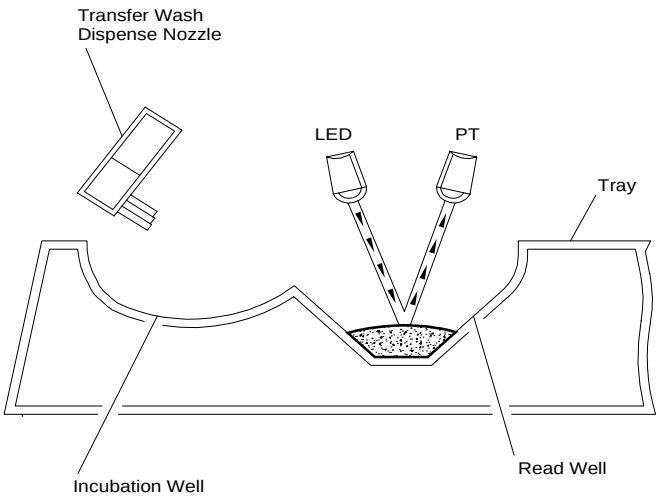


Figure 1-59.

NOTES:

Reagent Incubation

The Reagent Incubation System provides a temperature controlled environment during an assay run. The reaction incubation is performed by the following:

- Heater Cover
- Heater Controller

Heater Cover

The Heater Cover provides energy in the form of heat to the sample located in a disposable tray which is positioned below the Heater Cover on a channel. A second function of the Heater Cover is to partially shield the sample from environmental effects by providing an enclosure around the disposable tray. A third function for the Heater Cover is to provide a mechanism to support the dispense heads used to dispense reagents. A fourth function of the Heater Cover is to provide temperature sensing. The main components of the Heater Cover are the Heater Element and the Resistive Temperature Device (RTD).

Heater Controller

The Heater Controller maintains the temperature within specifications at each station by receiving temperature information from the Heater Covers and sending the appropriate drive voltage profiles to the heater elements. The Heater Controller communicates with the System Computer via an RS-232 link. To accomplish this, the Heater Controller performs the following functions:

- Temperature Monitoring
- Heat Supply Control

The Heater Controller consists of a Power Entry Assembly, Power Supply, CPU Board, Master Board, Slave Boards, and Driver Boards.

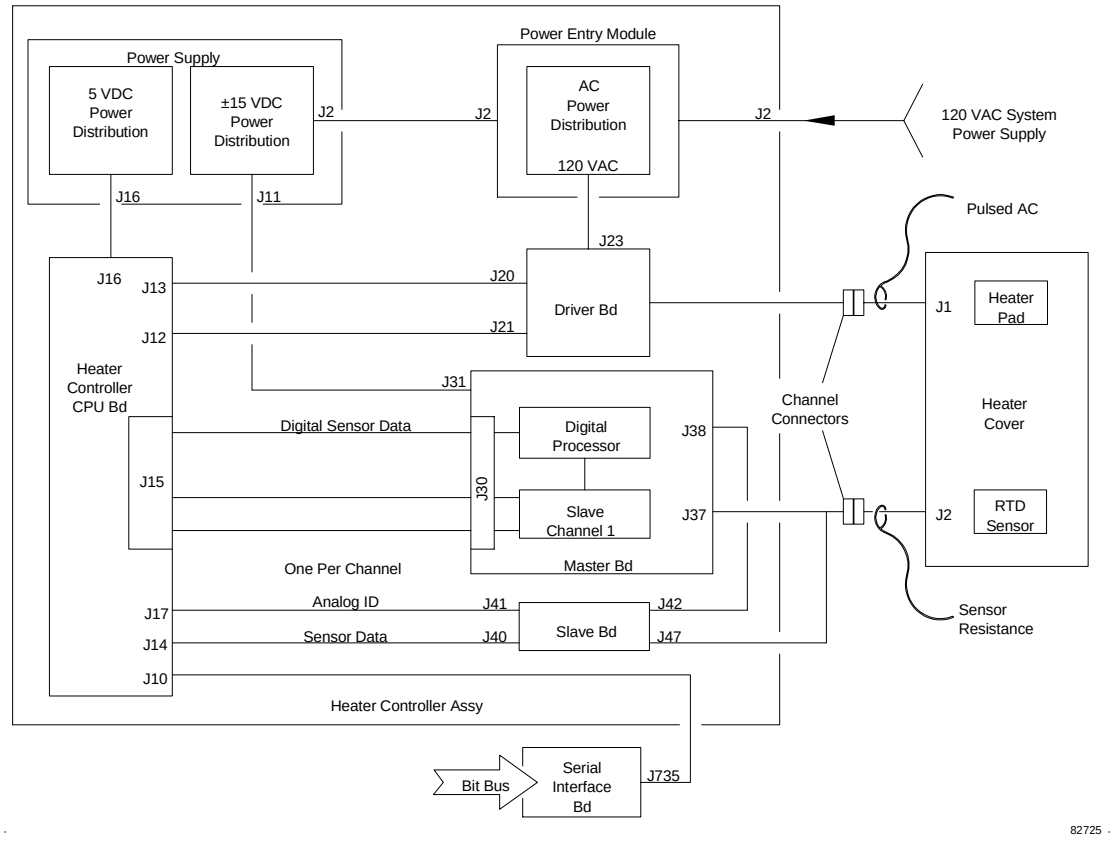


Figure 1-60.

Temperature Monitoring

To monitor the temperature of one of the 42 Heater Covers, the Heater Controller's CPU compares the computed resistance value with the actual RTD sensor resistance. The Heater Controller's CPU requests the Heater Cover's sensor data. The sensors are connected to the Slave Board. The Heater Cover Sensor sends the data to the Master Board, where it is digitized, and then sent to the CPU Board. The Slave Board for Channel 1 is actually built into the Master Board.

Heat Supply

The difference between the desired and actual temperature is determined from the monitoring function. The CPU then instructs the driver to drive the Heater Element by the appropriate amount. The Driver Board has LEDs arranged to correspond with the appropriate station. The bottom LED indicates Station 1 and the top LED indicates Station 8. Station 1 is not currently used and therefore its LED should not flash. By progressively pulsing the station's Heater Covers in an orderly manner, peak power is kept to a minimum.

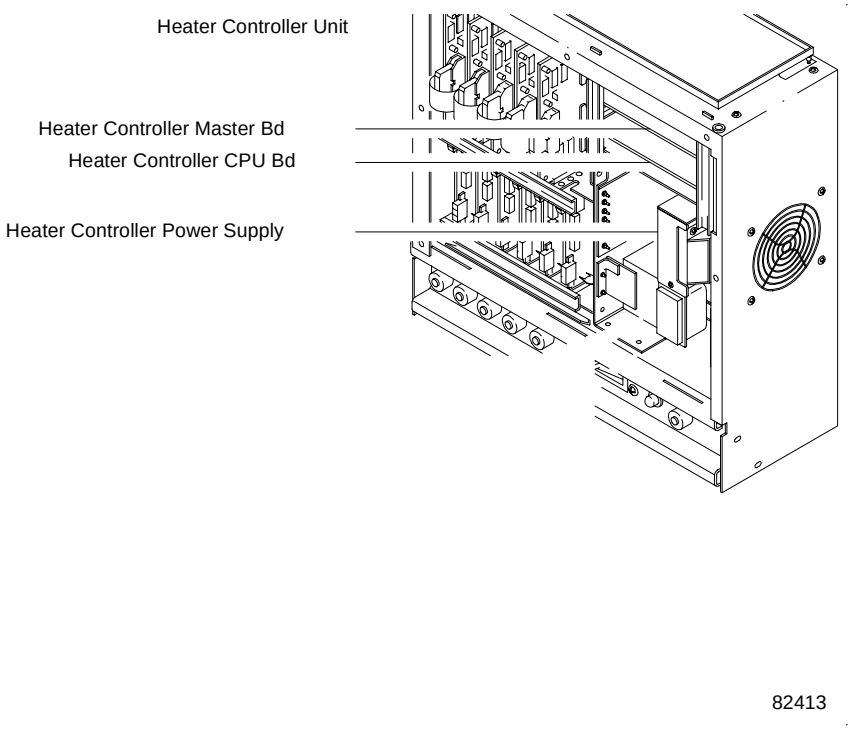


Figure 1-61.

Boot Sequence

During the initial power up, the Heater Covers may be at ambient temperature. To reduce the peak power requirements, the CPU uses the following sequence to drive the station's cover to the desired temperature:

Phase	Sequence
0	Start-up and system debug. The duration of this phase is four minutes.
1	Stations 2 through 4 in all channels are turned on in a control loop to drive to their set-point temperatures. These stations are the only ones energized and are allowed to use the full sine-wave of the power line so they will achieve final temperature more quickly. The duration of this phase is five minutes. At the end of this phase, any heater in stations 1-4 more than 1° C from its set-point will start reporting warnings to the System Computer.
2	Stations 2-4 in each channel have already achieved thermal equilibrium so they are limited to the use of every other cycle. Stations 5 and 6 in all channels are allowed to use full power under a control algorithm. This phase lasts for 5 minutes. At the end of this phase, any heater in stations 2-6 more than 1° C from its set-point will start reporting warnings to the System Computer.
3	Stations 2-6 in each channel have already achieved thermal equilibrium and are limited to the use of every other cycle. Station 7 in each channel is allowed to use full power under a control algorithm. The duration of this phase is five minutes. At the end of this phase, any heater in stations 2-7 more than 1° C from its set-point will start reporting warnings to the System Computer.
4	Stations 2-7 in each channel have already achieved thermal equilibrium and are limited to the use of every other cycle. Station 8 in each channel is allowed to use full power under a control algorithm. This phase lasts for 15 minutes. At the end of this phase, any heater more than 1° C from its set-point will start reporting warnings to the System Computer.

Table 1-6.

Optical Reading

The System performs an optical read by executing the following 2 functions:

1. Reader Positioning In Z Axis
2. Photon Count

The System Computer issues the following 2 commands to the Optics Assembly:

1. Dark Count
2. Activated Count

Dark Count

A dark count is a reading taken without dispensing Activator Solution. These counts are background noise.

Activated Count

For an activated count, the System performs a dark count, dispenses Activator Solution, and captures photons of emitted light.

Reader Positioning

Reader positioning is performed by the Optics Assembly and Shroud Lift Assembly. The Shroud Lift Assembly consists of the Shroud Reader Interface Board, Up Sensor, Down Sensor, Down/Down Sensor, Shroud Motor, and various mechanical hardware. The Optics Assembly contains a Photomultiplier (PMT) Amplified/Distribution Board, PMT Amplifier/High Voltage Power Supply Board, 2 Photomultiplier Tubes (PMTs), and 2 Optical Light Pipes. When the System directs the Optics Assembly to read a reaction, the control circuit verifies the Up, Down, and Down/Down Sensors for the current position of the Optics Assembly. If it is not down, the control circuit lowers the Shroud Motor and the sensors verify that the Shroud is down. After completing a read (see Photon Detection), the Shroud raises and the sensors verify the Shroud is up. The Up Sensor indicates the Shroud is in the up position. The Down Sensor indicates the Shroud Motor is in the down position. The Down/Down Sensor indicates the Shroud Lift is in the down position.

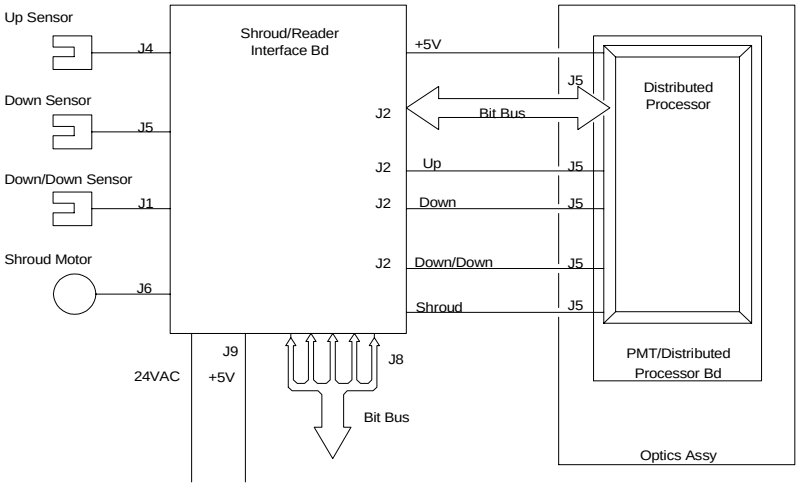


Figure 1-62.

Photon Detection

Photon detection is performed by the Optics Assembly and Low Voltage Power Supply (LVPS). The Optics Assembly contains a Photomultiplier (PMT) Amplified/Distribution Board, PMT Amplifier/High Voltage Power Supply Board, 2 Photomultiplier Tubes (PMTs), and 2 Optical Light Pipes. When the Optics Assembly is in the down position, the control circuit directs the High Voltage Circuit to turn on the high voltage. The Optical Light Pipes direct photons from the reaction well to the photocathode of the PMT. The PMT converts photons that arrive at the photocathode into electrical current. This current is routed to the PMT Amplifier Circuit and is converted into digital signals used for counting. The Control Circuit reads the output of the counters and communicates this information to the System Computer. The Control Circuit turns off the high voltage.

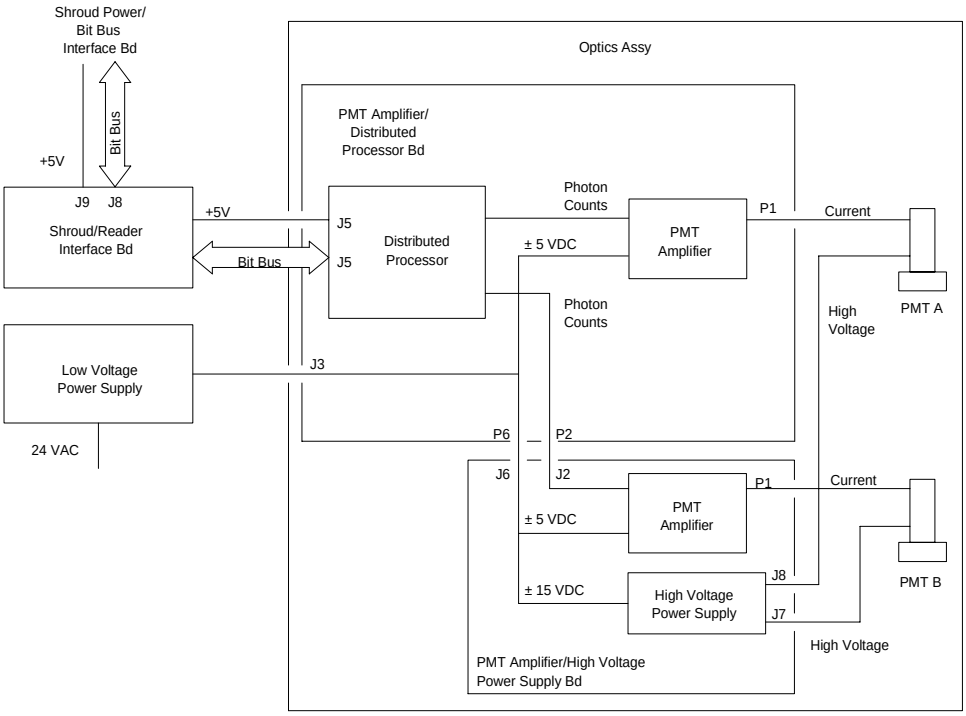


Figure 1-63.

NOTES:

Reagent Storage

The ABBOTT PRISM System has 2 types of on-board reagent storage.

- System Refrigerator
- Ambient Reagent Bay

System Refrigerator

The on-board Refrigerator holds bottles of Conjugate Solution, Probe Solution, Specimen Diluent, and Microparticles. The Refrigerator Control is self-contained and requires supply voltage only for operation. *Note: The supply voltage for the Refrigerator is delayed for 10 minutes after turning on the System Power Supply.* The System Refrigerator contains two Temperature Sensors to monitor the temperature in the Refrigerator and a Stirrer Assembly to stir microparticles.

Temperature Sensors

The Temperature Sensors are RTD (resistive thermal device) type sensors. These sensors are the Control Sensor and the External Sensor

Control Sensor

Feeds back information to the Refrigerator Control Circuitry (located inside the refrigerator).

Temperature Sensor

Provides a signal for an external chart recorder. The output of the sensor is connected to an amplifier and another connector on the same panel as the serial and parallel ports allowing customers to use their own recording device.

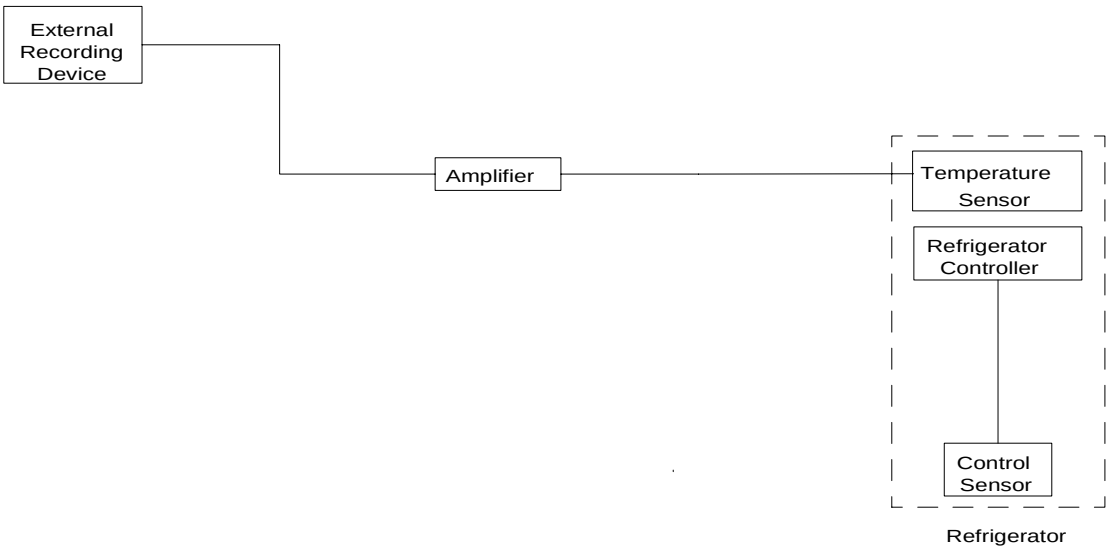


Figure 1-64.

Stirrer Assembly

The Stirrer Assembly is a magnetic stirrer that works in conjunction with a magnetic stirbar located in the Microparticle bottle. The Microparticles are stirred by spinning the stirbar. The System Parallel Interface Board generates a signal when instructed by the computer via the Bit Bus to the Stirrer Driver Board. The Stirrer Driver Board drives the Stirrer Assembly.

Power System

The Power System Function is divided into 2 major components:

- Uninterruptible Power Supply
- System Power Supply

Uninterruptible Power Supply

The Uninterruptible Power Supply (UPS) is installed between commercial power and the System Power Supply. During normal operation, the UPS takes in AC power (as well as any spikes and transients) and converts it to flat DC power. From this DC power, the UPS charges its batteries and creates a high-quality, AC waveform output. The result of this process is maximized power conditioning. If the AC power supplied to the UPS drops below a specified voltage, the unit's batteries automatically begin supplying power instead of receiving it. This assures continuous power with no interruption. If the batteries are fully charged, the UPS should be able to supply continuous power for up to 10 minutes.

System Power Supply

The System Power Supply converts power from the UPS to voltages required by the different areas of the System and detects power failures. The System Power Supply provides DC voltages with overvoltage, undervoltage, and overcurrent protection. The System Power Supply provides the following voltages:

AC Voltages	DC Voltages	
24	+5D1, +5D2, +5P	+24
120	+12	-12
240	+30	

Table 1-7.

DC voltages are monitored. When a failure is detected, the yellow, Check Pwr LED on the front panel illuminates. The input AC voltage will be monitored for losses of greater than 2 cycles @ 75% of rated line and continuously @ 88% of rated line. The above failures on the AC line will result in the Main AC Circuit Breaker to trip.

Schematics

Section Table of Contents

Section 2

Schematics

Power Supply Connector Pinouts

J1 - Input Power	
Pin	**Voltage**
1	Input - Voltage
2	Input - Neutral
3	Earth Ground
4	Not Used

J2 - Monitor	
Pin	**Voltage**
1	120V AC Line
2	120V AC Neutral
3	Earth Ground
4	Cond. Shield
5	Not Used
6	Alignment Pin
7	Not Used

J3 - Computer	
Pin	**Voltage**
1	Alignment Pin
2	Not Used
3	Earth Ground
4	Cond. Shield
5	Not Used
6	230V AV Line
7	230V AC Neutral

J10	
Pin	**Voltage**
1	Alignment Pin
2	5VD2
3	D Ground
4	5VD2 Sense
5	D Ground Sense

J5	
Pin	**Voltage**
1	Not Used
2	Not Used
3	Not Used
4	Not Used
5	Not Used
6	+12VD
7	Not Used
8	D Ground
9	Cond. Shield
10	24V AC Line
11	24V AC Neutral
12	Cond. Shield
13	24V AC Line
14	24V AC Neutral
15	Cond. Shield

J8 - Heater Controller AC	
Pin	**Ground**
1	120V AC Line
2	120V AC Neutral
3	Earth Ground

J9 - Refrigerator AC	
Pin	**Voltage**
1	230V AC Line
2	230V AC Neutral
3	Earth Ground
4	Alignment Pin
5	Cond. Shield

J11	
Pin	**Voltage**
1	24VP
2	P Ground
3	5VP
4	5VP Sense
5	P Ground Sense
6	P Ground
7	Not Used
8	Not Used
9	Not Used
10	Not Used
11	Not Used
12	Not Used
13	+12VD
14	D Ground
15	-12VD

J13	
Pin	**Voltage**
1	5VD1
2	D Ground
3	5VD1 Sense
4	Ground Sense
5	Alignment Pin

J14	
Pin	**Voltage**
1	30VP
2	P Ground
3	Alignment Pin
4	24VP
5	P Ground
6	Not Used
7	+12VD
8	D Ground
9	-12VD
10	Not Used
11	Not Used
12	Not Used
13	Not Used
14	Not Used
15	Not Used

J16	
Pin	**Voltage**
1	24V AC Line
2	24V AC Neutral
3	Earth Ground
4	24V AC Line
5	Not Used
6	Cond. Shield
7	230V AC Neutral
8	Earth Ground
9	Cond. Shield

Table 2-1. Power Supply Connector Pinouts

NOTES:

Cables Reference Table

Part Number	Description	From	To
14150-042	Printer Interface Cable	System Interface Panel	Printer
14257-013	Printer Extension Cable	System Computer	System Interface Panel
14257-017	Monitor Extension Cable	System Computer Monitor Connector	Monitor Cable
14257-019	Speaker Cable	System Computer	Speakers
14257-023	System Interface Port Cable	System Computer	System Interface Port Assy
50007	Prime Purge Valve Power Cable	System Power Distribution Bd J506	Chnl 1-6 Prime Purge Valves J2
50008	Tray Loader Power Cable	System Power Distribution Bd J514	Chnl 1-6 Tray Loader Interface Bd J5
50009	Electronics Bay Fans	System Power Distribution Bd J519	Electronics Bay Fans
50010-101 -102 -103 -104 -105 -106 -107	Pump Power Cable	System Power Distribution Bd J521 System Power Distribution Bd J522 System Power Distribution Bd J523 System Power Distribution Bd J524 System Power Distribution Bd J525 System Power Distribution Bd J526 System Power Distribution Bd J518	Channel 1 Pump Assys J2 Channel 2 Pump Assys J2 Channel 3 Pump Assys J2 Channel 4 Pump Assys J2 Channel 5 Pump Assys J2 Channel 6 Pump Assys J2 Channel 6 Sample Diluent Pump Assy J2
50011	System Power Distribution Bd Power Cable	System Power Supply J13 & J14	System Power Distribution Bd J501
50037	Bar Code Power Cable	System Card Cage J15	Bar Code Reader Bd J4 Bar Code Reader Interface Bd J4
50401	System Card Cage Power Cable	System Power Supply J10 & J11	System Card Cage J1 & J2 System Power Distribution Bd J513
50412	Purge/Shroud/Stirrer Power Cable	System Power Supply J5	Stirrer Driver Bd J5 PMT Shroud Motor Pwr Dist Bd J14 System Power Distribution Bd J505
50493	Bar Code Interface Cable	Bar Code Reader Interface Bd J6	Bar Code Sensor Interface Bd J1
50498	Heater Controller Fans Cable	System Power Distribution Bd J515	Heater Controller Bay Fans
50499	Air Tip Wash Power Cable	System Power Distribution Bd J512	Air Tip Wash Interface Bd J2
50639	Keyboard Extension Cable	50839 Cable	Keyboard Cable
50693	System Computer Power Cable	System Power Supply J3 (through Filter Box)	System Computer
50827	Bit Bus Cable Backplane/PMT	System Card Cage J22	50828 Bit Bus Cable
50828	Bit Bus Cable PMT's	50827 Bit Bus Cable	Channel 1-6 Shroud Optics Interface Bds J8
50839-102	Keyboard Adapter Cable	Keyboard Conversion Cable	Keyboard Cable
51047	Tray Loader Up/Down Sensor Cable	Tray Loader Interface Bd J4	Up/Down Sensor J1

Table 2-2. Cables Reference

Part Number	Description	From	To
51116	Dispense Verify/Drain Time Cable	System Filter Board JX	Dispense Verify Sensors
51117	Safety Interlock Switch Cable	System Power Distribution Bd J502	Interlock Switch
51118	Power Supply Jumper	Power Supply Jumper J12	
51443	Heater Controller Cable	System Card Cage J735	Heater Controller CPU Bd J10
51445	Rack Loader Cable	System Card Cage J732	Bar Code Reader Interface Bd J1
51446	Rack Sensors Cable	System Card Cage J731	Pipette Tip Rack Sensor Bd J1 Rack Sensors #1 Bd J1 Rack Sensors #2 Bd J1
51491	Monitor Power Extension Cable	System Power Supply J2 (through Filter Box)	Monitor
51496	Heater Controller Power Cable	System Power Supply J8	Heater Controller Assy
51497	Refrigerator Power Cable	System Power Supply J9	Refrigerator
51500	PMT Shroud Motors Pwr Dist Power Cable	System Power Supply J16 (through Filter Box)	PMT Shroud Motors Pwr Dist Bd J1
51516-101 -102 -103 -104 -105 -106	Shroud Motor Power Cables	PMT Shroud Motors Pwr Dist Bd J8 PMT Shroud Motors Pwr Dist Bd J9 PMT Shroud Motors Pwr Dist Bd J10 PMT Shroud Motors Pwr Dist Bd J11 PMT Shroud Motors Pwr Dist Bd J12 PMT Shroud Motors Pwr Dist Bd J13	Chnl 1 Shroud Optics Interface Bd J7 Chnl 2 Shroud Optics Interface Bd J7 Chnl 3 Shroud Optics Interface Bd J7 Chnl 4 Shroud Optics Interface Bd J7 Chnl 5 Shroud Optics Interface Bd J7 Chnl 6 Shroud Optics Interface Bd J7
51533	Optics Fans Cable	System Power Distribution Bd J517	Optics Fans
51540-1XX	Transport Motor Cable	System Card Cage JX11	Transport Motor
51541-108 -109 -110 -111 -112 -113	Transfer Pump Motor Cables	System Card Cage J112 System Card Cage J212 System Card Cage J312 System Card Cage J412 System Card Cage J512 System Card Cage J612	Chnl 1 Transfer Syringe Pump P2 & P3 Chnl 2 Transfer Syringe Pump P2 & P3 Chnl 3 Transfer Syringe Pump P2 & P3 Chnl 4 Transfer Syringe Pump P2 & P3 Chnl 5 Transfer Syringe Pump P2 & P3 Chnl 6 Transfer Syringe Pump P2 & P3
51542-114 -115 -116 -117 -118 -119	Transport Flag Cable (part of cable Harness 52967)	System Card Cage J113 System Card Cage J213 System Card Cage J313 System Card Cage J413 System Card Cage J513 System Card Cage J613	Chnl 1 Transport Interface Bd J4 Chnl 2 Transport Interface Bd J4 Chnl 3 Transport Interface Bd J4 Chnl 4 Transport Interface Bd J4 Chnl 5 Transport Interface Bd J4 Chnl 6 Transport Interface Bd J4
51543-108 -109 -110 -111 -112 -113	Syringe Pump Interface Cable (part of cable Harness 52951)	System Card Cage J114 System Card Cage J214 System Card Cage J314 System Card Cage J414 System Card Cage J514 System Card Cage J614	Chnl 1 Transfer Syr. Pump Int. Bd J1 Chnl 2 Transfer Syr. Pump Int. Bd J1 Chnl 3 Transfer Syr. Pump Int. Bd J1 Chnl 4 Transfer Syr. Pump Int. Bd J1 Chnl 5 Transfer Syr. Pump Int. Bd J1 Chnl 6 Transfer Syr. Pump Int. Bd J1
51544-113 -114 -115 -116 -117 -118	Tray Loader Cable (part of cable Harness 52968)	System Card Cage J121 System Card Cage J221 System Card Cage J321 System Card Cage J421 System Card Cage J521 System Card Cage J621	Chnl 1 Tray Loader Interface Bd J1 Chnl 2 Tray Loader Interface Bd J1 Chnl 3 Tray Loader Interface Bd J1 Chnl 4 Tray Loader Interface Bd J1 Chnl 5 Tray Loader Interface Bd J1 Chnl 6 Tray Loader Interface Bd J1
51550	Transport Encoder Bd Cable	Transport Interface Bd J1	Transport Encoder Bd J1

Table 2-2. Cables Reference

Part Number	Description	From	To
51555	Tip Wash Control Cable	System Card Cage J721	Air Tipwash Interface J1
51556	Miscellaneous Sensor Interface Bd Cable	Card Cage Assembly J722	Miscellaneous Sensor Interface Bd J8
51559	Bar Code Modular Cable	Bar Code Sensor Interface Bd J2	Bar Code Reader Scanner
51559	Bar Code Modular Cable	Bar Code Reader Bd J3	Bar Code Reader Interface Bd J5
51566	Stirrer Driver Bd Cable	Miscellaneous Sensor Interface Bd J9	Stirrer Driver Bd J6
51750-101 -102 -103 -104 -105 -106	Heater Controller Drive Cable	Chnl 1 Heater Controller Driver Bd Chnl 2 Heater Controller Driver Bd Chnl 3 Heater Controller Driver Bd Chnl 4 Heater Controller Driver Bd Chnl 5 Heater Controller Driver Bd Chnl 6 Heater Controller Driver Bd	Chnl 1 Heater Cover Drive Cable Chnl 2 Heater Cover Drive Cable Chnl 3 Heater Cover Drive Cable Chnl 4 Heater Cover Drive Cable Chnl 5 Heater Cover Drive Cable Chnl 6 Heater Cover Drive Cable
51751	Heater Cover Drive Cable	Chnl 1-6 Heater Controller Drive Cable	Chnl 1-6 Heater Cover J1
51752-101 -102 -103 -104 -105 -106	Heater Controller Sense Cable	Chnl 1 Heater Controller Slave Bd Chnl 2 Heater Controller Slave Bd Chnl 3 Heater Controller Slave Bd Chnl 4 Heater Controller Slave Bd Chnl 5 Heater Controller Slave Bd Chnl 6 Heater Controller Slave Bd	Chnl 1 Heater Cover Sense Cable Chnl 2 Heater Cover Sense Cable Chnl 3 Heater Cover Sense Cable Chnl 4 Heater Cover Sense Cable Chnl 5 Heater Cover Sense Cable Chnl 6 Heater Cover Sense Cable
51753	Heater Cover Sense Cable	Chnl 1-6 Heater Controller Sense Cable	Chnl 1-6 Heater Cover J2
51754-113 -114 -115 -116 -117 -120	FMI Pumps Cable (part of cable harness 51754-123)	System Card Cage J122 System Card Cage J222 System Card Cage J322 System Card Cage J422 System Card Cage J522 System Card Cage J622	Chnl 1 Purge Valve J1 & Pump Drv Bds J3 Chnl 2 Purge Valve J1 & Pump Drv Bds J3 Chnl 3 Purge Valve J1 & Pump Drv Bds J3 Chnl 4 Purge Valve J1 & Pump Drv Bds J3 Chnl 5 Purge Valve J1 & Pump Drv Bds J3 Chnl 6 Purge Valve J1 & Pump Drv Bds J3
51754-123	FMI Pumps Harness	System Card Cage JX22	Chnl 1-6 Valve and Pump Driver Bds
51954	Stirrer Cable	Stirrer Driver Bd J4	Refrigerator Stirrer Assembly Cable
52439	Optics Assembly Cable	Shroud Optics Interface BoardJ2	Optics Assembly J1
52444	Shroud Lift Power Cable	System Power Distribution Bd J516	Shroud Reader Interface Bds J9
52449-107	Activator Pumps Cable	Chnl 1-6 Optics Assembly J4	Chnl 1-6 Activator Pump Driver Bd J3
52694	Flex Cable P3 J202A to P202B J201A to P201B J200B to P204B & 205B	55073 Cable J3 & XY Axis Controller BIT BUS OUT XY AXIS Controller Y ENC XY Axis Controller Y MTR XY Axis Controller Y I/O	Z Axis Power Supply J1 Y Axis Motor Encoder Y Axis Motor Y Axis Limit Switches (2)
52696	Z Axis Card Cage Cable	Z Axis Power Supply J4	Z Axis Card Cage J300
52697	Level Sense Cable	Z Axis Power Supply J3	Level Sense Assy J1
52951	Cable Harness of 51543 Cables	System Card Cage JX14	Transfer Syringe Pump Interface Bd J1
52967	Cable Harness of 51542	System Card Cage JX13	Transport Interface Bd J4
52968	Harness of 51544	System Card Cage JX21	Tray Loader Interface Bd J1

Table 2-2. Cables Reference

Part Number	Description	From	To
55026	Jumpers (3) Used to Troubleshoot Power Supply	System Power Supply J10, J11, & J13	System Power Supply J10, J11, & J13
55049	LVPS Power Cable	PMT Shroud Motors Pwr Dist Bd J2-J7	Chnl 1-6 LVPS
55069	X Axis Limit Switches Cable	XY Axis Controller X I/O	X Axis Limit Switches (2)
55070	X Axis Motor Cable	XY Axis Controller X MTR	X Axis Motor
55071	X Axis Motor Encoder Cable	XY Axis Controller X ENC	X Axis Motor Encoder
55072	XY Axis Controller Bit Bus Cable	System Card Cage J24	XY Axis Controller Bit Bus In
55073	XY and Z Axis Power Cable	System Power Distribution Bd J500	XY Assy and Z Axis Assy
55140	Bar Code RS 232 Cable	System Card Cage J734 & J733	Bar Code Reader Bd J2
55141	BCR Bd Hand Scanner Cable	Bar Code Reader Bd J6	55142 Cable
55142	Skin Scanner Cable	55141 Cable	Tray Loader Cover Hand Scanner Connector
55566	Bit Bus, PMT - Computer Cable	50828 Cable	System Computer, Bit Bus Board
6A36-86	Power Cable	UPS	System Power Supply J1

Table 2-2. Cables Reference

Cable Schematics

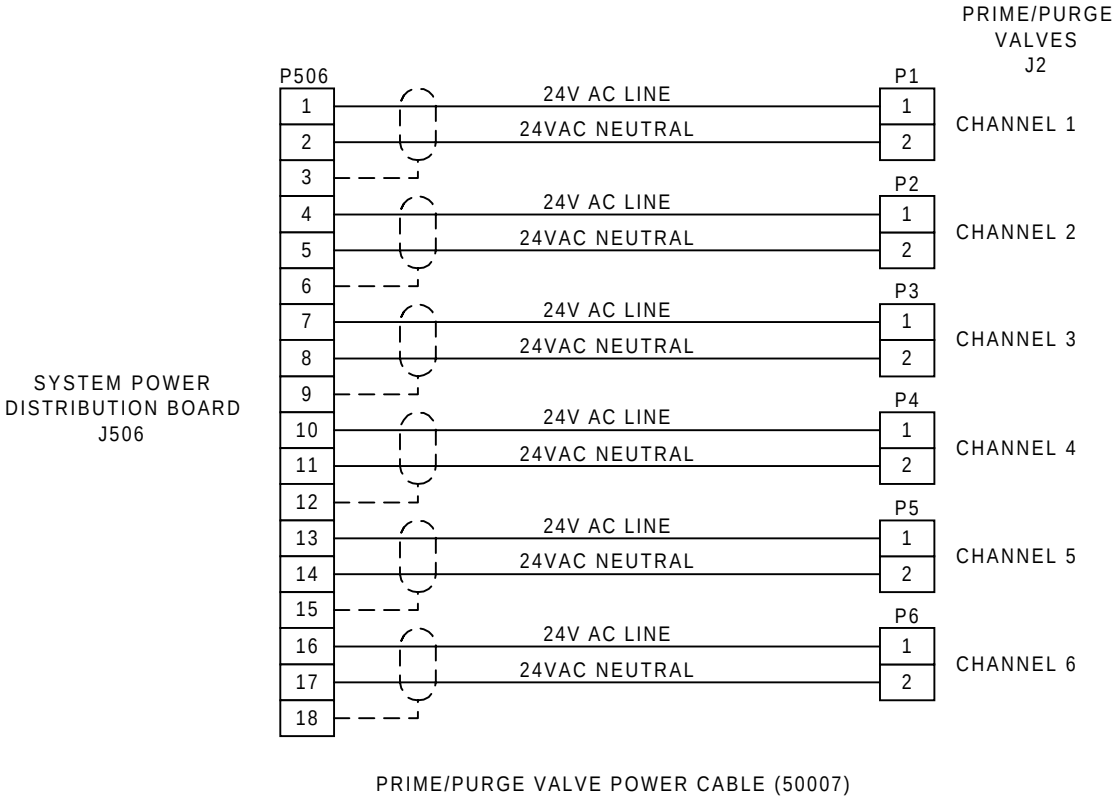


Figure 2-1. Cable 50007

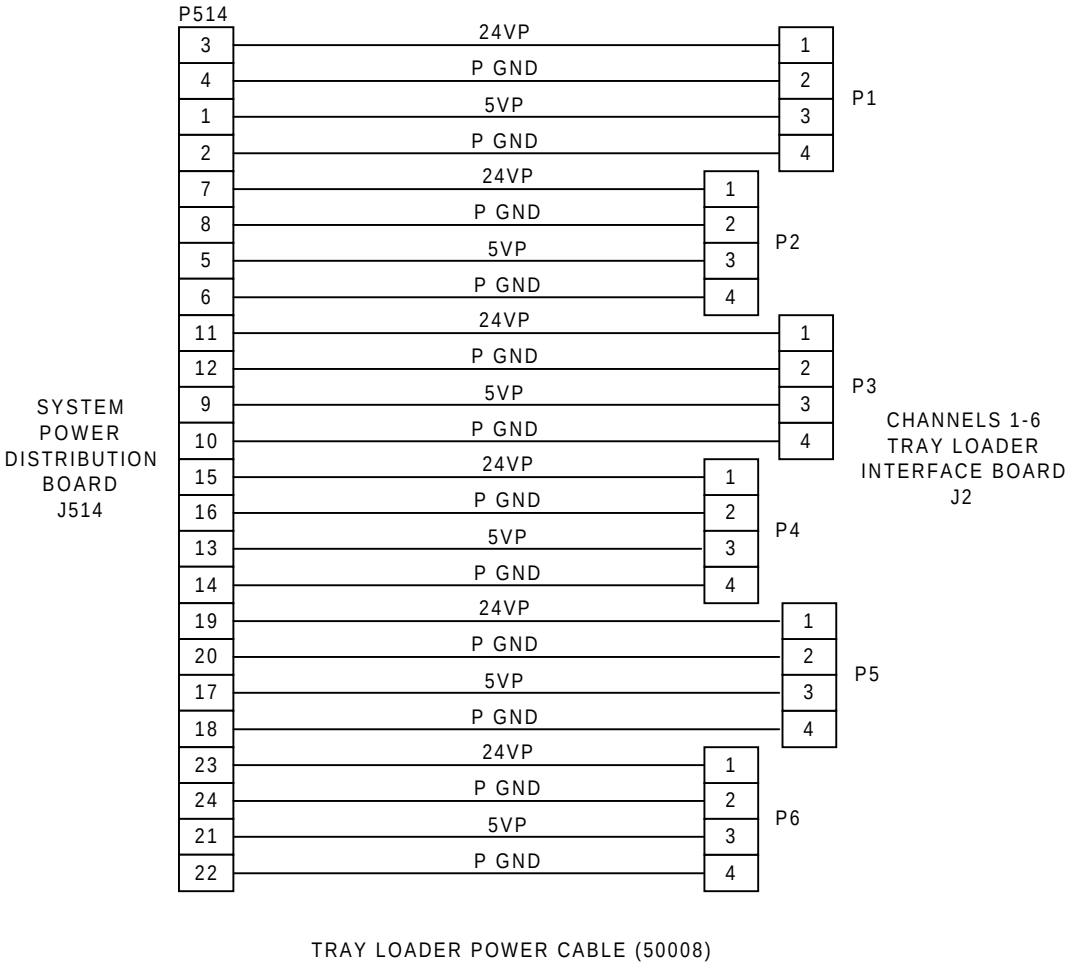


Figure 2-2. Cable 50008

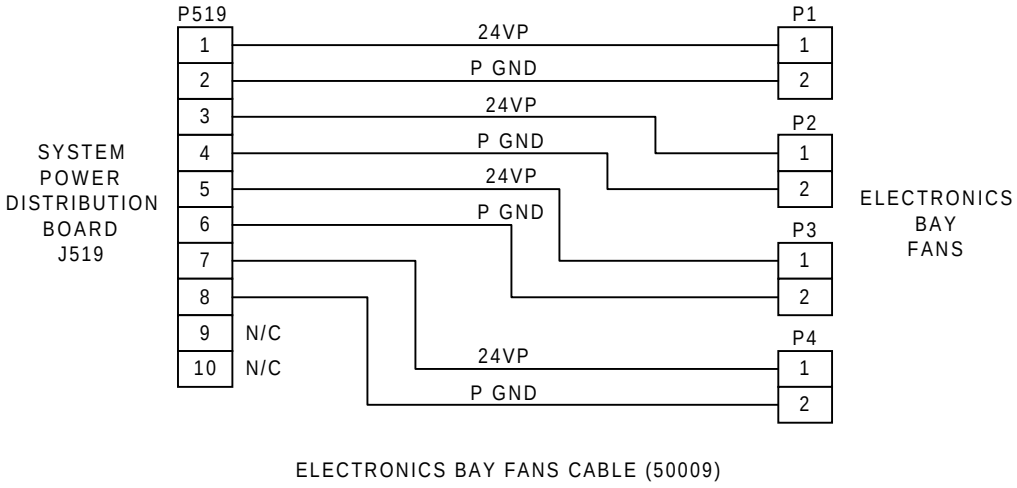


Figure 2-3. Cable 50009

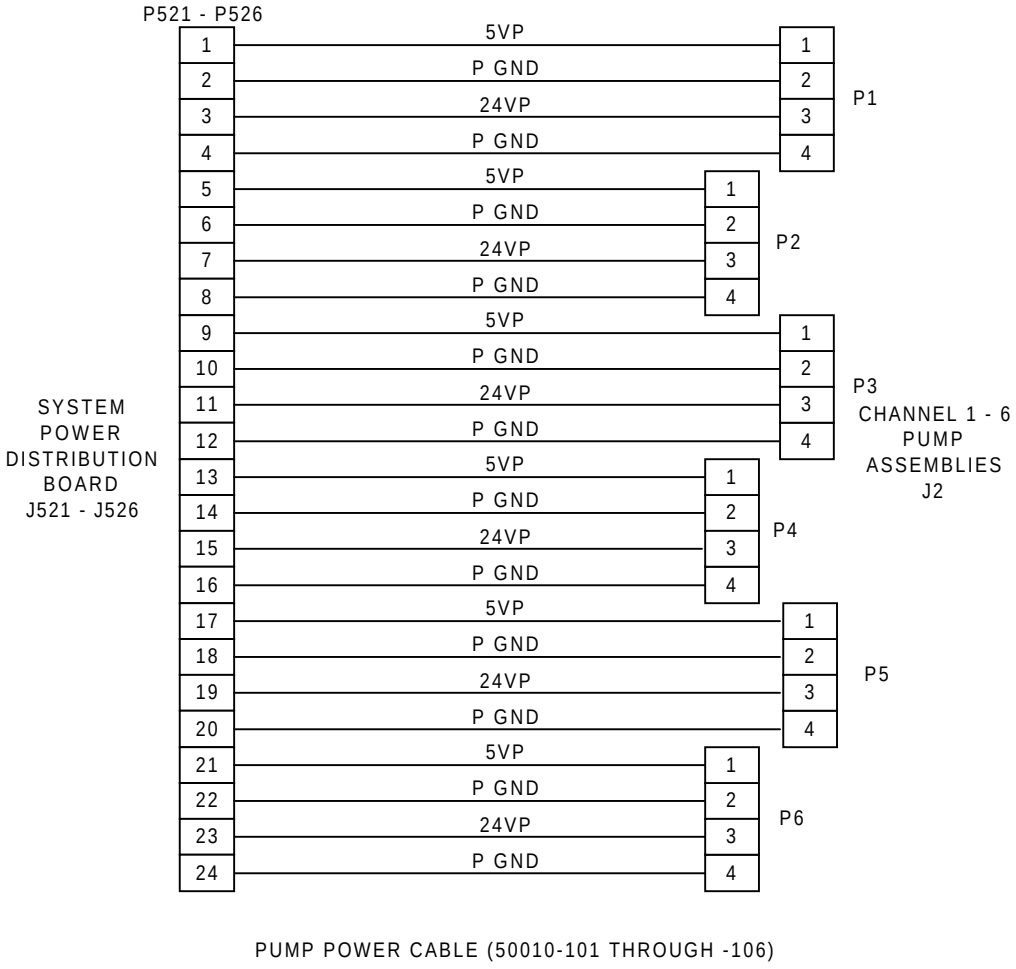


Figure 2-4. Cable 50010-101 through -106

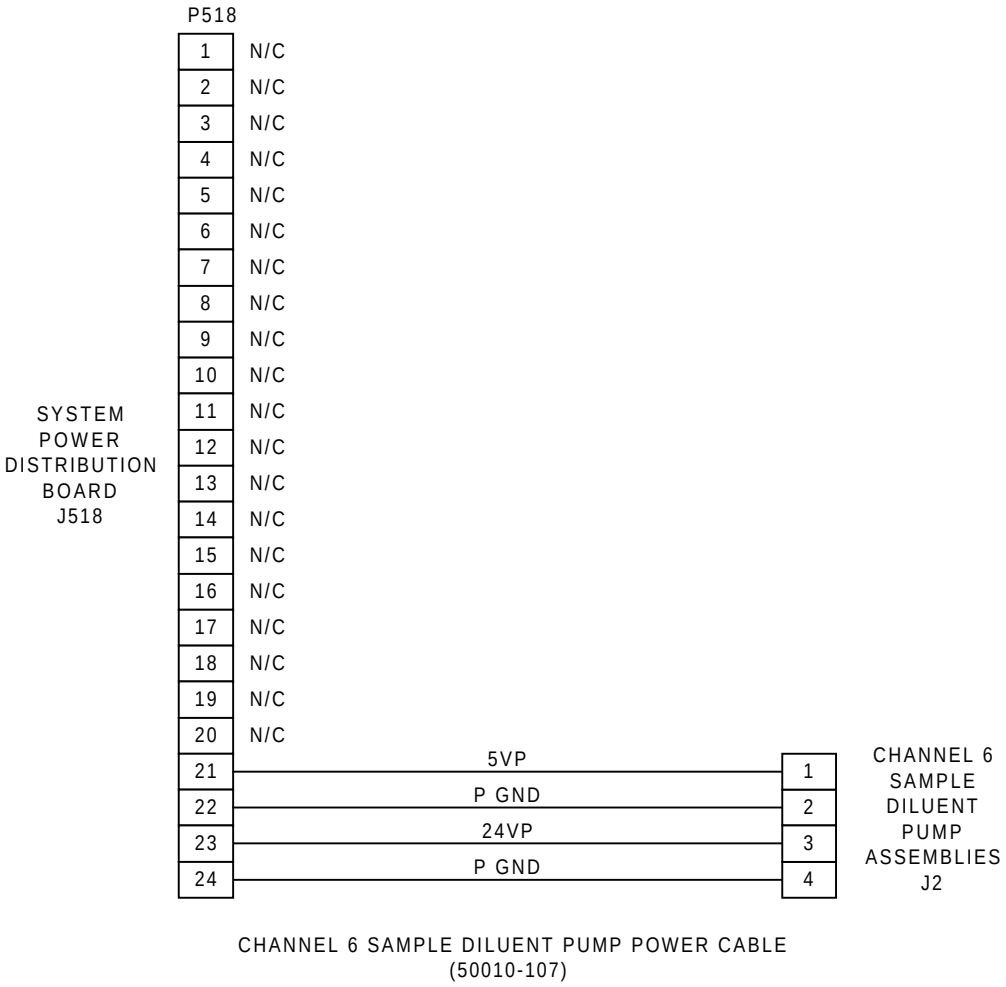


Figure 2-5. Cable 50010-107

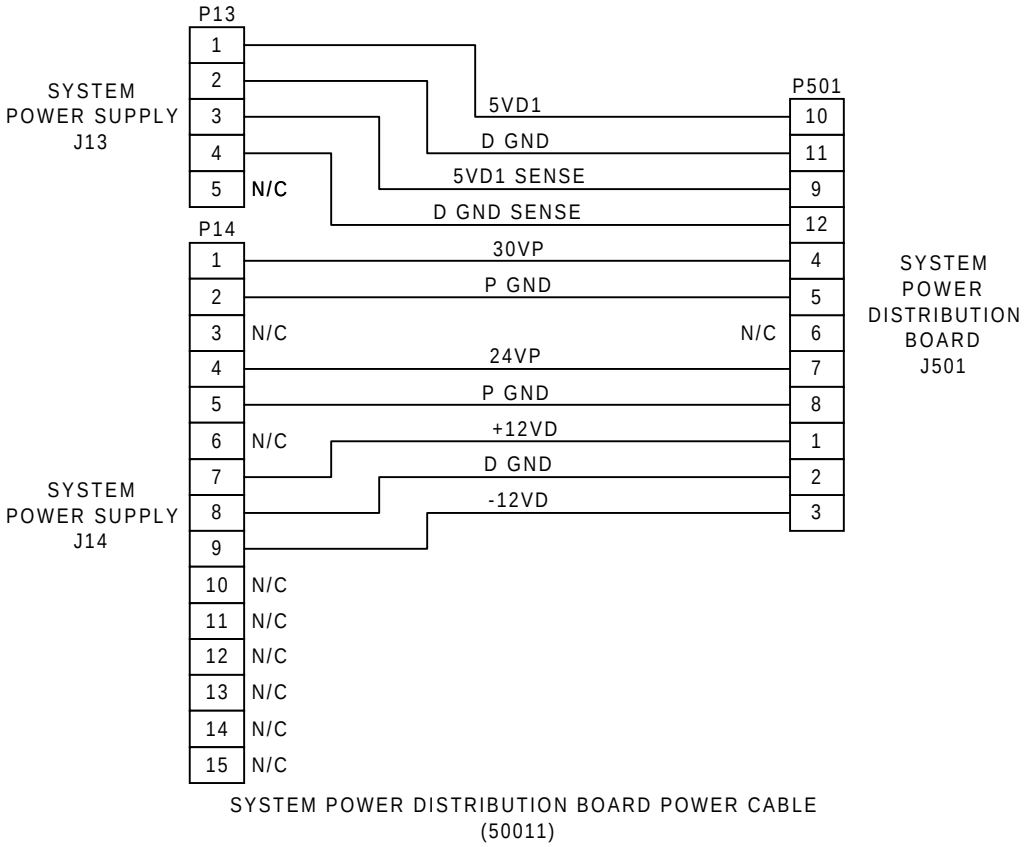


Figure 2-6. Cable 50011

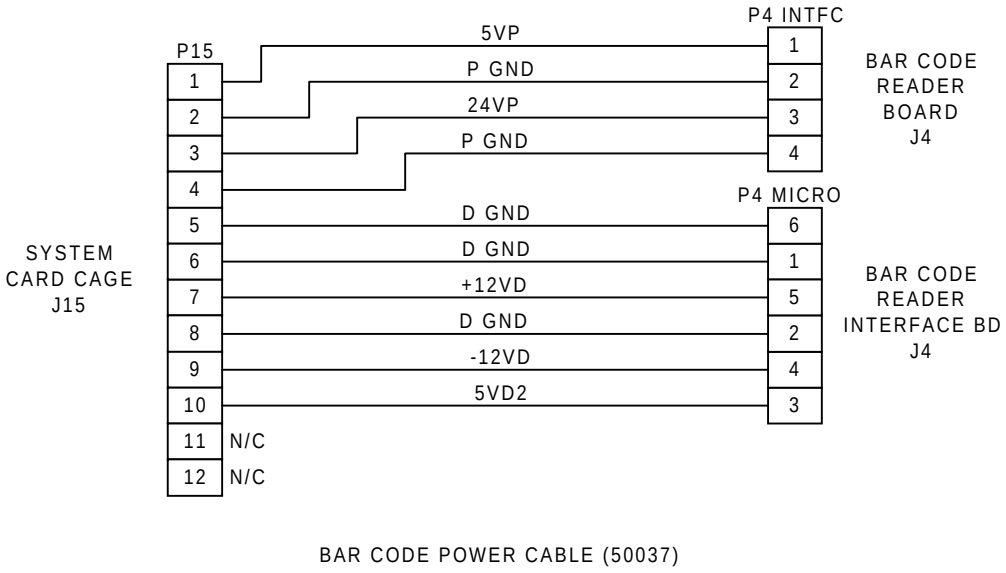


Figure 2-7. Cable 50037

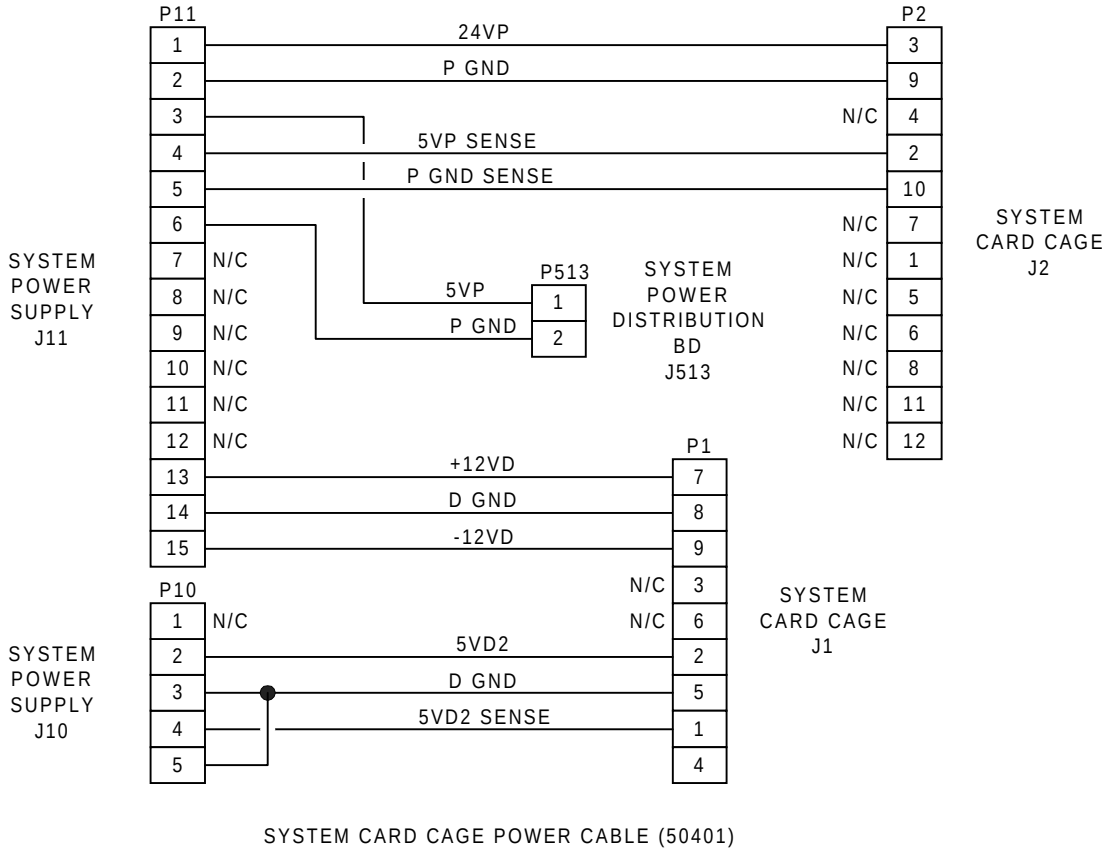


Figure 2-8. Cable 50401

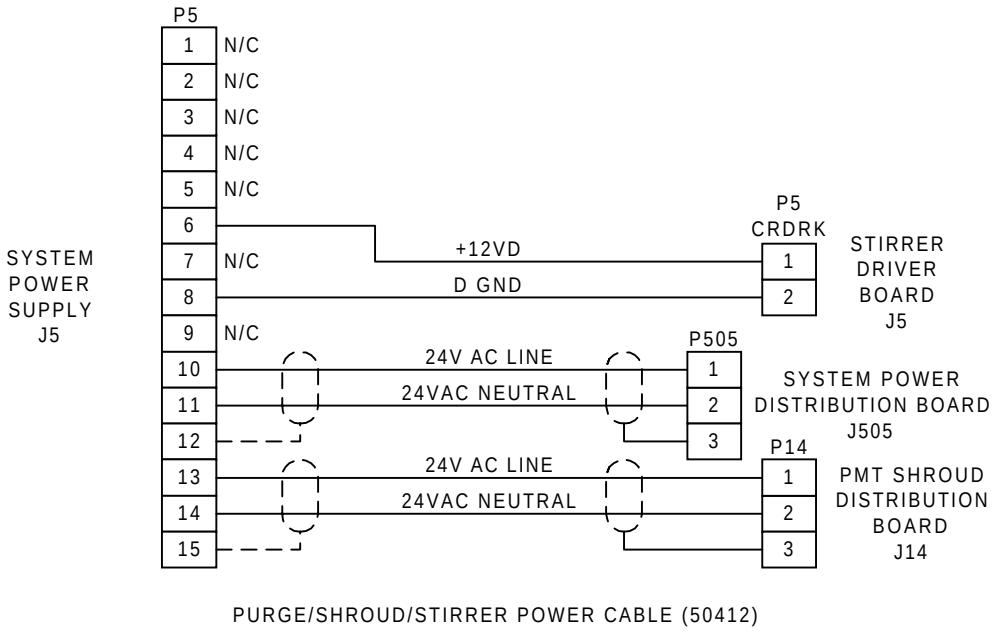


Figure 2-9. Cable 50412

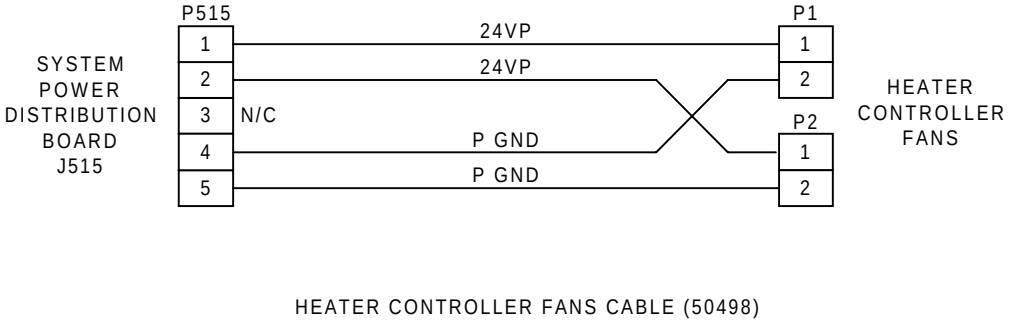


Figure 2-10. Cable 50498

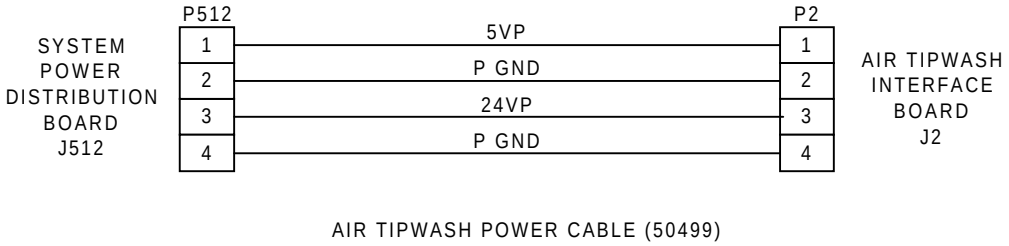


Figure 2-11. Cable 50499

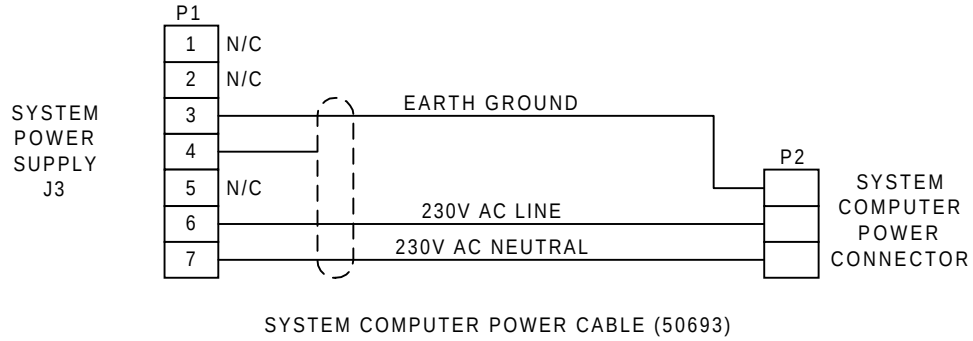


Figure 2-12. Cable 50693

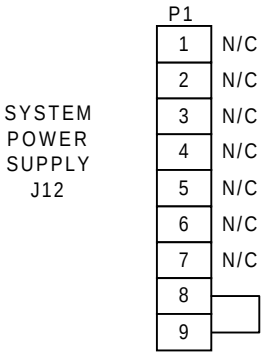


Figure 2-13. Cable 51118

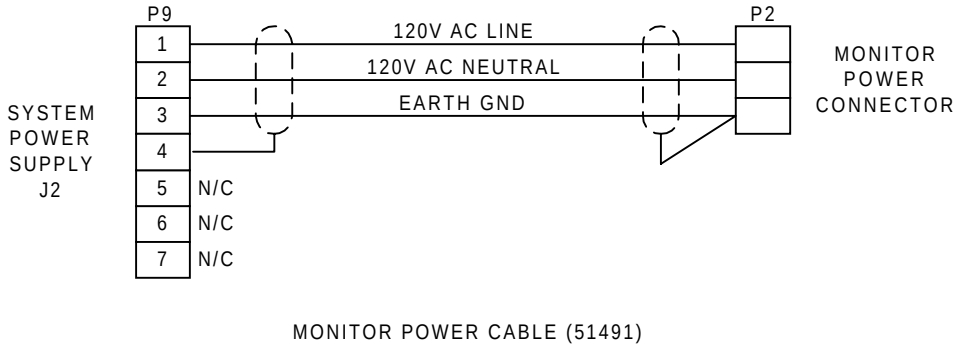


Figure 2-14. Cable 51491

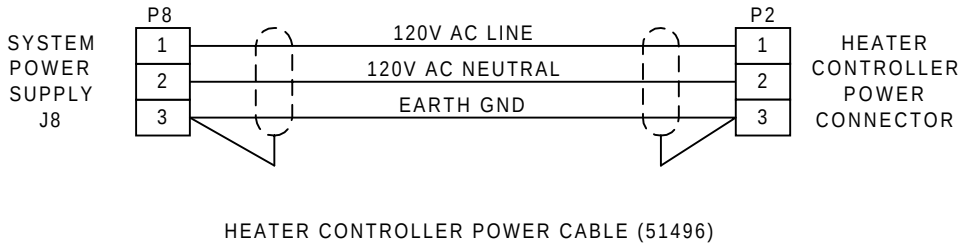


Figure 2-15. Cable 51496

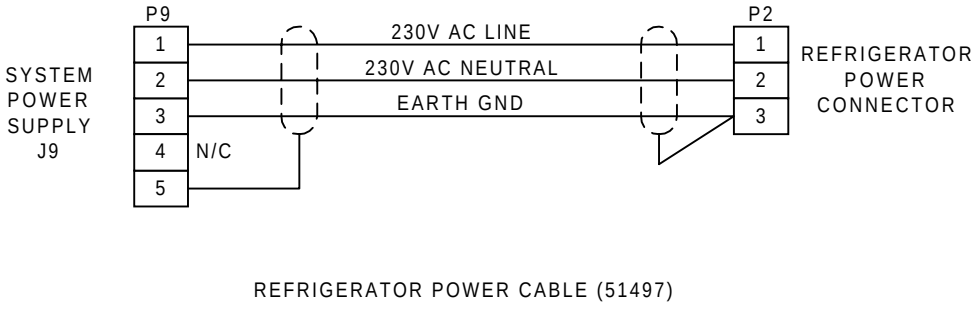


Figure 2-16. Cable 51497

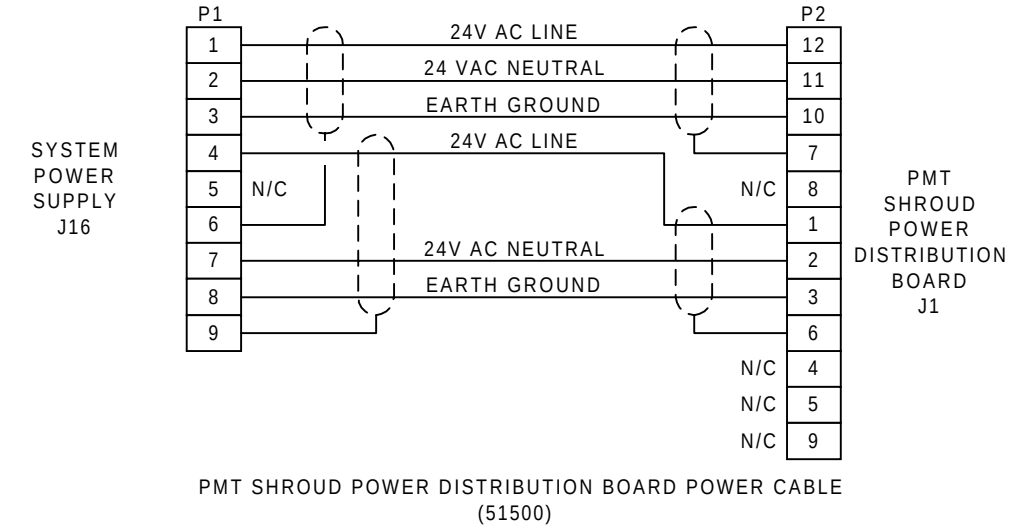


Figure 2-17. Cable 51500

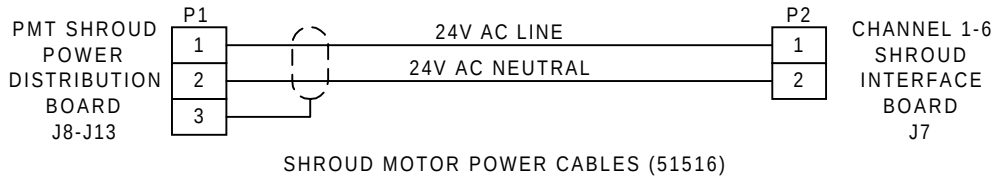


Figure 2-18. Cable 51516

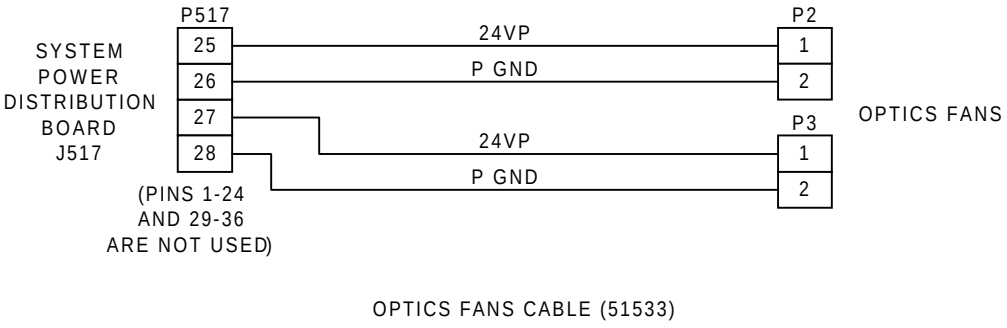


Figure 2-19. Cable 51533

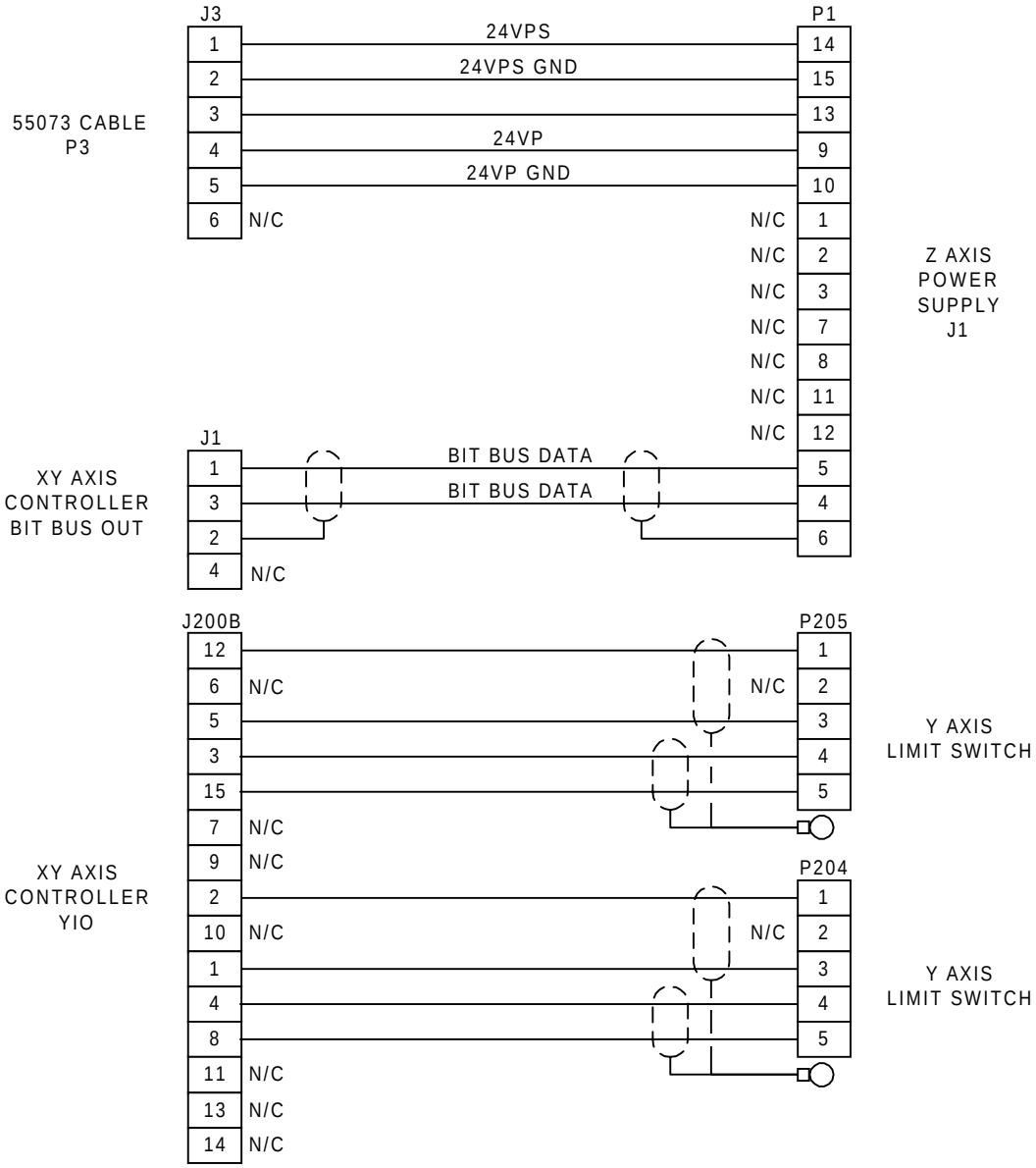


Figure 2-20. Flex cable (Cable 52694, Part 1)

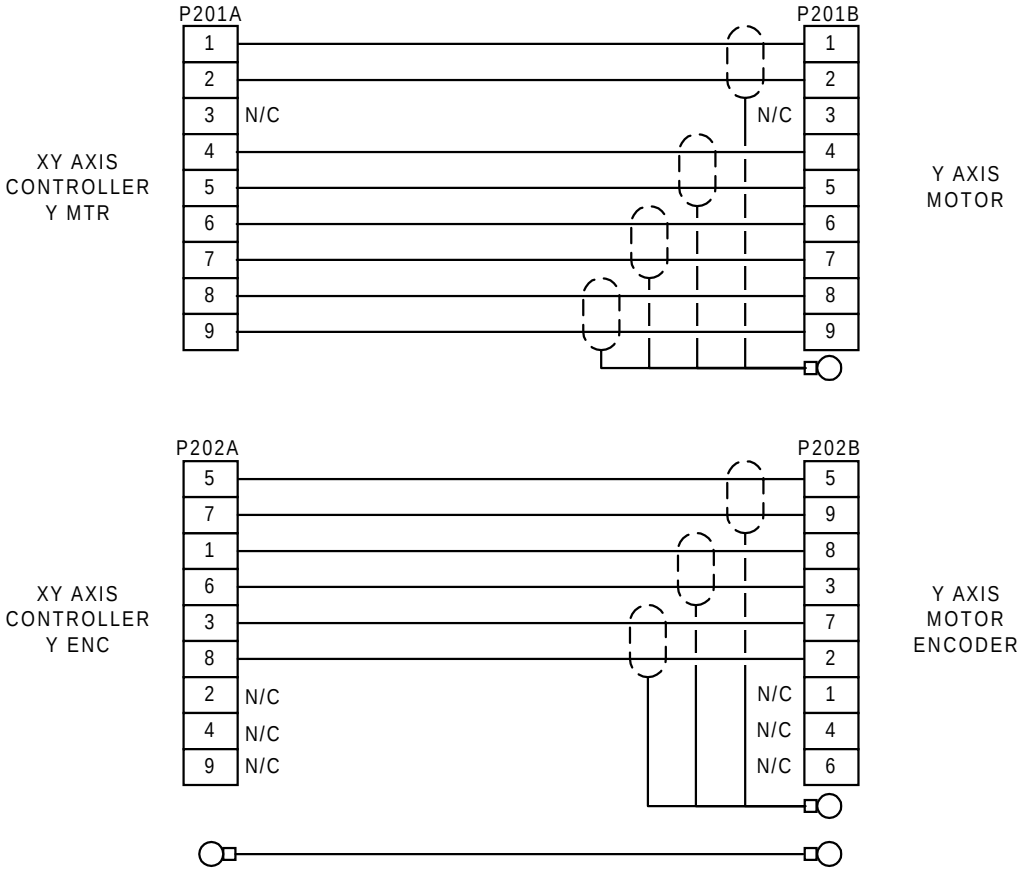


Figure 2-21. Flex Cable (Cable 52694, Part 2)

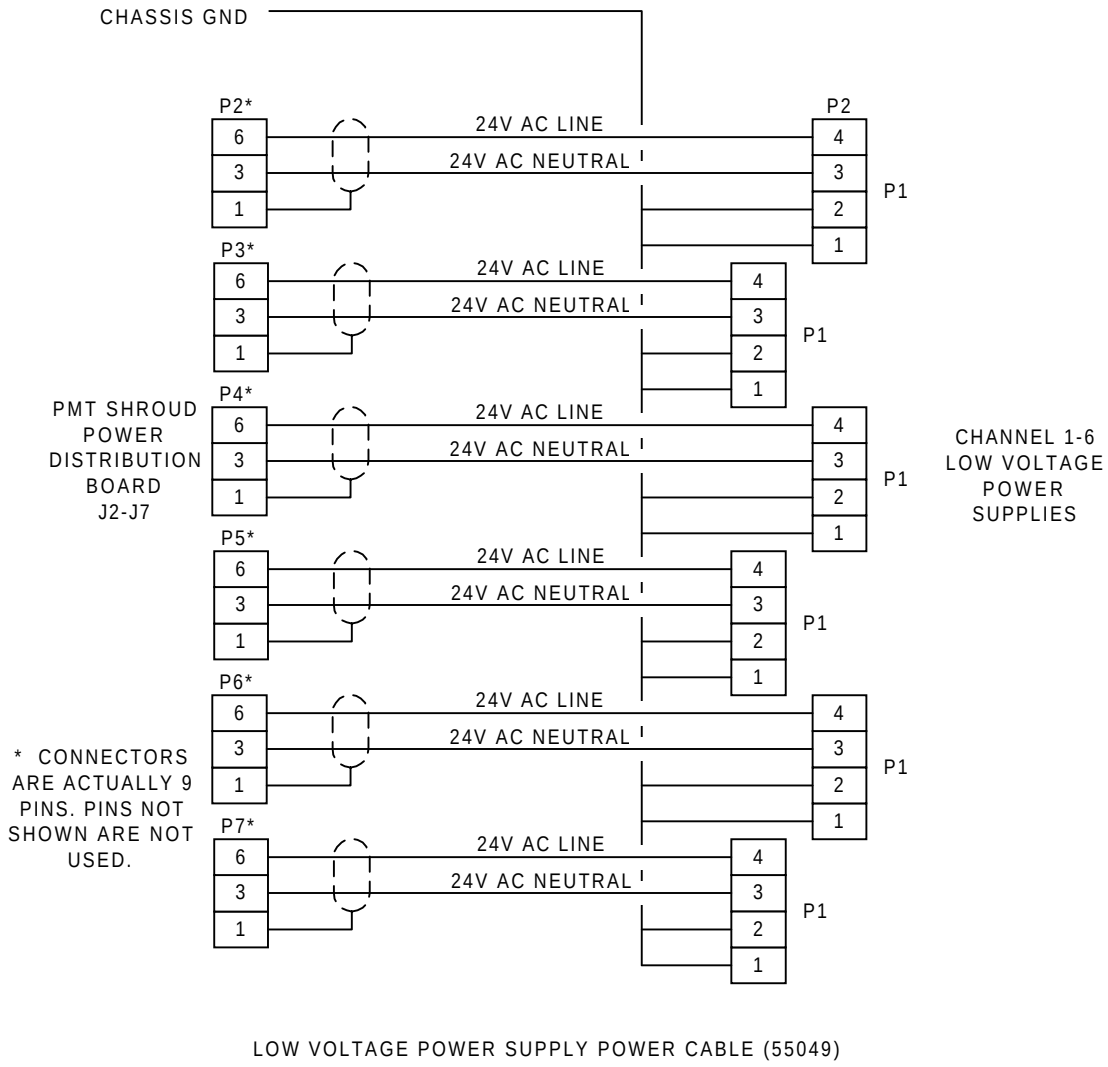


Figure 2-22. Cable 55049

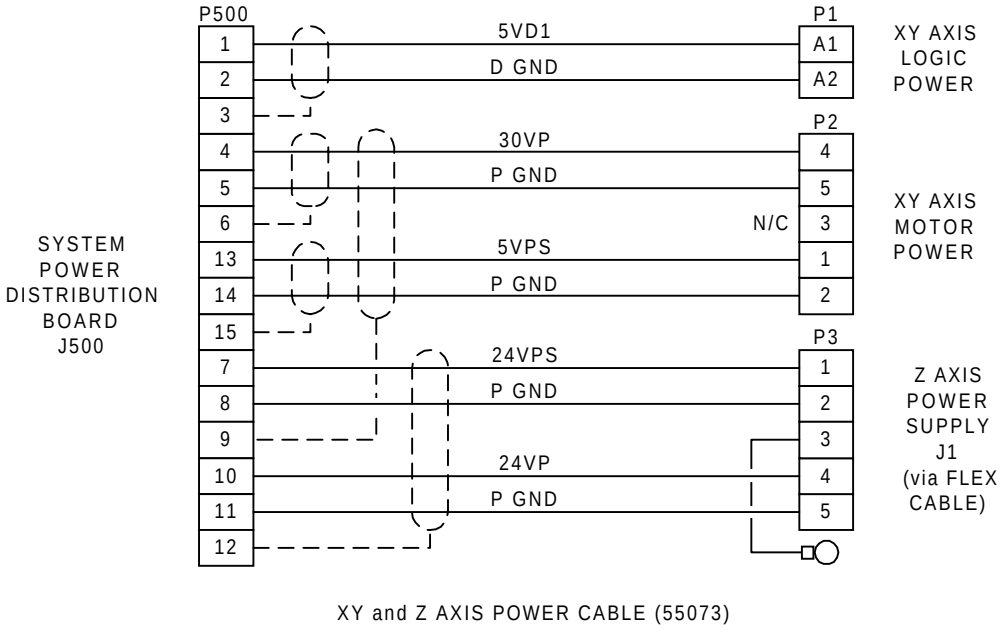


Figure 2-23. Cable 55073

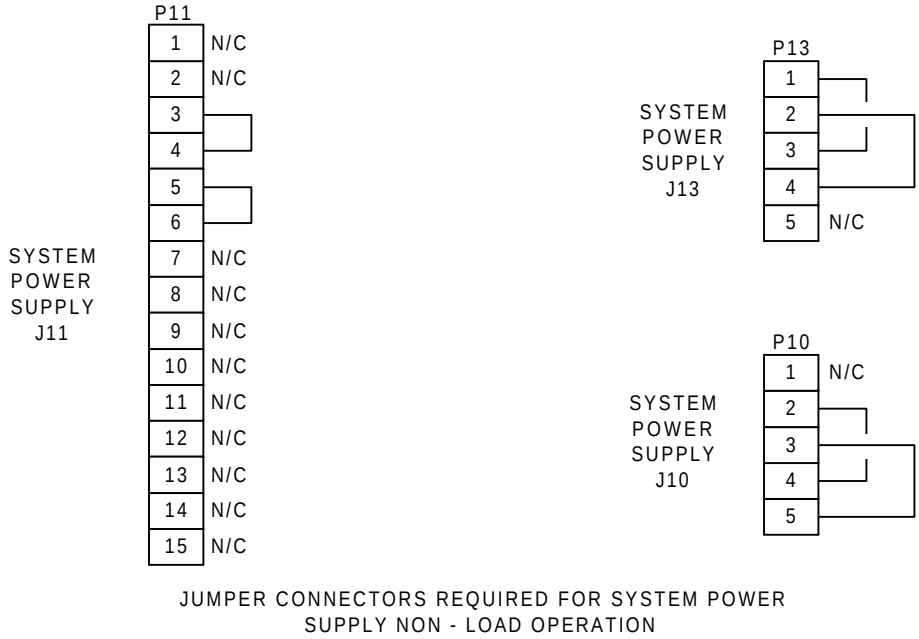


Figure 2-24. Jumpers (55026)