Operation & Maintenance Instructions

Generation III
Sonic Feeder Control System

Cedarapids
A Terex Company

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Introduction

To the Owner & Operator:

We have tried to provide information which will give you a clear understanding of equipment construction, function, capabilities and requirements. This information is based on the knowledge and experience of highly qualified people at our company and in our field organization. Proper use of this information will promote high efficiency, maximum service life and low maintenance costs.

We strongly recommend that all persons directly involved with this equipment be familiar with this manual.

The information contained in this manual should not be considered all-inclusive for every application. Questions about specific uses of this equipment should be directed to Cedarapids Inc. Anyone who uses this equipment for any purposes other than its intended use assumes the risk of any danger in doing so.

Respectfully,
Cedarapids Inc.

Important Notice!

Federal, state and local safety regulations must be complied with to prevent possible danger to person(s) or property from accidents or harmful exposure. This equipment must be used in accordance with all operation and maintenance instructions.

(1) Read all warning, caution and instruction signs. Know what guards and protective devices are included and see that each is used. Additional guards and protective devices that may be required due to proximity to related equipment must be installed by the user (owner) before operating.

(2) ***Never lubricate or adjust equipment when it is operating!***

(3) Securely lock out the involved power source before doing maintenance, cleaning, adjusting or repair. Secure the power source lockout to prevent start-up by other persons.

(4) Wear a protective mask whenever harmful air pollution exists.

(5) Use ear plugs whenever noise level is above established limits.

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Safety

Safety Rules

When operating this equipment, always follow the safety rules. Cedarapids makes no guarantee either expressed or implied that the equipment meets all local or federal safety regulations. It is the responsibility of the individual user to verify that all safety regulations are complied with before starting the machine.

Personal Safety Rules

Cedarapids equipment is designed to operate safely when used responsibly and as instructed in the operation manuals. Do not attempt to change, modify or eliminate the accident prevention devices installed at the factory. Make sure all personnel who regularly work or who might do work in the area of the equipment are familiar with the safety precautions. Operators are responsible for following safe operating procedures. It is the responsibility of the owner to establish a safe working environment and to train the employees on the employers safety policies

Guards, covers and shields are installed around moving parts at the factory whenever necessary to prevent accidental injury to operators and others working on or near the equipment. Do not remove them. In come cases the owner may need to install additional guarding and safety systems to protect the operator.

Warning! This manual contains important information regarding the operation of your machine. Carefully read the entire manual before attempting to operate. Failure to read this manual and follow the instructions and warnings in it could cause severe personal injury, death or substantial property damage.

- Only qualified and trained persons should operate, repair or maintain this equipment.
- Keep this manual for future reference.
- Federal, state and local safety regulations must be complied with to prevent possible danger to person(s) or property from accidents or harmful exposure.
- This equipment must be used in accordance with all operation and maintenance instructions.
- We strongly recommend that all persons involved with this equipment be familiar with this manual and all related engine manuals.
- Read all Danger, Warning, Caution and instruction decals.
- Know what guards and protective devices are included and see that each is used.

Hazard Seriousness Level

Signal words (Danger, Warning and Caution) are used to identify levels of hazard seriousness in this manual and on decals located on the equipment.

Definitions for identifying hazard levels are provided below with their respective signal words.

Danger! Immediate hazards which WILL result in severe personal injury or death.

Warning! Hazards or unsafe practices which COULD result in severe personal injury or death.

Caution! Hazards or unsafe practices which COULD result in minor personal injury.

Instructional and Informational Levels

Signal words are used to identify instructional procedures and informational suggestions or directions for Cedarapids equipment operation and maintenance.

Definitions for identifying instructional or informational levels are provided below.

Notice: Failure to follow proper instructional procedures could lead to serious and/or expensive damage to the equipment.

Important: Informational suggestions or directions regarding operational and maintenance of equipment.

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Safety

Warning! Failure to follow these guidelines may result in severe personal injury or death.

- Never attempt to install or remove any part or assembly when the paver is running.
- Do not allow personnel to walk between the machine and truck.
- Do not refuel the machine with the engine running. All sparks and open flames must be kept a minimum of 50 feet away from the machine when refueling.
- Wear snug-fitting clothing to prevent getting caught in moving parts. Loose-fitting clothing should never be worn.
- Mount and dismount the machine using only the steps, handrails and walkways provided.
- Do not mount or dismount the machine when it is moving.
- Keep all personnel clear of machine when operating.

Caution! Failure to follow these guidelines may result in minor personal injury and/or damage to the equipment.

- Wear protective mask when harmful air pollution exists.
- Wear safety goggles, gloves and long-sleeve shirts when in close proximity to hot asphalt materials.
- Wear ear plugs if needed.
- To prevent fire hazards, keep the engine area free of oil, fuel and trash buildup .

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Gen-III Feeder Controls

Introduction

The Gen-III feeder control is an optional control system that uses ultrasonic sensors or proportional sensors to monitor and maintain the head of material in front of the screed. As the material level changes the auger/conveyor speed is varied proportional to maintain the set material level.

Features of the Gen-III Feeder System

1) The screed mounted control unit allows for easy setup and adjustment of the material level without requiring the screedman to relocate the height of the sensor to meet varying conditions. Once the sensor has been mounted and targeted the material level can be adjusted from the rear of the screed.
2) The sonic system has detachable sensor and cable assemblies. The cable has connectors on both ends that allow quick replacement in the event a cable is damaged.
3) Standard proportional feeder controls can be plugged into the Gen-III feeder control and used in place of the sonic sensor.

Connecting Sonics Sensors

1) Plug one end of the power cable into the LH rear bulkhead of the tractor and the other end into the LH feeder control mounted on the screed (Figure 1). This cable can be left connected all the time.
2) Remove the protective cap from the LH side of the feeder control and plug in the coiled sensor cable (Figure 1).
3) Place sonic sensor in the LH end-gate sonic mount and route coiled cable to it. Plug coiled cable into sensor.

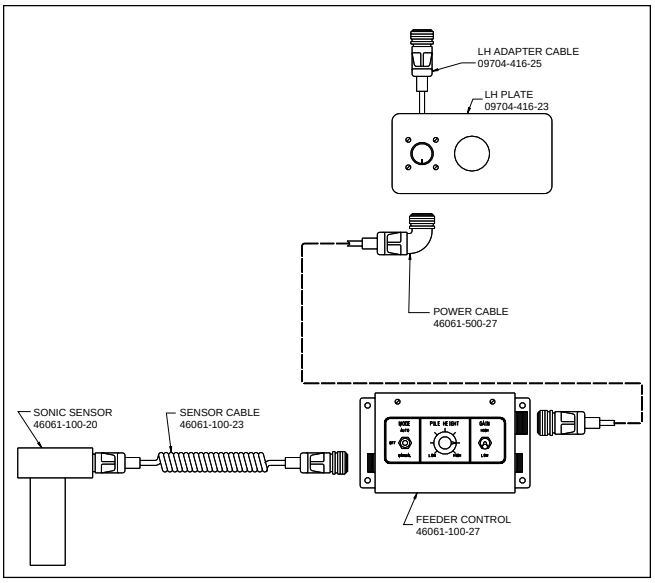

Figure 1

Plug one end the power cable into the RH rear bulkhead of the tractor and the other end into the RH feeder control mounted on the screed (Figure 2). This cable can be left connected all the time. Remove the protective cap from the RH side of the feeder control and plug in the coiled sensor cable (Figure 2). Place sonic sensor in the RH end-gate sonic mount and route coiled cable to it. Plug coiled cable into sensor.

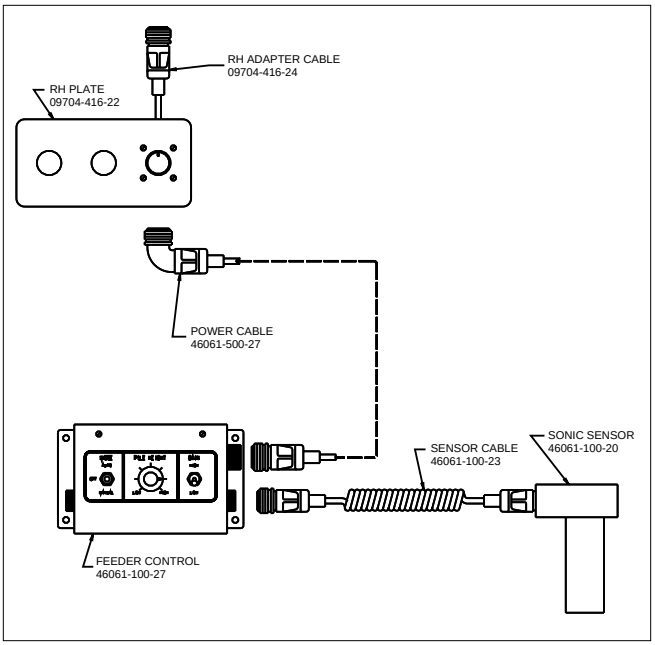

Figure 2

Connecting Proportional Sensors

1) Plug one end of the power cable into the LH rear bulkhead of the tractor and the other end into the LH feeder control mounted on the screed (Figure 3). This cable can be left connected all the time.
2) Place proportional sensor on outer auger bearing support or end-gate mount.
3) Remove the protective cap from the LH side of the feeder control and plug in the coiled sensor cable (Figure 3).

Notice: The proportional feed sensor should always be mounted with the sensor shaft facing the direction of travel.

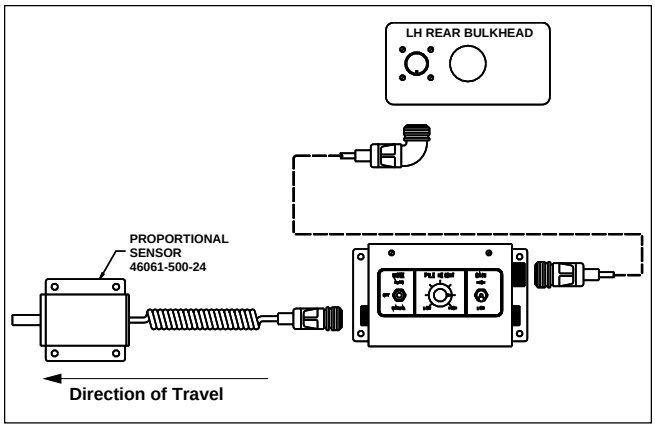

Figure 3

Connecting Proportional Sensors

1) Plug one end of the power cable into the RH rear bulkhead of the tractor and the other end into the RH feeder control mounted on the screed (Figure 4). This cable can be left connected all the time.
2) Place proportional sensor on outer auger bearing support or end-gate mount it.
3) Remove the protective cap from the RH side of the feeder control and plug in the coiled sensor cable (Figure 4)

Notice: The proportional feeder sensor should always be mounted with the sensor shaft facing the direction of travel.

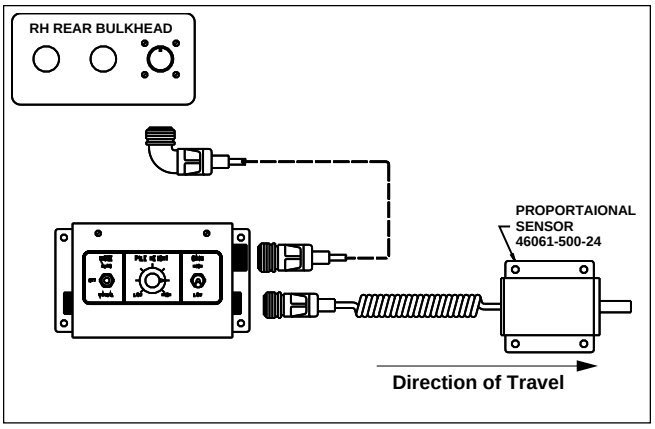

Figure 4

Wand Mounting

Loosen the control arm clamp and position the wand so that the roll pin is at 90° in relation to control arm (Figure 5). Tighten clamp.

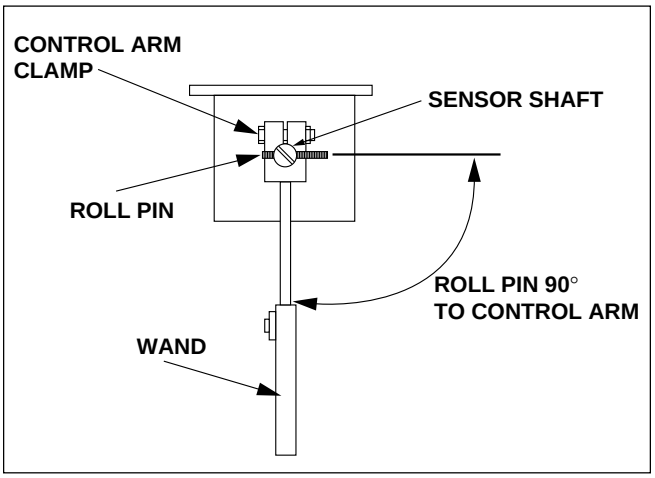

Figure 5

Feeder Control

1) **AUTO/OFF/MANUAL** (Item 1, Figure 6) switch is the primary means to control the auger/conveyor. When placed in the OFF position the auger/conveyor is off; when placed in the MANUAL position the auger/conveyor is turned on. The speed of the auger conveyor when in MANUAL is determined by the pile height knob setting. When placed in the AUTO position the auger/conveyor speed is controlled by the feed sensor. In AUTO mode the auger/conveyor has the capability of being driven from 0 to full speed depending on sensor output.

2) The **PILE HEIGHT** knob performs different functions depending on sensor used and setting of AUTO/OFF/MANUAL switch. It's used to set the maximum speed of the auger/conveyor when the AUTO/OFF/MANUAL switch is in the MANUAL mode (Item 2, Figure 6).

   Another usage is to set the distance from the face of the sonic sensor to the material when the AUTO/OFF/MANUAL switch is placed in the AUTO mode. Turning the knob counterclockwise lowers the material level. Clockwise rotation of the knob increases the material level.

   Finally, it's used to set the angle at which the proportional sensor shuts off when the AUTO/OFF/MANUAL switch is placed in the AUTO mode and the proportional sensor is used.

3) **GAIN** switch must be set in the LOW position when sonic sensors are used with the system (Item 3, Figure 6). When GAIN switch is in LOW, the sonic system controls the speed of the auger/conveyor proportionally within a 5" range. When GAIN switch is in HIGH position the control range is reduced to 2.5". Since the level of the mix can vary by more than 2.5" during normal operation, the sonic control will function like an on/off switch and will not provide proportional control.

   When proportional sensors are used with the system the GAIN switch sets the amount of rotation required for the sensing wand to go from OFF to full ON. In LOW gain, the wand will react in a 45° control range (Figure 7). In HIGH gain, the want will react in a 22° control range (Figure 7). Normally, the GAIN switch should be set to HIGH when using the proportional sensor.

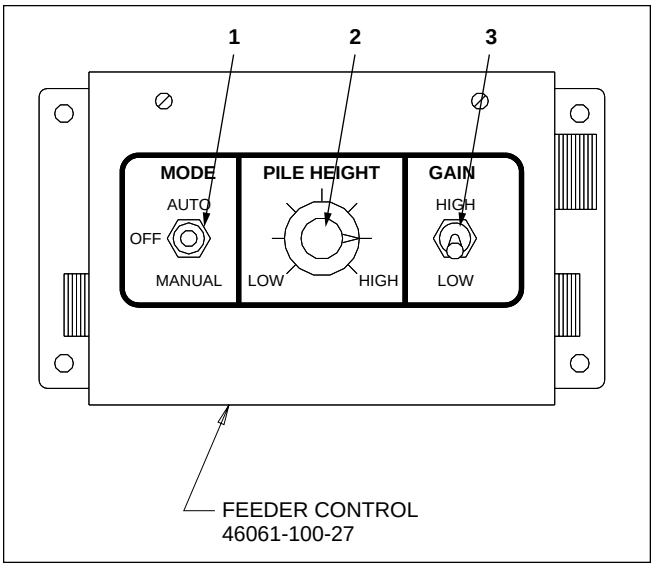

Figure 6

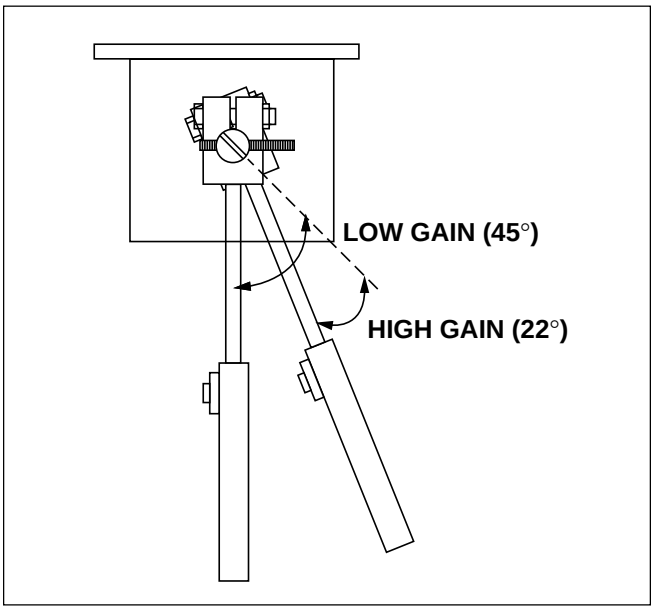

Figure 7

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Controls

Operator Console

1) Left Auger/Conveyor (Item 1, Figure 8) is a two position switch. When the switch is pressed into the STOP position, the auger/conveyor is stopped. When the switch is pressed into the OVERRIDE position the auger/conveyor is turned on.
2) Right Auger/Conveyor (Item 2, Figure 8) is a two position switch. When the switch is pressed into the STOP position, the auger/conveyor is stopped. When the switch is pressed into the OVERRIDE position the auger conveyor is turned on.
3) Left Flow Gate switch (Item 3, Figure 8) is used to control the amount of material that is delivered to the auger chamber .
4) Right Flow Gate switch (Item 4, Figure 8) is used to control the amount of material that is delivered to the auger chamber

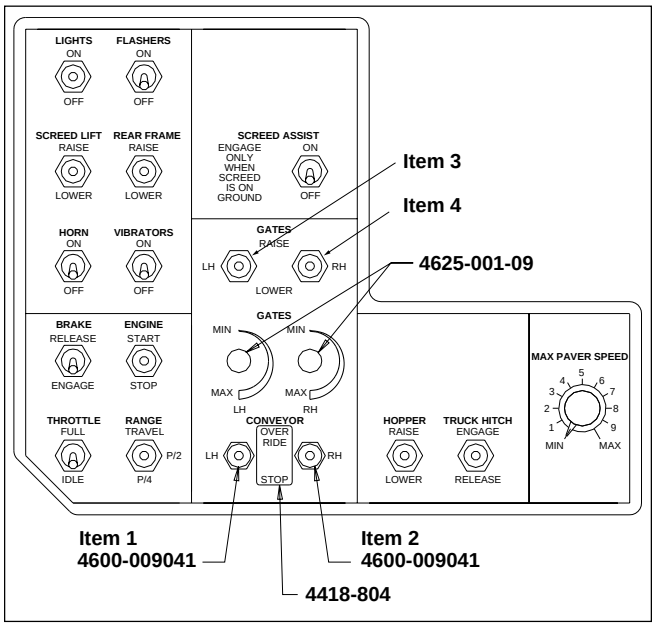

Figure 8

Remote Handset

The Stop/Override (Figure 9) is a two position switch. When the switch is pressed into the STOP position, the auger/conveyor is stopped. When the switch is pressed into the OVERRIDE position the auger conveyor is turned on.

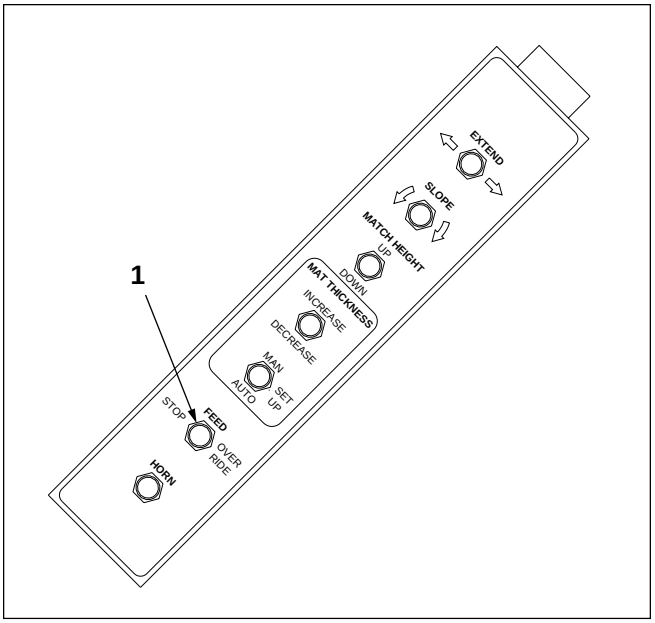

Figure 9

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Targeting Sonic Sensor

The sensor should be mounted in a position that targets the cone shaped field of view of the sensor on the ACTIVE MATERIAL near the outer end of the auger.

Sensor Distance

The sonic sensor should be no closer than 12 inches and no further than 30 inches away from the face of the material (Figure 10).

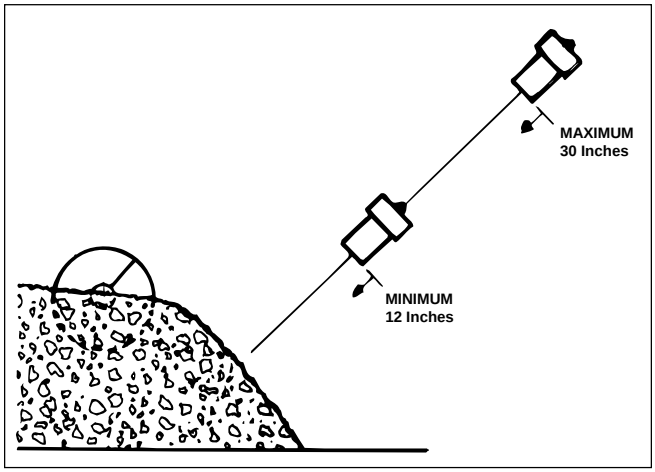

Figure 10

Sonic Sensor Alignment

For best possible results the sensor should be targeted perpendicular (90°) to the material surface being monitored. Misalignment decreases the amount of return echo's to the sensor. The type of material being used determines the amount of misalignment tolerance. Fine graded material designs, like sand mixes, have a low reflective value and require the sensor to be targeted perpendicular while course graded material designs have a high reflective value and may allow up to a 10° misalignment (Figure 11).

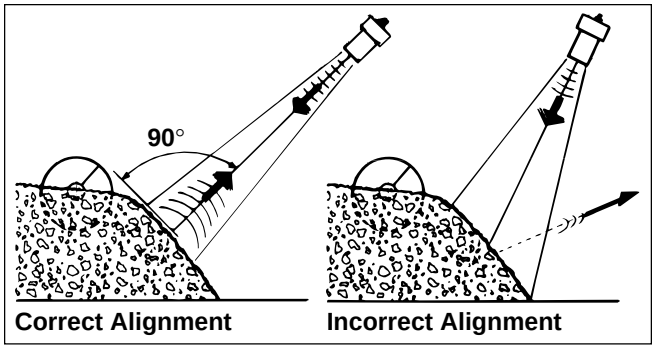

Figure 11

Targeting on Active Material

The sensor should always be targeted on the material that is actively moving. This area is traditionally on the forward outboard end of the auger (Figure 12). The sensor should be targeted in the center area of the face of material for best results.

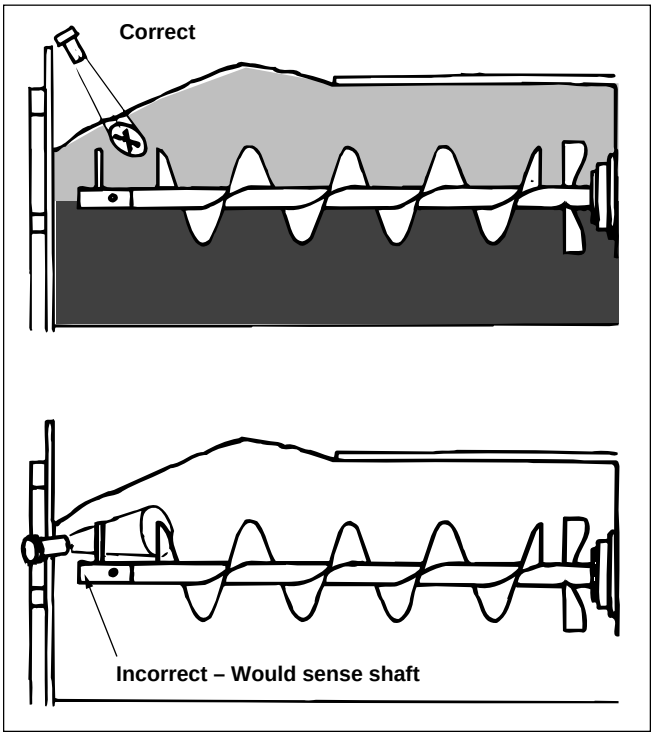

Figure 12

The most common problem encountered with the use of sonic feeder controls is improper mounting and targeting. The system will react to the object that is inside the view window and closest to the sensor (Figure 12). Care must be taken in mounting and targeting the sensors to prevent sensing objects (end gates, augers, material retaining plates, etc.) other than the desired material level.

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Targeting Sonic Sensor

Positioning Proportional Sensor

The proportional sensor should be mounted at the outboard end of the auger so the control arm is free to follow the level of material without interference from augers, material retaining plates and end gates. Best results occur when sensing on the active material.

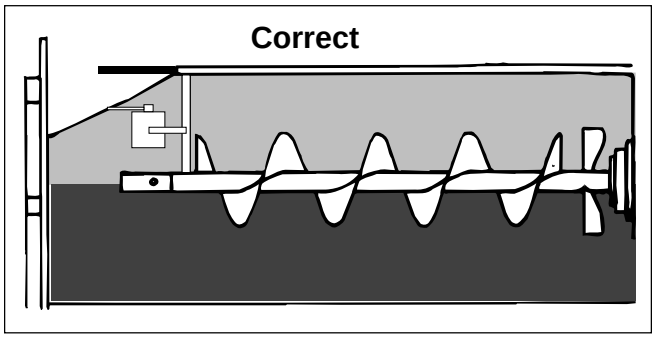

Figure 13

Setup & Use of Sonic

The following steps will initially establish the desired material level.

1) Connect the sensor cable to the sensor and to the feed control.
2) Place sensor in endgate mount and establish preliminary targeting.
3) Using either OVERRIDE/STOP switch or the feed control AUTO/OFF/MANUAL switch, auger out material until the desired level is established
4) Place the feed control AUTO/OFF/MANUAL switch in AUTO mode.

5) As the paver starts moving adjust the PILE HEIGHT knob until the desired level is maintained.

Important: The feed system will only operate in AUTO when the traction control lever is in forward and the brakes are released.

Setup & Use of Proportional

The following procedure will initially establish the desired material level:

1) Connect the sensor cable to the feed control.
2) Place sensor at the outboard end of the auger.
3) Using the remote handset OVERRIDE/STOP switch or the feed control AUTO/OFF/MANUAL switch, auger out material until the desired level is established
4) Place the feed control AUTO/OFF/MANUAL switch in AUTO mode.
5) As the paver start moving adjust the PILE HEIGHT knob until the auger just comes on.
6) Using the GAIN switch can effectively raise or lower the material level. Select the mode that produces the best result.
7) Minor adjustments to the PILE HEIGHT knob can fine tune the level of material that the auger shuts off. Note however the pile height knob has a limited working range (degree of rotation) that the proportional sensor will function in. If The pile height knob is set incorrectly the auger/conveyor could be either on or off continually.

Important: The system will only operate when the traction control lever is in forward and the brakes are released.

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Adjustments for Gen-III Systems

Maximum Speed Manual Override

To adjust the maximum speed of the auger in override mode:

1) Engine at full throttle.
2) Press and hold OVERRIDE switch in either the operator console or remote handset to override position.
3) Place a tachometer on the end of the auger shaft. The auger should be running between 135 and 150 RPM.

   If the auger speed is not within this range, the speed can be adjusted on the conveyor circuit card found in the main electrical junction box on the tractor (Figure 14). The circuit card has three speed adjustments; MAX, MIN and LIMIT. The MIN adjustment is not used with the Gen-III systems. Rotate the MAX adjustment clockwise to increase the auger speed and counterclockwise to decrease the auger speed. If the desired auger speed cannot be reached, rotate the LIMIT adjustment clockwise to increase the upper auger speed limit and continue adjusting the MAX speed adjustment to change the auger speed.

Warning! Failure to use caution when working near the rotating augers could result in serious injury or death.

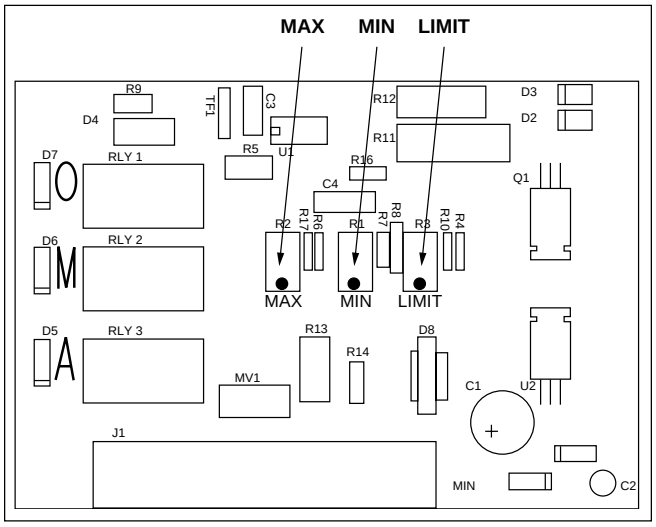

Figure 14

Maximum Speed Automatic Mode

The following procedure will adjust the maximum speed of the auger in Override mode:

1) Engine at full throttle.
2) Travel speed dial at 0.
3) Brakes released.
4) Travel lever in forward.
5) Feed control Auto/Off/Manual switch to AUTO.
6) Hold the sonic sensor 4 to 5 feet away from and pointed at the back of the tractor or a truck.
7) Using a tachometer on the end of the auger shaft, adjust the maximum speed set point on the feeder control card located inside the feed control box. The normal setting is 135 to 150 RPM (Figure 15).

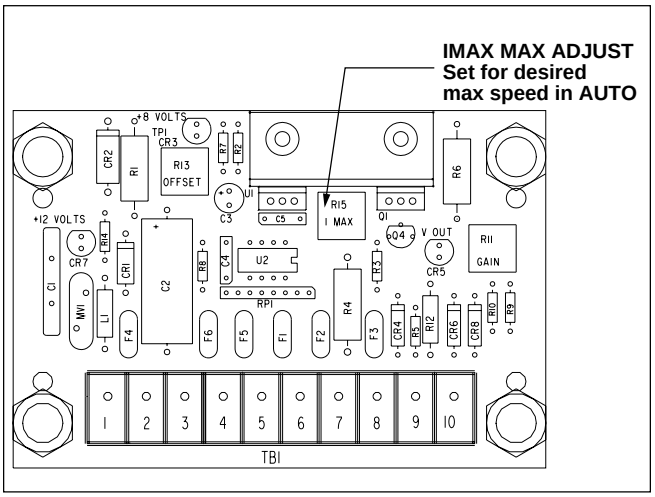

Figure 15

Maintenance Recommendations

1) Remove sonic sensors every evening and store in a secured location.
2) Install protective caps on all electrical connectors.
3) Handle sonic sensor with care to prevent damage to the transducer. The transducer is made of a ceramic material can be cracked or damaged if impacted.

Notice: If the transducer becomes damaged it will require replacement of the complete sensor. These are permanently sealed and can not be repaired.

4) Check transducer daily for material buildup. The transducer can be cleaned off with contact cleaner or a parts solvent. Place cleaning fluid on a clean rag and rub transducer gently to remove any material. Then wipe transducer clean and dry (Figure 16). Do not use a sharp or solid object to scrape materials off. This could possibly damage the sensor.

Theory of Operation

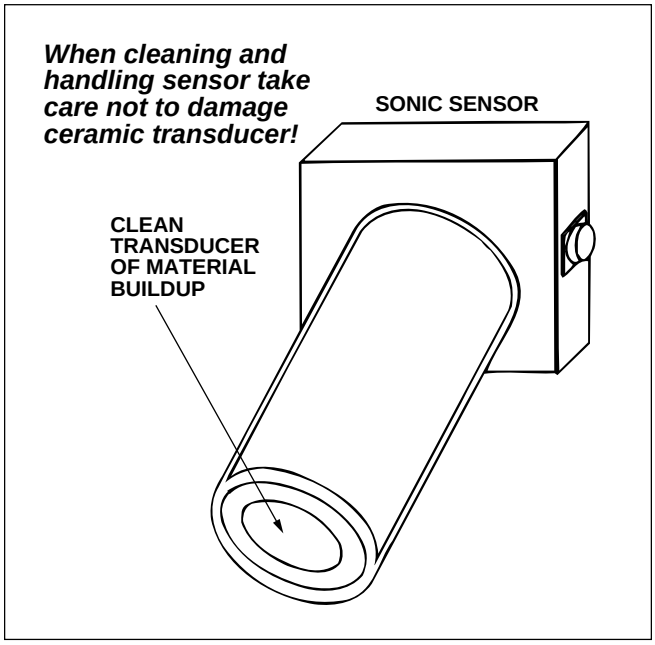

Figure 16

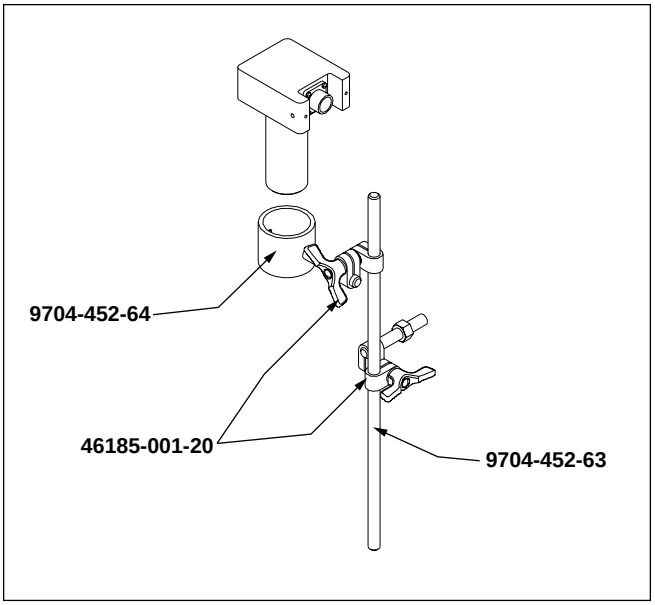

Figure 17
Mounting Hardware

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1st Generation Controls
Electrical Schematic

LH Feeder System

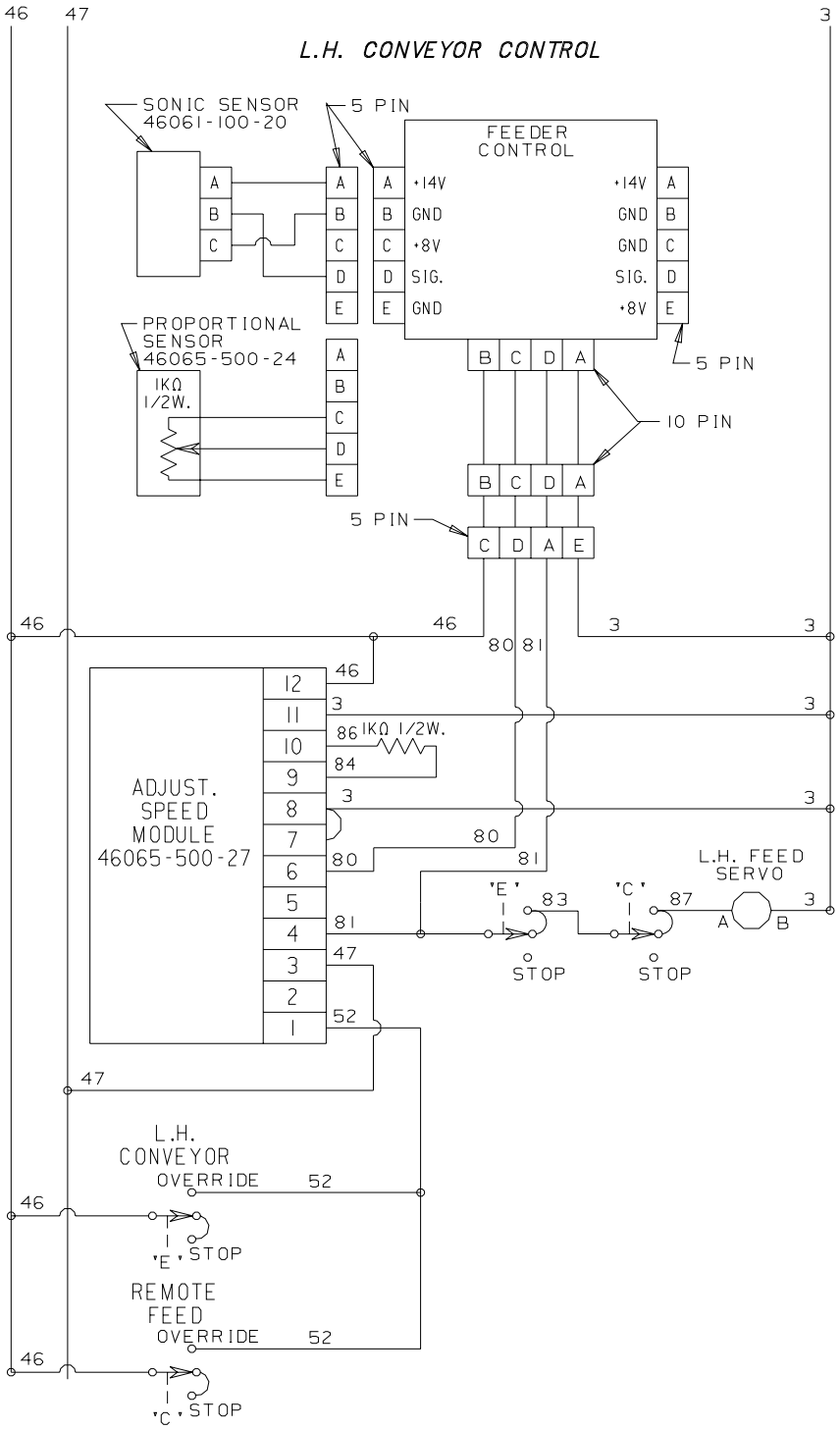

Figure 18

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1st Generation Controls
Electrical Schematic

RH Feeder System

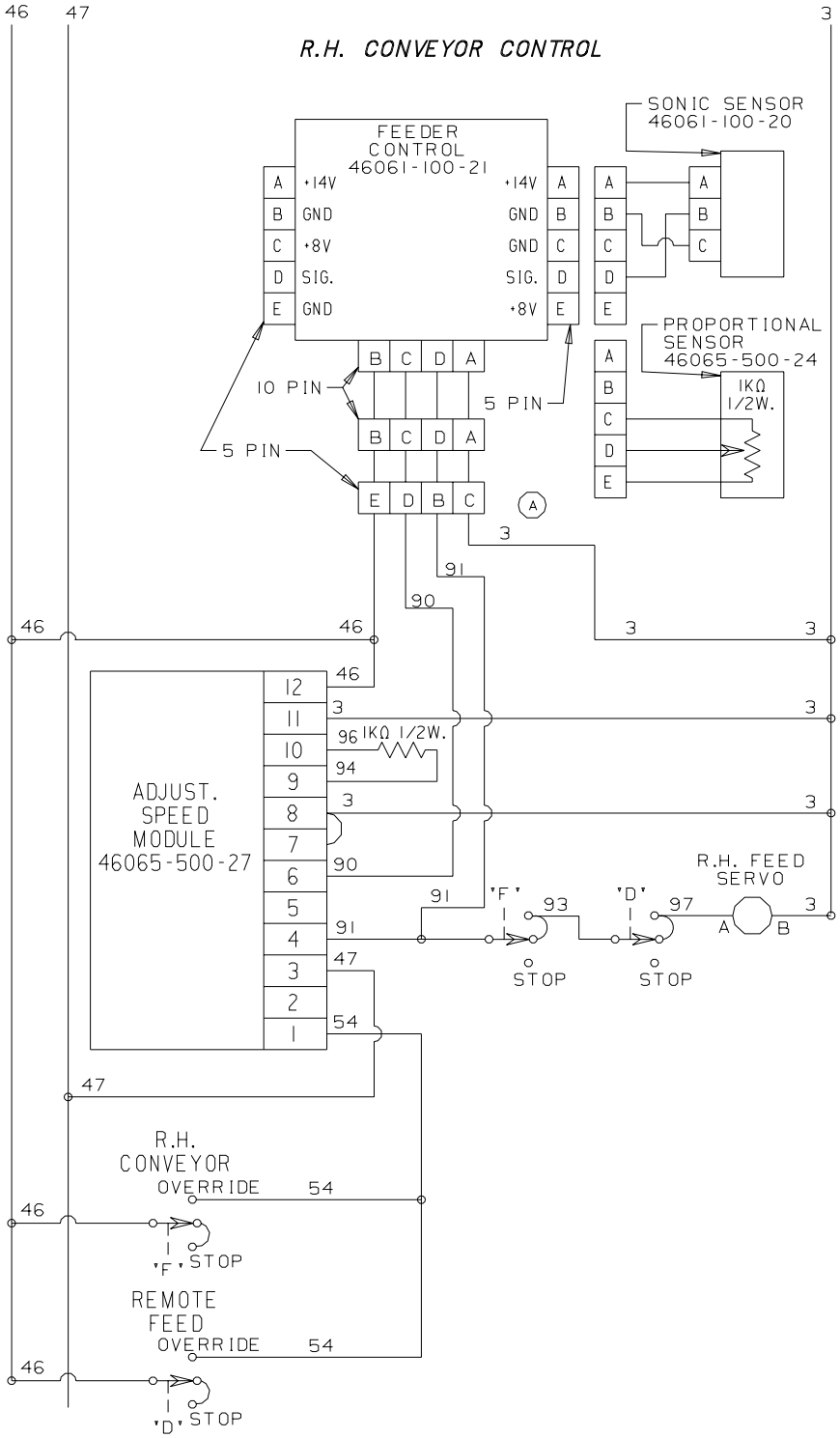

Figure 19

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2nd Generation Controls
Electrical Schematic

LH Feeder System

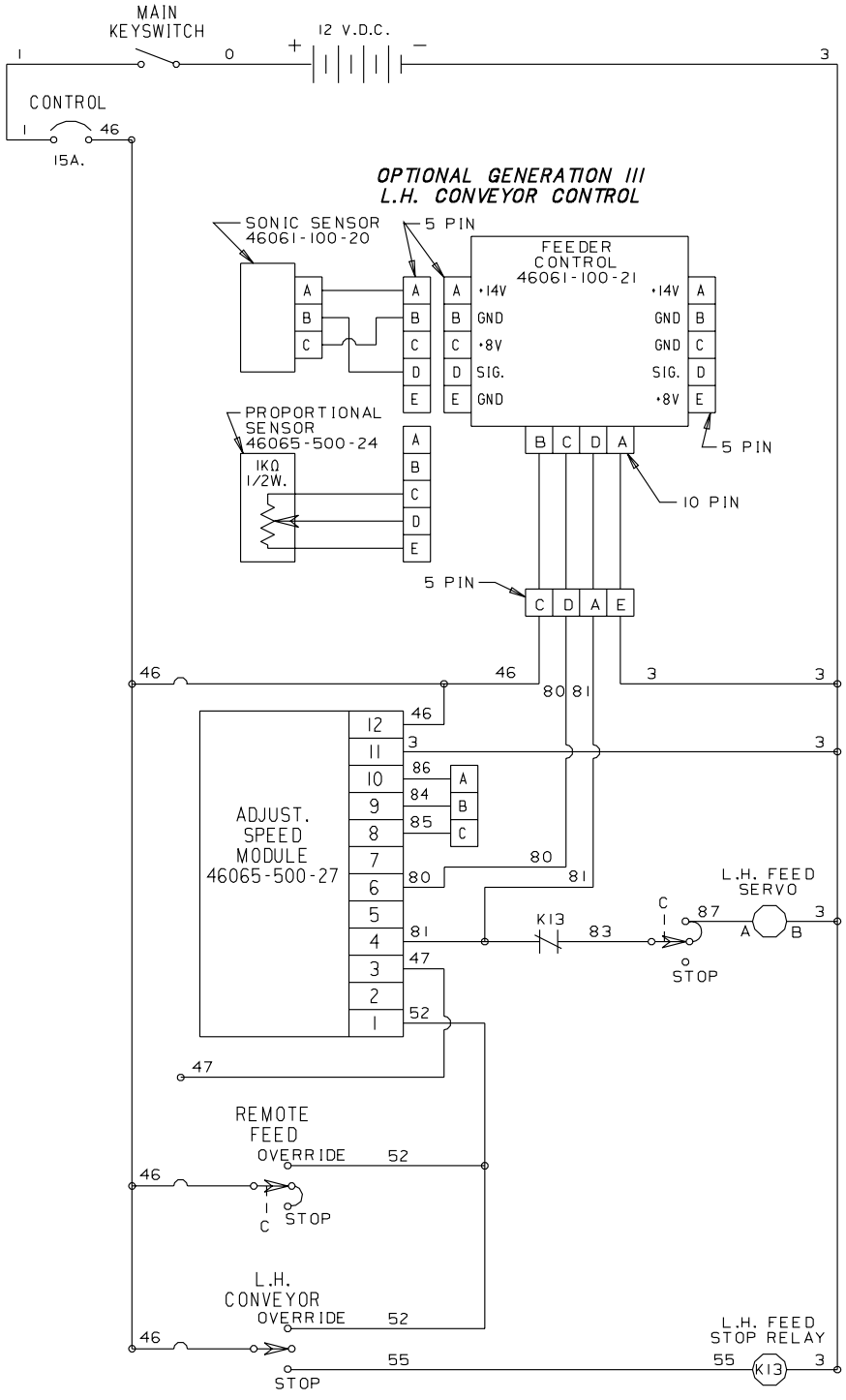

Figure 18a

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2nd Generation Controls
Electrical Schematic

RH Feeder System

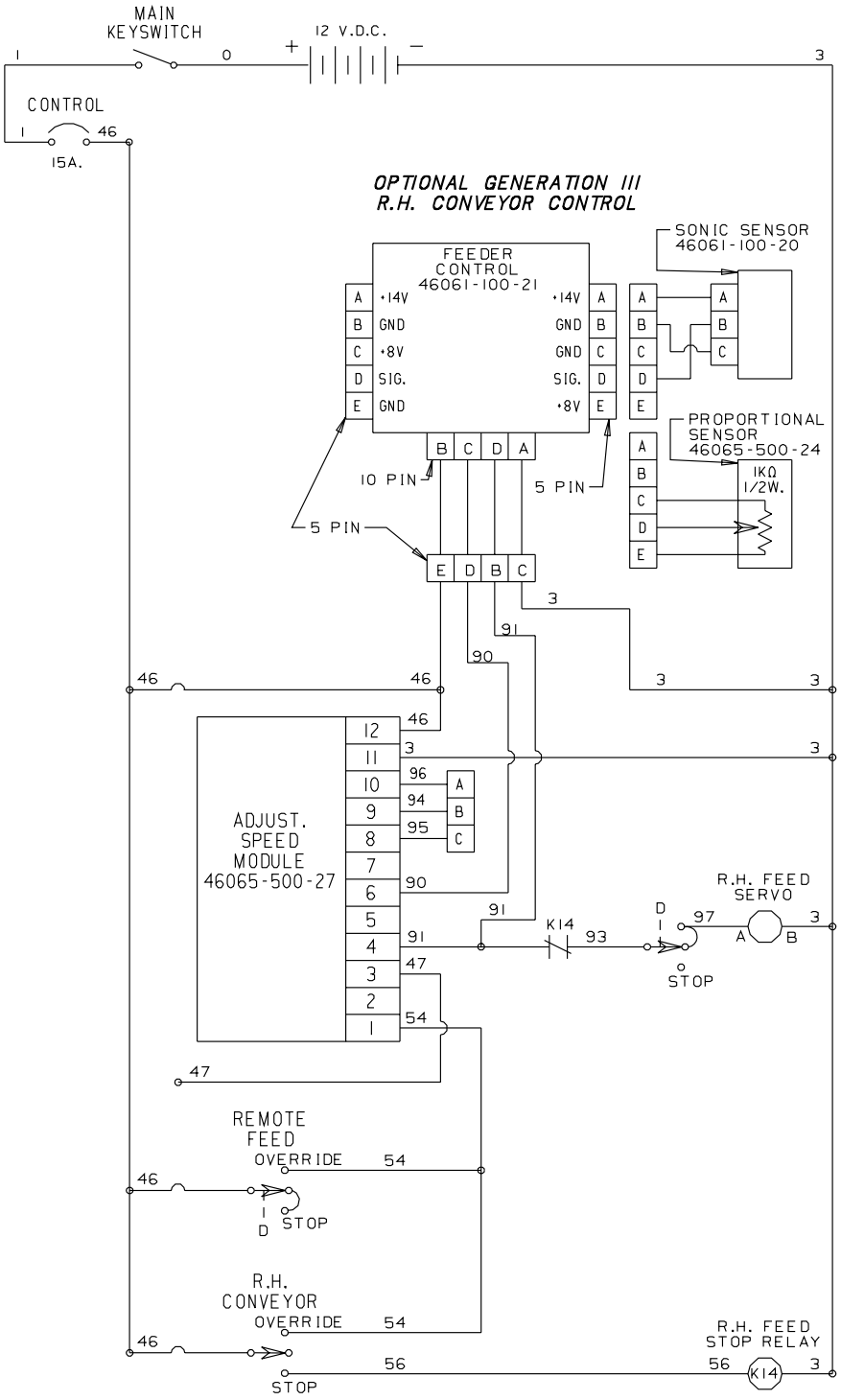

Figure 19a

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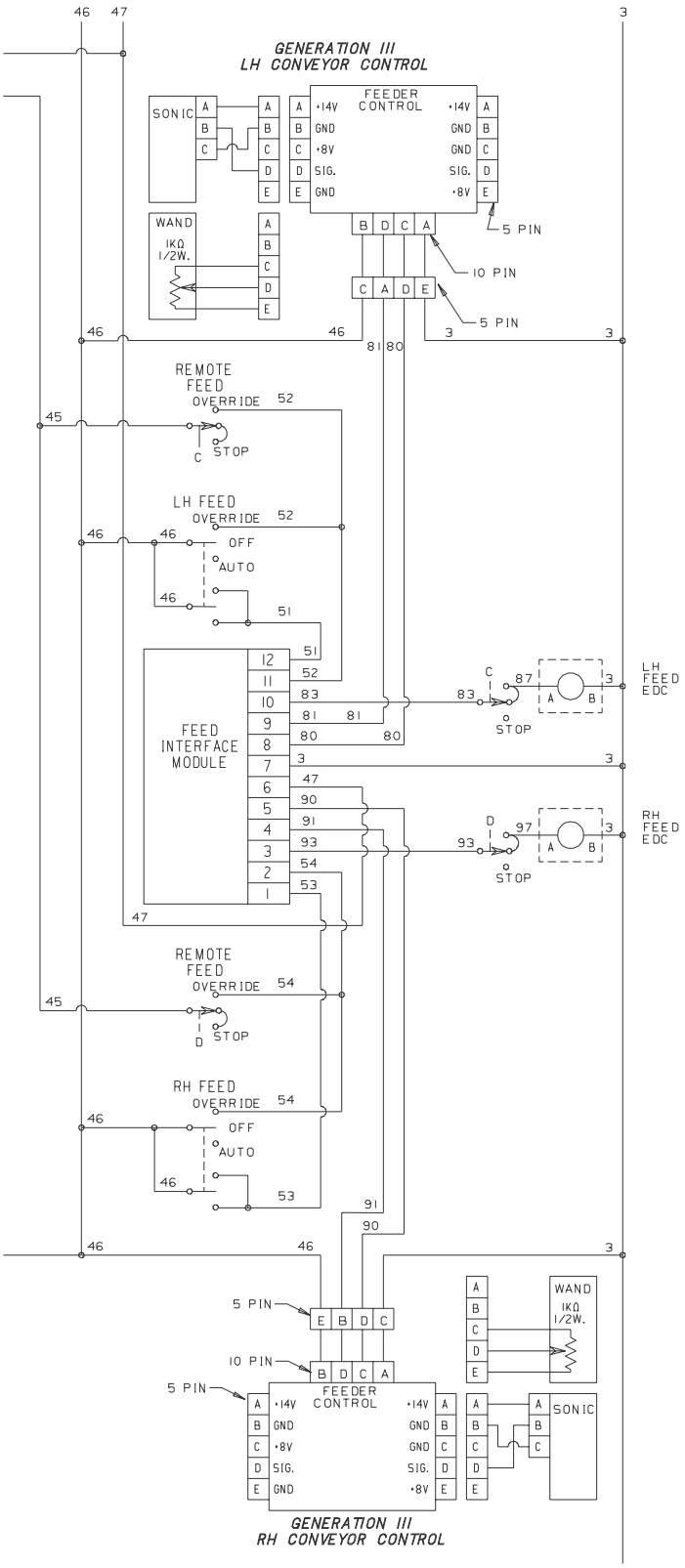
3rd Generation Controls
Grayhound Pavers 1999 & After



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3rd Generation Controls
Grayhound Pavers 1999 & After

GEN. III CONVEYOR CONTROL WITH SINGLE INTERFACE MODULE

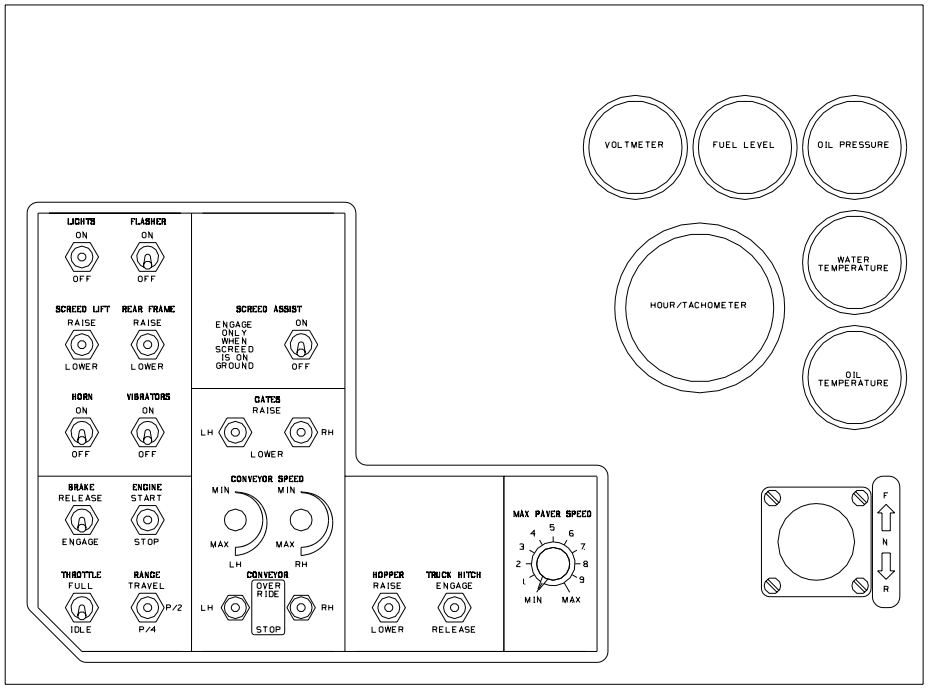
There are 5 relays used with this type control:
- One used for Automatic Mode
  - 1/2 of relay for LH
  - 1/2 of relay for RH
- One used for LH Run
- One used for RH Run
- One used for LH Override
- One used for RH Override

Use the following table to test controls.

Note: If NO 12 VDC voltage, check appropriate wiring and switches.

Conveyor Side	Wires	Voltage	Comment
Automatic Operation Mode			
LH	47...3 51...3 80...3 83...3 87...3	12VDC 12VDC 0-2VDC 0-2VDC 0-2VDC	Forward Direction Console in Auto Mode Voltage Readings for 0 to Full Speed
RH	47...3 53...3 90...3 93...3 97...3	12VDC 12VDC 0-2VDC 0-2VDC 0-2VDC	
Manual Operation Mode			
LH	51...3 81...3 83...3 87...3	12VDC 0-2VDC 0-2VDC 0-2VDC	Forward Direction Console in Manual Mode Voltage Readings for 0 to Full Speed
RH	53...3 91...3 93...3 97...3	12VDC 0-2VDC 0-2VDC 0-2VDC	
Override Mode			
LH	51...3 52...3 83...3 87...3	12VDC 12VDC 2VDC 2VDC	Forward Direction Switches in Override Voltage Readings for Full Speed Only
RH	53...3 54...3 93...3 97...3	12VDC 12VDC 2VDC 2VDC	

Operator Console



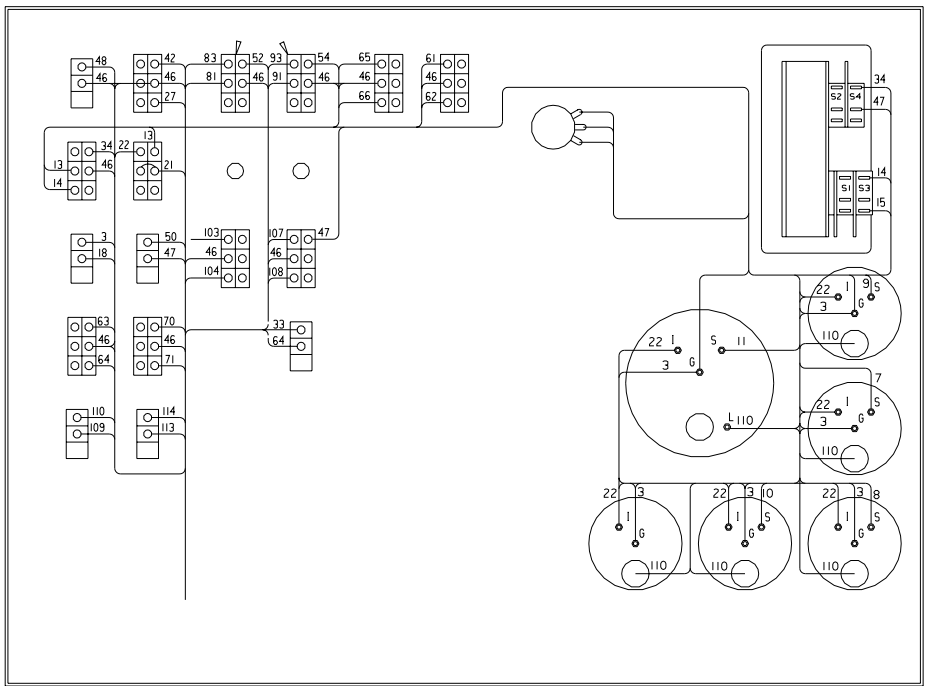


Figure 20

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Wiring Diagram

Main Junction

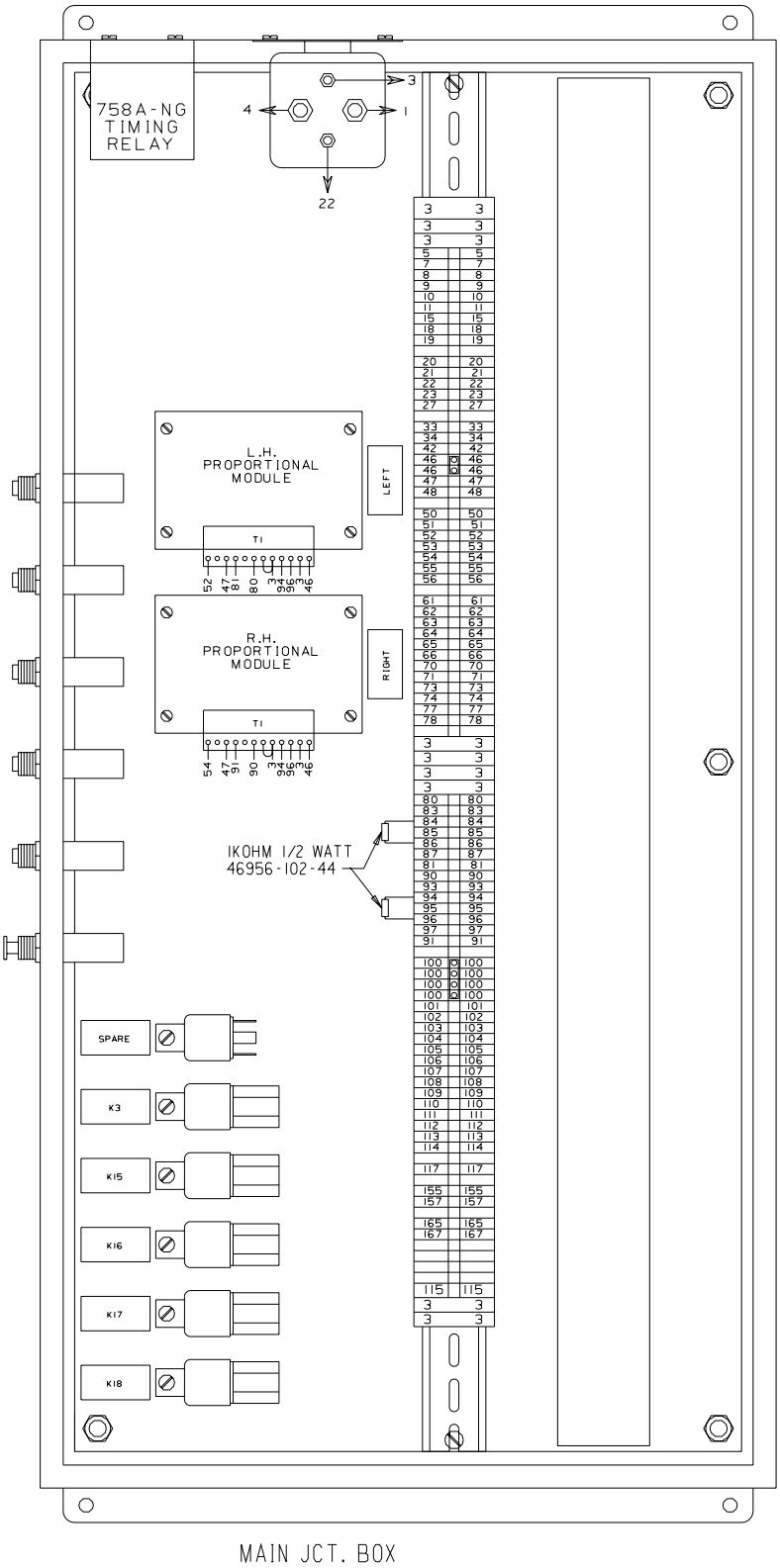

Figure 21

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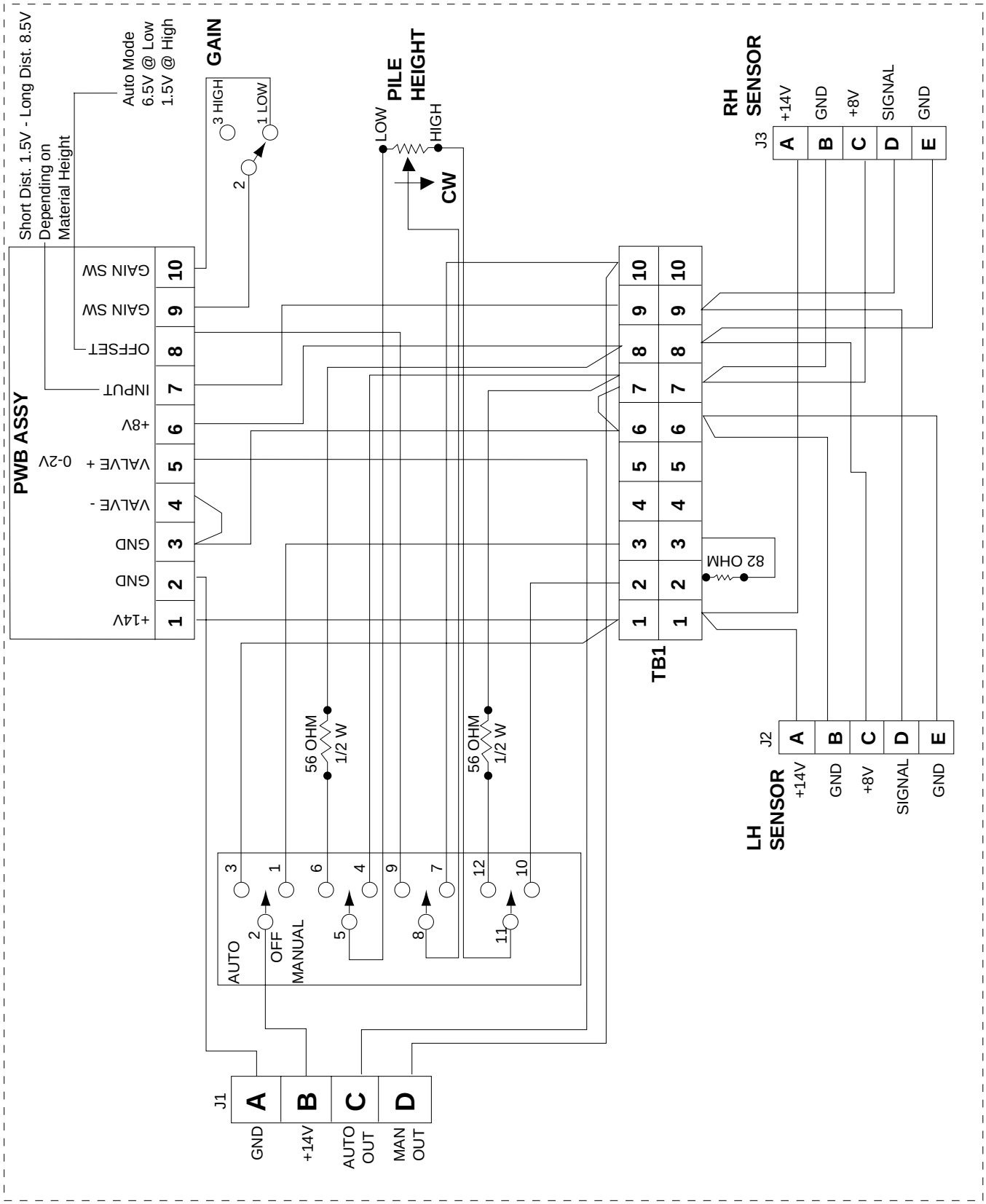
Wiring Diagram

Control Box



Theory of Operation

The Feed Conveyor System consists of a variable displacement hydrostatic pump that drives a hydrostatic motor. Output of the hydrostatic pump can be controlled by a variable electrical signal to the EDC (electrical displacement control) of the pump. A 0 to 2 volt dc signal changes the output speed from zero to maximum. The electrical signal to the EDC is affected by the following four (4) modes of operation:

Manual Override: Signal from the proportional speed module mounted in main electrical junction box triggered by a relay which is energized by the Override switch(es). Fixed output is adjustable via Max and/or Limit pots on conveyor circuit card (Figure 14).

Manual: Signal from the Feeder Control box at either end of the screed. Speed adjustable via Pile Height knob (maximum speed is non-adjustable).

Automatic : Signal from the Feeder Control box at either end of the screed. Speed variable via sensor signal which is limited by the pile height setting. This signal goes through the auto interlock relay contact on the conveyor circuit card in the main junction box on the tractor. This relay activates whenever the brakes are released and the control handle is pushed forward. Maximum output is adjustable via IMAX pot on feeder control board (Figure 15).

Stop: Either Override/Stop switch in Stop position disconnects power from the Conveyor pump servo coils.

Quick Troubleshooting Hints:

The system consists of two (2) identical subsystems, Left and Right. This allows substitution of working components from one side with suspected nonworking components on the other side. If the problem follows the component, replace the faulty component. If the problem remains on the original side, further testing must be performed.

These components are:

1) Sonic sensor (P/N 46061-100-20) affects automatic operation only.
2) Sonic sensor cable (P/N 46061-100-23) affects automatic operation only.
3) Proportional sensor (P/N 46065-500-24) affects automatic operation only.
4) Feeder control box (P/N 46061-100-27) affects manual and automatic operation only.
5) Feeder control board (P/N 46061-100-22) located inside feeder control box affects automatic operation only.
6) Proportional speed module (P/N 46065-500-27) mounted in tractor main junction box affects override and automatic operation only.
7) Override/Stop toggle switches at console and at screed remotes affect operation in override, manual, and automatic modes.

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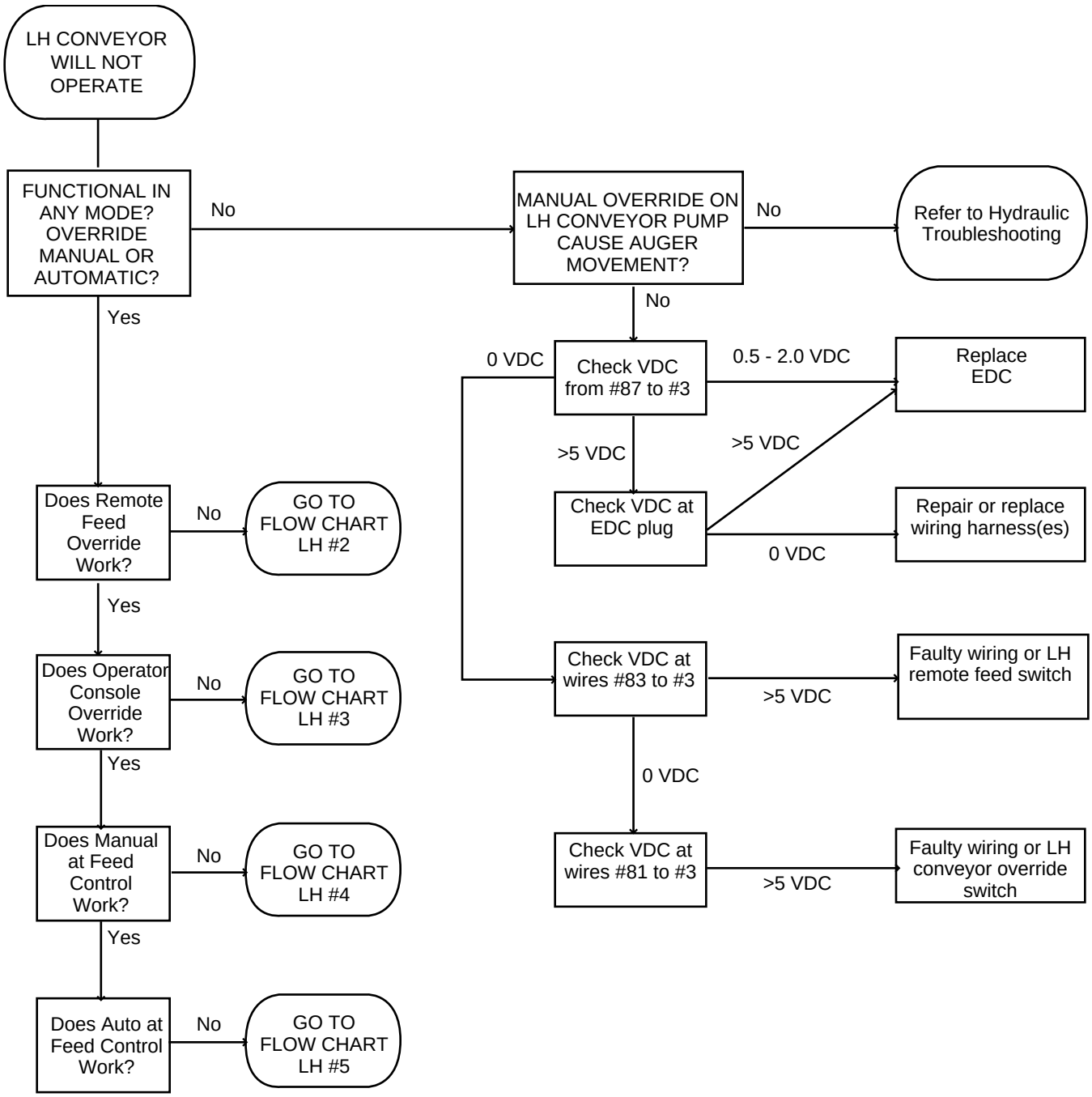
Left Conveyor Flow Charts

Flow Chart #1



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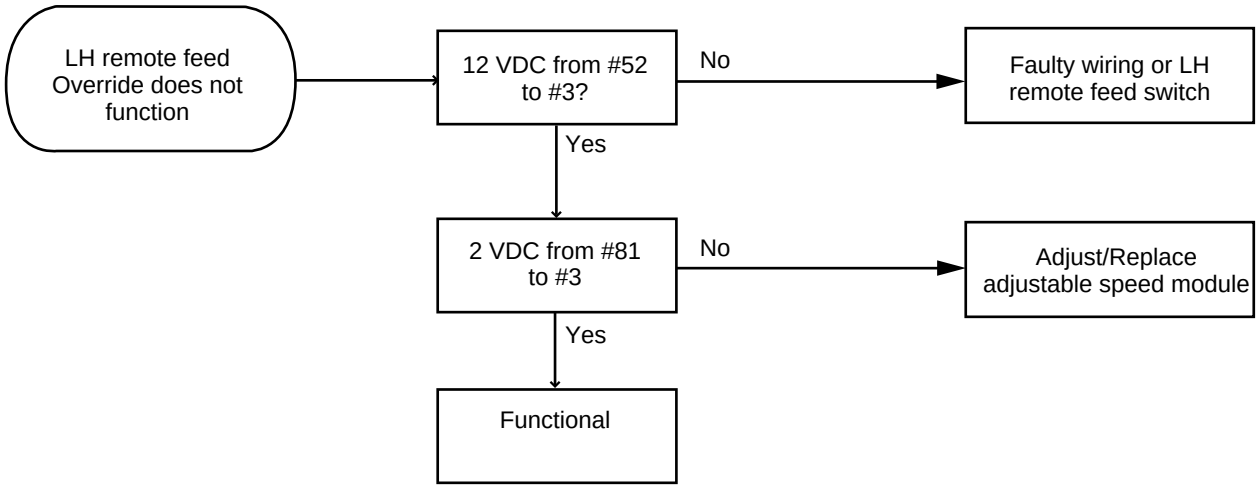
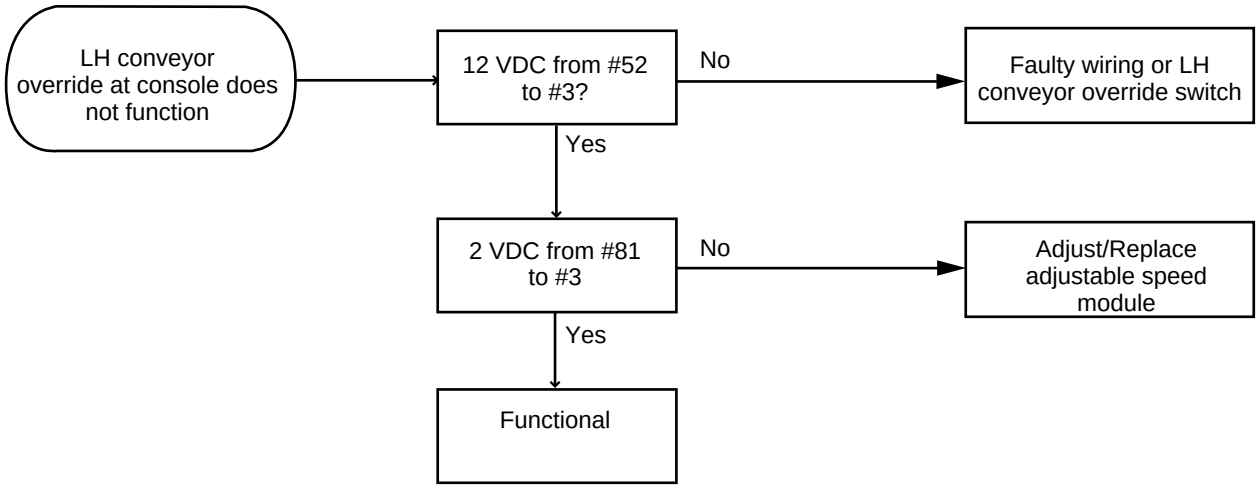
Left Conveyor Flow Charts

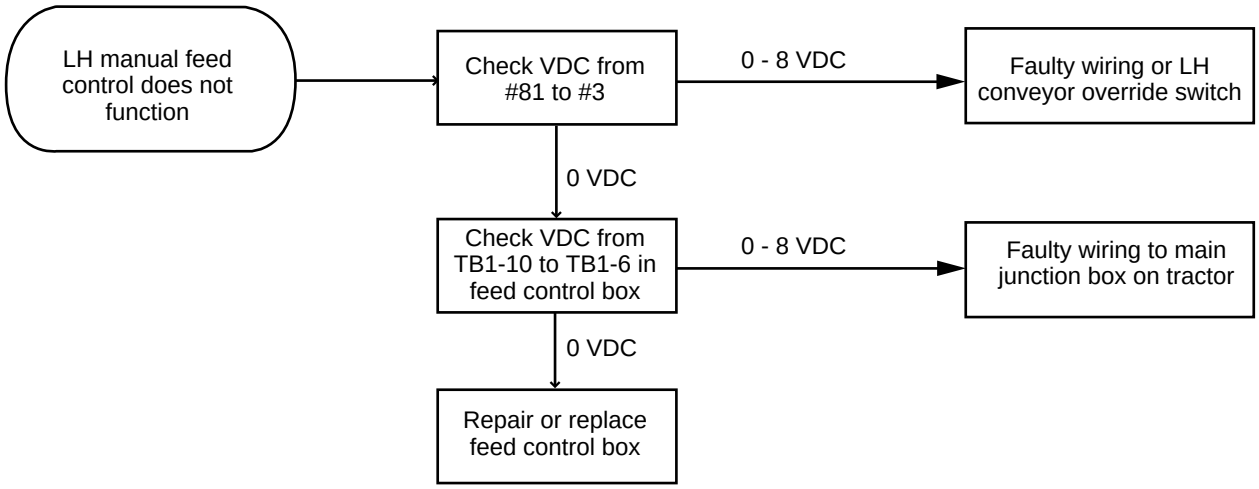
Flow Chart #2



Flow Chart #3



Flow Chart #4



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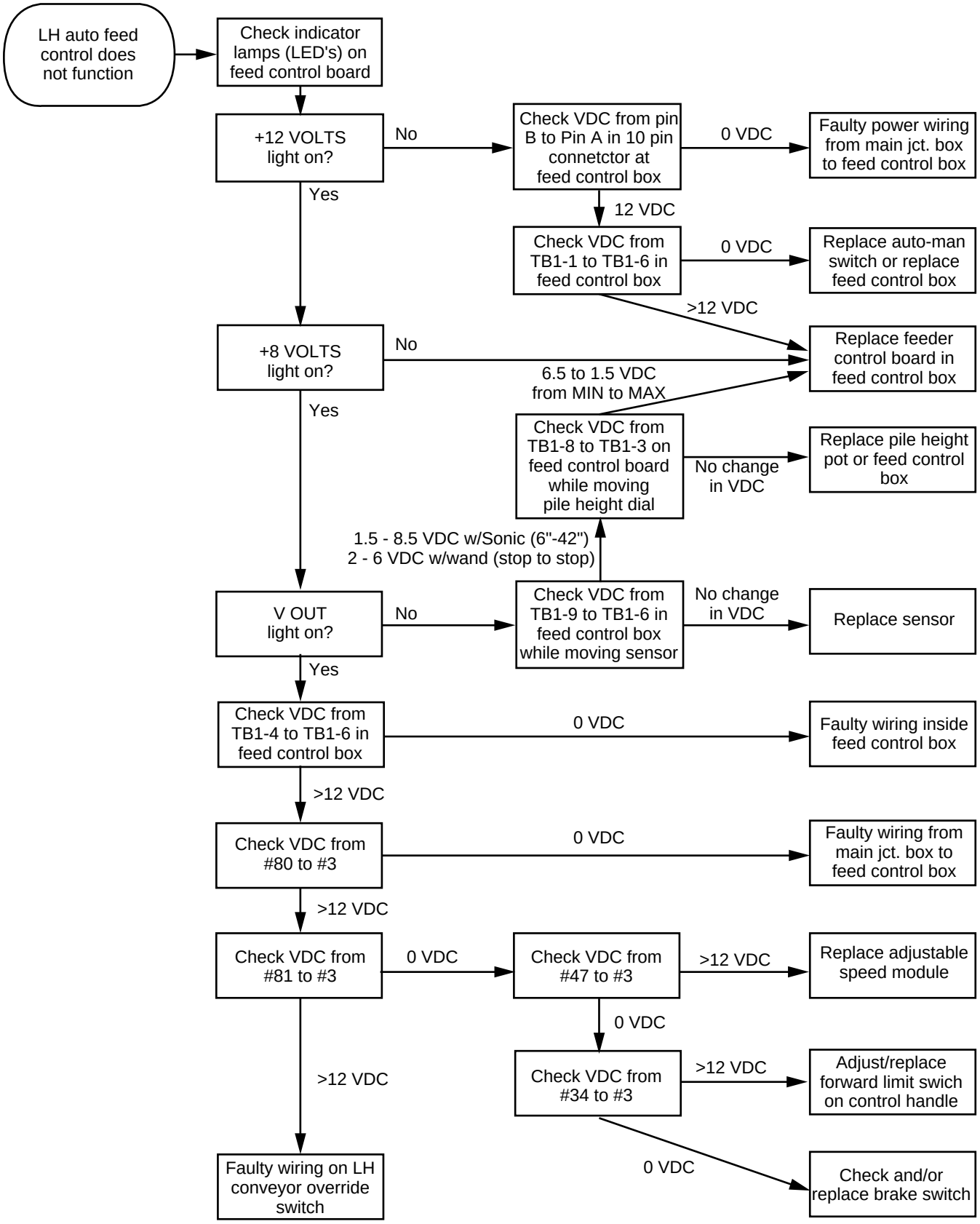
Left Conveyor Flow Charts

Flow Chart #5



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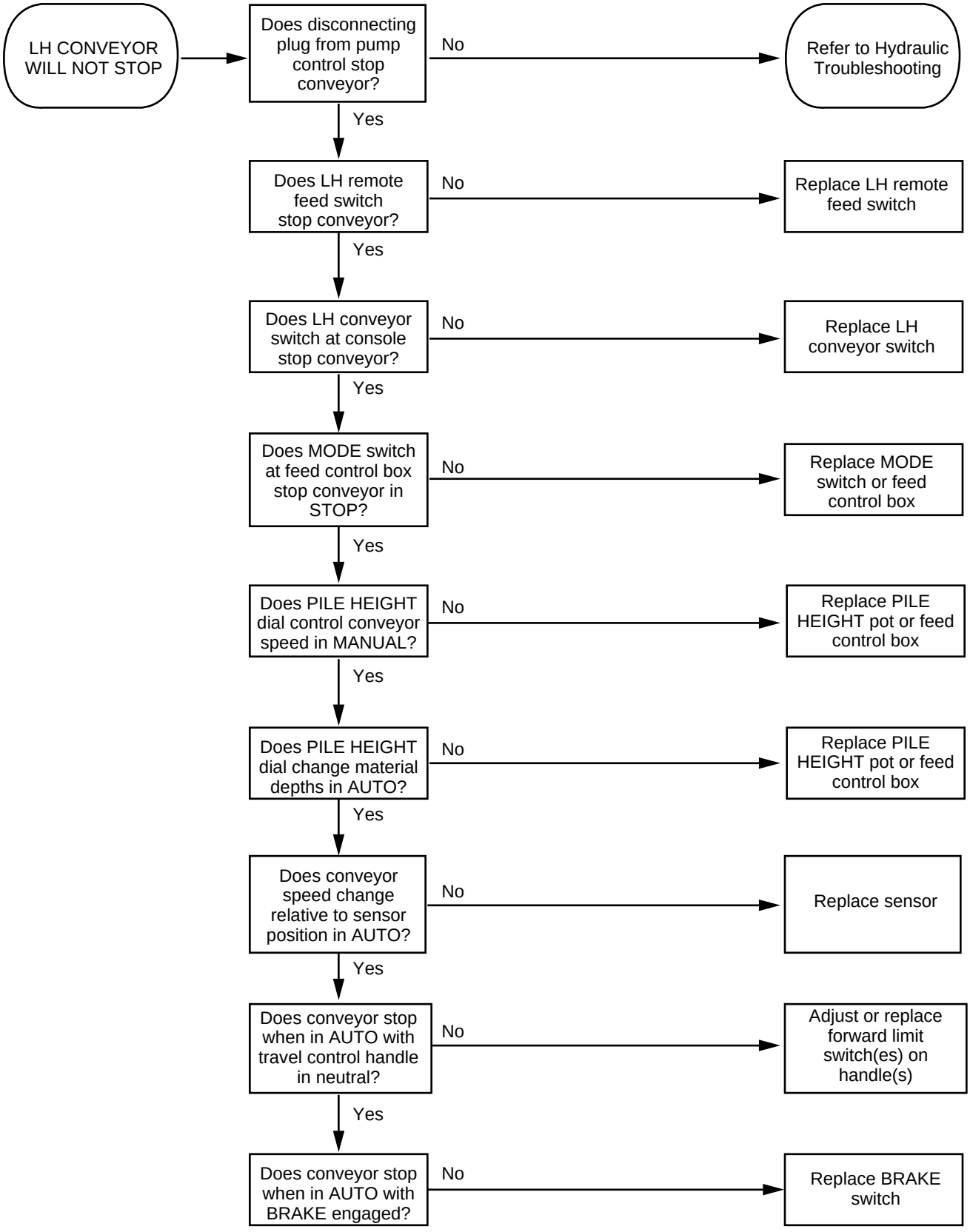
Left Conveyor Flow Charts

Flow Chart #6



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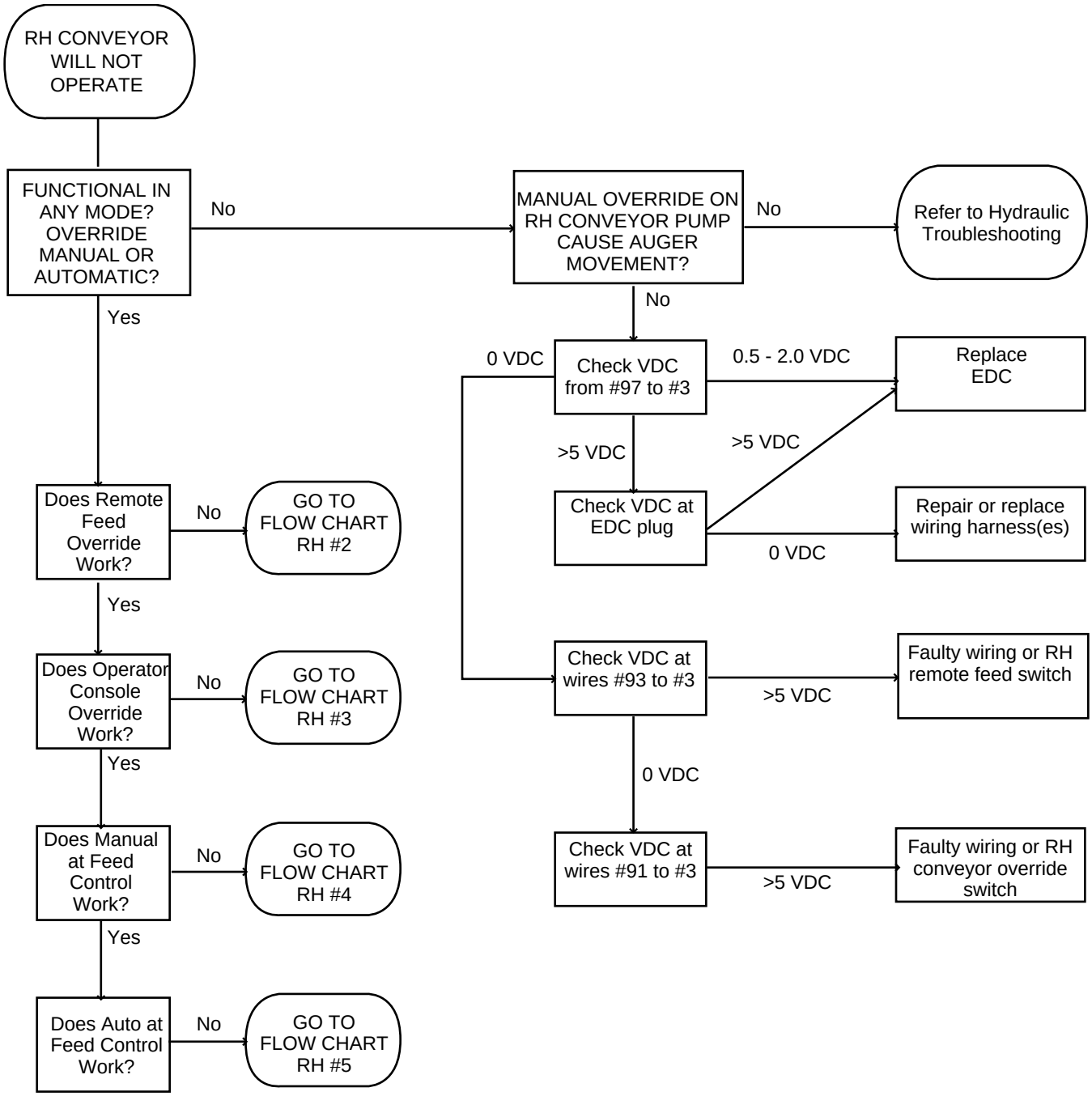
Right Conveyor Flow Charts

Flow Chart #1



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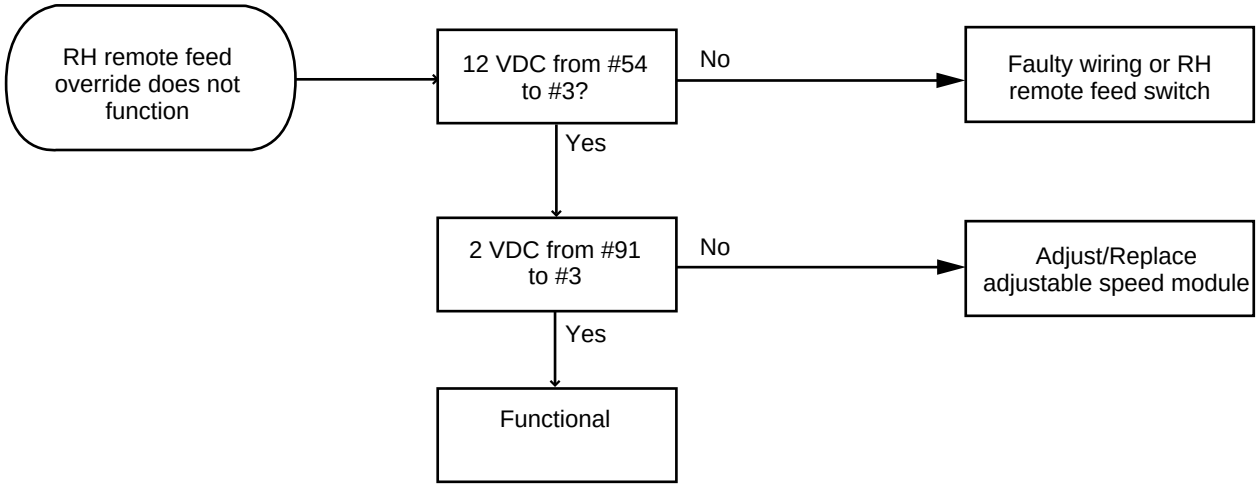
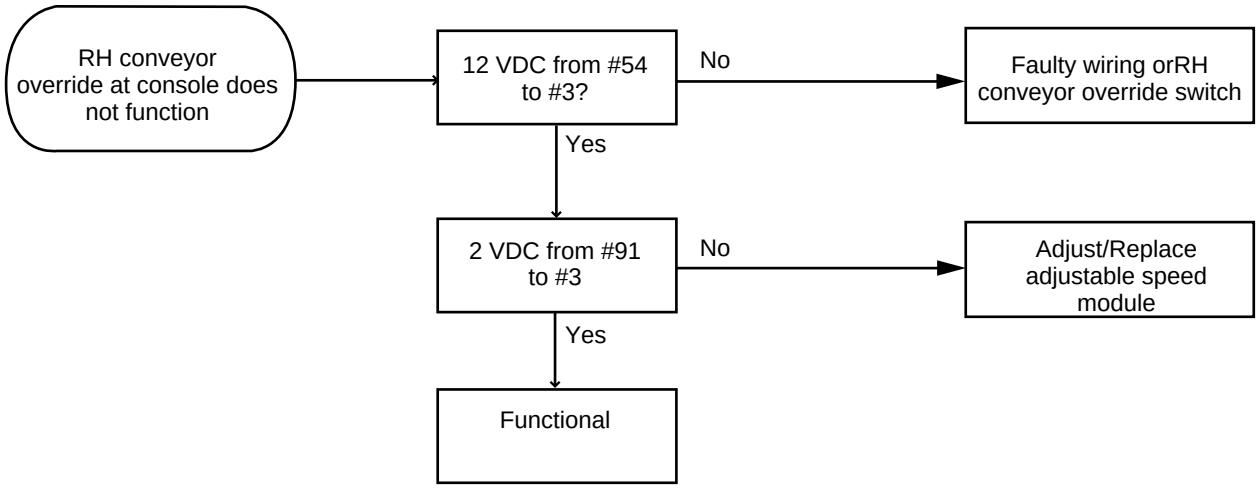
Right Conveyor Flow Charts

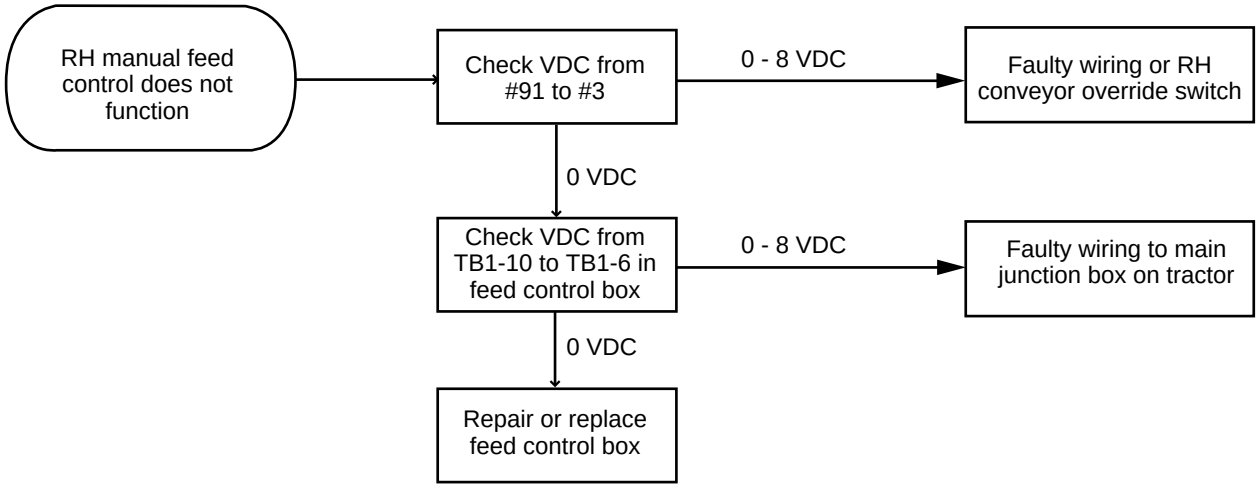
Flow Chart #2



Flow Chart #3



Flow Chart #4



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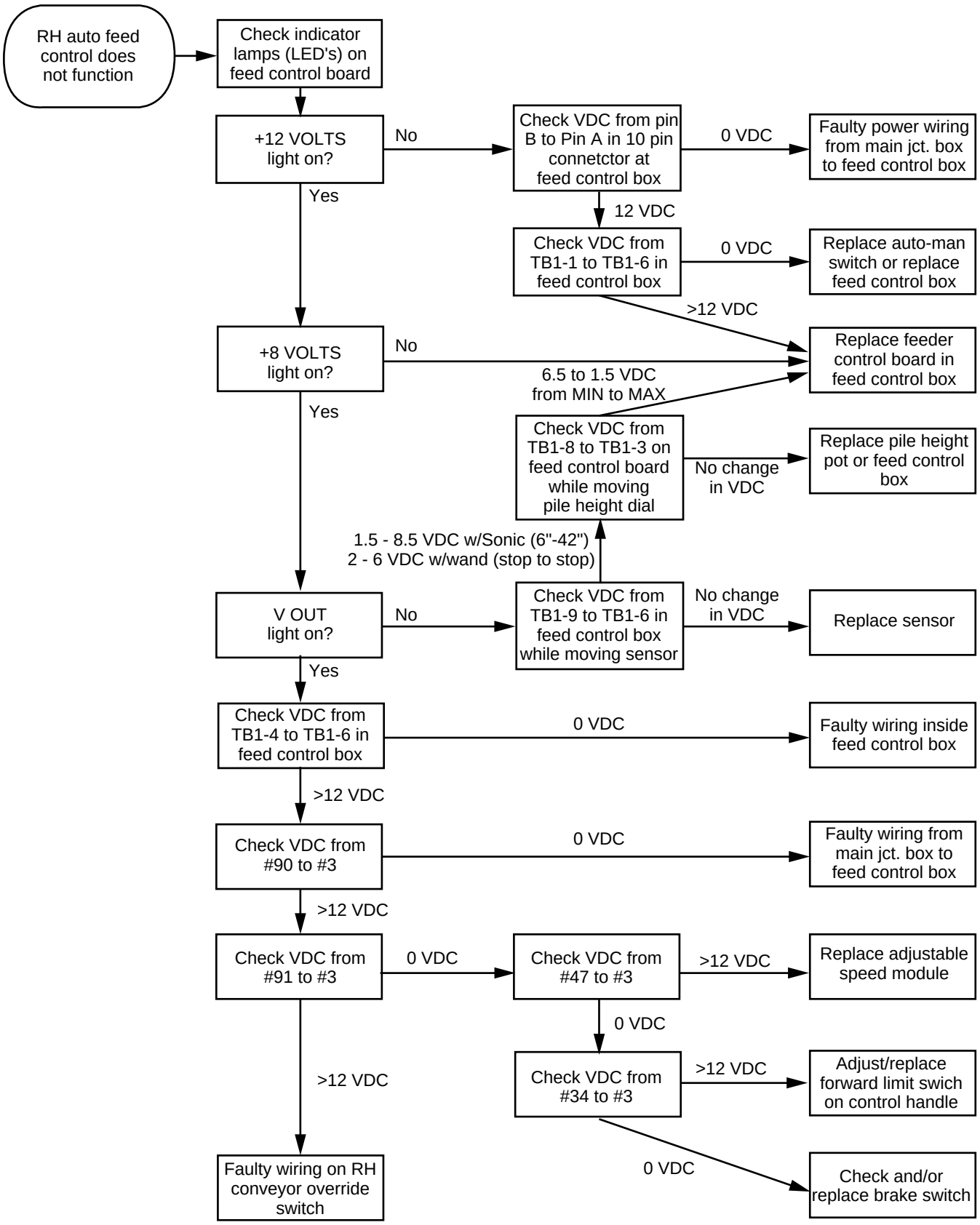
Right Conveyor Flow Charts

Flow Chart #5



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Right Conveyor Flow Charts

Flow Chart #6