

Conveyor and Pallet Tracking System



Operational Manual

Catalog #100149 Rev.C

January 2011

intelitek ▶▶

Copyright ©2010 Intelitek Inc.

Conveyor and Pallet Tracking System

Operation Manual

January 2011

Every effort has been made to make this guide complete and as accurate as possible. However, no warranty of suitability, purpose or fitness is made or implied. Intelitek Inc. is not liable or responsible to any person or entity for loss or damage in connection with or stemming from the use of the software, equipment and/or the information contained in this publication.

Intelitek Inc. bears no responsibility for errors which may appear in this publication and retains the right to make changes to the software, equipment and manual without prior notice.

Intelitek Inc.

444 East Industrial Park Drive

Manchester, NH 03109-5317

USA

Tel: (603) 625-8600

Fax: (603) 625-2137

website: <http://www.intelitek.com>

email: info@intelitek.com

Table of Contents

1. INTRODUCTION	1
2. COMPONENTS	3
2.1 CONVEYOR COMPONENTS	3
2.2 PALLET TRACKING COMPONENTS	4
3. INSTALLATION	5
3.1 INSTALLING THE CONVEYOR	5
3.2 INSTALLING THE PALLET TRACKING SYSTEM.....	12
3.3 CONNECTING THE PLC WIRES	14
3.4 INSTALLING THE PLC DEVICE DRIVER SOFTWARE	17
4. TESTING AND OPERATION	19
4.1 TESTING THE CONVEYOR	19
4.2 TESTING THE PALLET TRACKING SYSTEM	19
4.3 TESTING THE PALLET TRACKING SYSTEM USING DEVICE DRIVERS	19
5. APPENDIX A - SCHEMATIC DRAWINGS	21
5.1 DRAWING A: CONVEYOR MOTOR CONNECTIONS	21
5.2 DRAWING B: PLC CABINET CONNECTIONS	22
5.3 DRAWING C: CONVEYOR MOTOR CONTROL BOX	23

1. Introduction

The CIM system is formed around a closed loop, continuously moving, conveyor that moves pallets carrying materials and parts to the various CIM stations. The conveyor frame is constructed of extruded, black anodized aluminum, and its moving belt is a double flexible-chain rail.

In order to maximize efficiency of part conveyance in the CIM system, pallets are not removed from the conveyor. Instead, the pallets carry part templates that are loaded and unloaded at each station by robots and manipulators. The pallets are thus free to transport parts and materials to and from any CIM station. Magnetic codes embedded on the underside of the pallets enable tracking.

The conveyor stops that are positioned alongside each CIM workstation include magnetic *sensors* for pallet detection and pneumatic pistons for halting and releasing the pallets. A PLC control unit monitors and manages the flow of pallets on the CIM conveyor.



Figure 1: Closed Loop Conveyor

- ❖ **Note:** The closed loop conveyor is modular and can vary in shape and size. In addition, the pallet tracking system can be designed to accommodate between two and eight stations.

2. Components

This chapter lists the components of the closed loop conveyor. This chapter includes the following sections:

- Conveyor Components
- Pallet Tracking Components

2.1 Conveyor Components

The conveyor contains the following components:

Item #	Description	Catalog Number
1	90 Degree Corner (leg included)	021104
2	180 Degree Corner (legs included)	021105
3	Middle Leg	021110
4	1400 mm Rail	021101
5	760 mm Rail	021102
6	Motor Assembly (Including Clutch Key)	021109
7	Chain	342721
8	Pallet	021113
9	Plastic Covers for Conveyor	113053
10	Omega Plates	110770
11	Control Unit and Emergency Stop System. This component varies according to your system configuration. Control units supplied include Siemens, Allen Bradley, Omron, and LG.	

2.2 Pallet Tracking Components

The pallet tracking system contains the following components:

Item #	Description	Catalog Number
1	PLC Cabinet	Depends on the PLC type.
2	Station Box	021136
3	Station Stop Light	021122
4	Station Buffer	021113
5	Station Cover	110768
6	Station Cable Pillar	114205
7	Station Cable (length 6 m or 9 m)	040241 (6 m), 040245 (9 m)
8	Pneumatic Pipe ¼", 12m	324406

3. Installation

This chapter describes how to install the closed loop conveyor and a pallet tracking system. This chapter includes the following sections:

- Installing the Conveyor
- Installing the Pallet Tracking System
- Connecting the PLC Wires
- Installing the PLC Device Driver Software

3.1 Installing the Conveyor

Before you begin the installation ensure that the floor on which the conveyor will be placed is solid and level. Electrical power and compressed air outlets should be ready at the installation site.

The installation of the conveyor should be performed by at least two people. The following tools are required for the installation process:

- 13 mm wrench
- 5 mm Allen wrench
- 6 mm Allen wrench
- Spirit Level

To install the conveyor:

1. Unpack all conveyor parts, sort them and identify all major components with the help of the layout and packing list.
2. Place all components in their approximate locations on the floor. Verify that the feet of the conveyor are completely inside the shaft, as shown in Figure 2.



Figure 2: Conveyor Components – Floor Layout

3. Start building the conveyor from one side by fixing two 760 mm rails between two 90 degree corner legs. (If the conveyor uses 180 degree corners, ignore steps 3 and 4 as they are pre-assembled.) Attach the rails to the legs using the four T-slot screws and a 13 mm wrench. (See Figure 3 and Figure 4.)

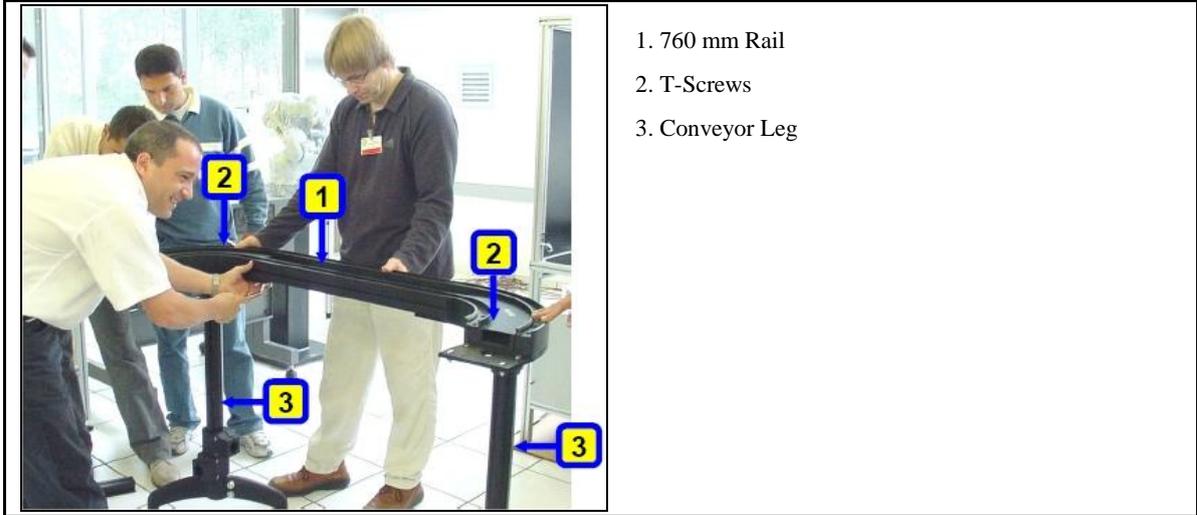


Figure 3: 760 mm Rail Assembly

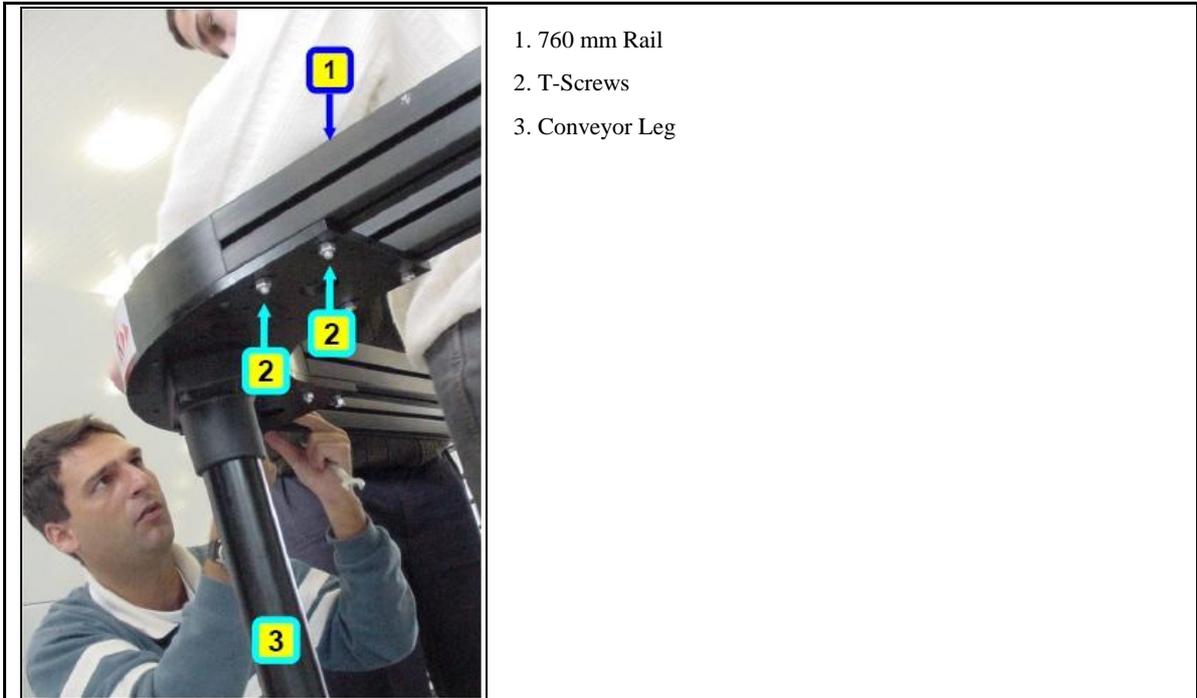


Figure 4: Rail Assembly – Connecting T-Screws

4. Open the plastic fixtures at the bottom of the leg and insert the lower pipe. Fix both sides with the 6 mm Allen wrench.

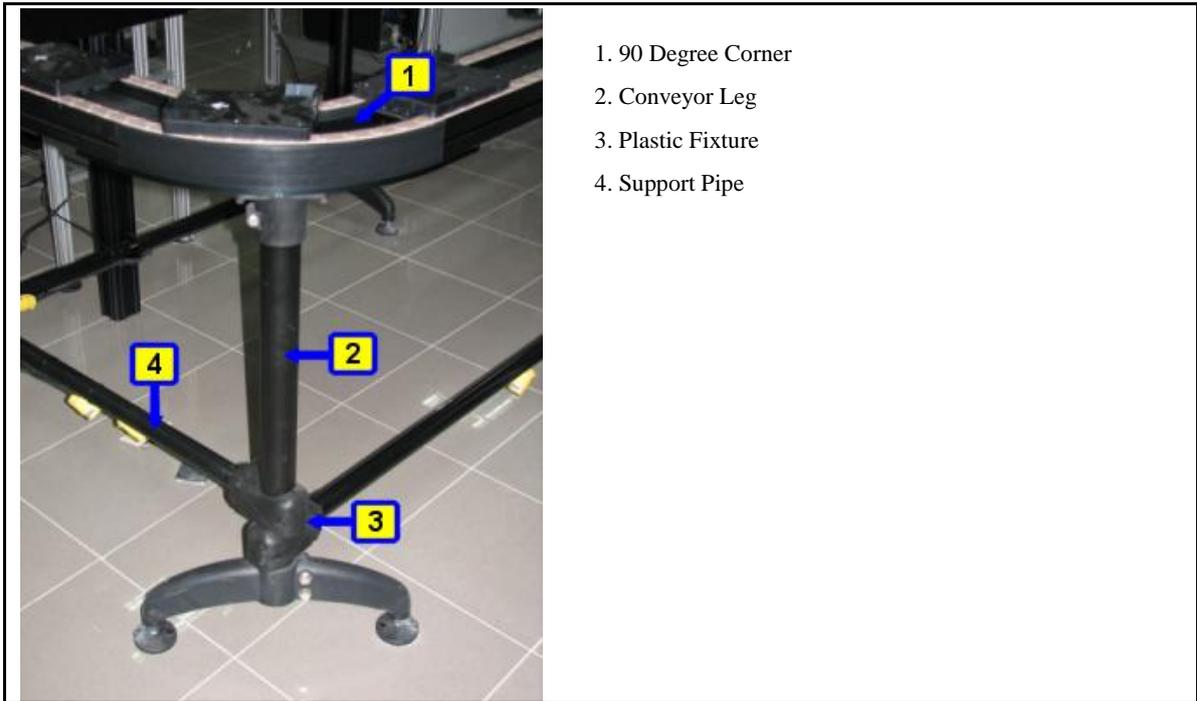


Figure 5: Conveyor Leg

- Put the assembly upright and add two 1400 mm rails and another leg. Proceed in the same way as before until only the 1400 mm gap for the motor unit is open. (See Figure, Figure 7 and Figure 8.)

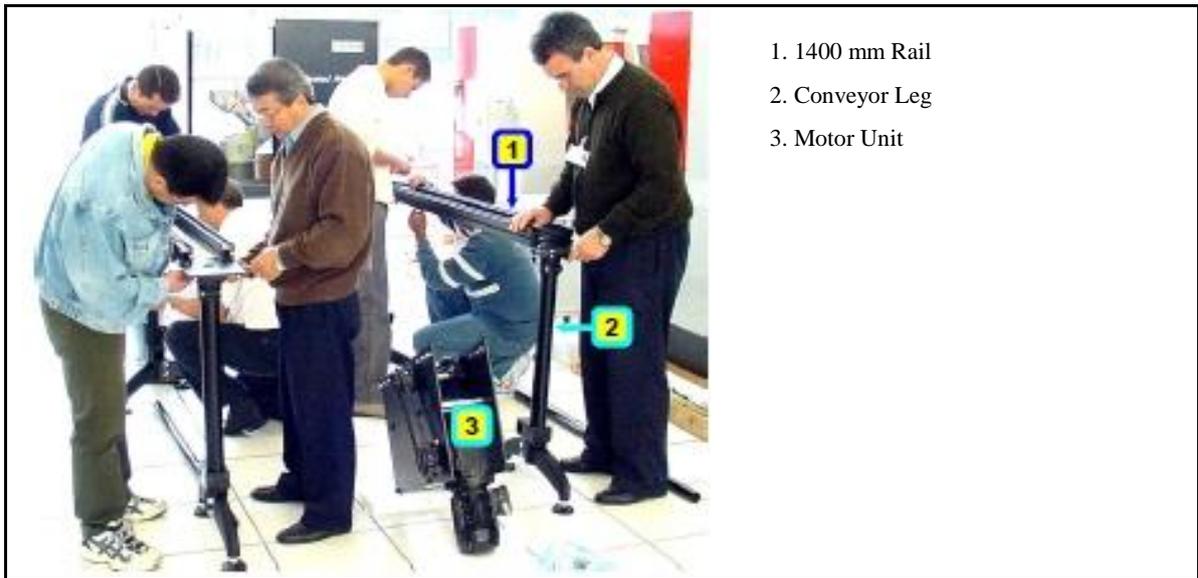


Figure 6: 1400 mm Rail Assembly



Figure 7: Conveyor Opening for Motor Unit

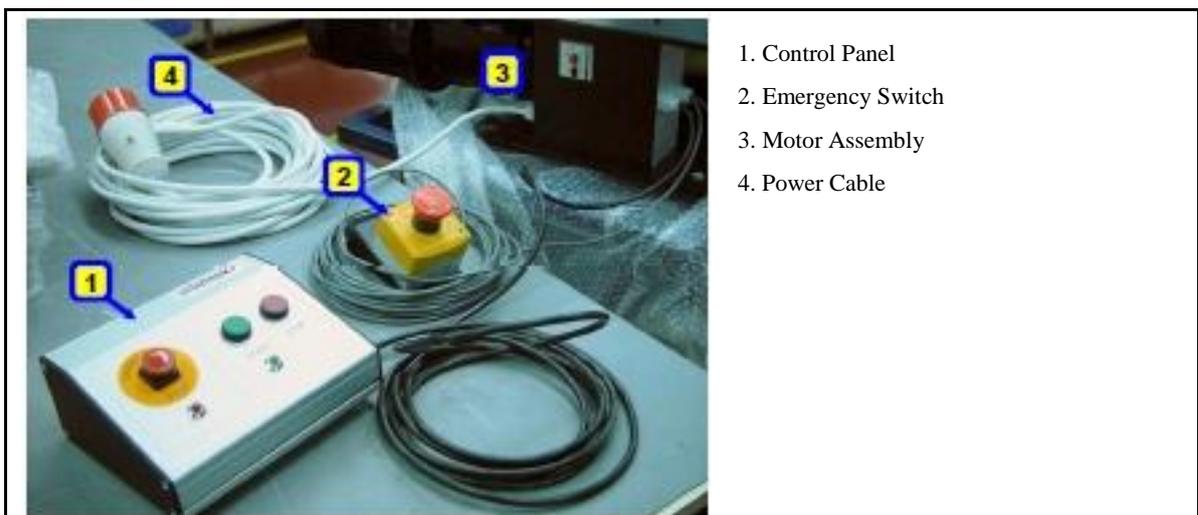


Figure 8: Motor Unit

6. Prepare the motor unit by attaching the two short and two long rails.
The side with the angle cut should point towards the motor. Attach the rails with the help of the motor markings on the side rails of the motor assembly. The overall length of the motor assembly should be 1400 mm. (See Figure 9 and Figure 10.)

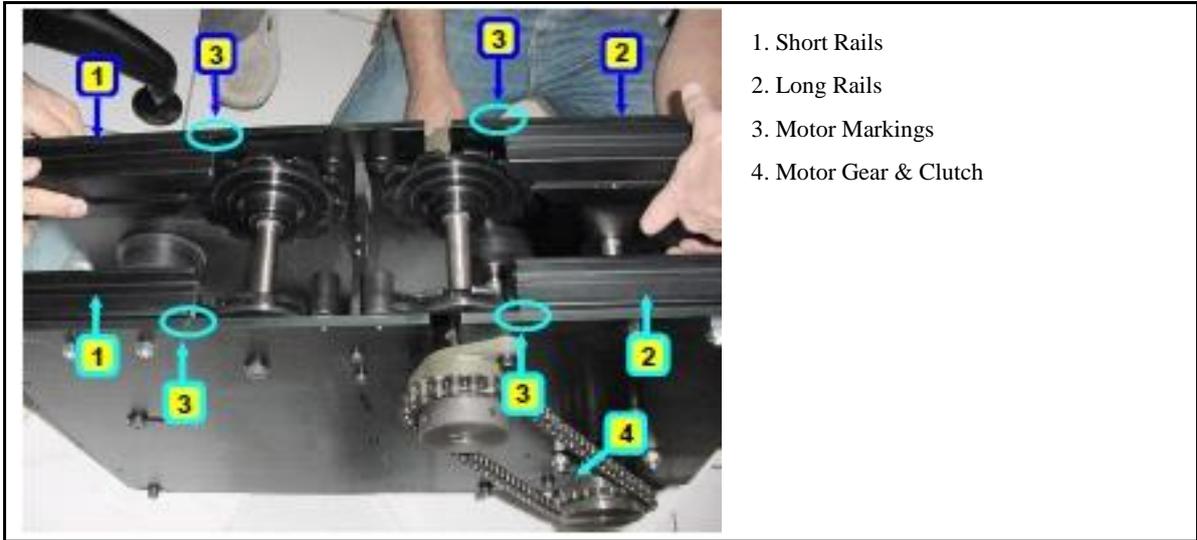


Figure 9: Preparing the Motor Unit



Figure 10: Fine Tuning the Motor Unit

7. Lift the complete motor unit assembly into the gap of the conveyor. Ensure that its orientation matches the required movement direction (clockwise or counterclockwise) and attach it using the T-slot screws. (See Figure 11.)



Figure 11: Lifting Motor into Conveyor Gap

8. Insert the inner and outer chain into the rail and thread through the transmission wheels, by opening the clutch unit of the motor gear. After threading the chain through, shorten the chain to its correct length and connect the first and last elements to form a closed loop. (See Figure 12.)

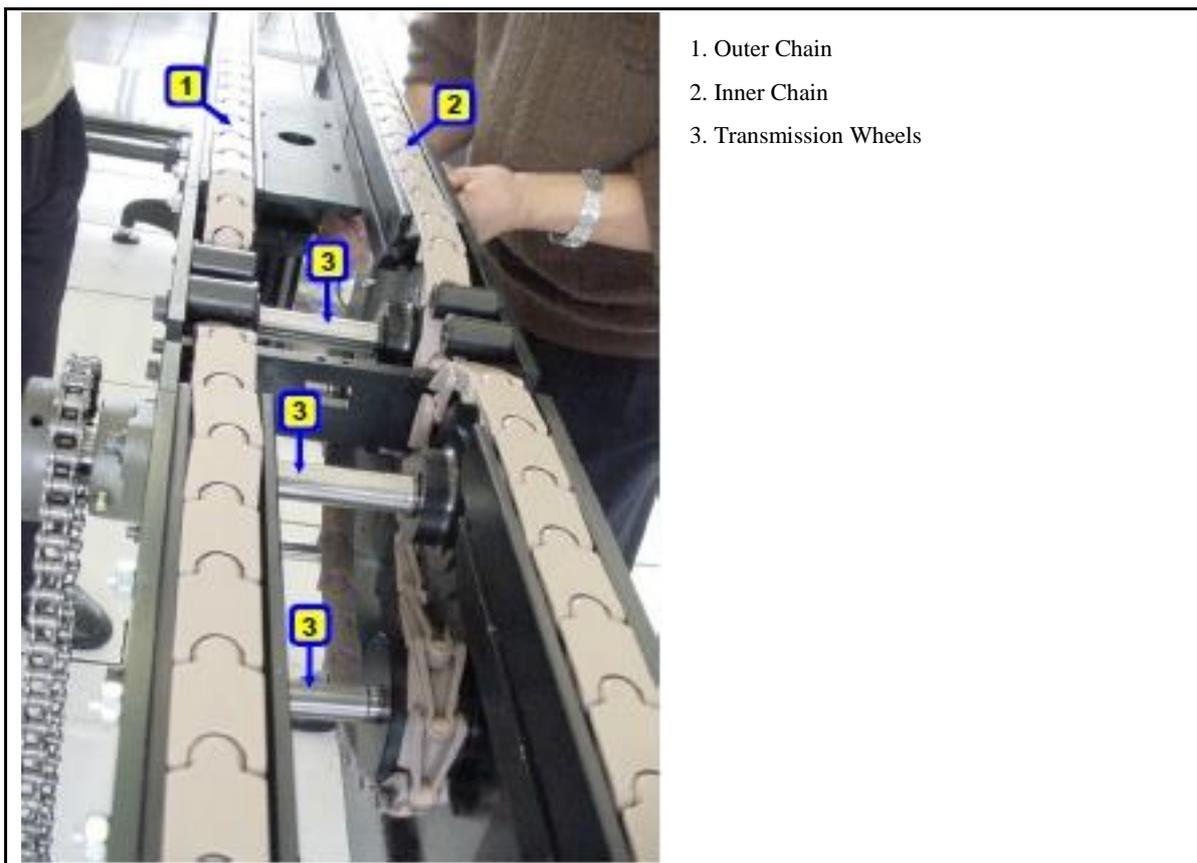


Figure 12: Threading the Chain through the Motor Unit

9. Install the rail adaptor to close the gap between the motor assembly rails.
10. Move the conveyor to its final location and use the spirit level to check that all the elements are level. Using the adjustable legs you can then adjust where required.
11. Make final adjustments to the conveyor's location and begin fixing the conveyor feet to the floor. Each foot should be attached with at least one bolt to the ground.
12. Insert the omega plates evenly in the free space between the conveyor rails in order to support the cables. (See Figure 13.)

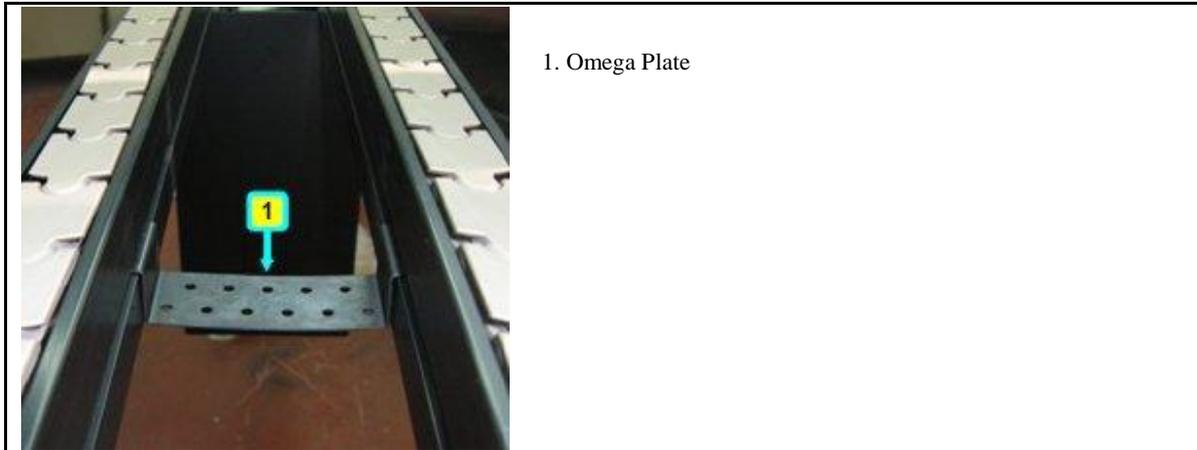


Figure 13: Placement of the Omega Plate in the Free Space between the Rails.

13. Place the pallets on the conveyor with the arrow of each pointing in the direction of the chain movement.

3.2 Installing the Pallet Tracking System

After assembling the conveyor components the next step is to install the pallet tracking system, as described in the following procedure.

To install the pallet tracking system:

1. Place and install the station boxes at the locations marked in the layout. Secure the station boxes using the T-Slot screws that fit into the bottom slots of the rail profiles.
2. Place the PLC cabinet in a suitable location and attach its Cable Pillar to the conveyor.
3. Connect the Station Cables (starting from Station 1) to the corresponding connections on the Workstation Connection Board, located in the PLC cabinet, using the 15 pin connector. (See Figure 14.)

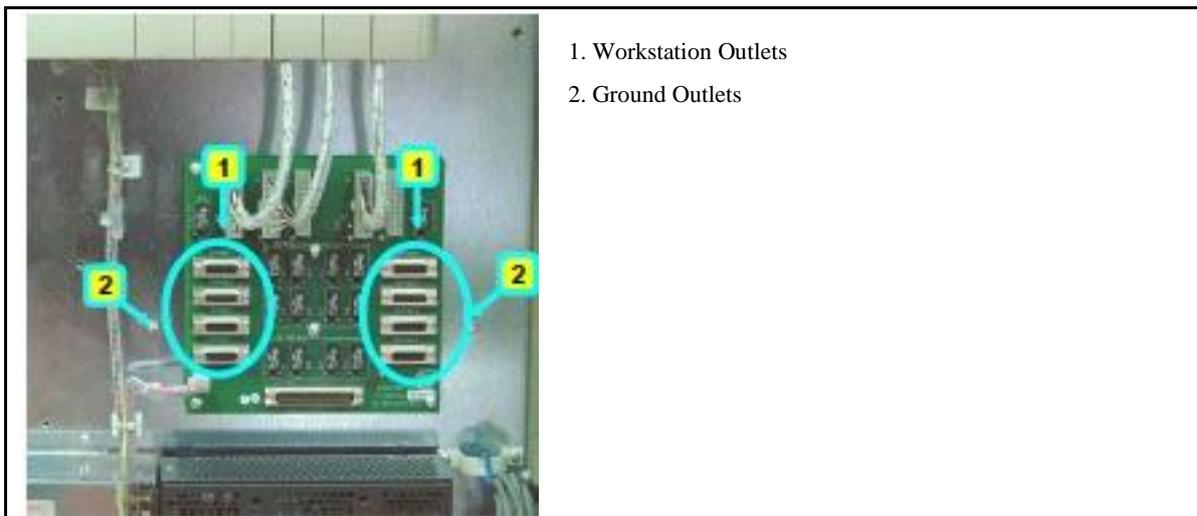


Figure 14: Workstation Connection Board

4. Pull each Station Cable through the Cable Pillar and in between the conveyor rails (use Omegas as support) until it reaches the required Station Box. See the PLC connections in Figure 14, and Figure 18.

- Attach the Station Cable to the required Station Box using a 25 pin connector (see #2 and #3 in Figure 17). Any spare cable length should be stored between the conveyor rails.

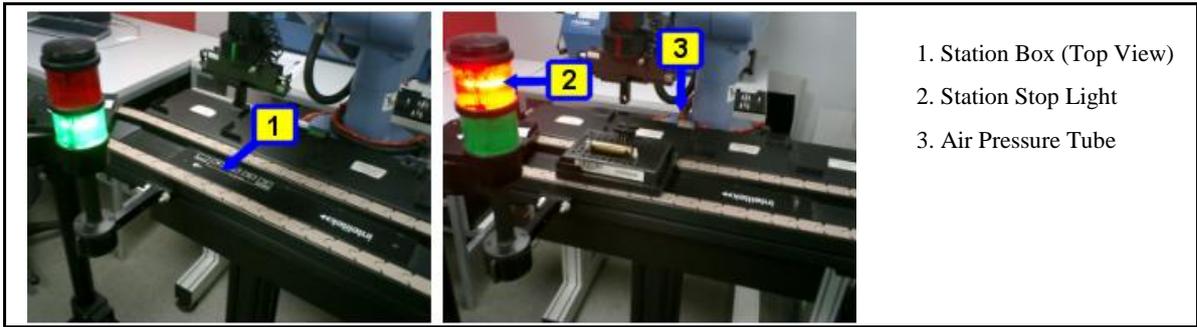


Figure 15: Station Box – Top View

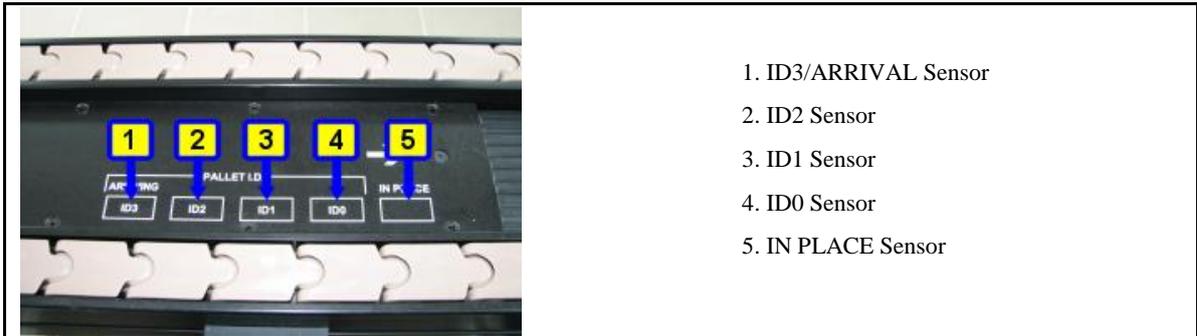


Figure 16: Station Box – Sensor View

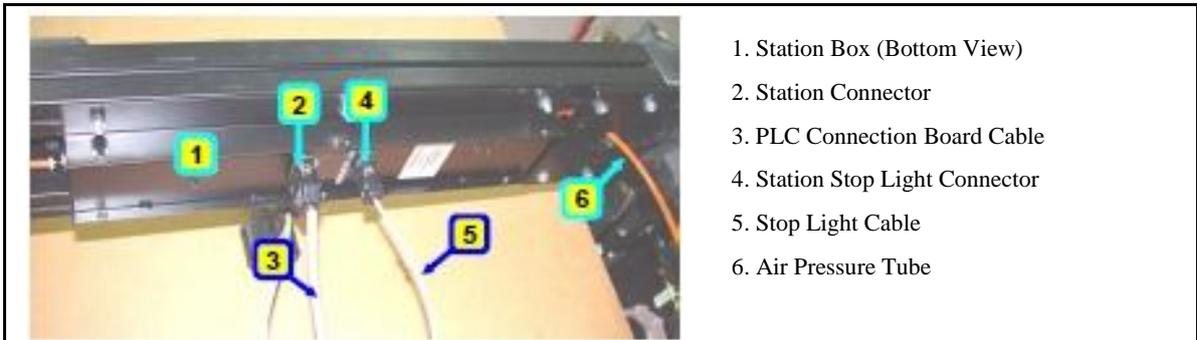


Figure 17: Station Box – Bottom View

- Attach the Station Light of each station to the conveyor rail using T-Slot screws and connect its 9 pin connector to the Station Box. (See #4, Figure 17).
- From the central air supply, thread the Air Pressure Tubes (see #6 in Figure 17) through the Conveyor (use the Omegas as support and loop them from station to station). Ensure the loop is closed to prevent air leakage.
- Connect the PLC Cabinet to the main power supply.
- Supply compressed air to the system.
- Turn on the PLC Unit.
- Wait until all the lights have turned green. Then, start the conveyor and verify that the pallets are stopped and released at each station.
- Stop the conveyor and install the Cable Pillar and Station Box Cover at each station.
- Connect the RS232 cable between the PLC Unit and the PLC Station PC.
- Cut the plastic covers into appropriate segments and insert the covers in between the stations.

3.3 Connecting the PLC Wires

This chapter explains how to wire the PLC Unit. The location of the PLC Unit and other components in the PLC Cabinet are shown in Figure 18.

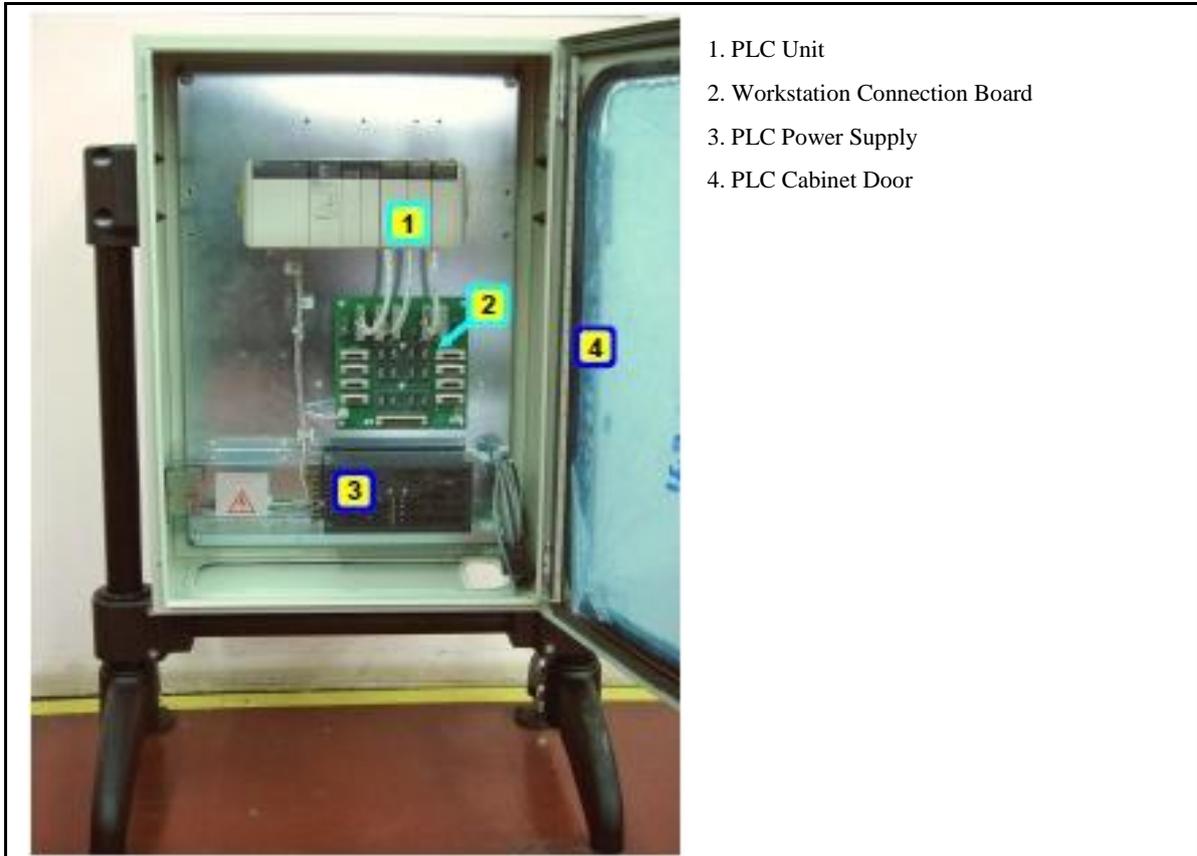


Figure 18: PLC Cabinet

Before connecting the PLC wires, ensure that the PLC cabinet is disconnected from the mains power supply.

❖ For additional details on the various connections, the following schematic drawings are provided in Appendix A.

- **Drawing A: Conveyor Motor Connections**
- **Drawing B: PLC Cabinet Connections**
- **Drawing C: Conveyor Motor Control Box**

The following procedure describes how to wire the PLC.

To connect the PLC wires:

1. Release the four screws securing the PLC High Voltage Cover to the PLC Power supply and remove the cover (see #2 in Figure 19).

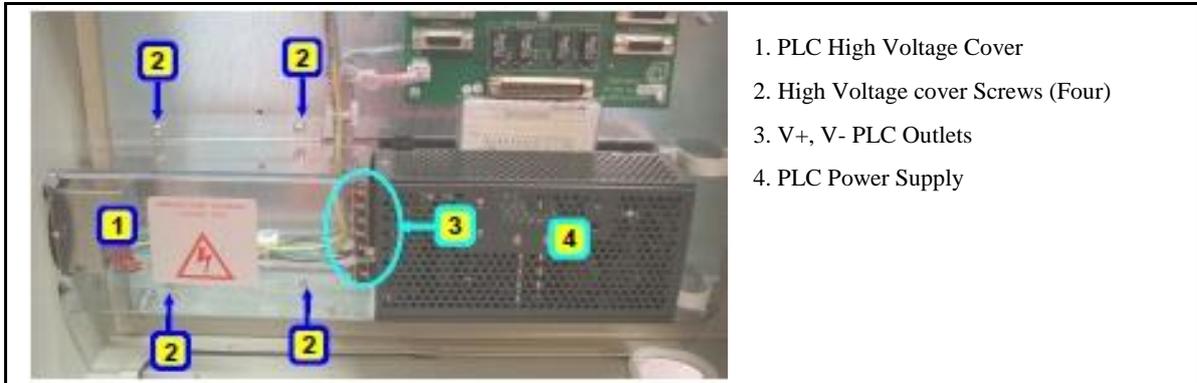


Figure 19: PLC Power Supply

2. Connect the Control Motor's cable (#3 in Figure 20) to the V+, V- outlets on the PLC Power Supply (#3 in Figure 18).
For additional details, see Appendix A, Drawing A: Conveyor Motor Connections and Drawing B: PLC Cabinet Connections.
3. Replace the PLC High Voltage Cover (#1 in Figure 19.)
4. Ensure that each workstation is connected to the corresponding workstation outlet on the Workstation Connection Board on the PLC Cabinet, using a connection cable (D-Type 15 pin to 25 pin). This step was performed previously in, step 3 (see Figure 14).
5. Connect the conveyor's three phase power supply to the main outlet.
For additional details, see Appendix A, Drawing A: Conveyor Motor Connections.
6. Connect the PLC power supply to the main outlet.

7. If required, you can create an additional emergency connection in the control motor, as follows:

- Remove the connection box cover.
- Remove plugs 23, 24 or 24, 25 or 25, 26 and replace them with emergency wires: (See #2, in Figure 20, or Figure 21, for a magnified view of the control motor plugs).

❖ *Note: After installing the Motor Unit, you must replace the existing Motor Top Plug with the plug provided with the Motor Unit.*

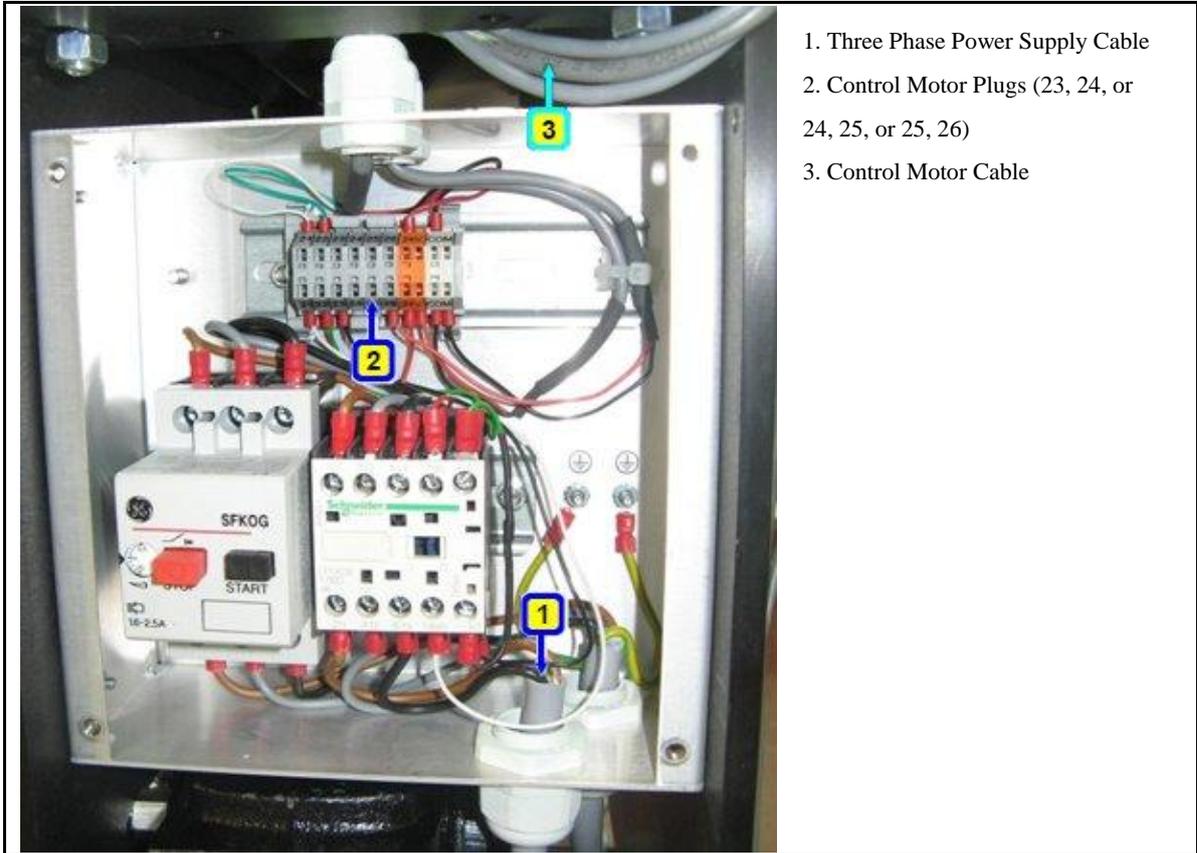


Figure 20: Control Motor

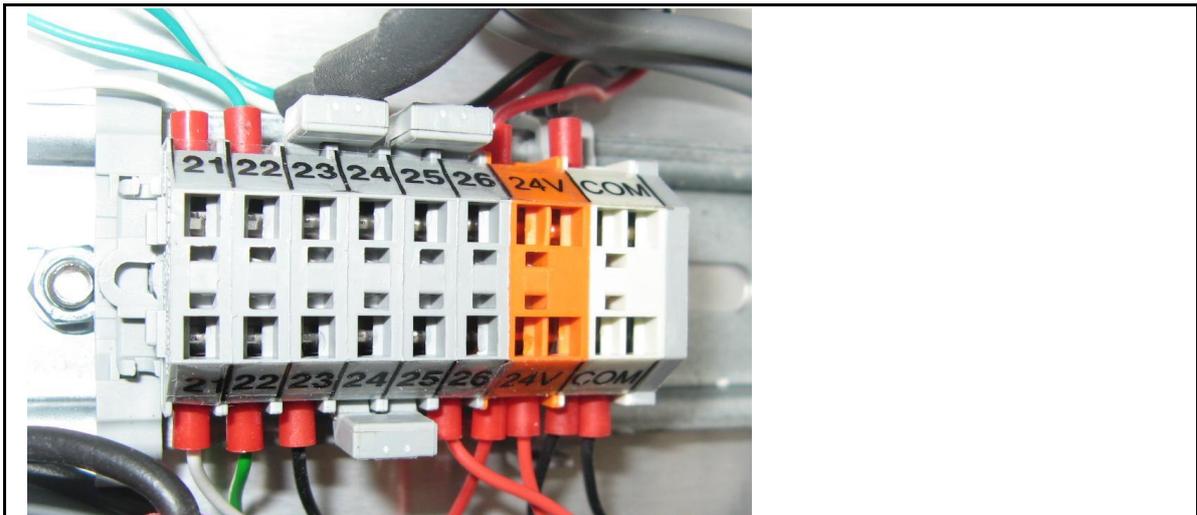


Figure 21: Control Motor Plugs

For additional details on the Control Motor connections, see Appendix A, Drawing C: Conveyor Motor Control Box.

3.4 Installing the PLC Device Driver Software

After installing the hardware components of the conveyor and connecting the wires the next step is to install the PLC Device Driver software as described in the following procedure. For further details refer to the OpenCIM User Manual provided.

To install the PLC Device Driver:

1. From the OpenCIM CD-ROM, install the OpenCIM software on the Manager PC and the workstation environment on each Station PC.
2. From the Manager PC, click the **Project Manager**  icon on your desktop and import the required project.
3. On each workstation desktop, create the relevant loader shortcut to the Manager PC.
4. Create a shortcut for the PLCDD loader shortcut  Loader of WS1 on the Station PC.

4. Testing and Operation

After installing the pallet tracking system and conveyor, the next step is to verify that the system is working properly with the software. This includes:

- Testing the Conveyor
- Testing the Pallet Tracking System
- Testing the Pallet Tracking System Using Device Drivers

4.1 Testing the Conveyor

The following procedure describes how to verify that the conveyor is moving properly.

To test the conveyor:

1. Start the conveyor and check that the chain moves in the correct direction.
2. Stop the conveyor.

4.2 Testing the Pallet Tracking System

The following procedure describes how to verify that the pallet tracking system is working properly.

To test the pallet tracking system:

1. Turn on the PLC Unit.
2. After initialization, start the conveyor and check that the pallets are stopped and released at each station.
3. Stop the conveyor and turn off the PLC Unit.

4.3 Testing the Pallet Tracking System Using Device Drivers

The following procedure describes how to verify that the pallet tracking system is working properly using the device drivers.

To test the pallet tracking system using device drivers:

1. Turn on the PLC and then activate the PLCDD using the loader icon on the PLC Station PC.
2. Start the conveyor and check if pallet movement is displayed correctly per station in the PLCDD window.
3. In each station verify that the following PLC device driver commands are working properly:
 - **DELIVER**
 - **GET FREE**
 - **FREE**
 - **RELEASE**

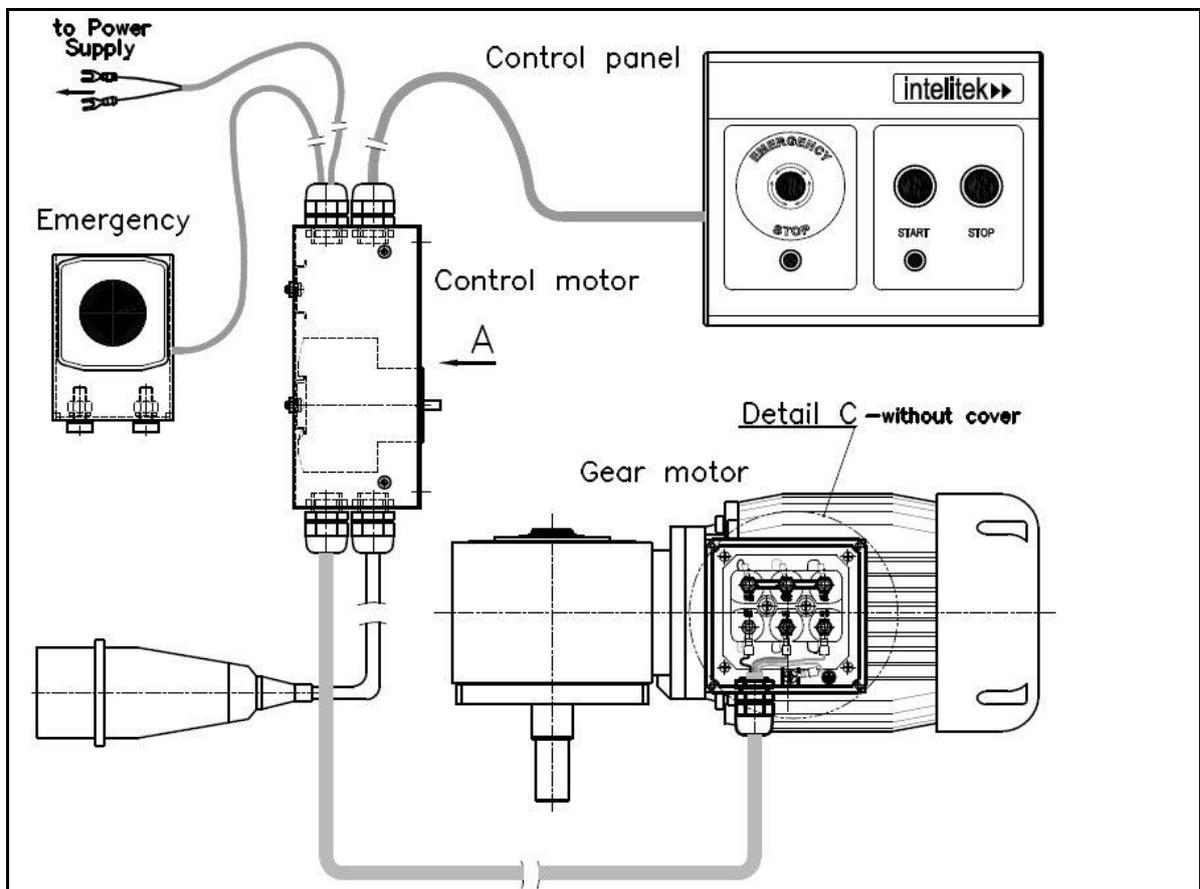
5. Appendix A - Schematic Drawings

This chapter displays schematic drawings of the electrical, mechanical and robotic devices of a conveyor and pallet tracking system.

5.1 Drawing A: Conveyor Motor Connections

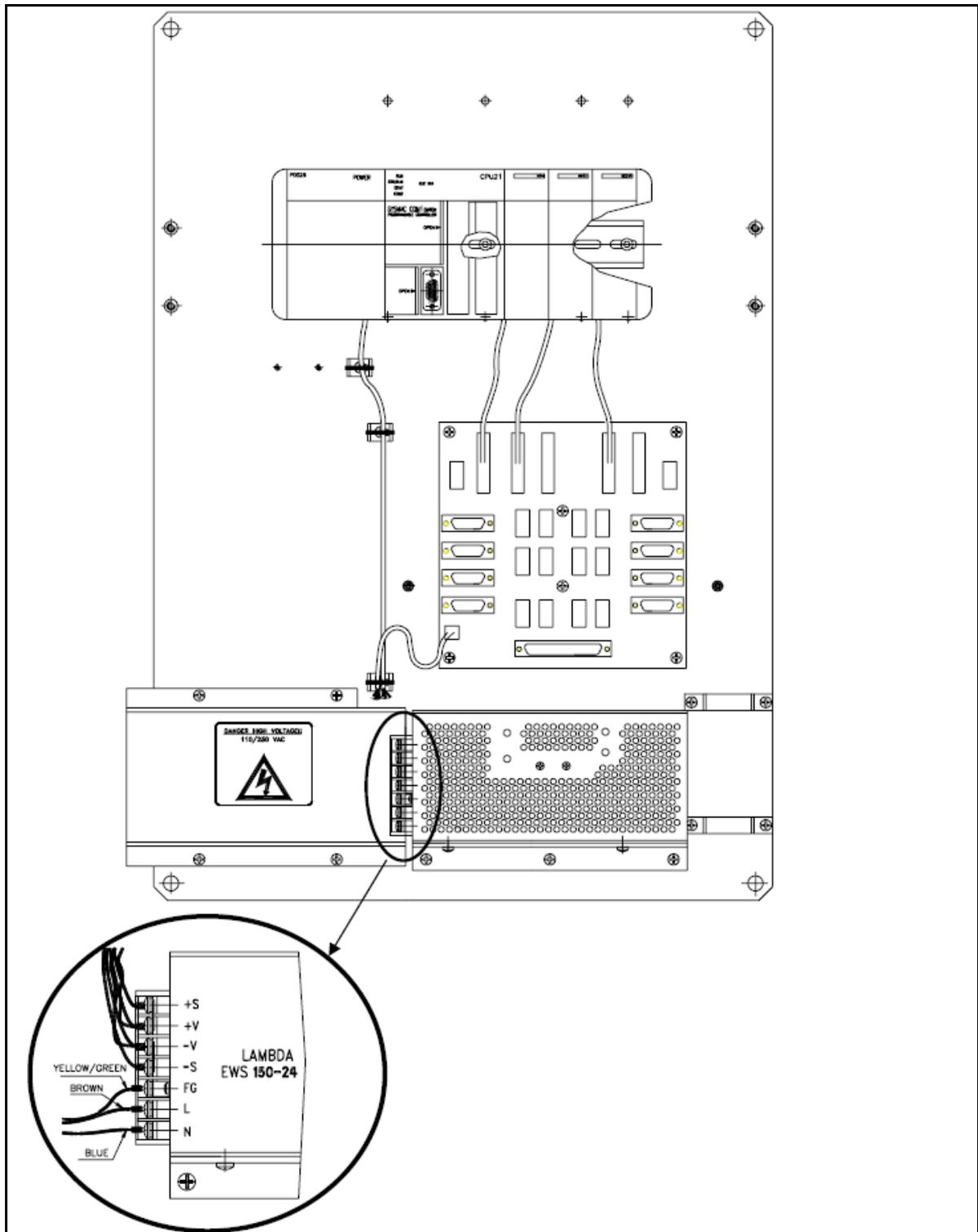
The diagram below shows an overall view of all the conveyor motor connections.

See **Drawing C: Conveyor Motor Control Box** for a magnified view of section A, the **Control Motor**, in the image below.



5.2 Drawing B: PLC Cabinet Connections

The diagram below shows the PLC cabinet connections.



5.3 Drawing C: Conveyor Motor Control Box

The diagram below shows a magnified view of the conveyor motor control box.

See **Drawing A: Conveyor Motor Connections**, for an overall view of the conveyor's motor connections.

