

# 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-2000 MAIN/SUB\*  
DOOR OPERATOR  
MANUAL**

(5th Edition 09/01/15)\*\*



US Patent No. 6,177,771 B1

**\*For use on double doors (w/astragal) where a Lead/Follow  
sequence is required**

**\*\*Replaces DO560 PLC with DO129 and DO1110 (Expansion Module)  
(note: Wiring Diagram revision)**

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# WARNING!

## IMPORTANT INSTALLATION INSTRUCTIONS IMPROPER INSTALLATION CAN LEAD TO SEVERE INJURY OR DEATH READ AND FOLLOW ALL INSTRUCTIONS

- Install only on a properly operating and balanced swing door within the rated values for door weight, door width and operating torque 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 the force settings are compliant with UL 325 (29.4 Entrapment) and the door speeds (closing/opening times) are set per Table 1 of this manual.
- 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' so small children cannot reach and (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 swinging door operator** for trained traffic\* use only. The manufacturer of this product does not include external safety devices as a standard feature. Since Entrapment shall be compliant with UL 325 Section 29.4, the addition of external safety devices on swinging door operators is considered redundant. If external safety devices are to be added to this operator, 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. After adjusting either the force, speed or the limit of travel, retest the door operator's safety features. 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 brookfield **NB-2000 Main/Sub** Swinging Door Operator has been designed, tested and is manufactured by **brookfield industries, inc.** in accordance with UL 325 and ANSI 156.10 for linear accelerator swing doors weighing up to 20,000 lbs and 75" wide. The **NB-2000** can be expected to safely operate doors at the maximum weight and width for at least 500,000 cycles, providing the door is set within the ANSI 156.10 speed criteria and the rated operating torque of 3000 lb-in (reflected to the operator) has not been exceeded. *If any one of the following: torque, weight, width or cycles exceeds the rated value, please contact the Engineering Department for further evaluation.*

The **Main/Sub** operator is intended for use on double doors with an astragal and is designed to open the **Lead Door** first and close it last, while the **Follow Door** opens last and closes first. The **Lead Door** and **Follow Door** can be setup as either the left hand or right hand operator. The **Main Operator** is designated as the right hand operator, while the **Sub** is always the left hand. The **Main Operator** houses a common **CPU (Central Processing Unit)**, **Analog/Digital Converter** and **Class (2) 24 VDC Power Supply** as well as a common **Terminal Strip** for hookup of input commands. All other components such as the **Motor Control**, **Drive Train** and **Rotary Position Transducer** are independent to each operator.

The **CPU** has been uniquely programmed to assure the doors remain in sequence during the closing cycle if one or both doors are in the **Entrapment** mode. The **CPU** program has been modified to automatically close the doors. The time the doors stay open can range from 0-300 seconds. This setting is titled **Closing Time** on the **Human Machine Interface (HMI)**. If you do not want the automatic closing time feature, simply type in the value 301 or higher and the automatic closing time will be disabled.

This power open/power close electro-mechanical operator with its state of the art components, make it the strongest and most compact in the industry today. Refer to the **Wiring Legend for Terminal Strip Hookup** for all open, close, stop and safety device inputs, which are all Class (2) 24VDC momentary contact (except terminal 9 which must be a maintained contact). Power supply hookups for both Class (2) 24VDC and 110VAC are also indicated. The PLC then processes all this information, in addition to many other features for proper control of these heavy lead doors. This door operator is patented under **US Patent No. 6,177,771 B1**.

We are Authorized to Mark the **NB-2000** with the **ETL (US and Canada)** Listing from Intertek Testing Services to assure compliance with UL 325(Control No. 3011624), FCC Part 15 (Emissions) and the following International Standards: CAN/CSA-C22.2 and ICES-003. 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**. The CPU also provides a door reversal function (a term we call *Automatic egress*) when **UL 325 section 29.4 Entrapment** criteria has been violated. This feature is active in all positions except **Latch Check**. The **NB-2000** has also been programmed to automatically clamp the door against the frame after each cycle. The motor will shut off after being in contact with the frame for about 5 seconds. This feature will maximize repeatability of the door-closed position, which minimizes the chance of the frame interlocks from being disengaged. If an external force acts on the door, such as a small pressure differential or if the door is simply pushed open above the **Auto Close Enable** preset value, the motor will restart and “clamp” the door against the frame once again.

**Input** commands to activate the door operator for normal operation is accomplished by making the appropriate connections on the **Terminal Strip Hookup**. By connecting one side of a momentary contact SPST switch to **Terminals 14 (Open)**, **12 (Close)** or **10 (Stop)** and connecting the other side of the switch to **Terminal 1**, provides the customer with discrete control by using a separate switch for each input command. Reversing the direction of the door while it's moving (dynamic) can be accomplished with any input that changes direction. Upon request, we can program the **CPU** and the **Human Machine Interface (HMI)** to **automatically close the door** after an open command. The time the door stays open can be preset on the **HMI** from (0-300 seconds) and is titled **Closing Time**.

**Inputs for External Safety Devices** that can be door mounted, such as reversing edge pressure switches or presence sensors (such as the BEA SuperScan) are provided on the **Terminal Strip Hookup Legend**. To **reverse the door in the closing cycle**, hookup normally open switch of sensor to **Terminal 11** and **1**. To **reverse the door in the opening cycle**, hook up to **Terminal 20** and **1**. Terminals 11 and 20 are inactive when the door is not moving. External safety devices can also be set up to **Stop** the door by connecting to **Terminal 10** and **1**. Assure the safety devices are attached to the door in such a manner that will provide the best safety performance, as well as allowing sufficient clearances under normal operation to prevent inadvertent activation. Refer to the external safety device owner's manual for proper installation and use. Presence sensors that are frame mounted, such as the BEA Bodyguard (DK-12), can be used to disable any door movement when the door is in the open or closed position, through a maintained connection between **Terminal 9** and **1**. This feature will not prevent the door from being activated when in any position other than the fully opened or the full closed. *The lockout device need not be purchased because the PLC has been internally programmed.* Any presence sensor that runs on 24 VDC, can be powered up by connecting to **Terminal 3** and **1** of the **Terminal Strip Hookup Legend**.

The **Stop** command (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 and Terminal N).**

A **Rotary Position Transducer** attached to the worm gear 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. This feature is called *Absolute Position Feedback Control*.

### **Motor Control:**

The **NB-2000** uses 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-2000** 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-2000** now has the flexibility of controlling separate latch check(creep close) speeds (**Preset 1**) and back check(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 in order to stall and reverse the door's direction so that **Entrapment Protection** requirements will be met (*this eliminates the need for unreliable and hard to adjust devices such as a manual or electromagnetic clutch*). 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 **FCL** and **RCL** trimpots, which controls the amount of DC current to the motor in both directions.

#### **Drive Train:**

A **5:1 Right Angle Worm Gear Reducer** (with a center distance of 3.00") provides the high output torque necessary to operate these heavy doors. A heavy-duty flexible coupling joins the worm gear to the **160:1 In-Line Helical Gear Reducer**; thus, substantially reducing torque before being coupled to a **1/4 HP 90VDC Permanent Magnet Motor, 1750 RPM TENF**.

#### **Battery Backup (option):**

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 a NEMA 1 box with a test switch that will interrupt power and allow for testing the system. 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).

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

*This is a redundant system and does not replace or substitute any requirements of UL 325 section 29.3 Interruption of Power for manual operation.*

**Manual Operation:**

In case of loss of power, manual operation shall not be more than 50 lbs to open, when applied at the widest point on the door with the power removed (ref. UL325 29.3).

**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, 50/60 Hz, single phase to 115 VAC step down, 0.5 KVA transformer. The transformer and surge protection are housed in a NEMA 1 enclosure ready to be field wired from the supply voltage to the door operator.

## brookfield NB-2000 (Main-Sub) 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.*

1. Before installing the door operator, measure the force near the lock edge of the door to accelerate the door to opening and closing speeds. This force, times the distance to the hinge pin centerline shall not exceed the **Rated Operating Torque of 3000 lb-in.**
2. Position **Door Operators** and **Door Attachments** in the horizontal and vertical positions as indicated on installation drawings: NB-2000-MS1, NB-2000-MS2, and NB-2000-MS3 for Pull Open Linkages. NB-2000-MS4, NB-2000-MS5, and NB-2000-MS6 for Push Open Linkages.
3. Mount **Door Operator** base plate and **Door Attachments** with the hardware specified (not included) on the installation drawings and tighten properly.
4. For Pull Open Linkages: check that linkage arm doesn't interfere with the door or **Slider Block**. In addition, make sure cam follower (attached to linkage arm) is properly engaged into **Slider Block**. *Proper engagement is defined as full engagement ( $-1/16"$ ) max.*
5. With linkage connected and power removed, measure force to open door/backdrive (at constant velocity). This force must be  $\leq 50$  lb (per **UL 325 section 29.3**) and be applied near the lock edge of the door. *Note: for doors less than 48" wide, the **Quick Disconnect Linkage Option** may be required to meet this criteria.*
6. All **PLC** and **Motor Control** settings have been preset by brookfield industries, inc.; however, we recommend these values be double-checked with the **Parameter** sheet supplied.
7. Install activation switches or push button stations: (a) within sight of the door, (b) at a minimum height of 5' so small children cannot reach and (c) away from moving parts of the door.
8. Before wiring 115 AC supply voltage to operator, assure power is disconnected and all "Lock-Out" Safety Procedures have been strictly adhered to.
9. Connect 115 VAC and class (2) 24 VDC wiring as shown on **Terminal Strip Hookup Legend** and **Wiring Diagrams**. Disconnect "Lock-Outs" and turn on breakers.
10. Assure speed trimpots on **Multi-Speed Board (Presets 1-4)** are in the 25% range before activating operator.
11. Make sure that all **Safety Instructions** and **Warnings** have been followed.
12. Activate **Open**, **Partial Open** and **Close** commands.
13. Adjust **Presets 1-4** clockwise until the minimum opening and closing times listed in **Table 1** have been obtained.
14. Adjust **Door Position** factory presets as required using the **HMI**. Refer to the **HMI Instruction**, **Door Position Setup Instructions** and **Parameters** as required.
15. Check and adjust, if necessary, the trimpot settings (refer to the **Parameter** sheet) on the **Motor Control**.
16. Check **Entrapment Protection** in both directions. This is accomplished by measuring the force that prevents a stopped door from moving in a particular direction and can be accomplished with a simple force gage. This force must be  $\leq 40$  lbs and is applied at the latch side per **UL 325 section 29.4 Entrapment**. When measuring this force be careful not to erroneously measure the inertia force of the door. This can be accomplished by first stopping the door without the gage, then substituting the gage with the minimum force to keep the door from moving in that particular direction. This force is adjusted by varying the **FCL** and **RCL** trimpots settings on the **Motor Control**.

# Door Position Setup and HMI Instructions

## GT-01/02 Touch Screen

1. Plug the eight prong Phoenix Connector into GT-01/02. 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.

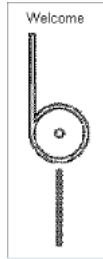


Fig. 2

3. For GT-01/02 software prior to Ver. 3, the screen in Fig. 3 will display. Choose either 'Standard' or 'Main/Sub' operator. For Ver. 3.7 of the GT-01/02 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. NOTE: Check PLC model number for appropriate 'Main-Sub' selection.

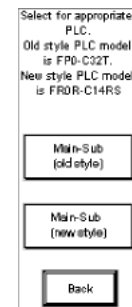
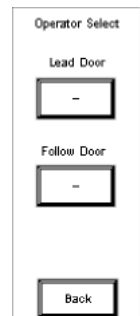


Fig. 5



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)

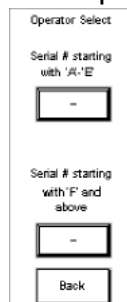


Fig. 6



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.

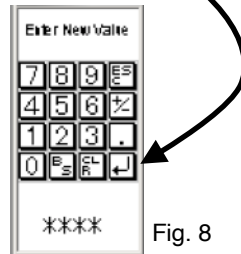


Fig. 8

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.

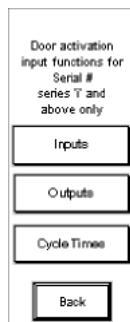


Fig. 9

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.

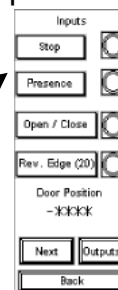
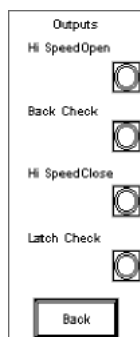


Fig. 10

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.

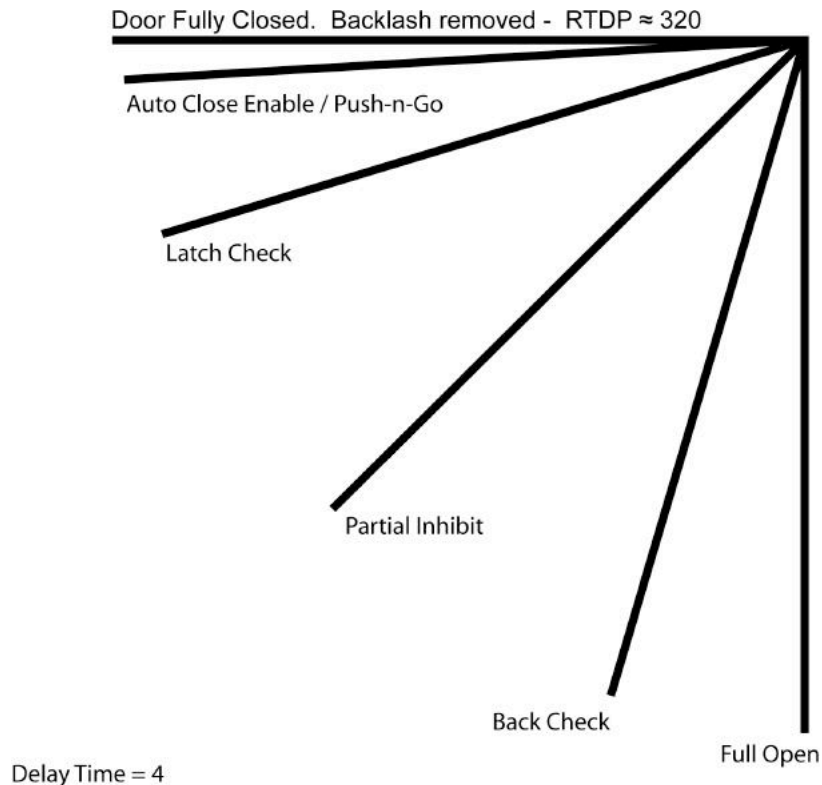


The lamps down the right side of the screen indicate when the PLC is sending the corresponding Output to the motor control.

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

NOTE: When using the newer GT-01/02 Software with an older PLC, or vice-versa, the initial startup of the GT-01/02 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

## HMI Instructions - For Swinging Doors



Graphical View of Door Operation with Default Settings

### HMI GT-01/02 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 Instructions

1. The factory settings 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 or Push Open/Close). When operator goes into Latch Check, it will move slowly until it rests fully against the frame. It will run for approximately 5 sec., then shut off. Insure that the Latch Check speed pot is set so that the door doesn't "slam" into the frame. The *Auto Close Enable* can now be set per the following.
  - a. After the door moves against the frame, runs for 5 sec., and shuts off; view the *Door Position (preset 300)* value. Cycle door several times to assure repeatability.
  - b. Set the *Auto Close Enable* preset to the *Door Position* value plus 30 units (i.e. if the *Door Position* is 310, set the *Auto Close Enable* to 340). **Note:** Some installations may require slightly higher/lower values for best results.
3. Check position of door when fully open. Assure that the door opens fully without the cam follower bottoming out in the cam follower slot. Adjust *Back Check* and *Full Open* if necessary.
4. Adjust the *Partial Inhibit* value to the desired position to allow required access through doorway.
  - Delays the scanning of the door position in the PLC until after the door starts moving to compensate for any play or backlash of the door operating system. This also allows for the time it takes of the door to stop and reverse while door is in operation. The default value of 4 seconds (40 tenths) covers speeds for doors weighing #6000-#12000. For doors weighing substantially < #6000 or whose cycle time is very high, this value may and should decrease.

## Battery Backup Instructions

(Operators shipped before 5/15/06)

**\*Bold refers to procedures for operators shipped after 5/15/06**

1. Disconnect Power. Read all safety instructions, warnings and cautions in this manual and labels on the door operator and battery backup before proceeding further.
2. *When adding a battery backup (with an upgrade kit) to an existing operator, proceed to step 3. For installation of a battery backup when it was ordered at the same time as the operator, proceed to step 7.*

**a. Install 110V Relay next to analog (FPO-A21)-DO128 on din rail  
Reference Drawing # NB-801K-AA-2**

3. Loosen left side end stop on DIN rail containing power supply (FPO-PSA1), CPU (FPO-C14RS) and analog unit (FPO-A21) and move assembly to the left. Loosen end stop on right and slide to right. Place 110 volt relay\* (Phoenix contact PLC-BSC-120UC21) along side of analog unit, making sure that terminals 11,12 and 14 are facing terminal strip. Slide right end stop on and tighten. Slide left side end stop and assembly back to the right and tighten end stop.

**a. Install circuit breaker into terminal strip #22 (after this step  
move to step #7)**

4. Remove right side end stop and remove terminal 22 from DIN rail. Replace with fuse block assembly\*. Replace end caps and end stop. Be sure to replace label numbers (#22) onto fuse block.
5. Loosen grounding end block on the left of terminal strip. Slide terminal blocks GND thru terminal 7 to the left about 3/8". Remove end cover from terminal 7. Attach end cover to the terminal block removed in step 4 and place it between terminal 7 and spacer block. Slide entire assembly to the right (against the spacer) and tighten the left grounding end block.
6. Place the jumper\* in between terminal 7 and the terminal that was installed in step 5 and tighten properly.

*\*Battery backup upgrade kit*

7. Properly install battery backup enclosure, conduit (not supplied), and adjustable N.C. limit switch (supplied) to be activated at door open position.
8. Assure hookup wires from the battery backup enclosure have been properly routed to the operator, so that all 110 volts AC enters from the left

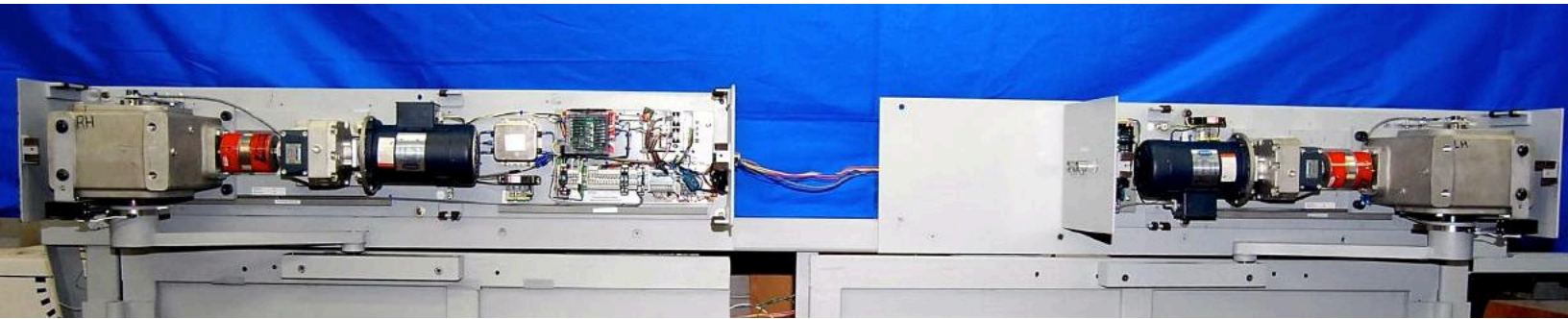


side of the operator and all class 2 (24VDC or less) enters from the right side of the operator.

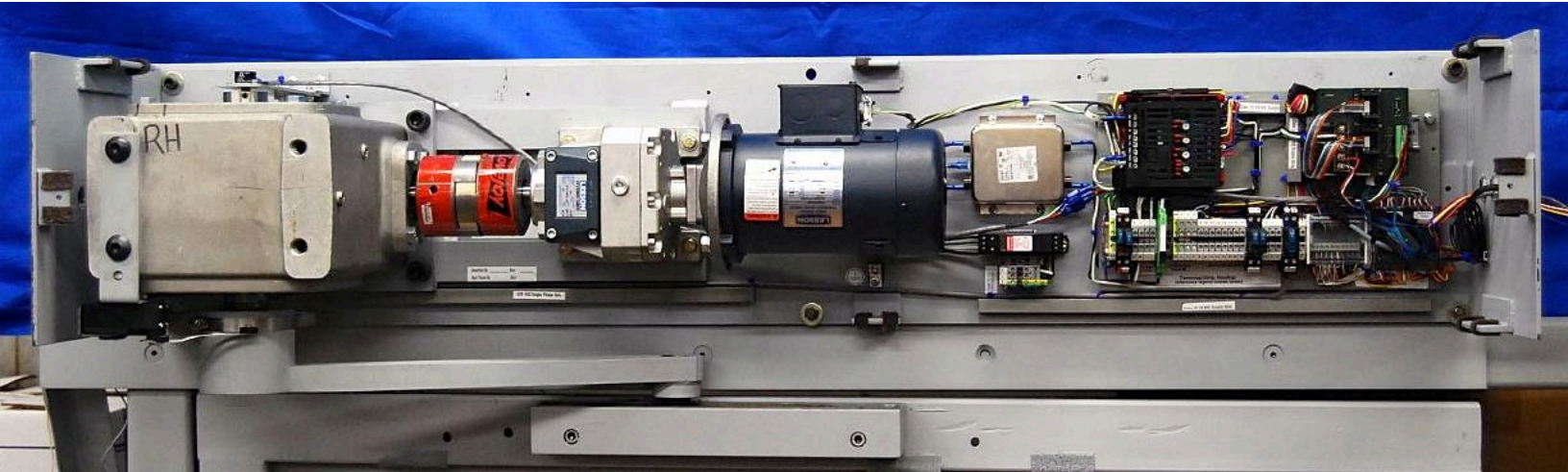
9. Connect all field wiring to the terminal strip and internal wiring to the proper termination as shown on the wiring diagram and as labeled on the wire ends.
10. Connect power supply leads to the battery backup (GRD, L1 and N)
11. Reconnect power and assure power switch (breaker) inside battery backup is in the "on" position.
12. Hookup battery leads to (-) terminal of battery. Battery backup is now ready for test.
13. Test battery backup by switching the power switch (breaker) to the "off" position marked "battery backup test". Adjust limit switch as required, to fine tune door opening position. Be sure to turn "on" the breaker after testing is complete.
14. If power is to be disconnected for any extended period of time, disconnect float charger from the battery to prevent the battery from being drained.

Main Operator

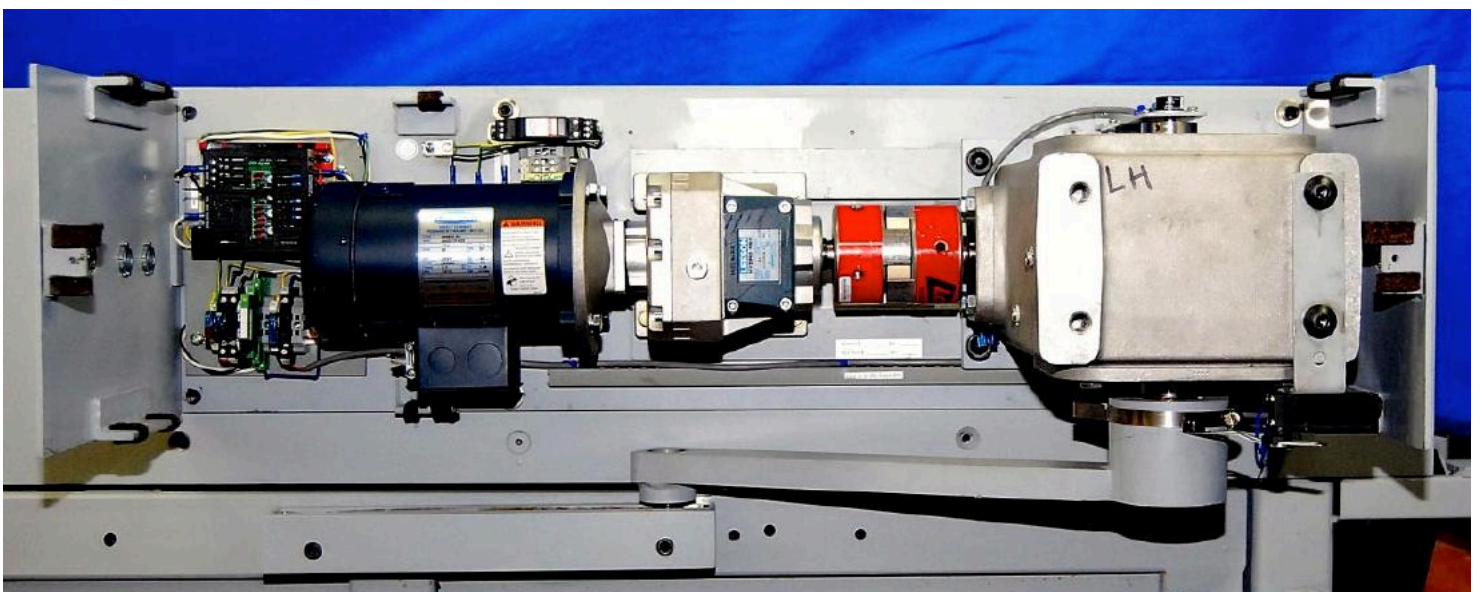
Sub Operator

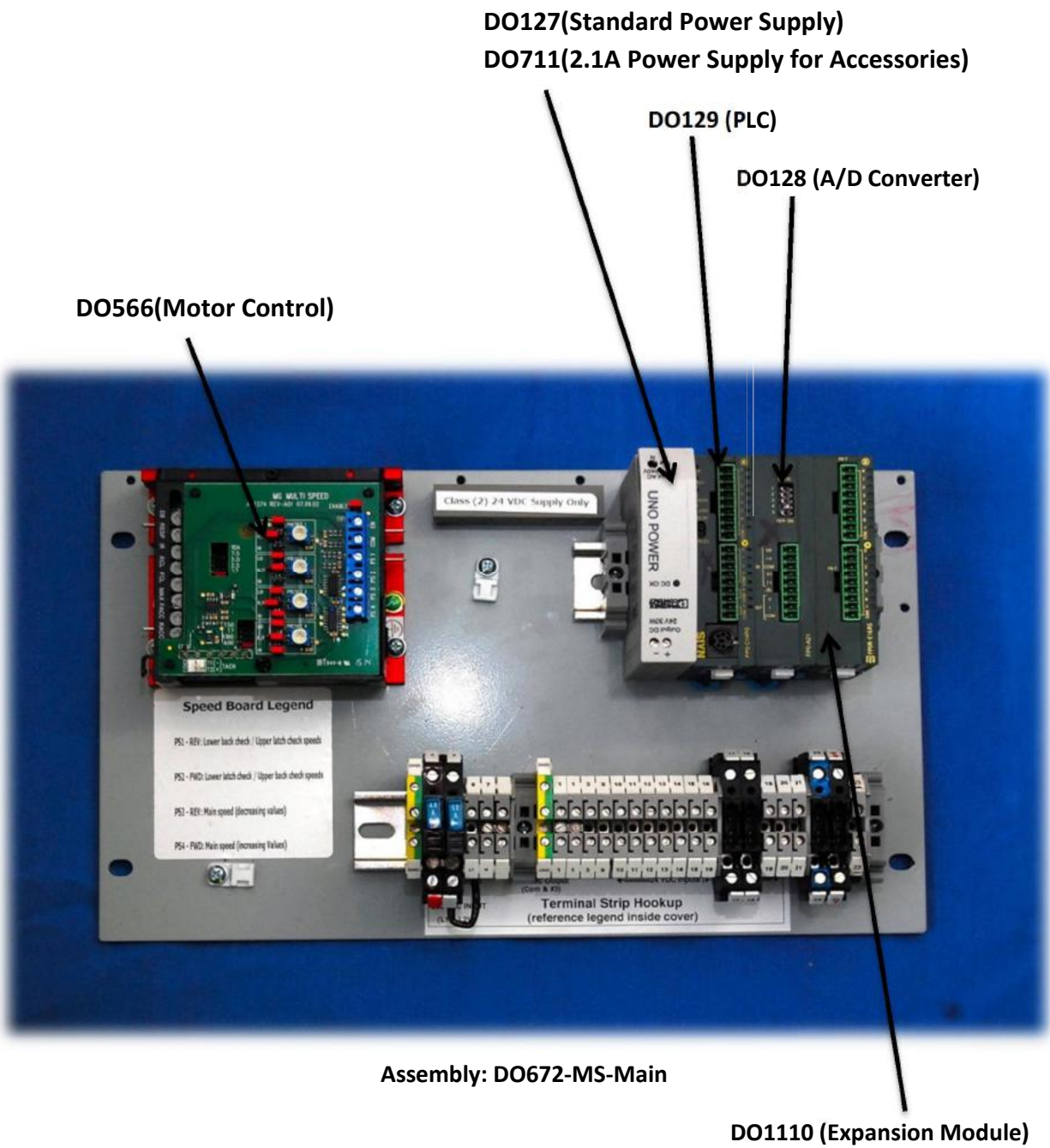


Main Operator



Sub Operator

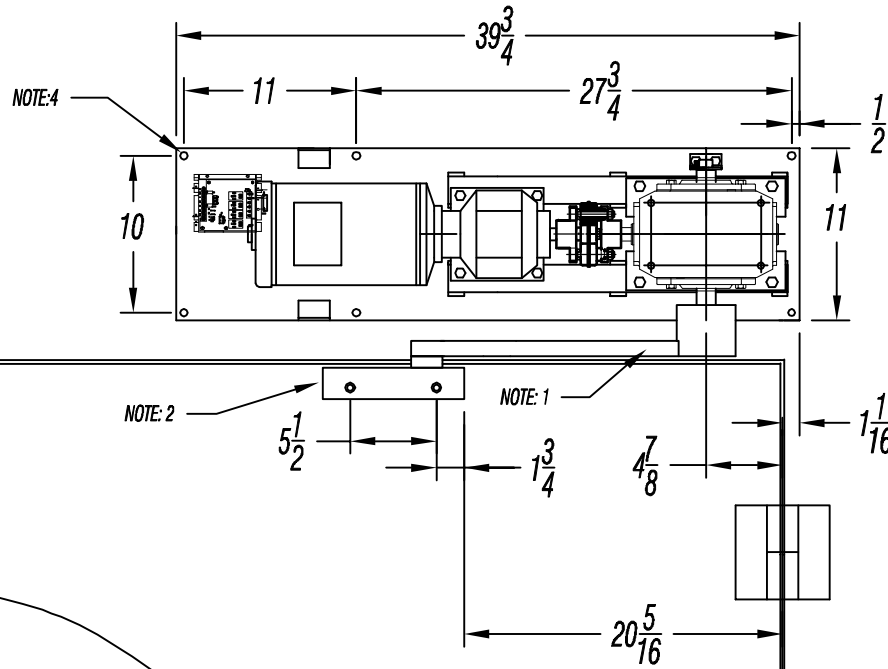








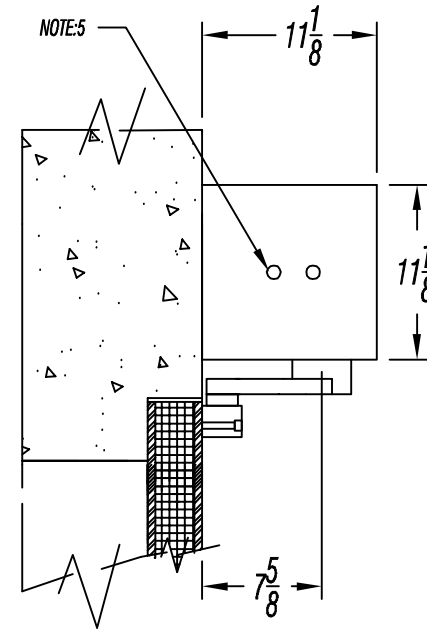
**NB-2000 SUB OPERATOR**  
(BASEPLATE OUTLINE)



**NOTES:**

- 1) LINKAGE ARM ADJUSTMENT +/- 1/4 " SHIM PACK  
THIS ALLOWS FOR PROPER ENGAGEMENT OF CAM FOLLOWER INTO SLIDER BLOCK AND PREVENTS THE  
THE LINKAGE ARM FROM INTERFERING WITH THE DOOR OR THE SLIDER BLOCK.
- 2) SLIDER BLOCK AND CAM FOLLOWER ASSEMBLY. 13/32" DIA. HOLES PROVIDED FOR 3/8" SOCKET  
HEAD BOLTS. (TYP. 2 PLACES)
- 3) ALL DIMENSIONS IN INCHES.
- 4) 1/2" DIA. THRU HOLES FOR 3/8" DIA. GRADE 5 BOLTS. (TYP. 6 PLACES)
- 5) FIELD WIRING (LH OR RH): ALWAYS RUN 110VAC THRU LEFT SIDE OF COVER  
AND CLASS 2 (24VDC OR LESS) THRU RIGHT SIDE OF COVER.
- (2) 7/8" DIA. HOLES FOR 1/2" DIA.  
CONDUIT (TYP. BOTH SIDES OF COVER)

**(COVER PLATE OUTLINE)**



**Notes:**

Tolerances	
Decimal	+/- 0.015
Fractional	+/- xxx
Angular	+/- xxx



**NB-2000 LH SUB INSTALLATION**

Drawn by **KPK**  
Checked by

Material

Date **12-16-13**

Scale **1:1**

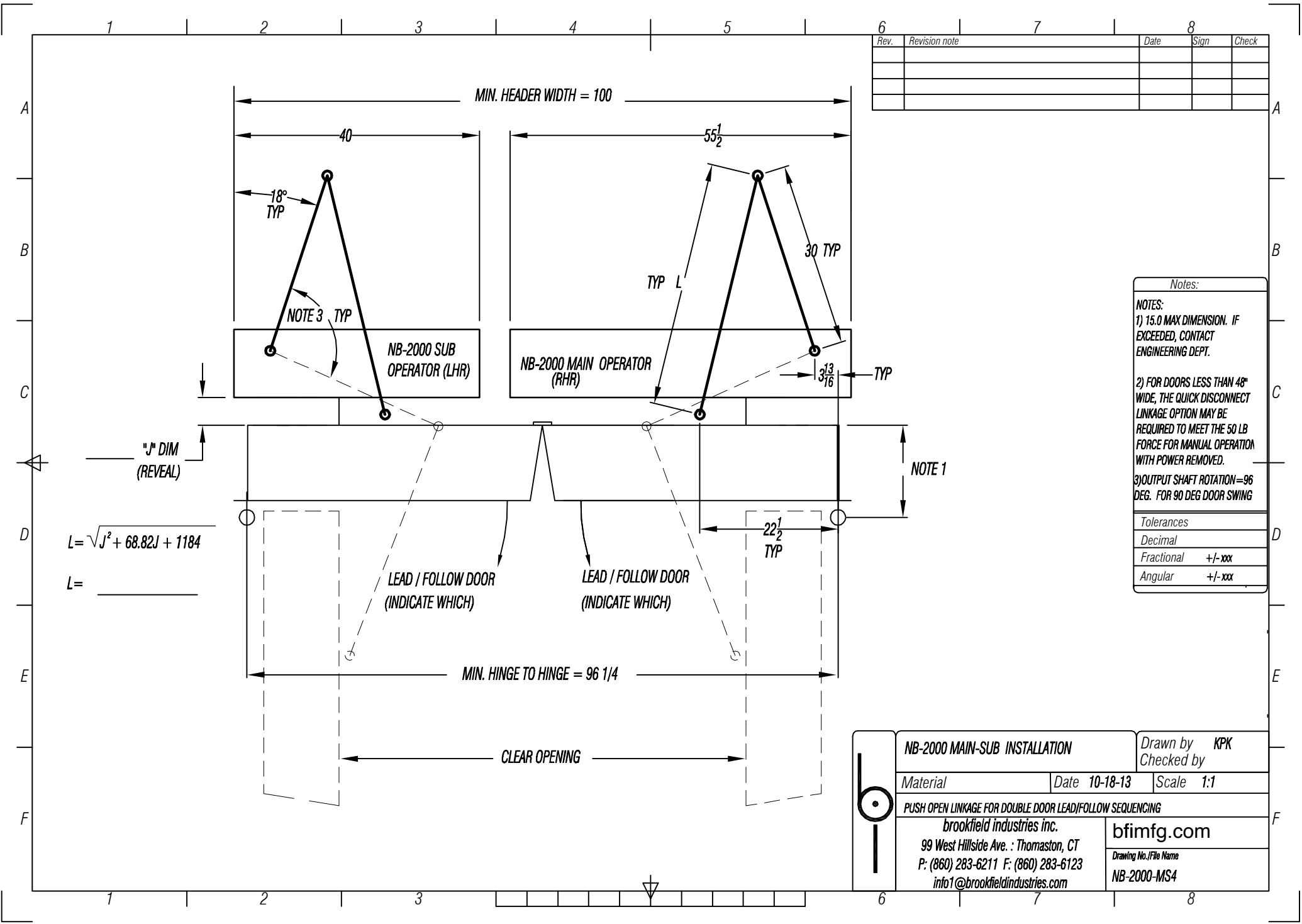
**PULL OPEN LINKAGE**

**brookfield industries inc.**  
99 West Hillside Ave. : Thomaston, CT  
P: (860) 283-6211 F: (860) 283-6123  
info1@brookfieldindustries.com

**bfimfg.com**

Drawing No./File Name  
**NB-2000-MS3**





Rev.	Revision note	Date	Sign	Check

Notes:

NOTES:

1) 15.0 MAX DIMENSION. IF EXCEEDED, CONTACT ENGINEERING DEPT.

2) FOR DOORS LESS THAN 48" WIDE, THE QUICK DISCONNECT LINKAGE OPTION MAY BE REQUIRED TO MEET THE 50 LB FORCE FOR MANUAL OPERATION WITH POWER REMOVED.

3) OUTPUT SHAFT ROTATION=96 DEG. FOR 90 DEG DOOR SWING

Tolerances	
Decimal	
Fractional	+/- .xxx
Angular	+/- .xxx

NB-2000 MAIN-SUB INSTALLATION		Drawn by <b>KPK</b>
Checked by _____		
Material	Date <b>10-18-13</b>	Scale <b>1:1</b>
PUSH OPEN LINKAGE FOR DOUBLE DOOR LEAD/FOLLOW SEQUENCING		
brookfield industries inc. 99 West Hillside Ave. : Thomaston, CT P: (860) 283-6211 F: (860) 283-6123 info1@brookfieldindustries.com		bfimfg.com
Drawing No./File Name		NB-2000-MS4



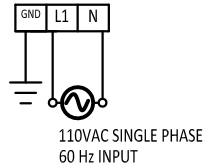




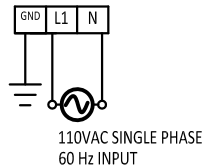
## TERMINAL STRIP EXTERNAL WIRING HOOKUP\*

### MAIN/SUB OPERATORS

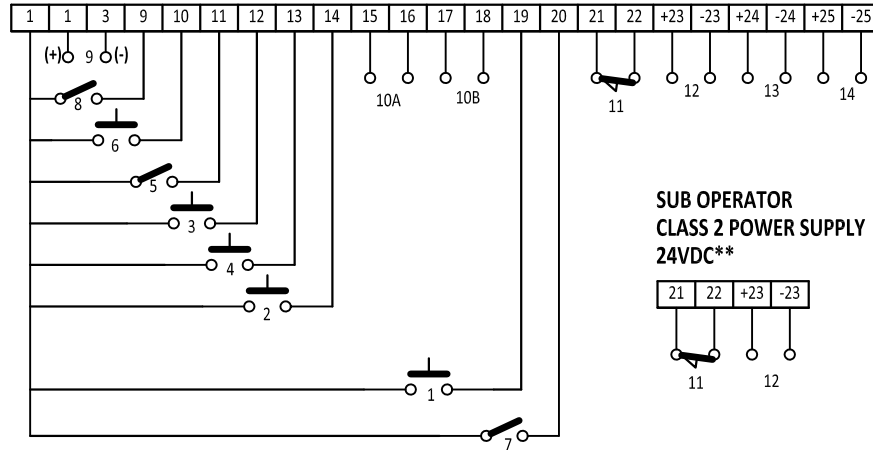
#### MAIN OPERATOR 110VAC POWER SUPPLY



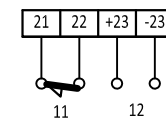
#### SUB OPERATOR 110VAC POWER SUPPLY



#### MAIN OPERATOR CLASS 2 POWER SUPPLY 24VDC\*\*



#### SUB OPERATOR CLASS 2 POWER SUPPLY 24VDC\*\*



#### INPUTS (CLASS 2 POWER SUPPLY 24VDC) NORMALLY OPEN MOMENTARY DRY CONTACT ACTIVATION (UNLESS NOTED OTHERWISE):

1. *OPTIONAL: LAST MAN OUT*
2. ACTIVATE TO **OPEN** (TYPE: PUSH BUTTON STATION)  
*OPTIONAL: MAINTAINED CONTACT*
3. ACTIVATE TO **CLOSE** (TYPE: PUSH BUTTON STATION)  
*OPTIONAL: MAINTAINED CONTACT*
4. *OPTIONAL: FIRE ALARM INPUT (MAINTAINED CONTACT)*
5. **ENTRAPMENT PROTECTION:** REVERSES DOOR WHILE CLOSING (TYPE: CONTACT SENSOR (TAPE SWITCH) NON CONTACT SENSOR (PRESENCE))
6. ACTIVATE TO **STOP** (TYPE: PUSH BUTTON STATION)
7. **ENTRAPMENT PROTECTION:** REVERSES DOOR WHILE OPENING (TYPE: CONTACT SENSOR (TAPE SWITCH) NON CONTACT SENSOR (PRESENCE))
8. **ENTRAPMENT PROTECTION:** N.O. MAINTAINED CONTACT ACTIVATION THAT DISABLES DOOR IN FULL OPEN/FULL CLOSED POSITION (TYPE: FRAME MOUNTED SENSORS)  
*NOTE: INPUT IS INACTIVE WHEN DOOR IS IN MOTION. DO NOT USE WITH PARTIAL*

#### OUTPUTS (CLASS 2 POWER SUPPLY 24VDC):

9. CONTINUOUS POWER : NON -CONTACT PRESENCE  
SENSORS OR ANY DEVICE (mA RANGE)

#### OPTIONS:

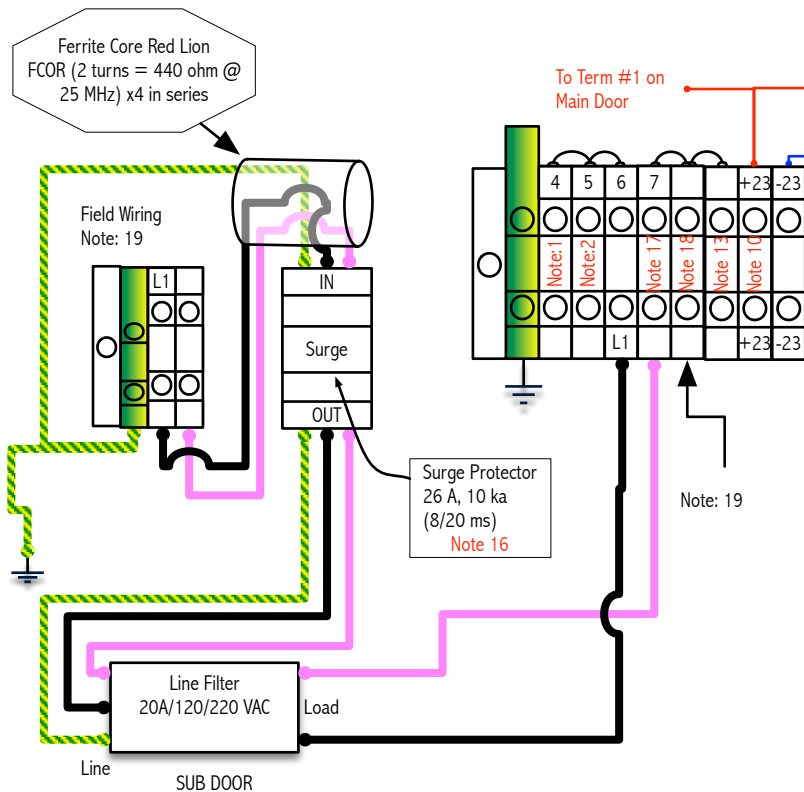
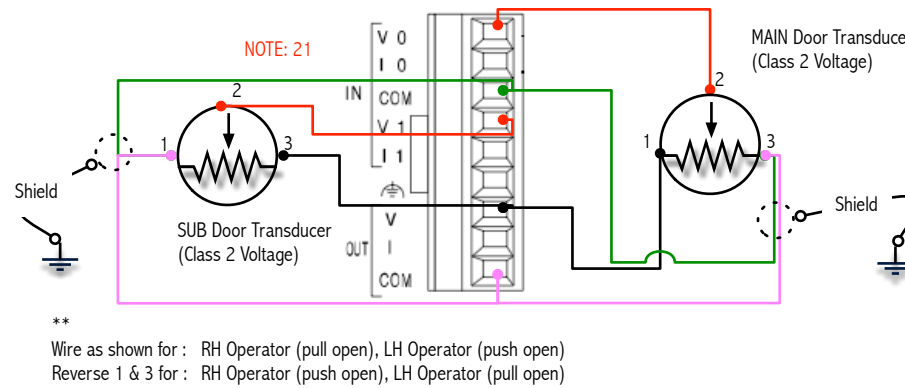
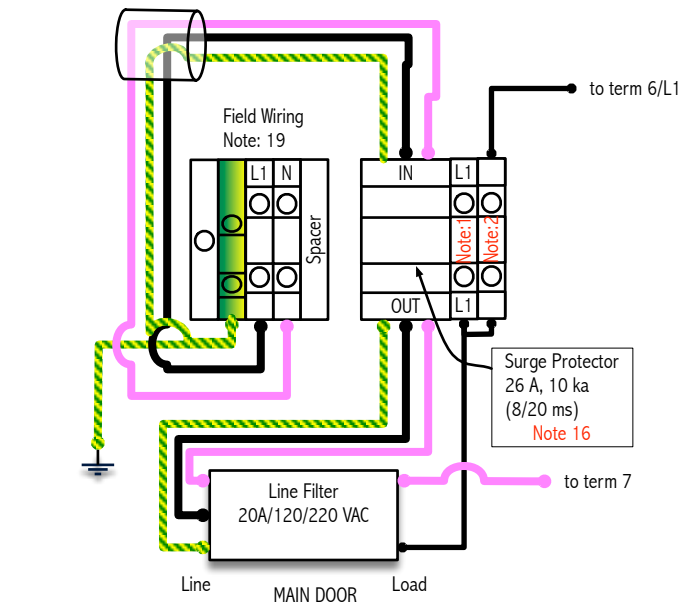
#### OUTPUTS (CLASS 2 POWER SUPPLY 24VDC, 2 AMP RATED):

- 10A. RESERVED
- 10B. RESERVED
11. BATTERY BACKUP: N.C. LIMIT SWITCH
12. MAGLOCK/ELECTRIC STRIKE
13. DOOR OPEN SIGNAL
14. DOOR CLOSED SIGNAL

\*USE COPPER CONDUCTORS ONLY (MAXIMUM CROSS-SECTION OF TERMINALS (4mm<sup>2</sup> )

\*\*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.





To Main Door SECOND Expansion Unit

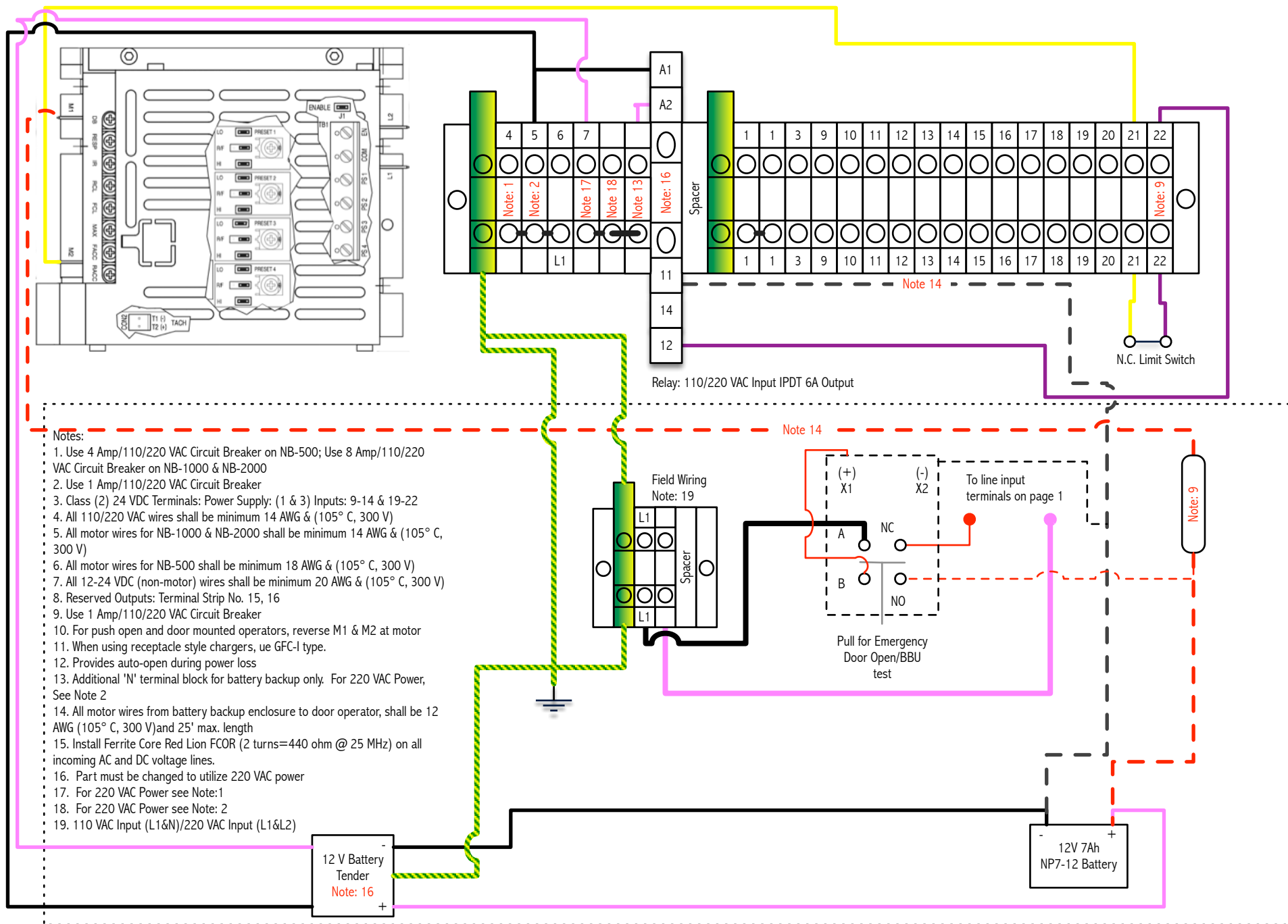
To Term #3 On Main Door TS

#### Notes:

1. Use 4 Amp/110/220 VAC Circuit Breaker on NB-500; Use 8 Amp/110/220 VAC Circuit Breaker on NB-1000 & NB-2000
2. Use 1 Amp/110/220 VAC Circuit Breaker
3. Class (2) 24 VDC Terminals: Power Supply: (1 & 3)
4. All 110/220 VAC wires shall be minimum 14 AWG & (105° C, 300 V)
5. All motor wires for NB-1000 & NB-2000 shall be minimum 14 AWG & (105° C, 300 V)
6. All motor wires for NB-500 shall be minimum 18 AWG & (105° C, 300 V)
7. All 12-24 VDC (non-motor) wires shall be minimum 20 AWG & (105° C, 300 V)
8. Wire M1 and M2 to motor as shown for Pull Open: Reverse M1 and M2 at motor control for Push Open Linkage
9. Use 3 Amp/110/220 VAC Circuit Breaker
10. Use 2 Amp/110/220 VAC Circuit Breaker
11. Pink wire designates WHITE on logic assembly.
12. Provides auto-ope during power loss
13. Additional 'N' block for battery backup only. For 220 VAC Power, See Note 2
14. All motor wires from battery backup enclosure to door operator, shall be 12 AWG (105° C, 200 V) and 25' max. length
15. Install Ferrite Core Red Lion FCOR (2 turns=440 ohm @ 25 MHz) on all incoming AC and DC voltage lines
16. Part must be changed to utilize 220 VAC power
17. For 220 VAC Power see Note:1
18. For 220 VAC Power see Note: 2
19. 110 VAC Input (L1&N)/220 VAC Input (L1&L2)
20. RH Lead Door/LH Follow Door:  
Wire Lead Door Outputs to RH Main Operator  
Wire Follow Door Outputs to LH Sub Operator
21. RH Follow Door/LH Lead Door  
Wire Follow Door Outputs to RH Main Operator  
Wire Lead Door Outputs to LH Sub Operator
21. Swap RED leads at V0 and V1 when reversing LEAD and FOLLOW doors.

PINK Wire Color designates WHITE Wire

Main Wiring Diagram Main/Sub Swinging Door (field wiring)



NEMA Enclosure

Battery Backup\* Wiring Detail - Provides automatic opening during power loss

\*The battery backup system is an optional addition

\*For Main/Sub operators, BBU is typical for each operator

## Parameters for NB-2000 (Main-Sub)

Door Position:		Lead Door	Follow Door
<b>Push Open Presets</b>		Digital Door Position	Digital Door Position
Full Open	=	2700	2700
Latch Check	=	800	Lead Door value - 200
Back Check	=	2500	2500
Delay Time	=	2 seconds	2 seconds
Close Time		0-30 seconds	0-30 seconds
Real Time (door position)		absolute position	absolute position
<b>Pull Open Presets</b>			
Full Open	=	2950	2950
Latch Check	=	850	Lead Door value - 200
Back Check	=	2600	2600
Delay Time	=	2 seconds	2 seconds
Close Time		0-30 seconds	0-30 seconds
Real Time (door position)		absolute position	absolute position

**Rotary Position Transducer Nominal Setting:** 320 (digital units) door closed position. Lead and Follow Door transducer home settings shall be within 10 units of each other.

### Motor Control Jumper Setting:

#### Upper Board (Multi-Speed)

**J1** Enable

**PRESET 1** (Creep close Speed): 

Lo

R

Hi

 / F

**PRESET 2** (Creep open Speed): 

Lo

R

Hi

 / F

**PRESET 3** (Close Speed): 

Lo

R

Hi

 / F

**PRESET 4** (Open Speed): 

Lo

R

Hi

 / F

#### Lower Board

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

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

J2-Armature Current **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 1-4** Adjust Creep Speed trimpots as well as Open and Close trimpots in a clockwise direction. Assure that the minimum closing and opening times (as a function of door weights and widths) have not been violated per Table 1 of this manual or ANS1 156.10.

For best sequencing results with **Main/Sub** operators, set the Lead Door trimpot settings (PS2 and PS4) to slightly higher values than the Follow Door settings in the open cycle. Conversely, set the Follow Door trimpot settings (PS1 and PS3) to slightly higher values than the Lead Door settings in the closing cycle.

#### Lower Board

<b>DB</b>	50%
<b>RESP</b>	50%
<b>IR</b>	50%
<b>RCL</b>	40%
<b>FCL</b>	40%
<b>MAX</b>	100%
<b>FACC</b>	75%
<b>RACC</b>	75%

## brookfield NB-2000

### Table 1

#### Minimum Closing Time (seconds) to Latch Check\*

#### Door Weight (lbs.)

Door Width(in.)	12000	13000	14000	15000	16000	17000	18000	19000	20000
48	28	30	31	32	33	25	35	36	37
54	32	33	34	36	37	18	39	40	41
60	35	37	38	40	41	20	43	44	46
66	39	40	42	43	45	23	48	49	50
72	42	44	46	47	49	25	52	53	55
75	44	46	48	49	51	52	54	55	57

\*PER ANSI 156.10. For weights and widths not listed,  $TIME = (DOOR\ WIDTH) \times (DOOR\ WEIGHT)^{1/2} / 188$

#### Minimum Opening Time (seconds) to Backcheck\*\*

\*\*shall be set to the same criteria as closing times.

**(Latchcheck or Backcheck): A door shall not close or open in the last 10 degrees in less than 1.5 seconds**

#### IMPORTANT:

Operating door at speeds faster than those established in ANSI 156.10 will void warranty and may damage operator.



## **Maintenance Intervals**

Although the NB-500, NB-1000 and NB-2000 operators are designed maintenance free for the normal service life, we do however, recommend frequent examination of all bolted hardware that may loosen after the initial installation or during normal operation. Also, inspect the operator for wear or damage to any of its components. The frequency of these inspections will vary upon installations 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 and Battery Backup 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 as well as those entrapment protection features internal to the operator and battery backup (if installed) must be tested frequently to assure the safety and reliability of the complete door operating system. The frequency of these tests will vary depending on the particular application.

# brookfield industries, inc.

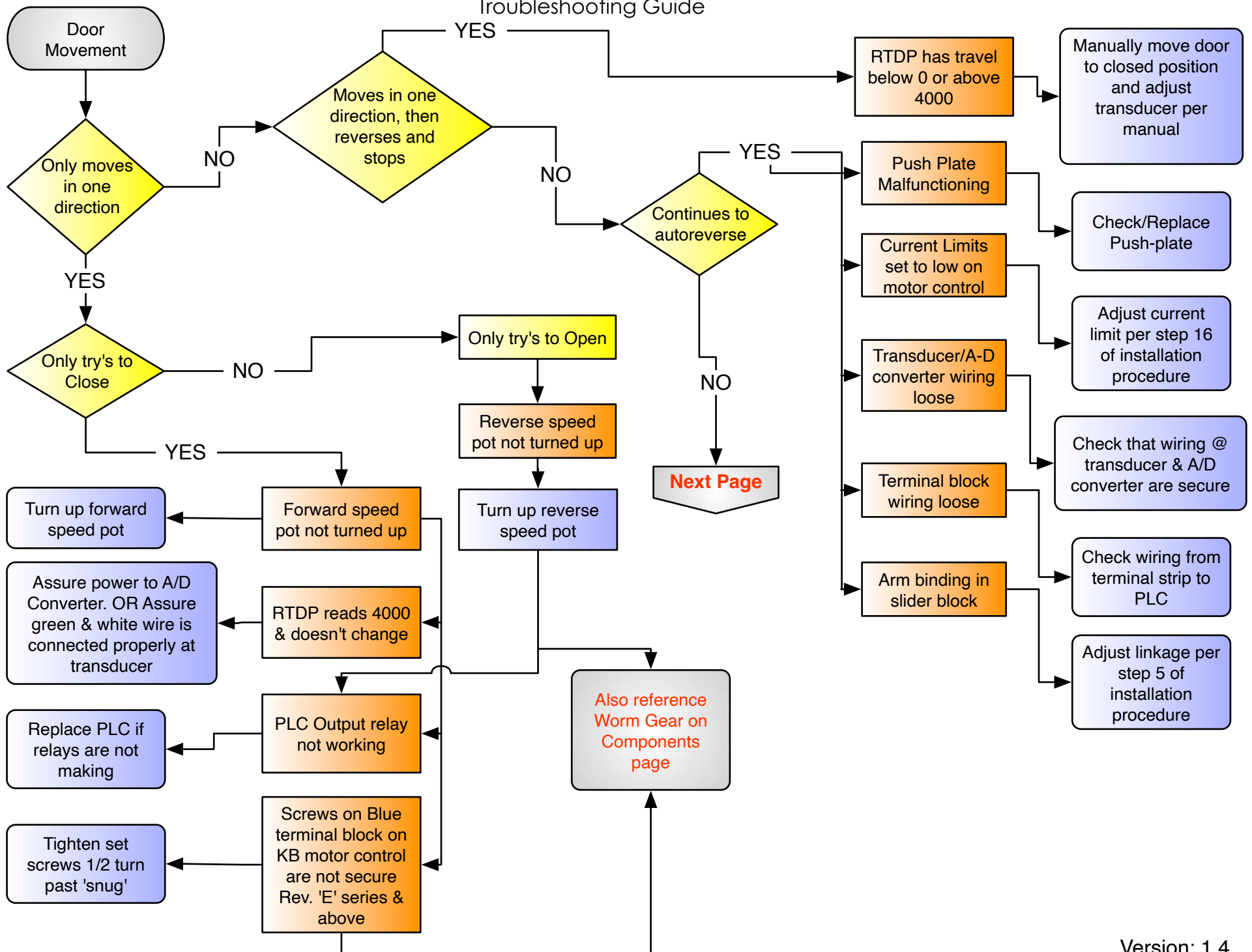
## Limited Warranty

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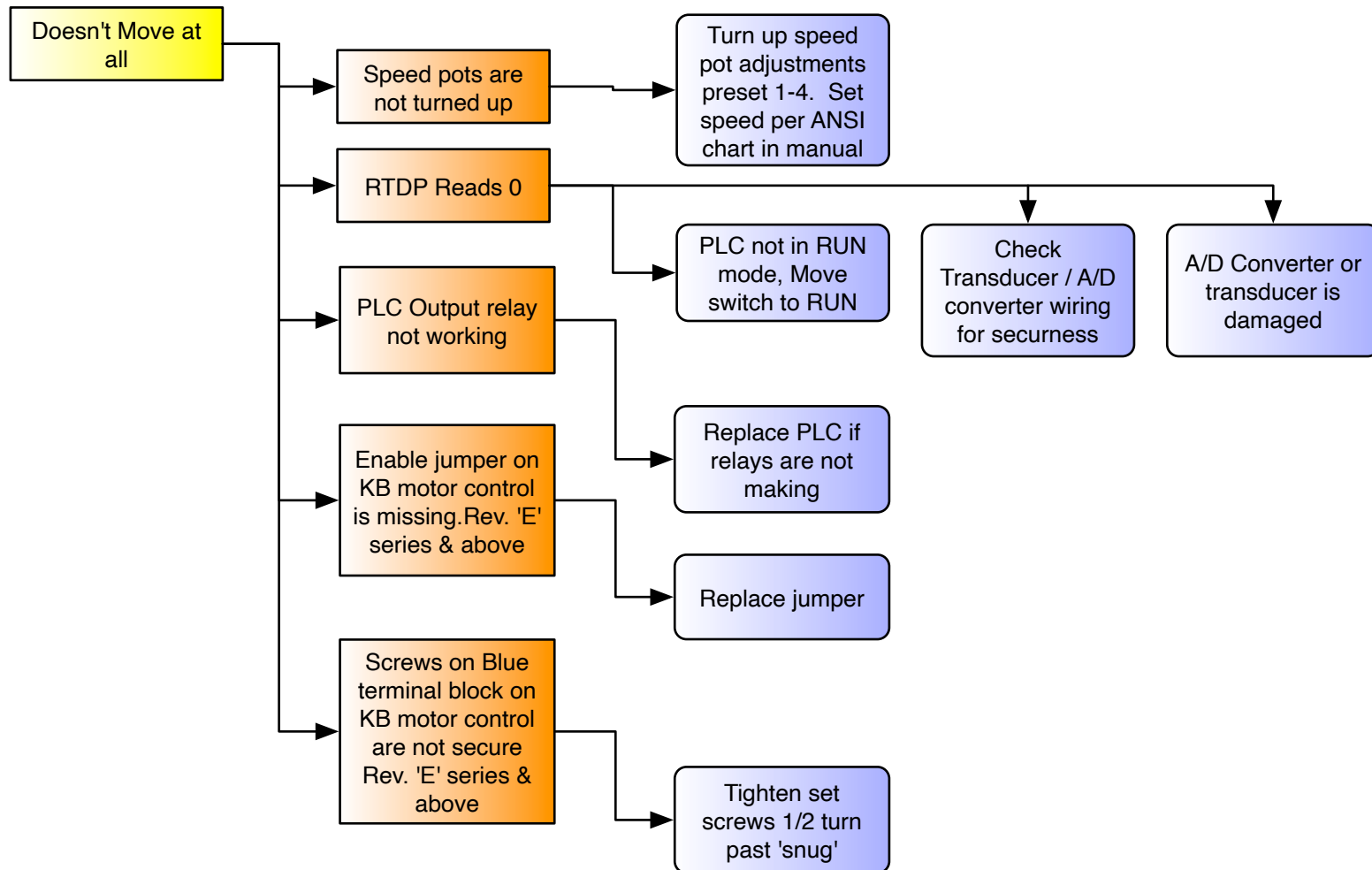
brookfield industries, inc. warrants that door operator models NB-500, NB-1000, NB-2000 and NB-4000 are free from defects in material and workmanship according to the following terms and conditions:

- 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.

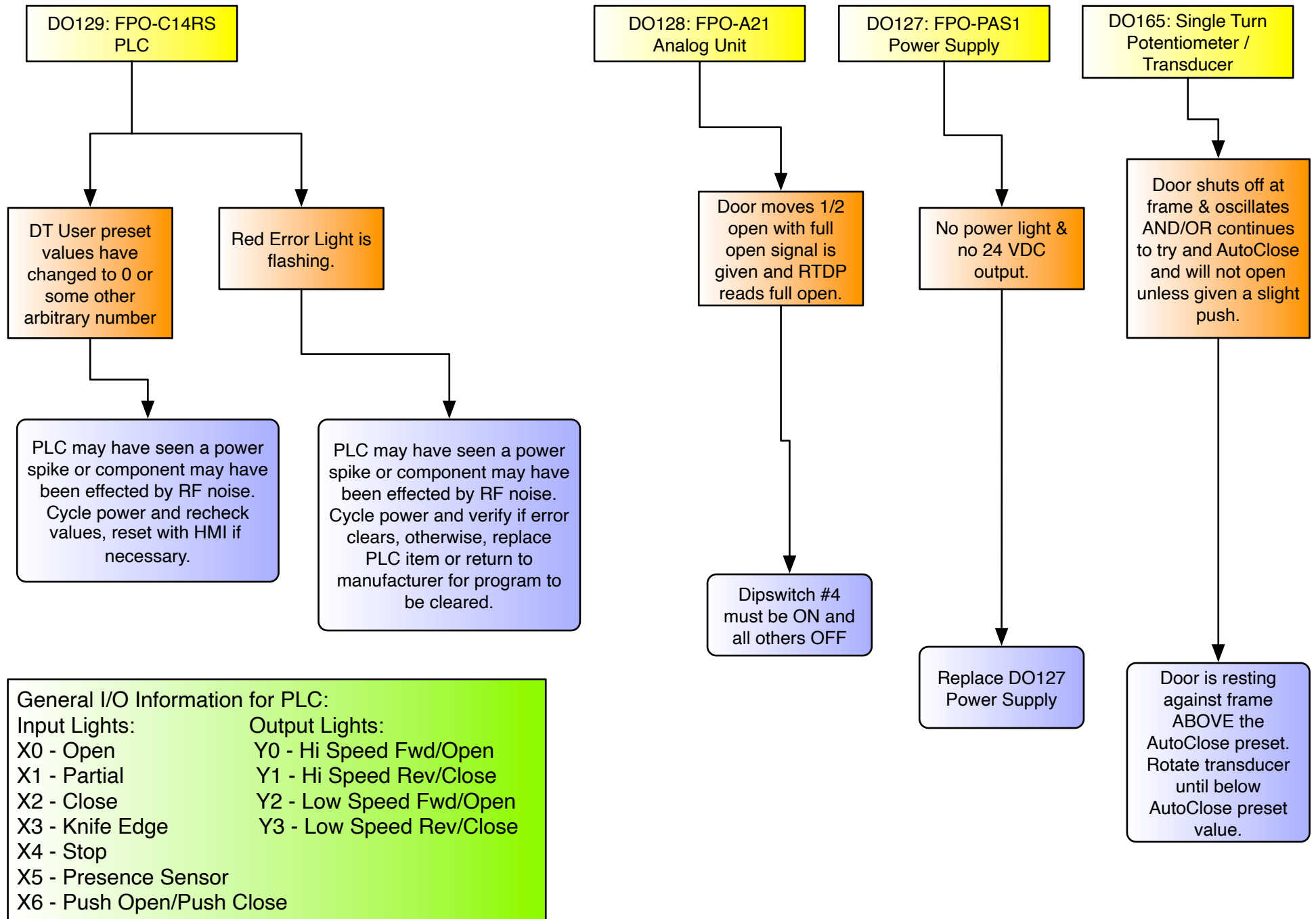
# Troubleshooting Guide



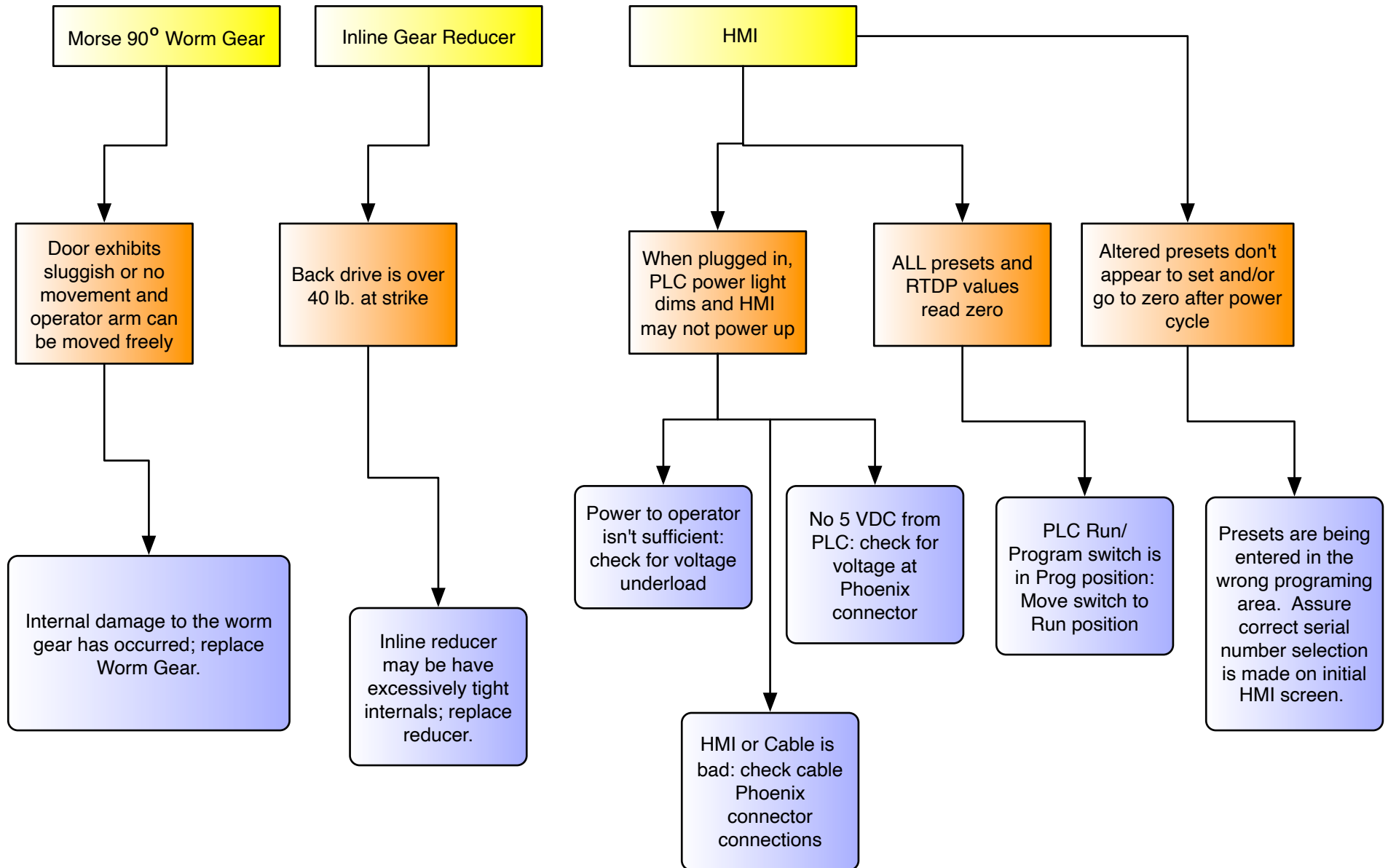
## Troubleshooting Guide



## Component Specific Problems



## Component Specific Problems



## Component Specific Problems

