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# BK7IB-2 Inline Base User's Guide

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## Manual History

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1.1	28-May-10	Changes to Electrical schematic, Appendix B, Pg B-6	Eco-1240

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## 1.1 Description

The Buskro BK7IB-2 Inline Base is a mailpiece transportation system and features a transport mechanism that is controlled via a centrally located operator control panel. The system was specifically designed as a flexible and reliable platform whose purpose is to optimize the performance of an inkjet imaging system. The BK7IB-2, in conjunction with Buskro Controllers, produces some of the highest quality imaging within one of the simplest and most efficient operating environments.

The mailpiece transport system, designed for the inkjet process, consists of vacuum equipped table belts with an electronic variable pitch control technology that permits regulation of the belt movement to adjust to the mailpieces size. In addition, an alignment section with side guides is present at the input of the base to reduce mailpiece skew prior to entry into the inkjet imaging area. A shaft encoder mounted on the transport belt provides sequencing of the inkjet process.

Operator control of the BK7IB-2 is provided by a series of electrical switches and buttons displayed on a clear, unhindered control panel centrally positioned at the front of the base. The control panel consists of rocker switches for the Main and Vacuum power; a resettable LCD piece totalizing counter; potentiometers for the conveyor speed, stack speed, base speed, and pitch control; Start/Stop/Jog pushbutton controls for machine operation; and an On/Off/Auto selector for the conveyor.

All these features, in addition to the manufacturing quality and innovative product design, add up to an extremely functional inkjet base capable of years of reliable operation.

In order to fulfill the specific needs of the customer, different configurations of the BK7IB-2 are available. From an electrical standpoint, a 200VAC Japanese and a standard 220-240 VAC model are available. In addition, the BK7IB-2 is available in a “right” running machine (product travel left to right from the operator’s perspective) or “left” running machine (product travel right to left).

The common version is designed for 220 - 240 VAC, 50/60 Hz operations but also has 115 VAC power outlets. This version was designed to be used at any location where the

power is 230 VAC, 50 or 60 Hz. The machine is equipped with an internal 230 VAC to 115 VAC isolation transformer rated at 1 kVA. The transformer powers the 115 VAC outlets at the rear of the machine to accommodate any peripheral equipment designed for the North American line voltage standard (e.g. a BK720 Friction Feeder).

A special Japanese version is also available, designed for operating at 200 - 240 VAC, 50 or 60 Hz. This version has an internal isolation transformer, rated at 2 kVA. It has primary taps at 200, 208, 220, 230 and 240 Volts and a secondary 230 Volt winding, tapped at 115 Volts. The transformer generates the 230 VAC needed internally for the BK7IB-2. In addition, it provides 115 VAC for those peripherals, which need that voltage.

## **1.2 Features**

### **1.2.1 Vacuum Table Belts**

The table belts, which transport the mailpieces past the inkjet imaging region, are equipped with vacuum to provide positive adhesion to the base. This helps to ensure accurate placement of the image on the mailpiece. The BK7IB-2 also provides adjustable outer belts to accommodate different size mailpieces.

### **1.2.2 Complete Instrument Panel**

All necessary controls required to operate the BK7IB-2 are easily accessible to the operator on a central instrument panel. The control panel comes complete with rocker switches, large pushbuttons for all machine/conveyor functions, variable speed potentiometers for machine/conveyor speed regulation, and a resettable piece counter.

### **1.2.3 BK1600 Series Conveyor Compatibility**

The BK7IB-2 is fully compatible with any BK1600 series conveyor model. Connection to the conveyor is made through a 7-pin round connector located at the rear of the base. A DC-speed controller mounted inside the base comes with a speed potentiometer, located on the front panel, for complete control of the conveyor's belt speed. A second potentiometer allows the operator to set the increased speed required during “stack” operation.

### **1.2.4 Tabber Compatibility**

The inkjet base is compatible with all Buskro Tabbers. This allows for full integration between the Tabber and base controls such that the controls on either system can directly stop and/or start the entire system. Connection to the Tabber is made through a connector located at the rear of the base. The Tabber may be operated either upstream or downstream from the BK7IB-2.

### **1.2.5 Auxiliary Feeder Compatibility**

The inkjet base is equipped with a 14-pin connector for control of a BK720 feeder. The feeder may be installed using an optional flip-up table, which is attached to the base, or using a separate stand. Its start/stop operation can be controlled from the base.

A BK425 feeder may also be used and would be connected to the upstream control connector of the BK7IB-2.



### **1.2.6 Maintenance Considerations**

The BK7IB-2 is designed to facilitate maintenance should it be required. All electrical components are contained in two main panels at the front and rear of the base. Removal of a small number of screws provides easy access to the main electronics of the system. In terms of mechanical access, removal of the front door provides access to the blower while removal of the transport tabletop provides access to the motor assembly.

### **1.2.7 Print Quality Considerations**

The BK7IB-2 has been specifically designed for the printing process. As a result, it incorporates certain unique features to optimize print quality. Included are a smooth mechanical transport, an encoder, vacuum-assisted transport belts, and a sturdy cabinet construction.

## 1.3 Specifications

1.3.1 Product handling			
	Minimum	3.0" x 5.0"	76 mm x 127 mm
	Maximum	16.0" x 17.0"	406 mm x 432mm
	Thickness	Single Sheet to 1 1/8"	Up to 28 mm
1.3.2 Physical			
	Weight ( <i>crated</i> )	530 lbs	240 kg
1.3.3 Production rate			
	Belt Speed	0 to 600 ft/min	0 to 3.05 m/s
	Conveyor Speed	0 to 26.0" in/s	0 to 0.7 m/s
1.3.4 Electrical requirements			
	Line Voltage	200 or 220 ± 15% VAC	
	Line Current	5 Amps	
	Power	1.2 kVA	
1.3.5. Operator controls			
	Circuit-Breaker Switch	Main, Vacuum	
	Machine Pushbuttons	Start, Stop, Run/Jog	
	Conveyor Selector	On/Off/Auto	
	Potentiometers	Production, Conveyor	
	Counter	8-digit resettable	

## 1.4 System Drawings

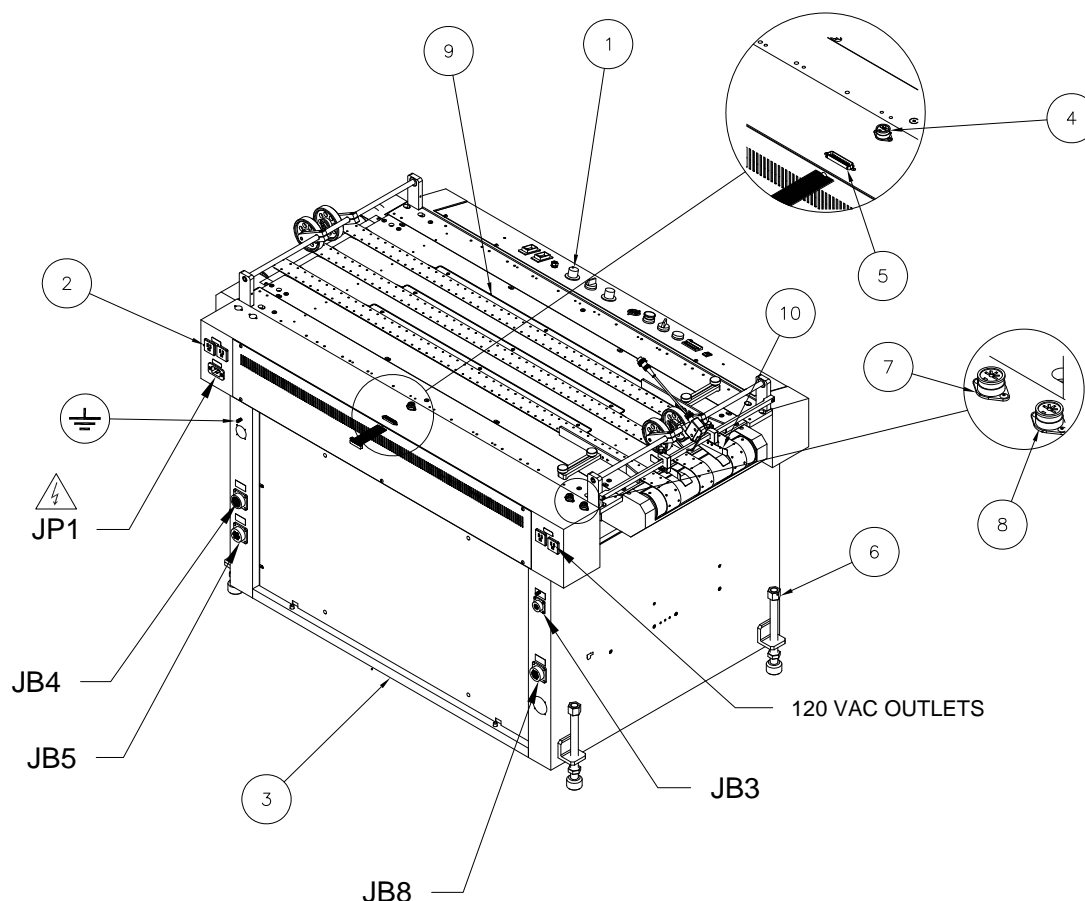
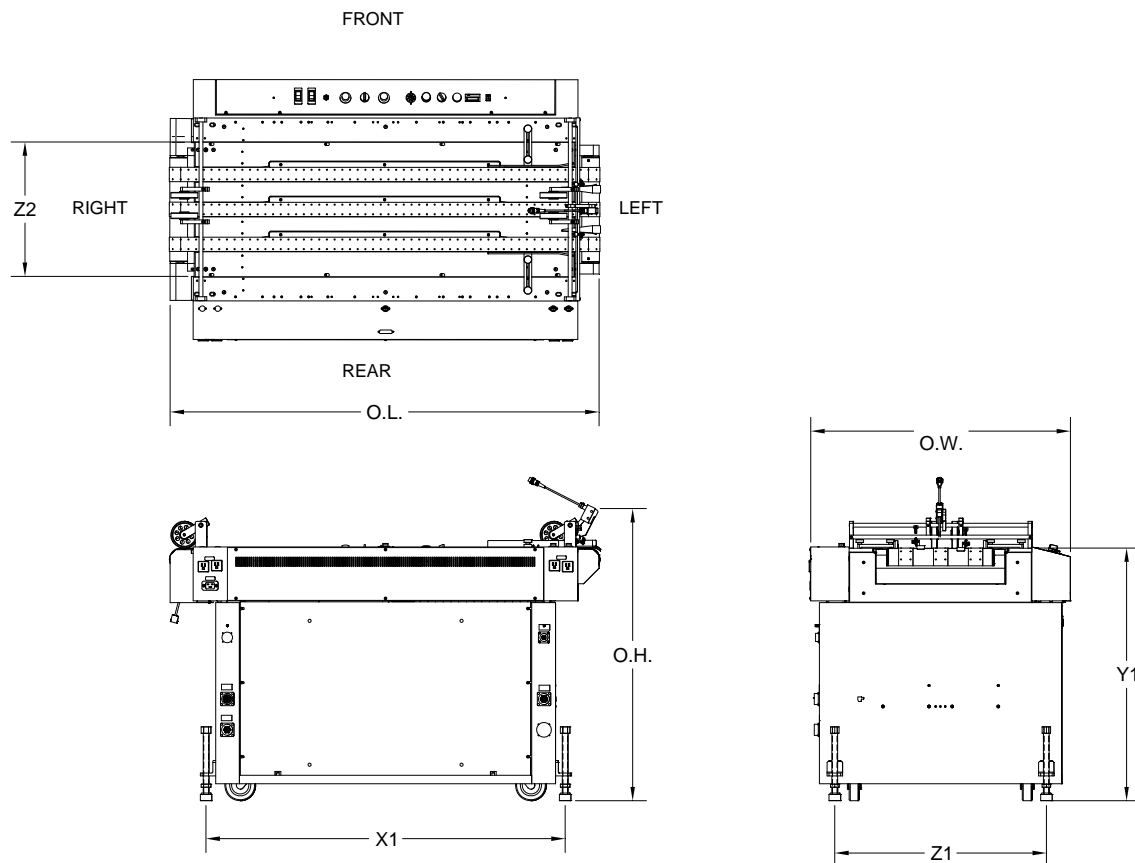


Table 1-1: *BK7IB-2 Features and Interface Specifications (BK7IBR-2 Shown)*

Item	Description	Reference
1	Instrument Panel Assembly	Buskro P/N, 9104908A
2	115 VAC Receptacle (Quantity 2)	
3	Base BK7IB-2, Rear View	
4	Photocue Sensor Connector (3-pin female)	
5	I/O Connector (26-pin male)	
6	Base Mounting Foot (Quantity 4)	
7	Cycle Sensor Connector (3-pin female)	
8	Jam Sensor Connector (3-pin female)	
9	Guide, Belt BK7IB Enhanced, 30 in Lg.	Buskro P/N, 9103791
10	Material Guide Assembly, BK7IB, 19"	Buskro P/N, 9103585A
JB3	Auxiliary Feeder Connector (17-14 CPC female)	
JB4	Downstream Connector (23-57 CPC female)	
JB5	Conveyor Connector (23-7 CPC female)	
JB8	Upstream Connector (23-37 CPC female)	
JP1	Base Power IEC Connection (220 VAC)	

Items 7, 8, JB3, JB4, JB5, and JB8 are on opposite ends of the base in the BK7IBL

Table 1-2: *BK7IB-2 Overall Dimensions*

Symbol	Description	Dimensions	
O.W.	Overall Width	33.9"	861 mm
O.L.	Overall Length	55.75"	1422 mm
O.H.	Overall Height	37.90"	962 mm
X1	Leveling Foot Length	46.68"	1186 mm
Y1	Tabletop Height	32.6" to 40.5"	902 to 940 mm
Z1	Leveling Foot Width	27.50"	699 mm
Z2	Tabletop Width	23.75"	603 mm



## 2.1 Instrument Panel Functions

The Buskro BK7IB-2 Inkjet base is equipped with a centrally located instrument panel (**Figure 2-1**) that displays all the necessary controls to operate the base. The controls can be sub-divided into the following six distinct functions:

- Power Switches (main and vacuum)
- Transport Control
- System Speed and Mode
- Conveyor Speed and Mode
- Feeder Control
- Piece Counter

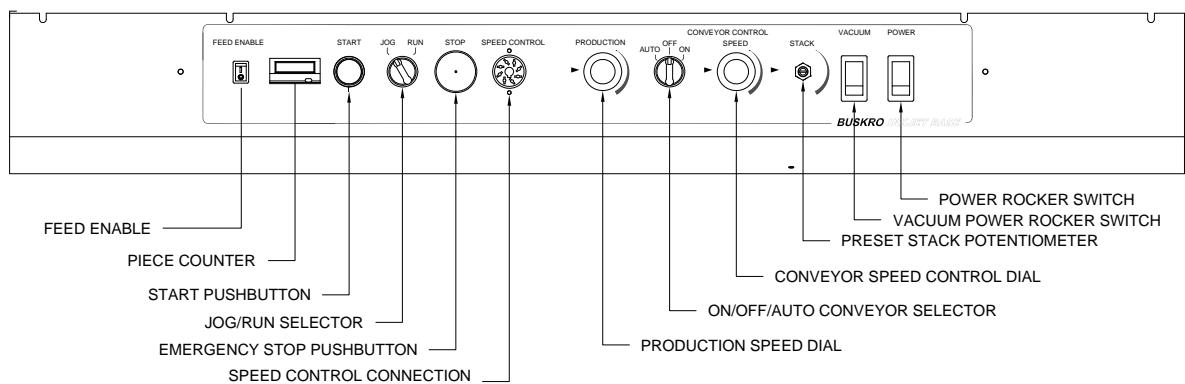


Figure 2-1: *Base Instrument Panel*

### 2.1.1 Rocker Switches

The two rocker switches located to the right of the piece counter provide power to the inkjet base and the transport blower.

The **Power Rocker Switch** turns on the main power to the inkjet base. When the “**I**” is pressed down, power is on and the switch is lit. Otherwise, when the “**O**” is pressed down, power is off.

**Note:** When working on the BK7IB-2 electrical components, disconnect the power plug for complete safety. Turning the **Power** rocker switch OFF will not disengage all 220 VAC circuitry.

The **Vacuum Rocker Switch** turns the transport blower on and provides vacuum to the transport tabletop. When the switch is ON, it should illuminate Green.

### 2.1.2 Production Dial

The production dial controls the speed of the transport belts on the BK7IB-2 base. A clockwise rotation corresponds to a speed increase while a counter-clockwise rotation results in a speed decrease.

### 2.1.3 Machine and Conveyor Function Pushbuttons

The pushbuttons and selector knobs located on the instrument panel permit control of the machine and conveyor operation. The **Start** (*green*) and **Stop** (*red*) pushbuttons allow engagement and suspension of the inkjet operation while the **Run/Jog** (*black*) selector sets the system to run continuously (RUN) when the **Start** button is momentarily depressed, or intermittently (JOG) while the **Start** button remains depressed.

The conveyor is equipped with its own control in the form of an **On/Off/Auto** selector knob (*black*), which determines the operating mode of the conveyor. It can be operated continuously, in conjunction with the base, or turned off completely.

#### Stop Pushbutton

The red *stop* button stops the transport belts.

### Start Pushbutton

The green *start* pushbutton will cause the transport belts to run. It will only activate the transport if there is no STOP input currently applied to the base, in which case the red indicator light in the Stop button will be lit.

### Run/Jog Selector

The Run/Jog selector is a 2-position rotary switch that permits a choice between continuous and intermittent machine operation. When the **Run** mode has been selected and the **Start** button is pressed, the machine will operate continuously. In the **Jog** mode, the machine will cycle only as long as the **Start** button remains pressed.

- **Run Mode** - Machine will operate when the momentary **Start** button is pressed.
- **Jog Mode** - Machine will operate only while the **Start** button is pressed.

### On/Off/Auto Selector

The conveyor On/Off/Auto selector determines the operating mode of the conveyor.

When set on *auto*, the conveyor is on when the transport base is on, and off when the base is off. In *on* mode, the conveyor runs continuously and independently of the operating mode of the base. Finally, an *off* selection suspends the conveyor's operation altogether.



### 2.1.3 Resettable Piece Counter

The counter located on the left side of the instrument panel monitors and totalizes the number of mailpieces that are detected by the Photocue sensor. The counter can be reset to zero by pressing the reset button located on the front of the counter.

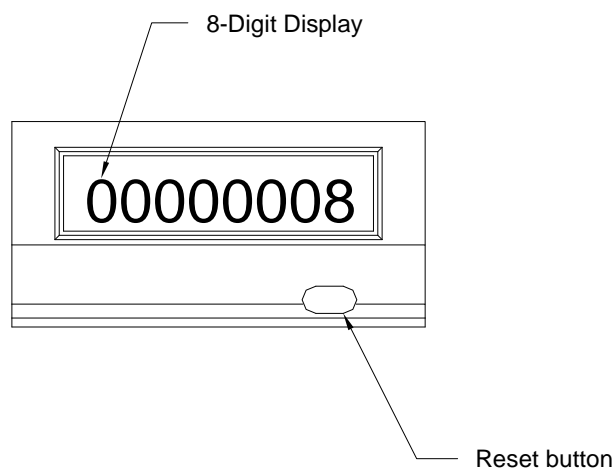


Figure 2-2: *Resettable Piece Counter*

## 2.2 Material Side Guide Adjustments

Proper adjustment of the material side guides shown in **Figure 2-3** will permit dependable and accurate feeding of the mailpieces so that they are correctly aligned when presented under the printhead(s). The objective of this section of the transport base is to straighten out any mailpiece that may come out of the feeder in a skewed manner. This will ensure that the image is properly placed on the piece. When adjustment of the side guides is performed, it is imperative that they not squeeze and retard the advancing mailpiece as this would result in incorrect print positioning.

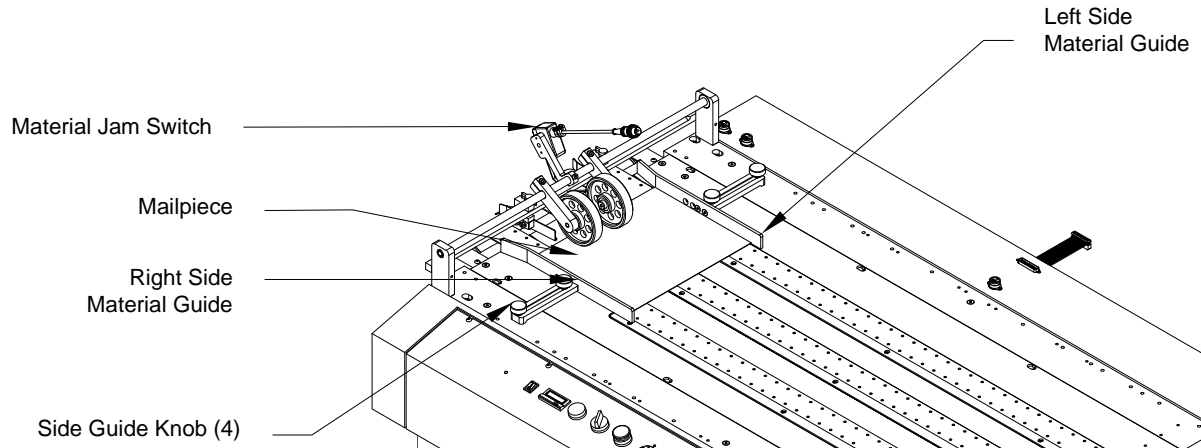


Figure 2-3: *Material Side Guides on the BK7IB-2*

The material side guides, must be set correctly to ensure that the mailpieces are directed in a straight fashion into the inkjet imaging area. In order to properly adjust the side guides, the following steps are recommended:

1. Loosen and remove the guide fastening knob(s) on each material side guide.
2. Slowly feed a mailpiece onto the transport belts. Stop the transport base when the mailpiece is between the side guides.
3. Place the left and right side guides about 1/16" to 1/8" from the corresponding edge of the mailpiece. Ensure that the guides do not pinch the mailpiece anywhere along its edges.
4. Replace the fastening knob(s) in the nearest threaded holes located in the base's tabletop and tighten them to secure the guides.
5. Slowly dispense another mailpiece onto the transport belts and check that the mailpieces path is unobstructed by the material side guides. If so, repeat steps 1 to 4.

**Note:** If the material side guides are improperly set, the mailpiece may become trapped between them and/or cause a jam at the output of the feed rollers. If the material side guides are incorrectly set, the Material Jam switch may be activated resulting in a system stoppage.

In some cases, the side guides will need to be secured with one knob each (as opposed to two) depending on the size of the mailpiece.

## 2.3 Upstream Compatibility

The BK7IB-2 was designed to be a part of a flexible system in which one or more units can precede or follow it in the process stream. Possible units, which may be placed upstream from the printing base, would be a feeder (e.g. a BK425) or a tabber (BK730). The required communication with an upstream device is carried out over the BK7IB-2's upstream connector (JB8, at the rear of the machine).

The functions found on this connector are: Start and Stop signals from the BK7IB-2 to the upstream device and Start and Stop signals from the upstream device to the BK7IB-2. The UPSTREAM connector of the BK7IB-2 is configured to communicate with the DOWNSTREAM connector of the upstream unit.

A separate 14-pin connector (*JB3*, on the rear of the machine) is provided for a BK720 Friction Feeder.

To be able to stop and start the system from any location (Emergency Stop), the Stop and Start functions are linked to the next unit via connections on the Upstream and Downstream connectors of the BK7IB-2.

### 2.3.1 BK720 Friction Feeder

The BK720 Friction Feeder differs from other equipment in a system configuration since it is a “table-top” unit, rather than the normal floor-standing units.

To accommodate this feeder, the BK7IB-2 can be equipped with an optional flip-up table. This table has the right height and dimensions to match the BK720 to the BK7IB-2 base.

The BK720 Feeder has been designed to work with the BK7IB-2. Although the feeder can function as a stand-alone unit with its own ON/OFF switch and speed control potentiometer, its operating mode can be switched so that the Run function is under the control of the BK7IB-2. An interface cable with the appropriate connectors is provided to connect the BK720 to connector JB3 at the back of the BK7IB-2.

**Note:** The stop function is not incorporated in the BK720 and therefore DIP switch S1-2 has to be set to *Disable* when a BK720 is used as a feeder.

## 2.4 Downstream Compatibility

Possible units, which may be placed downstream from the printing base, would be an extension table (BK703), a tabber (BK730) or even another printing base. The required communication with a downstream device is carried out over the BK7IB-2's downstream connector (JB4, at the rear of the machine).

The functions found on the downstream connector are basically the same as for the upstream connector, although the configuration is different. The DOWNSTREAM connector of the BK7IB-2 is configured to communicate with the UPSTREAM connector of the downstream unit. The control signal for a downstream drier is also provided on this connector.

A separate 7-pin connector (JB5 at the rear of the BK7IB-2) is provided for a Buskro Conveyor. This connector only has a provision for a *Stop* signal from the conveyor to the BK7IB-2. However, the speed control circuit for the conveyor is actually part of the BK7IB-2 and thus the drive voltage for the conveyor motor also has to be sent over the connector. This permits the BK7IB-2 to provide such features as Stack Control (i.e. providing gaps between certain stacks of mailpieces for sorting or bundling purposes).

If there is no unit downstream from the BK7IB-2, other than a conveyor, then the sensing circuit for the *Stop* button has to be set to *DISABLE*, or the BK7IB-2 cannot run. This function is performed by switch **S1-3** on the Base Control Board.

The same function for the conveyor is provided by **S1-1**, the *CONV DISABLE/ENABLE* switch. If a conveyor is not present in the system, **S1-1** has to be set to *DISABLE*.

## 2.5 Maintenance Schedule

The maintenance schedule table presented below applies to equipment, which is operated daily on an 8-hour basis. If the equipment is used more frequently, the maintenance schedule must be adjusted accordingly.

Table 2-1: *Maintenance Schedule Table*

Period	Maintenance Function
<b>Daily</b>	Wipe table surface clean of paper dust and other accumulated debris.  Remove the front door and clean any debris, which may have fallen into the machine.  Wipe away any ink, which may have settled on the tabletops, belts, and rollers. Clean under the belts as well.
<b>Monthly</b>	Clean vacuum lines and fittings with compressed air.
<b>Semi-Annually</b>	Examine all mechanical drive components, belts, and rollers for wear. Replace if necessary.

**Note:** The availability of a small air compressor is recommended. Compressed air is useful in removing debris and is indispensable in cleaning out the vacuum systems. However, the operator should avoid blowing any dirt or metal particles into the electrical/electronics compartments.



### 3.1 Introduction

Buskro controllers such as the BK705, BK1705, BK1710 or BK1720 were designed to work together with the BK7IB-2 base as a complete turnkey unit. To connect the controller to the BK7IB-2 base, the controller needs to be positioned near the BK7IB-2 base only limited by the length of the umbilical. In addition, electrical cables must be connected between the controller and the BK7IB-2 base for the encoder, photocue, stack signal, jam switch, cycle, and stop relay signals.

### 3.2 Physical Location

To connect the controller to the BK7IB-2 base, an interconnect kit is required. For the BK705, BK1705, BK1710, or BK1720 controllers, use BK-INT-1765.

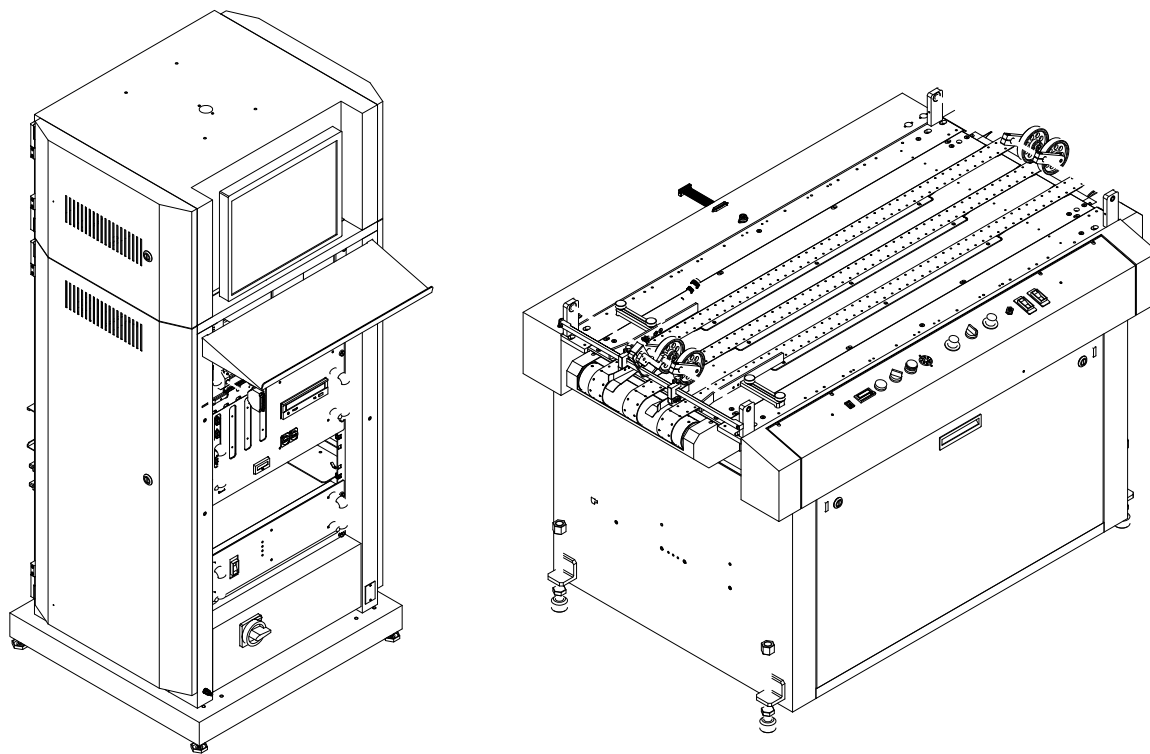
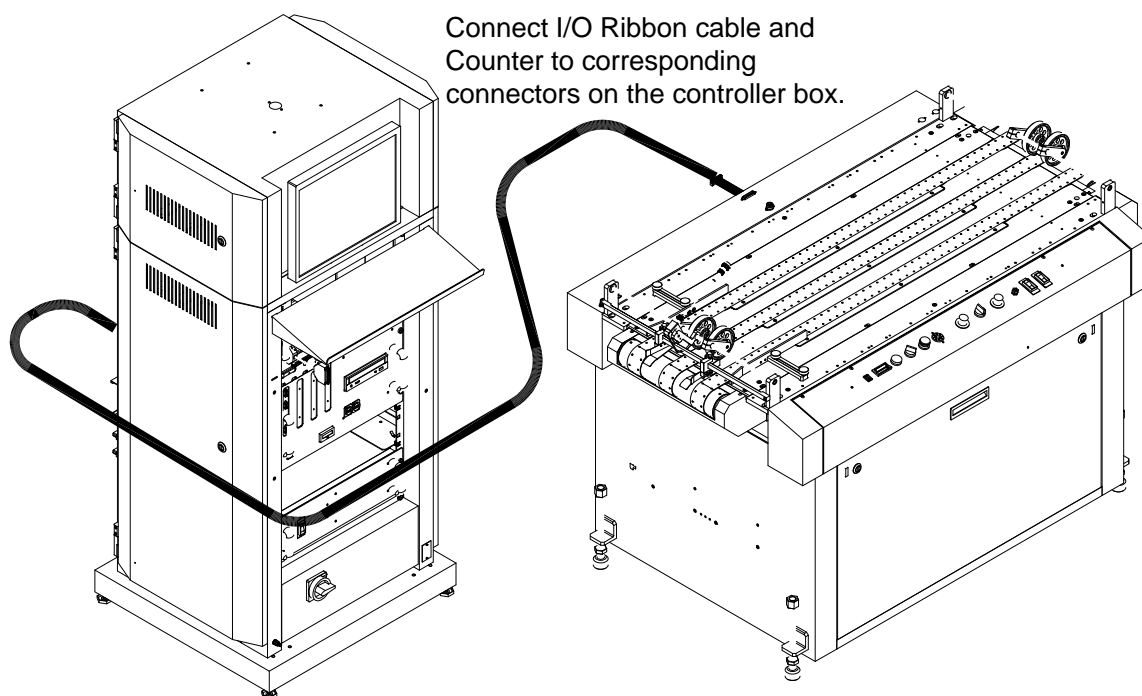


Figure 3-1: *Typical positioning of the BK1710 and BK7IB-2*

### 3.3 Cable Connections

To electrically integrate the BK1710 controller to the BK7IB-2 base, there are two options available. The recommended option (**Figure 3-2**) is to install an I/O ribbon cable from the I/O connector on the BK7IB-2 base to the I/O connector on the BK1710 controller.

Installing this cable will transmit the encoder, photocue, jam, cycle, stack, and stop signals from the BK7IB-2 base to the BK1710 controller



*Figure 3-2: Electrical Integration*





## 4.1 Introduction

The task of the electrical section of the BK7IB-2 Inkjet Base is two-fold: It controls the internal operation of the machine, and it communicates with the controller and other components, which form part of the complete system.

These tasks are performed by the Base Control Board (P/N 9102380), which communicates with various controls, sensors and external equipment and processes the information to achieve the desired operation.

Local controls are found on the unit's front panel and include Start and Stop, as well as mode switches (Feeder Enable/Disable and Run/Jog).

Local sensors would include the product detector, jam switch(es) and the shaft encoder.

External inputs include Start and Stop signals from upstream and downstream equipment, the Stop input from a conveyor and the controller, the speed information from a downstream machine, and from the master speed controller.

Internal control outputs activate and stop the base's own transport motor and the conveyor and to operate the status lights.

Control signals to the outside include the start and stop signals to upstream and downstream equipment, speed information to the upstream equipment and the controller, the control of a feeder (run/stop) and a heater on an extension table, as well as passing various sensor and status signals on to the controller.

Thus, the Base Control board forms the "heart" of the base and it can be configured quite extensively to suit the customer's requirements.

## 4.2 The Base Control Board

As mentioned above, the Base Control Board is the central electrical component of the base and understanding its functions and configuration is essential for a successful installation or troubleshooting session. The board is located in the rear compartment.

A detailed description of the functions and configuration is given below, while a schematic diagram for the unit is found in the electrical section of the Appendix.

The Base Control Board was designed as a universal control board for all Buskro machines. Therefore it has a number of features which may or may not be used in all machines and/or configurations.

It is important to remember that the board requires “dry-contact” inputs and provides “dry-contact” outputs (except for Heater control). Start inputs require a contact closure, while Stop inputs require a contact opening. Start and Run outputs will close when activated, while Stop outputs will open when they send a Stop signal. Keeping this in mind is also crucial when trying to interface Buskro equipment with that of other manufacturers.

Note also, that the board will reset to the rest position and also send out Stop pulses to any connected upstream and downstream equipment to make sure the entire system is initialized, when power is first applied.

The S1 configuration switches allow the unit to eliminate the need for Stop inputs in those machines and/or configurations where they may not be used.

Any external STOP input can be disabled, except the front panel STOP switch.

A red “STOP INPUT” light on the board (and in the Stop button on the front panel) means that it is receiving a STOP input (i.e. the input sees an open contact). The machine cannot start and it will not send a START signal to other equipment as long as it sees a STOP input. If there is a constant STOP light, disable the 5 STOP inputs on the control board (DIP switch S1) one by one until the red light goes off; then you have found the input which causes the stop condition.

The “Rule of Thumb” for the board is: If a STOP input closure is not supplied (i.e. there is no equipment to supply it), then the input must be disabled, otherwise it should be enabled.

Note that the 5 STOP Enable/Disable sections of DIP switch S1 will only disable the STOP inputs and **NOT** the START inputs. The board is looking for a contact closure on a START input and a contact opening on a STOP input. This is in keeping with “fail-safe” philosophy which dictates that a disconnect or a power failure in any part of the system will stop the entire system.

All START inputs need a contact to close to activate a “Start”, while all STOP inputs need a closed contact to open to sense a “Stop”. Thus, a lack of input for a start means no start action, while the lack of a closed contact for a STOP input means that there is a problem and the system should stop. Therefore non-existent STOP inputs must be disabled for proper operation.

Note that all input signals used in the unit are at a 12 VDC level, looking for a dry contact (STOP and START **from** other machines), while the unit provides dry contacts for those signals coming from other machines (STOP and START **to** other machines). The only exception is the drive output to the heater control which supplies a switched +12 VDC and Ground to activate the relay in the Heater Units.

There is also a choice of how a JAM input is handled. This is selected by jumper JP1.

There is also a configuration switch (S2) which determines the way a Stop input is handled: either a Stop pulse is sent to upstream equipment, or there is a steady Stop signal sent to the upstream equipment, as long as there is a Stop input. Each input can be configured separately to allow for maximum operational flexibility.

The following tables show the options and explain the implications:

1. S1:

Configuration	Settings	Explanation
S1-1 (CONV)	On = disabled Off = enabled	Enables or disables a STOP signal from the conveyor. If no conveyor is used in the system, the switch should be set to "disabled".
S1-2 (UPSTR)	On = disabled Off = enabled	Enables or disables a STOP signal from an upstream machine.  If no upstream equipment is used in the system, the switch should be set to "disabled".
S1-3 (DNSTR)	On = disabled Off = enabled	Enables or disables a STOP signal from a downstream machine.  If no downstream equipment is used in the system, the switch should be set to "disabled".
S1-4 (JAM)	On = disabled Off = enabled	Enables or disables a STOP signal from the JAM sensor.  If no JAM sensor is used in the machine, the switch should be set to "disabled".
S1-5 (CONTR)	On = disabled Off = enabled	Enables or disables a STOP signal from the control computer.  If no computer is used with the machine, the switch should be set to "disabled".
S1-6 (RUN)	On = disabled Off = enabled	This switch is connected in parallel to the Feeder Enable/Disable switch on the front panel. The switch enables or suppresses the START signal to upstream equipment and the RUN signal to a feeder. The function would be used for testing when the operator wishes to start the machine, without starting the upstream section of the system.  For machines which have a front panel switch, S1-6 should be open (=enabled) to enable the operation of the front panel switch, otherwise it should be open or closed (=disabled), as desired.

## 2. S2:

Configuration	Settings	Explanation
S2-1 (CONV)	Off = disabled On = enabled	<p>“Off” means that a 1 second <b>Stop</b> pulse will be sent upstream in response to a <b>Stop</b> input from the conveyor.</p> <p>“On” means that the <b>Stop</b> sent upstream will be in effect as long as a <b>Stop</b> input is received from the conveyor.</p>
S2-2 (UPSTR)	Off = disabled On = enabled	<p>“Off” means that a 1 second <b>Stop</b> pulse will be sent upstream in response to a <b>Stop</b> input from the upstream machine.</p> <p>“On” means that the <b>Stop</b> sent upstream will be in effect as long as a <b>Stop</b> input is received from the upstream machine.</p>
S2-3 (DNSTR)	Off = disabled On = enabled	<p>“Off” means that a 1 second <b>Stop</b> pulse will be sent upstream in response to a <b>Stop</b> input from the downstream machine.</p> <p>“On” means that the <b>Stop</b> sent upstream will be in effect as long as a <b>Stop</b> input is received from the downstream machine.</p>
S2-4 (FPSTOP)	Off = disabled On = enabled	<p>“Off” means that a 1 second <b>Stop</b> pulse will be sent upstream in response to a <b>Stop</b> input from the front panel <b>Stop</b> button.</p> <p>“On” means that the <b>Stop</b> sent upstream will be in effect as long as a <b>Stop</b> input is received from the front panel <b>Stop</b> button.</p>
S2-5 (CONTR)	Off = disabled On = enabled	<p>“Off” means that a 1 second <b>Stop</b> pulse will be sent upstream in response to a <b>Stop</b> input from the control computer.</p> <p>“On” means that the <b>Stop</b> sent upstream will be in effect as long as a <b>Stop</b> input is received from the control computer.</p>
S2-6 (JAM)	Off = disabled On = enabled	<p>“Off” means that a 1 second <b>Stop</b> pulse will be sent upstream in response to a <b>Stop</b> input from the Jam Detector.</p> <p>“On” means that the <b>Stop</b> sent upstream will be in effect as long as a <b>Stop</b> input is received from the Jam Detector.</p>

## 3. JP1:

JP1	<p>1 – 2: Jam signal is ignored by the board, but still passed on to the control computer.</p> <p>2 – 3: Jam signal is ignored by the board, and not passed on to the control computer.</p>	<p>Determines how the board handles a JAM input and the effect of S1-4.</p> <p>For some applications it is desirable to suppress the STOP signal from the JAM sensor, but to still report the condition to the control computer. In this case, selection 1-2 should be used.</p> <p>If no control computer is connected, either position may be used, with 1-2 preferred.</p> <p><b>Caution</b> – connecting 2 to 3 will cause a short circuit condition on the Jam input when the input is disabled (i.e., S1-4 is closed). However, diode D42 would prevent a positive input voltage from seeing this short circuit.</p>
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**Note:** If a Stop input is disabled using S1, then the corresponding setting of S2 no longer matters, since no output is generated in either case.

In “normal” operation, enabling the S2-2 will produce a lock-up condition between the 2 machines. S2-2 should therefore always be disabled (= Off). The function was only included on this channel for special installations. Usually all other positions of S2 are set to the “enabled” position, to make sure that no machine can start while a downstream machine has a problem. In the case of S2-2, no harm will be done if a downstream machine is started while an upstream machine has a problem.

#### 4.2.1 Troubleshooting the Base Control Board and Peripheral Circuitry

Six LEDs are included on the board to help in troubleshooting the equipment:

“12V OK”. This green LED indicates that 12 VDC is applied to the board. Note that this indicator is ahead of the fuse (F1) and will still be lit, even if the fuse is burned out. As long as the LED is lit, the technician will know that the 12 VDC supply in the base is operating properly.

“START I/P”. This amber LED indicates that the board is receiving a Start signal (either from upstream or downstream equipment, or from the front panel START switch).

“STOP I/P”. This red LED indicates that the board is receiving a STOP signal on any one of the 6 Stop inputs. The LED is also duplicated in the front panel STOP switch. As long

as these LEDs are lit, the machine cannot be started and the source of the signal should be determined and the condition has to be corrected to enable the system to start again.

If it is not obvious which input is causing the condition, simply disable the enabled inputs on S1, one after the other. When the LED goes off, you have found the source of the Stop input.

“START O/P”. This amber LED will light for about 1 second when a Start signal is received, indicating that the board is sending start signals to upstream (unless disabled by the front panel Feeder Enable switch) and downstream equipment.

“STOP O/P”. This red LED will light for about 1 second when a Stop signal is received, indicating that the board is sending stop signals to upstream and downstream equipment. The LED is connected to the pulse generator circuit and will only light up for one second, even if the pulse circuit is bypassed by S2.

“RUN O/P”. This green LED is lit as long as the board is in a “Run” condition. It is also duplicated in the Start button on the front panel. If it is lit, the board is activating the Run relays for the base transport and conveyor motors, closes the Run contact for the feeder and sends +12 VDC and ground to the downstream heaters. The lights will be extinguished when a STOP signal is received, or the power to the board is removed.

Using these lights and understanding what activates them, it is fairly easy to determine the source of any electrical problem in the machine. This, of course, assumes that the board itself is functioning properly. If it is not, and the problem is something other than simply a burned-out fuse, then the board should be replaced and returned to the factory for repair.

If the board itself is operating properly and all configuration switches are set as required by the application, then the problem must be in one of the peripheral components, such as the Run relays for the base and conveyor motors, the respective speed control units or the motors themselves, or there could be a loose wire or bad contact.



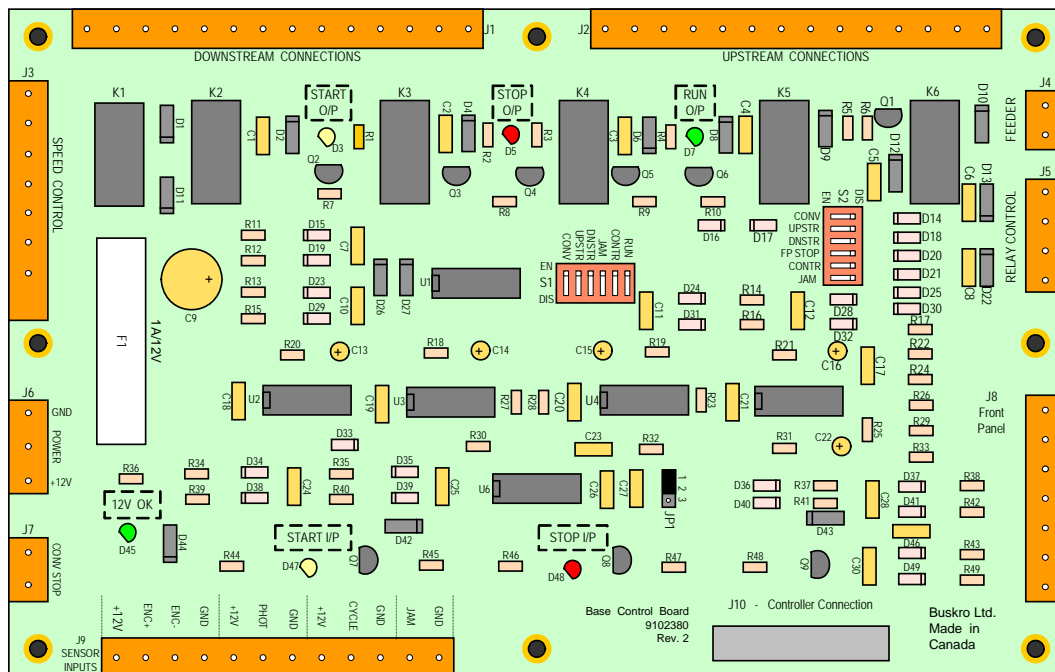


Figure 4-1: Base Control Board, showing the Indicator Lights and Switches S1 and S2

### 4.3 Start/Stop Control

The Start/Stop control for the base transport and conveyor motors is handled by 2 single-pole relays in the front compartment. These relays are activated by a voltage from the Base Control Board.

#### Base Transport Motor

The base transport motor is a 3-phase 230 V AC Motor, controlled by an inverter-type speed controller. When the relay closes, it allows the controller to apply a voltage to the motor. The frequency of this voltage, and thus the motor speed, is determined by the setting of the “Production Control” potentiometer on the front panel.

#### Conveyor Motor

The conveyor is driven by a DC motor, controlled by an SCR-based DC Speed Controller. When the Run relay closes, it applies a voltage to the high end of the control potentiometers (“Conveyor” and “Stack”), which causes the motor to run at the preset speed.

### 4.4 Transport Speed

The transport motor is a 230 V, 3-phase AC Motor rated at ½ hp and controlled by a Delta Type VDL inverter driver. The speed is determined by either the front panel “Production” potentiometer, or an optional Universal Speed Control card. The parameters for the Inverter Driver have been set at the factory and should not normally be changed in the field. However, if a change is required, or the controller has to be replaced, the required settings are given in a table in the appendix. If the inverter has to be replaced, the order of the phases is important. Interchanging any two of the 3 phases will cause the motor to run in the opposite direction.

## 4.5 Conveyor Speed

The conveyor is driven by a 1/8 hp DC motor controller. While the motor itself is part of the conveyor, the speed control board is located in the base. The conveyor is turned on or off by a Run relay (similar to the transport, energized by the Base Control Board). This will also depend on the setting of the conveyor mode switch (front panel):

ON means that the conveyor will always run as long as the base is powered, regardless if it is running or not.

OFF means that the conveyor is off, regardless of the status of the base.

AUTOMATIC means that the conveyor will run as long as the base is running and stop when the base is stopped. The conveyor speed is controlled by 2 front panel potentiometers: “Conveyor Speed” and “Stack”. The selection is done by the Stack Relay (front compartment), which is activated by the Base Control Board at the request from the control computer.

## 4.6 “Universal Speed Control” (Optional)

The “Universal Speed Control” is a concept, which permits the control of the transport speed of all machines in a system with a single “Master Controller” (plugged into a dedicated socket on the front panel of any machine in the system).

The capability of implementing this system is built into all newer model Buskro machines, including the BK7IB-2. The system requires that all machines in a system are equipped with a special control board. The machines can either be ordered with the boards already installed, or they can be retrofitted in the field. If a machine is not already equipped with the board, a retrofit consists of simply replacing the current “dummy” board with the proper one and calibrating the unit. All wiring is already done and all interconnections required are already wired and connected in the machines and the interconnect cables.

The “Master Controller” may be plugged into any machine in the system, since its signals are carried on a special bus. Once the speed is set, the controller may be removed and the

speed stays set until the controller is inserted into the front panel socket on any machine and the setting is changed.

The system synchronizes any machine to the encoder pulses from the next downstream machine, to ensure that no machine will run faster than the machine which follows it in the production stream.

The special control board obtains its input signals from a dedicated connector on the Base Control Board (J3), and the setting of the front panel Production potentiometer. It has 2 modes: manual and automatic. In the manual mode it links the Production potentiometer directly to the Inverter Driver; in the automatic mode it uses the signals from the Base Control Board to determine the desired speed and the Production potentiometer will allow a ratio of the speed to be selected (never higher than 1:1, the maximum setting of the potentiometer).

The board has a number of different operating modes (e.g. Master, Slave and Gap Control) and has to be configured and calibrated after installation. The explanation and specific calibration instructions are part of the upgrade kit.

## 4.7 Electrical Troubleshooting and Installation Problems

Note that the following troubleshooting hints apply only to the base itself and not to problems related to the controller and/or the print heads.

When electrical problems arise with a BK7IB-2 base, it must be remembered that it is a part of a larger system and the problem may not necessarily be in the base at all, but could be in the interfacing.

As a first step, make sure all equipment in the system has power and is turned on. Verify that all cables are connected and secured.

The upstream and downstream connections on the rear of the machine are configured differently and use different connectors to avoid confusion. An “upstream” connector (37

pins) is configured to work with the “downstream” connector (57 pins) of the next machine with is upstream from the base in the product flow, and similarly for a downstream connector. Thus, Buskro’s standard interconnect cable always has a 37-pin plug on one end and a 57-pin plug on the other. The respective pin/function assignment can be found on the schematic diagram of the base in Appendix B.

Most installation problems seem to be caused by incorrect settings of the configuration switches on the Base Control Board:

***The base does not react to a STOP signal from another machine.*** This is caused by the corresponding Stop input being disabled on S1. Make sure that it is enabled and that the “STOP I/P” LED lights up while the other machine sends a STOP signal.

***The base will not start and a red light is lit in the “Stop” button on the front panel.*** This will be caused by a STOP signal on one of the 6 Stop inputs on the board. Make sure that all inputs which correspond to an existing peripheral unit are enabled, while the others are disabled. Enabling an input which looks for a peripheral unit that does not exist in the system will cause this condition.

***The base will start, but the next machine upstream, or a feeder, will not start or run.*** This may be due to the wrong setting of the “Feeder Enable/Disable” rocker switch on the front panel. For upstream equipment to run with the base, the switch has to be set to “Enabled” and the Run/Jog switch has to be in the “Run” position.

While all Buskro machines are designed to work with each other seamlessly, problems may occur if the system also includes equipment made by other manufacturers. The main points to keep in mind when the installation technician is trying to get such equipment to work with Buskro equipment are:

Buskro works with internal DC voltages of 12V, while some other companies have standardized on 24 VDC.

Buskro equipment provides dry contacts on its outputs (rated for 1A max.) and expects to see dry contacts to activate its inputs. The maximum current drawn by an input is 10 mA. The low side of the input is connected to the system ground.

All Stop inputs look for a closed contact as the “no stop” condition. Opening a contact signifies a Stop signal. This system was chosen to make the equipment as “fail-safe” as possible. Disconnecting a cable or losing power in any machine in the system will cause the Stop input to open and the entire line will be stopped.

Buskro machines will send a Start pulse (closed dry contact) of about 1 sec duration to upstream and downstream equipment whenever either a Start pulse is received from other equipment, or the front panel Start button is pressed.

Buskro machines will send a Stop pulse (opened dry contact) of about 1 sec duration to upstream and downstream equipment whenever either a Stop signal is received from other equipment, or the front panel Stop button is pressed. Depending on the setting of the S2 configuration switches, the Stop signal sent upstream will be either a pulse, or a signal that lasts the duration of the Stop input.

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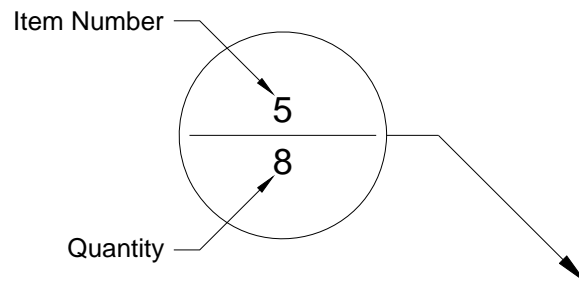
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## Balloon Annotation and Parts Listing



Item	Part Number	Quantity	Description	Reference
1				
2				

The following is a description of how to interpret the information in this section:

### Item:

This column indicates the item number used for each unique part in an assembly drawing. It is matched with the top number in the balloon pointing at the associated part.

### Part Number:

This column represents the Buskro part number.

### Quantity:

This represents the total number of a given part in an assembly. It is matched with the bottom number in the balloon pointing at the associated part.

### Description:

This column contains a brief description of the part.

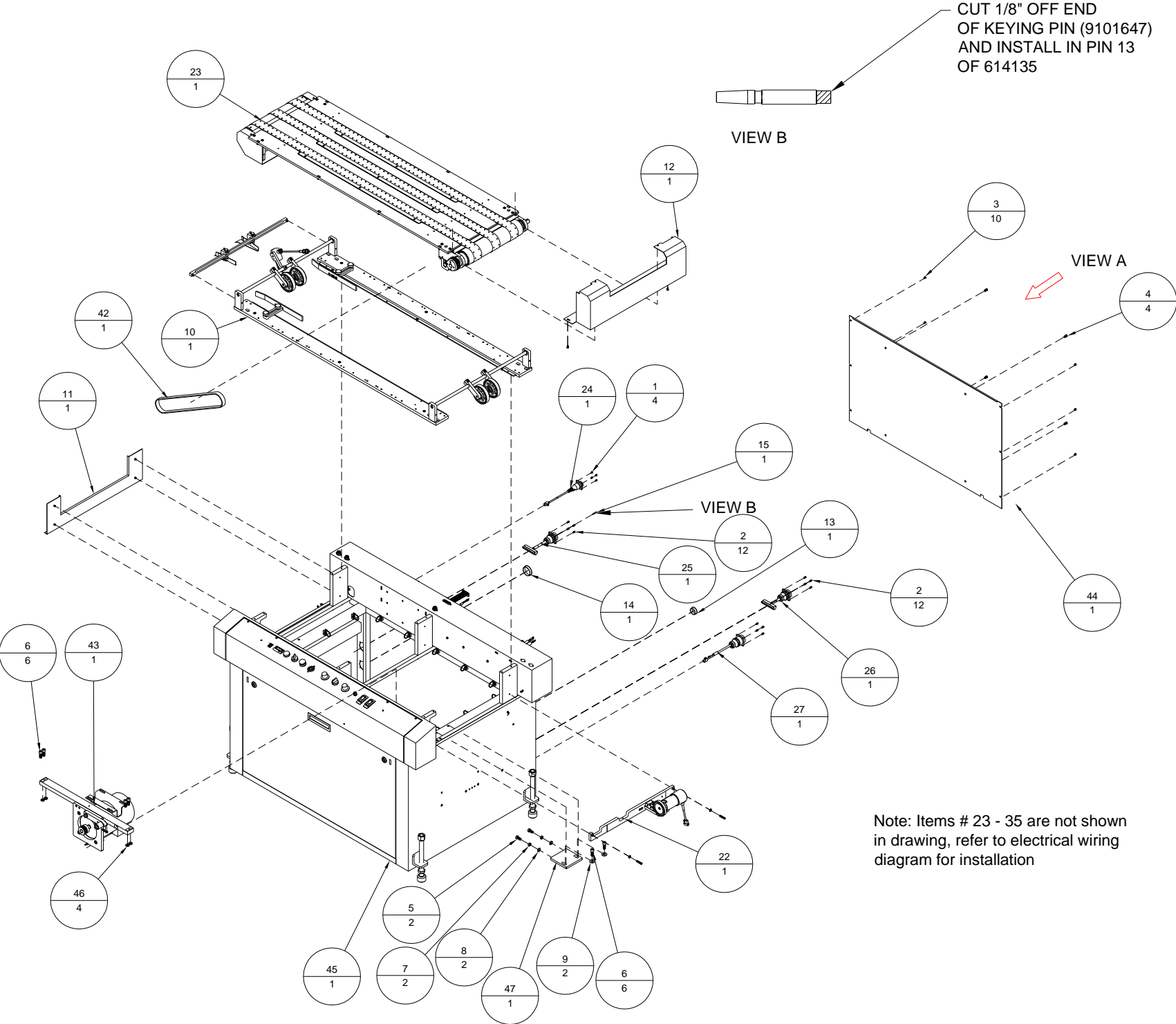
### Reference:

This column indicates the page location for sub-assemblies.

Table A-1: BKT7IBR-2 – Base, BK7IBR-2, Right

Item	Part Number	Quantity	Description	Reference
1	402310	4	Screw, PHMS, 6-32 UNC x 1/4"	
2	402320	12	Screw, PHMS, 6-32 UNC x 3/8"	
3	404510	10	Screw, BHCS, 10-32 UNF x 1/4"	
4	405530	4	Screw, BHCS, 1/4-20 UNC x 1/2"	
5	406650	2	Screw, HHMS, 5/16-18 UNC x 3/4"	
6	407270	6	Screw, SHCS, 3/8-16 UNC x 1"	
7	439015	2	Lockwasher, 5/16 I.D.	
8	440015	2	Washer, 5/16" ID	
9	440020	2	Washer, 3/8" ID	
10	9100374A	1	Inline tabletop assembly	
11	9100775	1	Inline outfeed shelf end cover	
12	9100780	1	Inline outfeed roller cover	
13	9101478	1	Hole Plug, Dome, 1.25"	
14	9101479	1	Hole Plug, Dome, 1.75"	
15	9101647	1	Keying Plug, Series 1	
16	9101888	1	Label, JB4 Downstream	
17	9101889	1	Label, JB5 Conveyor	
18	9101890	1	Label, JB3 Ext. Feeder	
19	9101891	1	Label, JB8 Upstream	
20	9101922	1	Label, 230VAC, 50/60 Hz, 8A	
21	9101924	2	Label, 120VAC 50/60Hz, 8A	
22	9103594A	1	Kit, Encoder Wheel, BK7IB	
23	9103800RA	1	Tabletop Assembly, BK7IB-2, Right	
24	9104142A	1	Cable, Rear Panel, Feeder to BCB, #31	
25	9104143A	1	Cable, Rear Panel, Upstream to BCB, #11	
26	9104144A	1	Cable, Down Stream To BCB, #10	
27	9104147A	1	Cable, Conveyor Stop To BCB, #2 & #26	
28	9104348A	1	Cable, Front Panel Power Switches, #1	
29	9104351A	1	Cable, AC Power To Speed Base Control, #5	
30	9104352A	1	Cable, Conveyor Speed Control, #16	
31	9104356A	1	Cable, Production Control, #24	
32	9104358A	1	Cable, AC, Signals To Base Speed CTRL, #9	
33	9104452A	1	Cable, SCB Connector & 12VDC, #22	
34	9104453A	1	Cable, Front Panel, SCB Power, #23	
35	9104457A	1	Cable, Production Pot to SCB, #24	
36	9104591A	1	Material Guide Assembly, 23.75", BK7IB	
37	9104615A	1	Cable, Counter I/O, #4	
38	9104617A	1	Cable, Power from IEC to Front Panel, #21	
39	9104618A	1	Cable, Production Pot To Terminal, #7	
40	9104620A	1	Cable, Front Panel To Blower, #3	
41	9104627A	1	Cable, AC, Signal To Base Speed CTRL, #19	
42	9104635	1	Belt, Poly-V 6-Groove	
43	9104637RA	1	Inline AC Motor Assembly (Right)	
44	9104659	1	Inline Rear Cover	
45	9104761A	1	Base Cabinet Assembly, BK7IB-2	
46	9104957	4	Rubber Washer 3/8ID x 5/8OD x 1/8THK	
47	9104969	1	Mount, Anti-Vibration Brace, AC Motor	

Figure A-1: BKT7IBR-2 – Base, BK7IBR-2, (Right)



*Table A-2: 603021A – Jam Switch Assembly*

Item	Part Number	Quantity	Description	Reference
1	603020	1	Sensor, Microswitch	
2	603021	1	Cover, Microswitch	
3	606013	1	Cable, #22-3, Unshielded, 26" Long	
4	609116	3	Terminal, Ring, #10, 22-18 AWG, Red	
5	9100724	1	Plug, Preh, Locking, 3 Pin	

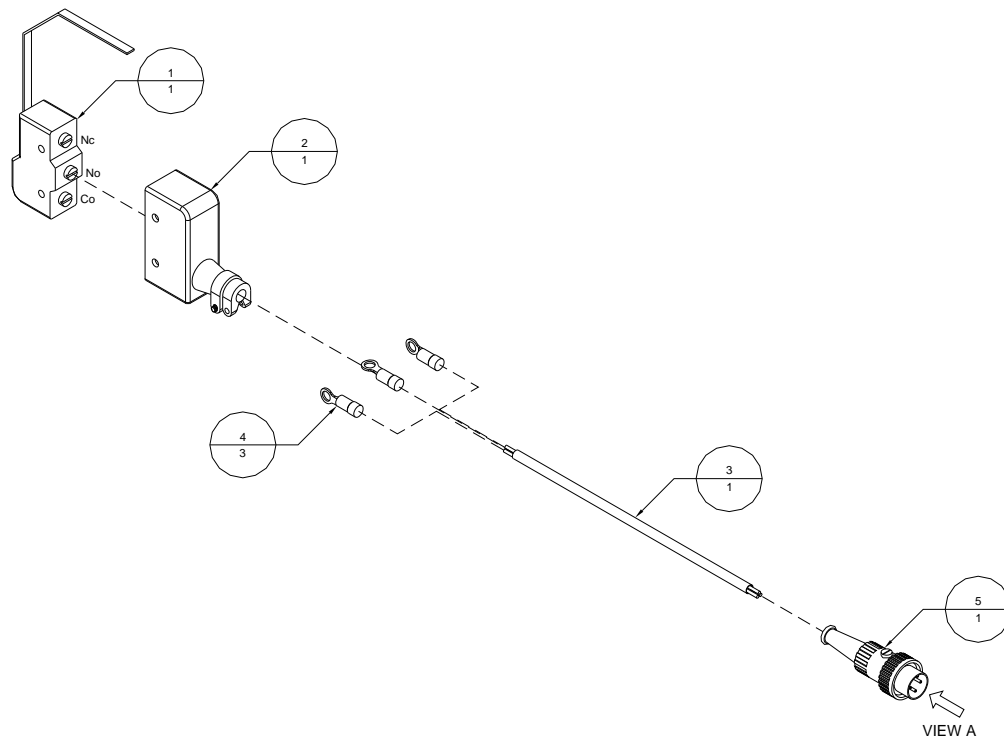
*Figure A-2: 603021A – Jam Switch Assembly*

Table A-3: 9100374A – Inline Tabletop Assembly

Item	Part Number	Quantity	Description	Reference
1	330112W	1	Switch Bracket, 9 x 12	
2	402370	2	Screw, PHMS, 6-32 UNC x 1"	
3	404020	6	Screw, FHCS, 10-32 UNF x 3/8"	
4	404050	14	Screw, FHCS, 10-32 UNF x 3/4"	
5	404220	1	Screw, SHCS, 10-32 UNF x 3/8"	
6	438110A	4	Knob Assembly, 10-32 UNF x 1 1/4"	
7	603021A	1	Sensor, Jam Switch Assembly, NO/NC, 26"	
8	9100374	2	Tabletop, Outer Fixture	
9	9104886A	2	Outfeed Roller Assembly	
10	9105150A	1	Material Guide, Extended Bracket, Right	
11	9105151A	1	Material Guide, Extended Bracket, Left	

Figure A-3: 9100374A –Inline Tabletop Assembly

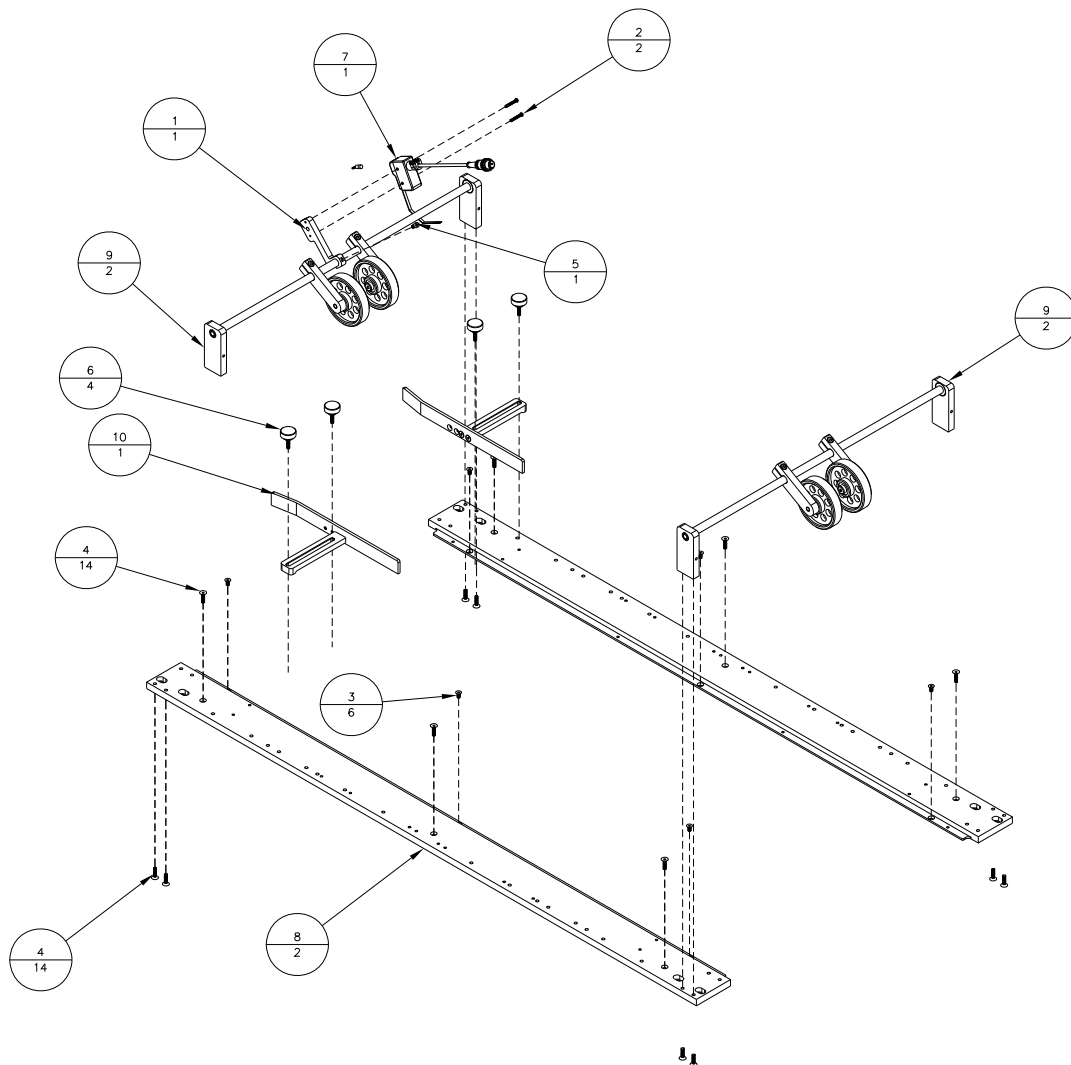
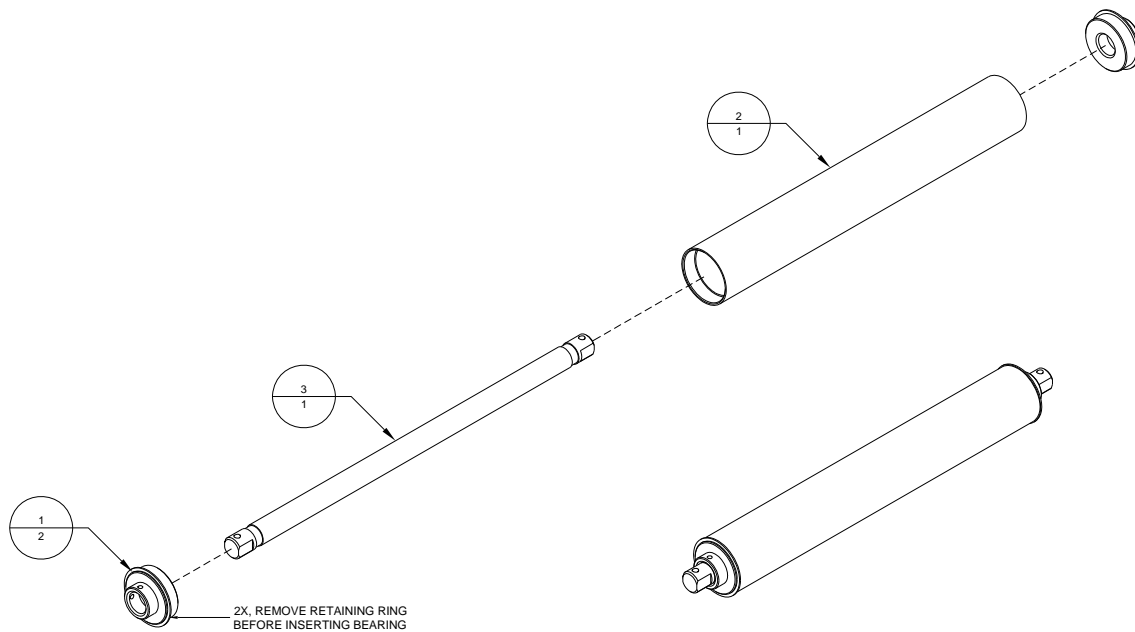


Table A-4: 9101031A – Take-up Roller Assembly

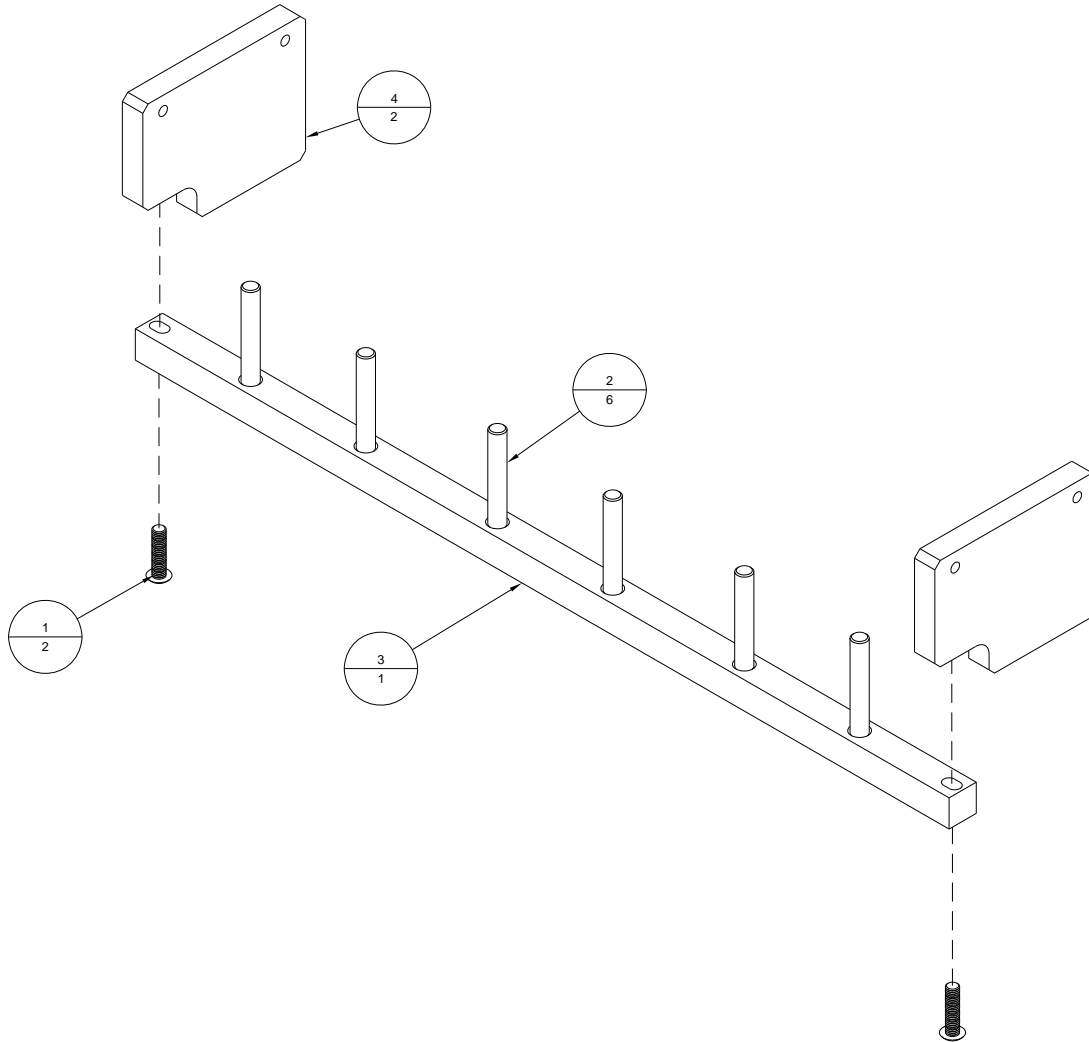
Item	Part Number	Quantity	Description	Reference
1	403550	4	Screw, BHCS, 8-32 UNC X 3/4"	
2	404550	2	Screw, BHCS, 10-32 UNF x 3/4"	
3	405240	2	Screw, SHCS, 1/4-20 UNC x 5/8"	
4	420007	4	Nut, 8-32 UNC	
5	438505	2	Knob, Tee, Black Plastic, 1/4 in Screw	
6	439009	4	Lockwasher, No. 10	
7	9103556	1	Material Guide Right, BK7IB	
8	9103557	1	Material Guide Left, BK7IB	
10	9103586	2	Material Guide Support, BK7IB	
11	9103587	2	Material Guide Block, BK7IB	
12	9104591	1	Material Guide Crossbar 23.75" Lg., BK7IB	

Figure A-4: 9101031A – Take-up Roller Assembly



*Table A-5: 9101038A – Belt Guide Assembly, BK71B*

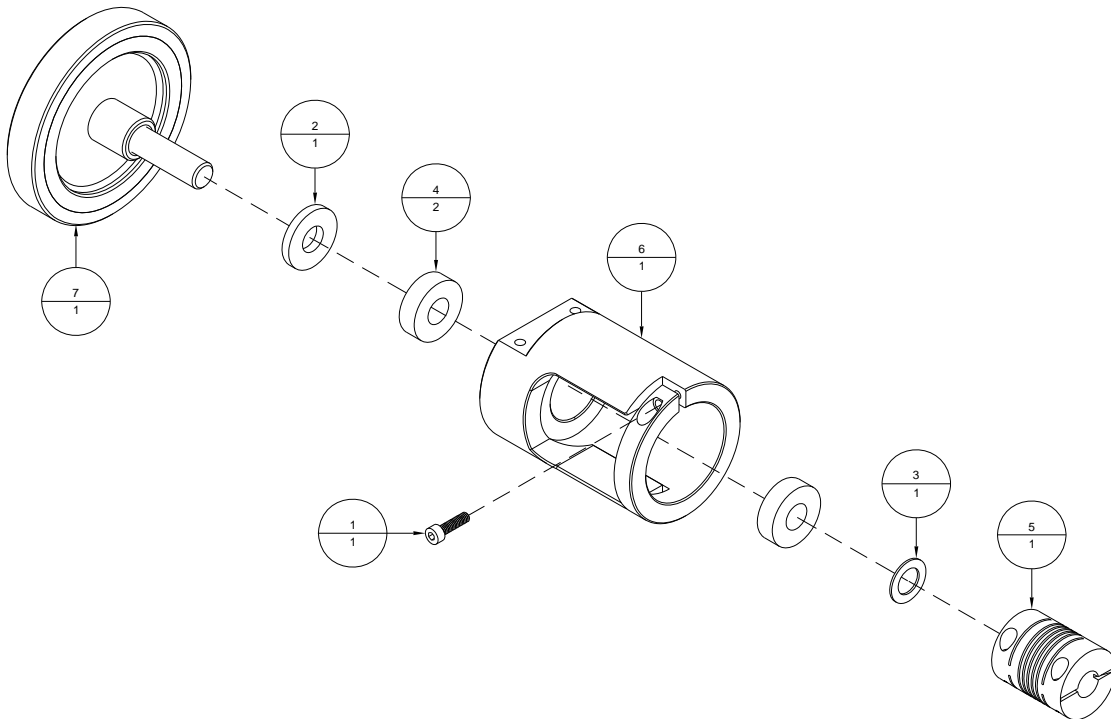
Item	Part Number	Quantity	Description	Reference
1	404550	2	Screw, BHCS, 10-32 UNF x 3/4"	
2	436348	6	Dowell Pin, 1/4" Dia. x 2" Long	
3	9103607	1	Support, Belt Guide Crossbar	
4	9103610	2	Belt Guide Mounting Block, BK71B	

*Figure A-5: 9101038A – Belt Guide Assembly, BK71B*

*Table A-6: 9103592A – Encoder Wheel Assembly, BK71B*

Item	Part Number	Quantity	Description	Reference
1	402230	1	Screw, SHCS, 6-32 UNC X 1/2"	
2	440020	1	Washer, 3/8" ID	
3	443830	1	Spacer Washer, 3/8 I.D. x 0.031 THK	
4	500020	2	Bearing, R6, 3/8 ID	
5	9102353	1	Helical Coupling, 3/8,1/2ID, 1OD	
6	9103592	1	Encoder Wheel Mount	
7	9103595A	1	Encoder Wheel, 2.88" OD	

*Figure A-6: 9103592A – Encoder Wheel Assembly, BK7IB*



**Note:** The encoder wheel changes with the required encoder resolution. The required encoder resolution depends on the print technology. By default, the BK71B is equipped with 660 DPI encoder resolution which utilizes 9103595A for the encoder wheel. This supports Apollo, Apollo-4C, and Atlas/Aurora 1250, 2250, and 3250 printheads. For systems that use 600 DPI (e.g. optional for Apollo, Apollo-4C, and Hyperion-DC), use encoder wheel 9105600A.



Table A-7: 9103594A – Kit, Encoder Wheel, BK7IB

Item	Part Number	Quantity	Description	Reference
1	402070	2	Screw, FHCS, 6-32 UNC x 1"	
2	402830	1	Screw, SHSS, 6-32 UNC x 1/2 in	
3	403040	2	Screw, FHCS, 8-32 UNC x 5/8"	
4	404050	2	Screw, FHCS, 10-32 UNF x 3/4"	
5	404270	2	Screw, SHCS, 10-32 UNC X 1"	
6	416140	1	Shoulder Bolt, 3/8" x 5/8", (5/16-18)	
7	439009	2	Lockwasher, No. 10	
8	440008	2	Washer, #10 ID	
9	455030	1	Ball Plunger, 1/4-20 UNC x 1/2" Long	
10	9103592A	1	Encoder Wheel Assembly, BK7IB	
11	9103596	1	Crossbar, Encoder Wheel, BK7IB	
12	9103618	1	Encoder Arm	
13	9103619	1	Encoder Arm Pivot Block	
14	9103633	1	Bushing, Brass, 3/8" ID x 1/2" OD x 3/8" Lg.	
15	9103713	1	Encoder Wheel Support Plate	
16	9104040	1	Spring, Compression, 3/8" I.D. X 1.25" L	

Figure A-7: 9103594A – Kit, Encoder Wheel, BK7IB

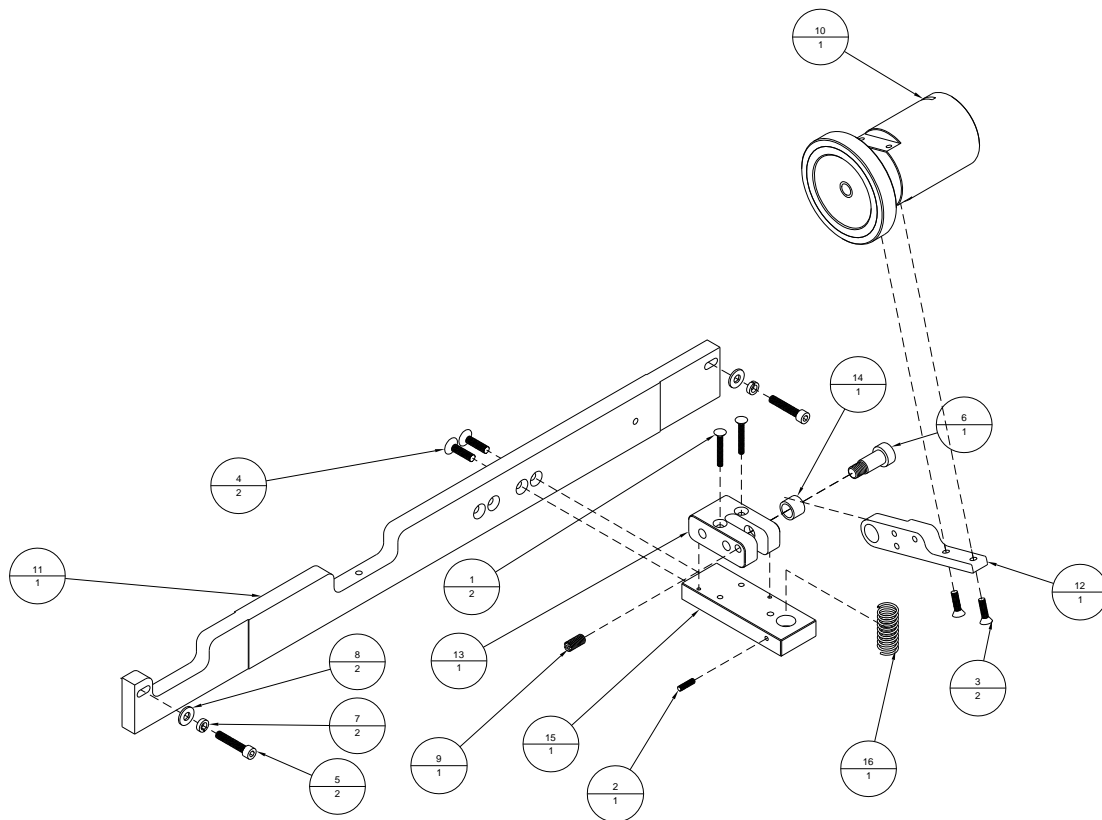


Table A-8: 9103734A – Blower Assembly Vacuum, 60Hz.

Item	Part Number	Quantity	Description	Reference
1	406250	4	Screw, SHCS, 5/16-18 UNC x 3/4"	
2	407275	4	Screw, SHCS, 3/8-16 UNC x 1 1/4"	
3	439015	4	Lockwasher, 5/16 I.D.	
4	439020	4	Lockwasher, 3/8" I.D.	
5	440015	4	Washer, 5/16" ID	
6	440020	4	Washer, 3/8" ID	
7	440511	4	Rubber Washer, 5/16" x 1 1/2 x 1/4	
8	606034	1	Cable, #16-3, SJOW-A (65" Long)	
9	609111	1	Terminal, Ring, #10, 16-14 AWG, Blue	
10	615131	1	Cable Clamp, 3/8", Metal	
11	9101480	1	Bracket, UV Exhaust Blower	
12	9103725	1	Reducer tube, 4" x 2.5"	
13	9103731	1	Clamp, 3-5/16" - 4-1/4"	
14	9103734	1	Blower, Exhaust/Vacuum, 60 Hz, CW-DB	

Figure A-8: 9103734A – Blower Assembly Vacuum, 60Hz.

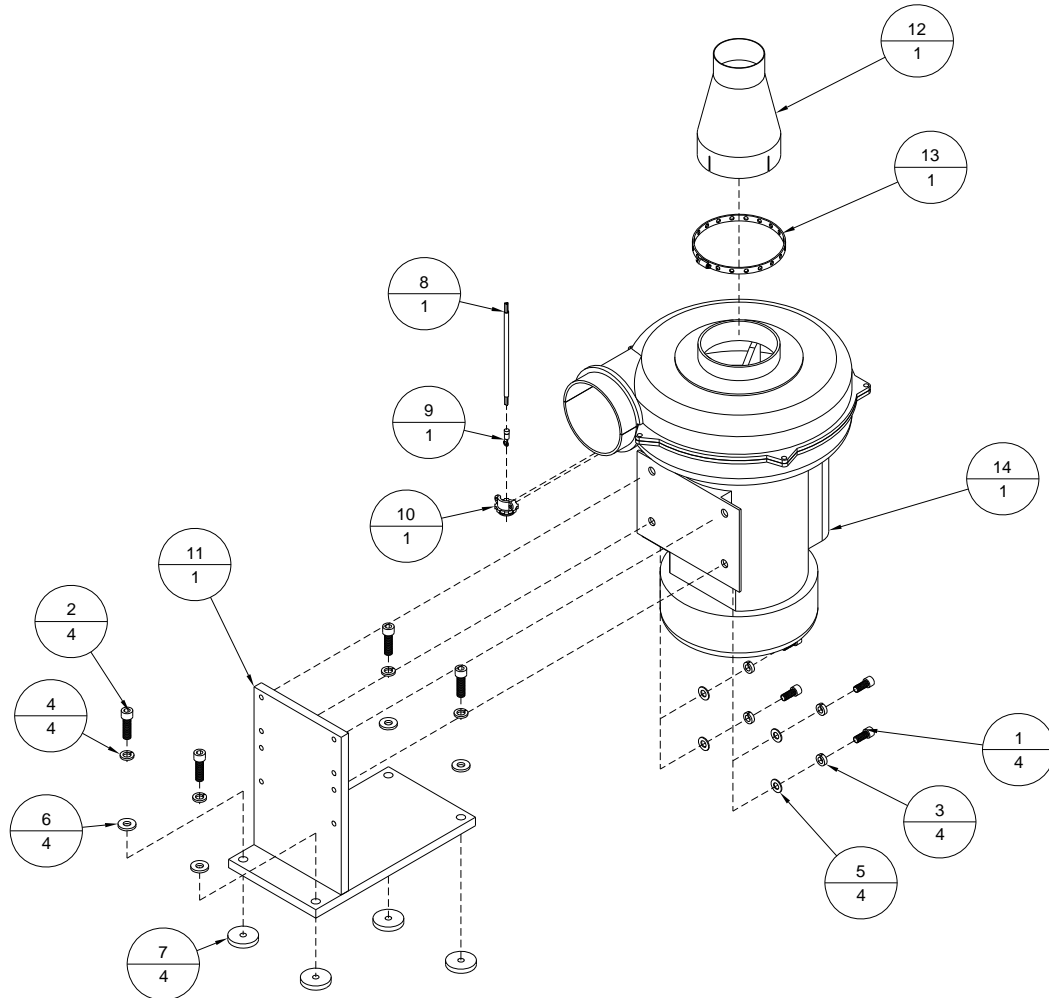


Table A-9: 9103735A – Blower Assembly Vacuum, 50Hz.

Item	Part Number	Quantity	Description	Reference
1	406250	4	Screw, SHCS, 5/16-18 UNC x 3/4"	
2	407275	4	Screw, SHCS, 3/8-16 UNC x 1 1/4"	
3	439015	4	Lockwasher, 5/16 I.D.	
4	439020	4	Lockwasher, 3/8" I.D.	
5	440015	4	Washer, 5/16" ID	
6	440020	4	Washer, 3/8" ID	
7	440511	4	Rubber Washer, 5/16" x 1 1/2 x 1/4	
8	606034	1	Cable, #16-3, SJOW-A (65" Long)	
9	609111	1	Terminal, Ring, #10, 16-14 AWG, Blue	
10	615131	1	Cable Clamp, 3/8", Metal	
11	9101480	1	Bracket, UV Exhaust Blower	
12	9103725	1	Reducer tube, 4" x 2.5"	
13	9103731	1	Clamp, 3-5/16" - 4-1/4"	
14	9103735	1	Blower, Exhaust/Vacuum, 50 Hz, CW-DB	

Figure A-9: 9103735A – Blower Assembly Vacuum, 50Hz.

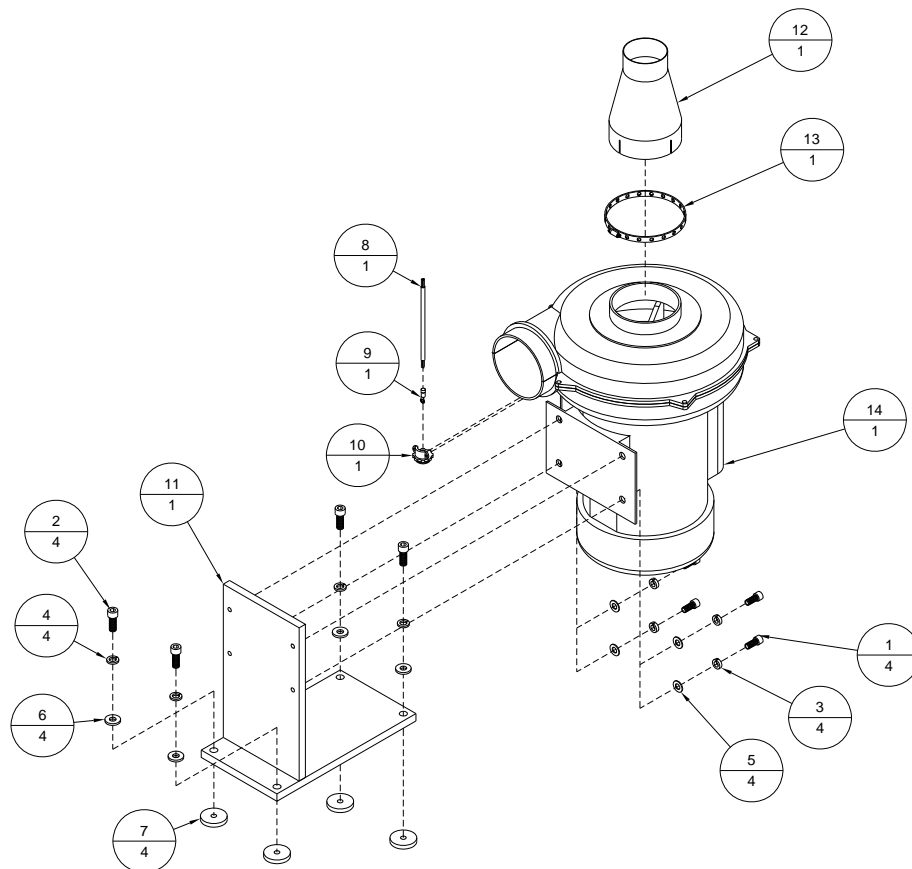


Table A-10: 9103800LA – Tabletop Assembly, BK7IB-2, Left

Item	Part Number	Quantity	Description	Reference
1	402510SS	9	Screw, BHCS, 6-32 UNC x 1/4" SS	
2	404050	8	Screw, FHCS, 10-32 UNF x 3/4"	
3	404510	16	Screw, BHCS, 10-32 UNF x 1/4"	
4	404520	6	Screw, BHCS, 10-32 UNF x 3/8"	
5	404570	4	Screw, BHCS, 10-32 UNF x 1"	
6	405250	4	Screw, SHCS, 1/4-20 UNC x 3/4"	
7	405530	8	Screw, BHCS, 1/4-20 UNC x 1/2"	
8	405830	2	Screw, SHSS, 1/4-20 UNC x 1/2"	
9	405997	2	Screw, RHMS, 1/4-20 UNC X 4"	
10	430250	1	Woodruff Key, #606, 3/16 X 3/4	
11	439009	16	Lockwasher, No. 10	
12	440010	2	Washer, 1/4" I.D.	
13	442530	4	Spacer Washer, 1/4 I.D. x 0.032 THK	
14	500055	4	Bearing, UBR-204-12S, 3/4" ID	
15	9100776	1	Inline Outfeed Guide Cover	
16	9101031A	1	Inline Roller	
17	9101033	4	Inline Drive Roller Mounting Block	
18	9101037	2	Take-up Shaft Guide Block	
19	9101038A	1	Take-Up Roller Assembly	
20	9101041	1	Inline Roller Shaft	
21	9101042	2	Roller Finger Guard	
22	9102600	2	Knob, Thumb, Knurled, 1/4-20 Thru	
23	9103530A	1	Belt, Flat, 1.865 x 114.5" Lg. (Set of 3)	
24	9103607A	1	Belt Guide Assembly, BK7IB	
25	9103719	1	Tray, Vacuum, 3G tabletop	
26	9103720	1	Fitting, Flange, 2.5"	
27	9103730	2	Clamp, 1-13/16" - 2-3/4"	
28	9103732	1	Hose, 2-1/2" I.D., 7" Lg.	
29	9103791	3	Belt Guide, 30" Lg., BK7IB Enhanced	
30	9103800	1	Inline Belt Tabletop w/3 Grooves	
31	9103907	1	Hole plug, Dome, 2.5"	
32	9104035	1	Valve, Vacuum Adjustment Plate, BK7IB-2	
33	9104599	1	Inline Roller Tube	
34	9104882A	1	Multi-V Pulley	

Figure A-10: 9103800LA – Tabletop Assembly, BK7IBL-2, Left

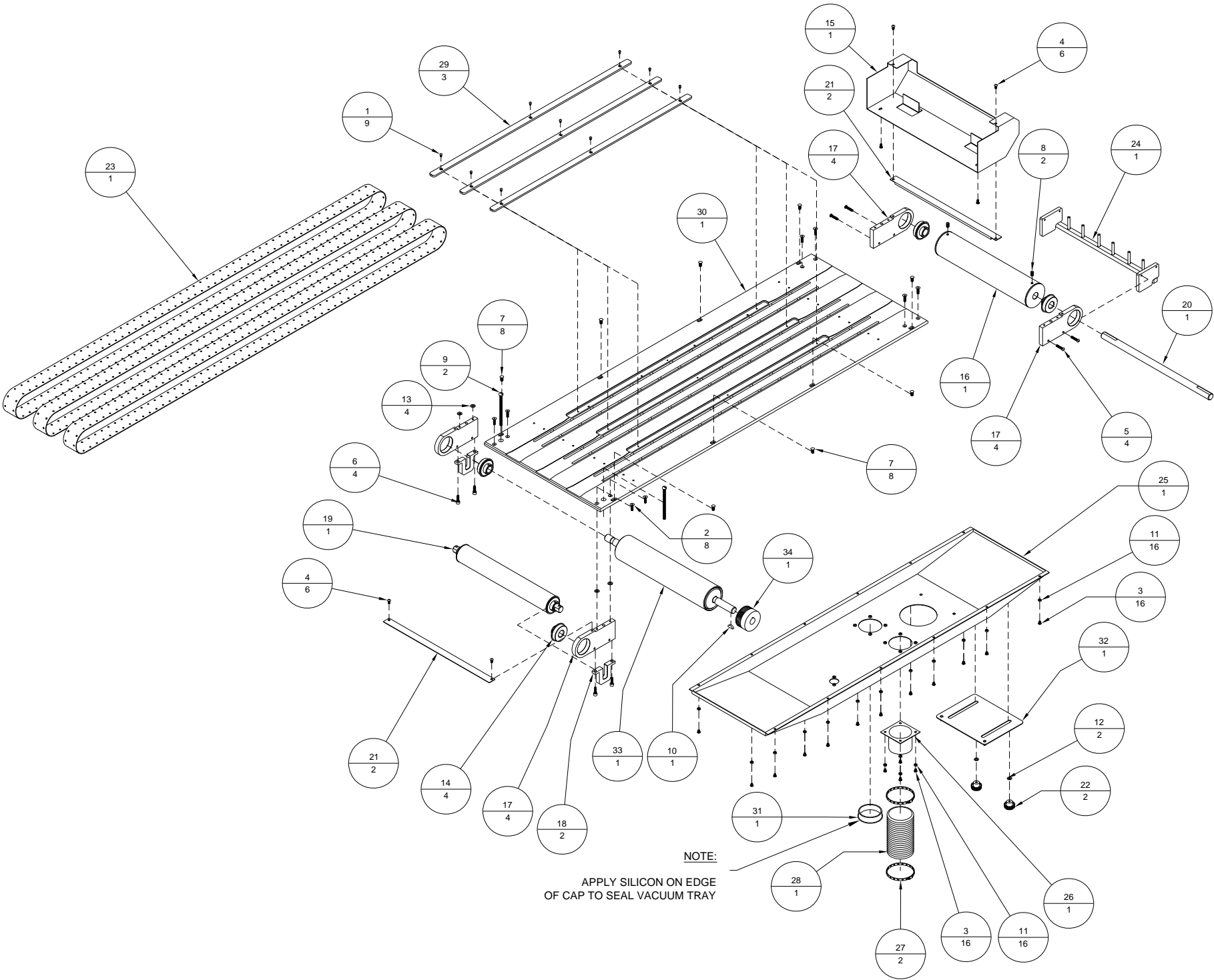


Table A-11: 9103800RA – Tabletop Assembly, BK7IB-2, Right

Item	Part Number	Quantity	Description	Reference
1	402510SS	9	Screw, BHCS, 6-32 UNC x 1/4" SS	
2	404050	8	Screw, FHCS, 10-32 UNF x 3/4"	
3	404510	16	Screw, BHCS, 10-32 UNF x 1/4"	
4	404520	6	Screw, BHCS, 10-32 UNF x 3/8"	
5	404570	4	Screw, BHCS, 10-32 UNF x 1"	
6	405250	4	Screw, SHCS, 1/4-20 UNC x 3/4"	
7	405530	8	Screw, BHCS, 1/4-20 UNC x 1/2"	
8	405830	2	Screw, SHSS, 1/4-20 UNC x 1/2"	
9	405997	2	Screw, RHMS, 1/4-20 UNC X 4"	
10	430250	1	Woodruff Key, #606, 3/16 X 3/4	
11	439009	16	Lockwasher, No. 10	
12	440010	2	Washer, 1/4" I.D.	
13	442530	4	Spacer Washer, 1/4 I.D. x 0.032 THK	
14	500055	4	Bearing, UBR-204-12S, 3/4" ID	
15	9100776	1	Inline Outfeed Guide Cover	
16	9101031A	1	Inline Roller	
17	9101033	4	Inline Drive Roller Mounting Block	
18	9101037	2	Take-up Shaft Guide Block	
19	9101038A	1	Take-Up Roller Assembly	
20	9101041	1	Inline Roller Shaft	
21	9101042	2	Roller Finger Guard	
22	9102600	2	Knob, Thumb, Knurled, 1/4-20 Thru	
23	9103530A	1	Belt, Flat, 1.865 x 114.5" Lg. (Set of 3)	
24	9103607A	1	Belt Guide Assembly, BK7IB	
25	9103719	1	Tray, Vacuum, 3G tabletop	
26	9103720	1	Fitting, Flange, 2.5"	
27	9103730	2	Clamp, 1-13/16" - 2-3/4"	
28	9103732	1	Hose, 2-1/2" I.D., 7" Lg.	
29	9103791	3	Belt Guide, 30" Lg., BK7IB Enhanced	
30	9103800	1	Inline Belt Tabletop w/3 Grooves	
31	9103907	1	Hole plug, Dome, 2.5"	
32	9104035	1	Valve, Vacuum Adjustment Plate, BK7IB-2	
33	9104599	1	Inline Roller Tube	
34	9104882A	1	Multi-V Pulley	

Figure A-11: 9103800RA – Tabletop Assembly, BK7IB-2, Right

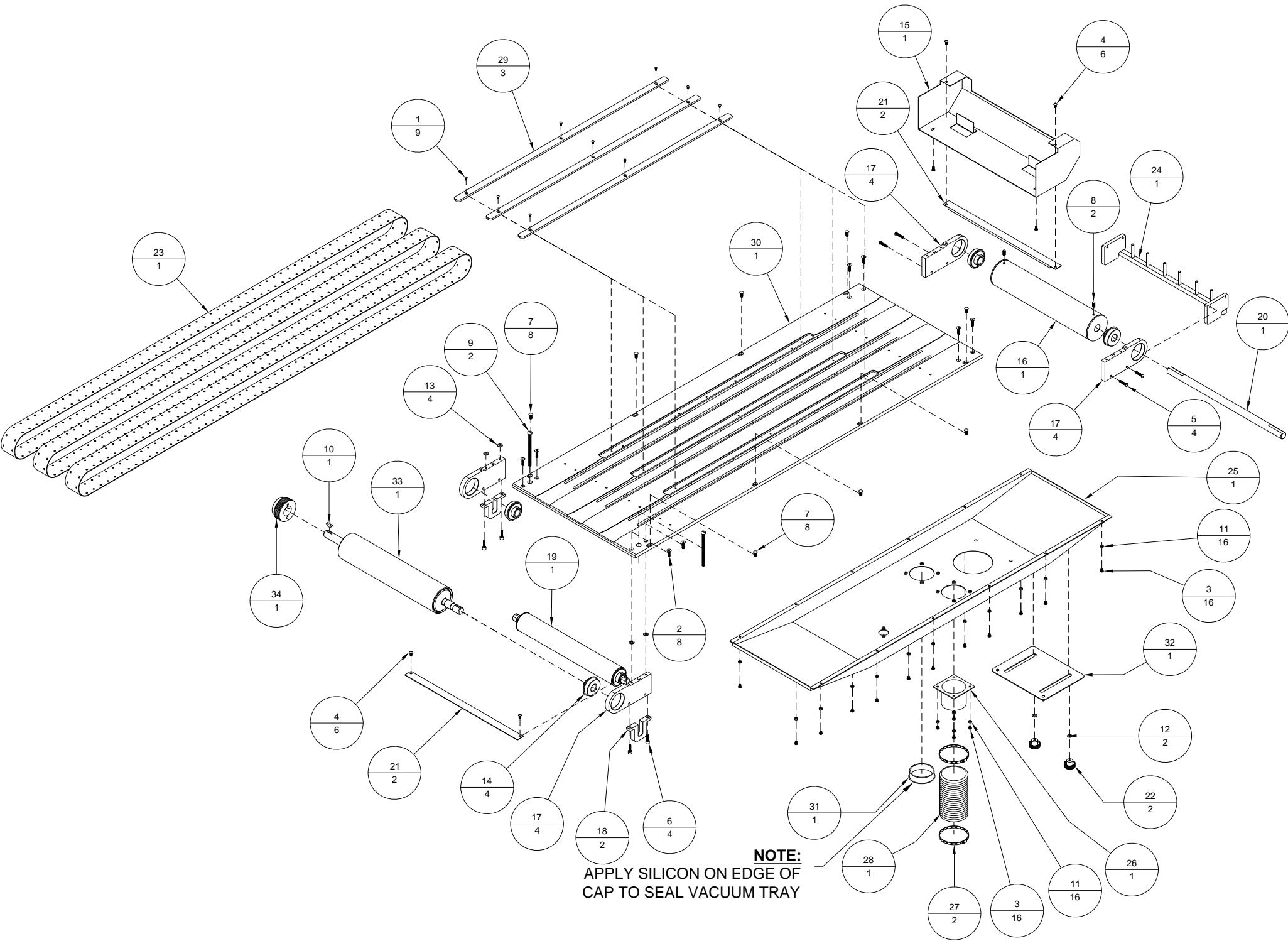


Table A-12: 9104027A – Front Panel Assembly, BK7IB-2

Item	Part Number	Quantity	Description	Reference
1	403510	4	Screw, BHCS, 8-32 UNC x 1/4"	
2	404510	10	Screw, BHCS, 10-32 UNF x 1/4"	
3	405550	2	Screw, BHCS, 1/4-20 UNC x 3/4"	
4	420008	3	Nut, 10-32 UNF	
5	439005	2	Lockwasher, No.8	
6	439009	3	Lockwasher, No. 10	
7	600005	1	DC Controller, 90 VDC	
8	700321	1	Cover, Dart Control	
9	9103875	1	Board, Dummy for Speed Control Board	
10	9104027	1	Front Panel, BK7IB-2	
11	9104032A	1	Terminal Block Assembly, Front, BK7IB-2	
12	9104121	1	AC Drive Controller, 230V, 1.5 Amps	
13	9104348A	1	Cable, Front Panel Power Switches, #1	
14	9104908A	1	Front Panel Access Assembly, BK7IB-2	
15	9104936	1	Bracket, AC Power Supply	

Figure A-12: 9104027A – Front Panel Assembly, BK7IB-2

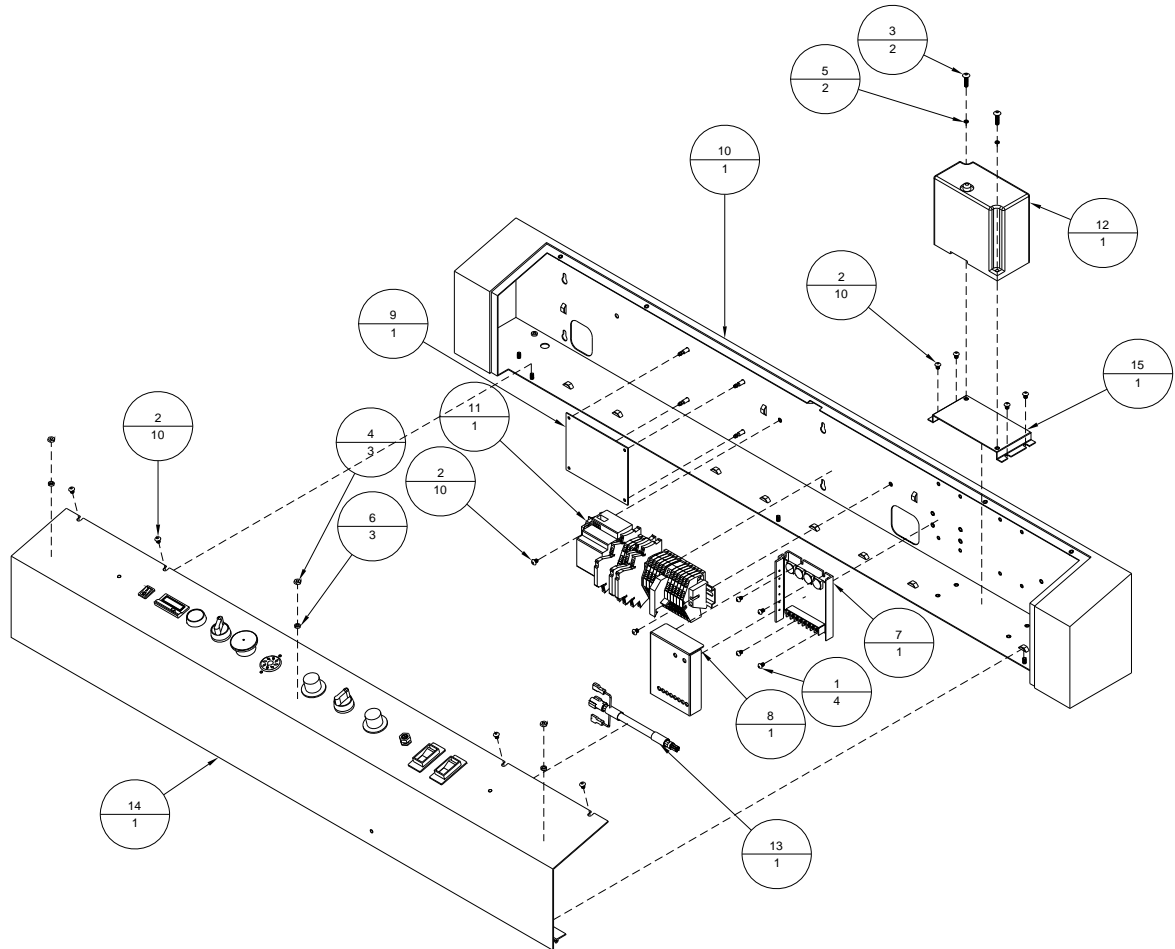




Table A-13: 9104032A – Terminal Block Assembly, Front, BK7IB-2

Item	Part Number	Quantity	Description	Reference
1	615021	1	T Rail, DIN, 10"	
2	9102050	11	Terminal Marker, WS 12/6, L	
3	9102299	4	Terminal Marker, WS 12/6, GND	
4	9103436	10	Terminal block, Z-roofstyle, ZDU 4-2/4AN	
5	9103437	4	Terminal block, Z-roofstyle, ground, ZPE 4-2/4AN	
6	9103438	2	End plate, ZAP ZDU 4-2/4AN	
7	9103439	2	Cross-connection, ZQV 4/2	
8	9103440	1	Fuse terminal, ZSI 2.5/2, 1/4 X 1 1/4, 10A	
9	9103442	4	End bracket, EW 35	
10	9103446	1	Fuse, 5A, 1/4" x 1-1/4"	
11	9103465	1	Power Supply, Switching, 12V	
12	9103685	3	Relay, 12 VDC, SPDT, Din Rail Mounting	

Figure A-13: 9104032A – Terminal Block Assembly, Front, BK7IB-2

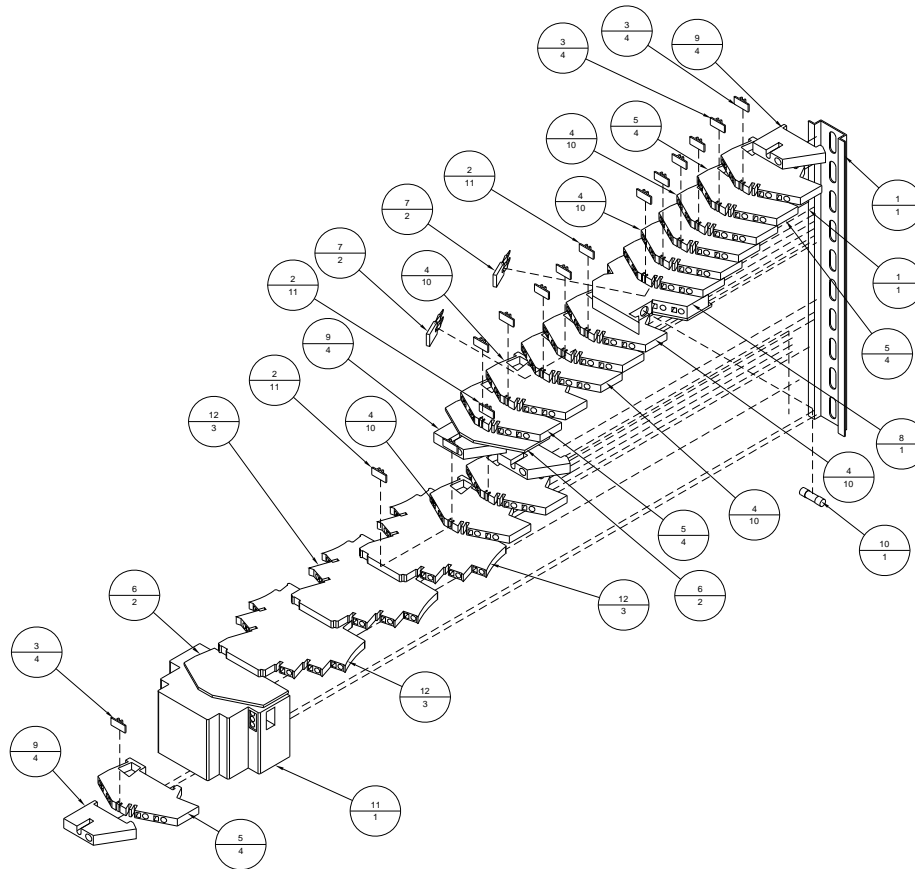
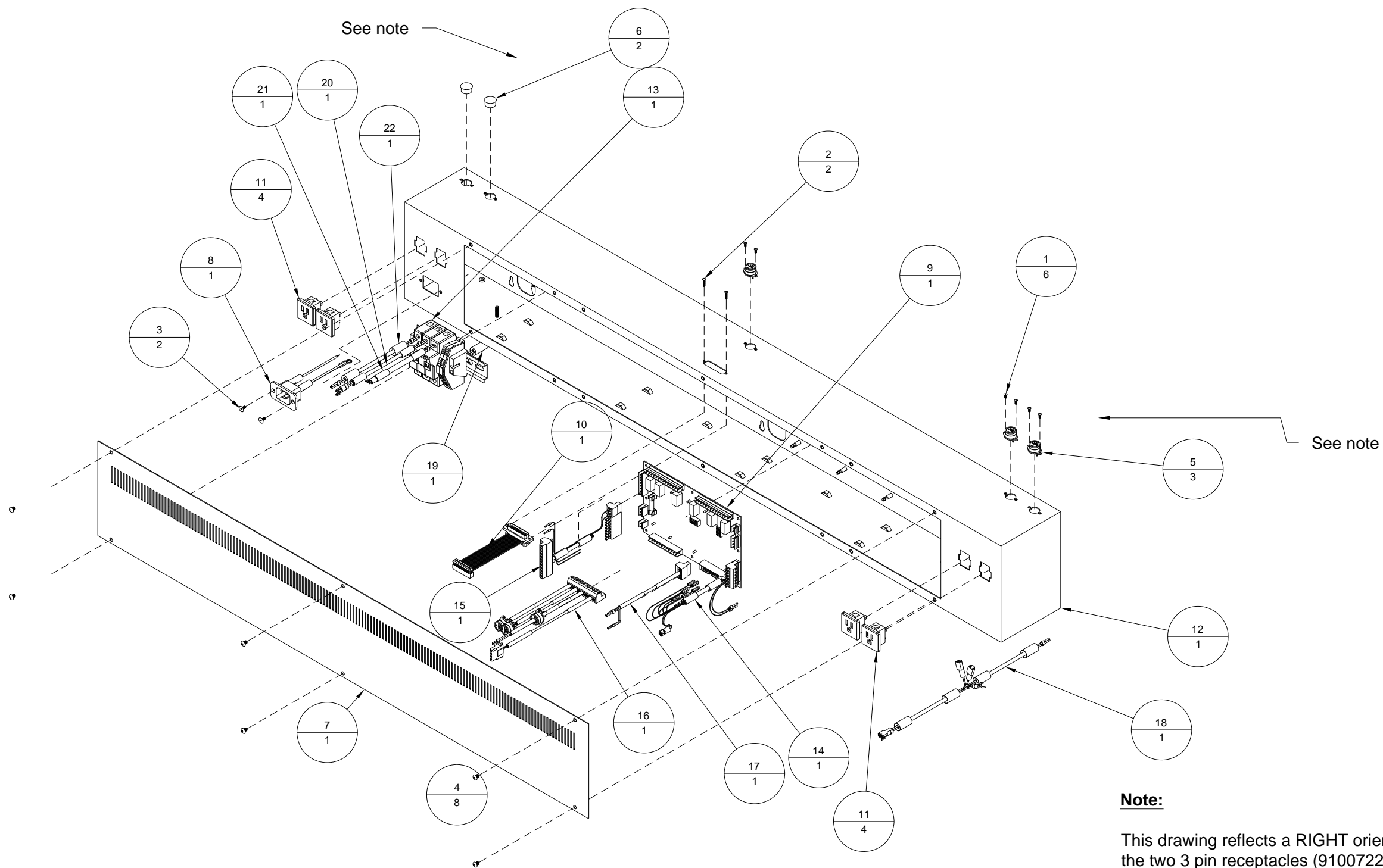


Table A-14: 9104033A – Rear Panel Assembly, BK7IB-2

Item	Part Number	Quantity	Description	Reference
1	401310	6	Screw, PHMS, 4-40 UNC x 1/4"	
2	401330	2	Screw, PHMS, 4-40 UNC x 1/2"	
3	402015	2	Screw, FHCS, 6-32 UNC x 5/16"	
4	404510	8	Screw, BHCS, 10-32 UNF x 1/4"	
5	9100722	3	Receptacle, Preh, Locking, 3-pin	
6	9101120	2	Hole Plug, Dome, 0.625"	
7	9101842	1	Cover, Rear Panel, BK7IB/BK750	
8	9102358A	1	Cable, IEC Receptacle	
9	9102380	1	Board, Base Control	
10	9102733A	1	Cable, Controller I/O Receptacle, 30"	
11	9103567	4	Socket, Straight blade, 15A/125VAC, Snap-in	
12	9104033	1	Rear Panel, BK7IB-2	
13	9104036A	1	Terminal Block Assembly, Rear HV, BK7IB-2	
14	9104140A	1	Cable, Front Panel, LV Controls, #14	
15	9104145	1	Cable, Power Supply, Speed Control To BCB, #12	
16	9104148A	1	Cable, Sensor Inputs To BCB, #18,28,29,30	
17	9104149A	1	Cable, Relay Control To BCB, #13	
18	9104341A	1	Cable, 115V Outlets To Fuse Blocks, Left, #21	
19	9104342A	1	Cable, 115V Outlets To Fuse Blocks, Right, #20	
20	9104343A	1	Cable, Transformer, Primary (Right), #33	
21	9104619A	1	Cable, Power From Transformer, #8	
22	9105616A	1	Cable, Main Power From Rear, #32	

Figure A-14: 9104033A – Rear Panel Assembly, BK7IB-2



**Note:**  
This drawing reflects a RIGHT orientation inline. For a left inline, the two 3 pin receptacles (9100722) are switched with the two hole plugs (9101120) at the opposite end of the panel.

*Table A-15: 9104079A – Stop Button, Mushroom Head, Red Illumination*

Item	Part Number	Quantity	Description	Reference
1	9104866	1	Pushbutton, Start, Momentary	
2	9104868	1	Bezel, Aluminum Raised	
3	9104872	1	LED, Red, 12VDC	
4	9104890	1	Cap, Red Lens	
5	9104928	1	Diffuser, EAO Type	

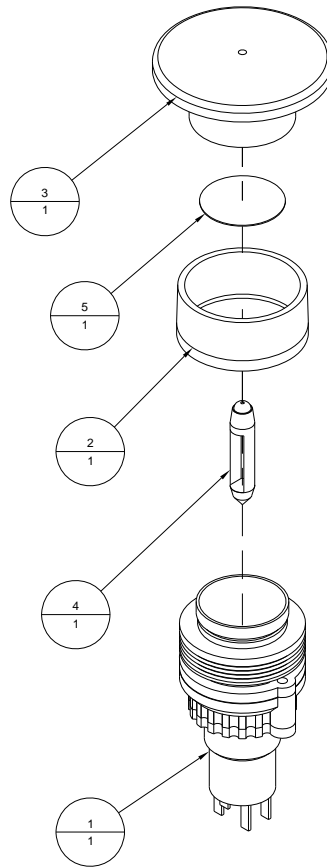
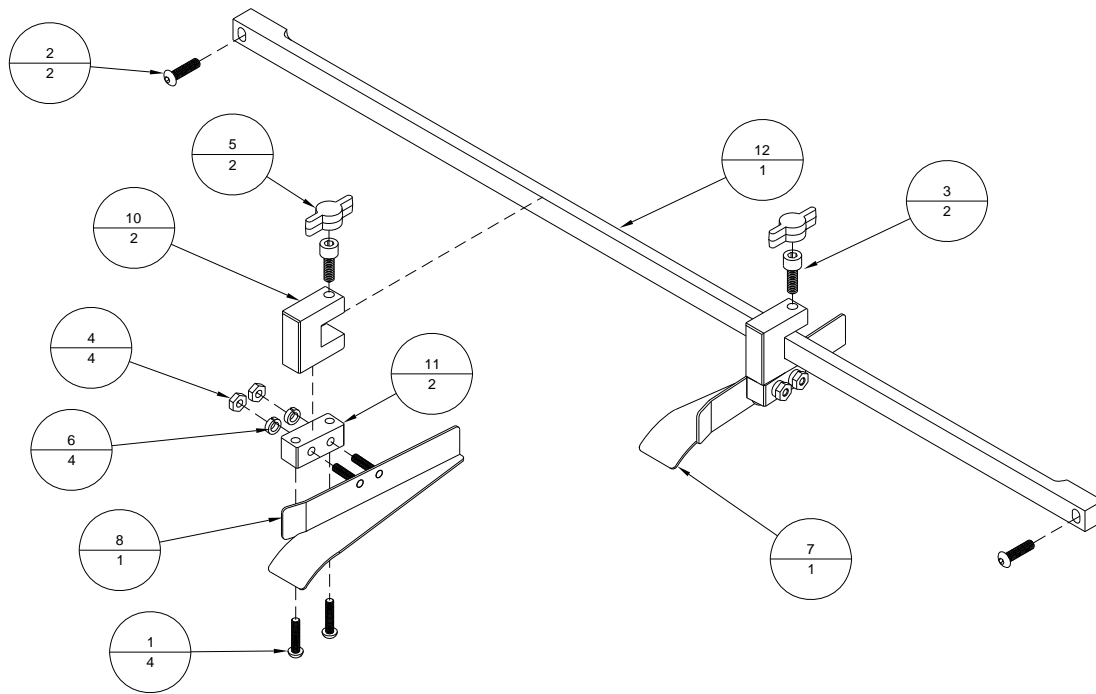
*Figure A-15: 9104079A – Stop Button, Mushroom Head, Red Illumination*

Table A-16: 9104591A – Material Guide Assembly, 23.75 Lg

Item	Part Number	Quantity	Description	Reference
1	403550	4	Screw, BHCS, 8-32 UNC X 3/4"	
2	404550	2	Screw, BHCS, 10-32 UNF x 3/4"	
3	405240	2	Screw, SHCS, 1/4-20 UNC x 5/8"	
4	420007	4	Nut, 8-32 UNC	
5	438505	2	Knob, Tee, Black Plastic, 1/4 in Screw	
6	439009	4	Lockwasher, No. 10	
7	9103556	1	Material Guide Right, BK7IB	
8	9103557	1	Material Guide Left, BK7IB	
10	9103586	2	Material Guide Support, BK7IB	
11	9103587	2	Material Guide Block, BK7IB	
12	9104591	1	Material Guide Crossbar 23.75" Lg., BK7IB	

Figure A-16: 9104591A –Material Guide Assembly, 23.75" Lg



*Table A-17: 9104601A – Inline Motor Tensioner Assembly*

Item	Part Number	Quantity	Description	Reference
1	106100	1	Belt Alignment Tube	
2	406530	1	Screw, BHCS, 5/16-18 UNC X 1/2 in	
3	416160	1	Shoulder Bolt, 3/8" x 7/8", (5/16-18)	
4	416175	1	Shoulder Bolt, 3/8" x 1 1/4", (5/16-18)	
5	440021	1	Brass Washer, 3/8" ID	
6	500020	2	Bearing	
7	505110	2	Bushing, Flange, 3/8" ID x 1/2" OD x 3/8" Lg.	
8	9103727	1	Washer, Fiber, 3/8" I.D. 1/2" O.D. 1/32" THK	
9	9104601	1	Arm, Pivot	

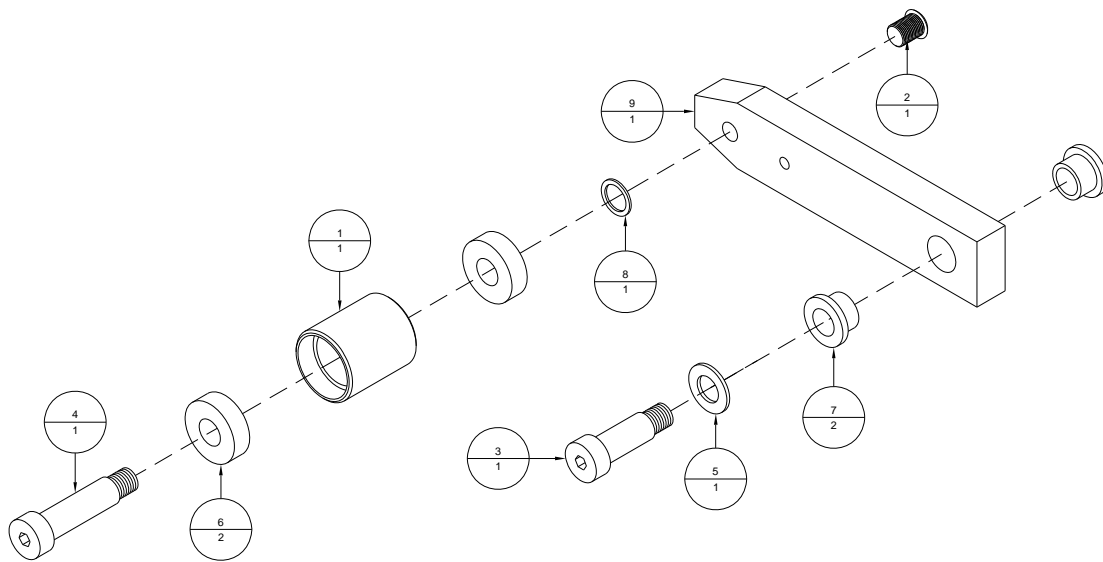
*Figure A-17: 9104601A – Inline Motor Tensioner Assembly*

Table A-18: 9104637LA – Inline AC Motor Assembly, Left

Item	Part Number	Quantity	Description	Reference
1	404275	1	Screw, SHCS, 10-32 UNF x 1 1/4	
2	407230	4	Screw, SHCS, 3/8-16 UNC x 1/2"	
3	407282	2	Screw, SHCS, 3/8-16 UNC x 1 3/4"	
4	433160	1	Keystock, 3/16 X 1"	
5	609101	4	Marrette, #16	
6	615131	1	Cable Clamp, 3/8", Metal	
7	9100394	1	Inline Motor Mounting Bar	
8	9101665	1	Encoder Wheel Extension Spring	
9	9102247	1	Shrink Wrap, 1/2" I.D.	
10	9103435	4	Ferrule, #16 AWG, Red	
11	9103993	1	Dowel pin, 1/4" DIA., 0.625" long.	
12	9104122	1	AC Drive Motor, 0.5 Hp	
13	9104346	1	Cable, #16-4, Unshielded, 46.5", Total	
14	9104600	1	Inline Motor Mounting Plate	
15	9104601A	1	Tensioner, Inline Motor Assembly	
16	9104633	1	Pulley, 1.5" OD. 3/4" ID.	

Figure A-18: 9104637LA – Inline AC Motor Assembly, Left

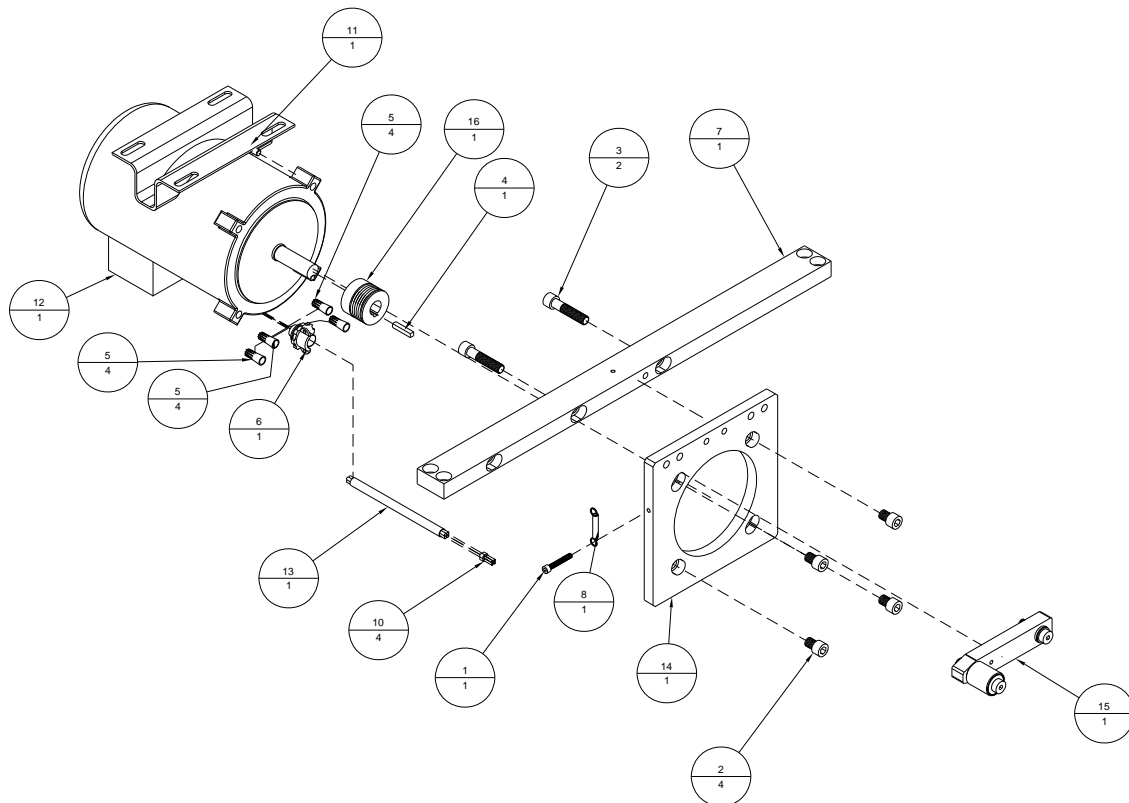


Table A-19: 9104637RA – Inline AC Motor Assembly, Right

Item	Part Number	Quantity	Description	Reference
1	404275	1	Screw, SHCS, 10-32 UNF x 1 1/4	
2	407230	4	Screw, SHCS, 3/8-16 UNC x 1/2"	
3	407280	2	Screw, SHCS, 3/8-16 UNC x 1 1/2"	
4	433160	1	Keystock, 3/16 X 1"	
5	609101	4	Marrette, #16	
6	615131	1	Cable Clamp, 3/8", Metal	
7	9100394	1	Inline Motor Mounting Bar	
8	9101665	1	Encoder Wheel Extension Spring	
9	9102247	1	Shrink Wrap, 1/2" I.D.	
10	9103435	4	Ferrule, #16 AWG, Red	
11	9103993	1	Dowel pin, 1/4" DIA., 0.625" long.	Page A-13
12	9104122	1	AC Drive Motor, 0.5 Hp	
13	9104346	1	Cable, #16-4, Unshielded, 46.5", Total	
14	9104600	1	Inline Motor Mounting Plate	
15	9104601A	1	Tensioner, Inline Motor Assembly	
16	9104633	1	Pulley, 1.5" OD. 3/4" ID.	

Figure A-19: 9104637RA – Inline AC Motor Assembly, Right

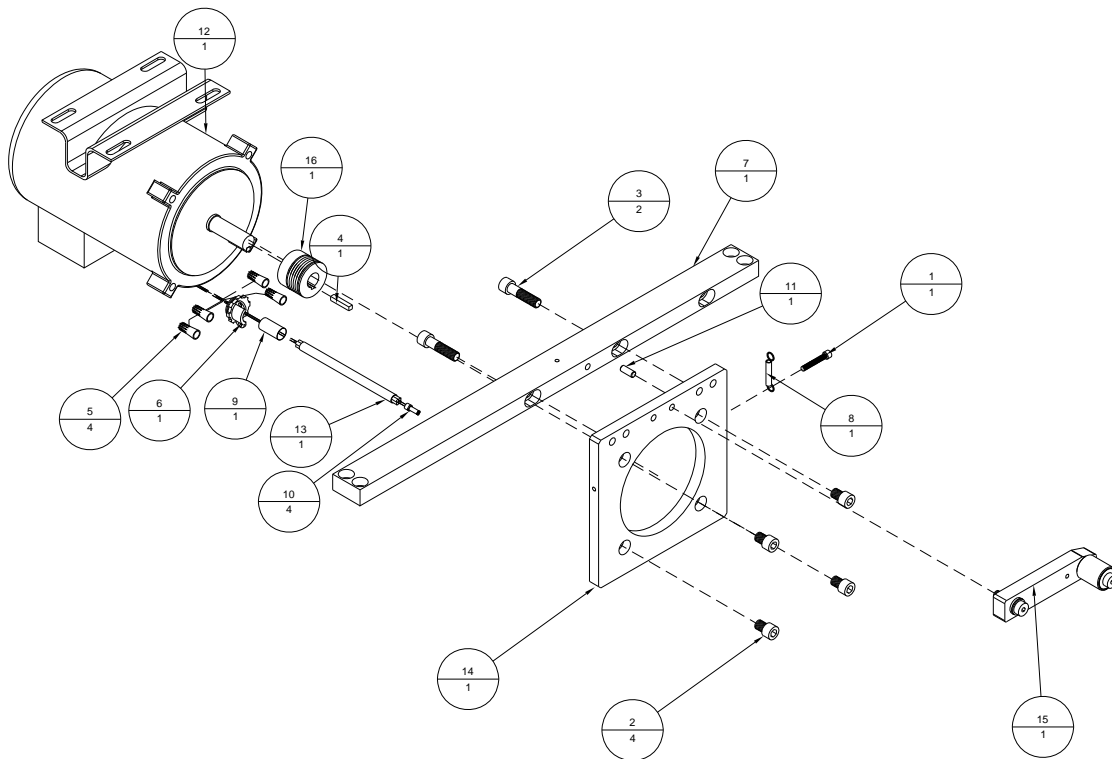
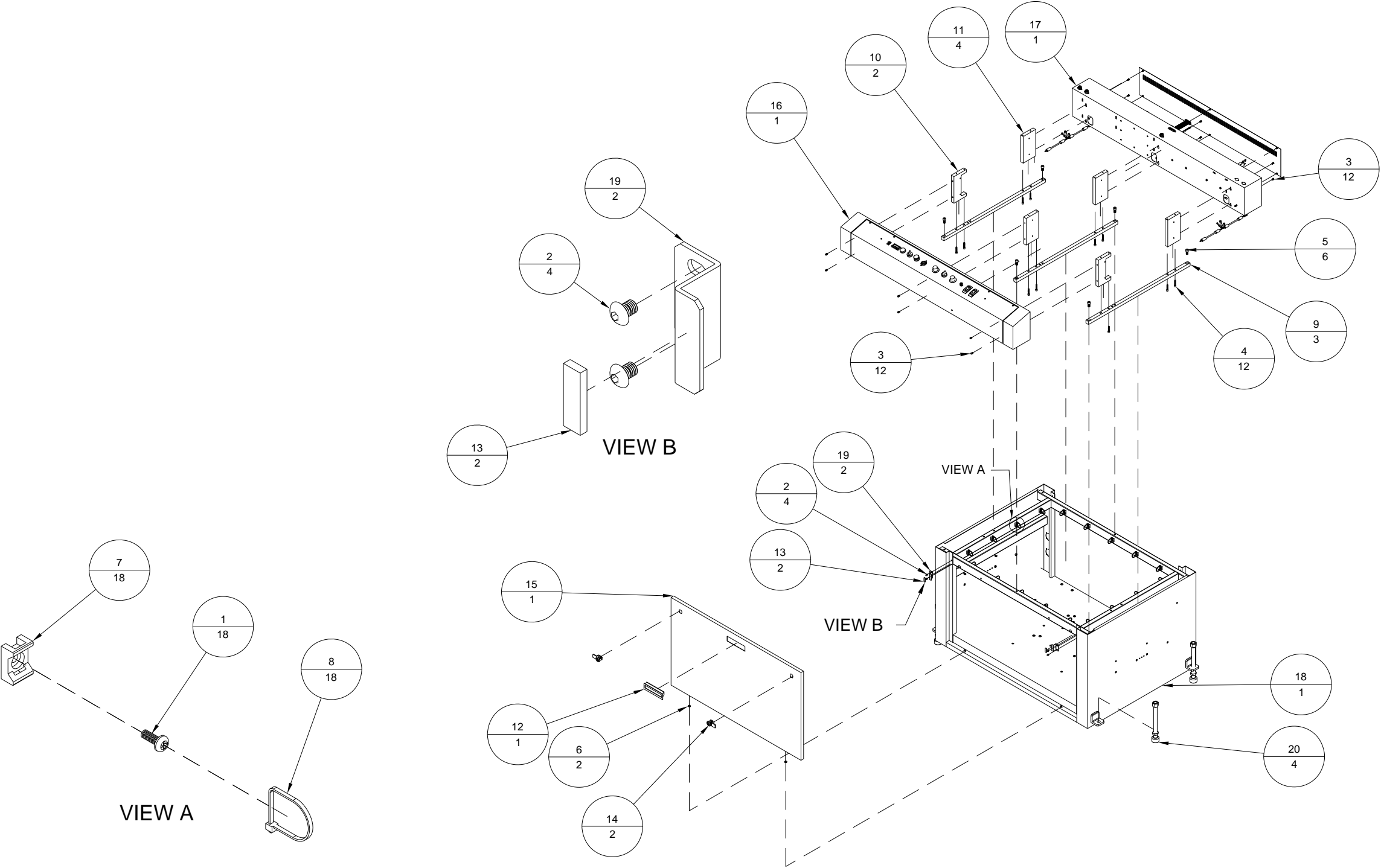




Table A-20: 9104761A – Base Cabinet Assembly, BK7IB-2

Item	Part Number	Quantity	Description	Reference
1	404331	18	Screw, PHMS, 10-32 UNF x 1/2", RT	
2	404510	4	Screw, BHCS, 10-32 UNF x 1/4"	
3	404520	12	Screw, BHCS, 10-32 UNF x 3/8"	
4	405275	12	Screw, SHCS, 1/4-20 UNC x 1 1/4"	
5	407250	6	Screw, SHCS, 3/8-16 UNC x 3/4"	
6	440510	2	Rubber Washer, 1/4" I.D.	
7	615102	18	Tie mount	
8	615140	18	Lashing tie	
9	9100371	3	Inline mounting bar	
10	9100372	2	Inline Tabletop Support	
11	9100392	4	Inline main tabletop support	
12	9101640	1	Handle, Panel Snap Style	
13	9101644	2	Sponge Rubber Weather-Stripping	
14	9103789	2	Latch, Quarter turn, 51 mm	
15	9103792	1	Door, Base Cabinet	
16	9104027A	1	Front Panel Assembly, BK7IB-2	
17	9104033A	1	Rear Panel Assembly, BK7IB-2	
18	9104757A	1	Base, Inline, BK7IB/BK750	
19	9104767	2	Door Catch	
20	9104834A	4	Levelling Leg Assembly	

Figure A-20: 9104761A – Base Cabinet Assembly, BK7IB-2



*Table A-21: 9104834A – Levelling Leg Assembly*

Item	Part Number	Quantity	Description	Reference
1	343010	1	Base Mounting Foot	
2	343016	1	Jam Nut, 3/4-10 UNC	
3	405260	1	Screw, SHCS, 1/4-20 UNC x 7/8"	
4	9104815	1	Levelling Leg Assembly	

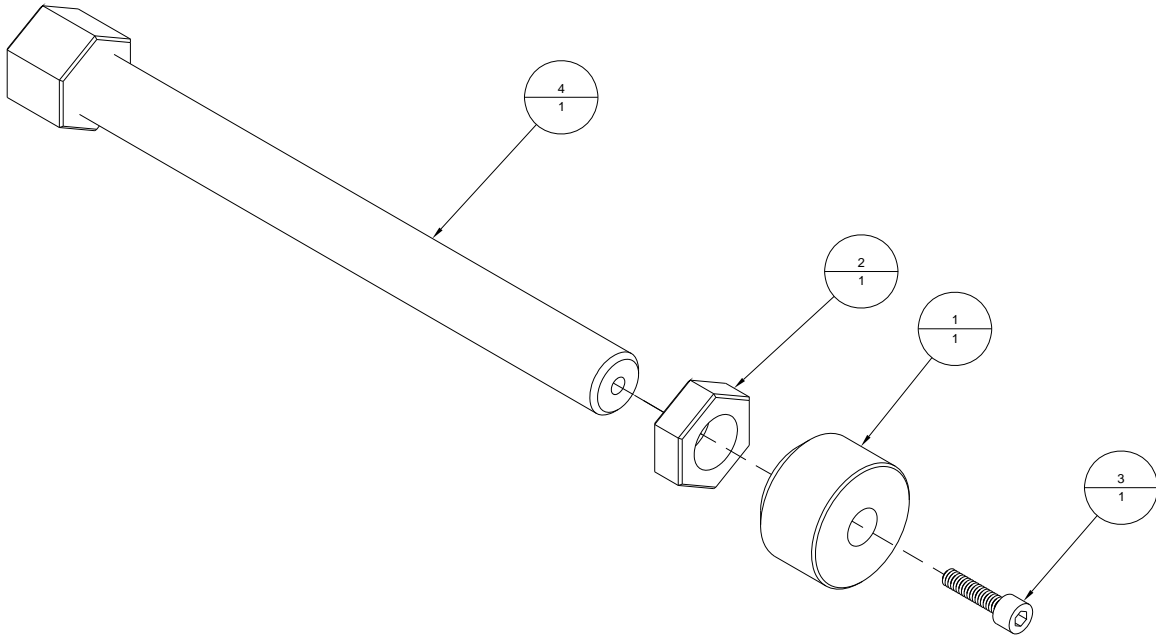
*Figure A-21: 9104834A – Levelling Leg Assembly*

Table A-22: 9104886A – Outfeed Roller Assembly

Item	Part Number	Quantity	Description	Reference
1	106182	2	Pressure Roller	
2	203302	2	Outfeed Roller Arm	
3	330309	2	Outfeed Roller Bracket	
4	405250	2	Screw, SHCS, 1/4-20 UNC x 3/4"	
5	416170	2	Shoulder Bolt, 3/8" x 1" (5/16-18)	
6	443830	2	Spacer Washer, 3/8 I.D. x 0.031 THK	
7	500020	6	Bearing, R6, 3/8 ID	
8	9104590	1	Shaft, 0.5" x 23.75" Lg.	

Figure A-22: 9104886A – Outfeed Roller Assembly

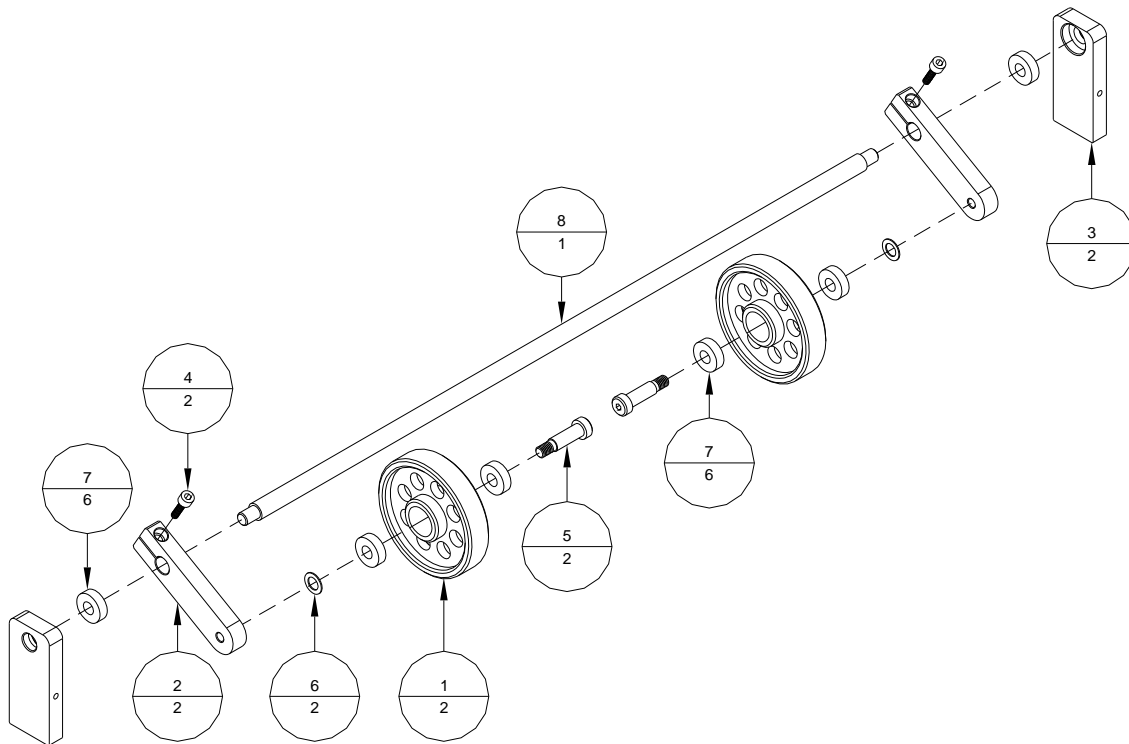
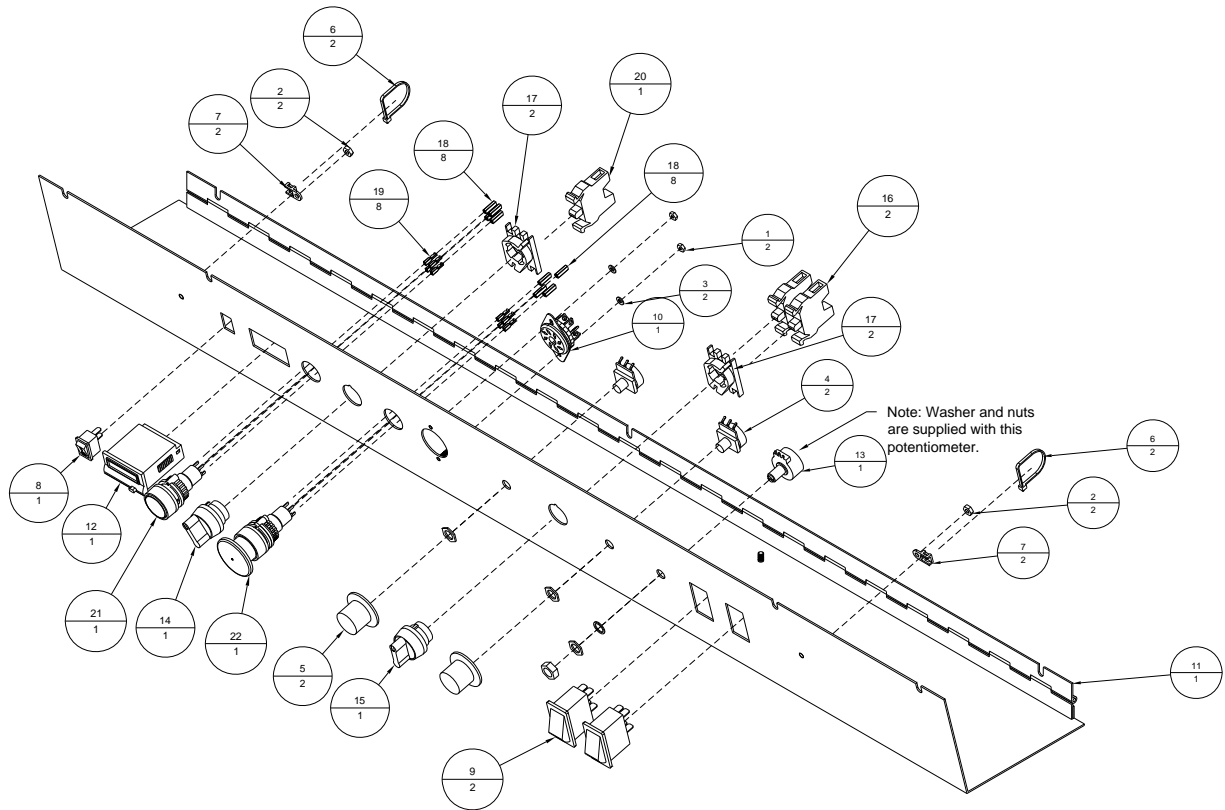


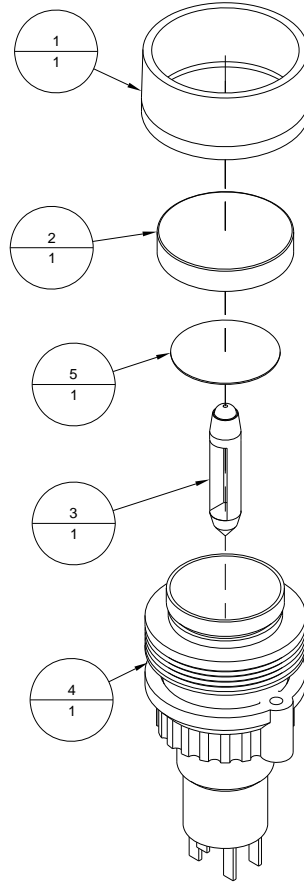
Table A-23: 9104908A – Front Panel Access Assembly, BK7IB-2

Item	Part Number	Quantity	Description	Reference
1	420006	2	Nut, 6-32 UNC	
2	420007	2	Nut, 8-32 UNC	
3	440005	2	Washer, #6, I.D.	
4	600011	2	Potentiometer, 5k Ohm, 1/4 Watt	
5	613002	2	Knob, 36mm Skirted	
6	615140	2	Lashing Tie, Small	
7	9100728	2	Tie Anchor Mount, #8 Screw	
8	9102422	1	Switch, Rocker, 125VAC/4A, 250VAC/2A	
9	9102601	2	Switch, Rocker, 250VAC/10A, DPST, LTIGK51	
10	9103967	1	Connector, 8-Octal, Standard Socket, Type S	
11	9104028	1	Front Panel Access Door, BK7IB-2	
12	9104063	1	Counter, LCD Front Panel Mount, Black, NPN	
13	9104636	1	Potentiometer, Stack	
14	9104873	1	Switch, Run/Jog, 2 Positions, Maintained Action	
15	9104874	1	Switch, Mode, 3 Positions, ON-OFF-ON	
16	9104875	2	Contact, N/O, Block, Series 44	
17	9104876	2	Adapter, Front Mounting	
18	9104877	8	Sleeve, Insulation, For Flat Receptacle 31-945	
19	9104879	8	Receptacle, Flat, For Universal Terminal	
20	9104883	1	Contact, N/C, Block, Series 44	
21	9104978A	1	Push Button, Green, Start Assembly	
22	9104979A	1	Push Button, Red, Stop	

*Figure A-23: 9104908A – Front Panel Access Assembly, BK7IB-2*

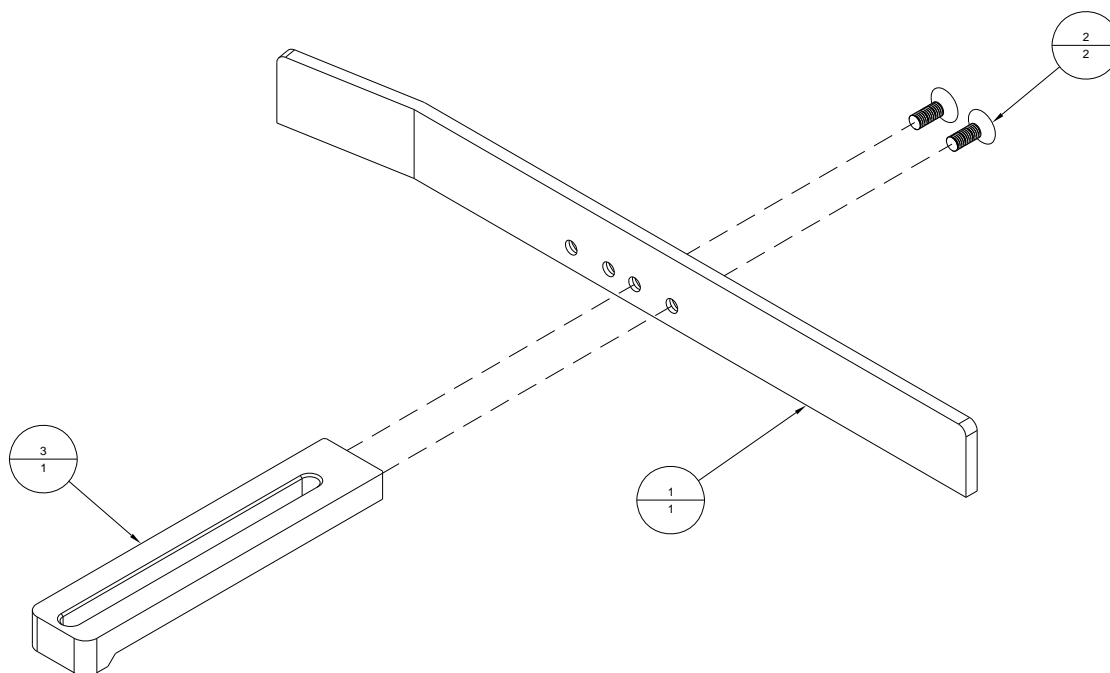
*Table A-24: 9104978A – Pushbutton, Start, Green Illuminated*

Item	Part Number	Quantity	Description	Reference
1	9104868	1	Bezel, Aluminum Raised	
2	9104869	1	Cap, Green Lens	
3	9104871	1	LED, Green, 12 VDC	
4	9104885	1	Pushbutton, Start	
5	9104928	1	Diffuser, EAO Type	

*Figure A-24: 9104978A – Pushbutton, Start, Green Illuminated*

*Table A-25: 9105150A – Material Guide Assembly, Right, Extended*

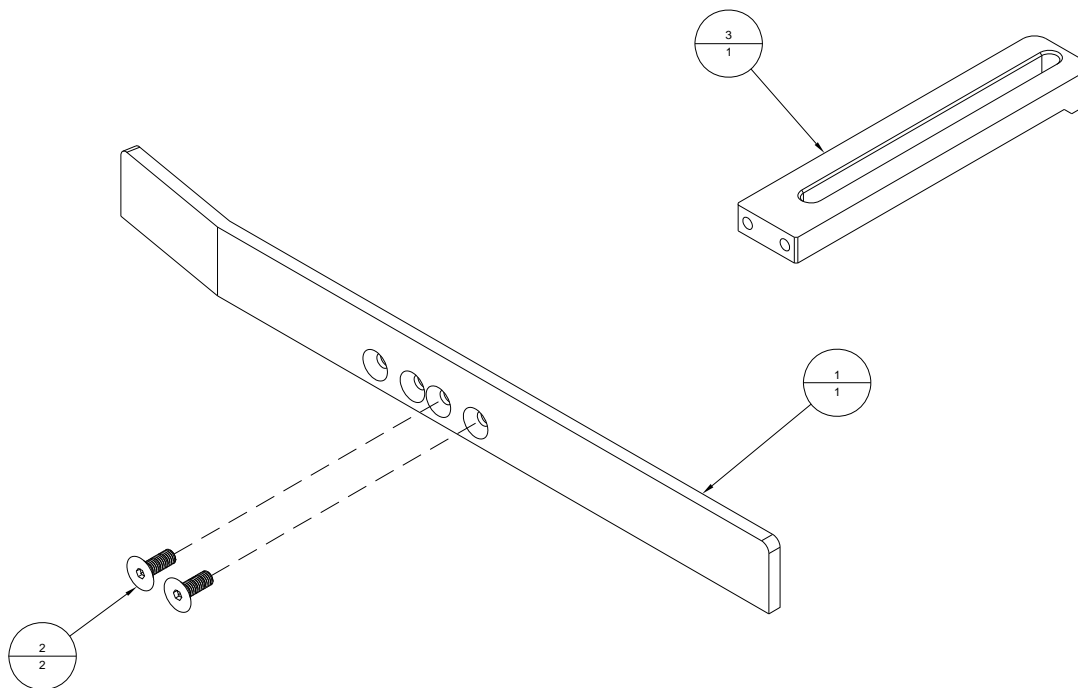
Item	Part Number	Quantity	Description	Reference
1	212301	1	Right Material Guide	
2	404030	2	Screw, FHCS, 10-32 UNF x 1/2"	
3	9103726	1	Side Guide Bracket, Extended	

*Figure A-25: 9105150A – Material Guide Assembly, Right, Extended*



*Table A-26: 9105151A – Material Guide Assembly, Left, Extended*

Item	Part Number	Quantity	Description	Reference
1	212300	1	Left Material Guide	
2	404030	2	Screw, FHCS, 10-32 UNF x 1/2"	
3	9103726	1	Side Guide Material, Extended	

*Figure A-26: 9105151A – Material Guide Assembly, Left, Extended*

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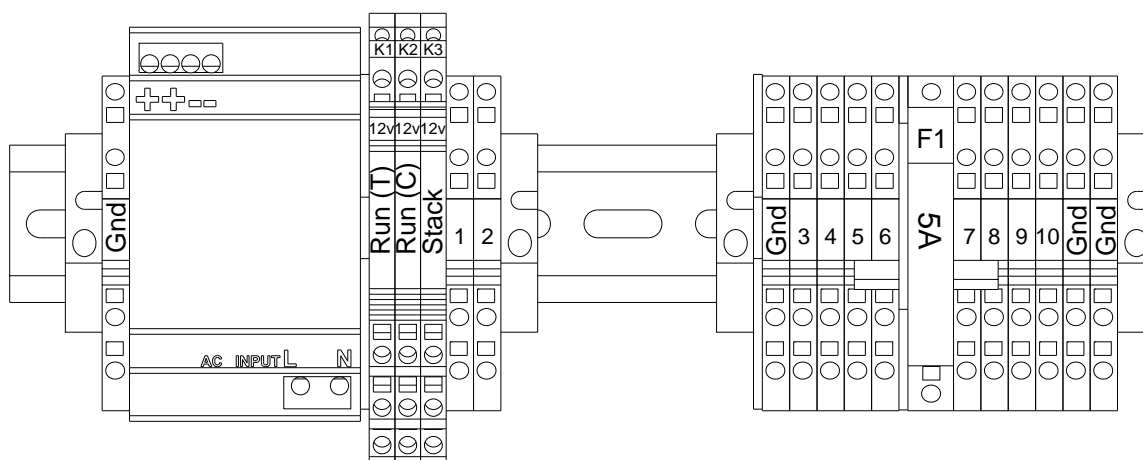
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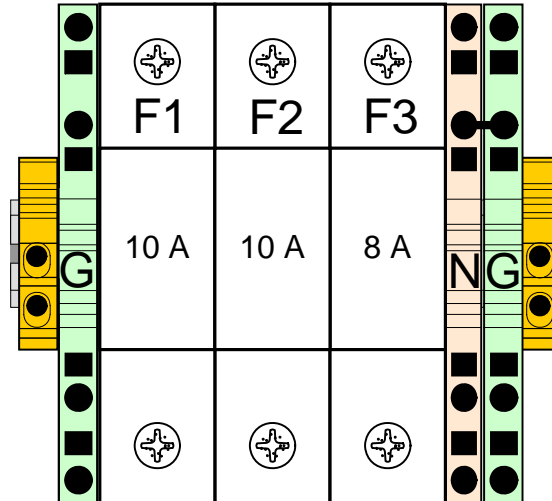
Table B-1: Terminal Block Assembly, Front, BK7IB-2, (9104032A).....B-1

Table B-2: Terminal Block Assembly, 220VAC (9104036A).....B-2

Figure B-1: *Terminal Block Assembly, Front, BK7IB-2 (9104032A)*Table B-1: *Terminal Block Assembly, Front, BK7IB-2, (9104032A)*

Symbol	Part Number	Function	Part Description
Gnd	9103437	Earth Ground.	Terminal block, Z-roofstyle, ground, ZPE 4-2/4AN
N Gnd L	9103465	Neutral and Line Power to +12VDC supply.	Power Supply -12v, Wiedmuller, 9928890012
Run (T)	9103685	Run Relay, Base Motor Control	Relay, 12 VDC, SPDT, Din Rail Mounting
Run (C)	9103685	Run Relay, Conveyor Motor Control.	Relay, 12 VDC, SPDT, Din Rail Mounting
Stack	9103685	Stack Relay.	Relay, 12 VDC, SPDT, Din Rail Mounting
1	9103436	Function for Conveyor Speed. Lo wires.	Terminal block, Z-roofstyle, ZDU 4-2/4AN
2	9103436	Function for Conveyor Speed Run Control (Hi).	Terminal block, Z-roofstyle, ZDU 4-2/4AN
Gnd	9103437	Earth Ground	Terminal block, Z-roofstyle, ground, ZPE 4-2/4AN
3	9103436	Neutral - from Blower switch to Blower.	Terminal block, Z-roofstyle, ZDU 4-2/4AN
4	9103436	Line – from Blower switch to Blower.	Terminal block, Z-roofstyle, ZDU 4-2/4AN
5	9103436	Neutral – Power from main switch.	Terminal block, Z-roofstyle, ZDU 4-2/4AN
6	9103436	Neutral – Power from main switch.	Terminal block, Z-roofstyle, ZDU 4-2/4AN
F1	9103440	Fuse – Power for Conveyor (Line).	Fuse terminal, ZSI 2.5/2, 1/4 X 1 1/4, 10A
7	9103436	Line – Power from main switch.	Terminal block, Z-roofstyle, ZDU 4-2/4AN
8	9103436	Line – Power from main switch.	Terminal block, Z-roofstyle, ZDU 4-2/4AN
9	9103436	Neutral – Power to main switch.	Terminal block, Z-roofstyle, ZDU 4-2/4AN
10	9103436	Line – Power to main switch.	Terminal block, Z-roofstyle, ZDU 4-2/4AN
Gnd	9103437	Earth Ground.	Terminal block, Z-roofstyle, ground, ZPE 4-2/4AN

Gnd	9103437	Earth Ground.	Terminal block, Z-roofstyle, ground, ZPE 4-2/4AN
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Figure B-2: *Terminal Block Assembly, 220VAC (9104036A)*Table B-2: *Terminal Block Assembly, 220VAC (9104036A)*

Symbol	Part Number	Function	Part Description
Ground	9103437	Earth Ground	Terminal block, Z-roofstyle, ground, ZPE 4-2/4AN
F1	9103437	220 VAC, Incoming line power (Hot) Top. 220 VAC, Switch power to Front Panel, bottom.	Fuse holder, 13/32" dia.
F2	9103437	220 VAC, Incoming line power (Neutral) top. 220 VAC, Switch power to Front Panel (Neutral), bottom.	Fuse holder, 13/32" dia.
F3	9103437	From Secondary Side of Transformer, 115V (Hot) top. From Secondary Side of Transformer 115V, (Hot) to outlets, bottom.	Fuse holder, 13/32" dia.
N	9103436	From Secondary Side Transformer 115V, (Neutral) to outlets, top. From Secondary Side Transformer 115V, (Neutral) to outlets, bottom.	Terminal block, Z-roofstyle, ZDU 4-2/4AN
Ground	9103437	Earth Ground	Terminal block, Z-roofstyle, ground, ZPE 4-2/4AN

Figure B-3: Base Power Schematic, 230 VAC

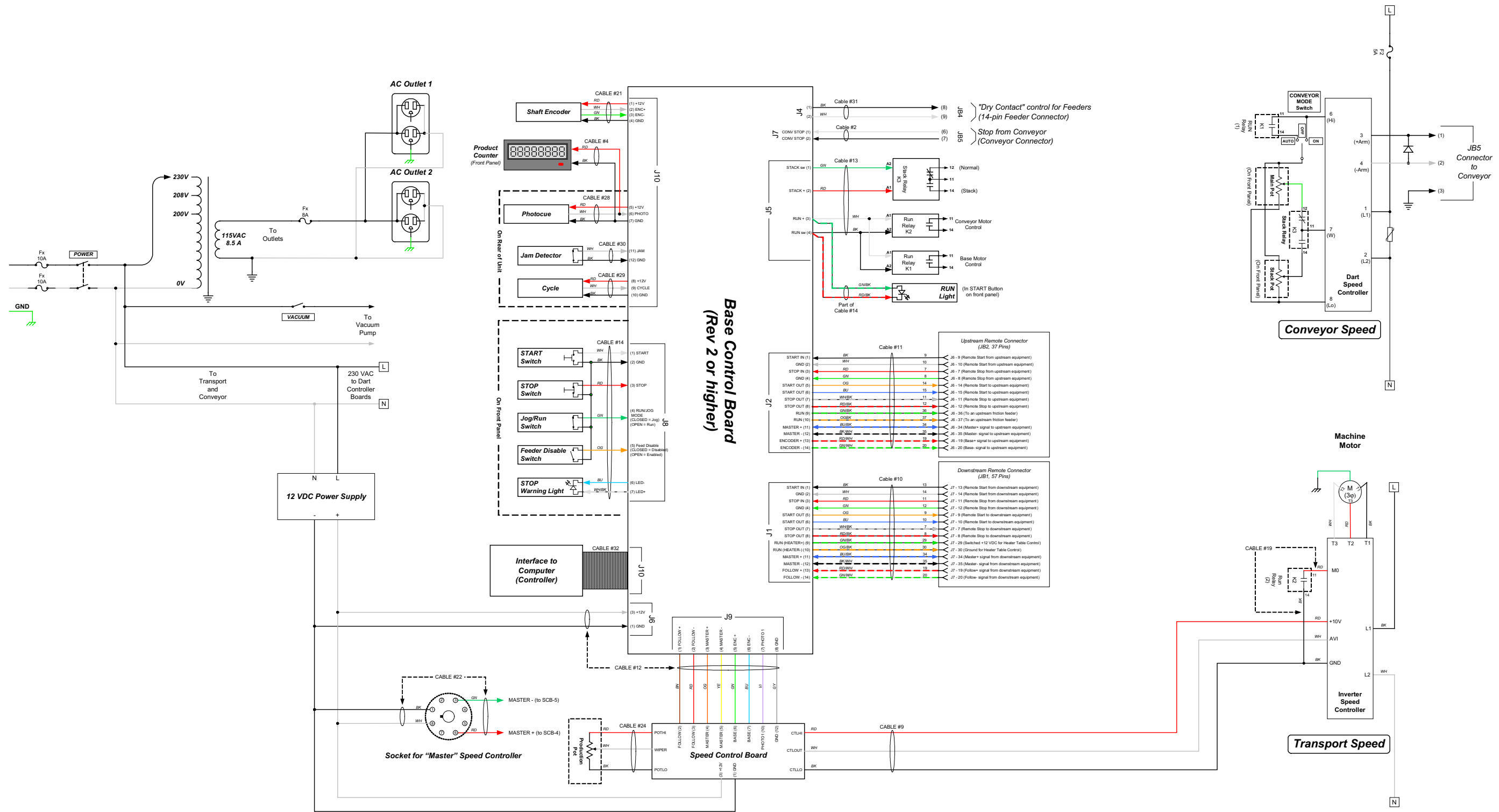
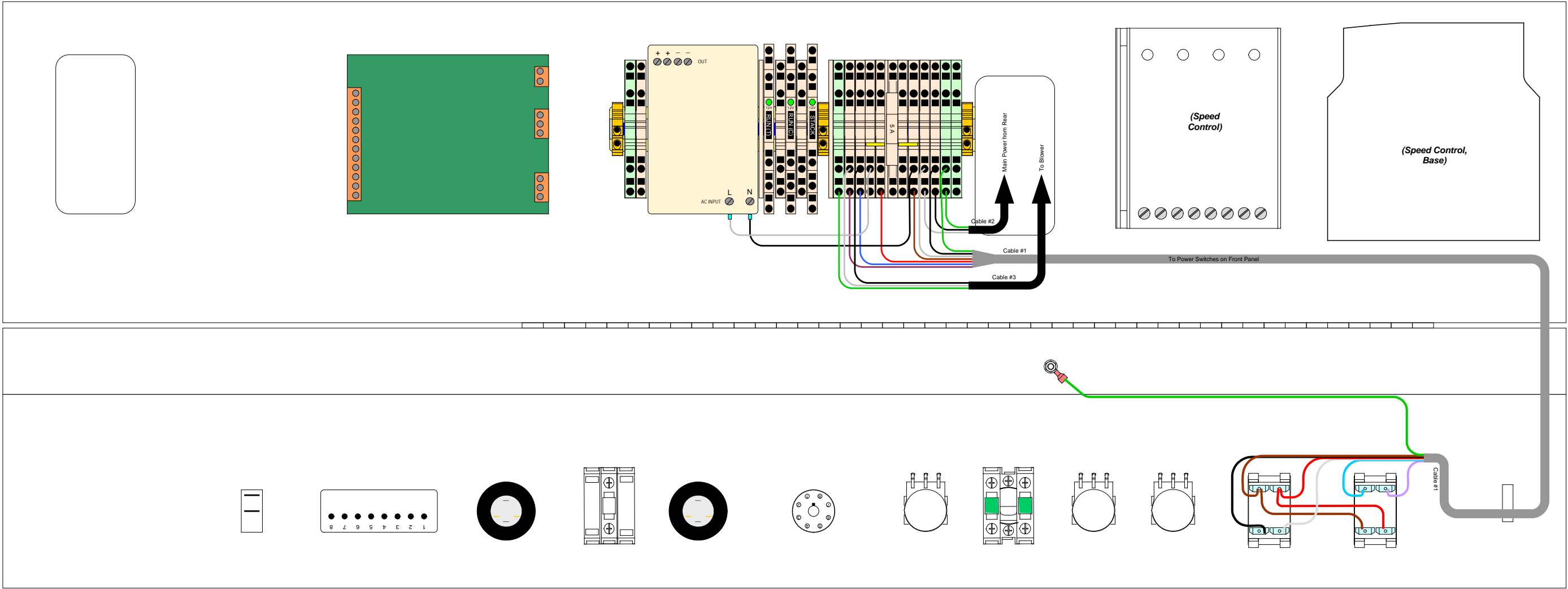


Figure B-4: *Front Panel Enclosure, AC Wiring (9104027A)*



Note: Reference the appropriate schematics in this Appendix for wiring details.

Figure B-5: *Transport and Conveyor Wiring, 220VAC (9104027A)*

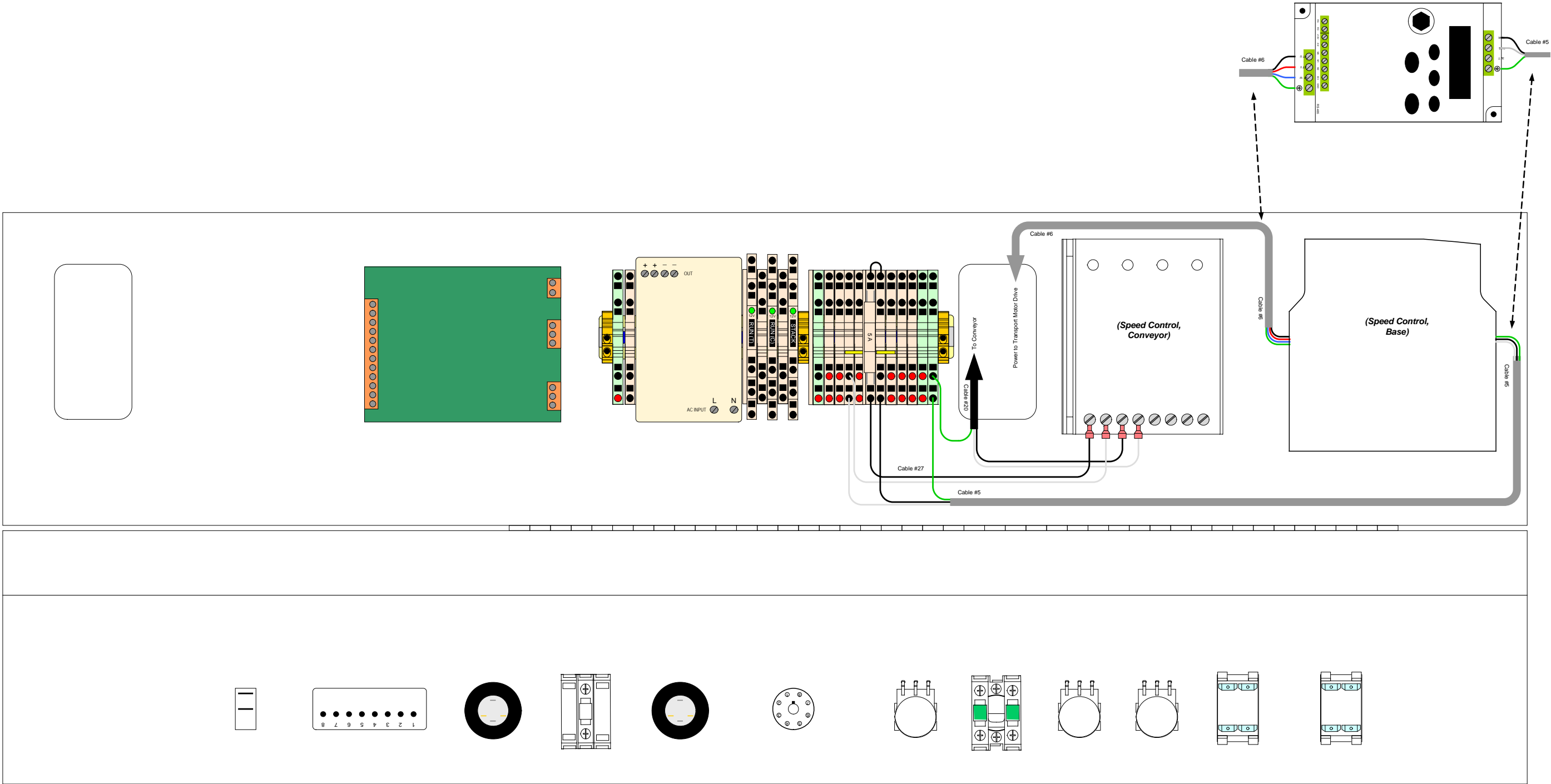


Figure B-6: *Front Panel Enclosure, Control Wiring, (9104027A)*

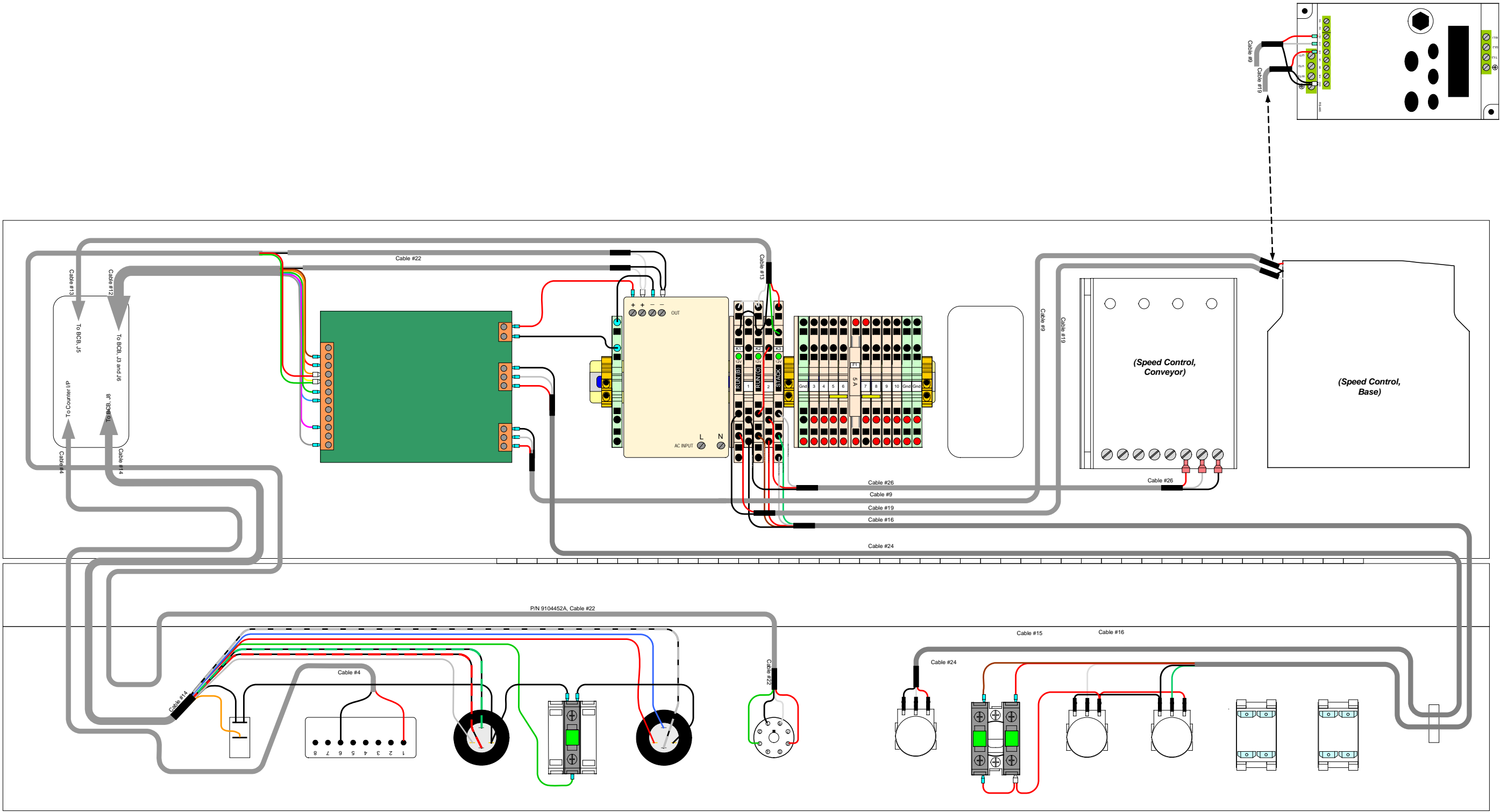




Figure B-7: *Rear Panel Enclosure, AC Wiring, (91004033A)*

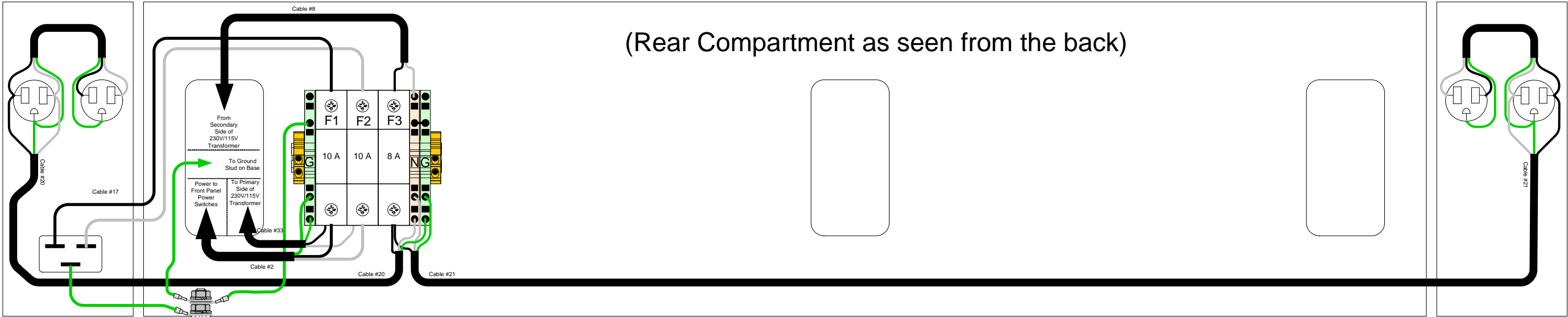


Figure B-8: Control and Sensor Wiring, Rear Panel, (91004033A)

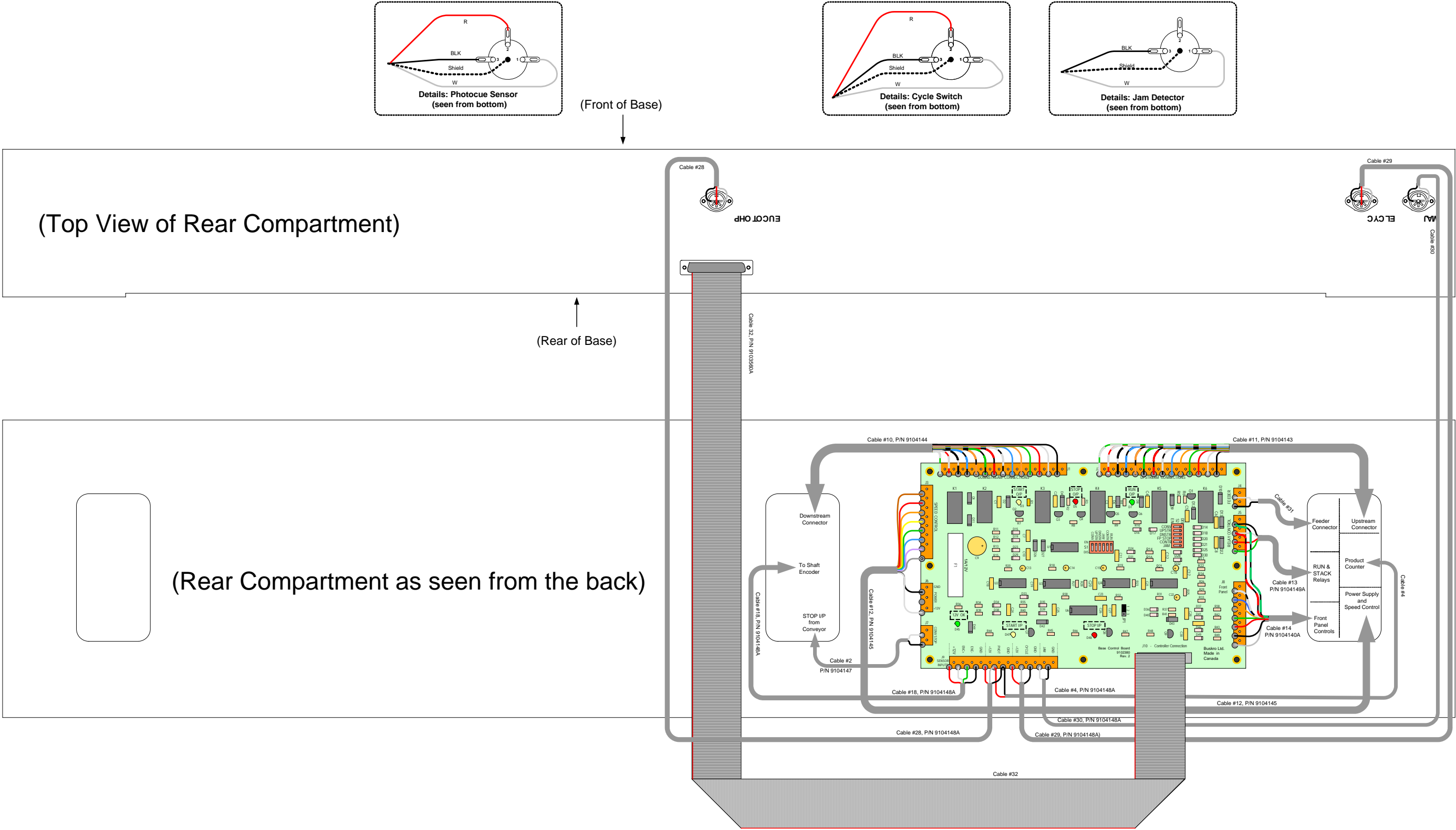
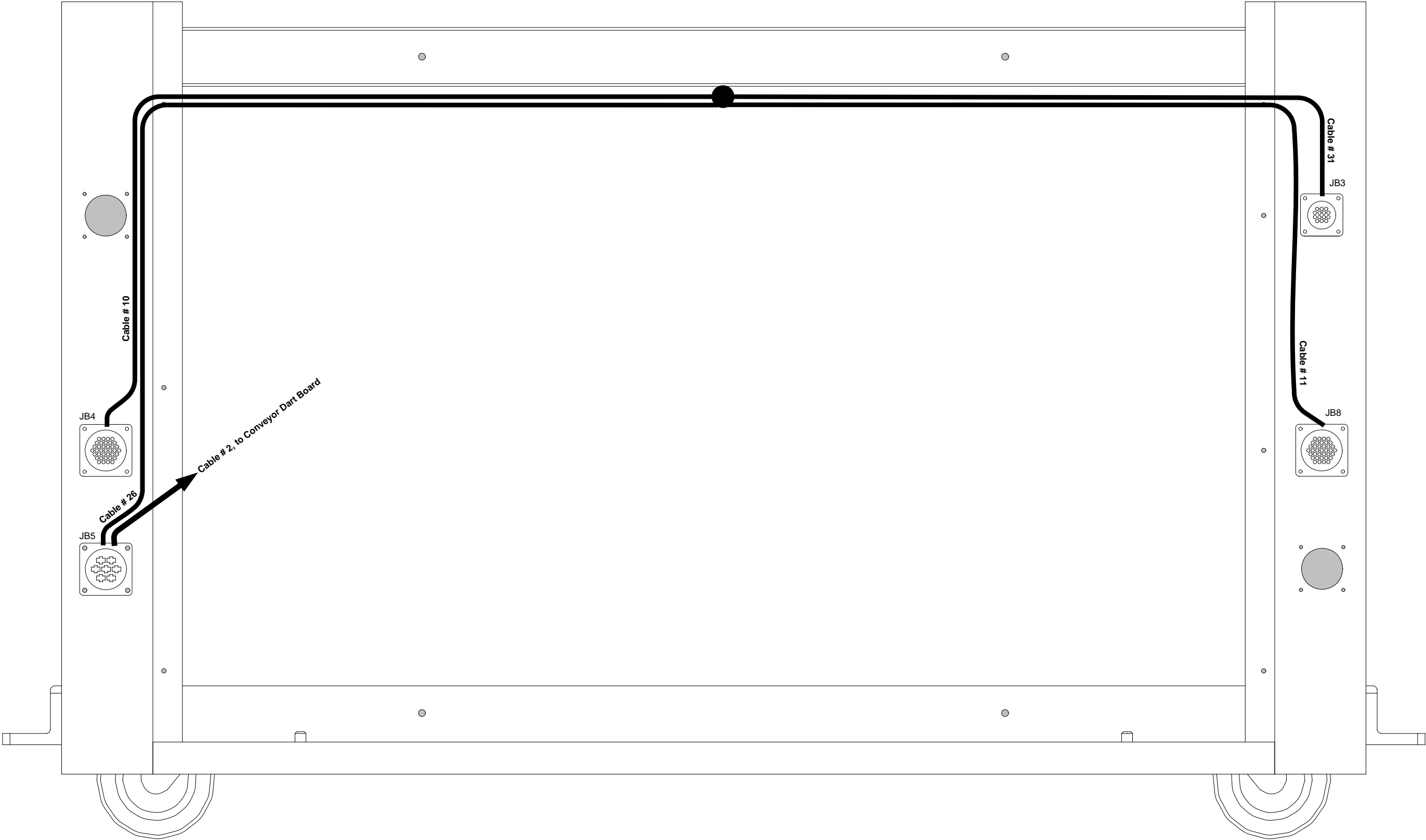


Figure B-9: *Base Rear Connections, (BK7IB-2)*



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# AC Motor Driver Settings

## Appendix **C**

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## C.1 Introduction

The Delta AC Controller Unit can be programmed to suit a variety of operating conditions. The controller has been preprogrammed to the desired settings at the factory. However, under some circumstances these parameters have to be “tweaked” to improve operation. Thus the programming procedure has been included in this manual. Following the basic programming instructions, a table is included which contains the optimal parameters for “standard” operation. The parameters can determine practically any functional characteristic of the controller/motor combination and are organized into functional groups. The settings are selected and set using 5 front panel buttons. A picture of the AC controller is shown in Figure C-1 to identify the controls required to program the unit.

*Figure C-1: Delta AC Controller Unit - VFD-L Series*



## C.2 AC Controller Programming Procedure

As an example, we will program the unit to allow external control of the unit. The following procedure should be used:

The desired feature to be enabled is specified as 2-01 with a required setting of 2 in order to allow external inputs to control the unit. This is detailed in page 8 of the user manual. Push on the “PROG / DATA” button in order to begin programming the AC controller. An input screen will then appear on the LED display to allow the user to define which parameter function “group” needs to be programmed. For example, in the function tables from the manual, it is clear that Group 2 allows for programming functions relating to how the unit should operate and Group 5 allows the user to program multi-step speed and PLC options. Push the “UP SCROLL” button twice in order to select the Group 2 parameter library. Push the “PROG / DATA” button in order to confirm that you want to program the Group 2 library functions. The user will now be able to define the function type within the Group 2 library. In this example, we are interested in programming the “– 01” or “source of operation command” function. Push the “UP SCROLL” button until “01” appears in the LED display. Then push the “PROG / DATA” button in order to confirm and store the setting. The final step involves specifying a function group setting or what Delta refers to as the “Parameter data”. For this example, we would like to program setting “2”, which enables the source of command operation to be controlled by external terminals and disables the integrated keypad STOP button from functioning. A “d 0” should be visible on the LED display upon completion of step 5. Use the “UP SCROLL” button to set the value to 2 as desired and press the “PROG / DATA” button to store the value in memory. Upon completion of step 6, “End” will appear in the LED display for 0.5 seconds to confirm that the programming procedure was successful. The user can now click on the “MODE / RESET” button three times in order to return to the main menu of the controller which by default, displays the operating frequency of the controller. When the controller is properly programmed and wired, the frequency will vary based on the front panel production (base speed) potentiometer.

**Note:** The values shown in the table have been found to be the optimal values for the Buskro machines. Any modification of these values can produce undesired consequences, such as poor print quality, vibrations in the machines, overheating of motors (resulting in a thermal shutdown to protect the equipment), and others. Buskro Ltd. therefore advises very strongly against modifying the parameters.

Figure C-2: Programming procedure flow chart for Delta VDF-L controller unit.

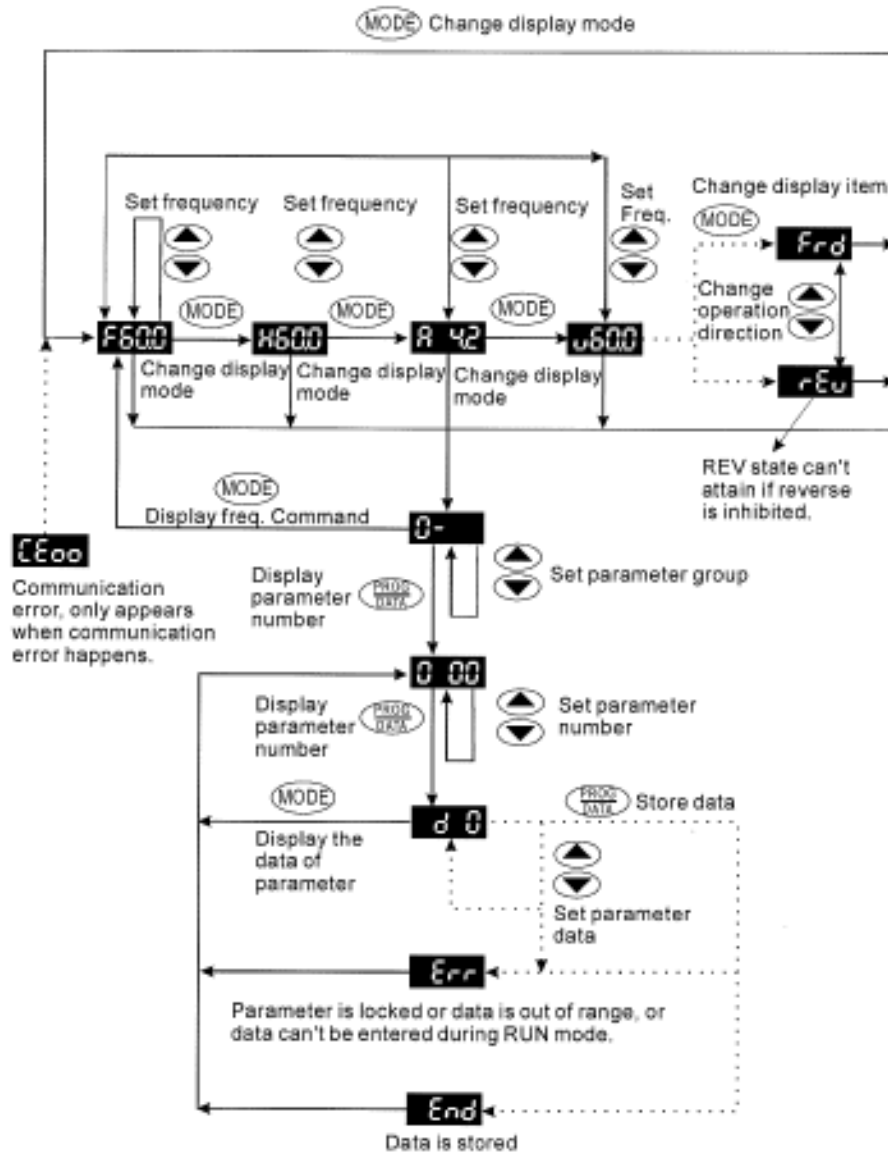




Figure C-3: Typical display messages while programming the controller.

Display Message	Descriptions
<b>F60.0</b>	The AC drive Master Frequency
<b>H60.0</b>	The Actual Operation Frequency present at terminals U/T1, V/T2, and W/T3.
<b>A 5.0</b>	The output current present at terminals U/T1, V/T2, and W/T3
<b>u60.0</b>	The custom unit (u), where $u = H \times Pr \ 0-05$ .
<b>C999</b>	The counter value (C)
<b>I-5.0</b>	The internal PLC process step currently being performed.
<b>U3 10</b>	The DC-BUS voltage
<b>E220</b>	The output voltage
<b>0-</b>	The specified parameter group
<b>0-00</b>	The specified parameter
<b>d 0</b>	The actual value stored within the specified parameter.
<b>Frd</b>	AC drive forward run status
<b>rEv</b>	AC drive reverse run status
<b>End</b>	"End" displays for approximately 0.5 second if input has been accepted. After a parameter value has been set, the new value is automatically stored in memory. To modify an entry, use the  and  keys.
<b>Err</b>	"Err" displays, if the input is invalid.



## C.3 Summary of Parameters

This section provides the parameters for the controller functions.

### C.3.1 Group 0: User Parameters

Table C-1: ♣ = the parameter may be set during operation.

	Parameters	Functions	Settings	Buskro Setting
	0-00	Identity code of drive (Read only)	1: 40W 2: 100W 3: 200W 4: 400W 5: 750W 6: 1.5KW	(4)
	0-01	Rated current display (Read only)	40W: 0.4A 100W: 0.8A 200W: 1.6A 400W: 2.5A 750W: 4.2A 1.5K: 7.0A	
	0-02	Parameter reset	10: Reset Parameters to Factory Setting	0
♣	0-03	Start-up display of AC drive	0: F (Frequency command) 1: H (output frequency) 2: U (user-defined unit) 3: A (output current)	0
♣	0-04	User-defined Unit	0: Display User-Defined Unit (u) 1: Display Counter Value (C) 2: Display Process Operation (1 = tt) 3: Display DC-BUS voltage (U) 4: Display output voltage (E)	0
♣	0-05	User-defined coefficient K	0.1 ~ 160	1.0
	0-06	Software version	Read only	#. #
	0-07	Password input	0 ~ 999	0
	0-08	Password configuration	0 ~ 999	0

### C.3.2 Group 1: Basic Parameters

Table C-2:

	Parameters	Functions	Settings	Buskro Setting
	1-00	Maximum operation Freq.	50.0 ~ 400Hz	50.0
	1-01	Maximum setting Freq.	10.0 ~ 400Hz	60.0
	1-02	Maximum output voltage	2.0 ~ 255V	230
	1-03	Mid-point freq.	1.0 ~ 400Hz	1.0
	1-04	Mid-point voltage	2.0 ~ 255V	12.0
	1-05	Minimum output free.	1.0 ~ 60.0Hz	1.0
	1-06	Minimum output voltage	2.0 ~ 255V	12.0
	1-07	Upper bound of freq.	1 ~ 110%	85
	1-08	Lower bound of freq.	0 ~ 100%	3.0
♣	1-09	Accel time 1 (Tacc1)	0.1 ~ 600 Sec	2.5
♣	1-10	Decel time 1 (Tdec1)	0.1 ~ 600 Sec	1.0
♣	1-11	Accel time 2	0.1 ~ 600 Sec	10.0
♣	1-12	Decel time 2	0.1 ~ 600 Sec	10.0
♣	1-13	JOG Accel time	0.1 ~ 600 Sec	10.0
♣	1-14	JOG Decel time	0.0 ~ 600 Sec	10.0
♣	1-15	JOG frequency	1.0Hz ~ 400Hz	6.0
	1-16	Auto-accel/decel	0: Linear Accel/Decel 1: Auto accel, linear decel 2: Linear accel, auto decel, 3: Auto Accel/Decel 4: Linear accel. Auto decel, stall prevention during deceleration 5: Auto accel. Auto decel, stall prevention during deceleration	0
	1-17	S-curve setting in acceleration	0 ~ 7	0
	1-18	S-curve setting in deceleration	0 ~ 7	0

### C.3.3 Group 2: Operating Mode Parameters

Table C-3:

	Parameters	Functions	Settings	Buskro Setting
	2-00	Source of frequency command	0: Digital keypad 1: 0 ~ 10V from AVI 2: 4 ~ 20mA from AVI 3: Controlled by V.R on drive 4: RS-485 communication interface	1
	2-01	Source of operation command	0: By digital keypad 1: By external terminals, keypad STOP enable 2: By external terminals, keypad STOP disable 3: By RS-485 communication interface, keypad STOP enable 4: By RS-485 communication interface, keypad STOP disable	2
	2-02	Stop method	0: Ramp stop 1: Coast stop	0
	2-03	Carrier freq.	3 - 10K Hz	10
	2-04	Reverse operation inhibit	0: Enable reverse 1: Disable reverse 2: Disable forward	0
	2-05	ACI (4 - 20mA) input loss detection	0: Decel to 0Hz 1: Stop immediately, display <b>EF</b> 2: Run with the last freq.	0
	2-06	Line Start Lockout	0: Enable 1: Disable	0

### C.3.4 Group 3: Output Function Parameters

Table C-4:

	Parameters	Functions	Settings	Buskro Setting
	3-00	Desired freq, attained	1.0 ~ 400 Hz	1.0
	3-01	Terminal count value	0 ~ 999	0
	3-02	Preliminary count value	0 ~ 999	0
	3-03	Multi-function (relay output)	0: not used 1: AC drive operational 2: Max. Output Freq. Attained 3: Zero Speed 4: Over Torque 5: Base-Block (B.B.) 6: Low Voltage Detection 7: AC Drive Operation Mode 8: Fault Indication 9: Desired Freq. Attained 10: PLC Program Running 11: PLC Program Step Complete 12: PLC Program Complete 13: PLC Program Operation Pause 14: Terminal Count Value Attained 15: Preliminary Count Value Attained 16: Ready State Indicator	8

### C.3.5 Group 4: Input Function Parameters

Table C-5:

	Parameters	Functions	Settings	Buskro Setting
♣	4-00	Potentiometer bias freq.	0.0 ~ 350Hz	0.0
♣	4-01	Potentiometer bias polarity	0: positive bias 1: negative bias	0
♣	4-02	Potentiometer freq. gain	1 ~ 200%	100
	4-03	Potentiometer reverse motion enable	0: not used 1: reverse motion enable 2: forward motion only	0
	4-04	Multi-function input terminal 1 (M1) (d O ~ d 20)	0: not used 1: M0: FWD/STOP, M1: REV/STOP 2: M0: RUN/STOP, M1: FWD/REV	2
	4-05	Multi-function input terminal 2 (M2)	3: M0, M1, M2: 3-wire operation control mode	6

	4-06	Multi-function input terminal 3 (M3) (d 0, d 4 ~ d 20)	4: External fault, normally open (N.O.) 5: External fault, normally closed (N.C.) 6: RESET 7: multi-step speed command 1 8: multi-step speed command 2 9: jog operation 10: accel/decel speed inhibit 11: first or second accel/decel time selection 12: base-block (B.B.), normally open (N.O.) 13: base-block (B.B.), normally closed (N.C.) 14: increase master freq. 15: decrease master freq. 16: run PLC program 17: pause PLC 18: counter trigger signal 19: counter reset 20: select ACI/deselect AVI	7
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### C.3.6 Group 5: Multi-step Speed and PLC Parameters

Table C-6:

	Parameters	Functions	Settings	Buskro Setting
	5-00	1 <sup>st</sup> step speed freq.	0.0 ~ 400Hz	0.0
	5-01	2 <sup>nd</sup> step speed	0.0 ~ 400Hz	0.0
	5-02	3 <sup>rd</sup> step speed freq.	0.0 ~ 400Hz	0.0
	5-03	PLC mode	0: Disable PLC operation 1: Execute one program cycle 2: Continuously execute program cycles 3: Execute one program cycle step by step (separate by STOP) 4: Continuously execute one program cycle step by step (separate by STOP)	0
	5-04	PLC forward/reverse motion	0 ~ 15 (0: Forward, 1: Reverse)	0
	5-05	Time duration step	0 ~ 65500 Sec	0
	5-06	Time duration step	0 ~ 65500 Sec	0
	5-07	Time duration step	0 ~ 65500 Sec	0
	5-08	Time duration step	0 ~ 65500 Sec	0

### C.3.7 Group 6: Protection Parameters

Table C-7:

	Parameters	Functions	Settings	Buskro Setting
	6-00	Over-Voltage Prevention Level	0: disable 350 ~ 410V	390
	6-01	Over-current Prevention Level	0: disable 20 ~ 200%	170
	6-02	Over-torque detection	0: disable 1: enable during constant speed operation and continues until the continuous limit is reached. 2: enabled during constant speed operation and halted after detection. 3: enabled during accel and continues before continuous output time limit is reached. 4: enabled during accel and halted after over-torque detection.	0
	6-03	Over-torque detection level	30 ~ 200%	150
	6-04	Over-torque detection time	0.1 ~ 10.0 Sec	0.1
	6-05	Electronic thermal overload relay	0: Not used 1: Act with standard motor 2: Act with special motor	0
	6-06	Electronic thermal characteristic	30 ~ 600 Sec	60
	6-07	Present fault record	0: No fault occurred	0
	6-08	Second most recent fault record	1: oc (over current) 2: ov (over voltage)	
	6-09	Third most recent fault record	3: oH (over heat) 4: oL (over load)	
	6-10	Forth most recent fault record	5: oL 1 (electronic thermal) 6: EF (external fault)	
	6-11	Fifth most recent fault record	7: Reserved 8: Reserved	
	6-12	Sixth most recent fault record	9: ocA (current exceed during acceleration) 10: ocd (current exceed during deceleration) 11: ocn (current exceed during steady state)	

### C.3.8 Group 7: Motor Parameters

Table C-8:

	Parameters	Functions	Settings	Buskro Setting
♣	7-00	Motor rated current	30 ~120 %	85
♣	7-01	Motor no-load current	0 ~ 90 %	50
♣	7-02	Torque compensation	0 ~ 10	7
♣	7-03	Slip compensation	0.0 ~ 10.0	6.0

### C.3.9 Group 8: Special Parameters.

Table C-9:

	Parameters	Functions	Settings	Buskro Setting
	8-00	DC braking voltage level	0 ~ 30%	0
	8-01	DC braking time during start-up	0.0 ~ 60.0 Sec	0.0
	8-02	DC braking time during stopping	0.0 ~ 60.0 Sec	0.0
	8-03	Start-point for DC braking	0.0 ~ 400.0 Sec	0.0
	8-04	Momentary power loss	0: Stop operation after momentary power loss. 1: Continues after momentary power loss, speed search starts with master freq. 2: Continues after momentary power loss, speed search starts with min. output freq.	0
	8-05	Max. allowable power loss time	0.3 ~ 5.0 Sec	2.0
	8-06	B.B. time for speed search	0.3 ~ 5.0 Sec	0.5
	8-07	Max. speed search current level	30 ~ 200%	150
	8-08	Skip freq. 1 upper bound	0.0 ~ 400 Hz	0.0
	8-09	Skip freq. 1 lower bound	0.0 ~ 400 Hz	0.0
	8-10	Skip freq. 2 upper bound	0.0 ~ 400 Hz	0.0
	8-11	Skip freq, 2 lower bound	0.0 ~ 400 Hz	0.0
	8-12	Skip freq, 3 upper bound	0.0 ~ 400 Hz	0.0
	8-13	Skip freq. 3 lower bound	0.0 ~ 400 Hz	0.0
	8-14	Auto restart after fault	0 ~ 10	0
	8-15	AVR function	0: AVR function enable 1: AVR function disable 2: AVR function disable when decel	2
	8-16	Dynamic braking voltage	350 ~ 450V	380
	8-17	DC braking lower bound limit	0.0 ~ 400 Hz	0.0



### C.3.10 Group 9: Communication Parameters

Table C-10:

	Parameters	Functions	Settings		Buskro Setting
	9-00	Communication address	1 ~ 247		1
	9-01	Transmission speed	0: Baud rate 4800 1: Baud rate 9600 2: Baud rate 19200		1
	9-02	Transmission fault treatment	0: Warn and continue running 1: Warn and ramp to stop 2: Warn and coasting stop 3: No warn and keep running		0
	9-03	Modbus communication watchdog timer	0: Disable 1 ~ 20: 1 ~ 20 Sec		0
	9-04	Communication protocol	ASCII mode	0: 7,N,2 1: 7,E,1 2: 7,0,1 3: 8,N,2 4: 8,E,1 5: 8,0,1	0
			RTU mode	6: 8,N,2 7: 8,E,1 8: 8,0,1	