

brookfield industries, inc.

Commercial / Industrial Door Operator Manual

SWINGING AND SLIDING DOOR OPERATORS FOR LEAD
SHIELDED DOORS



*For All Door Operator Model Numbers
for Swinging and Sliding Doors*

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Brookfield Industries, Inc.

**NB-4120-2-DC Single/Bi-Parting
COMMERCIAL/INDUSTRIAL
SLIDING
DOOR OPERATOR
MANUAL**

(6th Edition 01/01/2021)*

***Incorporates Maintained Contact to Close per UL 325 Entrapment
and improved safety relay.**



US Patent No. 6,177,771 B1

Table of Contents

- **Important Instructions for Installation**
- **Important Safety Instructions**
- **Overview**
- **Installation Instructions**
- **Installation Instructions for Emergency Hand wheel**
- **HMI Instructions**
- **Door Position Setup Instructions**
- **NB-4120-2-DC Drawings: *NB-4120-2C4, NB-4120-2DC4, NB-4120-2DC8, NB-4120-2DC9, NB-4120-2P2, NB-4120-2-DC-Travel, NB-4120-2-DC-SingleSlide-1***
- **Terminal Strip Hookup Legend (Power Supply and Class 2 Voltages)**
- **Wiring Diagrams**
- **Parameters**
- **Maintenance Intervals**
- **Safety Systems**
- **Limited Warranty**
- **Sliding Door Operator Troubleshooting**

WARNING!

IMPORTANT INSTALLATION INSTRUCTIONS

IMPROPER INSTALLATION CAN LEAD TO SEVERE INJURY OR DEATH

READ AND FOLLOW ALL INSTRUCTIONS

- **Commercial/Industrial Sliding Door Operator** that has exposed moving parts capable of causing injury to persons or employs a motor deemed indirectly accessible by UL 325,10.6 by virtue of its location above the floor shall include:
 - (a) Install the operator at least 8 ft (2.44 m) or more above the floor; or
 - (b) If the operator must be installed less than 8 ft (2.44 m) above the floor, exposed moving parts must be protected by covers or guarding, provided by the operator or door manufacturer; or
 - (c) Both (a) and (b)
- Install only on a properly operating and balanced door within the rated values for door weight, door width and operating forces as stated on the ratings label
- Do not connect door operator to source of power until instructed to do so
- This door operator shall be installed and serviced by a qualified technician, electrician or electrical maintenance person familiar with its operation and the potential hazards involved.
- Any person performing installation or service on this product shall read this manual first. Proper installation includes following all steps outlined in the **Installation Instructions** and the settings specified under the **Parameters** section.
- Assure all electrical wiring and grounding is installed as specified in this manual and as required by any local codes. Proper installation can also reduce the risk of electrical shock, fire or explosion.
- Locate activation switches or push button stations: (a) within sight of the door, (b) at a minimum height of 5 ft (1.53 m) above floors, landings, steps, or any other adjacent walking surface (c) away from moving parts of the door.
- As described in this manual, the Stop command controlled by the motor drive is not intended to be a fail safe or Emergency Stop (E-Stop) since it does not prevent the motor drive from malfunctioning. This can only be accomplished by disconnecting the AC power to the operator (terminals L1 and N).
- This door operator is to be a permanent or "hard" wired connection to the supply voltage. The electrical contractor shall install a dedicated breaker or line switch to disconnect each ungrounded pole of the door operator from the supply voltage. Each ungrounded pole shall have a minimum of 3mm contact separation.
- If this model is equipped with a manual release, disengage pin(s) between door and door operator before manually moving the door.

WARNING!

IMPORTANT SAFETY INSTRUCTIONS IMPROPER USAGE CAN LEAD TO SEVERE INJURY OR DEATH READ AND FOLLOW ALL INSTRUCTIONS

- **Commercial/Industrial Sliding Door Operator** for trained traffic* use only. The manufacturer of this product does not include external safety devices as a standard feature.
- **External safety devices** are required on this door operator. The installer is solely responsible for selecting and installing the correct safety devices to prevent severe injury or death. Refer to the Terminal Strip Hookup in this manual for proper wiring and to the owner's manual of the external safety device manufacturer for proper installation and use.
- No person shall perform any service or activate this door operator unless they have been properly trained in its safe usage and have read the owner's manual.
- Never let children operate or play with door controls.
- Before activating this door operator, check the following:
 1. Assure that all personnel are clear of the path of this operator and the door that it is attached to.
 2. Assure that all fingers, hands, feet, limbs and articles of clothing are clear of all moving parts and pinch points.
- Personnel should keep away from a door in motion and keep the moving door in sight until it is completely closed or open. NO ONE SHOULD CROSS THE PATH OF A MOVING DOOR.
- Test the door's safety features at least once a month. Make any adjustments or repairs as necessary and retest. Failure to do so may cause severe injury or death.
- KEEP DOORS PROPERLY OPERATING AND BALANCED. Refer to door manufacturer's manual. Have repairs done by trained technicians.
- Prior to performing any service on this product (including the replacement of any fuses or circuit breakers), disconnect the operator from the supply voltage.
- For continued protection against fire, replacement fuses or circuit breakers shall be of the same type and ratings as those being replaced.

*Defined in ANSI 156.10 as a controlled group of people trained in the safe use and operation of a particular door installation.

SAVE THESE INSTRUCTIONS

Overview

The NB-4120-2-DC, Single and Bi-Parting Sliding Door Operator, is designed and tested for lead shielding doors weighing up to **35,000 lbs** (single door)/**17,500 lbs** (each bi-parting door), operating at linear speeds of **6.0 in/sec** maximum (single door)/**12.0 in/sec** maximum (bi-parting doors), or a maximum horizontal operating force of **700 lbs** (single door) or **350 lbs** (each bi-parting door). The drive train features a 2" wide (H) pitch, polyurethane, steel reinforced timing belt, coupled to a ¾ hp, 90VDC, helical-bevel (high torque) gear motor. Since the drivetrain features a ¾ hp DC motor, this operator also includes a **Battery Backup System** and **Manual Operation** as a redundant backup for power interruption. *Applications involving heavier doors at slower speeds/acceleration rates should be referred to the Engineering Department.*

The NB-4120-2-DC is designed to be used in conjunction with an existing linear bearing/rail system capable of supporting heavy doors with a low coefficient of friction or standard beam trolley supports for hanging the door. The open ended style timing belt normally clamps to the side of the door carriage/attachment structure. Once the timing belt has been properly aligned and pre-loaded, in addition to the motor control parameters being correctly set, the **NB-4120-2-DC** will provide many years of maintenance free service.

This power open/power close electro-mechanical operator with its state of the art components, make it the strongest, most reliable and easiest to install in the industry today. Refer to the **Wiring Legend for Terminal Strip Hookup** for all open, close, stop and **External Safety Device** inputs, which are all Class (2) 24VDC normally open momentary contact (*except the stop input, terminal #10, which is a normally closed input*). Power supply hookups for both Class (2) 24VDC, and 230VAC, 3 phase are also indicated. The PLC then processes all this information, in addition to many other features for proper control of these heavy lead or concrete doors. This door operator is patented under **US Patent No. 6,177,771 B1**.

The **NB4120-DC Commercial/Industrial Sliding Door** is compliant with **UL 325** under Section **External Entrapment Protection** featuring **Fail Safe Monitoring**, providing all External Safety Devices are wired and installed per this manual.

We are Authorized to Mark the **NB-4120-DC** with the **ETL** and **CE** markings from Intertek Testing Services to assure compliance with **UL 325**, **FCC Part 15** (Emissions) and the following International Standards: **EN 60335-1** and **-2** (Safety), **EN 61000-6-2** (Immunity) and **EN 61000-6-4** (Emissions). The "listing" reports specifically refer to the heavy commercial/industrial doors associated with linear accelerator rooms.

Logic Control:

This Operator offers the latest technology in PLC (Programmable Logic Control). The following (3) modules snap to a DIN rail base: **CPU (Central Processing Unit)** - processes and stores data in its internal register such as door position presets, inputs from pushbutton

stations and outputs to motor controls. This extremely compact unit houses (8) LED 24 VDC inputs and (6) LED outputs with (3) isolated commons.

Analog/Digital Converter- converts the analog signal of the Rotary Position Transducer to a digital value.

Class (2) 24 VDC Power Supply- converts 110 supply voltage to Class (2) 24VDC power to operate the CPU, A/D converter, Rotary Position Transducer and presence sensors.

These plug-in modules with LED make diagnostics and replacement of parts easy and quick to perform.

Interface with the PLC is necessary to adjust **Door Position Presets** in the field. This is accomplished by plugging in an 8- Pin Phoenix connector to the back of the **Human Machine Interface (HMI)** and a round female connector into the side panel of the operator. The **HMI** is a hand held, touch screen device that is purchased separately.

The CPU has been programmed to adjust on the fly, such door position presets as **Back Check, Full Open, Latch Check and Full Closed**.

Input commands to be processed by the PLC, are done so by making the appropriate connections on the **Terminal Strip Hookup**. By connecting a separate normally open SPST switch between terminals 1 and 14 to open, terminals 1 and 13 to partially open, terminals 1 and 12 to close, and a normally closed SPDT switch to terminals 1 and 10 to stop the door, provides the customer discrete control of each input from a momentary contact push button station (not included). These commands can also be activated by presence sensors, or control mats. Reversing the direction of the door while it's moving (dynamic) can be accomplished by simply pressing the appropriate switch to change direction. *We do not include any activation devices or push button stations with our door operators.*

The **NB-4120** features momentary contact **Input** commands for **External Safety Devices** that comply with **UL 325 Section External Entrapment Protection** featuring **Fail Safe Monitoring**. These devices are normally door mounted, **4-wire reversing edge contact type sensors** that reverse the door while closing. However, they can be substituted with non-contact type presence sensors providing the external wiring is compatible with our internal wiring. ***Note: The door will not be allowed to close unless these sensors are correctly wired per this manual.*** When installing contact type sensors, assure they are properly secured to the leading edge of the door with sufficient spacing and length to assure safe activation (refer to the owner's manual). Momentary contact **Input** commands and a low **voltage Class (2) power supply** are also provided for **additional (redundant) sensors**, such as **non-contact type presence sensors** that are frame mounted. brookfield industries does not manufacture nor do we include **External Safety Devices** with any of our door operators. *The installer is solely responsible for selecting the correct sensors to prevent injury.* To assure that external safety devices are properly installed and adjusted correctly, refer to the owner's manual for that device. For proper wiring, refer to **Terminal Strip Hookup** and the **Wiring Diagram** included in this manual.

The NB-4120 also features a maintained contact (constant pressure/dead man) Input (Terminals 1 & 20) to close the door that complies with UL 325, Entrapment. For proper wiring to this input, please refer the Terminal Strip Hookup.

The user now has the flexibility of choosing either one of the above methods: Entrapment by means of maintained contact or External Entrapment Protection through safety sensors. Both methods can be employed by simply connecting to both inputs. The maintained contact could then be utilized as an emergency override for closing the door in case the tape switches fail. This allows the door to stay in operation until the contact sensors can be repaired.

The **Stop** command (normally closed terminal #10) will stop the door in any position when activated but it will not prevent a motor drive from malfunctioning nor is it a true emergency stop. **Emergency Stop (E-Stop) can only be accomplished by disconnecting AC power to the operator (Terminal L1, L2, L3 and Terminal N).**

The **NB-4120** features the same ***Absolute Position Feedback Control*** system and software as other **brookfield industries, inc.** door operators. There are no limit or proximity switches to adjust or install for any of the door positions under normal operation. Simply adjust the door's positioning presets as required by interfacing with the PLC via a hand held Human Machine Interface (purchased separately).

A **Rotary Position Transducer** attached to the gear motor output shaft provides the position of the door. As the door changes position, the output signal from the transducer varies in value. This signal, once converted to a digital value, is stored in the CPU for further processing. This device does not need to be "homed" or reset if there is a power loss or electrical noise nor does it need to go through "learn speed" after power up or after adjustments have been made.

Motor Control:

The **NB-4120-2-DC** utilizes a state of the art **Regenerative (4-Quadrant) 90 VDC Motor Control**. This provides the best assurance that the door's high inertia characteristics will not "overhaul" (or "freewheel") the motor; thus, resulting in controlled door motion. The **NB-4120** now features a **multi-speed board** that attaches to the top of the **motor control**. The logic panel is greatly simplified with the elimination of the external speed pots and the associated wiring. The new multi-speed board features control of (4) independent speeds. The **NB-4120** now has the flexibility of controlling separate creep close speeds (**Preset 1**) and creep open speeds (**Preset 2**) as well as close speeds (**Preset 3**) and open speeds (**Preset 4**). The motor control also features additional trimpots, which greatly improve the performance of the drive and motion profile of such heavy doors. The **DB** (Dead Band) trimpot sets the amount of main speed trimpot rotation to initial output voltage and controls the amount of delay before regeneration starts. If not properly set, the motor may oscillate

or continue to hum. The **RESP** (Response) trimpot adjusts the dynamic response of the system; therefore, increasing this setting will increase response time (if set too high, unstable operation may result). The **IR Comp** trimpot determines the amount in which the motor speed is held constant as the motor load changes. For example, if set too low, the motor may not obtain the desired speed fast enough or not at all. If set too high, the motor may oscillate. The **RCL** (Reverse Current Limit) trimpot and **FCL** (Forward Current Limit) trimpot adjusts the armature current limit or motor torque in their respective directions. When properly set, the operator will have sufficient torque to operate in both directions, while at the same time limiting the current to the motor. This will prevent damage to any of the mechanical components of the door operator (*also eliminates the need for unreliable and hard to adjust manual slip or electromagnetic clutches*).

The **MAX** (maximum speed) trimpot adjusts the voltage or speed of the motor in the forward and reverse directions. The **FACC** (Forward Acceleration) trimpot adjusts the acceleration time in the forward direction as a function of the maximum rated motor speed. It also controls the Reverse Deceleration time. The **RACC** (Reverse Acceleration) trimpot adjusts the acceleration time in the reverse direction as a function of the maximum rated motor speed. It also controls the Forward Deceleration time.

Overload Protection for the DC motor is provided by using the appropriate line fuse to the 110VAC power supply of the motor control (see wiring diagram) and by the proper setting of the **Reverse Torque** and **Forward Torque** trimpots, which controls the amount of DC current to the motor in both directions.

Drive Train:

The **NB-4120-2-DC** is a linear drive system comprised of a 2" wide XH polyurethane steel reinforced timing belt driven by a single phase, 3/4 hp, 1750 RPM, DC motor that is coupled to a helical-bevel (92:1) gear reducer with an output torque rating of 3540 lb-in and overhang load rating of 1250 lbs. The timing belt is open-ended and is attached to the doors with matching aluminum clamping plates. The belt is adjusted for pre-tension and tracking from the take-up end frames. A properly installed and adjusted timing belt will provide operating forces up to 700 lbs (total both doors) at the maximum speed of 6 in/sec (each leaf in opposite directions).

Supply Voltage:

115 VAC, (+/-)10%, 50/60 Hertz, single phase. Motor control and power supply are equipped with in-line circuit breakers. Surge protection and filtering of the supply voltage is featured to protect door operator components and to assure reliable performance (immunity) as well as minimizing RF noise (emissions).

For European installations we offer a 230 VAC single phase to 115 VAC 50 Hz conversion. *Please specify when ordering.*

Current Consumption (AC Line Input):

Maximum current: 12 amps

Manual Operation:

In case of loss of power, manual operation shall be less than 50 lbs to open per **UL 325 Interruption of Power**. This is accomplished by engaging a flexible shaft into the rear shaft of the motor via a remote control cable. A lever arm, which activates the remote control cable, and a 7" diameter hand wheel, which is connected to the flexible shaft, are contained in a NEMA 1 box. Approximate opening time, while manually operating the hand wheel, is about 2.5 minutes.

Battery Backup (standard):

When power is interrupted, and if the door is in any position other than fully open, the battery backup will be activated and provide low voltage DC power directly to the motor. The system is designed to open the door once for each power interruption at a constant speed. This system is not designed to open and close the door repeatedly. A float charger is included to provide a constant charge on the battery. These components are installed in the NEMA 1 control panel. Also included is an end of travel limit switch, which must be installed so that it disconnects power to the motor when the door is fully open. (this limit switch is only for use in battery backup mode and not for normal operation).

*This is a redundant system and does not replace or substitute any requirements of **UL 325 Interruption of Power** for manual operation.*

Assure used batteries are disposed of at the appropriate drop off center.

Emergency Open Operation:

Emergency Open (Battery Backup Test): pulling out the mushroom head switch located on Emergency Hand Wheel enclosure will disconnect AC power to the motor and provide DC battery power to automatically open the door. The mushroom head LED light will come on indicating the operator is in emergency mode. Note: power entering this enclosure is class 2 low-voltage.

With the Emergency Hand Wheel enclosure easily accessible to the technician, activation will provide 2 benefits: (1) automatically opens the door in the event that any normal functioning component (motor control, PLC, safety sensors, activation switches) has malfunctioned; (2) provides a much easier method, then in the past, for performing periodic **Battery Backup Tests**. In both cases, the end of travel limit switch will disconnect DC

power to stop the door in the open position. Pushing in the mushroom head switch will reset the operator.

Sequence of events: pulling out the mushroom head E-stop* (see *photo*), removes power to normally closed (N.C.) Relay 1** (providing DC power to the motor) and normally open (N.O.) Relay 2** (disconnecting AC power to the motor control) and provides for **Emergency Open Operation** or performs a **Battery Backup Test**.

Emergency Hand Wheel Manual Operation: opening the enclosure door will automatically disconnect AC and DC power to the motor. This provides for safe and easy method of testing the Emergency Hand Wheel Manual Operation without any danger of battery backup activation caused by a possible power interruption while performing the test (fail-safe). In addition, opening the door removes any resistance caused by the regenerative feature of the motor drive. *In the past, the 8 amp and 15 amp breakers inside the main panel needed to be shutoff prior to performing this test.*

Sequence of events: Opening the enclosure door (see *photo*), breaks the circuit to the normally open (N.O.) limit switch*, disconnecting DC power to the motor and providing for fail -safe operation of the Emergency Hand Wheel. At the same time, the circuit to the normally open (N.O.) magnetic proximity switch* is broken, disconnecting power to the (N.O.) Relay 2 and removing AC power to the motor control.

*Class 2 components added to Emergency Hand Wheel enclosure

**Relay 1 and Relay 2 have been added to the main control panel and replace the breaker switch formally used for Battery Backup tests



IMPORTANT

Do not remove this tag from the door until the supply voltage is restored and the emergency alarm is reset. After the alarm is reset, the door must be closed and the tag must be removed. Do not remove this tag.

Open Door
TO ACTIVATE
EMERGENCY
HANDWHEEL

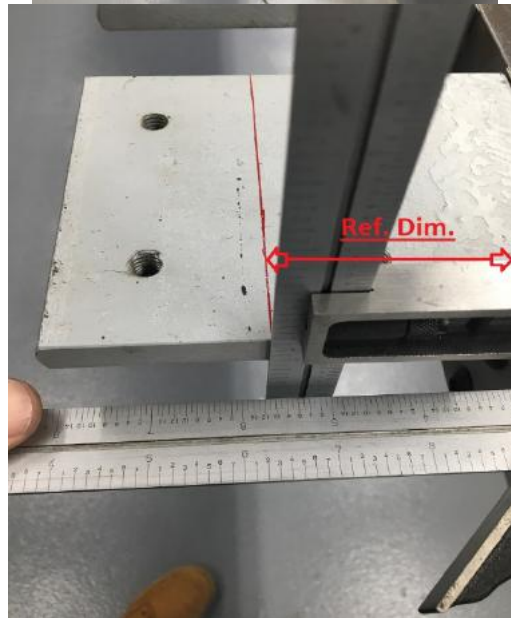
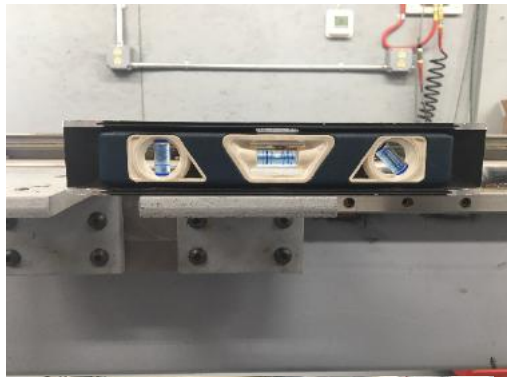
PULL
EMERGENCY
DOOR OPEN
Or
Battery Backup Test
PUSH TO RESET

Installation Instructions

Although each Door Operator has been fully inspected and tested prior to shipment, assure that no physical damage has occurred during shipping and handling. *Premature failure may occur if any part of the installation is not done properly.*

To install the NB-4120-2-DC on bi-parting doors, refer to drawings **NB-4120-2DC4** or **NB-4120-2DC-Travel**. For single slide doors, refer to drawing **NB-4120-2DC-SingleSlide-1**.

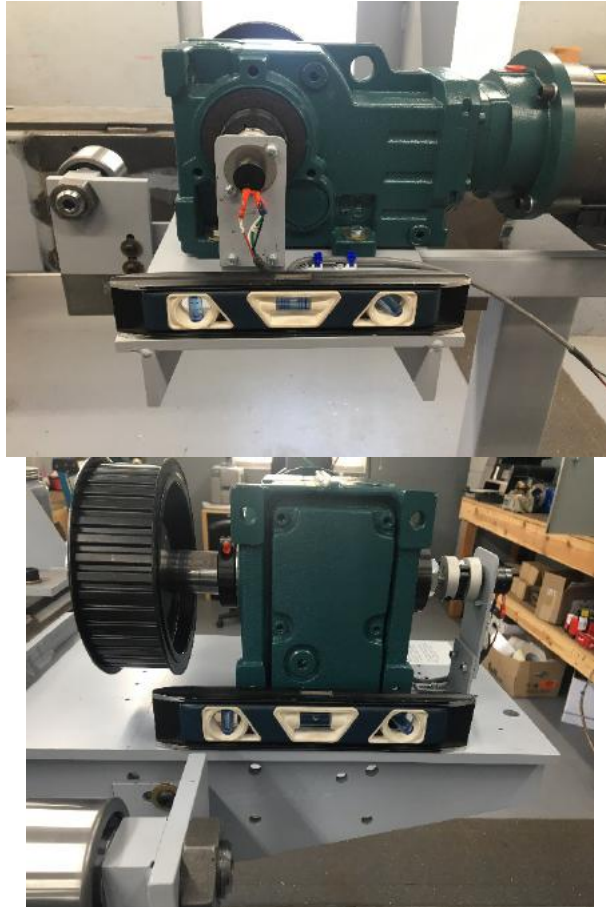
1. Install 2 door attachments (lower belt)- refer to drawing **NB-4120-2P2**.
 - Assure door attachments are *level*
 - Create a centerline on the door attachment. Assure that it is parallel with the track centerline within (+/-) 1/32". (shim as required)
 - Use the centerline on the door attachment as your reference dimension center line for the motor and take-up end brackets

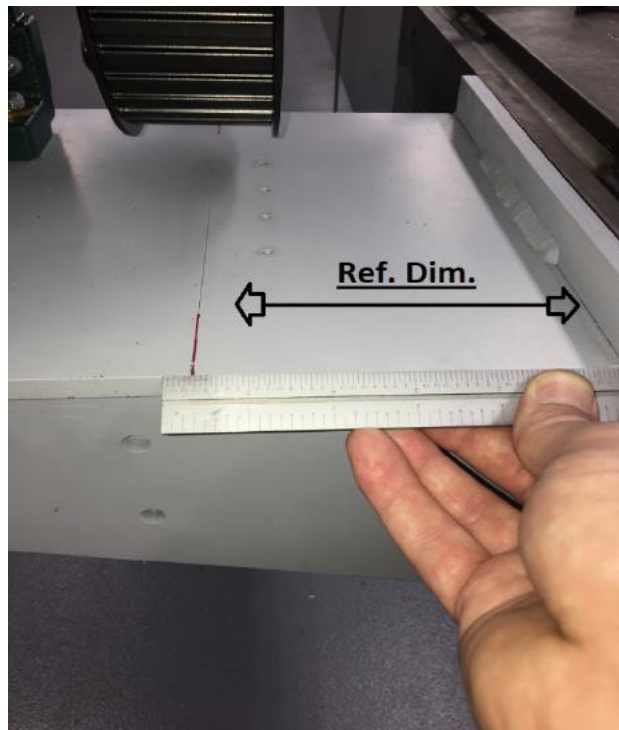


2. Mount take-up end – refer to drawing **NB-4120-2C4**
- Verify take-up end is *level*
 - Using the reference center line from the door attachments (from step 1) assure the pulley is the same distance from the track center line within $(\pm) 1/16"$. (shim as required)
 - Minor adjustments can be made by loosening the shaft collars, loosening the set screws on take up bearings, and moving the take up shaft from side to side



3. Mount motor end – refer to drawing **NB-4120-2DC9**
- Verify motor end is *level*
 - Using the reference center line from the door attachments (from step 1) assure the pulley is the same distance from the track center line within $(+/-) 1/16"$. (shim as required)





4. Mount timing belt

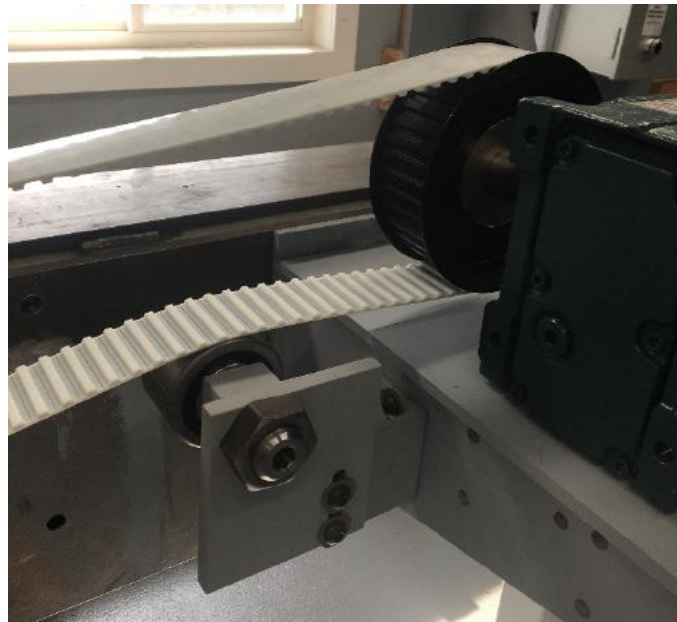
- Adjust take-up end pulley toward the motor end to allow for maximum adjustment
- For Bi-parting doors, assure both doors are in the closed position
- Attach one side of the 2" timing belt to the **lower door attachment closest to the take-up end**, secure belt with clamping plate and mounting hardware that was provided. Use torque pattern while tightening



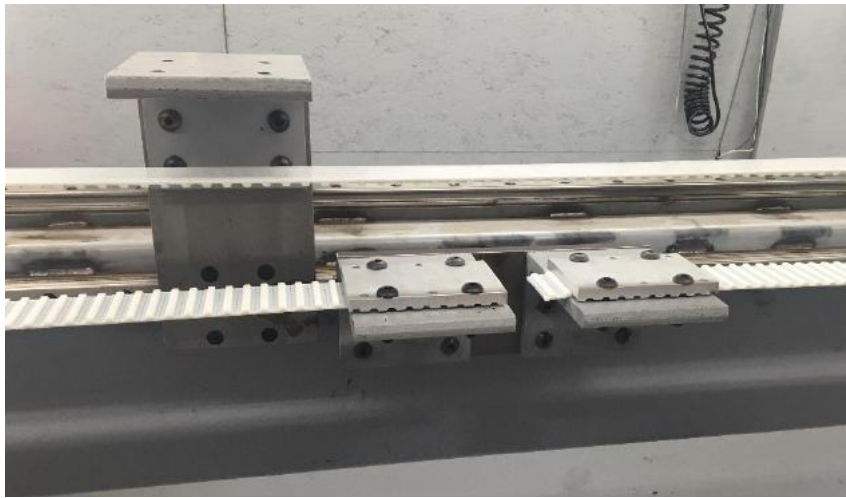
- Pull the belt through the take up end and around the pulley



- Pull the belt to the motor end and around the motor end pulley while pulling out as much slack as possible (you may need to use c-clamps to hold the belt to the pulley's)



- Attach other end of the 2" timing belt to the lower door attachment closest to the motor end, secure belt with clamping plate and mounting hardware that was provided. Use torque pattern while tightening (remove any c-clamps)



- Verify the belt teeth are fully engaged into their respective pulleys. Adjust the take-up end threaded rods as required. Adjust the motor end by shimming the bracket at the mounting surface
5. Setting the belt tension – refer to parameter section of the 4120 Manual
- Belt tension is calculated and listed on a label on the motor end bracket and inside the electrical panel
 - Belt tension should be set with the belt idler engaged (about 3/8" into the belt)
 - For single slide doors: measure the force it takes to deflect the top belt 1" at the dead center of the belt between the pulleys, use take up end to adjust accordingly
 - For bi-parting doors: **move the door to the open position** then set tension the same as a single slide door above
6. Install door attachment for upper belt– (Bi-parting Door only) refer to drawing
- NB-4120-2P2**
- Move both doors back to the full closed position
 - Assure door attachment is *level* and *parallel* with track centerline within (+/-) 1/32", using same center line dimension from lower door attachments (shim as required)
 - Assure clamping plate is engaged into the belt teeth and bolted to the left door attachment (shim as required)



7. Install Emergency Hand Wheel – refer to drawing **NB-4120-2DC8** and the **Instructions for installation (Emergency Hand wheel)** below.
8. Pull the black cable harness with the 6 14-gauge wires into the Emergency Hand wheel enclosure. Insert the 5 colored wires from the pigtail into the matching colors labeled on the connector splice using the insertion tool supplied (attached to the wiring inside the enclosure)
- Caution:** To prevent risk of serious injury, assure source voltage has been disconnected and all “lock-out” safety procedures have been strictly adhered to.
9. Hookup 115 VAC supply voltage (230 VAC supply voltage for European installations) and grounding per **Terminal Strip Hookup**, the applicable **Wiring Diagram**, and/or local codes.
10. Connect 90-volt DC motor leads to the corresponding labeled wires (A1 and A2) on motor
11. Connect all Class (2) (24) VDC inputs per the **Terminal Strip Hookup** and the **Wiring diagram** including required **External Safety Devices** (not included with operator) that comply with the **External Entrapment Protection of UL 325 for Fail Safe Monitoring**.
12. These devices can be door mounted, **4-wire reversing edge contact type sensors** that reverse the door while closing or compatible non-contact presence sensors. **Note: The door will not be allowed to close unless these sensors are correctly wired per this manual.** When installing contact type sensors, assure they are properly secured to the leading edge of the door with sufficient

spacing and length to assure safe activation (refer to the owner's manual).

13. Attach the limit switch provided for battery backup end of travel mode. We recommend this be between 1-2" past the fully open position, when properly adjusted. Assure adequate clearance exists between the door carriage and the door operator mounting plates once the limit switch has been activated.
14. Disconnect "lock-outs" and turn on power supply breakers.
15. Connect the positive and negative leads to the correct battery post.
16. All PLC and motor control settings have been preset prior to shipping; however, these values may require field adjustments that can vary for each installation (see **Parameter for NB-4120**).
17. Assure external speed "Pots" are set to the 10-20% range before activating the operator.
18. Assure all **Safety Instructions** and **Warnings** have been followed.

19. Setting the transducer

- Hook up the HMI
- Remove shroud covering transducer
- Using a 3mm allen, tighten the coupling to the transducer shaft
- rotate the coupling until the door position reads 320
- tighten the coupling to the output shaft of the gearbox
- reinstall transducer shroud

20. Activate Open, Close, and Stop commands

21. Be prepared to hit stop button: in-case any obstacles are encountered, or the door position readout is counting the wrong way-check motor or transducer wiring.

22. Check timing belt tracking and adjust as required with the take-up end adjusting rods

23. Adjust **Open, Partial Open and Close** speed "Pots" clockwise to the 65%-70% maximum setting.

24. Adjust **PLC** door position factory presets as required. Refer to the **Door Position Setup** and **HMI Instructions** and the **NB-4000 Parameters** sheet if necessary.

25. Adjust **Latch Check** and **Back Check** trimpots until a smooth stop has been obtained (20-30% range).

26. *WARNING! To avoid serious injury or death: while the door is closing, activate contact sensors and assure Latch Check trimpot speed is properly adjusted to prevent injury. Check for pinch points and adjust the Latch Check Door Position accordingly. Repeat for Back Check while the door is opening when required.*

27. Check operation of all other safety devices including redundant and non-contact type. Refer to the installation/owner's manual from the sensor manufacturer for proper settings and adjustments.

28. Operate the door several times assuring all inputs, such as open, close, partial open and stop features function properly. Make the necessary adjustments as required.

Instructions for Installation

Remote Actuator Cable to the Emergency Handwheel Flex Shaft

(Revised 6/8/2006)

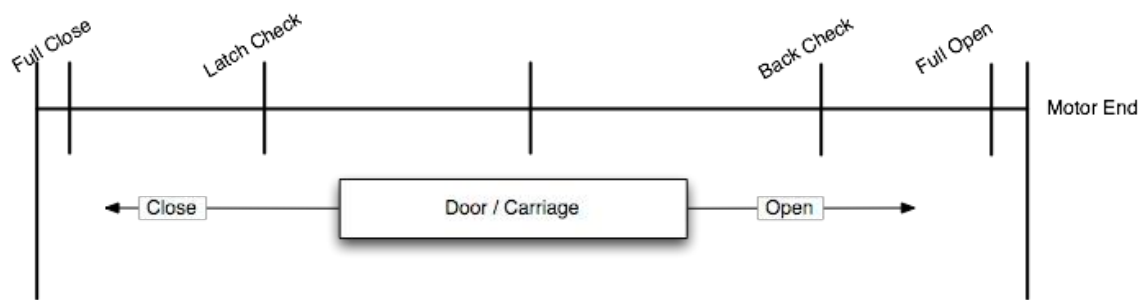
Refer to drawing NB-4120-2DC8

1. If this is a new installation, skip down to step #7.
2. If upgrading to remote disconnect, go to step #3.
3. Mount Emergency Handwheel box to the wall, run cables to the back end of the motor.
4. Unbolt 5/16"-18 bolts from gear reducer, place aside.
5. Place the attachment plate for the remote actuator beneath the upper mounting plate of the gear reducer.
6. Bolt the remote actuator attachment plate and the gear reducer to the upper mounting plate using 5/16"-18 x 1 3/4" bolts. DO NOT TIGHTEN.
7. Remove detent screw from square hole bushing on shaft extension of motor.
8. Attach remote actuator cable block to attachment plate with 1/4"-20 x 1 3/4" Allen head cap screws. DO NOT TIGHTEN.
9. Using lever in the emergency handwheel control box, gently pull lever towards you and turn the handle until the 1/2" square end of the flex shaft is inserted into the square hole bushing on the back of the motor; and cable lever locks into place.
10. Tighten the 1/4"-20 screws on the remote actuator cable block.
11. Tighten upper mounting plate screws.
12. To release lever, push red button in on the emergency handwheel lever and push forward towards the back of the box until it locks in place.
13. Test 3 or 4 times by releasing and re-engaging and rotating the motor each time.

*****Caution*****

Before using door operator, assure that the flex shaft is fully disengaged by pushing lever arm forward until it is locked in place and closing the door on Nema 1 box.

HMI Instructions



HMI GT-02 Touch Screen

1. Plug the eight prong Phoenix Connector into HMI. For operator series before 'G,' use the **black** cable, plug the opposite round end into the PLC unit on the operator. For 'G' series and above, use the **gray** cable and plug the opposite round end into the receptacle on the end cover of the operator (right side).
2. A "Please Wait" message will flash for a few seconds and then a selection screen will show.
3. Choose either Master / Slave or Standard operator. For Master / Slave, select Lead or Follow Door on the next screen, then skip to step 6.
4. For Standard operator, choose the appropriate ship date of the operator on the next screen.
5. You'll be given a display of the first three user presets. To edit a preset, simply touch the preset **number value**.
6. You'll then be given a keypad display for entering the new preset. Enter the desired value and touch the enter (back arrow) key to set the value. Press **ESC** to cancel and go back to the preset list.
7. Press Next to display the remaining user presets.

*Note: Real Time Door Position (RTDP) is always displayed on both preset screens

Door Position Setup and HMI Instructions

GT-01 Touch Screen

1. Plug the eight prong Phoenix Connector into GT-01. For operator series before 'G,' use the black cable, plug the opposite ROUND end into the PLC unit on the operator. For 'G' series and above, use the gray cable and plug the opposite ROUND end into the receptacle on the end cover of the operator (right side).
2. A "Please Wait" logo message will flash for a few seconds and then a selection screen will show.

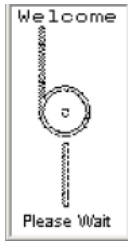


Fig. 2

3. For GT-01 software prior to Ver. 3, the screen in Fig. 3 will display. Choose either 'Standard' or 'Main/Sub' operator. For Ver. 3 of the GT-01 software, the screen in

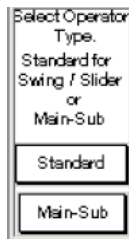


Fig. 3

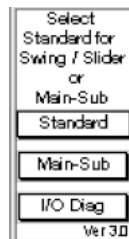


Fig. 4

Fig. 4 will display. For Main/Sub, select 'Lead Door' or 'Follow Door' on the next screen (Fig. 5), then skip to step 5.



Fig. 5

4. Selecting Standard will give you the screen shown in Fig. 6. Choose the appropriate serial number series of the operator, to get to the first preset screen (Fig. 7)

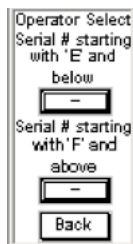


Fig. 6

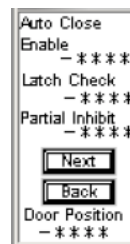


Fig. 7

5. You'll be given a display of the first three user presets (Fig. 7). To edit a preset, simply touch the preset number.
6. A keypad will then display for entering the new preset (Fig. 8). Enter the desired value and touch the ENTER (bent arrow) key to set the value. Press ESC to cancel and go back to the preset list.



Fig. 8

7. Press 'Next' (Fig. 7) to display the remaining user presets or 'Back' to return to the previous screen.

Note: Real Time Door Position (RTDP) is always displayed on both preset screens

I/O Diagnostics for Series 'i' Operators and Above only

Selecting the 'I/O Diag' button from main screen (Fig. 4), will bring you to the screen in Fig. 9. 'Outputs' will display the screen in Fig. 11.

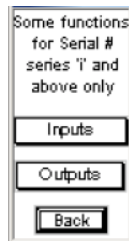


Fig. 9

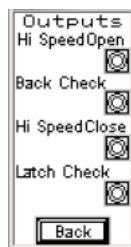
Select 'Inputs' to display the Input Diagnostic Screen (Fig. 10).

The buttons down the left side, represent an actual input to the PLC. All standard Operator functions can be tested using these buttons.



Fig. 10

The lamps down the right side of the screen indicate when an actual 'hard' input is being read by the PLC. E.g., if a Wall Switch or other device is sending an input, the applicable lamp will be lit.

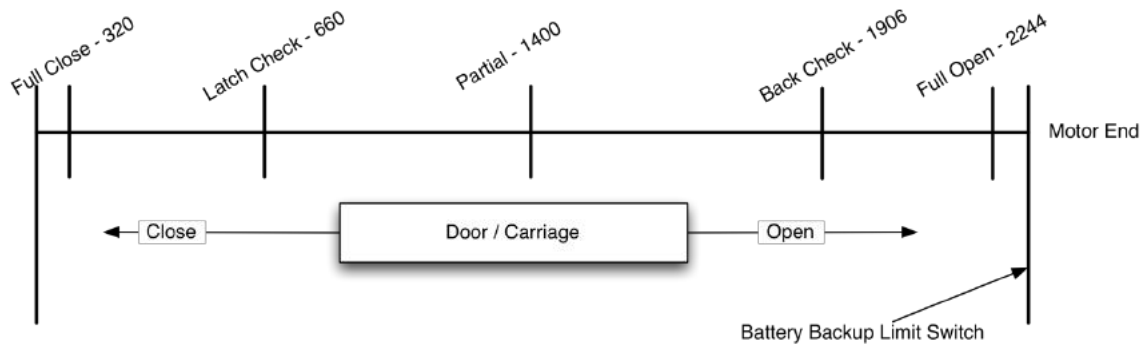


The lamps down the right side of the screen indicate when the PLC is sending the corresponding Output to the motor control.

The serial number series referred to in these instructions is the starting letter of the Operators Serial Number.

NOTE: When using the newer GT-01 Software with an older PLC, or vice-versa, the initial startup of the GT-01 may be longer than usual and/or may display an error on the screen, it will then clear and go to the initial screen shown in either Fig. 3 or Fig. 4

Door Position Setup Instructions



1. The factory settings represented in above diagram are a **starting point** and may need to be adjusted for each application depending on installation and environment variables.
2. Initiate a signal to have the operator close the door (Close button). Insure that the Creep speed pot is set so that the door doesn't "slam" into the frame. Operator will move closed at high speed then go into Creep and stop. Adjust the *Full Close* value lower or higher so that the door stops in the desired position.
3. Check position of door when fully open. Adjust *Back Check* and *Full Open* if necessary.
4. Adjust the *Partial Inhibit* value to the desired position to allow required access through doorway.

RevNo	Revision note	Date	Signature	Checked
1	ADD BELT LENGTH	12-1-14		
2	ADD SHOP NOTES	01/16/17		

A

B

C

D

E

F

A

B

C

D

E

F

(OVERALL = 2 X TRAVEL + 123 1/16)

178 3/16

(CENTER TO CENTER = 2 X TRAVEL + 100)

155 11/16

NB-4120-2C4

(TRAVEL)

27 7/8

4 1/16

(TRAVEL)

27 7/8

NB-4120-2DC9

NB-4120-2P2

83 9/16

(DISTANCE = TRAVEL + 55 11/16)

51 7/16

(DISTANCE = TRAVEL + 23 9/16)

EMERGENCY
HAND WHEEL
CONNECTION
NB-4120-2DC8

OPEN

OPEN

BELT LENGTH (INCHES) = 4 X TRAVEL + 200

Drawing Notes:

FOR SHOP ONLY:
TRAVEL < 96" USE 10 TURN POT AND
NB-4120 PLC PROGRAM.

Tolerances

Decimal + / - 1/16 UNO

Fractional + / - .xxx

Angular + / - .xxx

NB-4120-2 (DC) BI-PART SINGLE BELT

Drawn by KPK
Checked by XXX

FRONT ELEVATION INSTALLATION

Edition 0

Approved by - date
XXX - 00/00/00

Filename

Date
4/2/13

Scale
1:1

brookfield industries inc.
99 West Hillside Ave. ; Thomaston, CT 06787
P: (860) 283-6211 F: (860) 283-6123

Material
SEE BOM

NB-4120-2DC4

WARNING!

ENGAGE ONLY DURING POWER INTERRUPTION
FOR EMERGENCY OPERATION ONLY
DISENGAGE FOR ALL OTHER USE

RevNo	Revision note	Date	Signature	Checked

Drawing Notes:

TO ENGAGE:
WHILE TURNING HAND WHEEL,
PULL LEVER OUT UNTIL IT
LOCKS.

TO DISENGAGE:
PUSH HANDLE IN UNTIL IT
LOCKS.

NOTE: TO UNLOCK HANDLE,
PUSH IN HANDLE RELEASE

Tolerances

Decimal $\pm 1/16$ UNO

Fractional $\pm .xxx$

Angular $\pm .xxx$

132" LONG REMOTE
CONTROL CABLE

12" MIN. RADIUS

121" LONG FLEX SHAFT

REMOTE CONTROL
HANDLE

HAND WHEEL
MANUAL OPERATION

16 X 20 X 8- $\frac{5}{8}$
NEMA I ENCLOSURE

NB-4120-2 (DC) INSTALLATION

Drawn by KPK
Checked by XXX

EMERGENCY HAND WHEEL

Edition 0

Approved by - date
XXX - 00/00/00

Filename

Date
4/2/13

Scale
1:1

brookfield industries inc.
99 West Hillside Ave., Thomaston, CT 06787
P: (860) 283-6211 F: (860) 283-6123

Material
SEE BOM

NB-4120-2DCB

RevNo	Revision note	Date	Signature	Checked
1	ADD TOLERANCES	2/11/20		

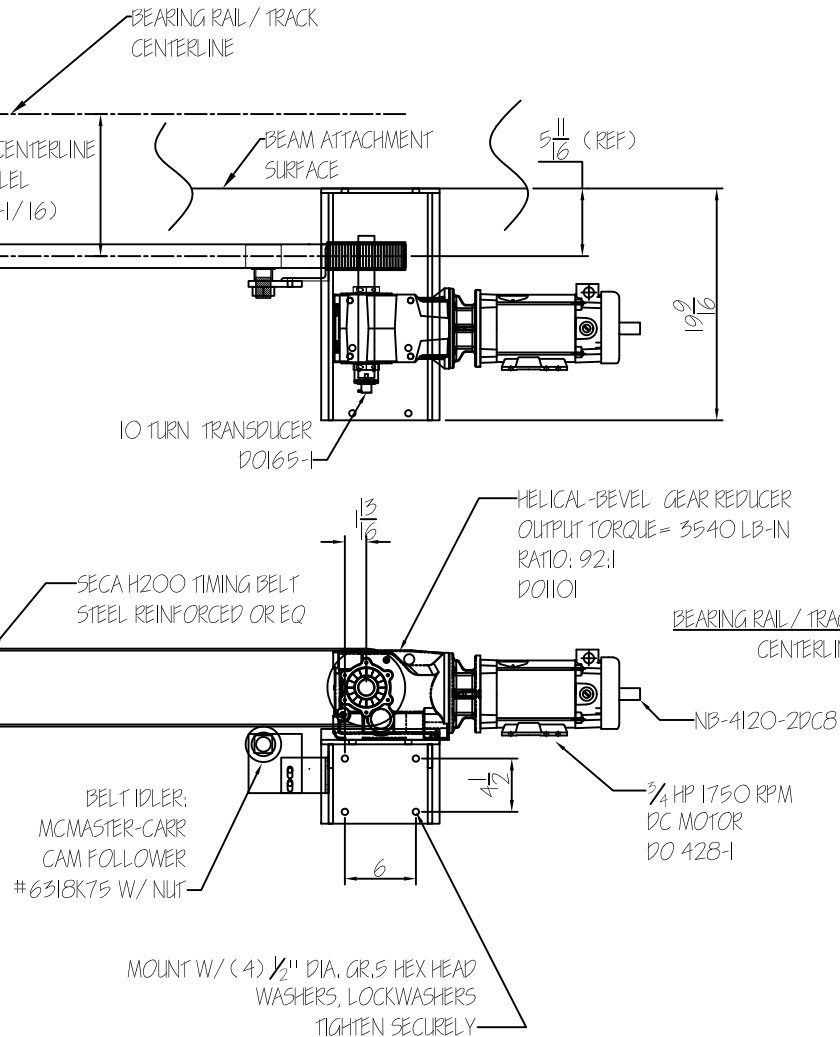
Drawing Notes:

Tolerances

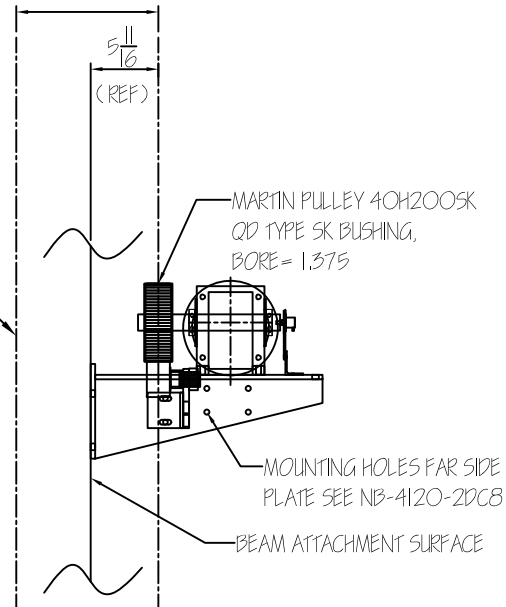
Decimal $\pm 1/32$ UNO

Fractional $\pm .xxx$

Angular $\pm .xxx$



PULLEY
CENTERLINE
PARALLEL
($\pm 1/32$)



NB-4120-2 (DC) SINGLE BELT

Drawn by KPK
Checked by XXX

GEAR MOTOR BRACKET INSTALLATION

Edition 0

Approved by - date
XXX - 00/00/00 XXX

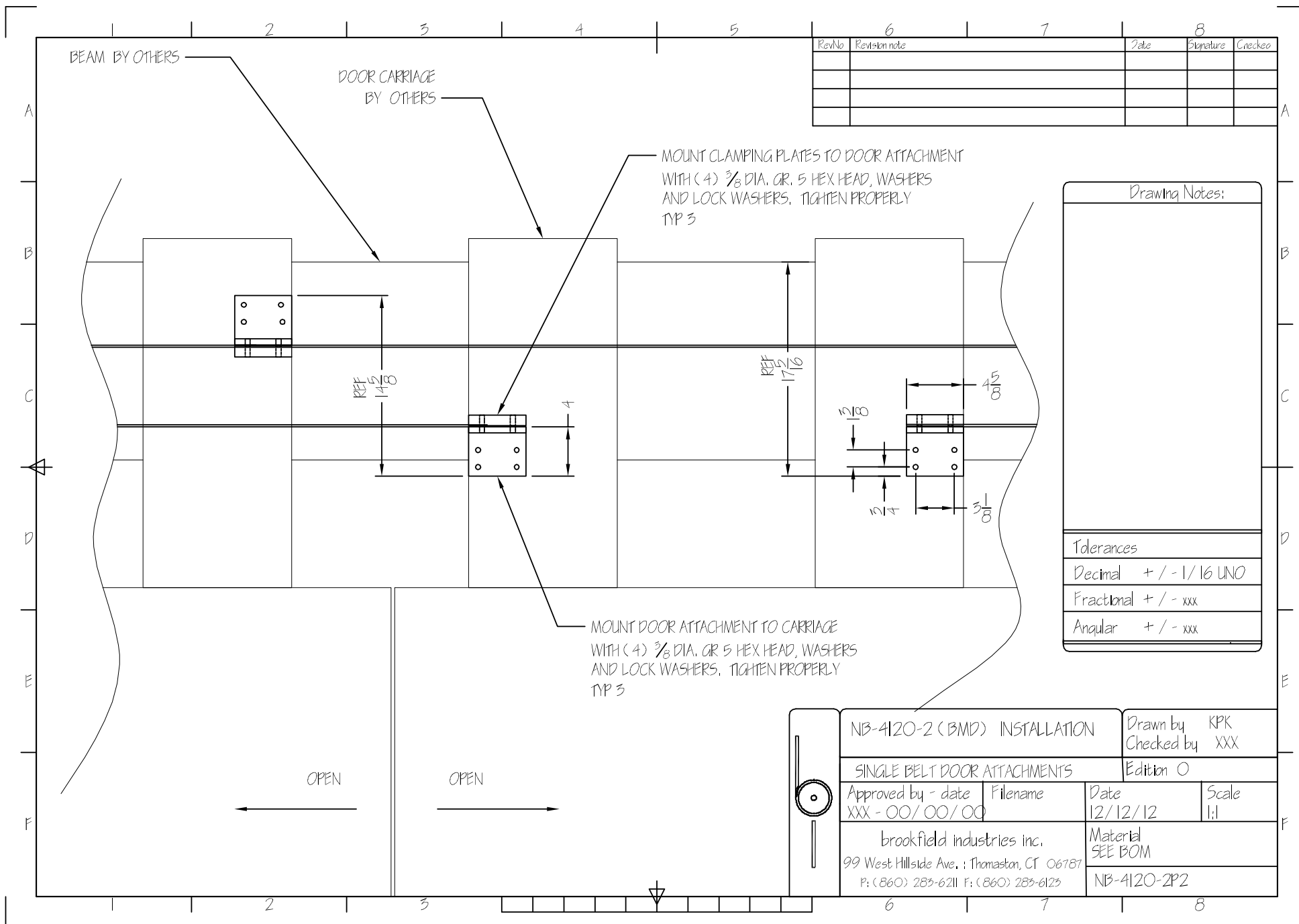
Date
4/9/13

Scale
1:1

brookfield industries inc.
99 West Hillside Ave. ; Thomaston, CT 06787
P: (860) 283-6211 F: (860) 283-6123

Material
SEE BOM

NB-4120-2DC9



RevNo	Revision note	Date	Signature	Checked
1	ADD BELT LENGTH	12-1-14		
2	REVISE BELT LENGTH/ ADD NOTE	5/30/18		

INCHES
(CENTER TO CENTER + 33.5)

INCHES
(CENTER TO CENTER)*

NB-4120-2C4

IN
(TRAVEL)

IN
(TRAVEL)

NB-4120-2DC9
NB-4120-2P2

*NOTE: 1

*NOTE: 1

EMERGENCY
HAND WHEEL
CONNECTION
NB-4120-2DC8

OPEN

OPEN

INDICATE WHICH
MOTOR/ TAKEUP ORIENTATION:

BELT LENGTH (INCHES) = 2 X C-C + 25

INCHES

MOTOR RIGHT/ TAKE-UP LEFT (AS SHOWN)

MOTOR LEFT/ TAKE-UP RIGHT (OPPOSITE)

Drawing Notes:

FOR SHOP ONLY:
TRAVEL > 96" < 180" USE 10 TURN POT
AND NB-4000 PLC PROGRAM
TRAVEL > 180" < 276" USE 15 TURN POT
AND NB-4000 PLC PROGRAM

NOTES:

1) MINIMUM SHALL BE TRAVEL + 18

Tolerances

Decimal + / - 1/16 UNO

Fractional + / - .xxx

Angular + / - .xxx

NB-4120-2 (DC) BI-PART SINGLE BELT

Drawn by KPK
Checked by XXX

ELEVATION-INSTALLATION

Edition 0

Approved by - date
XXX - 00/00/00

Filename

Date
4/2/13

Scale
1:1

brookfield industries inc.
99 West Hillside Ave. ; Thomaston, CT 06787
P: (860) 283-6211 F: (860) 283-6123

Material
SEE BOM

NB-4120-2DC-Travel

RevNo	Revision note	Date	Signature	Checked
1	REVISE BELT LENGTH	05/30/18		
2	REVISE FORMULA	9/03/24		

Drawing Notes:

Tolerances	
Decimal	+ / - 1/16 UNO
Fractional	+ / - xxx
Angular	+ / - xxx

NB-4120-2-DC SINGLE SLIDE

Drawn by KPK
Checked by XXX

FRONT ELEVATION INSTALLATION

Edition 0

Approved by - date
XXX - 00/00/00

Filename

Date
7/11/16

Scale
1:1

brookfield industries inc.
99 West Hillside Ave. : Thomaston, CT 06787
P: (860) 283-6211 F: (860) 283-6123

Material
SEE BOM

NB-4120-2DC-SingleSlide-1

OVERALL = PULLEY C-C + 33.5 =

PULLEY C-C = TRAVEL + CARRIAGE OVERALL + 36 =

18 MIN

TRAVEL =

CARRIAGE OVERALL =

18 MIN

NB-4120-2P2

TAKEUP END
NB-4120-2C4

SECA H200 STEEL REINFORCED
TIMING BELT LENGTH = 2 x C-C + 25

NB-4120-2DC9

EMERGENCY HAND WHEEL
CONNECTION
NB-4120-2DC8

INDICATE WHICH
TRAVEL DIRECTION:

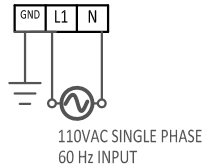
← CLOSE OPEN →
← OPEN CLOSE →

MOTOR / TAKE-UP ORIENTATION:

MOTOR RIGHT / TAKE-UP LEFT (AS
SHOWN)

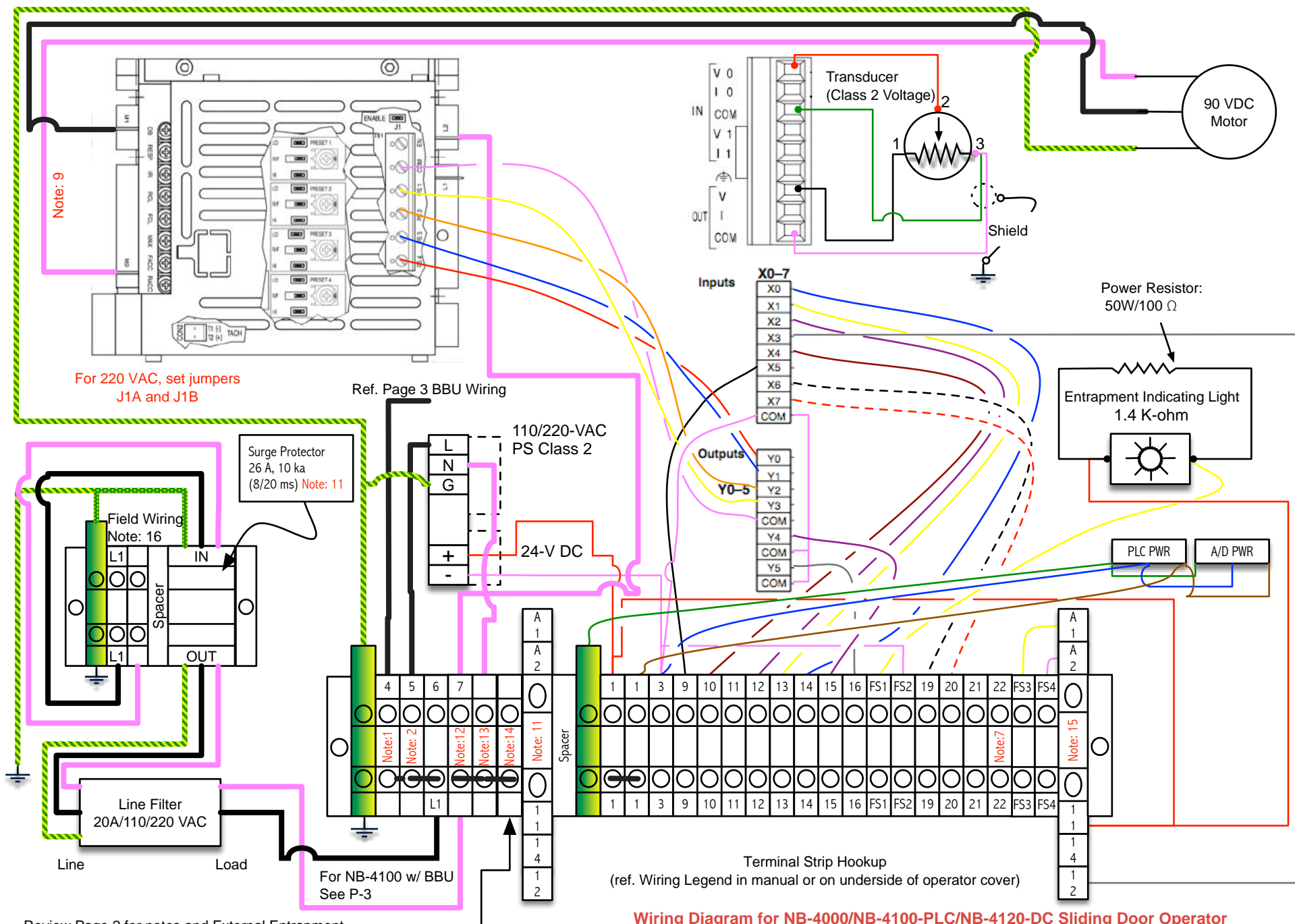
MOTOR LEFT / TAKE-UP RIGHT
(OPPOSITE)

NB-4000, NB-4000-XXX, NB-4120-2-DC, NB-4100-PLC



1. *RESERVED*
- OPTIONAL: LAST MAN OUT*
2. PUSH TO **OPEN** (TYPE: PUSH BUTTON STATION)
3. PUSH TO **CLOSE**(TYPE: PUSH BUTTON STATION)
4. PUSH FOR **PARTIAL OPEN** (TYPE:PUSH BUTTON OR PRESS WALL SWITCH)
5. *RESERVED*
6. PUSH ONCE TO **STOP** (TYPE: PUSH BUTTON STATION, **NORMALLY CLOSED**)
7. MAINTAINED CONTACT TO CLOSE
8. BI-PARTING: MAINTAINED CONTACT THAT DISABLES THE CLOSE INPUT (NO REVERSE)
SINGLE SLIDE: SEE 10B
- 10A. **REVERSES A CLOSING DOOR:** 4-WIRE (FAIL SAFE) TAPE SWITCH(UL325 SECT. 30.2) OR FAIL SAFE PRESENCE SENSOR**
- 10B. **REVERSES A CLOSING DOOR:** REDUNDANT NON-CONTACT PRESENCE SENSOR
11. BATTERY BACKUP: N.C. LIMIT SWITCH

***CABLE SUPPLIED WITH OPERATORS FOR CLASS 2 CONNECTION TO AN EXTERNAL DEVICE, AND CABLE SUPPLIED WITH AN EXTERNAL DEVICE FOR CONNECTION TO A CLASS 2 CIRCUIT OF AN OPERATOR SHALL BE: TYPE CL2, CL2P, CL2R, CL2X COMPLYING WITH THE STANDARD FOR POWER-LIMITED CIRCUIT CABLES, REF. ANNEX A, REF. NO. 12, OR OTHER CABLES WITH EQUIVALENT OR BETTER ELECTRICAL, MECHANICAL AND FLAMMABILITY RATINGS; OR CABLE THAT IS FACTORY-CONNECTED INTEGRAL PART OF A CLASS 2 POWER SUPPLY COMPLYING WITH STANDARD FOR CLASS 2 POWER UNITS, REF. IN ANNEX A, REF. NO. 13, OR A CLASS 2 TRANSFORMER COMPLYING WITH THE STANDARD FOR LOW VOLTAGE TRANSFORMERS-PART 3: CLASS 2 AND CLASS 3 TRANSFORMERS, REF IN ANNEX A, REF. NO. 11, OR AN LPS(LIMITED POWER SOURCE) COMPLYING WITH THE STANDARD FOR INFORMATION TECHNOLOGY EQUIPMENT-SAFETY-PART 1: GENERAL REQUIREMENTS REF. IN ANNEX A, REF. NO. 14.

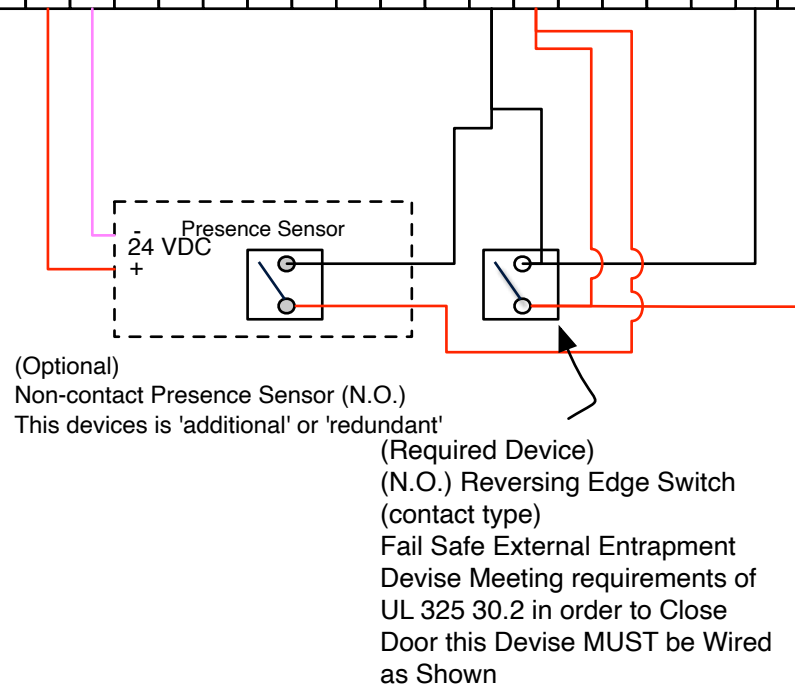
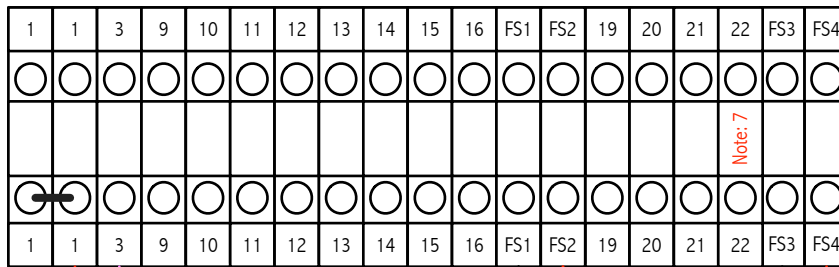


Review Page 2 for notes and External Entrapment Wiring.
Review Page 3 for Battery backup wiring detail.

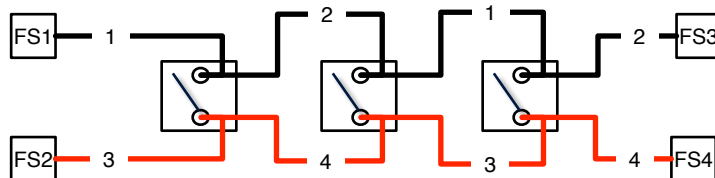
110 VAC Input (L1&N)/220 VAC Input (L1&L2)

Wiring Diagram for NB-4000/NB-4100-PLC/NB-4120-DC Sliding Door Operator

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Daisy Chain Connection of 4-Wire Tape Switches



(Fail Safe)

Notes:

1. Use 15 Amp/110/220 VAC; Circuit Breaker
2. Use 1 Amp/110/220 VAC slow-blow; Circuit Breaker
3. Class (2) 24 VDC Terminals: Power Supply: (Com & 3)
Inputs: 9-14 & 17-22
4. All 110/220 AC wires shall be minimum 14 AWG & (105° C, 300 V)
5. All 12-24 VDC (non-motor) wires shall be minimum 20 AWG & (105° C, 300 V)
6. All motor wires shall be minimum 12 AWG & (105° C, 300 V) and 25' max. length
7. Use 8 Amp/110/220 VAC slow-blow; Circuit Breaker
8. Wire as shown for normal direction, reverse 1&3 for opposite direction and reset transducer to 320 at new home position
9. For normal direction wire M1 & M2 as shown. To reverse direction, switch black wire to M2 & white wire to M1.
DO NOT ALTER BATTERY BACKUP WIRING
10. Install Ferrite Core Red Lion FCOR (2 turns=440 ohm @ 25 MHz) on all incoming AC and DC voltage lines
11. Part must be changed to utilize 220 VAC power
12. For 220 VAC Power see Note:1
13. For 220 VAC Power see Note: 2
14. Additional 'N' terminal block for battery backup only. For 220 VAC Power, See Note 2
15. 24V Safety Relay PSR-SCF24 UC/URM/2x21 (or equal impedance)
16. 110 VAC Input (L1&N)/220 VAC Input (L1&L2)

Transducer Wiring:

Wire as shown for : RH Operator (pull open), LH Operator (push open), LH Door Mounted
Reverse 1 & 3 for : RH Operator (push open), LH Operator (pull open), RH Door Mounted

Legend: _____
Pink solid line designates a WHITE wire.



Parameters for NB-4120-2 –DC Door Operator

Based on the following **PLC** and **Motor Control Settings**, the approximate time to travel 48" is 6-8 seconds for a bi-parting door and 12-16 seconds for a single slide.

PLC Settings of Door Position in Digital Value (DV):

Full Close	=	320
Full Open	=	(Travel (in) x A) + 320
Partial Open	=	(Desired Opening (in) x A) + 320
Back Check	=	Full Open - (A x 9)
Latch Check	=	320 + (A x 9)
Resolution:		
DV/in	=	A = 40 ($\leq 84"$ Travel) = 20 ($>84" \leq 168"$ Travel) = 4.0 ($>168" \leq 900"$ Travel)

Rotary Position Transducer Setting: 320 door closed position

Motor Control Jumper Setting:

Upper Board (Multi-Speed)

J1 Enable

PRESET 1 (Creep close Speed): **Lo**
R / **F**
Hi

PRESET 2 (Creep open Speed): **Lo**
R / **F**
Hi

PRESET 3 (Close Speed): **Lo**
R / **F**
Hi

PRESET 4 (Open Speed): **Lo**
R / **F**
Hi

Lower Board

J1A- Line Voltage **115V** / 230V

J1B- Line Voltage **115V** / 230V

J2-Armature Current 1.7A / 2.5A / 5.0 / **7.5A** / 10A

J3-Armature Voltage **A90** / A180 / T7 / T50

J4-Potentiometer Operation **15V** / 10V

J5-Speed Control **SPD** / TRQ

J6-Regenerate to Stop **RTS** / CTS

Motor Control Trimpot Settings (Approximate):
Upper Board (Multi Speed)

PRESET 1: Creep Close (REV) Speed POT 50%*

PRESET 2: Creep Open (FWD) Speed POT 50%*

PRESET 3: Close (REV) Speed POT 80%*

PRESET 4: Open (FWD) Speed POT 80%*

*Factory settings. Adjust in field as required for optimum performance

Lower Board

DB	50%
RESP	50%
IR	50%
RCL	50%
FCL	50%
MAX	100%
FACC	20%
RACC	20%

Reversing Direction: Can be accomplished by (2) methods:

Method 1)

Physically rotate the operator 180 degrees by placing the motor end to the transducer end and the transducer end to the motor end.

Method 2)

1. With the door in the new home or closed position, reset the **Rotary Position Transducer** to 320.
2. On the **Rotary Position Transducer**: Move the green and white wire to terminal 1 and the black wire to terminal 3.
3. On the **Motor Control**: switch the black wire to M2 and the white wire to M1. Do not change the battery backup wiring.

Timing belt pre-tension:

Must be properly set to assure the timing belt teeth stay engaged when operating at design loads.

$F = 924/c-c$

F= the vertical force to deflect the belt 1.0" at mid span.

c-c= the center to center distance between pulleys.

Maintenance Intervals

Check all nuts, bolts and screws for tightness every 100,000 cycles. Also, inspect the operator for wear or damage to any of its components. The frequency of these inspections will vary upon the installation and will be directly proportional to the usage of the operator. **Do not use the operator if any component is worn or damaged**

Safety Systems Test Intervals

Reversing edge safety sensors, presence sensors and other external devices that are not normally supplied by the manufacturer of the door operator but added during installation, must be properly tested on a frequent enough basis so as not to compromise the safety and reliability of the complete door operating system on a continuing basis. These tests should normally range from daily to weekly checks.

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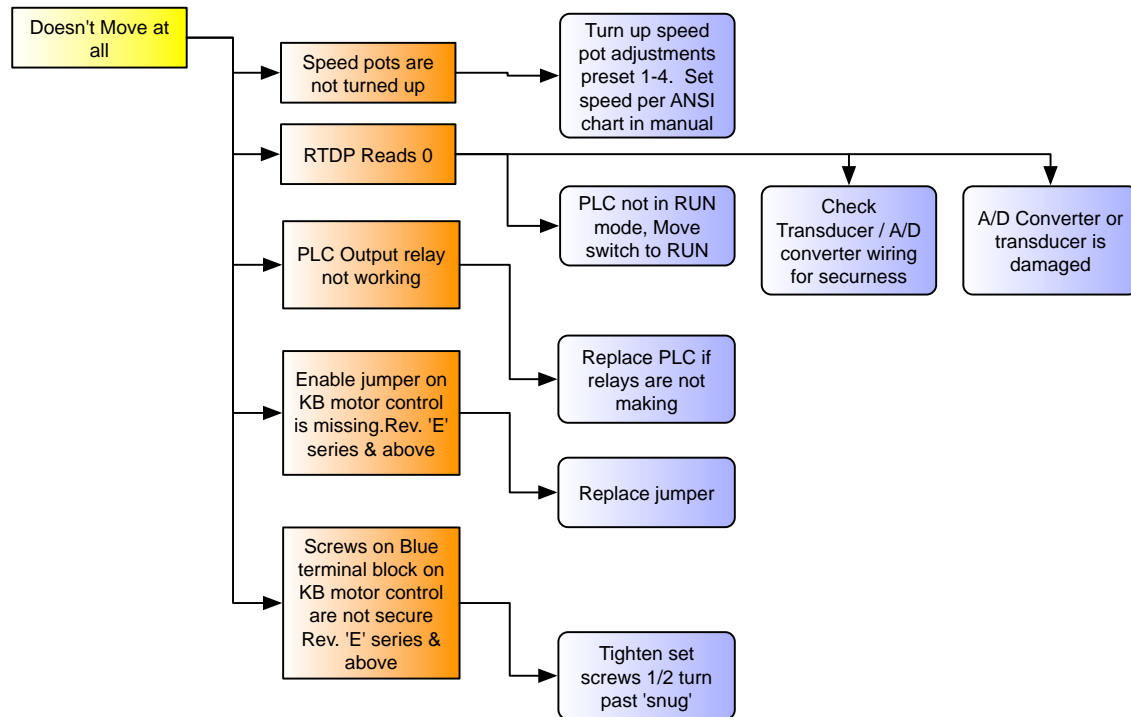
brookfield industries, inc.

Limited Warranty

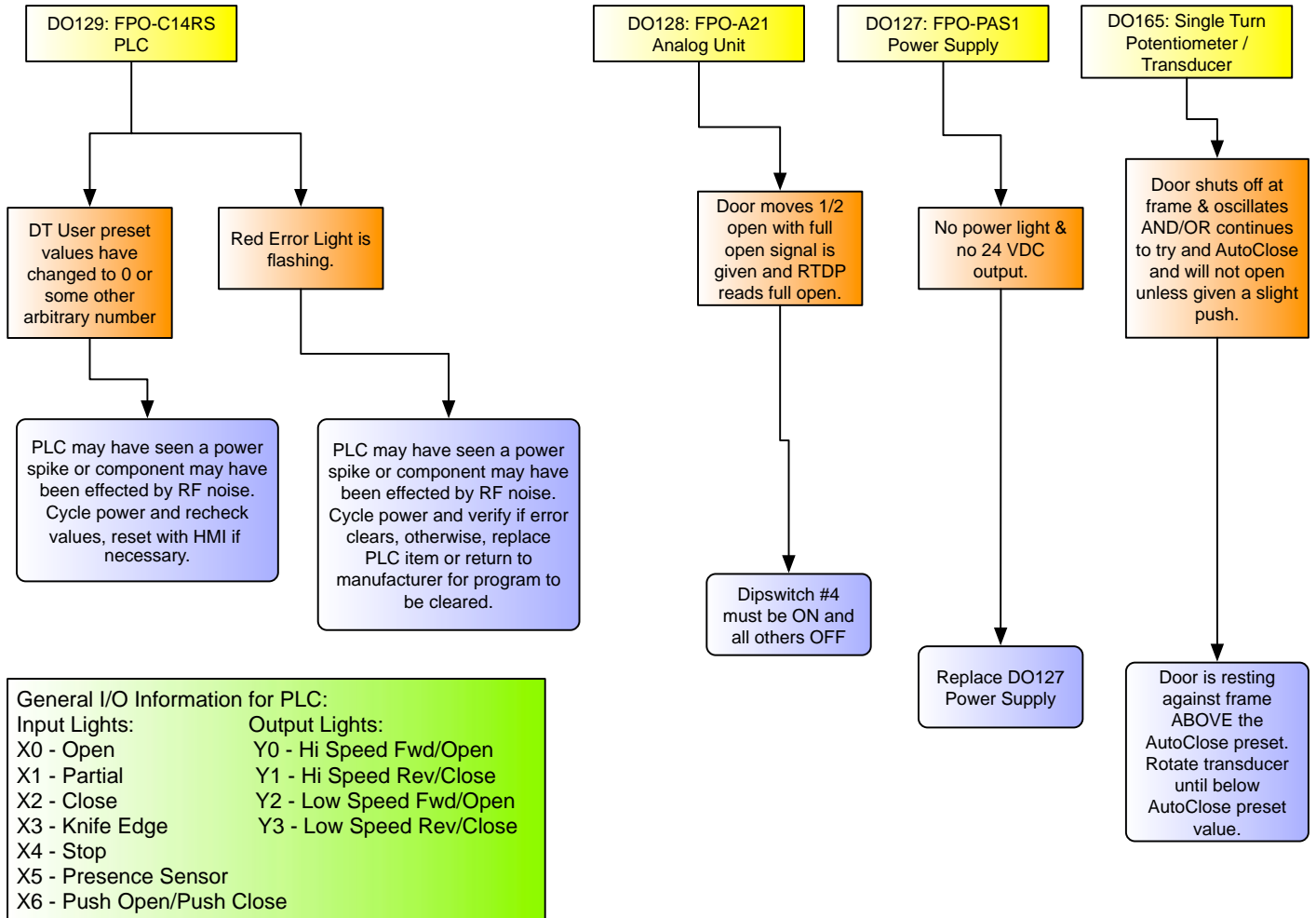
brookfield industries, inc. warrants that door operator models NB-500, NB-1000, NB-2000 and NB-4000 are free from defects in material and workmanship according to the following terms and conditions:

- 1) The limited warranty for all aforementioned products extends for (1) year beginning on the date of shipment from our facility.
- 2) During the limited warranty period, *brookfield industries, inc.* will repair or replace any defective component or any part that does not operate as originally specified or intended with a new or rebuilt part. No charge will be made to the consumer for any such parts. Credits or reimbursements, as well as associated shipping costs, will be issued only after any replacement parts have been returned by the consumer.
- 3) *brookfield industries, inc.* will also reimburse or credit the consumer for any reasonable labor charges associated with the repair or replacement of a particular part. *brookfield industries, inc.* and the consumer must agree upon the dollar amount as well as the scope of work, before any amount is allocated. This amount may vary depending on the geographical location of the labor market. Travel expenses are not applicable.
- 4) *brookfield industries, inc.* shall not cover, nor will the consumer have any benefits under this limited warranty if any of the following conditions apply to any returned parts as determined through an evaluation by *brookfield industries, inc.* or any of its vendors:
 - a) The product has been subjected to: improper installation, installation practices or any settings not in accordance with the operator manual, abnormal use, abnormal conditions, exposure to moisture, dampness or any other severe environmental conditions, unauthorized modifications, unauthorized connections, unauthorized repair, misuse, neglect, abuse, accident, altercation, door weights and/or door speeds and/or operating forces that exceed the rated values, or other acts which are out of the control of *brookfield industries, inc.*, such as damage caused by shipping.
 - b) Removing or altering of the serial number or any other action that prohibits *brookfield industries, inc.* from determining the original purchase date.

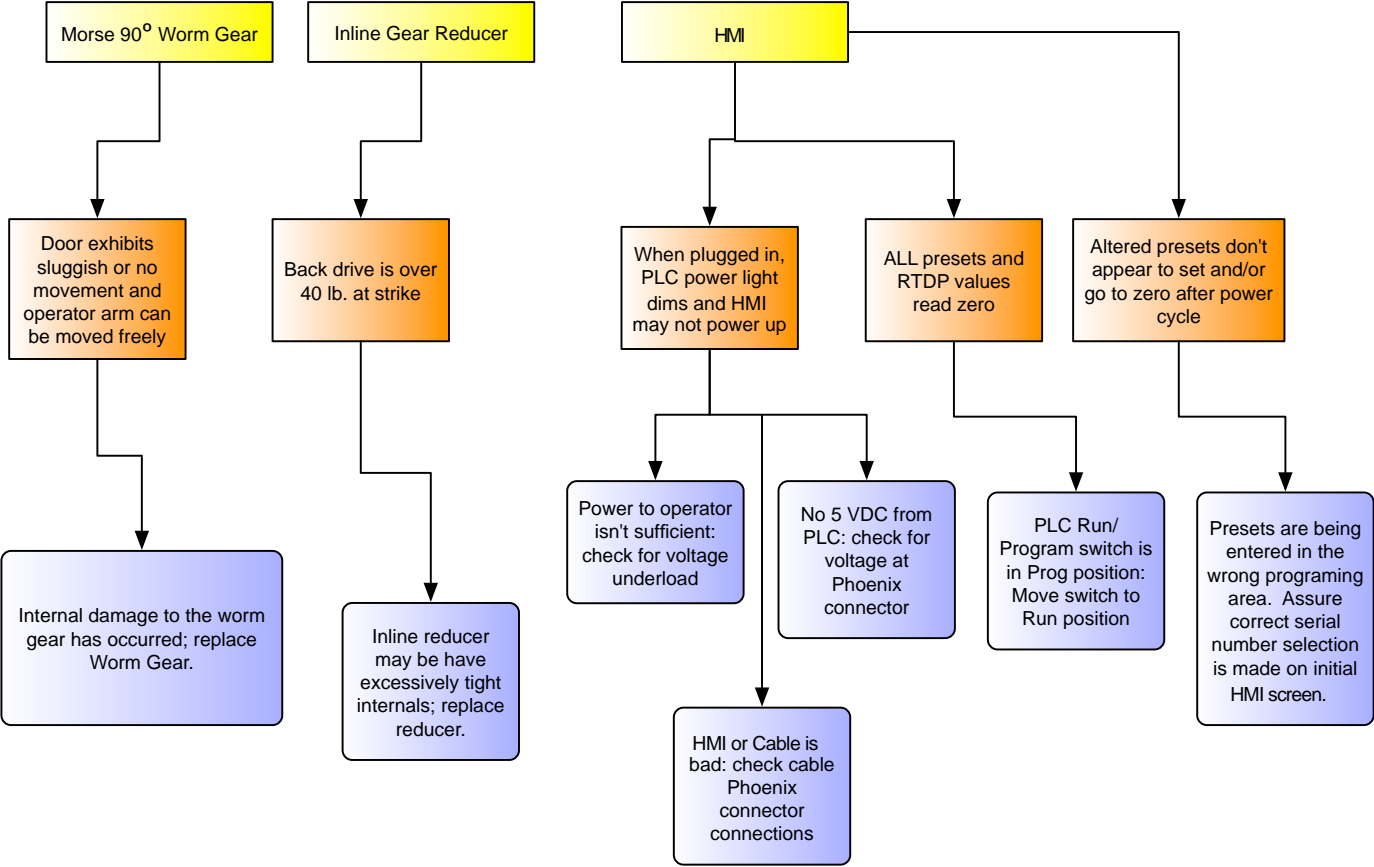
Troubleshooting Guide



Component Specific Problems



Component Specific Problems



Component Specific Problems

