Bucky Connection and Troubleshooting Guide

Introduction

This document has been created to serve two purposes:

1. As a quick and easy reference on how to connect different types of buckys to our equipment.
2. As an educational document explaining essential concepts that will assist Field Service Engineers to:
   - •hook up *any* bucky to *any* generator
   - •troubleshoot failures of the bucky interface

The Basic Interface

There are **three elemental parts** of the interface between an x-ray generator and a bucky.

- •Power
- •A signal that comes from the generator to start the grid moving
- •A signal sent back to the generator which allows the x-ray exposure to begin.

The number of wires used to make these connections can change; however, the three basic elements of the interface *always* remain the same. The following text and tables describe these basic signals:

Table 1: The Basic Bucky Interface

Basic Signal Type	Comes From	Goes To	Description
Power	Generator	Bucky	For our equipment this is always 120 VAC and 120 VAC Return (Neutral). *Note: Some bucky types have a selectable power input of 120 or 240 VAC, make sure it's set to 120 VAC.* *Note:*
Start the grid moving.	Generator	Bucky	This signal is usually 120 Volts AC. (L-F Par Speed Buckys use this signal as power to drive the grid)
Start the x-ray exposure.	Bucky	Generator	Can be 120 Volts AC. Can also be an isolated relay contact. **(See Table 2 on page 2)**

The Basic Elements

Power:

The power to the bucky is used for the following purposes:

1. To drive the grid motor and provide power to other internal circuits.
2. To drive the ACL (automatic cassette loader) portion of a LF 9000 Bucky.
3. To drive input and output signals to the generator.

Start Grid Motion:

The signal to start the grid moving occurs when x-ray is requested by the operator. This usually becomes active immediately upon pressing the “X-Ray” or “Expose” button on the operators control panel. In the most simple type of interface, this signal also provides the power to the bucky.

Start (Enable) Exposure:

A short time after the grid starts to oscillate, the bucky sends a signal back to the generator, telling it to begin the exposure. This action delays the exposure until the grid is moving. This ensures that the grid is moving when the exposure starts and reduces the chance that the grid will be visible on the radiograph.

Our X-Ray generators require one of two different types of exposure start signals: one that needs an AC voltage input and one that needs an isolated contact closure. Refer to the following table:

Table 2: Gendex-Del / Universal - “Exposure Start” Signal Types

Type of Generator	Required Signal Input
Gendex-Del / Universal High Frequency (e.g.: MP500, GX525, AP 500, ATC 725, etc.)	Isolated Relay Contact This type of interface uses a low voltage, DC circuit to command the microprocessor in the generator to start the exposure. The isolated contact completes a circuit that turns on an opto-coupler.
Basic Single Phase (e.g.: X-TEK, UNIMATIC, etc.)	120 VAC This type of interface sends the bucky input power back to the generator to close a relay and start the exposure.

Signal Nomenclature

Common terminal names are use by many manufacturers of generators and buckys alike; however, even if the names are the same, the signals that ride on those terminals can be very different.

The following table illustrates the *dramatic* difference of signal names used on different types of devices:

Table 3: Bucky / Generator Terminal Names by Function

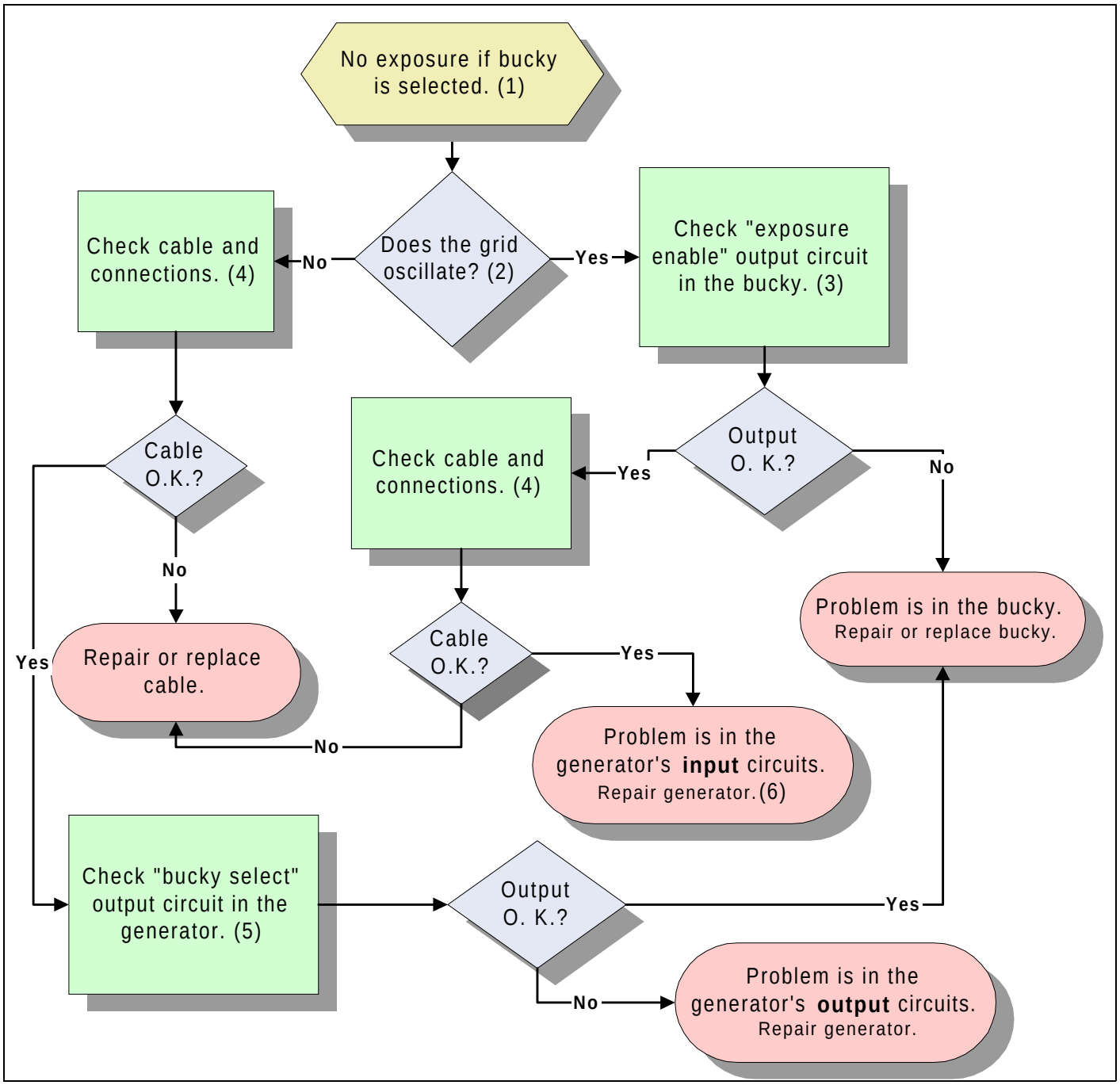
Function → / Device ↓	Start the x-ray exposure (into generator)	Start the x-ray exposure (into bucky)	Start the grid moving.	120 VAC Power	Power Return
AP / ATC	FB	CKT COM	SEL	117VAC	117VAC COM
MP / GX (names from I/O PCB schematic)	Exp. Release	Exp. Release Return	120 VAC BUCKY ON	120 VAC BUCKY RESET	120 VAC RET.
Unimatic	B1 (120 VAC)	B2 (120 VAC)	B3 (120 VAC)	B4	F1
X-Tek 400	B1 (+24vdc)	B2 (+24vdc)	B3 (0 VAC)	B4	B8
LF Par Speed	B1	B2	B3	-- n/a --	B4
LF Super Speed	B1	B2	B3	B8	B4
LF 8000-9000 & Progeny True Speed	1	2	3	L	N
Midwest 14 x 36	B2	-- n/a --	B1	B3	B4
Universal / Gendex 14x36 (made by Midwest)	B1	-- n/a --	B3	S1	B4

Troubleshooting the Interface

NOTE: If problems occur upon installation, use the connection diagrams in the following section to ensure proper interface wiring *prior* to using this troubleshooting procedure.

The following diagram is provided to assist in troubleshooting any bucky interface. Each of the significant blocks are numbered and those numbers correspond the following numbered paragraphs.

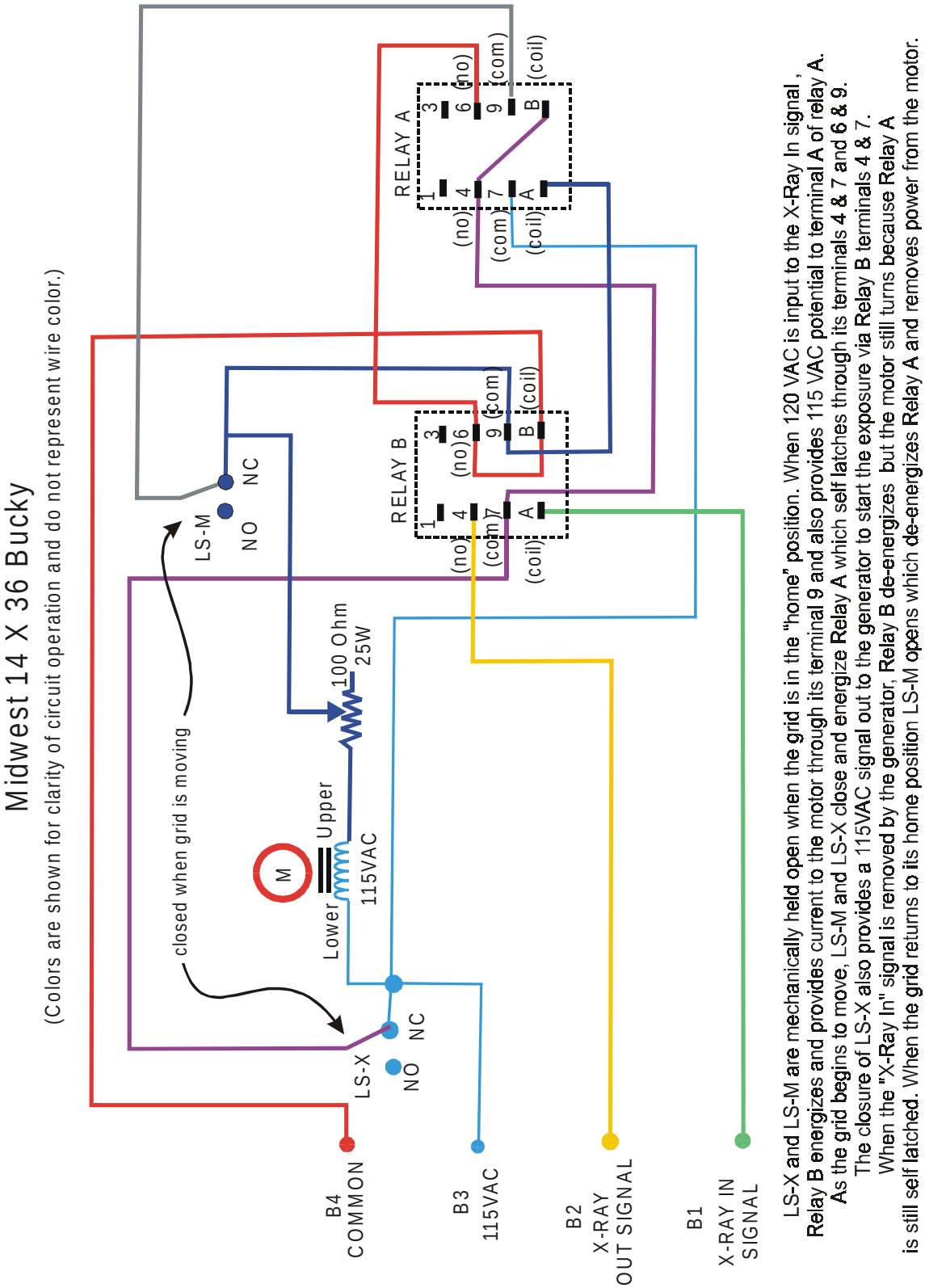
Figure 1: Troubleshooting Flow Chart



1. If no exposure occurs when one of the buckys in an X-Ray system is selected, the problem is most likely in the bucky interface. The purpose of the interface is to:
   - •start the grid moving at the appropriate instant
   - •delay the exposure until the grid is moving

   If there is any failure in the interface the symptom will most likely be “no exposure”. If an exposure occurs but the grid does not move, the most likely cause would be incorrect wiring of the interface. In this case, use the connection diagrams in the following section to ensure proper interface wiring.
2. If the grid oscillates upon “expose”, it can be certain that half of the interface is functional.
3. The “exposure enable” output from the bucky can be different depending on the manufacturer and model of the bucky. Most buckys provide an isolated contact closure which redirects a current (which comes from the generator) back to the generator. Refer to the manufacturer’s documentation. For the Midwest (or Universal-Gendex) 14 x 36 bucky, refer to “Midwest Bucky Schematic” on page 6
4. Cable failure can be caused by excessive bending, rubbing or by accidental severance. The connections can fail from a poor crimp on a connector or a loose terminal screw.
5. The “bucky select” output circuit in the generator is the circuit that sends a signal to the bucky to start the grid moving. This circuit sends the signal upon the exposure command. The signal is usually 120VAC but in some cases it is 0 VAC. See Table 3, “Bucky / Generator Terminal Names by Function,” on page 3
6. The exposure enable input circuit in the generator may use a simple relay to pass an exposure signal. It is also possible that it uses a complex set of relays, optical encoders, and microprocessor signals. Refer to the X-Ray generator’s service documentation to troubleshoot this circuit.

Figure 2: Midwest Bucky Schematic



Bucky Interface Wiring Diagrams

Use the diagrams on the following pages for specific generator to bucky interface wiring.

Figure 3: AP or ATC Generator to L-F Par Speed Bucky

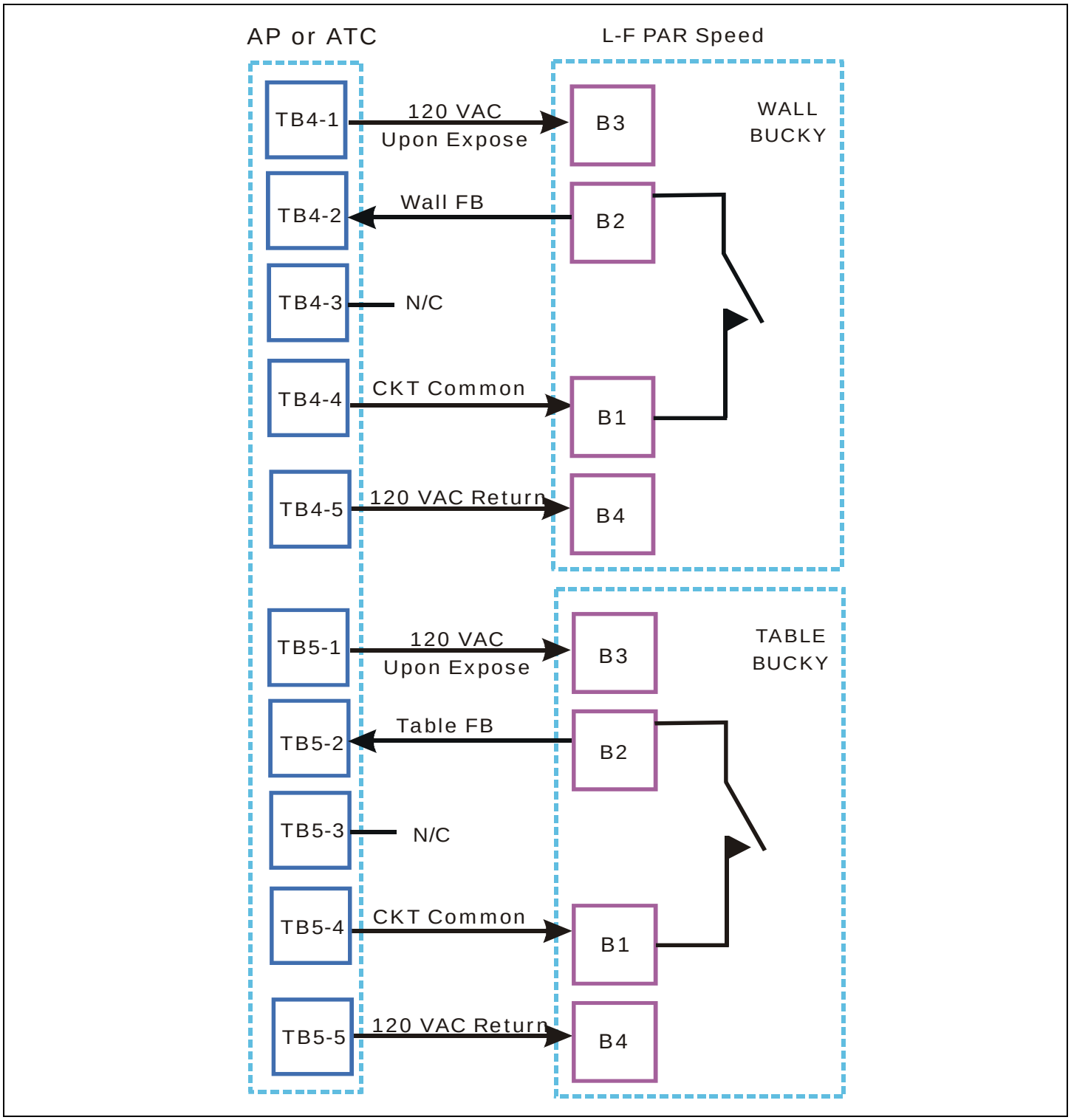


Figure 4: AP or ATC Generator to L-F Super Speed Bucky

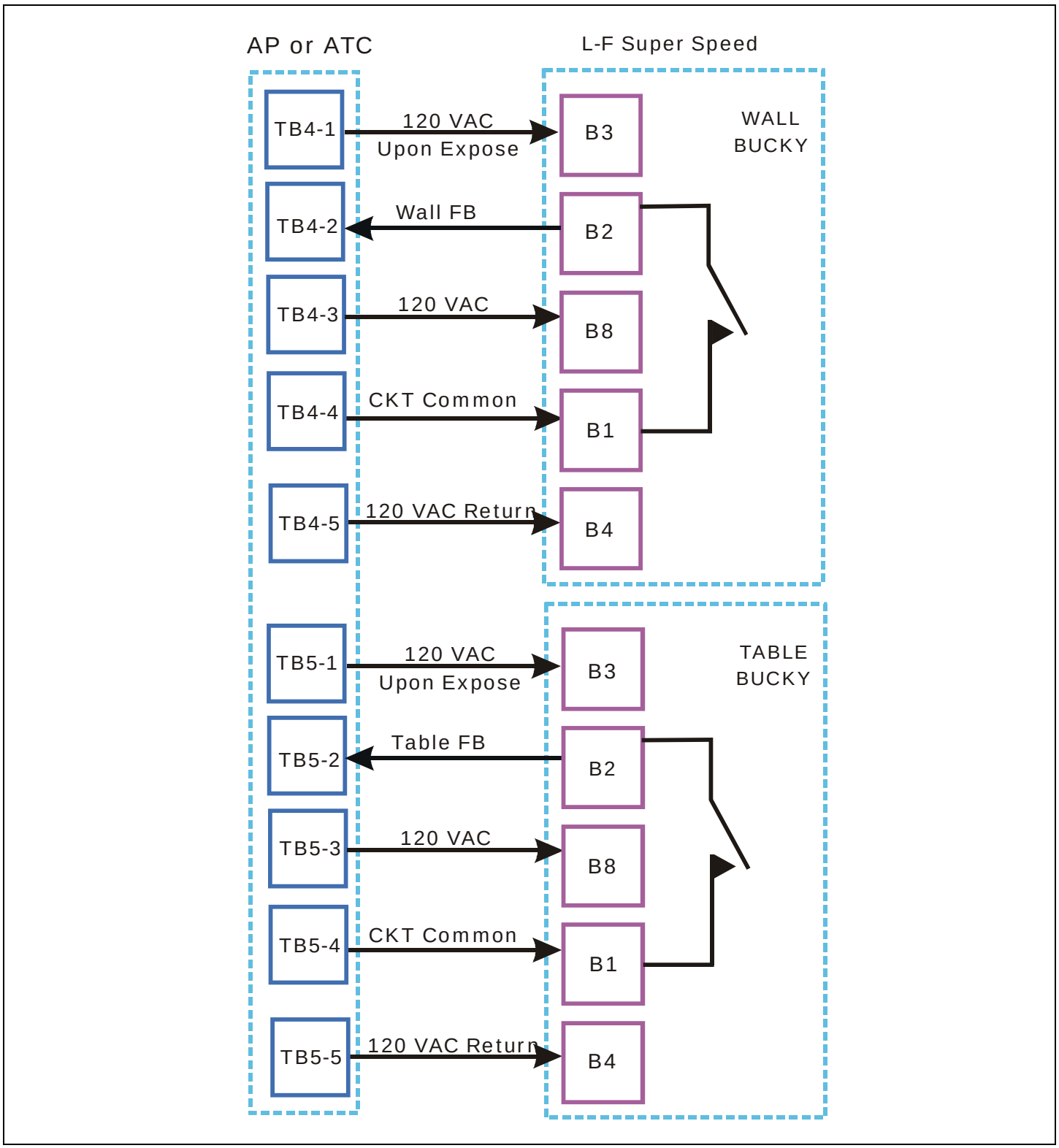


Figure 5: AP or ATC Generator to L-F 8000 & 9000 or Progeny True Speed Bucky

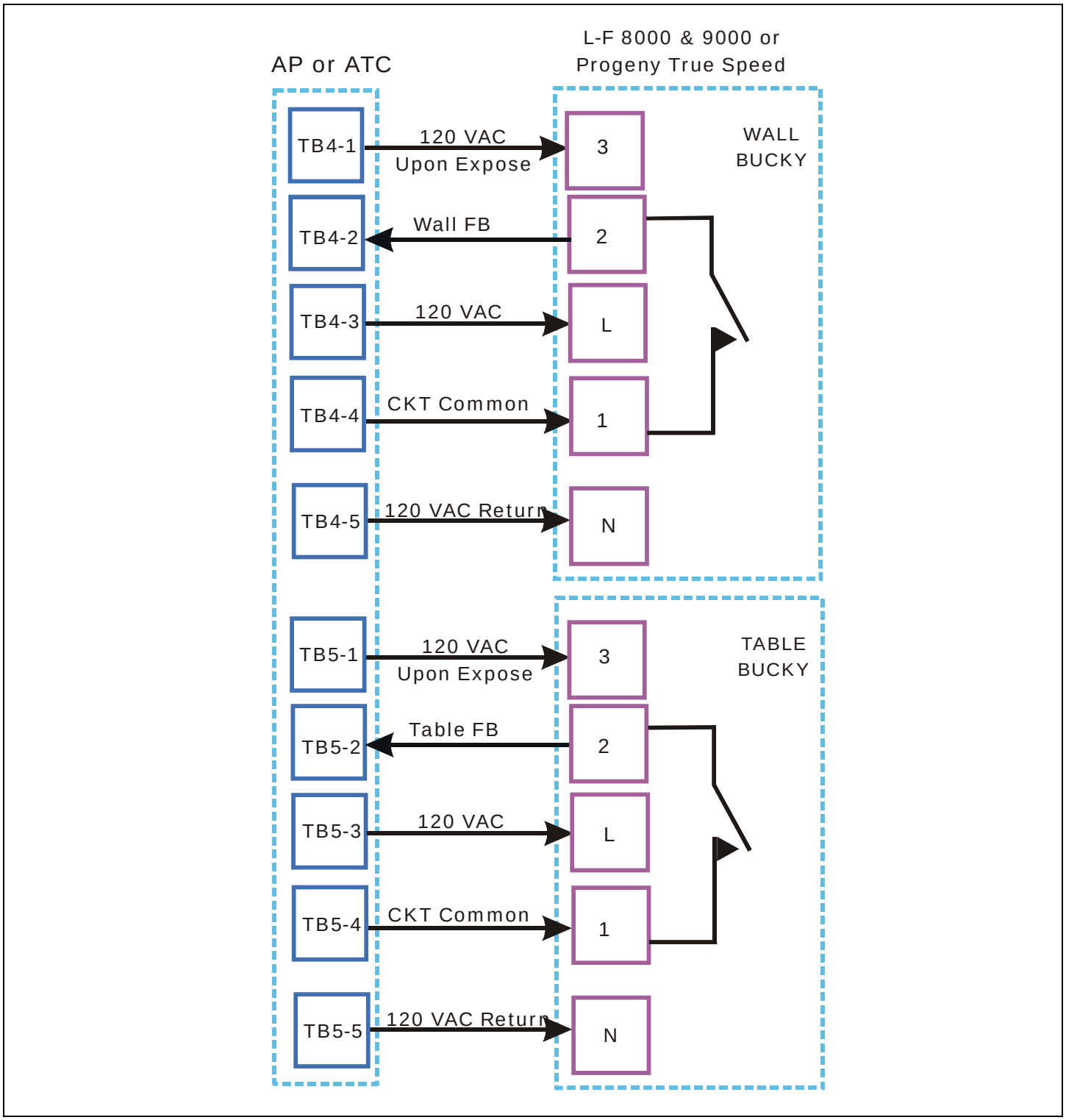


Figure 6: AP or ATC Generator to Midwest 14 x 36 Bucky

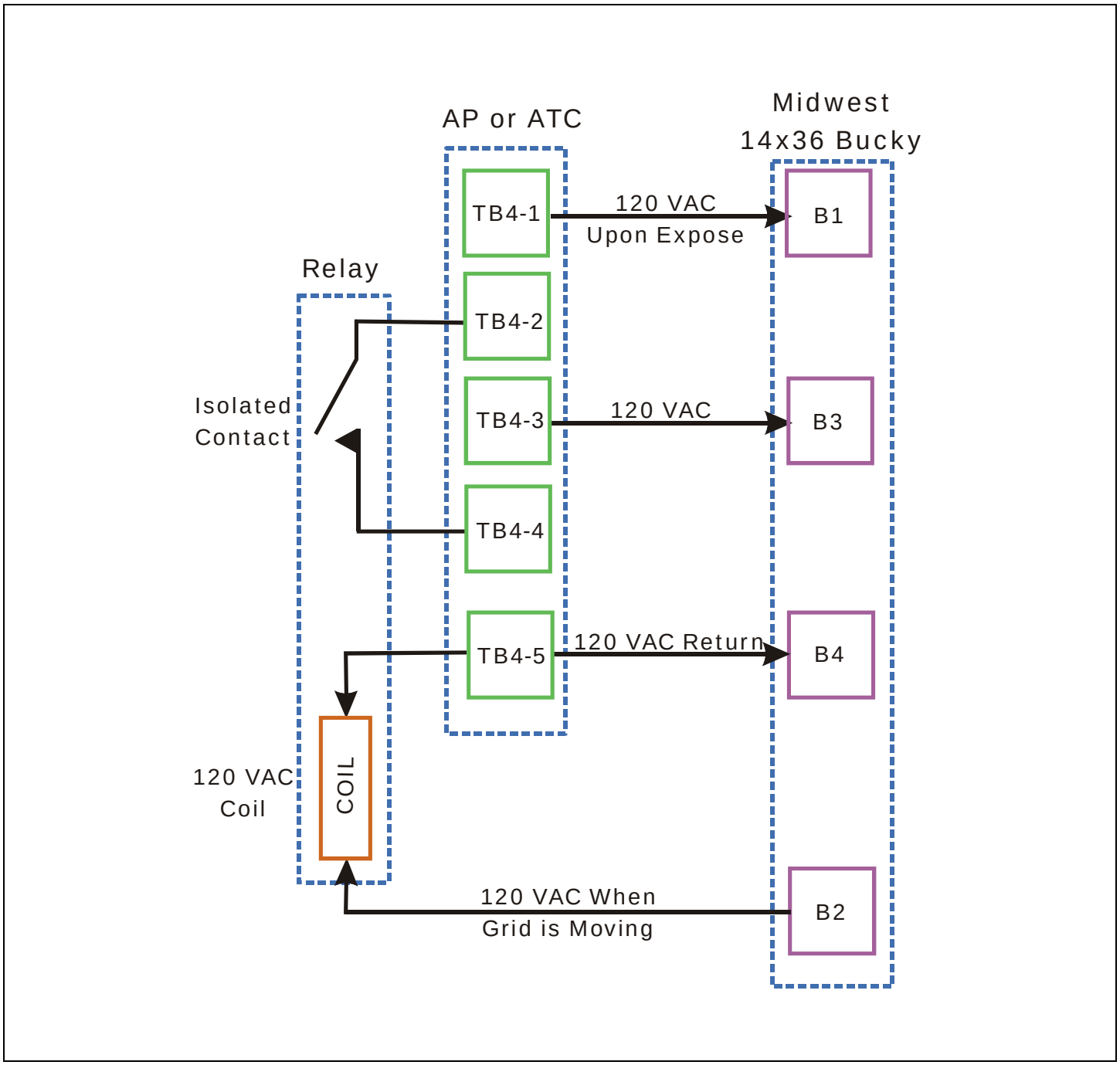


Figure 7: AP or ATC Generator to Universal/Gendex 14 x 36 Bucky (made by Midwest)

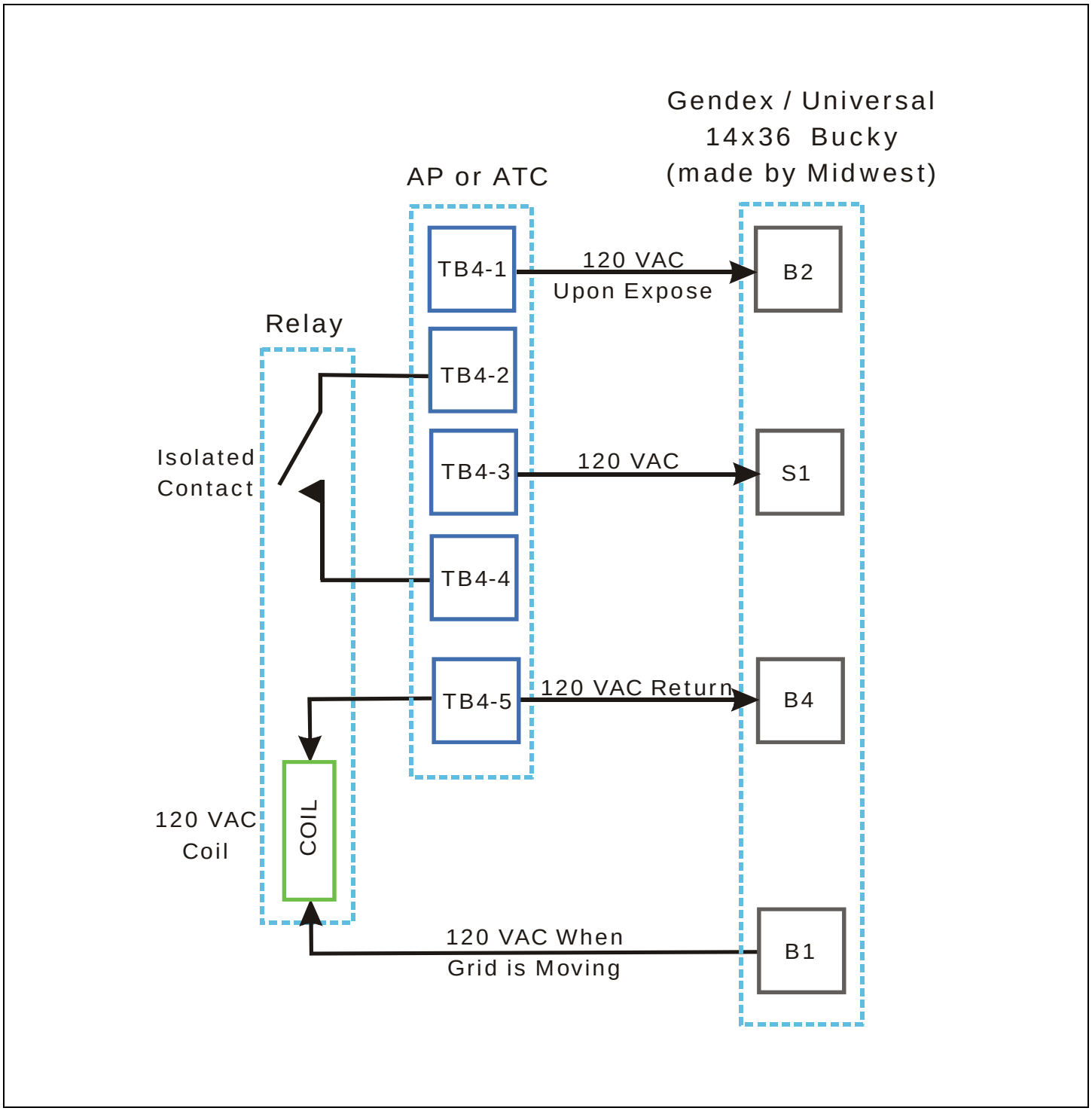


Figure 8: AP or ATC Generator to Hans Pausch Bucky

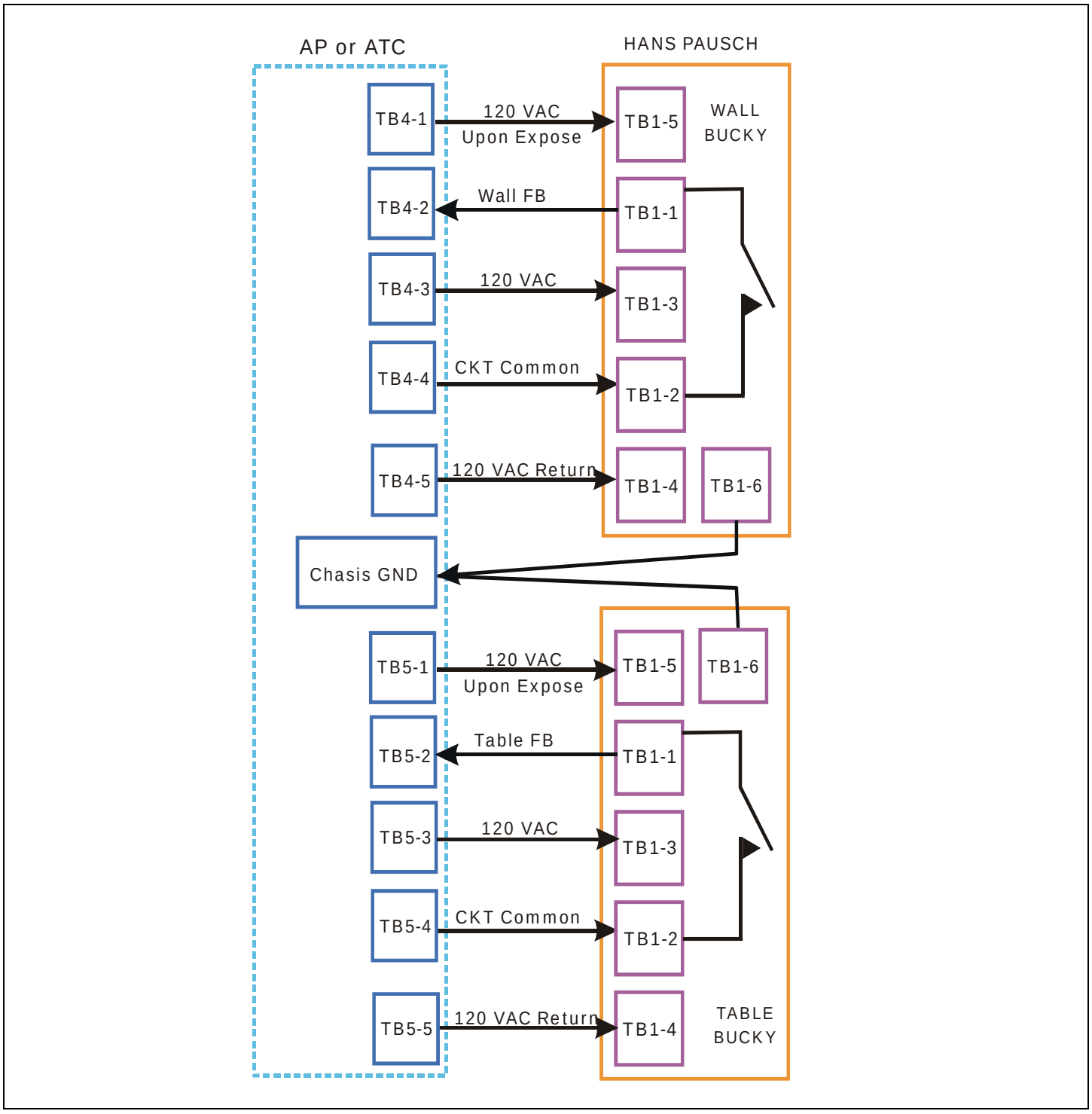


Figure 9: MP or GX (stand alone) to L-F Par Speed Bucky

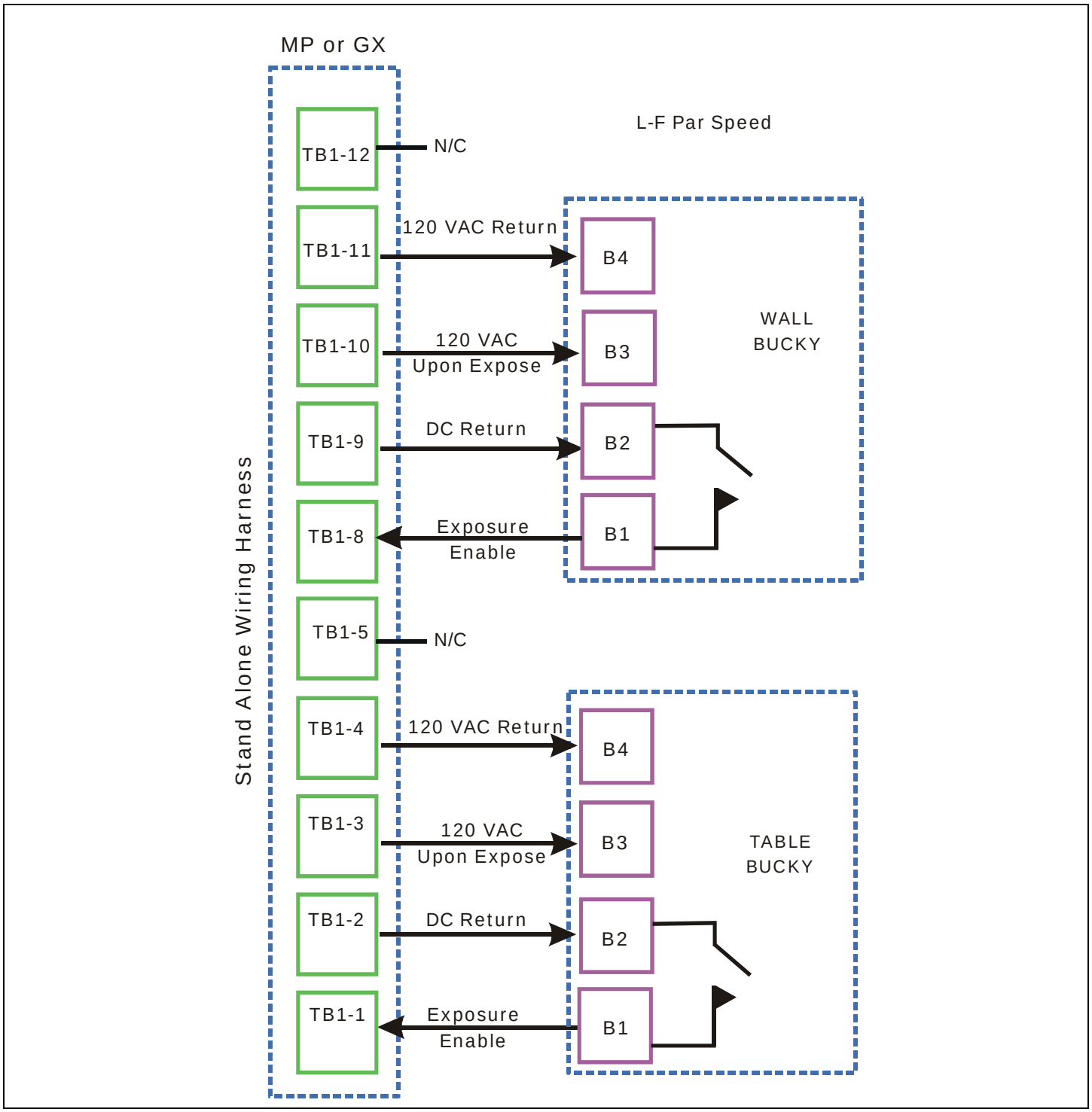


Figure 10: MP or GX (stand alone) to L-F Super Speed Bucky

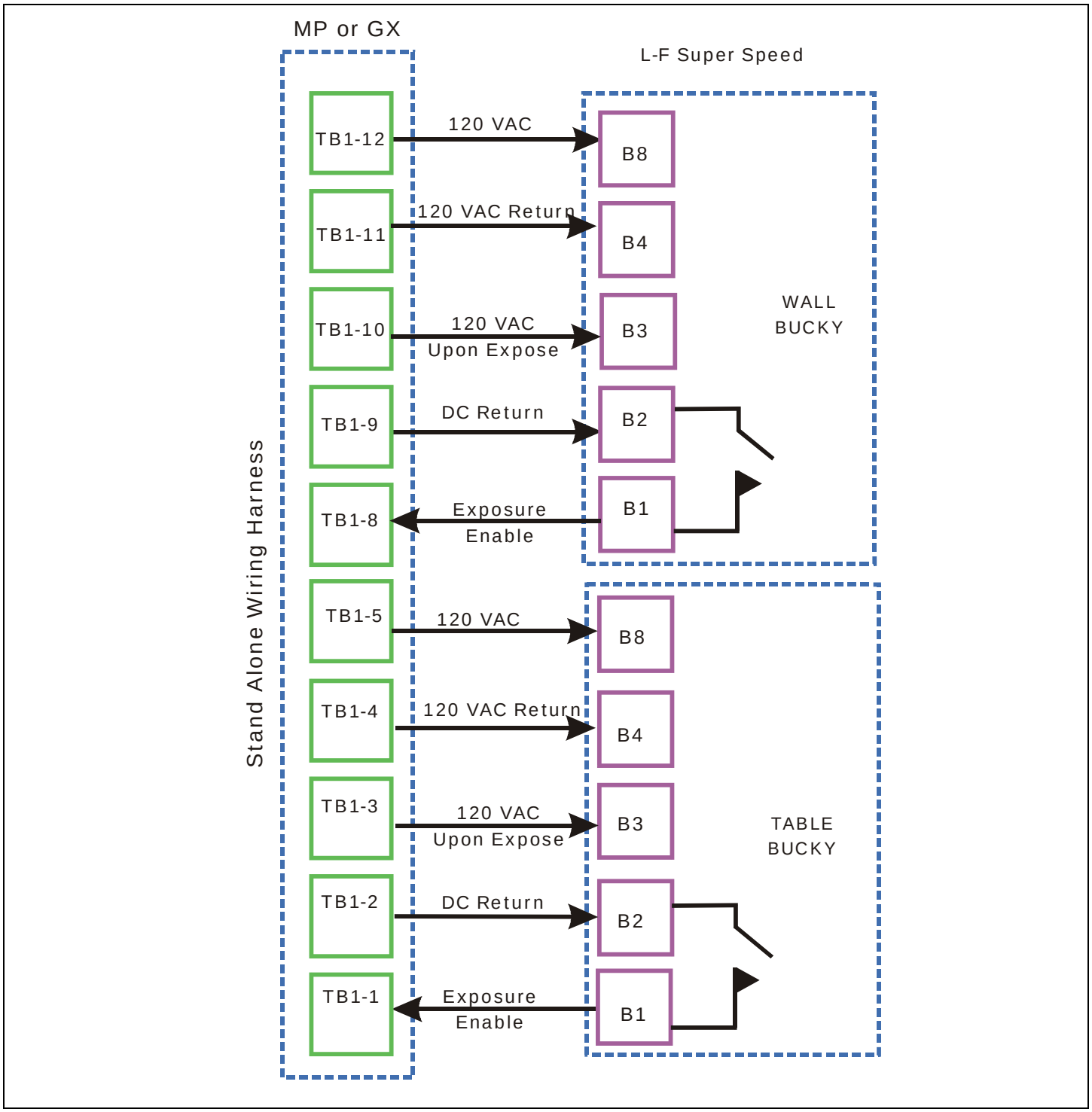


Figure 11: MP or GX (stand alone) to L-F 8000 & 9000 or Progeny True Speed Bucky

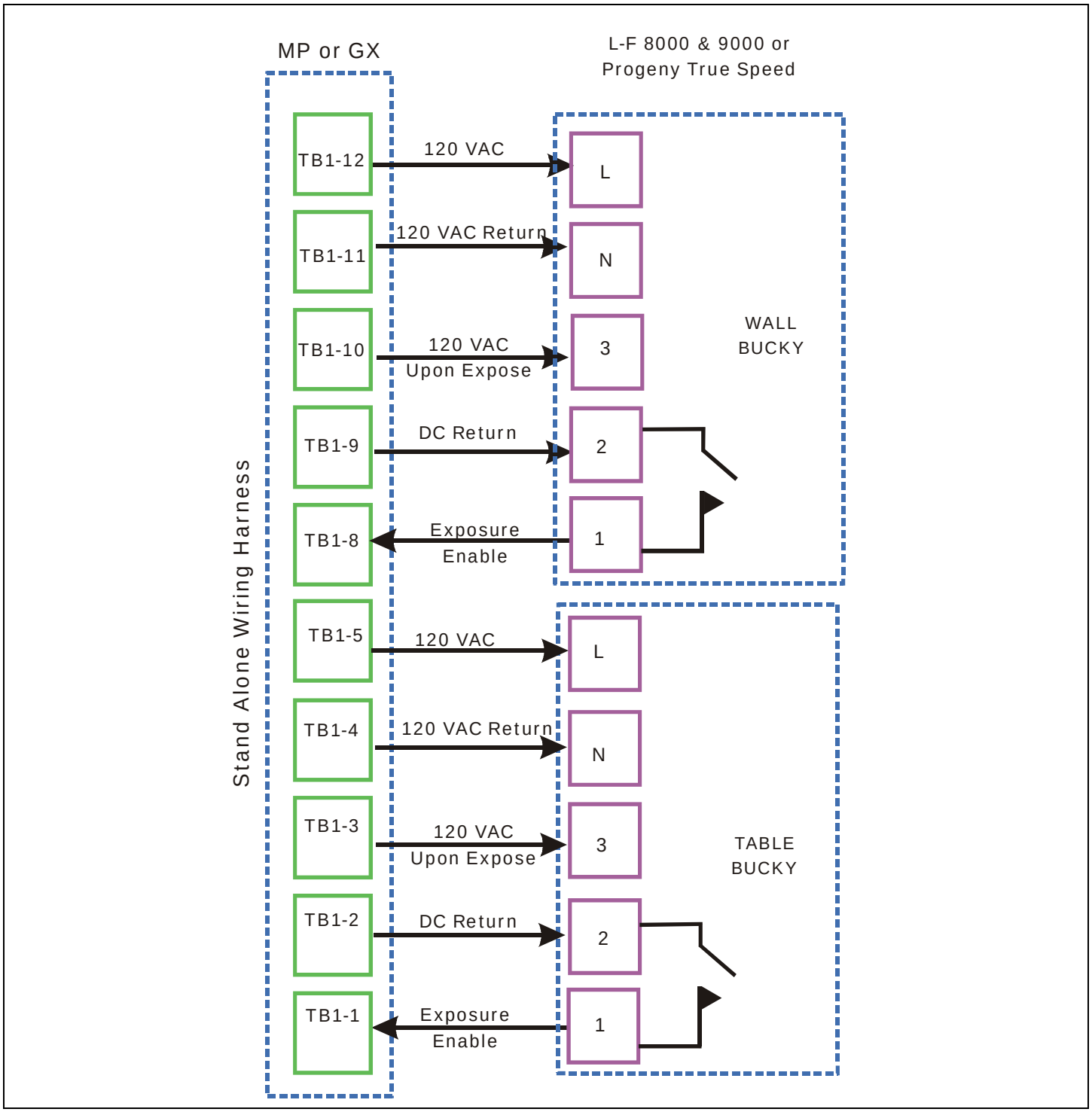


Figure 12: MP or GX (stand alone) to Midwest 14 X 36 Bucky

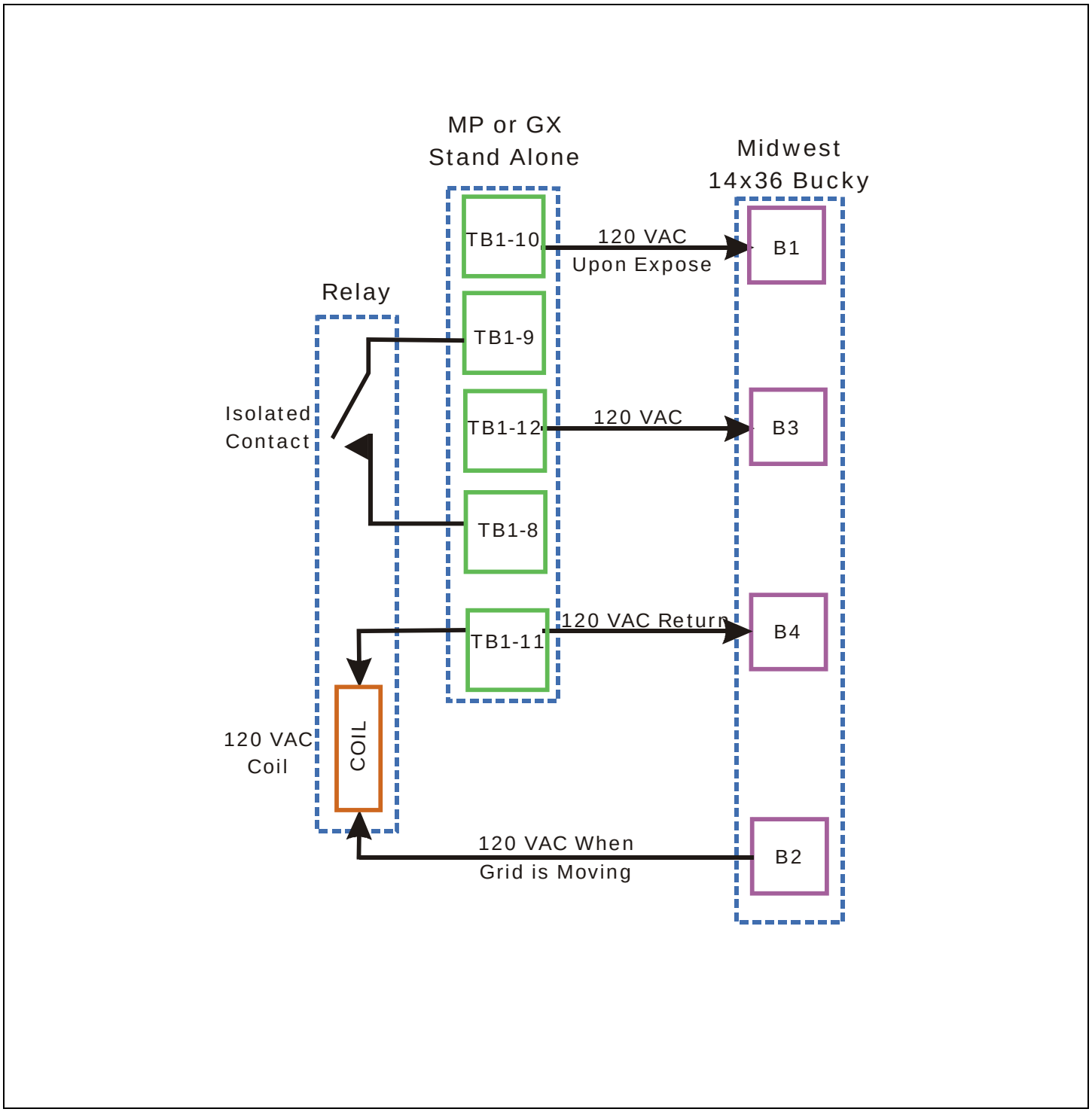


Figure 13: MP or GX (stand alone) to Universal/Gendex 14 x 36 Bucky (made by Midwest)

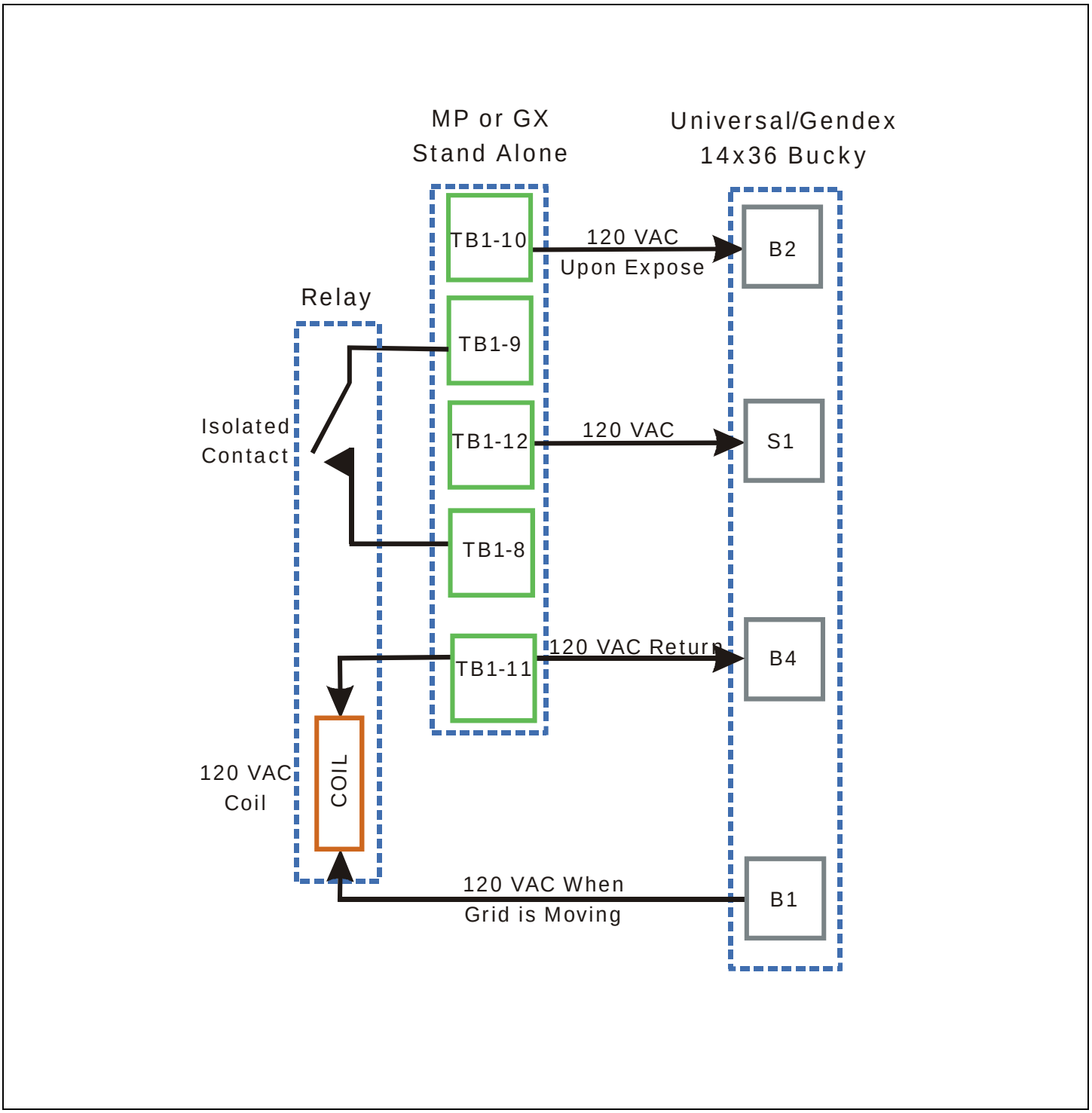


Figure 14: MP or GX (in table) to L-F Par Speed

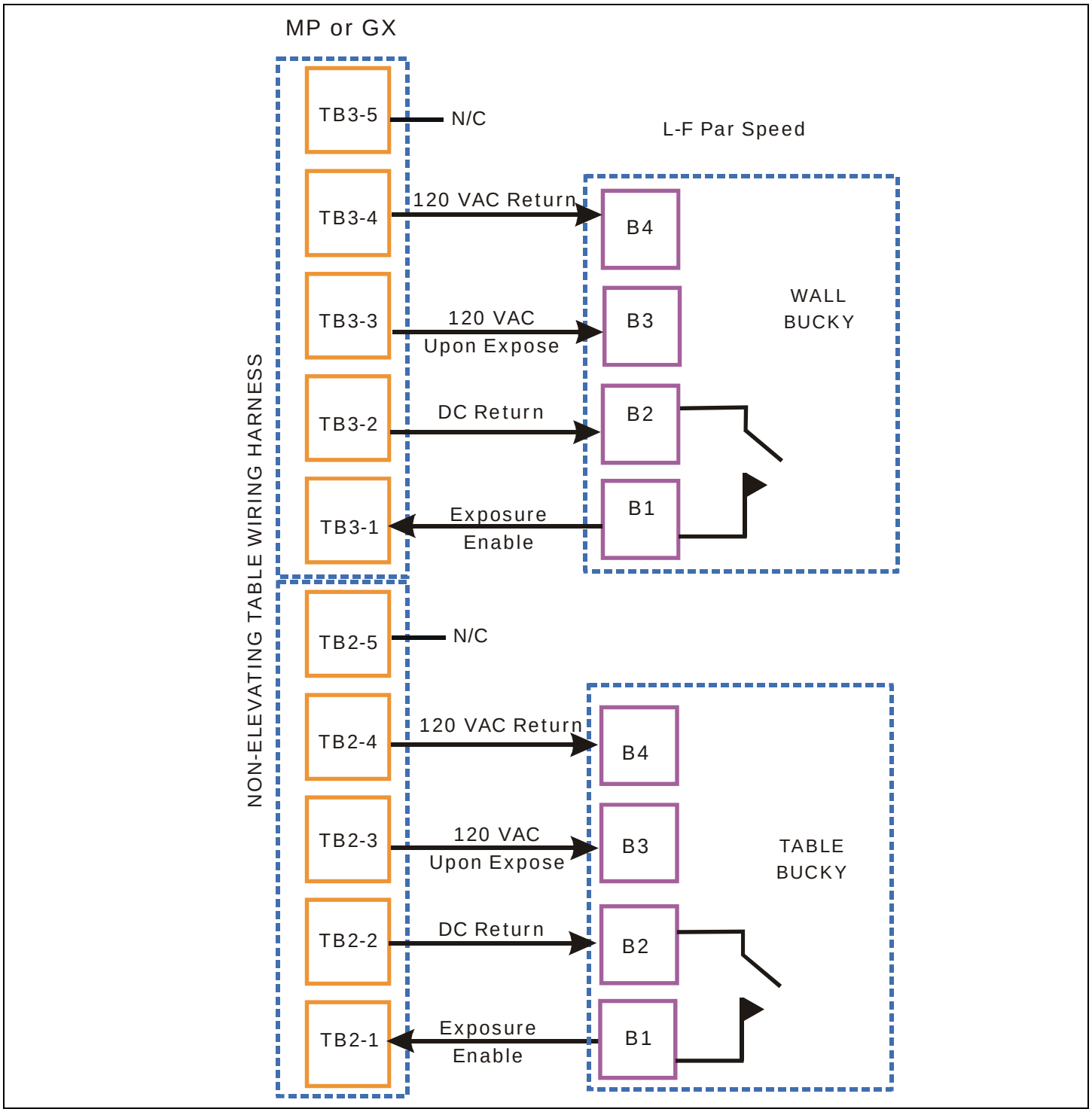


Figure 15: MP or GX (in table) to L-F Super Speed

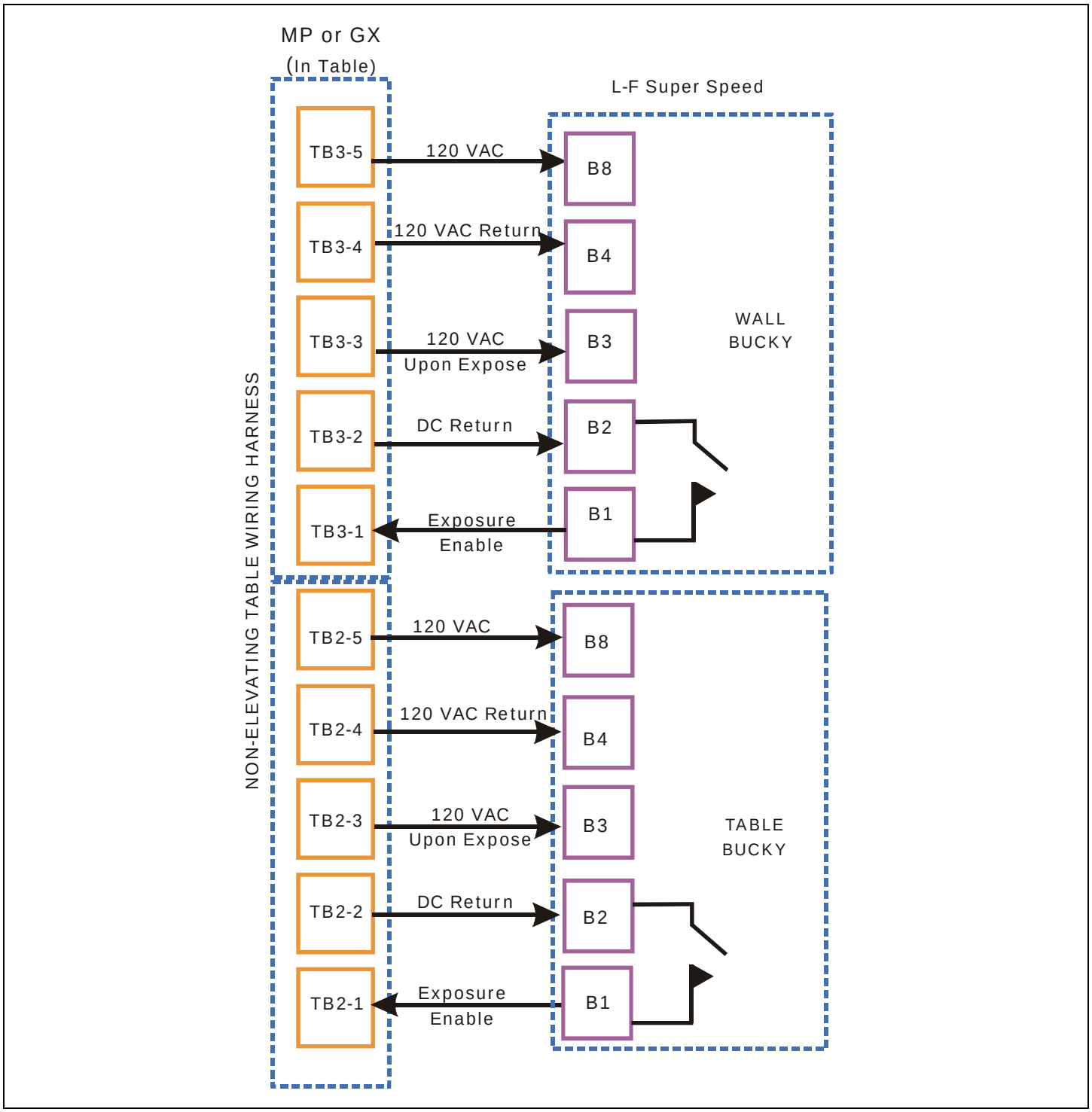


Figure 16: MP or GX (in table) to L-F 8000 & 9000 or Progeny True Speed Bucky

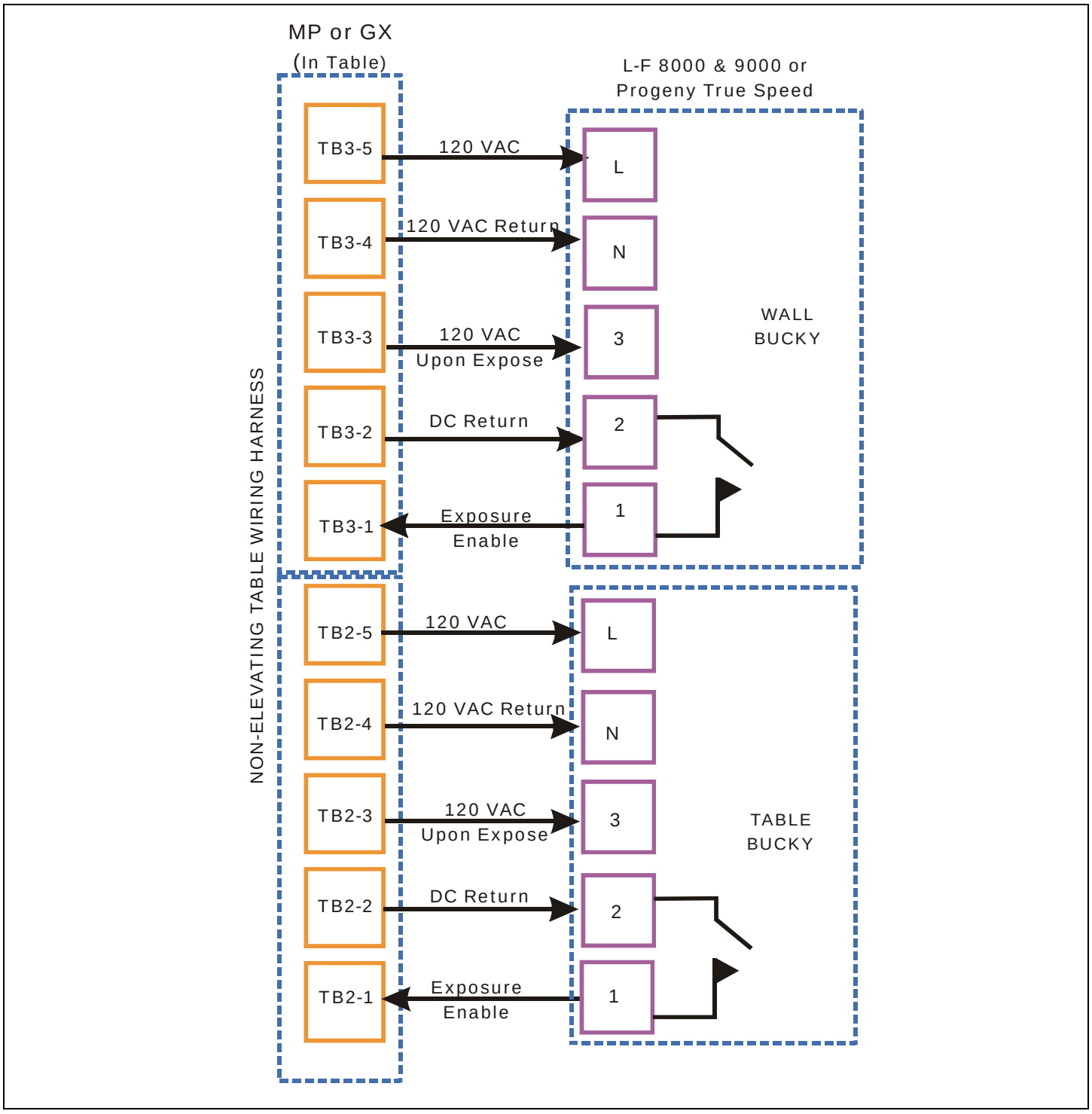


Figure 17: MP or GX (in table) to Midwest 14 x 36 Bucky

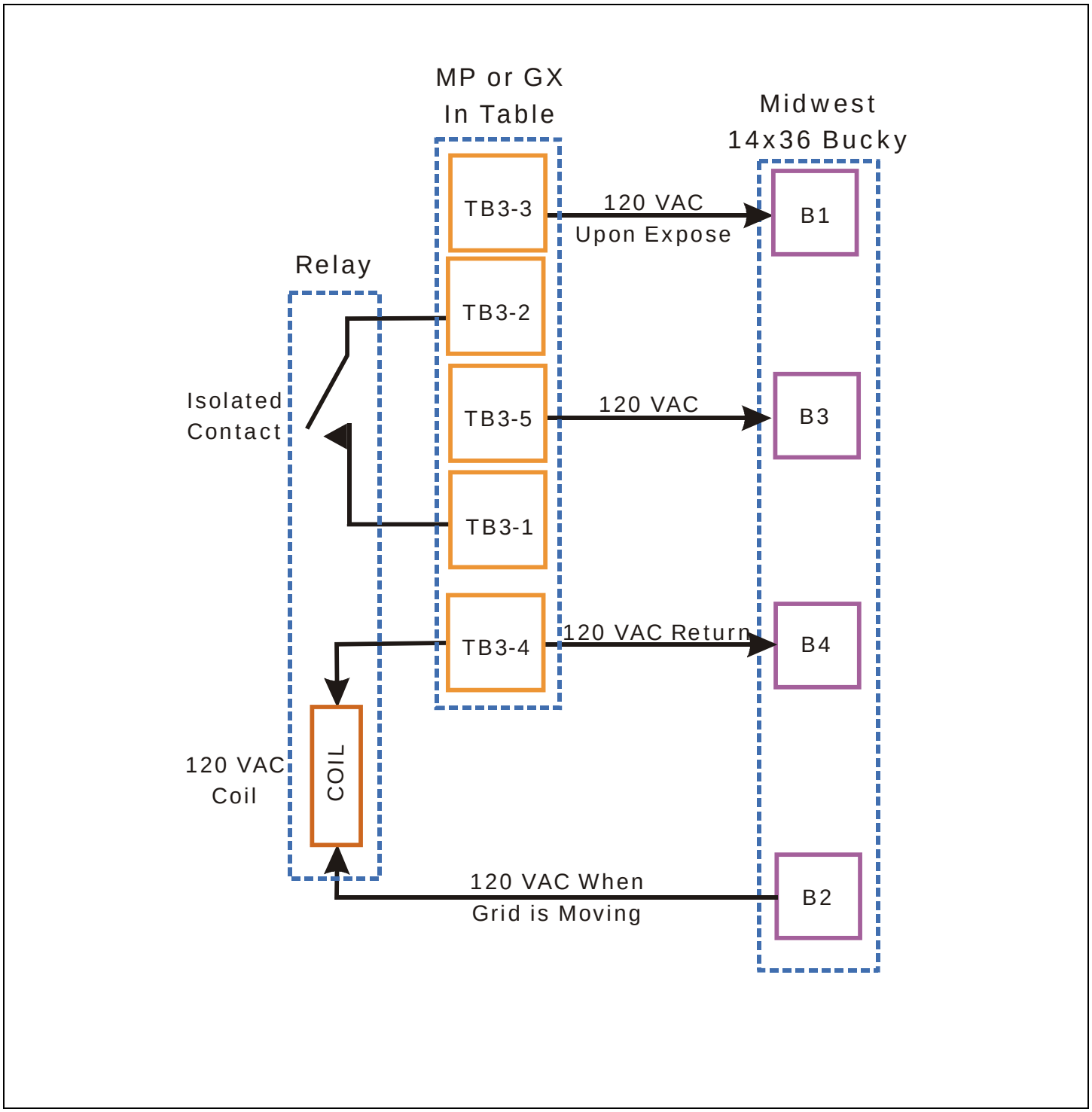


Figure 18: MP or GX (in table) to Universal/Gendex 14 x 36 Bucky (made by Midwest)

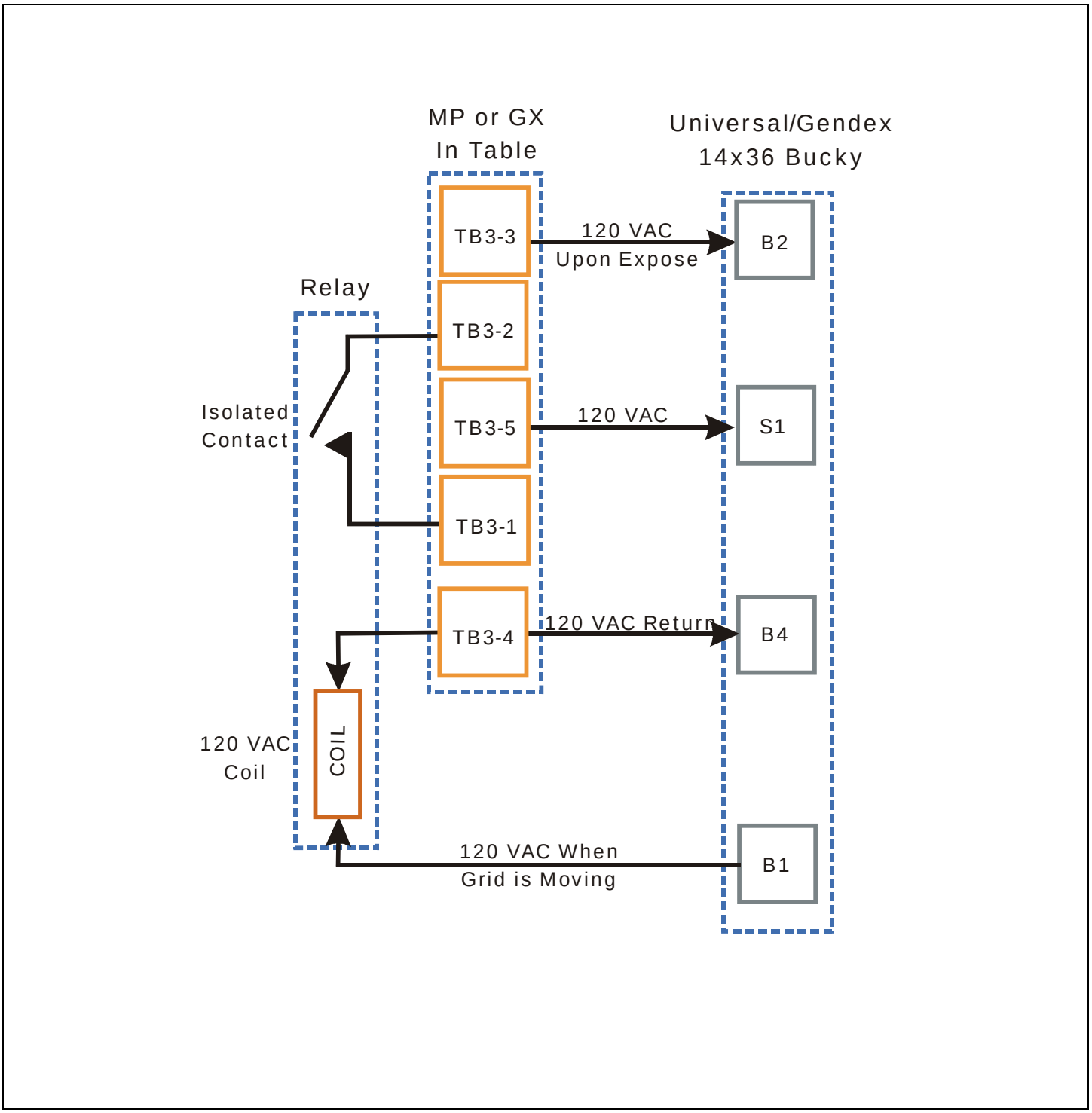


Figure 19: Unimatic 325D Generator to L-F Par Speed Bucky

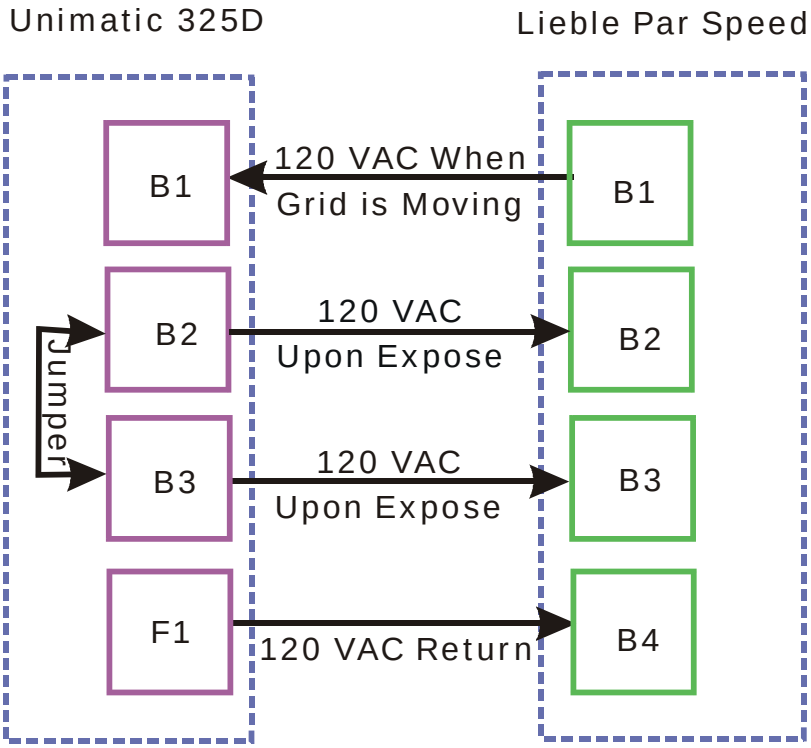


Figure 20: Unimatic 325D Generator to L-F Super Speed Bucky

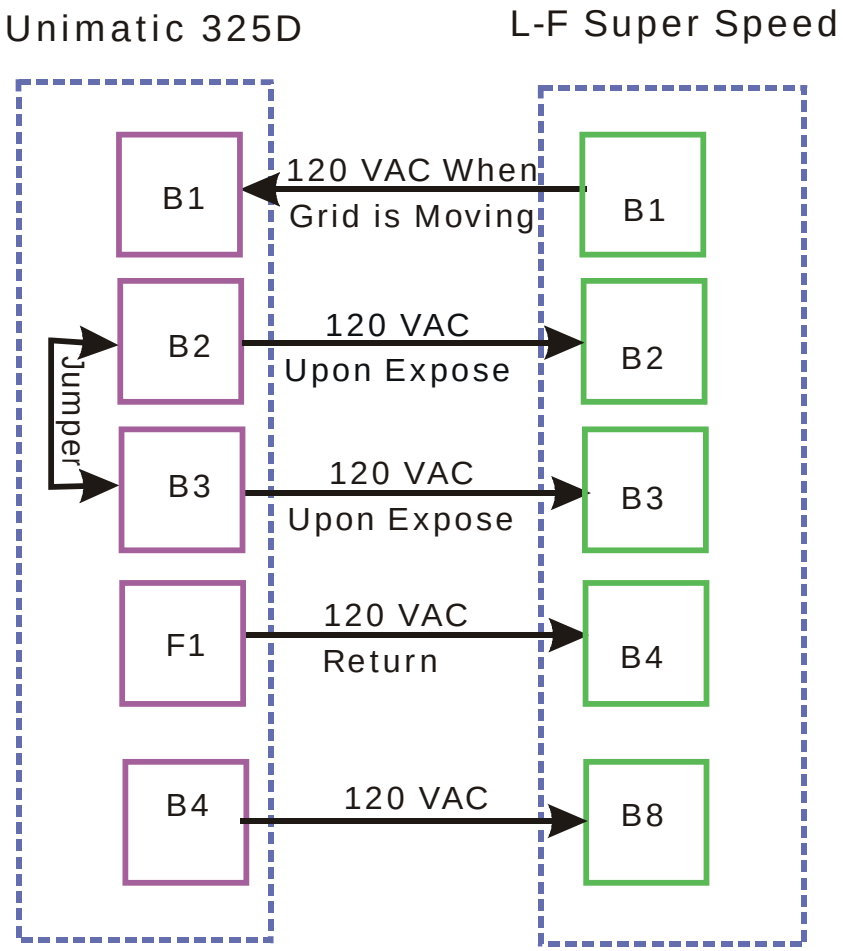


Figure 21: Unimatic 325D to L-F 8000 & 9000 or Progeny True Speed Bucky

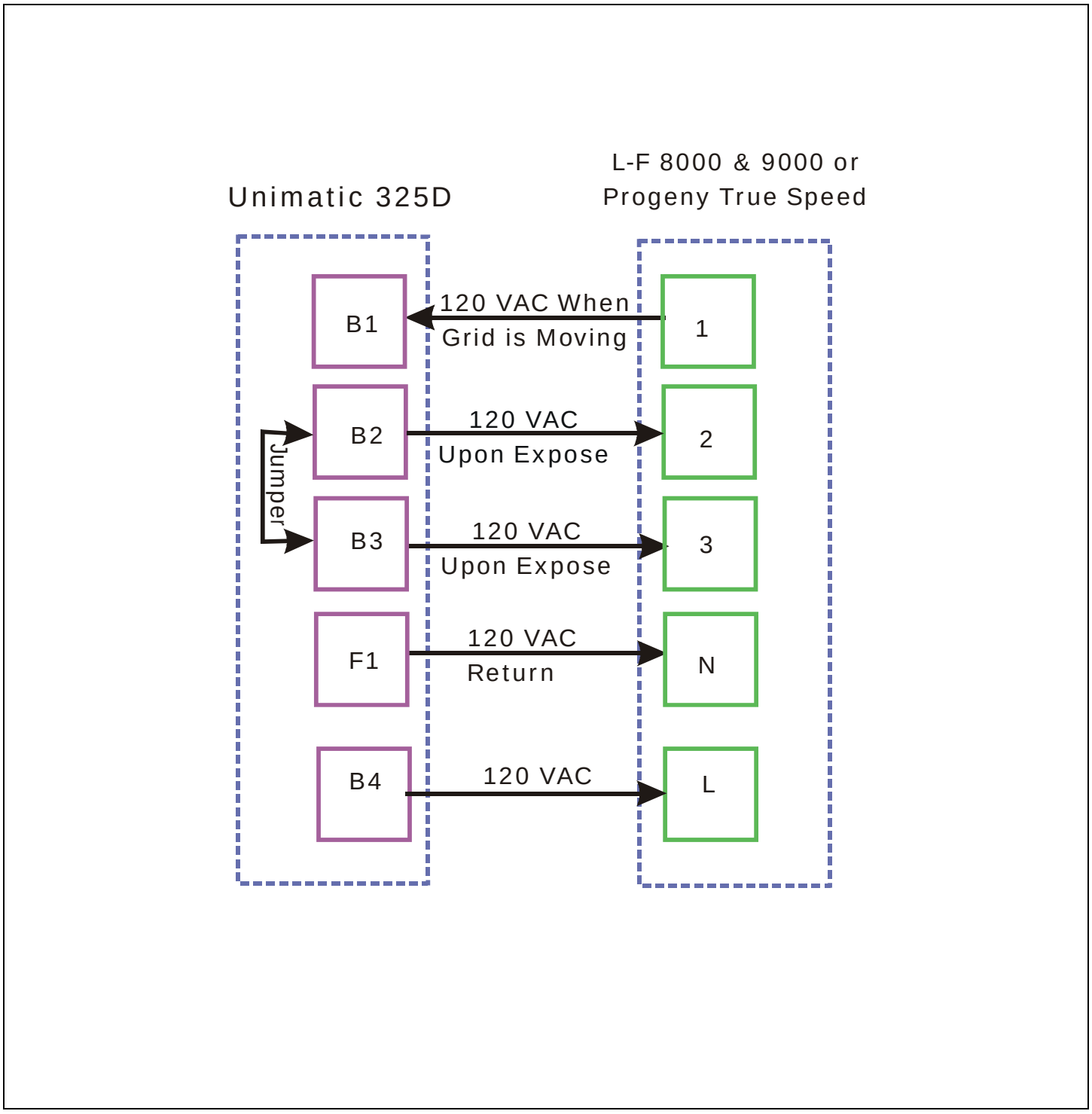


Figure 22: Unimatic 325D to Midwest 14 x 36 Bucky

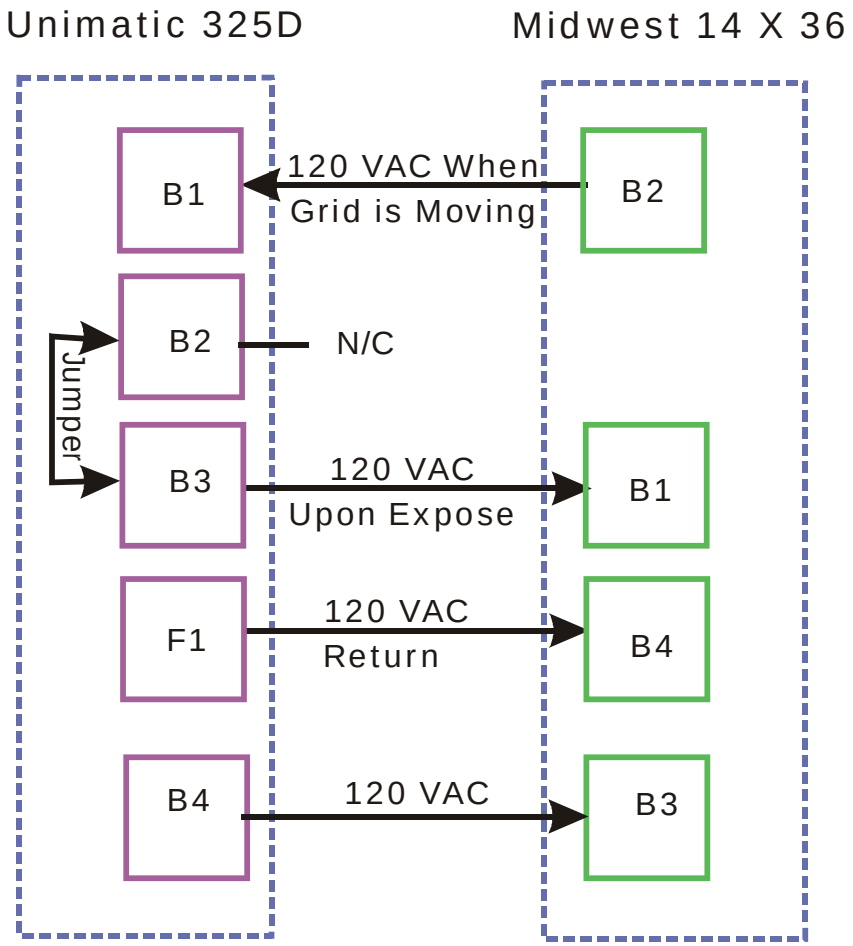


Figure 23: Unimatic 325D to Universal/Gendex 14 x 36 Bucky made by Midwest)

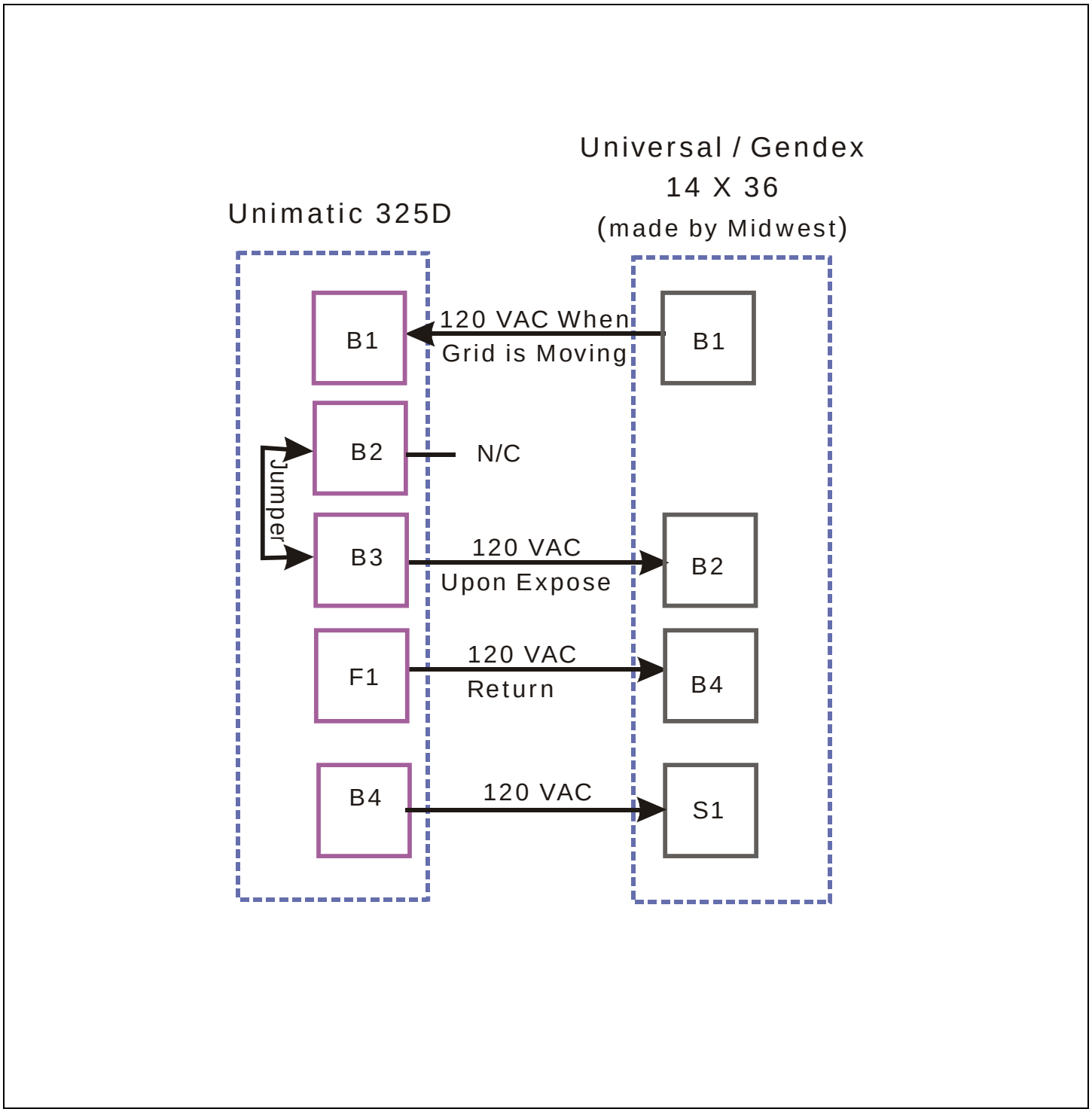


Figure 24: X-Tek 400 Generator to L-F Par Speed Bucky

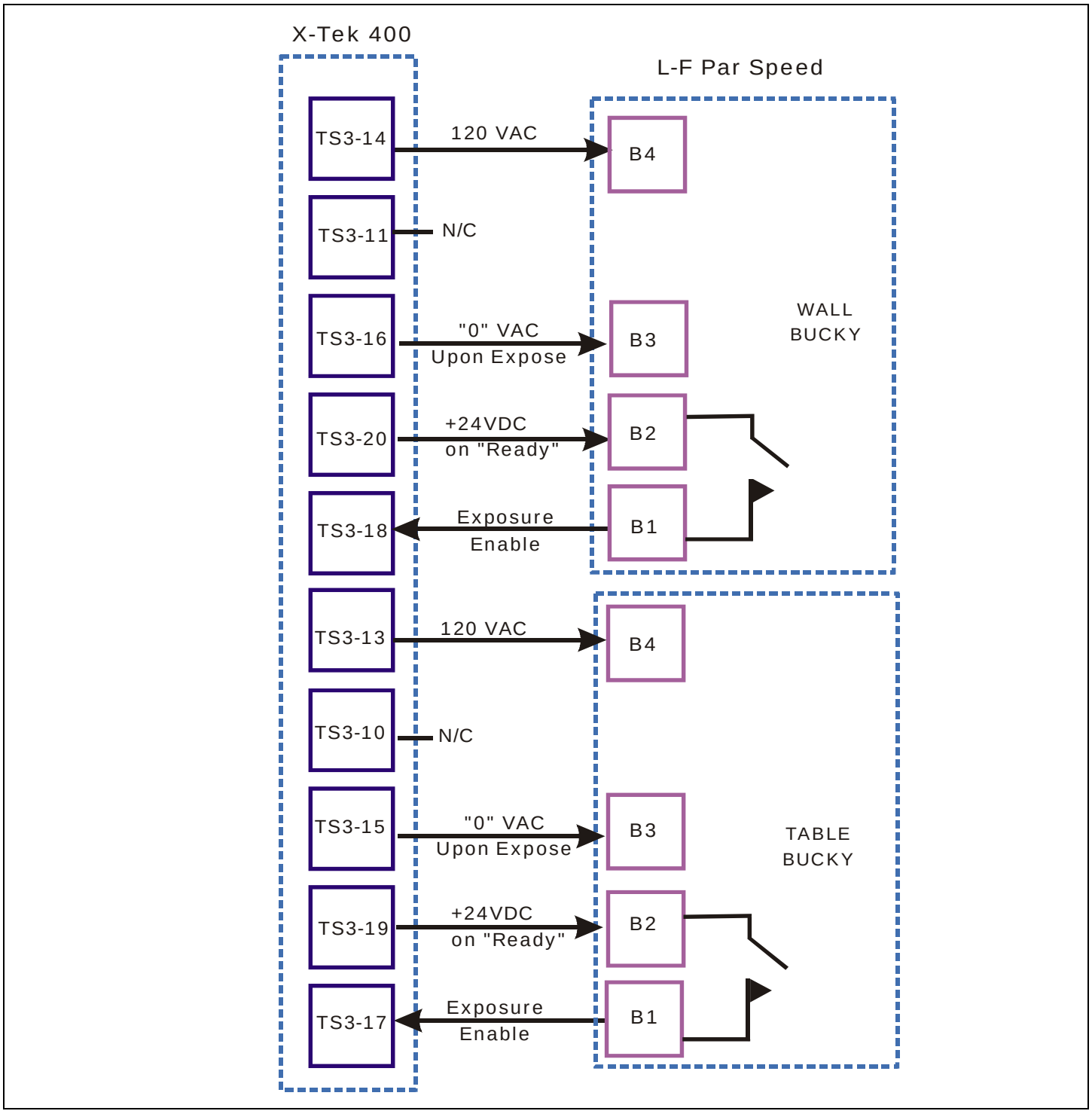


Figure 25: X-Tek 400 Generator to L-F Super Speed Bucky

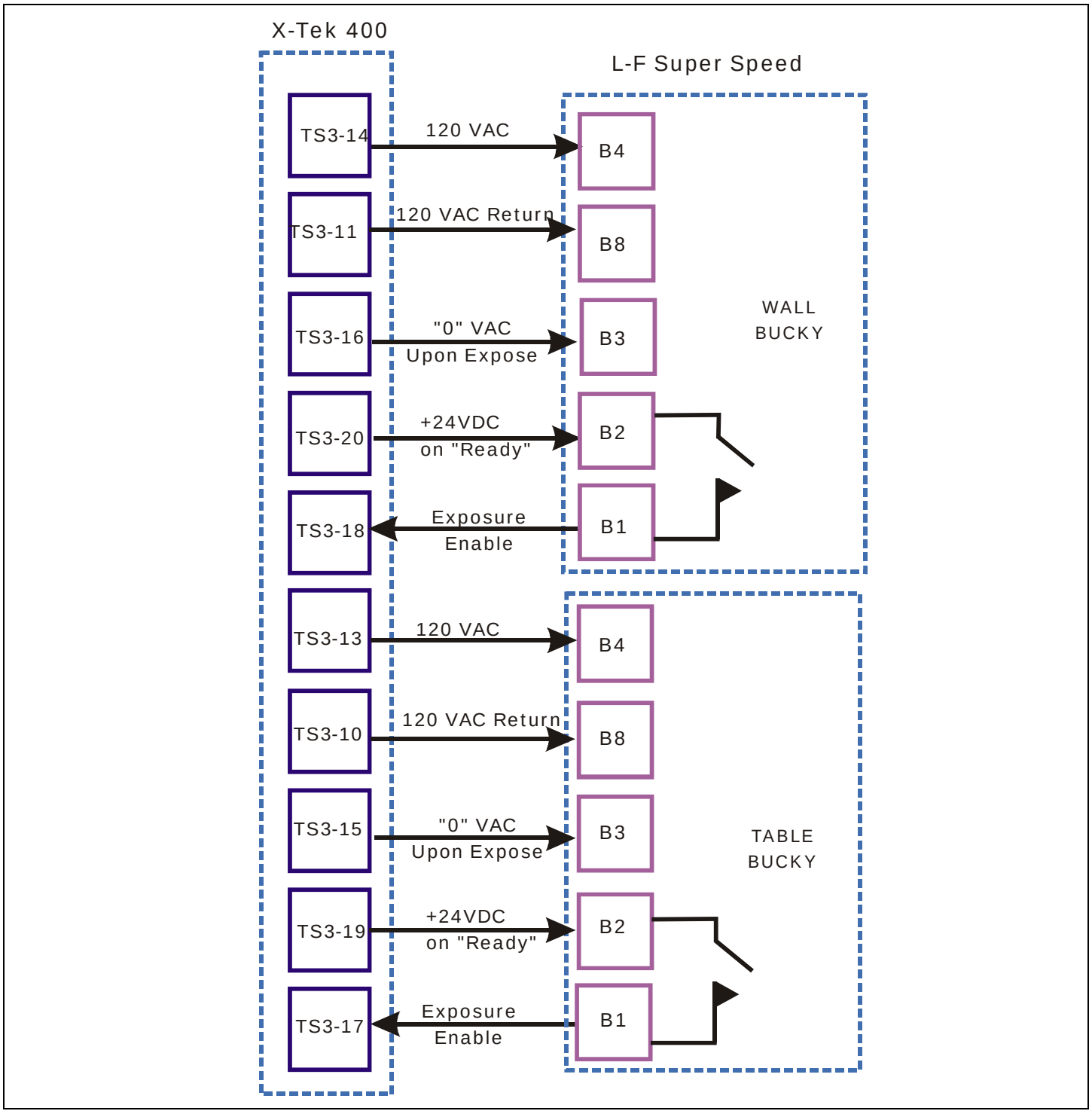


Figure 26: X-Tek 400 Generator to L-F 8000 & 9000 or Progeny True Speed Bucky

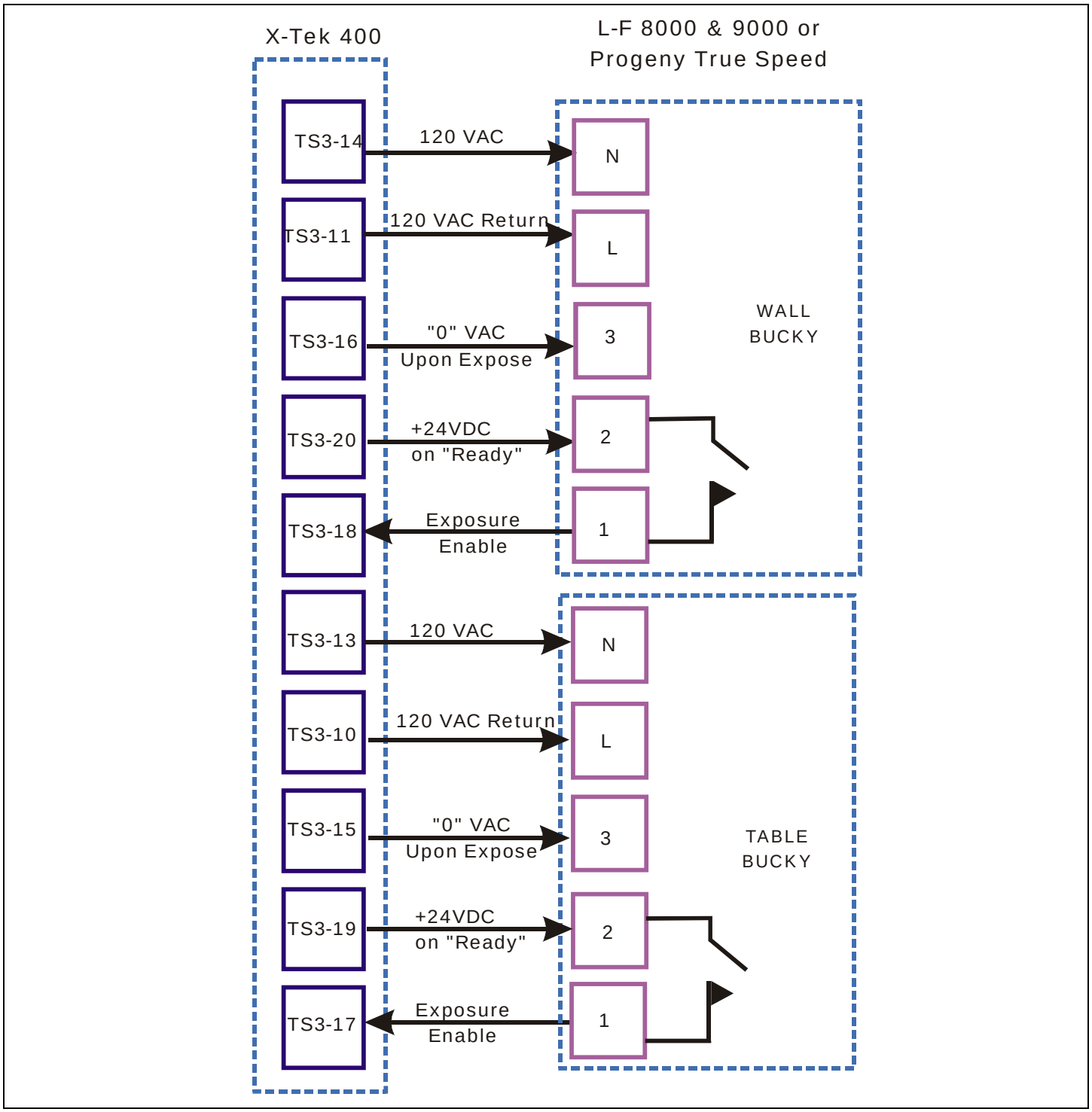


Figure 27: X-Tek 400 Generator to Midwest 14 x 36 Bucky

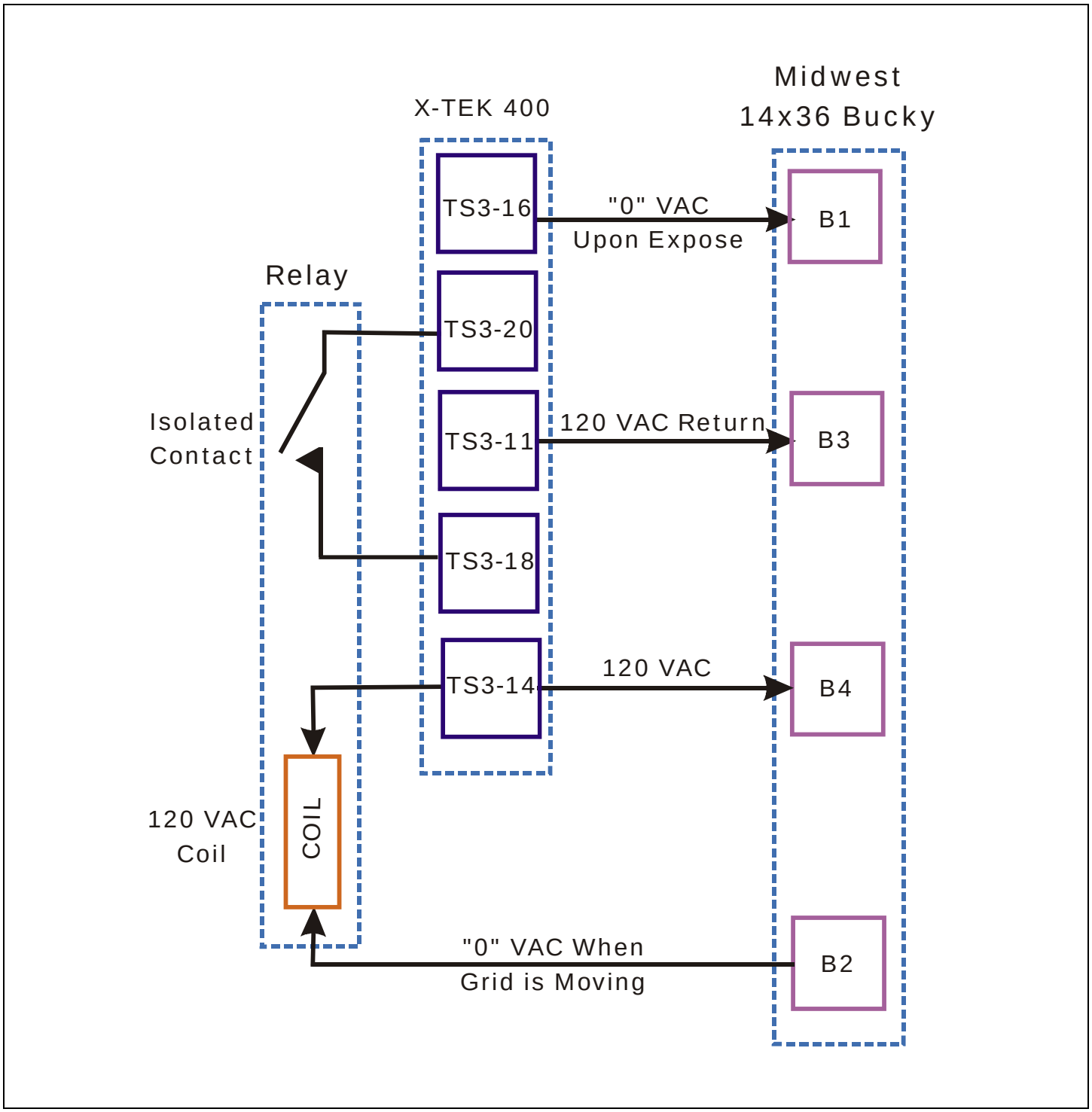


Figure 28: X-Tek 400 Generator to Universal/Gendex 14 x 36 Bucky (made by Midwest)