Operation, Repair, Parts

LineLazer™ ES 1000 / ES 2000 Airless Line Striper

3A4603F
EN

For the application of line striping materials.
For professional use only.
Not approved for use in explosive atmospheres or hazardous locations.

Maximum Operating Pressure: 3300 psi (22.8 MPa, 228 bar)

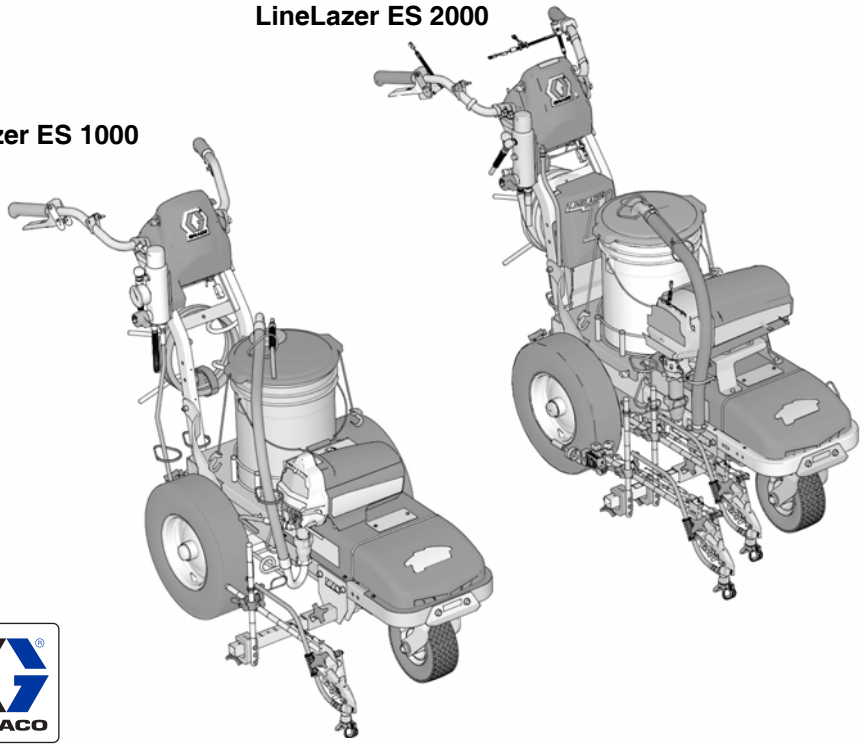
Important Safety Instructions

Read all warnings and instructions in this manual and in related manuals before using the equipment. Be familiar with the controls and the proper usage of the equipment. Save these instructions.

Related Manuals:			
ES 1000		**ES 2000**	
311254	Gun	311254	Gun
334599	Pump	310643	Pump
		3A3428	Auto-Layout Application Methods

LineLazer ES 2000

LineLazer ES 1000



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?? www.graco.com/techsupport ??
GRACO

Use only genuine Graco replacement parts.
The use of non-Graco replacement parts may void warranty.

Contents

Models

LineLazer ES 1000		
Model	1 Battery Included	2 Batteries Included
25M226	✔ 120V	
25N784		✔ 120V
25M228 CE	✔ 230V	
25N785 CE		✔ 230V

LineLazer ES 2000									
Model	2 Batteries Included	Standard Series	HP Auto Series	Number of Manual Guns	Number of Auto Guns	120V	230V	LazerGuide 1700	LazerGuide 2000
25N550	✔	✔		2	0	✔			
25N551	✔		✔	1	1	✔		✔	
25N552	✔		✔	0	2	✔		✔	
25N559	✔		✔	1	1	✔		✔	✔
25N560	✔		✔	0	2	✔		✔	✔
25N553 CE	✔	✔		1	0		✔		
25N554 CE	✔		✔	0	1		✔		
25N561 CE	✔	✔		2	0		✔		
25N562 CE	✔		✔	0	2		✔		
25N657 CE	✔		✔	1	1		✔		

Warnings

The following warnings are for the setup, use, grounding, maintenance, and repair of this equipment. The exclamation point symbol alerts you to a general warning and the hazard symbols refer to procedure-specific risks. When these symbols appear in the body of this manual or on warning labels, refer back to these Warnings. Product-specific hazard symbols and warnings not covered in this section may appear throughout the body of this manual where applicable.

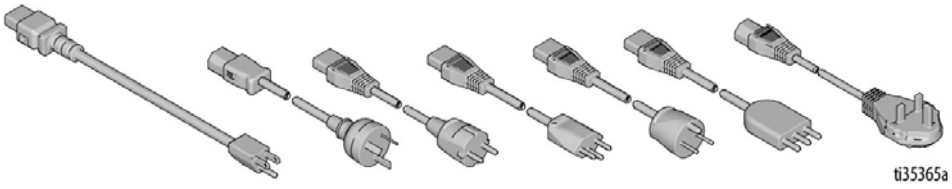
⚠WARNING

GROUNDING

This product must be grounded. In the event of an electrical short circuit, grounding reduces the risk of electric shock by providing an escape wire for the electric current. This product is equipped with a cord having a grounding wire with an appropriate grounding plug. The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.

- Improper installation of the grounding plug is able to result in a risk of electric shock.
- When repair or replacement of the cord or plug is required, do not connect the grounding wire to either flat blade terminal.
- The wire with insulation having an outer surface that is green with or without yellow stripes is the grounding wire.
- Check with a qualified electrician or serviceman when the grounding instructions are not completely understood, or when in doubt as to whether the product is properly grounded.
- Do not modify the plug provided; if it does not fit the outlet, have the proper outlet installed by a qualified electrician.
- This product is for use on a nominal 120V or 230V circuit and has a grounding plug similar to the plugs illustrated in the figure below.

120V US 230V



- Only connect the product to an outlet having the same configuration as the plug.
- Do not use an adapter with this product.

Extension Cords:

- Use only a 3-wire extension cord that has a grounding plug and a grounding receptacle that accepts the plug on the product.
- Make sure your extension cord is not damaged. If an extension cord is necessary use 12 AWG (2.5mm^2) minimum to carry the current that the product draws.
- An undersized cord results in a drop in line voltage and loss of power and overheating.

WARNING

FIRE AND EXPLOSION HAZARD

Flammable fumes, such as solvent and paint fumes, in work area can ignite or explode. To help prevent fire and explosion:

- Do not spray flammable or combustible materials near an open flame or sources of ignition such as cigarettes, motors, and electrical equipment.
- Paint or solvent flowing through the equipment is able to result in static electricity. Static electricity creates a risk of fire or explosion in the presence of paint or solvent fumes. All parts of the spray system, including the pump, hose assembly, spray gun, and objects in and around the spray area shall be properly grounded to protect against static discharge and sparks. Use Graco conductive or grounded high-pressure airless paint sprayer hoses.
- Verify that all containers and collection systems are grounded to prevent static discharge. Do not use pail liners unless they are antistatic or conductive.
- Connect to a grounded outlet and use grounded extensions cords. Do not use a 3-to-2 adapter.
- Do not spray flammable or combustible liquids in a confined area.
- Sprayer generates sparks. Keep spray area well-ventilated. Keep a good supply of fresh air moving through the area.
- Keep pump assembly in a well ventilated area when spraying, flushing, cleaning, or servicing. Do not spray pump assembly.
- Do not smoke in the spray area or spray where sparks or flame is present.
- Do not operate light switches, engines, or similar spark producing products in the spray area.
- Keep area clean and free of paint or solvent containers, rags, and other flammable materials.
- Know the contents of the paints and solvents being sprayed. Read all Safety Data Sheets (SDSs) and container labels provided with the paints and solvents. Follow the paint and solvents manufacturer's safety instructions.
- Keep a working fire extinguisher in the work area.

SKIN INJECTION HAZARD

High-pressure spray is able to inject toxins into the body and cause serious bodily injury. In the event that injection occurs, **get immediate surgical treatment.**

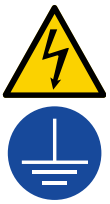
- Do not aim the gun at, or spray any person or animal.
- Keep hands and other body parts away from the discharge. For example, do not try to stop leaks with any part of the body.
- Always use the nozzle tip guard. Do not spray without nozzle tip guard in place.
- Use Graco nozzle tips.
- Use caution when cleaning and changing nozzle tips. In the case where the nozzle tip clogs while spraying, follow the **Pressure Relief Procedure** for turning off the unit and relieving the pressure before removing the nozzle tip to clean.
- Equipment maintains pressure after power is shut off. Do not leave the equipment energized or under pressure while unattended. Follow the **Pressure Relief Procedure** when the equipment is unattended or not in use, and before servicing, cleaning, or removing parts.
- Check hoses and parts for signs of damage. Replace any damaged hoses or parts.
- This system is capable of producing 3300 psi (22.8 MPa, 228 bar). Use Graco replacement parts or accessories that are rated a minimum of 3300 psi (22.8 MPa, 228 bar).
- Always engage the trigger lock when not spraying. Verify the trigger lock is functioning properly.
- Verify that all connections are secure before operating the unit.
- Know how to stop the unit and bleed pressure quickly. Be thoroughly familiar with the controls.

WARNING

EQUIPMENT MISUSE HAZARD

Misuse can cause death or serious injury.

- Do not operate the unit when fatigued or under the influence of drugs or alcohol.
- Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See **Technical Data** in all equipment manuals.
- Use fluids and solvents that are compatible with equipment wetted parts. See Technical Data in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request Safety Data Sheet (SDS) from distributor or retailer.
- Do not leave the work area while equipment is energized or under pressure.
- Turn off all equipment and follow the **Pressure Relief Procedure** when equipment is not in use.
- Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only.
- Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards.
- Make sure all equipment is rated and approved for the environment in which you are using it.
- Use equipment only for its intended purpose. Call your distributor for information.
- Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces.
- Do not kink or over bend hoses or use hoses to pull equipment.
- Keep children and animals away from work area.
- Comply with all applicable safety regulations.



ELECTRIC SHOCK HAZARD

This equipment must be grounded. Improper grounding, setup, or usage of the system can cause electric shock.

- Turn off, disconnect power cord, and disconnect battery before servicing equipment.
- Connect only to grounded electrical outlets.
- Use only 3-wire extension cords.
- Ensure ground prongs are intact on power and extension cords.
- Do not expose to rain. Store indoors.
- Wait five minutes after disconnecting power cord before servicing.

MOVING PARTS HAZARD

Moving parts can pinch, cut or amputate fingers and other body parts.

- Keep clear of moving parts.
- Do not operate equipment with protective guards or covers removed.
- Equipment can start without warning. Before checking, moving, or servicing equipment, follow the **Pressure Relief Procedure** and disconnect all power sources.

TOXIC FLUID OR FUMES HAZARD

Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled, or swallowed.

- Read Safety Data Sheet (SDS) to know the specific hazards of the fluids you are using.
- Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.

BURN HAZARD

Equipment surfaces and fluid that's heated can become very hot during operation. To avoid severe burns:

- Do not touch hot fluid or equipment.

WARNING

PERSONAL PROTECTIVE EQUIPMENT

Wear appropriate protective equipment when in the work area to help prevent serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. This protective equipment includes but is not limited to:

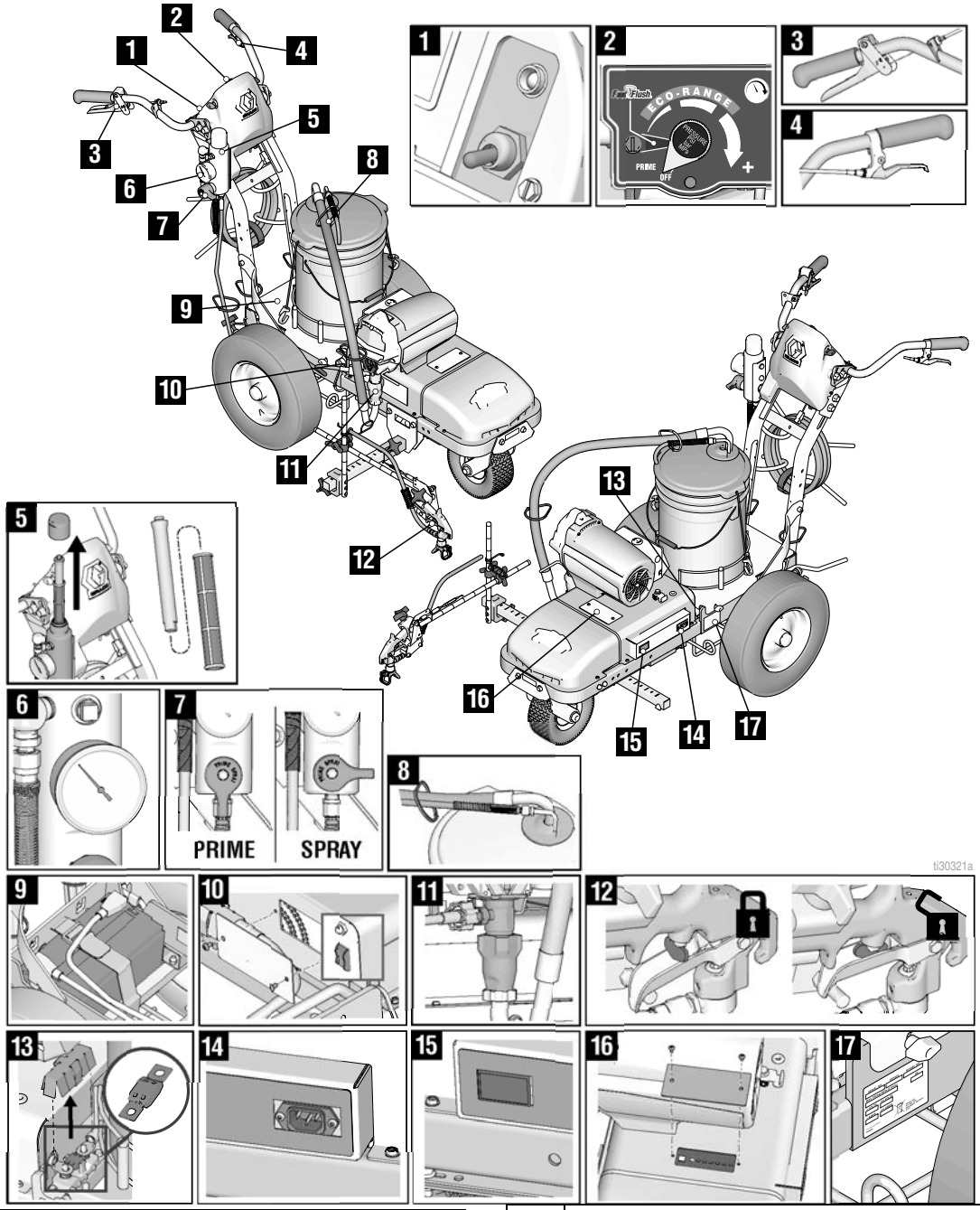
- Protective eyewear, and hearing protection.
- Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.

BATTERY HAZARD

Lead-acid batteries produce explosive gases and contain sulfuric acid that can cause severe burns. To avoid sparks and injury when handling or working with a lead-acid battery:

- Only use the battery type specified for use with the equipment. See **Technical Data**.
- Read and follow the battery manufacturer's warnings.
- Exercise caution when working with metallic tools or conductors to prevent short circuits and sparks.
- Keep all sparks, flames, and cigarettes away from batteries.
- Always wear protective eyewear and protective equipment for face, hands, and body.
- If you have direct contact with battery fluid, flush with water and consult a physician immediately.
- Installation and maintenance must be performed by knowledgeable personnel only.

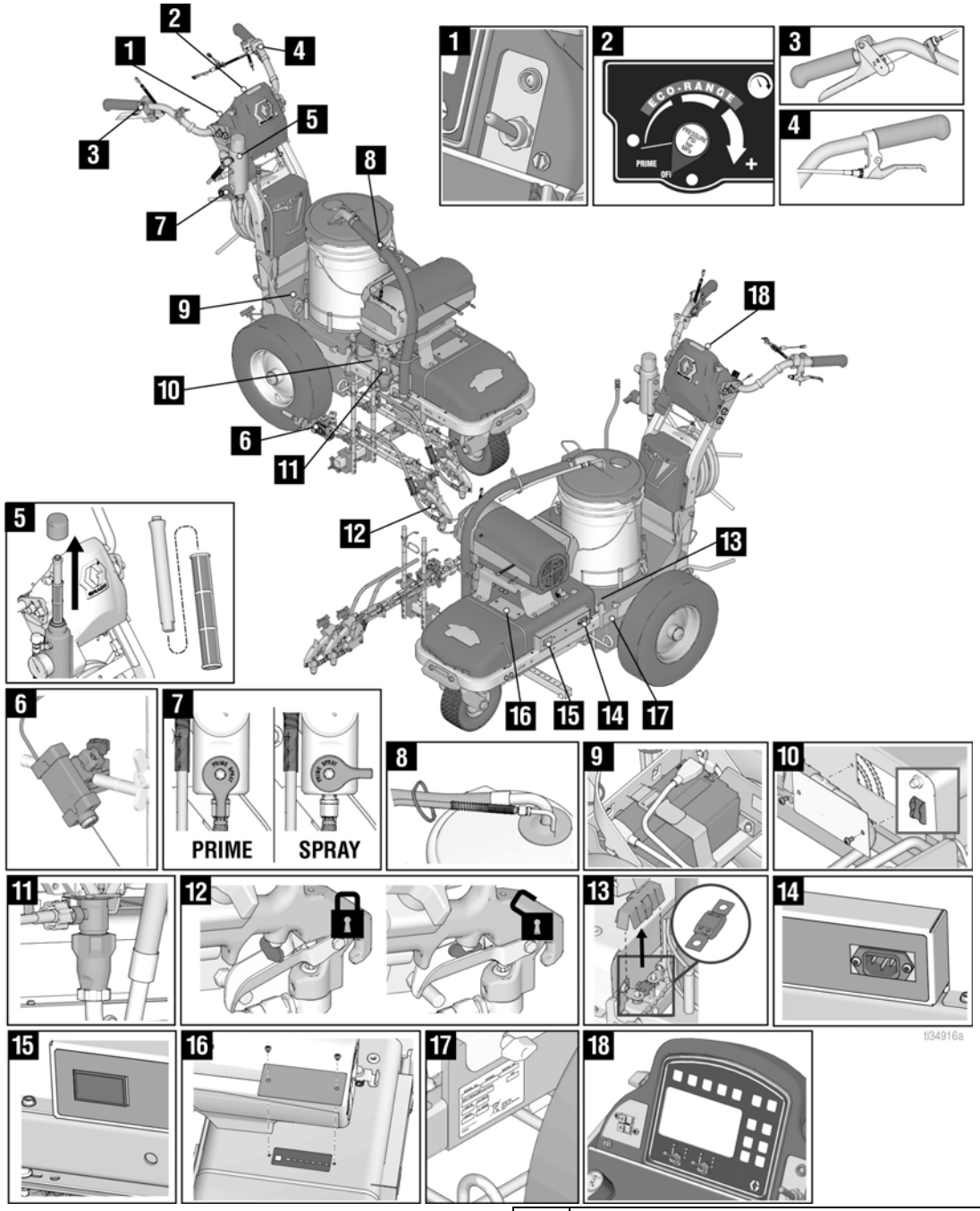
Component Identification (ES 1000)



1	ON/OFF Switch
2	Pressure Control & Display
3	Spray Gun Trigger
4	Turn Control
5	Filter
6	Pressure Gauge
7	Prime/Pressure Valves
8	Drain and Siphon Hoses
9	Battery Compartment

10	Inverter Circuit Breakers
11	Pump
12	Trigger Safety
13	Fuse
14	Charging Port
15	Voltage Meter
16	LED Status Center & Battery Type Selector Access
17	Serial ID

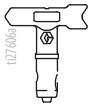
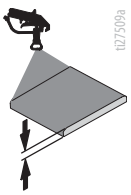
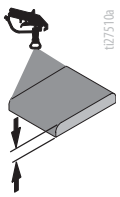
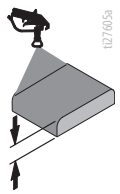
Component Identification (ES 2000)



1	ON/OFF Switch
2	Pressure Control & Display
3	Spray Gun Trigger
4	Turn Control
5	Filter
6	Laser
7	Prime/Pressure Valves
8	Drain and Siphon Hoses
9	Battery Compartment

10	Inverter Circuit Breakers
11	Pump
12	Trigger Safety
13	Fuse
14	Charging Port
15	Voltage Meter
16	LED Status Center & Battery Type Selector Access
17	Serial ID
18	Display

Tip Selection

	 in. (cm)	 in. (cm)	 in. (cm)	 in. (cm)			
LL5213*	2 (5)				✔		
LL5215*	2 (5)					✔	
LL5217		4 (10)				✔	
LL5219		4 (10)					✔
LL5315		4 (10)			✔		
LL5317		4 (10)			✔		
LL5319		4 (10)				✔	
LL5321		4 (10)				✔	
LL5323		4 (10)				✔	
LL5325		4 (10)					✔
LL5327		4 (10)					✔
LL5329		4 (10)					✔
LL5331		4 (10)					✔
LL5333		4 (10)					✔
LL5335		4 (10)					✔
LL5355		4 (10)					✔
LL5417			6 (15)		✔		
LL5419			6 (15)		✔		
LL5421			6 (15)		✔		
LL5423			6 (15)			✔	
LL5425			6 (15)			✔	
LL5427			6 (15)			✔	
LL5429			6 (15)			✔	
LL5431			6 (15)				✔
LL5435			6 (15)				✔
LL5621				12 (30)	✔		
LL5623				12 (30)	✔		
LL5625				12 (30)	✔		
LL5627				12 (30)	✔		
LL5629				12 (30)	✔		
LL5631				12 (30)		✔	
LL5635				12 (30)		✔	
LL5639				12 (30)			✔

*Use 100 mesh filter to reduce tip clogs.

Battery and Charger

NOTICE

If the battery level is below 9.7V, the on-board charger will not be allowed to charge the battery. Charge battery with an external charger to raise the level above 10.0V to activate the on-board charger, or replace the battery.

NOTICE

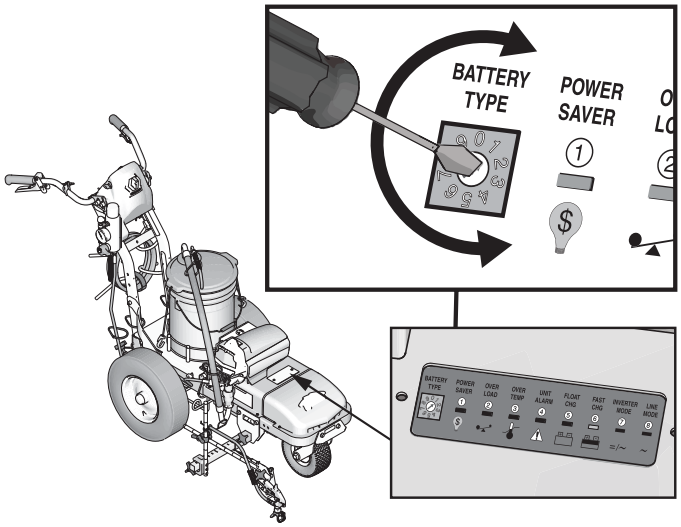
Do not expose sprayer to rain or washdown. Exposure could cause damage to electrical components. Store and transport covered or indoors.

- **Battery Protection Features:** Unit is designed to protect the battery by shutting down at 10.5V and not allowing charging to occur above 15.5V.
- **Self Discharge:** Lead acid batteries can self-discharge in as little as 3 months depending on storage temperatures. The hotter the storage temperature, the faster the self-discharge occurs. To prevent damage to the battery, it is important to keep the battery in a charged state.
- **Battery Life:** Battery recharge cycles depend on the depth of discharge per cycle. A battery that is discharged to 50% depth will get over twice as many cycles in its life compared to it being discharged to 100% depth each cycle.

Battery Type and Charging Profiles

Graco recommends using a 12V 100 Ahr Absorbent Glass Mat (AGM) **DEEP CYCLE** battery.The charger is set for this charging profile from the factory. If a different battery is used, the charging profile can be set at the LED Status Center. The initial charge rate is 30 amps.

Only use batteries that allow an initial charge rate of 30 amps or higher.
Use a small flat head screw driver to turn the arrow to point at the number that correlates with the chosen battery.



BATTERY TYPE SELECTOR SETTINGS

Switch Position	Description	Boost/Vdc	Float/Vdc
0	Charger Off		
1	Gel USA	14.0	13.7
2	AGM 1	14.1	13.4
3	AGM 2 (Graco Supplied)	14.6	13.7
4	Sealed Lead Acid	14.4	13.6
5	Gel Euro	14.4	13.8
6	Open Lead Acid	14.8	13.3
7	LiFePO4	14.4	14.4
8	De-sulphation	15.5 (4 hours then Off)	
9	Not used		

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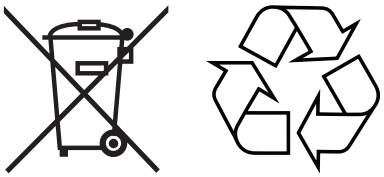
Battery Disposal

Do not place batteries in the trash. Recycle batteries according to local regulations.



Charging the Battery

Replace and charge battery only in well-ventilated area and away from flammable or combustible materials, including paints and solvents.

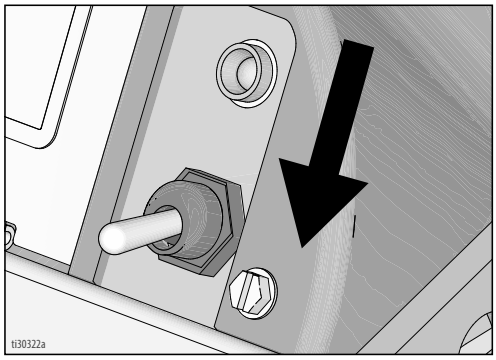
If the battery level is below 9.7V, the on-board charger will not be allowed to charge the battery. Charge battery with an external charger to raise the level above 10.0V to activate the on-board charger, or replace the battery.

Use an extension cord with an undamaged ground contact. If an extension cord is necessary, use a 3-wire, 12 AWG (2.5 mm^2) minimum.

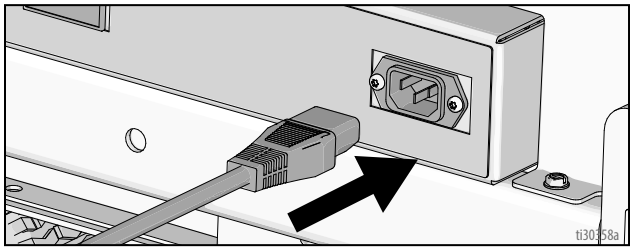
Batteries are fully charged when leaving the factory. Due to self-discharging of the battery, charge battery before first use. It takes ~3 hours to charge a dead battery to 80%. It takes ~5 hours to charge a fully depleted battery (double these times for 2 battery unit).

1. Place unit in dry, well-ventilated area and away from flammable or combustible materials, including paints and solvents.

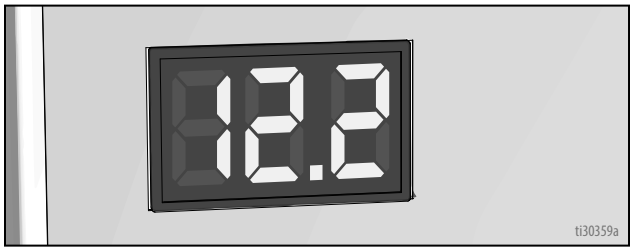
2. Ensure power switch is in **OFF** position.



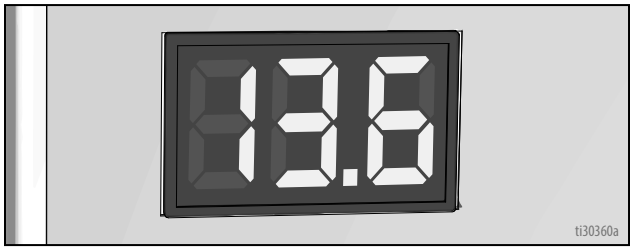
3. Plug charging cord into charging port on the unit. Connect an extension cord, minimum 12AWG (2.5mm^2), to the charging cord and plug it into wall power.



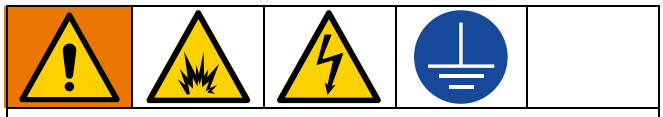
4. When power is connected the voltmeter will turn on and the charger will immediately begin charging. User should be able to see voltmeter start to climb to indicate charging is occurring.



5. Battery will charge to 14.6-14.8 volts and then it will come back down to ~13.6 volts when fully charged.



Grounding Procedure
(AC Wall Power)



This equipment must be grounded to reduce the risk of static sparking and electric shock. An electric shock or static spark can cause fumes to ignite or explode. An improper ground can cause electric shock. A good ground provides an escape wire for the electric current.

Position the striper so the wheels are on a true grounded surface. Not on pavement.

The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.

Do not modify the plug provided; if it does not fit the outlet, have the proper outlet installed by a qualified electrician.

Power Requirements

- 100-120V units require 100-120 VAC, 50/60 Hz, 12 or 15A, 1 phase.
- 230V units require 230 VAC, 50/60 Hz, 7 or 9A, 1 phase.

Extension Cords

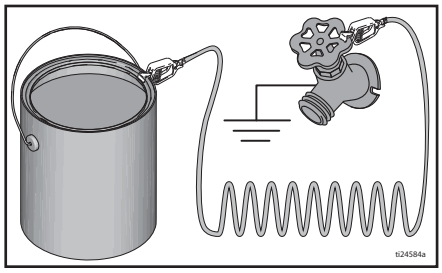
Use an extension cord with an undamaged ground contact. If an extension cord is necessary, use a 3-wire, 12 AWG (2.5 mm^2) minimum.

Pails

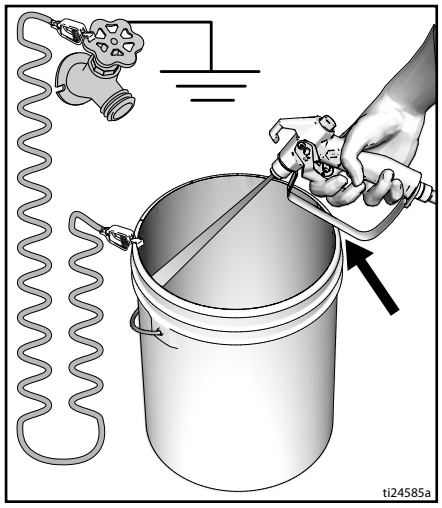
Solvent and oil-based fluids: follow local code. Use only conductive metal pails, placed on a grounded surface such as concrete.

Do not place pail on a non-conductive surface such as paper or cardboard which interrupts grounding continuity.

Always ground a metal pail: connect a ground wire to the pail. Clamp one end to the pail and the other end to a true earth ground such as a water pipe.



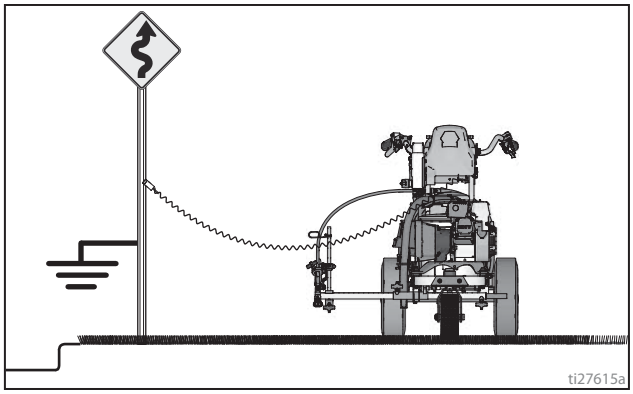
To maintain ground continuity when sprayer is flushed or pressure is relieved: hold metal part of spray gun firmly to the side of a grounded metal pail then trigger gun.



Grounding Procedure (Battery Power) (For Flammable Flushing Fluids Only)

This equipment must be grounded to reduce the risk of static sparking. Static sparking can cause fumes to ignite or explode. Grounding provides an escape wire for the electric current.

1. Position striper so that the tires are not on pavement.
2. Striper is shipped with a grounding clamp. Grounding clamp must attach to grounded object (e.g., metal sign post).



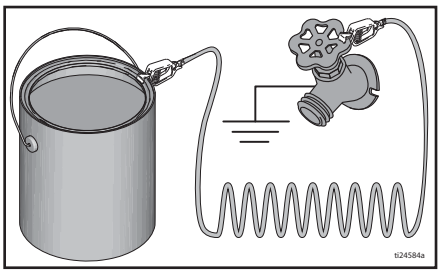
3. Disconnect grounding clamp after flushing is complete.

Pails

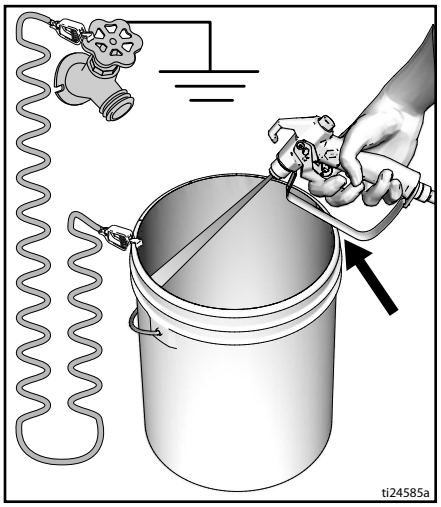
Solvent and oil-based fluids: follow local code. Use only conductive metal pails, placed on a grounded surface such as concrete.

Do not place pail on a non-conductive surface such as paper or cardboard which interrupts grounding continuity.

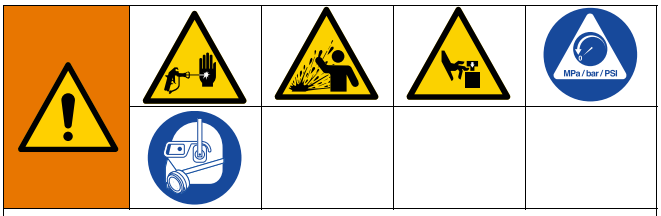
Always ground a metal pail: connect a ground wire to the pail. Clamp one end to the pail and the other end to a true earth ground such as a water pipe.



To maintain ground continuity when sprayer is flushed or pressure is relieved: hold metal part of spray gun firmly to the side of a grounded metal pail then trigger gun.

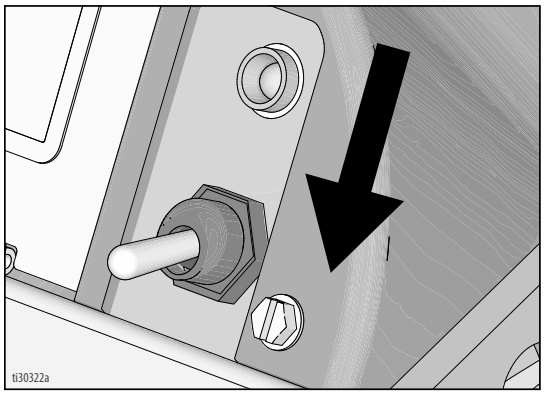


Pressure Relief Procedure

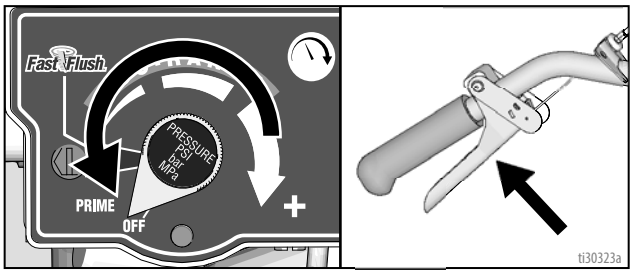


This equipment stays pressurized until pressure is manually relieved. To help prevent serious injury from pressurized fluid, such as skin injection, splashing fluid and moving parts, follow the **Pressure Relief Procedure** when you stop dispensing and before cleaning, checking, or servicing the equipment.

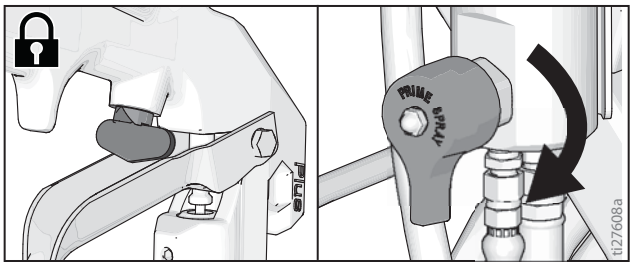
1. Perform **Grounding Procedure** if using flammable materials.
2. Turn ON/OFF Switch to **OFF**.



3. Turn pressure control to lowest setting. Trigger all guns to relieve pressure.

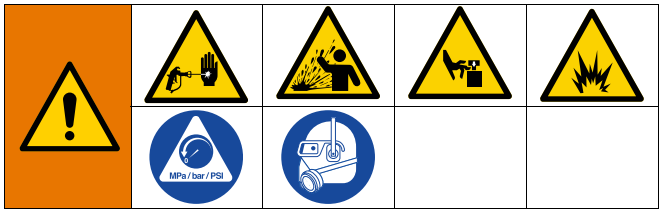


4. Engage all gun trigger locks. Turn prime valve down.

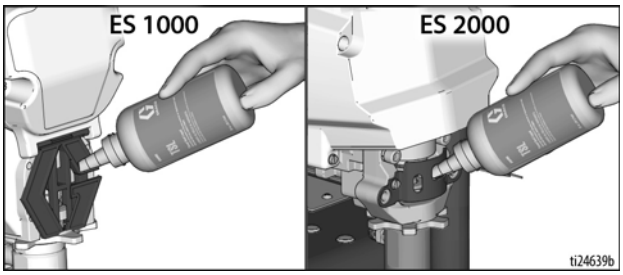


5. If you suspect the spray tip or hose is clogged or that pressure has not been fully relieved:
   a. VERY SLOWLY loosen the tip guard retaining nut or the hose end coupling to relieve pressure gradually.
   b. Loosen the nut or coupling completely.
   c. Clear the obstruction in the hose or tip.

Setup/Startup

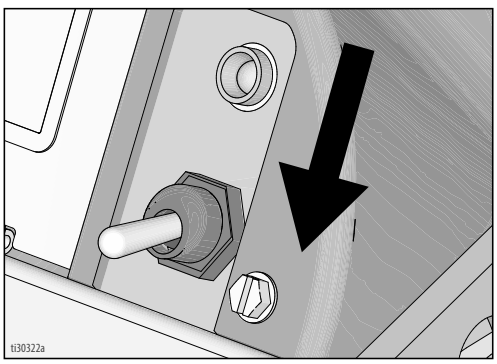


1. Perform **Pressure Relief Procedure**, page 16**.**
2. **Charging the Battery**, page 13.
3. Perform **Grounding Procedure (AC Wall Power)**, page 14, **or Grounding Procedure (Battery Power) (For Flammable Flushing Fluids Only)**, page 15, if using flammable materials.
4. Fill throat packing nut with TSL to prevent premature packing wear. Do this daily or each time you spray.
   a. Place the TSL bottle nozzle into the top center opening in the grill at the front of the sprayer.
   b. Squeeze bottle to dispense enough TSL to fill the space between the pump rod and packing nut seal.

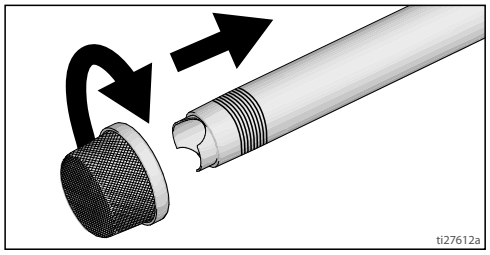


NOTE: If running off wall power, plug cord into charging port. If using an extension cord, use a 3-wire, 12 AWG (2.5mm^2) minimum with an undamaged ground contact.

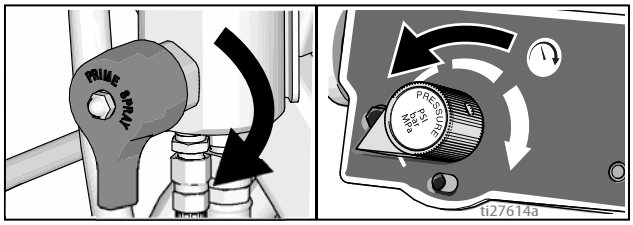
5. Turn ON/OFF Switch to **OFF**.



6. If removed, install strainer.

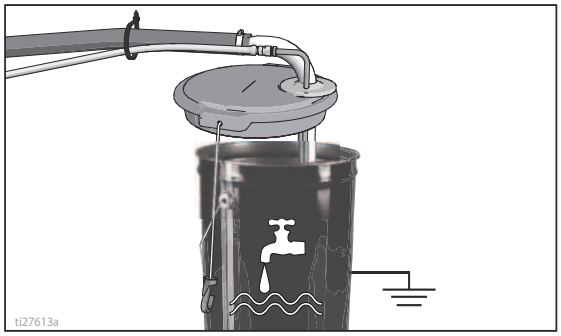


7. Turn prime valve down. Turn pressure control counterclockwise to lowest pressure.

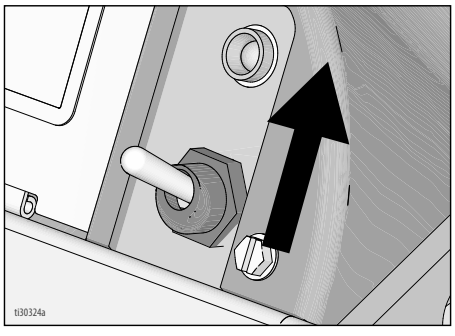


NOTE: Minimum hose size for proper sprayer operation is 1/4 in. x 50 ft for LL ES 1000 and 3/8 x 20’ for ES 2000.

8. Place siphon tube set in grounded metal pail partially filled with flushing fluid. Attach ground wire to true earth ground. Use water to flush water-based paint and mineral spirits to flush oil-based paint and storage oil.

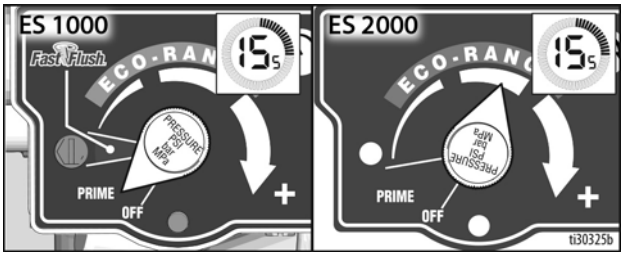


9. Turn ON/OFF Switch to ON:

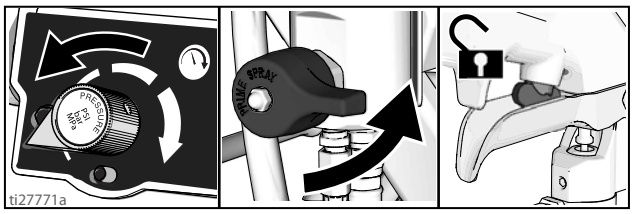


10. **ES 1000:** Turn pressure control to prime. Allow fluid to circulate for 15 seconds.

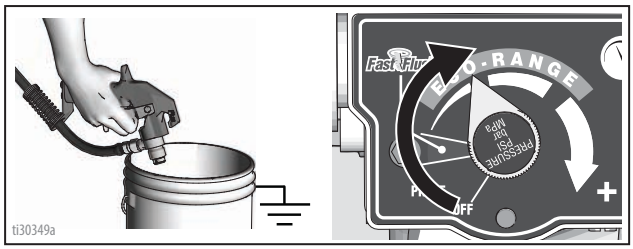
    ES 2000: Increase pressure 1/2 turn to start motor and allow fluid to circulate for 15 seconds.



11. Turn pressure down, turn prime valve horizontal. Disengage gun trigger lock.



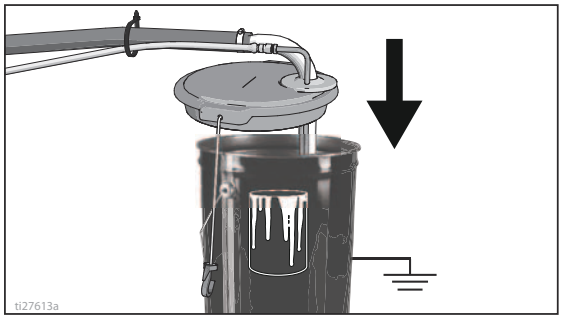
12. Hold all guns against a grounded metal flushing pail. Trigger guns and increase fluid pressure slowly until pump runs smoothly to spray.



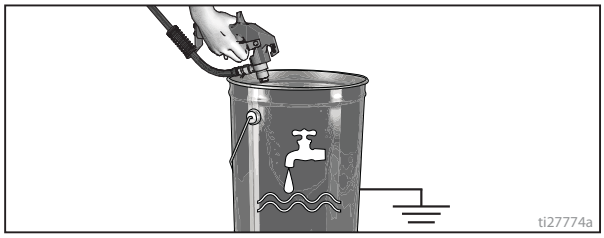
High-pressure spray is able to inject toxins into the body and cause serious bodily injury. Do not stop leaks with hand or rag.

13. Inspect fittings for leaks. If leaks occur, turn sprayer OFF immediately. Perform **Pressure Relief Procedure**, page 16. Tighten leaky fittings. Repeat **Setup/Startup**, steps 1 - 13. If no leaks, continue to trigger gun until system is thoroughly flushed. Proceed to step 14.

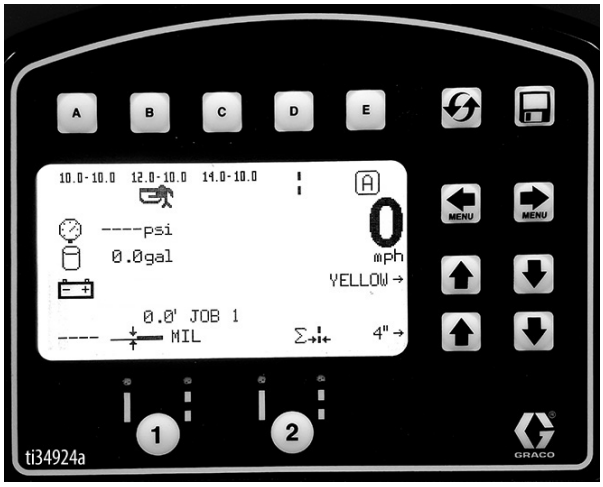
14. Place siphon tube in paint pails.



15. Trigger all guns again into a flushing fluid pail until paint appears. Assemble tips and guards.



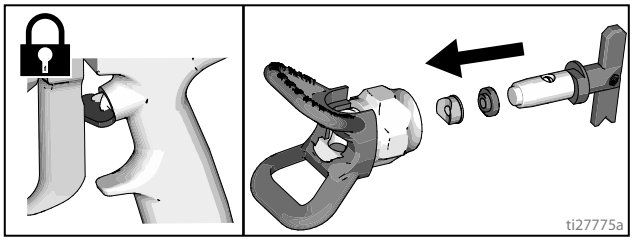
16. **ES 2000:** Digital display is functional when unit is turned on.



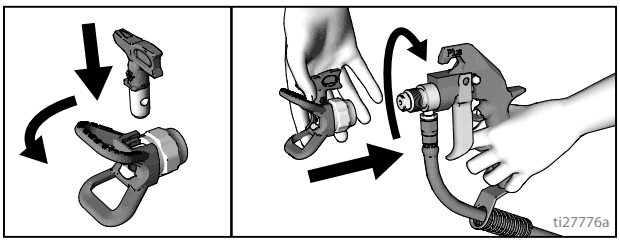
SwitchTip and Guard Assembly

To avoid serious injury from skin injection do not put your hand in front of the spray tip when installing or removing the spray tip and tip guard.

1. Engage trigger lock. Use end of SwitchTip to press OneSeal into tip guard, with curve matching tip bore.



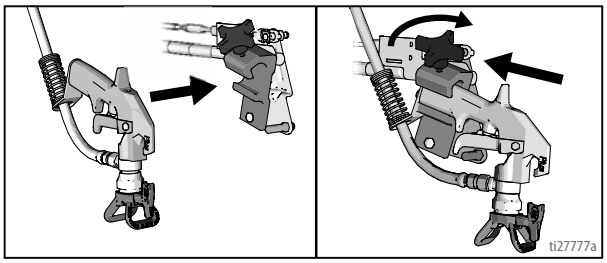
2. Insert SwitchTip in tip bore and firmly thread assembly onto gun.



Gun Placement

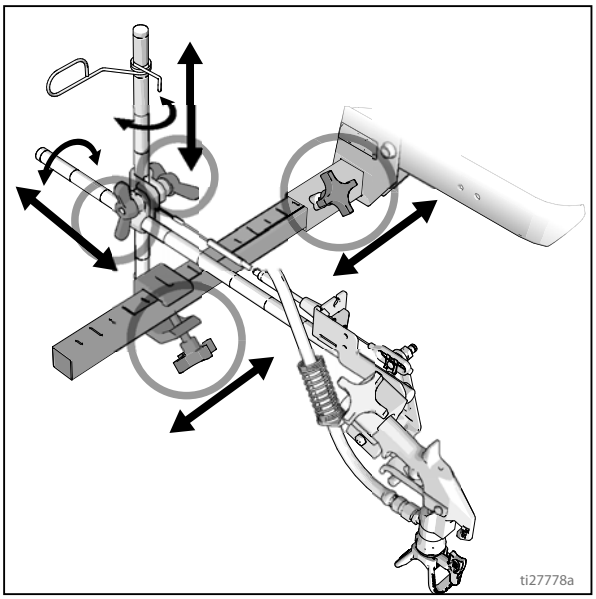
Install Gun

1. Insert guns into gun holder. Tighten clamps.

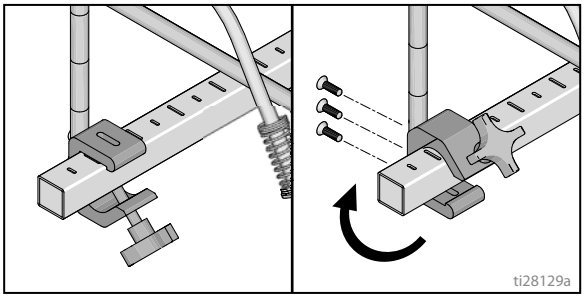


Position Gun

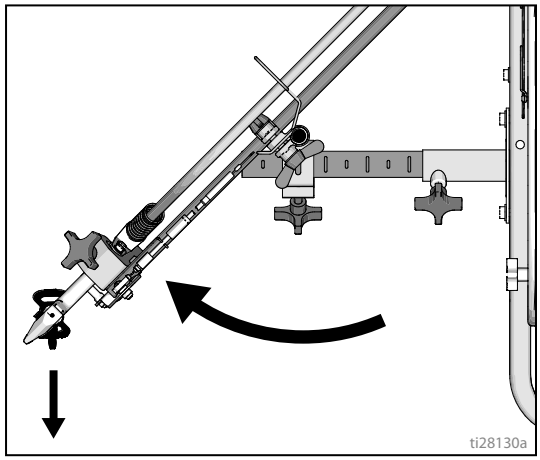
2. Position gun: up/down, forward/reverse, left/right. See **Gun Positions Chart**, page 22 for examples.



NOTE: When striping above a curb, the mounting clamp can be rotated for clearance.

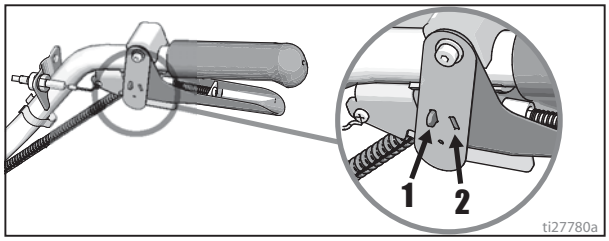


Another option can be to swing the gun out at an angle and rotate the tip guard. This results in better visibility for the user.



Select Manual Guns

3. Connect gun cables to left or right gun selector plates.



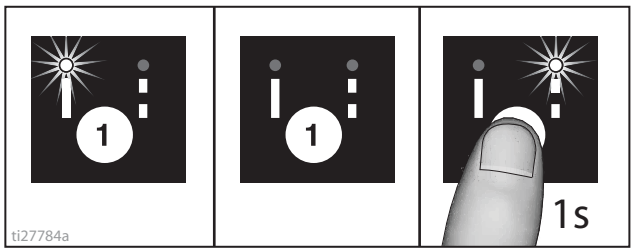
a. One gun: Disconnect one gun selector plate from trigger.

b. Both guns simultaneously: Adjust both gun selector plates to the same position.

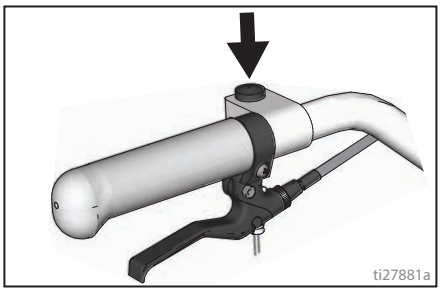
c. Solid-skip and skip-solid: Adjust solid-line gun to position 1 and skip-line to position 2.

Select Auto Guns (ES 2000)

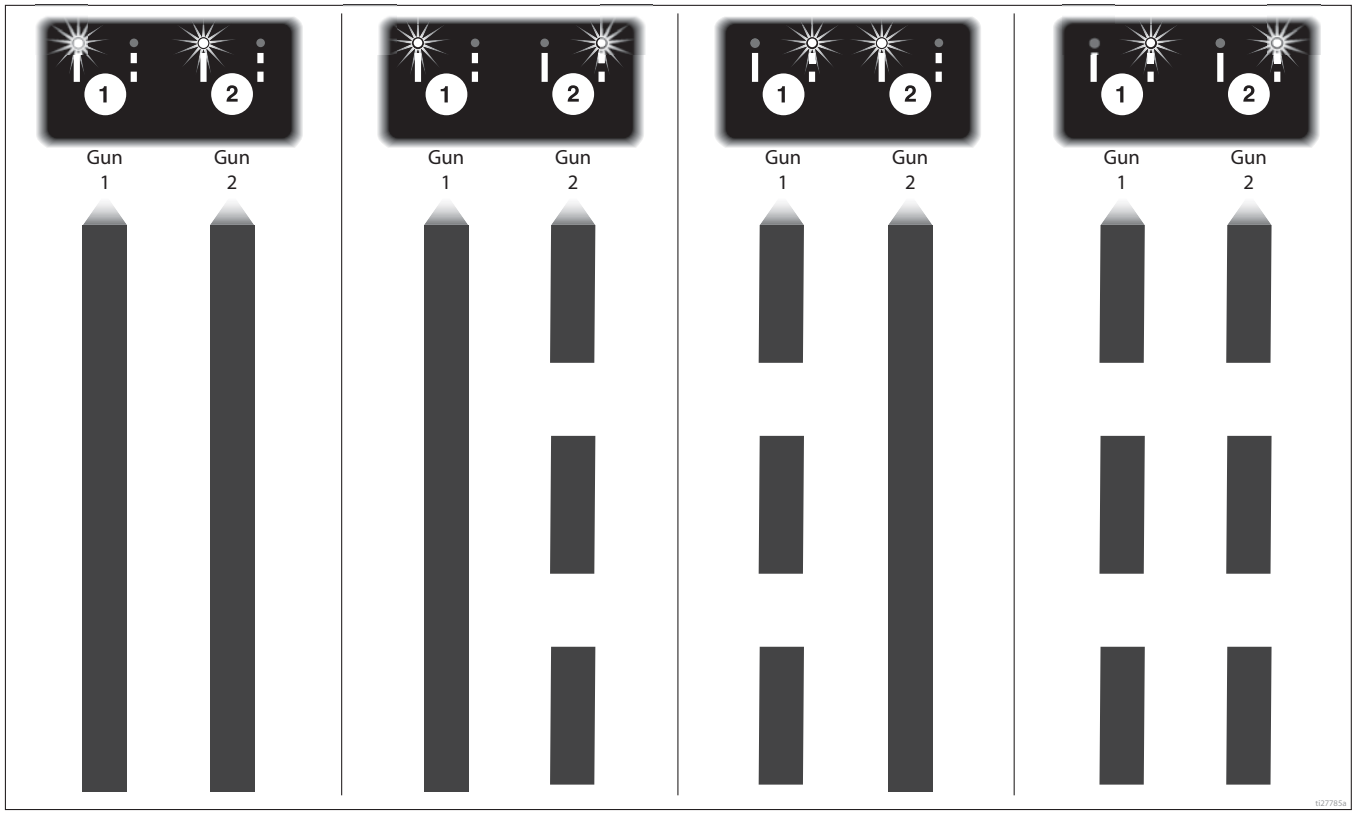
1. Use the gun selector buttons to determine which guns are active. Each gun selector has 3 settings: continuous line, OFF and programmed line pattern.



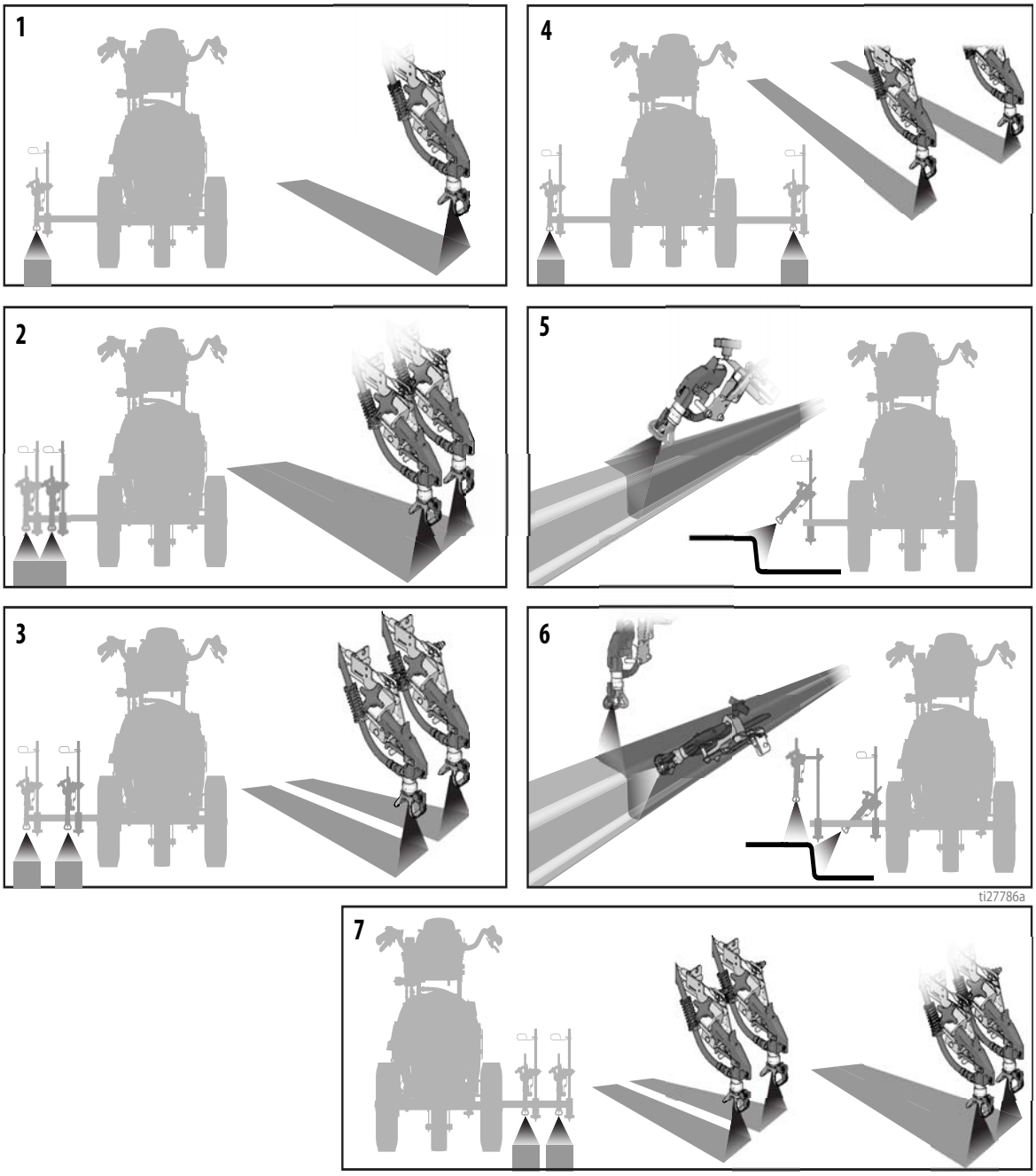
2. Use the gun trigger control to actuate auto guns.



4 Examples:



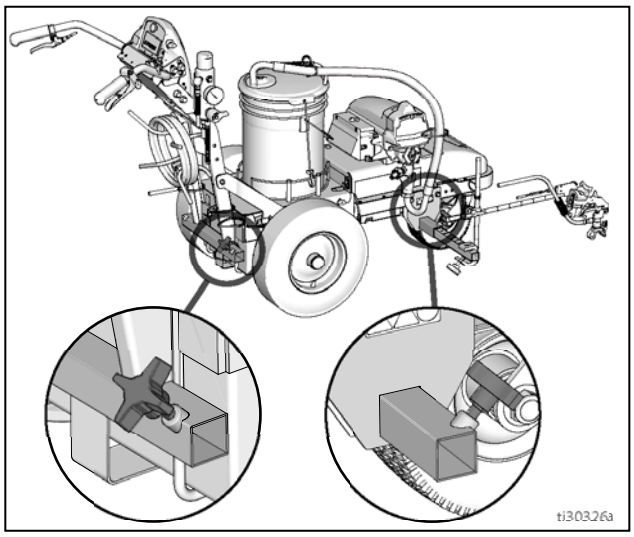
Gun Positions Chart



1	One line
2	One line up to 24 in. (61cm) wide
3	Two lines
4	One line or two lines to spray around obstacles
5	One gun curb
6	Two gun curb
7	Two lines or one line up to 24 in. (61 cm) wide

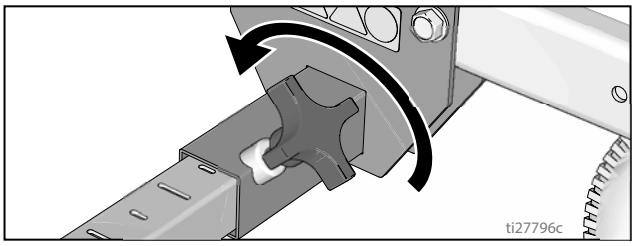
Gun Arm Mounts

This unit is equipped with front and rear gun arm mounts.

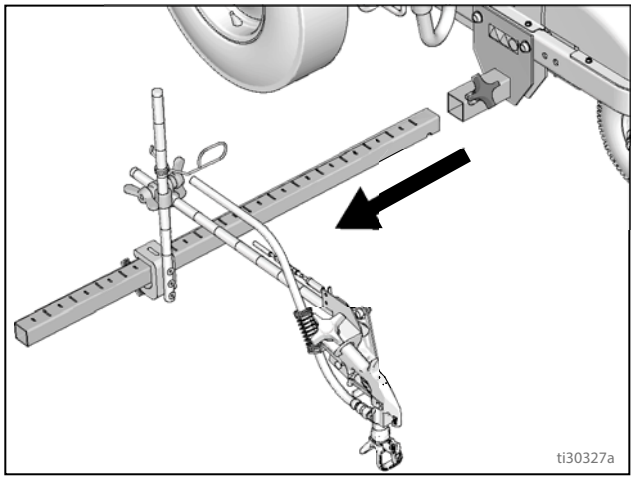


Change Gun Position (Front and Back)

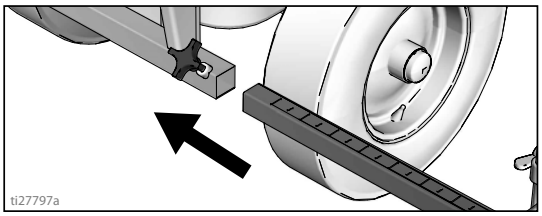
1. Loosen gun arm knob and remove from gun arm mounting slot.



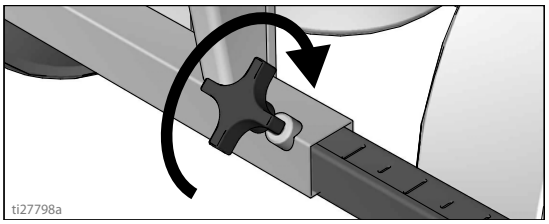
2. Slide gun arm assembly (including gun and hoses) out from gun arm mounting slot.



3. Slide gun arm assembly into desired gun arm mounting slot.



4. Tighten gun arm knob into gun arm mounting slot.



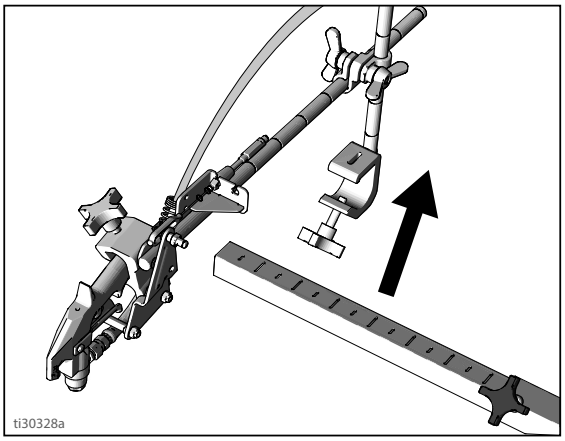
NOTICE

Make sure all hoses, cables, and wires are properly routed through brackets and do NOT rub on tire. Contact with tire will result in damaged hoses, cables, and wires.

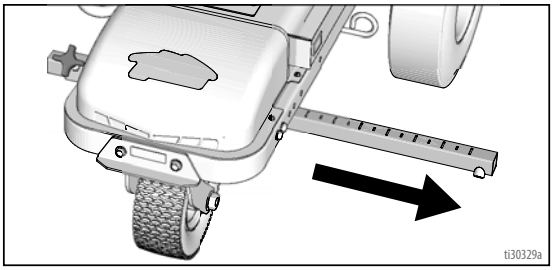
Change Gun Position (Left and Right)

Removal

1. Loosen vertical gun arm knob on gun arm mounting bar and remove.

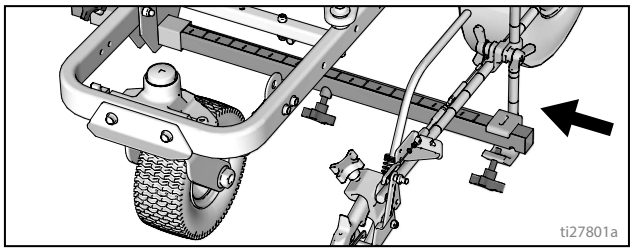


2. Extend mounting bar on opposite side of the machine.



Installation

1. Install vertical gun mount onto gun bar.

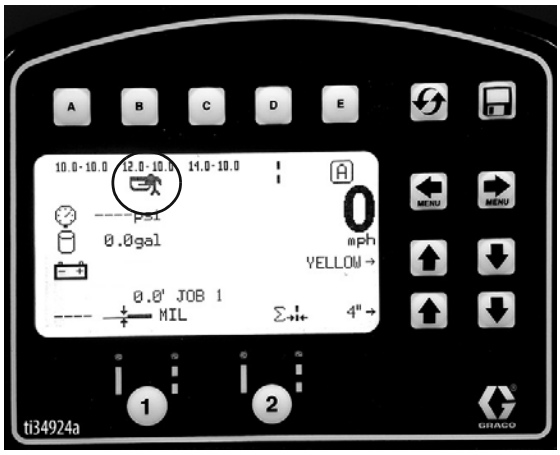


NOTE: Make sure all hoses, cables, and wires are properly routed through brackets.

Trigger Sensor Adjustment (ES 2000)

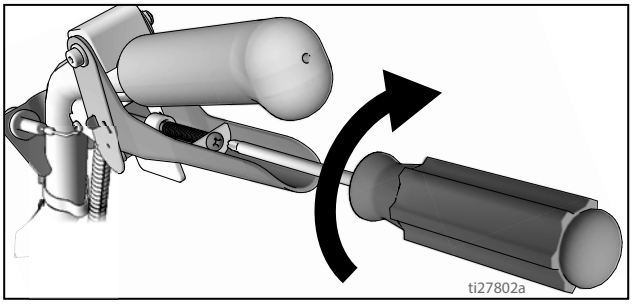
1. Turn striper on. Engage trigger. Spray icon should appear simultaneously with start of fluid spray.

ES 2000



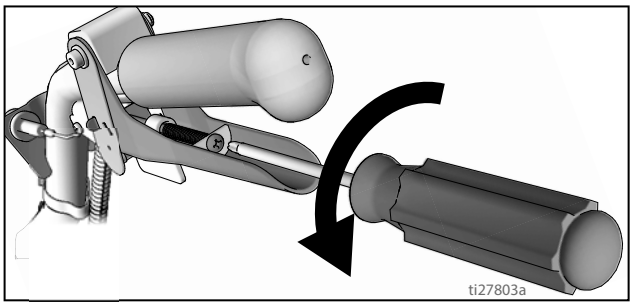
No fluid spray

2. Turn screw in handle clockwise if spray icon appears before fluid spray starts.

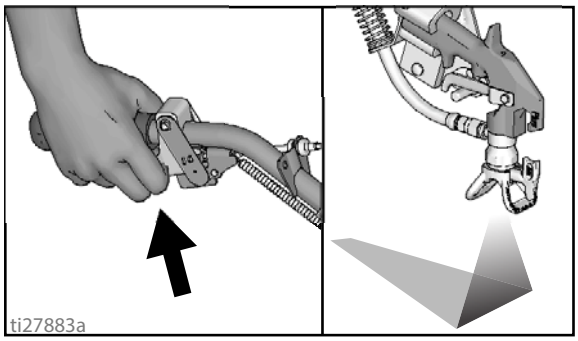


No spray icon

3. Turn screw in handle counterclockwise if fluid spray starts before spray icon appears.

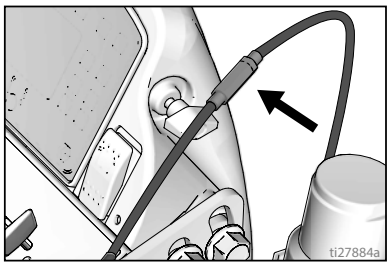


4. Continue adjusting screw in handle until timing of spray icon and fluid spray are synchronized. Adjustment of the gun cables might be necessary.



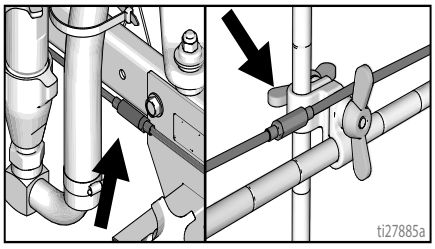
Gun Cable Adjustment

Adjusting the gun cable will increase or decrease the gap between the trigger plate and the gun trigger. To adjust trigger gap, perform the steps below.

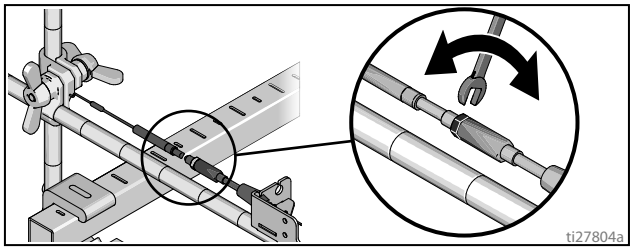


ES 1000 & ES 2000

ES 2000



1. Use wrench to loosen locking nut on cable adjuster.

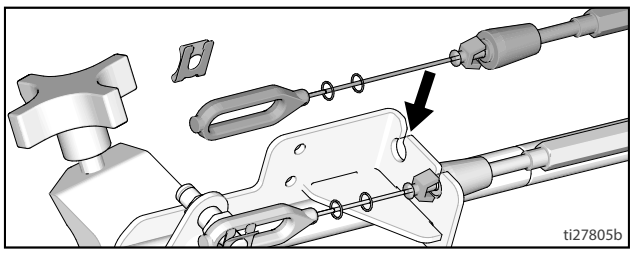


2. Loosen or tighten adjuster until desired result is achieved. **NOTE:** More thread exposed means less gap between gun trigger and trigger plate.
3. Use wrench to tighten locking nut on the adjuster.

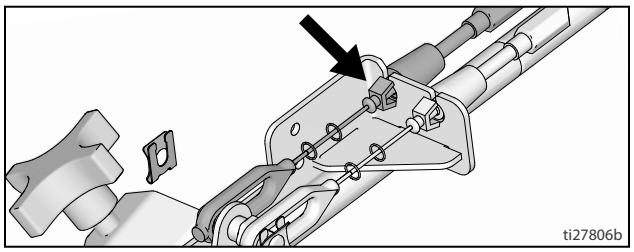
Adding Gun Cable (ES 2000)

The ES 2000 can be equipped with two gun actuators. Each gun actuator is capable of operating one cable.

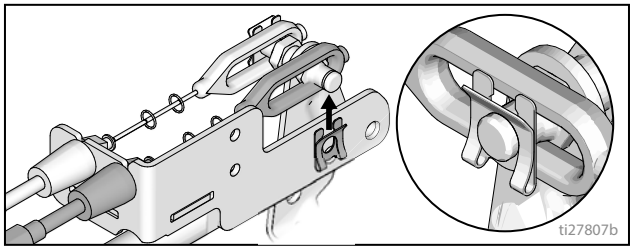
1. Select cable end with adjuster.
2. Install exposed cable through cable bracket slot.



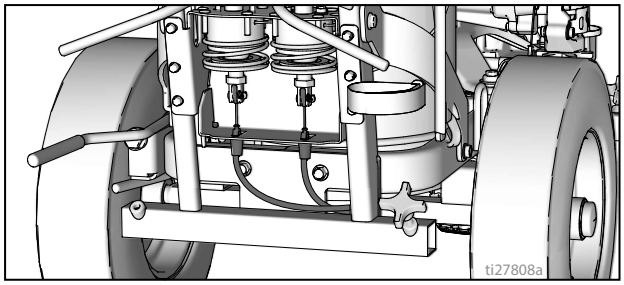
3. Insert plastic cable retainer into cable bracket hole.



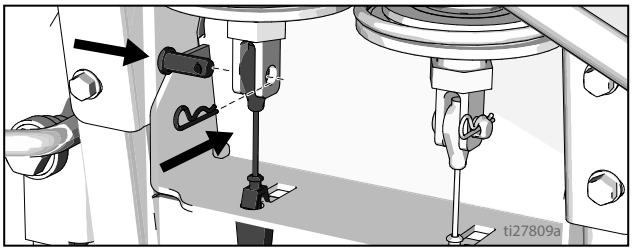
4. Install cable end onto trigger plate pin and install clip.



5. Route cable around unit and up through cable holes behind hose mount.



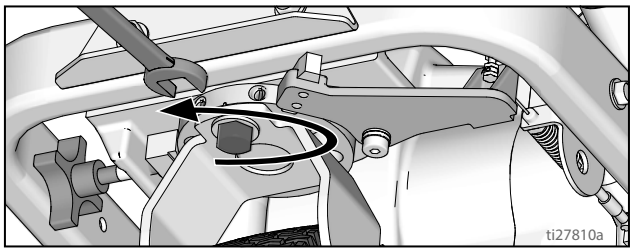
6. Route cable end loop through rectangular hole in bracket and insert plastic cable retainer into the actuator bracket. Install cable end onto actuator rod and install pin.



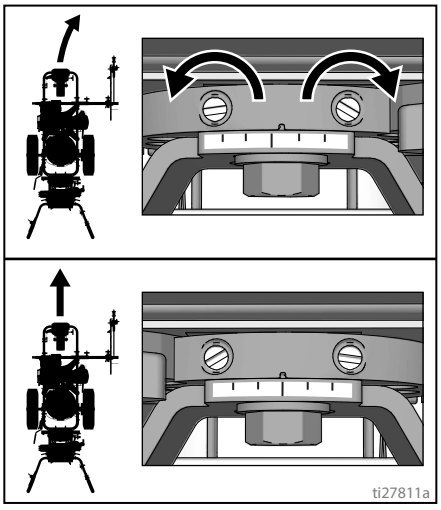
Straight Line Adjustment

The front wheel is set to center the unit and allow the operator to form straight lines. Over time, the wheel may become misaligned and will need to be readjusted. To re-center the front wheel, perform the following steps:

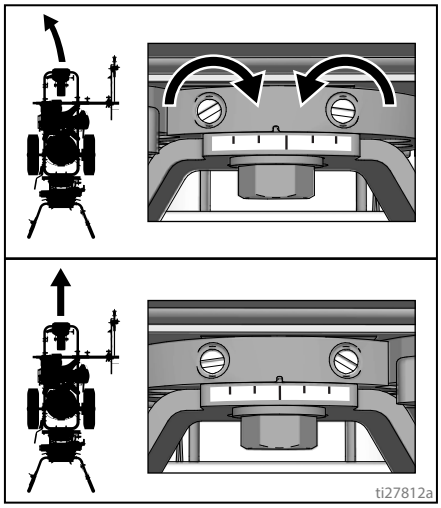
1. Loosen bolt on the front wheel bracket.



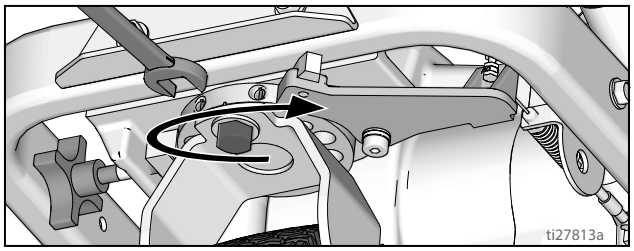
2. If striper arcs to the right, loosen left set screw and tighten right set screw for fine tune adjustment.



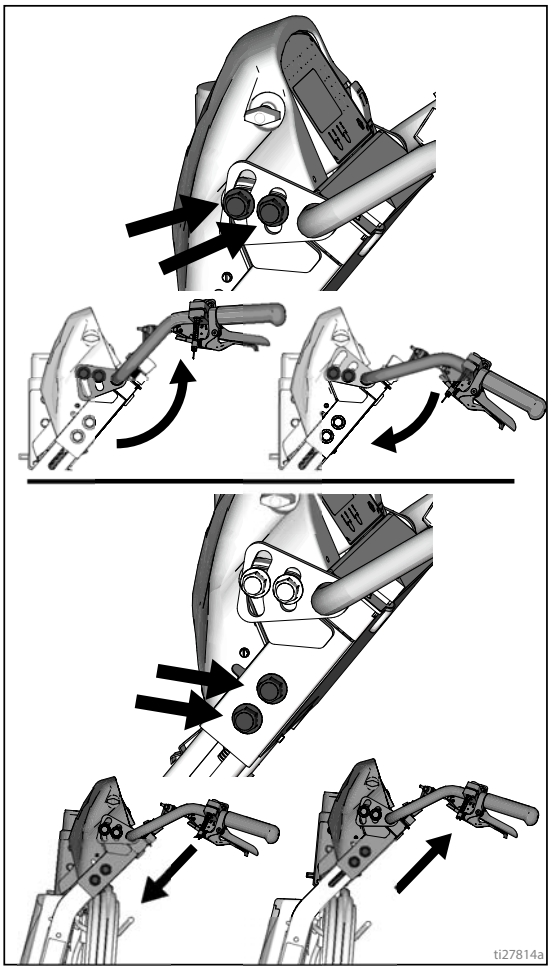
3. If striper arcs to the left, loosen right set screw and tighten left set screw.



4. Roll the striper. Repeat steps 2 and 3 until striper rolls straight. Tighten bolt on wheel alignment plate to lock the new wheel setting.

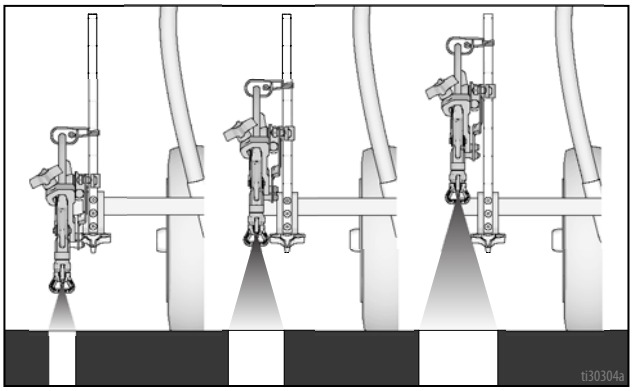


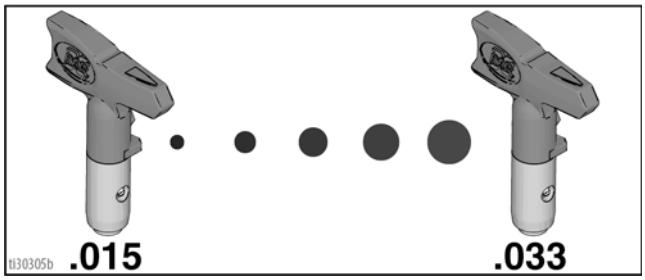
Handle Bar Adjustment



Paint Stripe Width

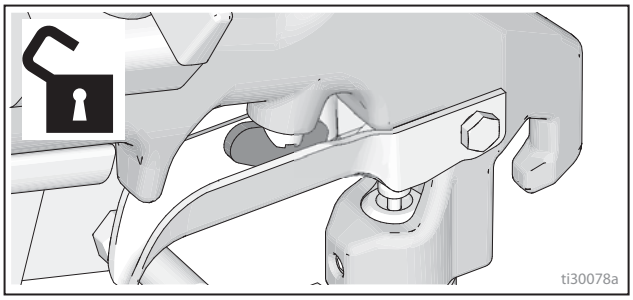
1. Adjust gun up or down to change paint stripe width.



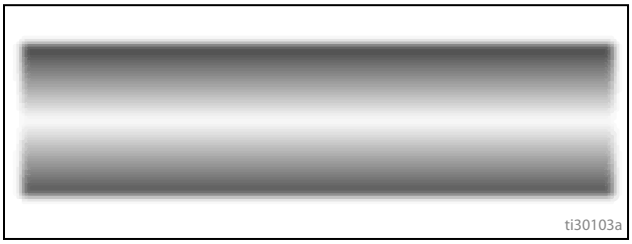


Spray Test Stripe

1. Disengage trigger lock.

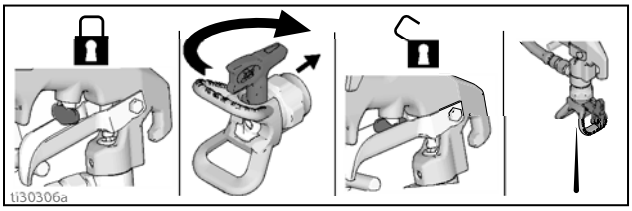


2. Trigger gun and spray test pattern. Slowly adjust pressure to eliminate heavy edges. Use smaller tip size if pressure adjustment can not eliminate heavy edges.

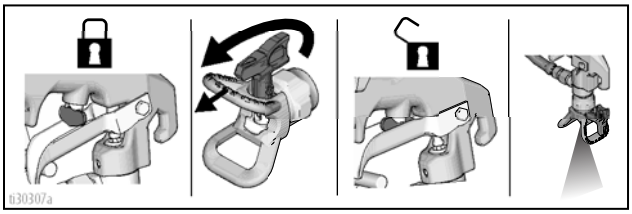


Clearing Tip Clogs

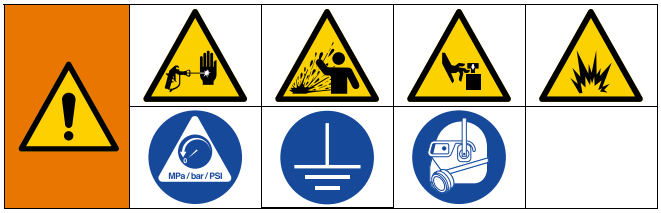
1. Release trigger. Engage gun trigger lock. Rotate SwitchTip. Disengage gun trigger lock and trigger gun to clear the clog.



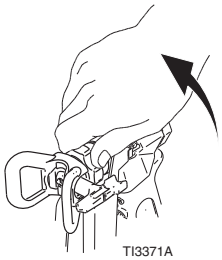
2. Engage gun trigger lock, return SwitchTip to original position, disengage gun trigger lock and continue spraying.



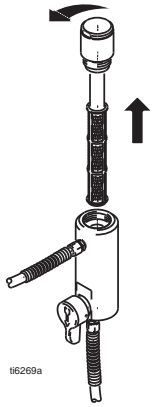
Cleanup



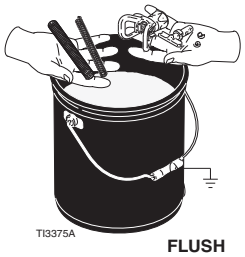
1. Perform **Pressure Relief Procedure**, page 16.
2. Remove guard and SwitchTip from all guns.



3. Unscrew cap, remove filter. Assemble without filter.



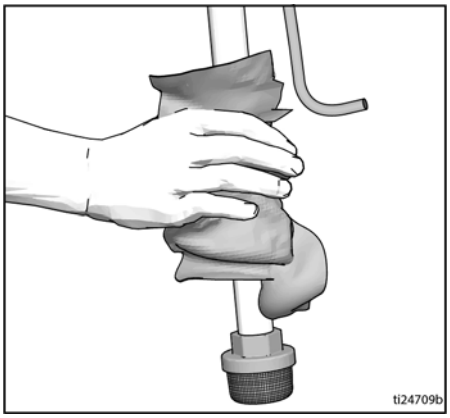
4. Clean filter, guard and SwitchTip in flushing fluid.



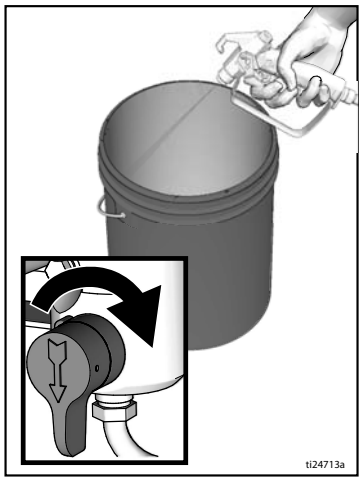
5. Attach ground wire to true earth ground or plug unit into grounded outlet.

Flush Drain Tube

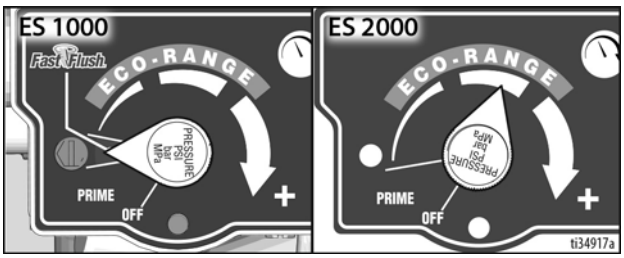
6. Remove fluid intake and drain tube from paint, wipe excess paint off outside.



7. Place siphon tube set in grounded metal pail partially filled with flushing fluid. Use water for water base paint and mineral spirits for oil-based paint.
8. To flush drain tube and pump turn prime valve down.



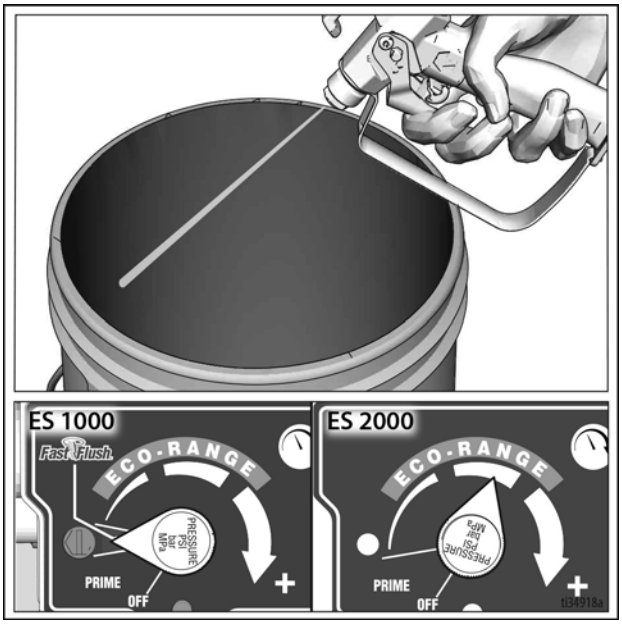
9. Turn pressure control to Fast Flush (ES1000), or 1/2 position (ES2000), and operate until the pump runs steady and flushing fluid appears in the waste pail.



Flush Hose and Gun

10. To flush airless hose and spray gun, turn prime valve horizontal.

11. Hold gun against waste pail. Disengage trigger lock. Trigger gun and turn pressure control to Fast Flush (ES1000), or 1/2 position (ES2000), and operate until the pump runs steady and flushing fluid appears.



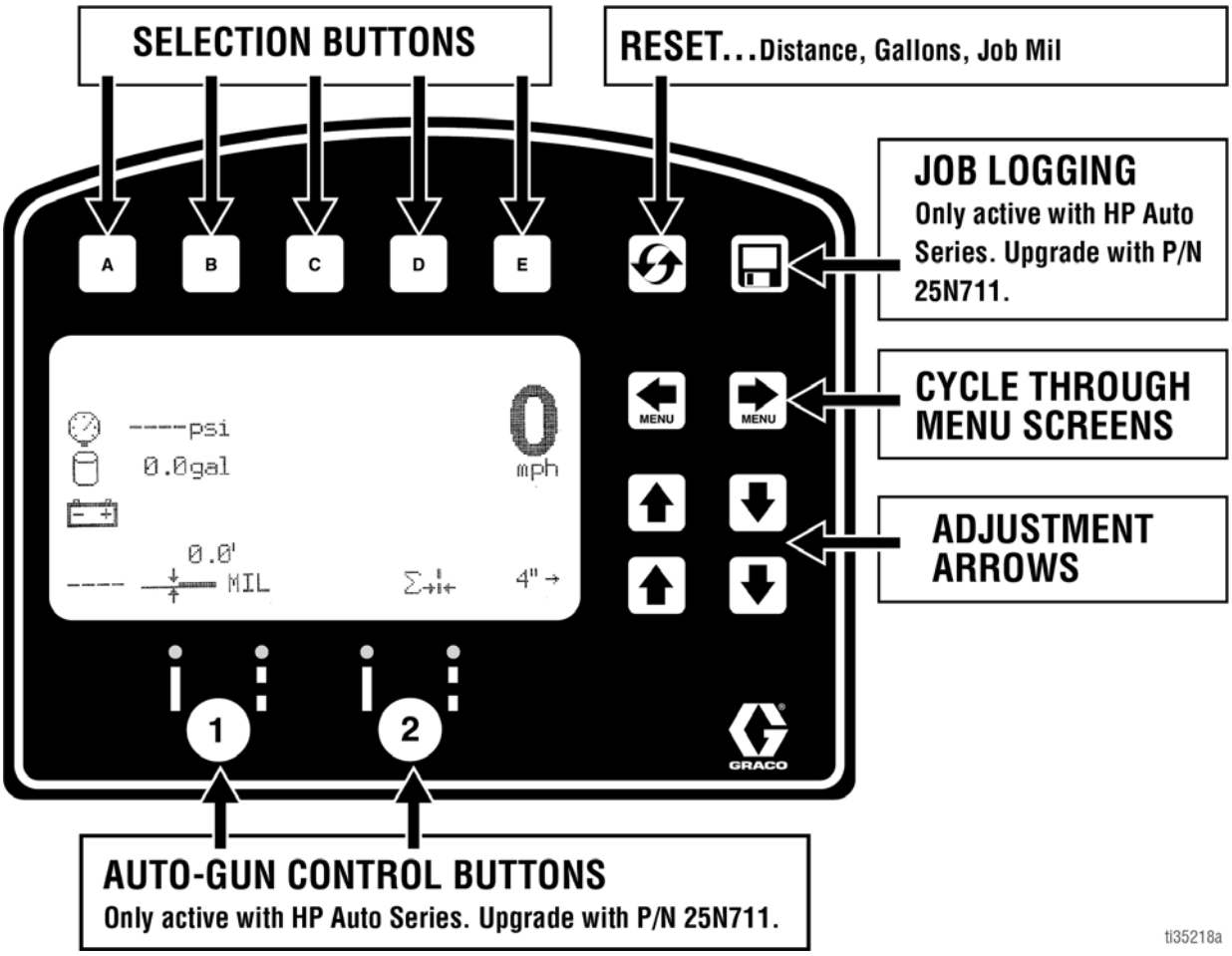
12. Stop triggering gun.

13. Fill pump with Pump Armor and reassemble filter, guard and SwitchTip.

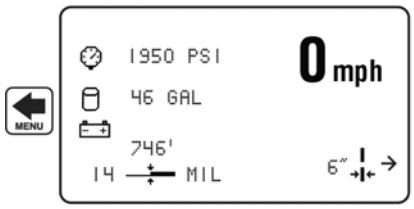
14. Each time you spray and store, fill throat packing nut with TSL to decrease packing wear.

LineLazer V LiveLook Display

ES 2000 (Standard Series)

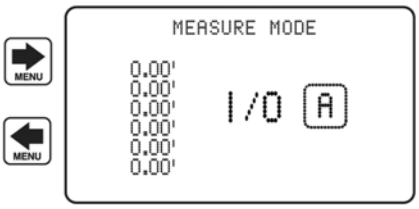


STRIPING SCREEN



- Displays:
  - Distance of sprayed line
  - Gallons Pumped
  - Job Mil and Live Mil
  - Speed
  - Pressure
  - Input Line Width

MEASURE MODE



- Take up to 6 measurements by pressing the A button to start the measurement and pressing it again to end the measurement.

SETTING/INFO

- Settings and information can be accessed from this screen.
- For accurate distance calculations, the machine must be calibrated. Press A to calibrate the machine. Use a distance of at least 25 feet or more.

ti35219a

Initial Setup (ES 2000 Standard Series)

The initial setup prepares the striper for operation based on a number of user entered parameters. Language selections and the units of measure selections can be set before you start or changed later.

Language

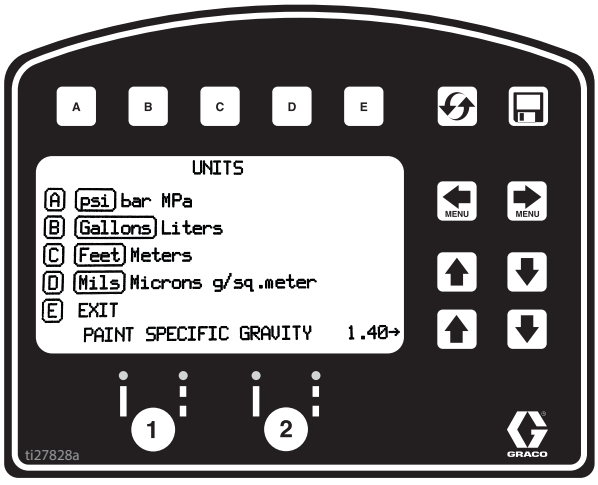
From Setup/Information select appropriate language by pressing D until the language is outlined.

ENG = English
SPA = Spanish
FRE = French
DEU = German
RUS = Russian
WORLD = Symbols see **World Key Symbol**, page 113**.**

NOTE: Language can be changed later.

Units

Press B to enter settings and then B again to enter units. Select appropriate units of measure.



US Units
- Pressure = psi
- Volume = gallons
- Distance = feet
- Line Thickness = mil

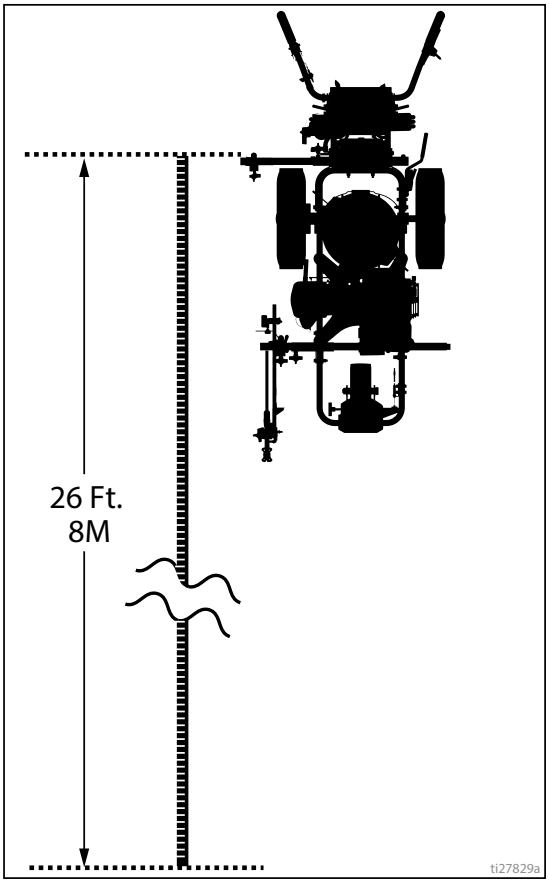
SI Units
- Pressure = bar (MPa available)
- Volume = liters
- Distance = meters
- Line thickness = micron (g/m^2 available)

Paint Specific Gravity = Use UP and DOWN arrows to set specific gravity. Required to determine paint thickness.

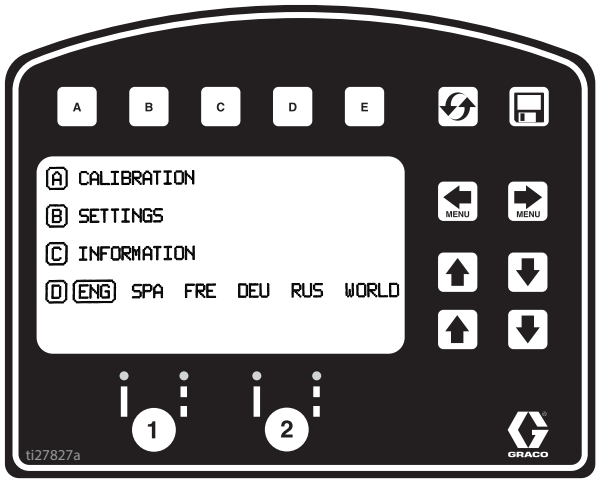
NOTE: All units can be changed individually at any time.

Calibration

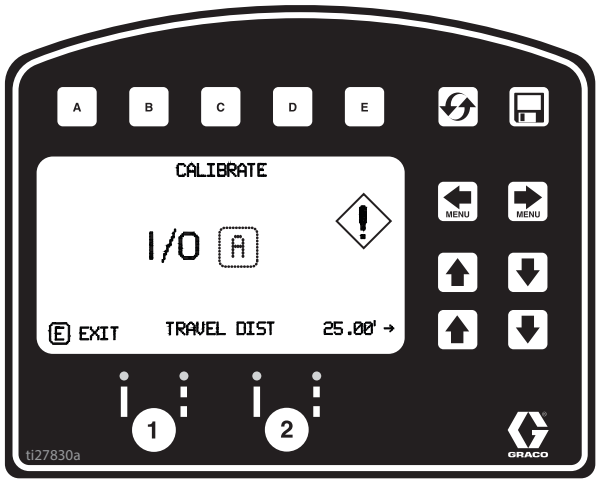
1. Check rear tire pressure 55 ± 5 psi (379 ± 34 kpa) and fill if necessary.
2. Extend steel tape to distance greater than 26 ft. (8m).



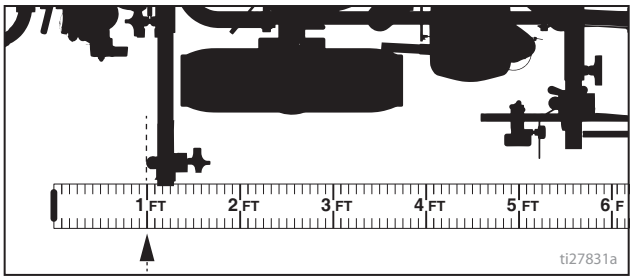
3. Press MENU MENU to select Setup/Information.



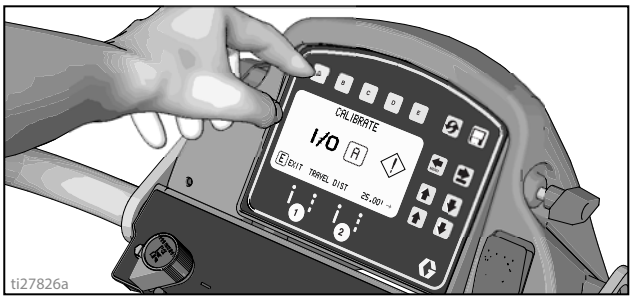
4. Press A for Calibration. Set TRAVEL DIST to 25 ft (7.6m) or longer. Longer distances ensure better accuracy, depending on conditions.



5. Align part of the unit with 1 foot (30.5cm) on steel tape.

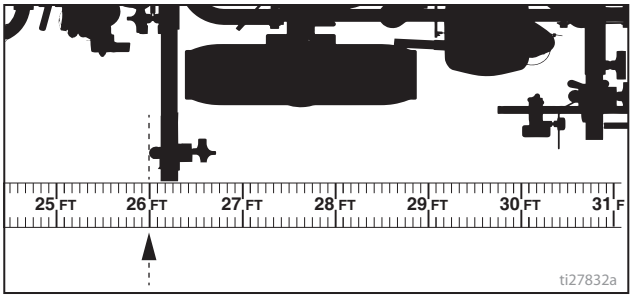


6. Push A to start calibration.

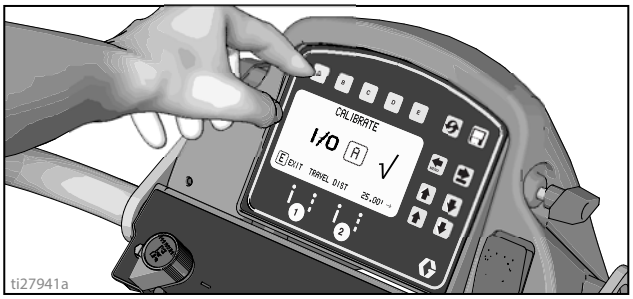


7. Move striper forward. Keep unit aligned with steel tape.

8. Stop when chosen part of unit aligns with 26-ft (8m), or distance entered, on steel tape (25-ft./ 7.6m distance).



9. Push A to complete calibration.

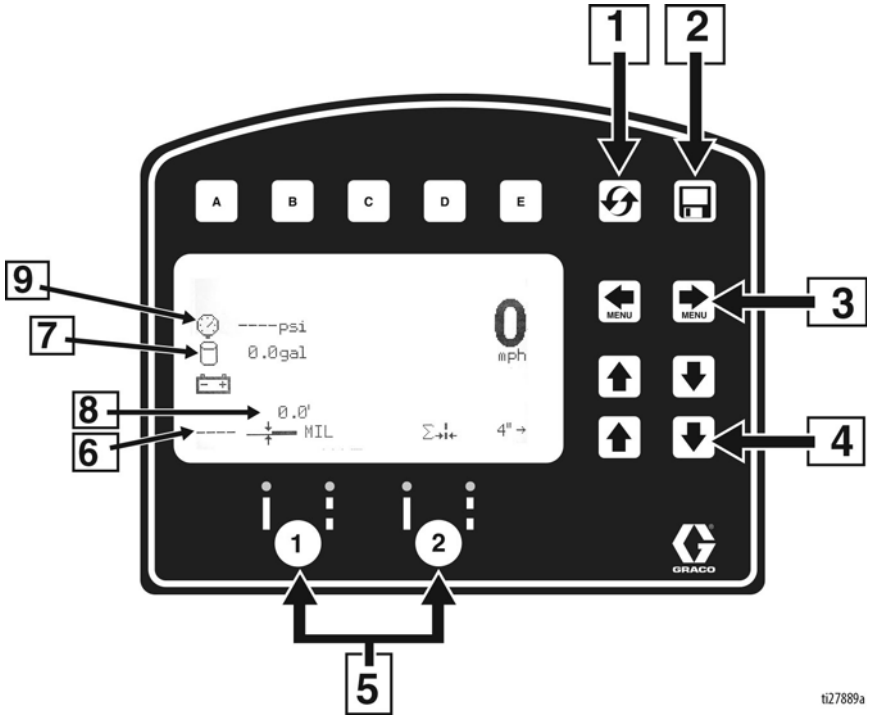


- Calibration is not complete when the exclamation symbol ⚠ is displayed.
- Calibration is finished when the check mark symbol ✓ is displayed.

10. Calibration is now complete.

Go to **Measure Mode (ES2000 Standard Series)**, page 34, and verify accuracy by measuring the tape.

Striping Mode (ES2000 Standard Series)

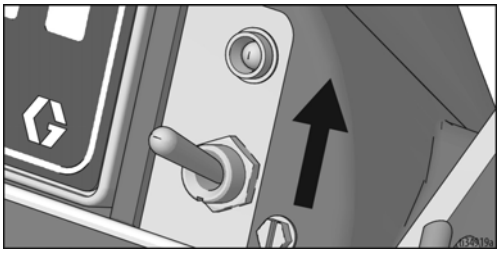


Ref.	Description
1	Resets Distance, Gallons, Mils
*2	Job logging
3	Scroll between menu screens
4	Line width adjustment buttons
*5	Auto gun buttons
6	MIL thickness. While spraying “Instant MIL avg” is displayed. When stopped total “Job MIL avg” is displayed.
7	Total gallons sprayed
8	Total line length sprayed.
9	Pressure

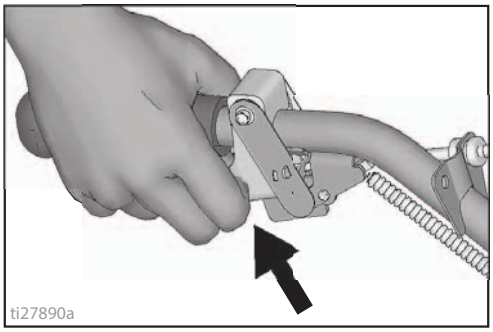
* Not active in Standard Series. Upgrade to HP Auto Series with P/N 25N711.

Operating in Striping Mode

1. Make sure ON/OFF switch is ON position.
2. Set pump switch to ON.



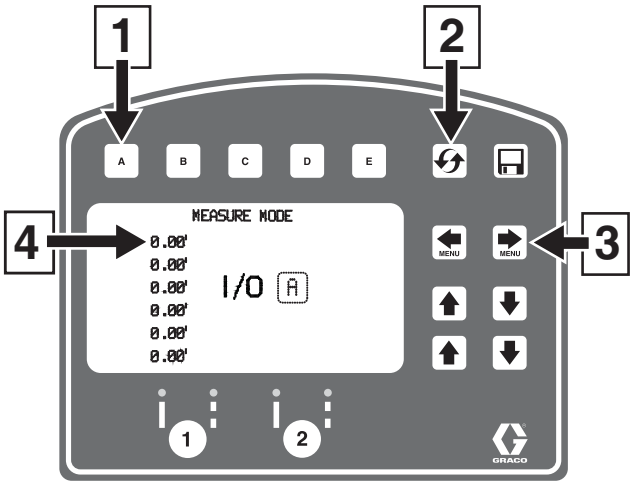
3. Pull trigger to spray.



Measure Mode (ES2000 Standard Series)

Measure Mode replaces a tape measure to measure distances when laying out an area to be striped.

1. Use MENU MENU to select Measure Mode.



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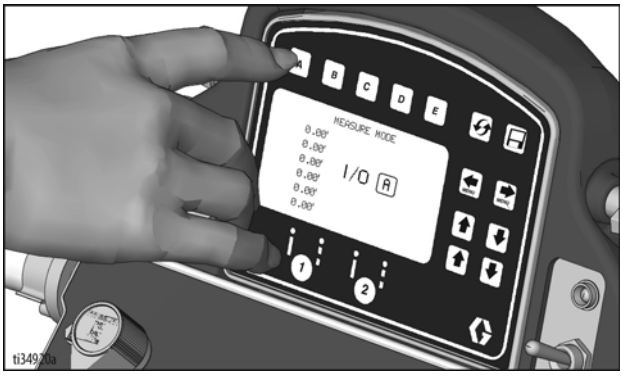
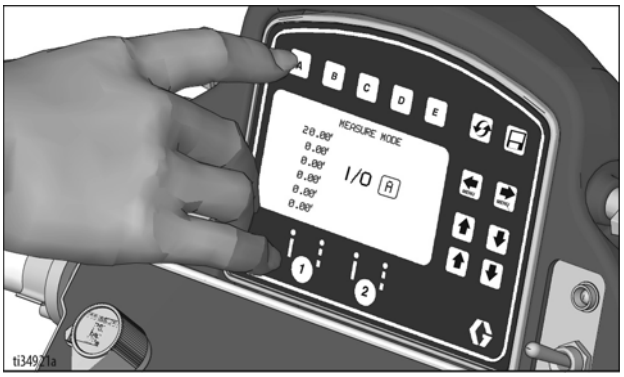
Ref.	Description
1	Press to start measurement, Press to stop measurement
2	Hold to reset values to zero
3	Scroll between main menu screens
4	Last measurement taken

2. Press and release A. Move striper forwards or backwards. (Moving backwards is a negative distance.)



ti34920a

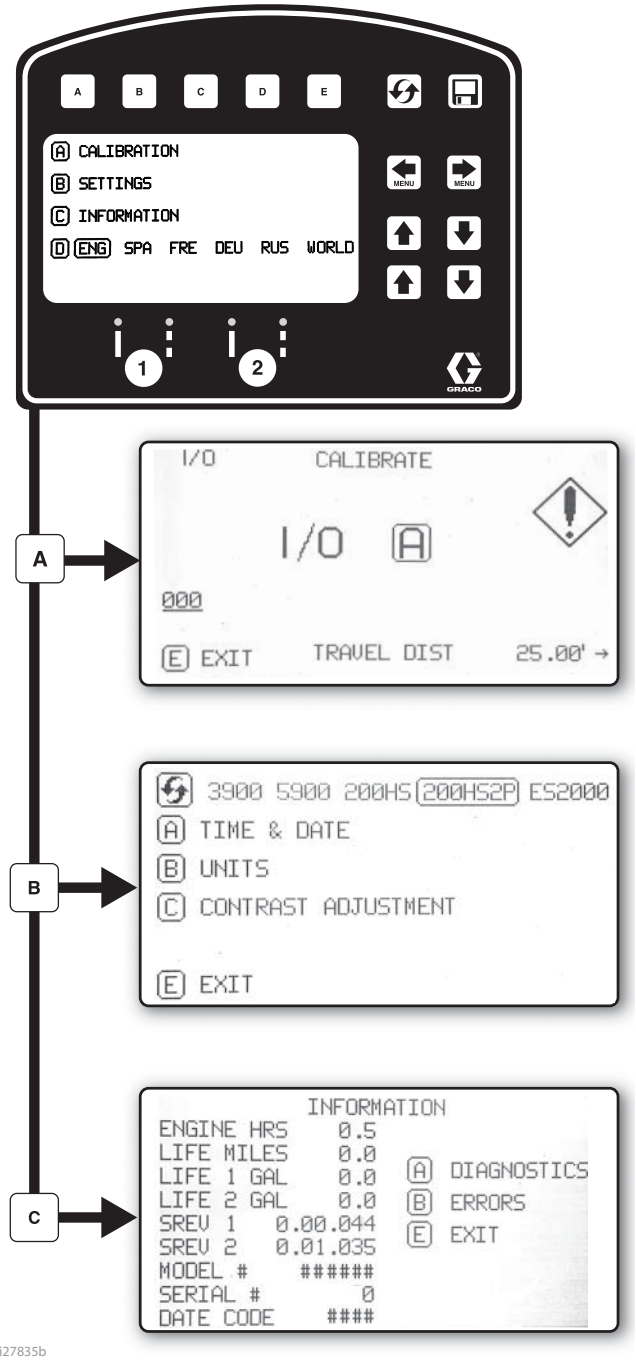
3. Press and release A to end measured length. Up to six lengths are viewable.



ti34921a

Setup/Information

Use MENU MENU to select Setup/Information.



Press D to select Language.
See **Language**, page 31.

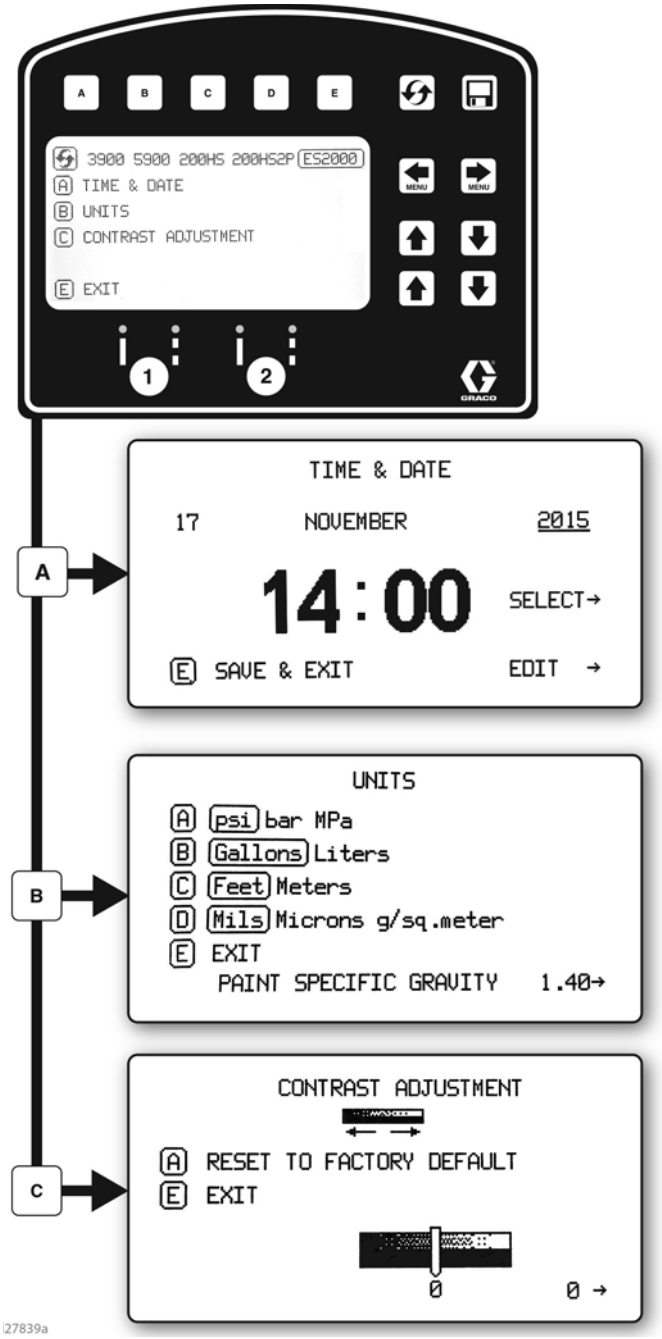
See **Calibration**, page 31.

See **Settings**, page 36.

See **Information**, page 37.

Settings

Use [MENU] [MENU] to select Setup/Information. Press [B] to open Settings Menu.



Chooses the machine type. Necessary for accurate gallon counting.

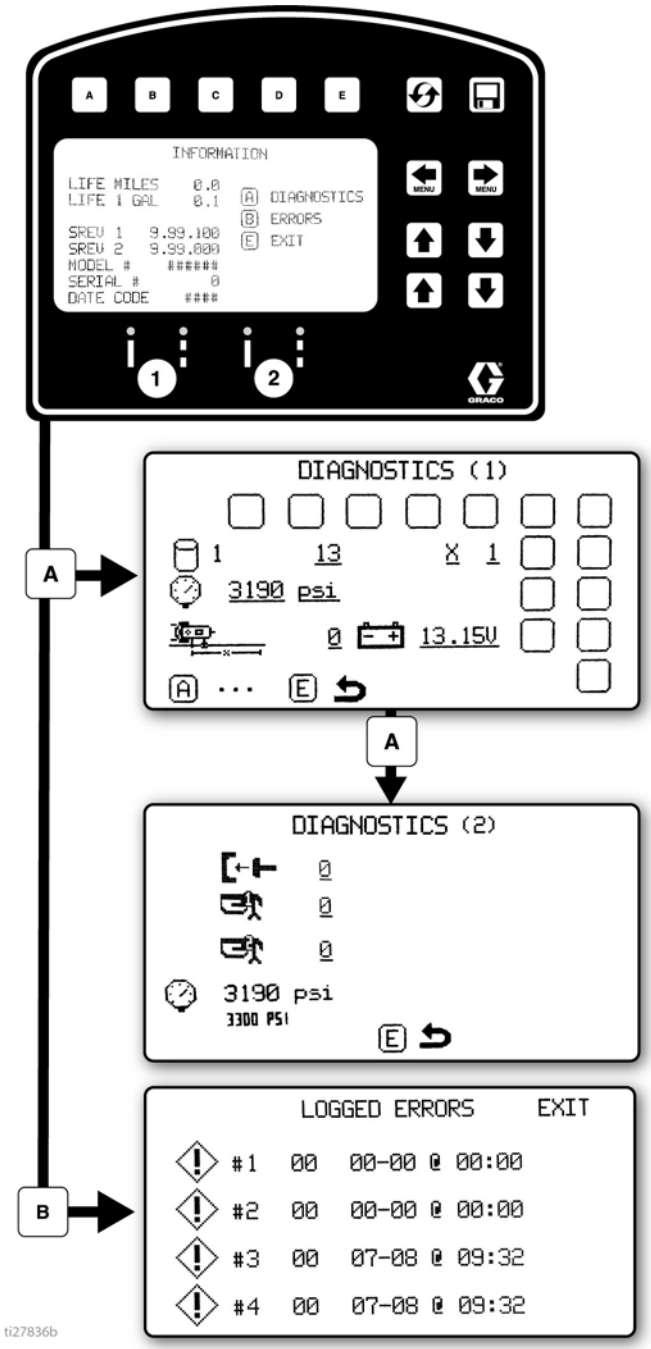
Use [▲] [▼] to set time and date.

Set units with [A] [B] [C] [D]

Use [▲] [▼] to adjust screen contrast to the desired value.

Information

Use MENU MENU to select Setup/Information. Press C to open Information Menu.



Displays and logs life data and striper information.

View and test functionality of components.

Stroke Counter

Touch Pad Buttons

Pressure Transducer

Distance Sensor

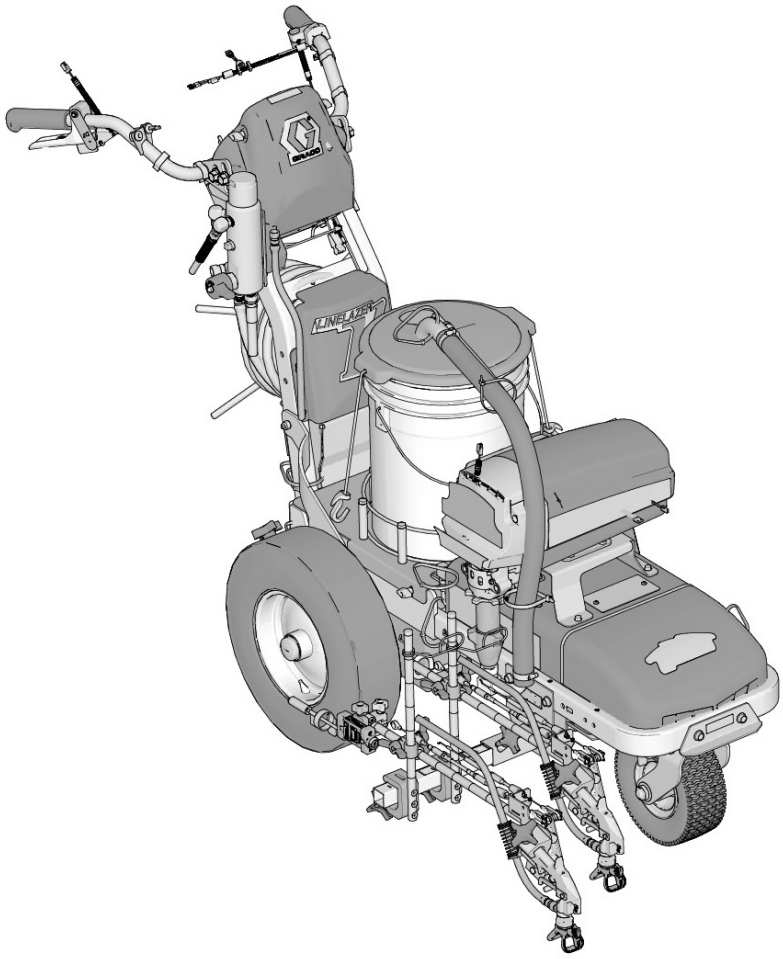
Battery Voltage

Logs last four error codes that occurred.

Code Description
02 = Over pressure
03 = No transducer detected

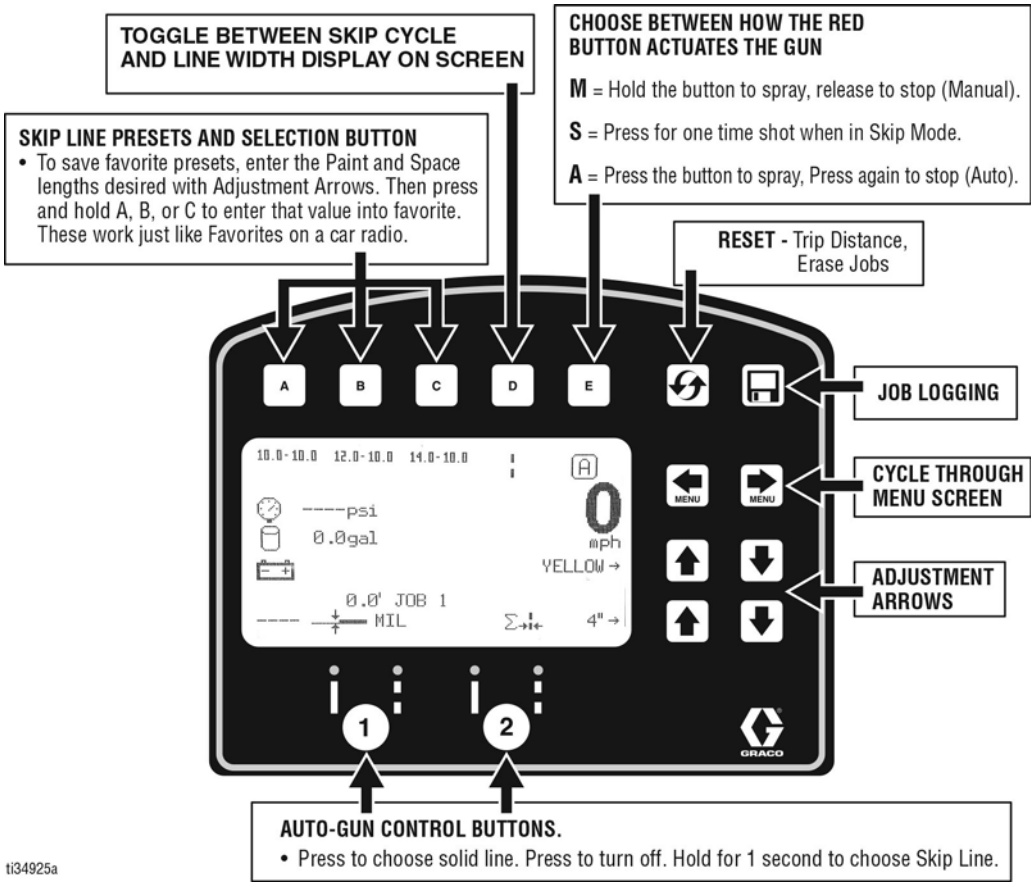
Reset error codes

ES2000 (HP Auto Series)

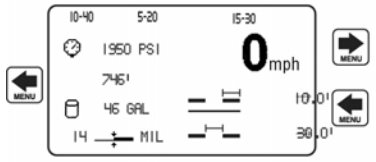


LineLazer V LiveLook Display

ES2000 (HP Auto Series)



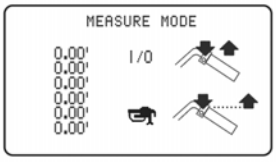
STRIPING SCREEN



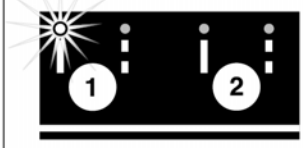
- **Main striping screen.** Must be in this mode to electronically actuate guns.
- Automatic Skip Cycles can be laid from this screen. Choose skip line on the desired gun to fire. Enter the Paint and Space distance wanted and begin spraying.
- Press the E Button to choose how the red button actuates the guns.

M = Hold to spray, release to stop
S = Press for one time shot when in Skip Mode.
A = Press to start , press to stop

MEASURE MODE



- **Measure Mode.** Ability to take up to 6 measurements by pressing the red button to start the measurement and pressing it again to end the measurement.
- If an Auto Gun is selected (see below) and the red button is held down, a dot will be dropped every 12" until the red button is released.



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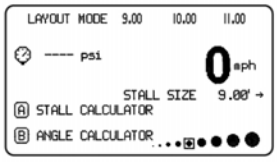
LAYOUT MODE

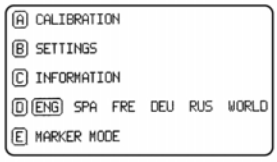


- **Layout Mode.** Drop a dot at a chosen distance to layout a parking lot.
- Enter stall size, activate an auto gun, press the red button, and roll the machine. To stop dotting, press the red button again. Favorites can be saved just like in the main screen.

Ⓐ STALL CALCULATOR
see page 45

Ⓑ ANGLE CALCULATOR
see page 46

SETTING/INFO



- Settings and Information can be accessed from this screen.
- For accurate distance calculations the machine must be calibrated. Press A to calibrate the machine. Use a distance of at least 25' or more.

Initial Setup (ES2000 HP Auto Series)

The initial setup prepares the striper for operation based on a number of user entered parameters. Language selections and the units of measure selections can be set before you start or changed later.

Language

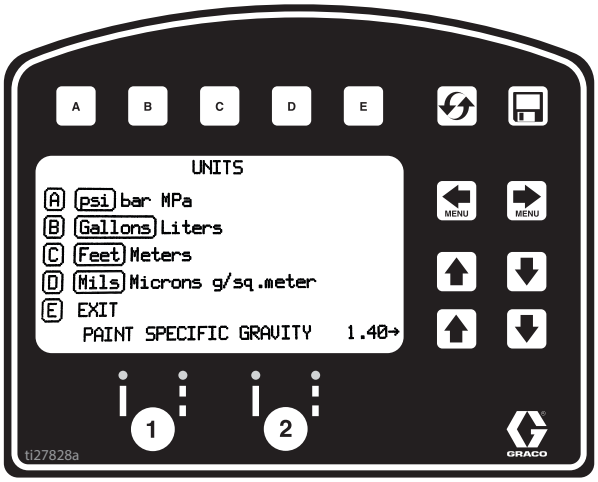
From Setup/Information select appropriate language by pressing D until the language is outlined.

ENG = English
SPA = Spanish
FRE = French
DEU = German
RUS = Russian
WORLD = Symbols see **World Key Symbol**, page 113**.**

NOTE: Language can be changed later.

Units

Press B to enter settings and then B again to enter units. Select appropriate units of measure.



US Units
- Pressure = psi
- Volume = gallons
- Distance = feet
- Line Thickness = mil

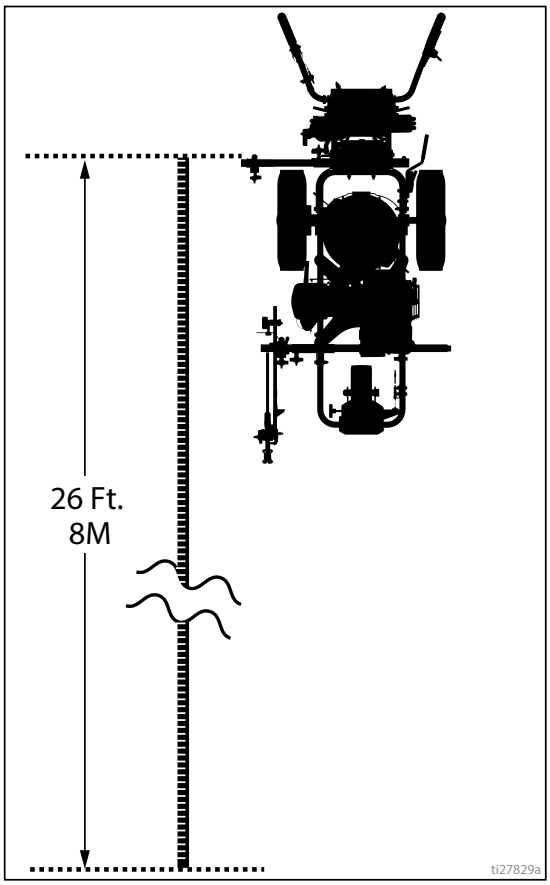
SI Units
- Pressure = bar (MPa available)
- Volume = liters
- Distance = meters
- Line thickness = micron (g/m^2 available)

Paint Specific Gravity = Use UP and DOWN arrows to set specific gravity. Required to determine paint thickness.

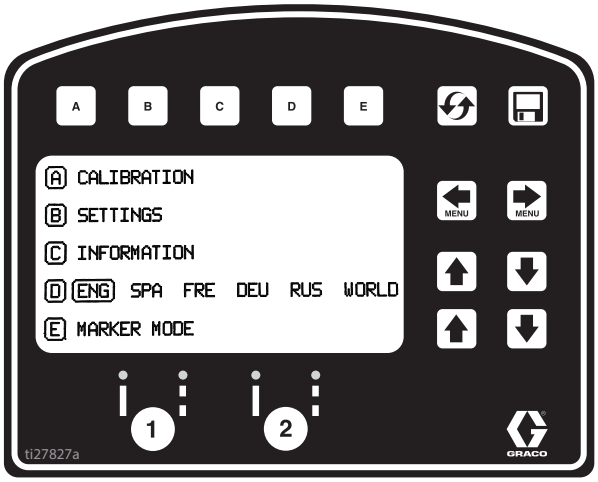
NOTE: All units can be changed individually at any time.

Calibration

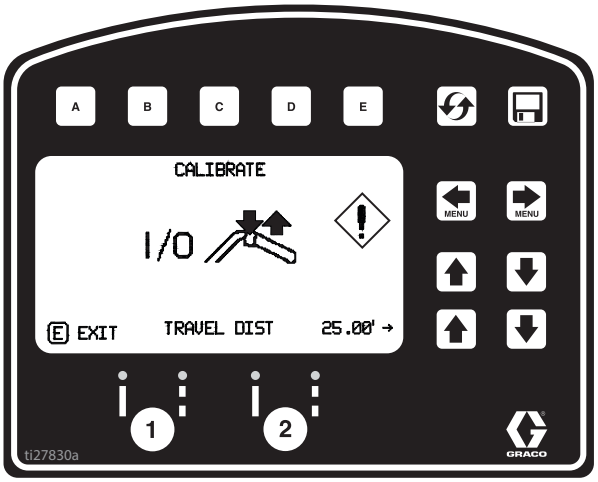
1. Check rear tire pressure 55 ± 5 psi (379 ± 34 kpa) and fill if necessary.
2. Extend steel tape to distance greater than 26 ft. (8m).



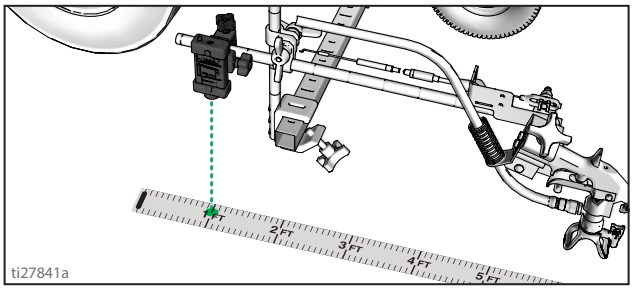
3. Press ◀ MENU ▶ MENU to select Setup/Information.



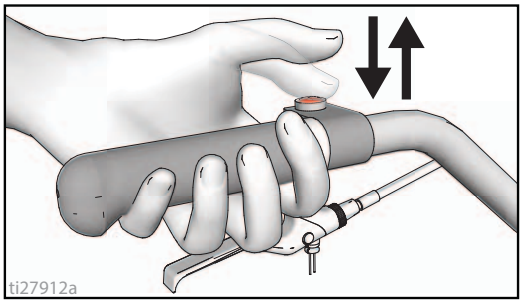
4. Press A for Calibration. Set TRAVEL DIST to 25 ft (7.6m) or longer. Longer distances ensure better accuracy, depending on conditions.



5. Turn on laser and align laser dot with 1 foot (30.5cm) on steel tape.

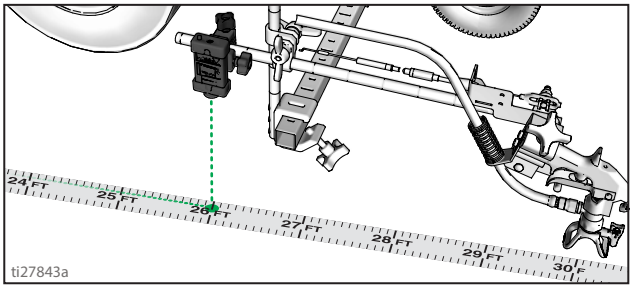


6. Press and release gun trigger control to start calibration.

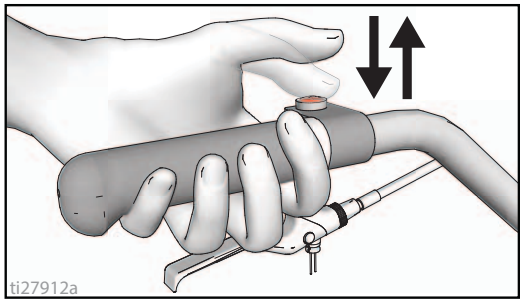


7. Move striper forward. Keep laser dot on steel tape.

8. Stop when laser aligns with 26-ft (8m) or distance entered on steel tape (25-ft./7.6m distance).



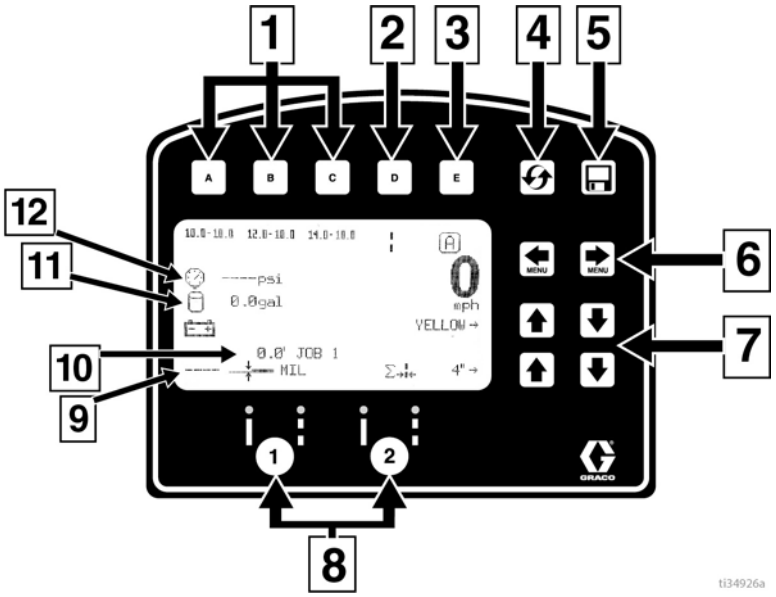
9. Press and release gun trigger control to complete calibration.



- Calibration is not complete when the exclamation symbol ⚠ is displayed.
- Calibration is finished when the check mark symbol ✓ is displayed.

10. Calibration is now complete.

Striping Mode (ES2000 HP Auto Series)



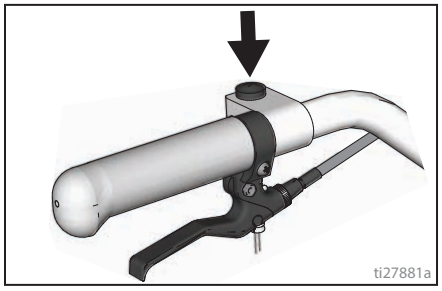
Ref.	Description
1	**Select** a “Favorite”, press for less than one second.
	Save a “Favorite”, press and hold for more than three seconds.
2	Cycles between viewing line width or paint and space value.
3	Cycles between Manual Mode, Semi-Automatic Mode, Automatic Mode.
	Manual Mode [M] **:** Press and hold gun trigger control to stripe.
	Semi-Automatic Mode [S] **:** Press and release gun trigger control to stripe the programmed length one time when in Skip Mode.
	Automatic Mode [A] **:** Press and release gun trigger control to start striping. Press and release button again to stop.
4	Resets trip distance.
5	Job Data Logger, page 52.
6	Scrolls between menu screens.
7	Paint and Space length **OR** line width adjustment buttons.
8	Auto guns activation buttons.
9	MIL thickness. While spraying “Instant MIL avg” is displayed. When stopped total “Job MIL avg” is displayed.
10	Total gallons (liters) sprayed.
11	Total line length sprayed.
12	Pressure

Operating in Striping Mode

Striper must be running before activating gun trigger control.

1. Make sure ON/OFF switch is ON position.
2. Use gun activation buttons to select guns and line type.

3. Press gun trigger control to begin spraying.

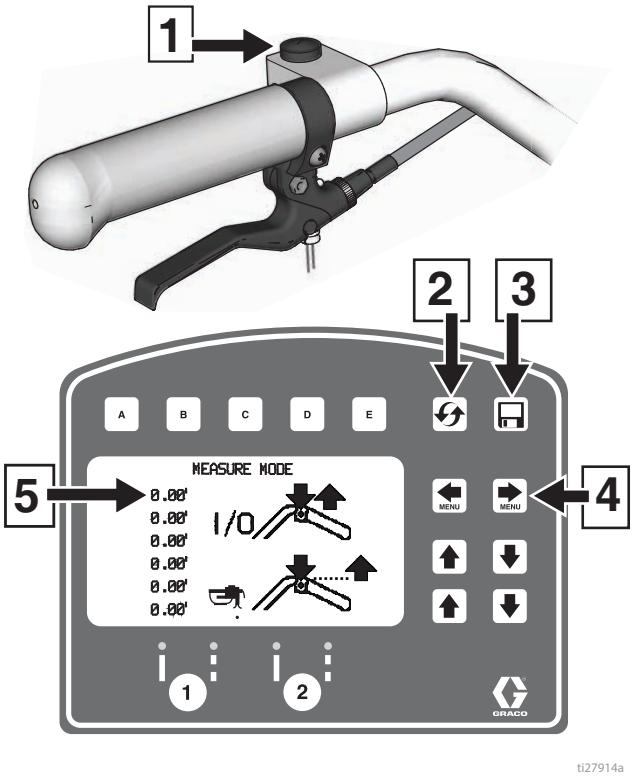


In Automatic Mode or Semi-Automatic Mode the [A] or [S] will flash when gun trigger control is pressed to signal mode is active.

Measure Mode (ES2000 HP Auto Series)

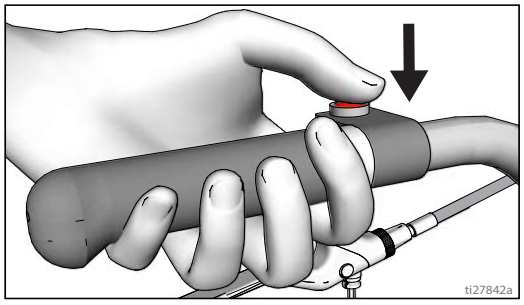
Measure Mode replaces a tape measure to measure distances when laying out an area to be striped.

1. Use MENU MENU to select Measure Mode.



Ref.	Description
1	Press to start measurement, Press to stop measurement.
2	Hold to reset values to zero.
3	Job Data Logger, page 52.
4	Scroll between main menu screens
5	Last measurement taken

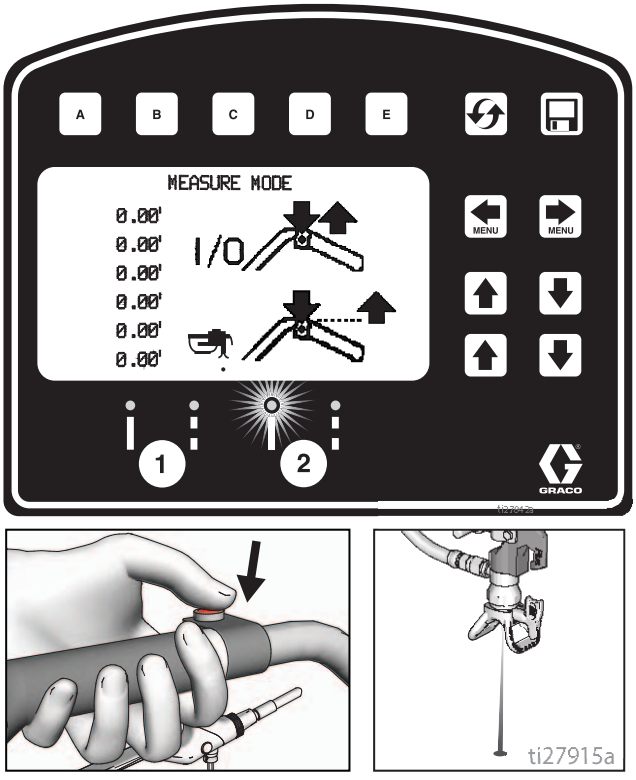
2. Press and release gun trigger control. Move striper forwards or backwards. (Moving backwards is a negative distance.)



3. Press and release gun trigger control to end measured length. Up to six lengths are viewable.

The most recent measured length is also saved as the measured distance in the Stall Calculator display. See **Stall Calculator**, page 45.

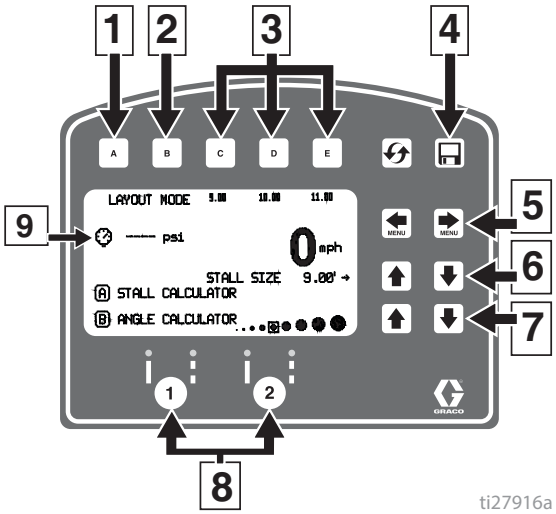
If an auto gun is activated, press and hold gun trigger control at any time to apply a dot. If trigger is held while striper is moving, a dot is marked every 12-inches (30.5cm).



Layout Mode

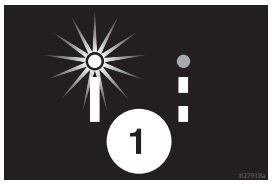
Layout Mode is used to calculate and mark parking lot stalls.

1. Use  to select Layout Mode.

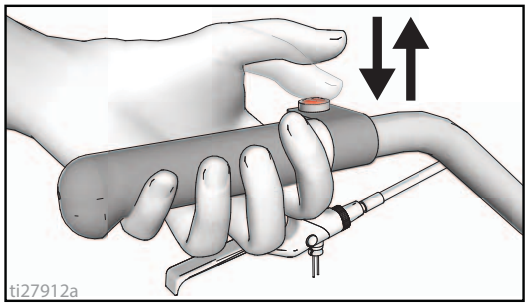


Ref.	Description
1	Opens Stall Calculator Menu. See **Stall Calculator**, page 45.
2	Opens Angle Calculator Menu. See **Angle Calculator**, page 46.
3	**Select** a “Favorite”, press for less than one second.
	Save a “Favorite”, press and hold for more than three seconds.
4	Job Data Logging, page 52.
5	Scroll between menu screens.
6	Adjust stall size/dot spacing.
7	Adjust dot size.
8	Auto Gun activation buttons.
9	Pressure.

2. Use gun activation buttons to select guns.



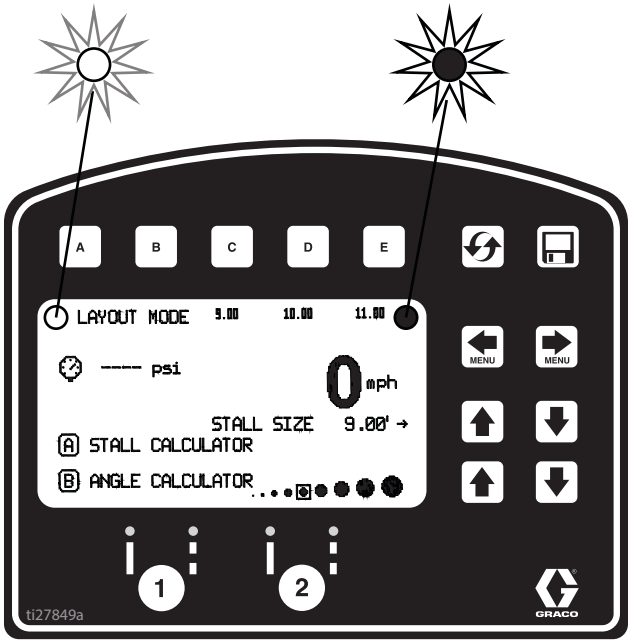
3. Press and release gun trigger control and move striper forward.



4. Striper default is to place a dot every 9.0 ft (2.7m) to mark the stall size. Stall size is adjustable.

5. Dots are laid down until gun trigger control is pressed and released again.

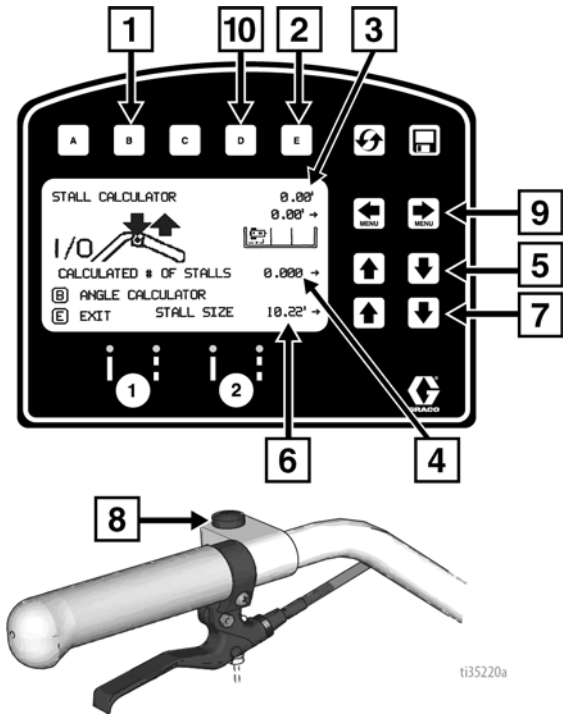
An indicator on the screen alternately flash when gun trigger control is pressed to signal mode is active.



Stall Calculator

Stall Calculator is used to set the stall size. The striper divides the measured length by the stall size to determine the number of stalls that will fit in the length measured. User can adjust number of stalls to a round number and stall width is calculated.

1. Use MENU MENU to select Layout Mode. Press A to open Stall Calculator Menu.



Ref.	Description
1	Opens Angle Calculator Menu. See **Angle Calculator**, page 46.
2	Exits and returns stall size to Layout Mode.
3	Measured distance.
4	Calculated # of stalls. Changing the number of stalls will change the stall size.
5	Adjusts number of stalls.
6	Stall size. Changing stall size changes the calculated # of stalls.
7	Adjusts stall size.
8	Press to start measurement, Press to stop measurement.
9	Adjust Offset (x).
10	Stores Offset (x). Hold for 2 seconds to store value.

2. The most recent length measured in Measure Mode is automatically displayed. Press gun trigger control to start a new measurement. Press again to stop measuring.

   When measuring between curbs, the distance from the back tire/curb to the gun/laser dot, can be accounted for by setting the Offset (x) value.

   a. Back the striper up to the curb, then use a tape measure to measure from where the tire touches the curb to the laser dot on the ground.

   b. Use MENU MENU to enter the offset (x) value.

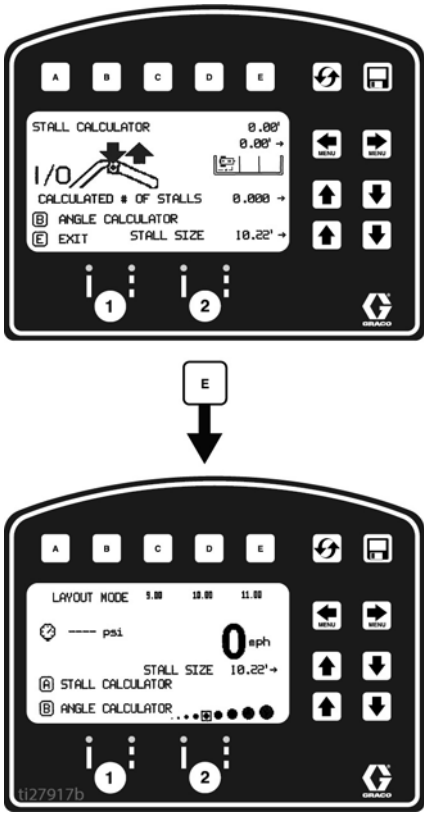
   c. This value can be stored by holding D for 2 seconds.

   d. The value stored under D can be added to the measured distance before or after the measurement is taken between the curbs.

   e. The offset (x) value can also be adjusted before or after the measurement is taken by using MENU MENU.

   Stall size and calculated number of stalls are both adjustable.

3. Press E to return to Layout Mode. The Stall size is saved and displayed on the Layout Mode screen.

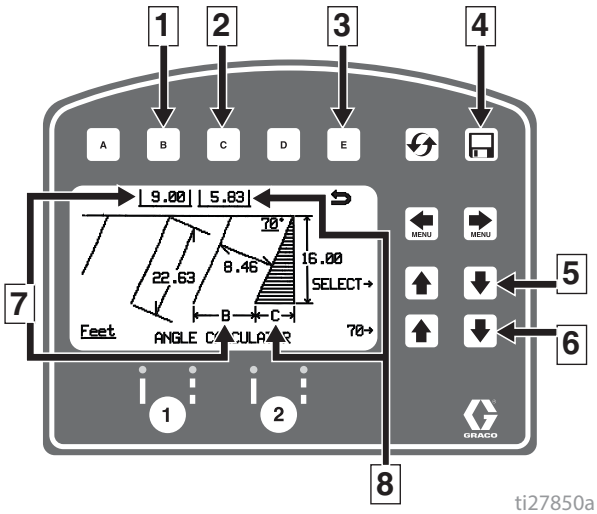


4. Press and release gun trigger control to start marking dots. Press and release gun trigger control again to stop.

Angle Calculator

Angle Calculator is used to determine the offset value and dot spacing value for a layout.

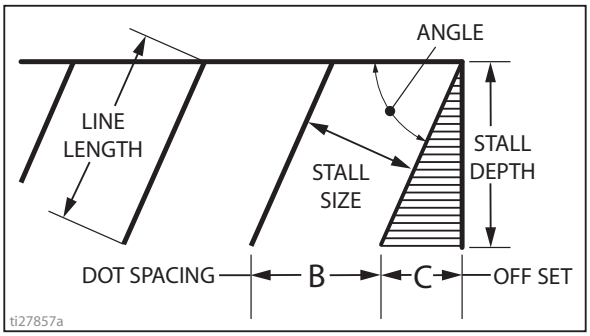
1. Use [MENU] [MENU] to select Layout Mode. Press [B] to open Angle Calculator Menu.



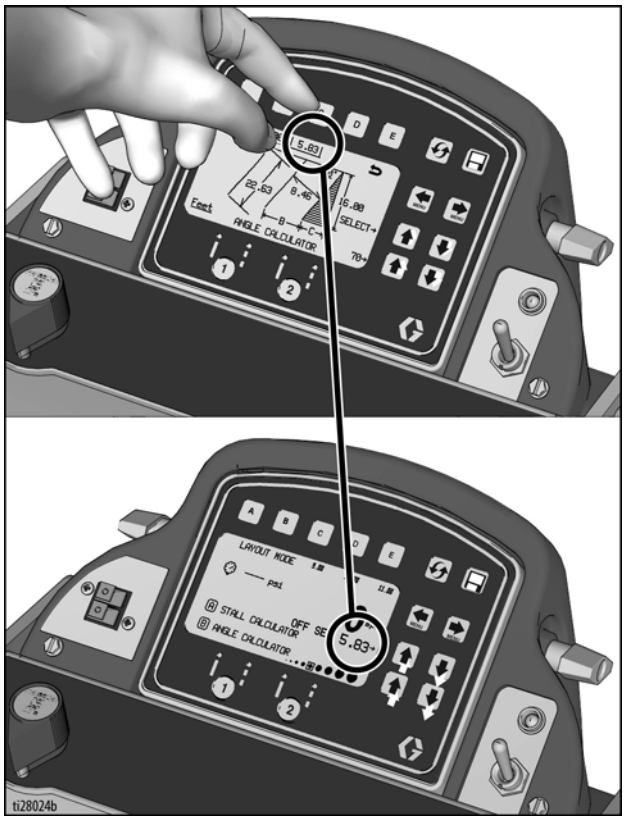
Ref.	Description
1	Transfers calculated dot spacing, B, to Layout Mode.
2	Transfers calculated off set, C, to Layout Mode.
3	Exits and returns to Layout Mode without transferring any values.
4	Data Logging.
5	Select input variables.
6	Adjust the variable selected.
7	Calculated dot spacing, B.
8	Calculated off set, C.

2. Dot spacing (B) and offset (C) are calculated based on the parameters entered:

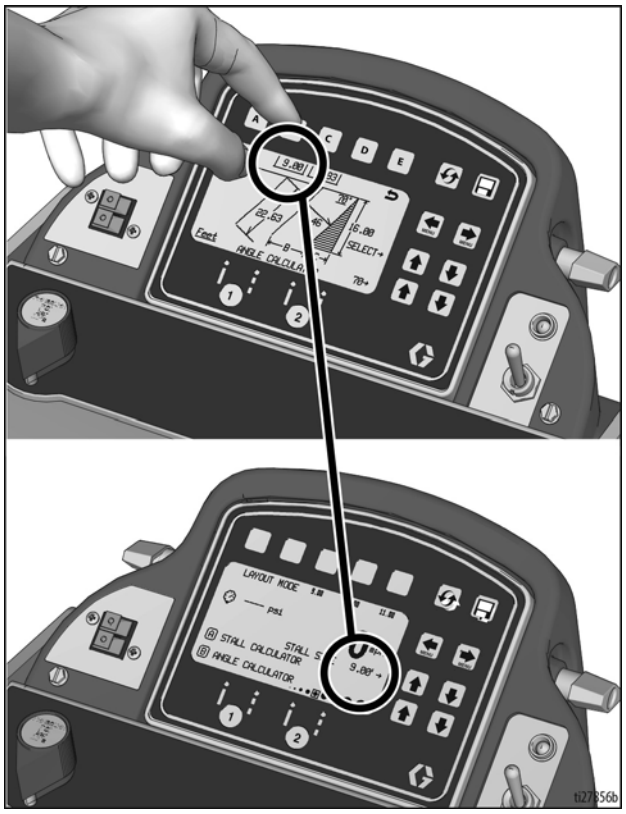
   Stall angle
   Stall depth
   Stall size (width)
   Line Length



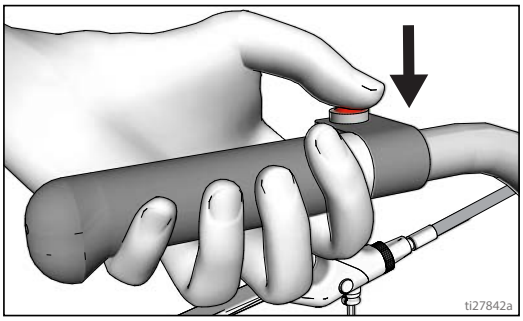
3. Press [C] to transfer calculated off set distance to Layout Mode. Save this value in favorites if desired.



4. Press B to transfer calculated dot spacing distance to Layout Mode. Save this value in favorites if desired.

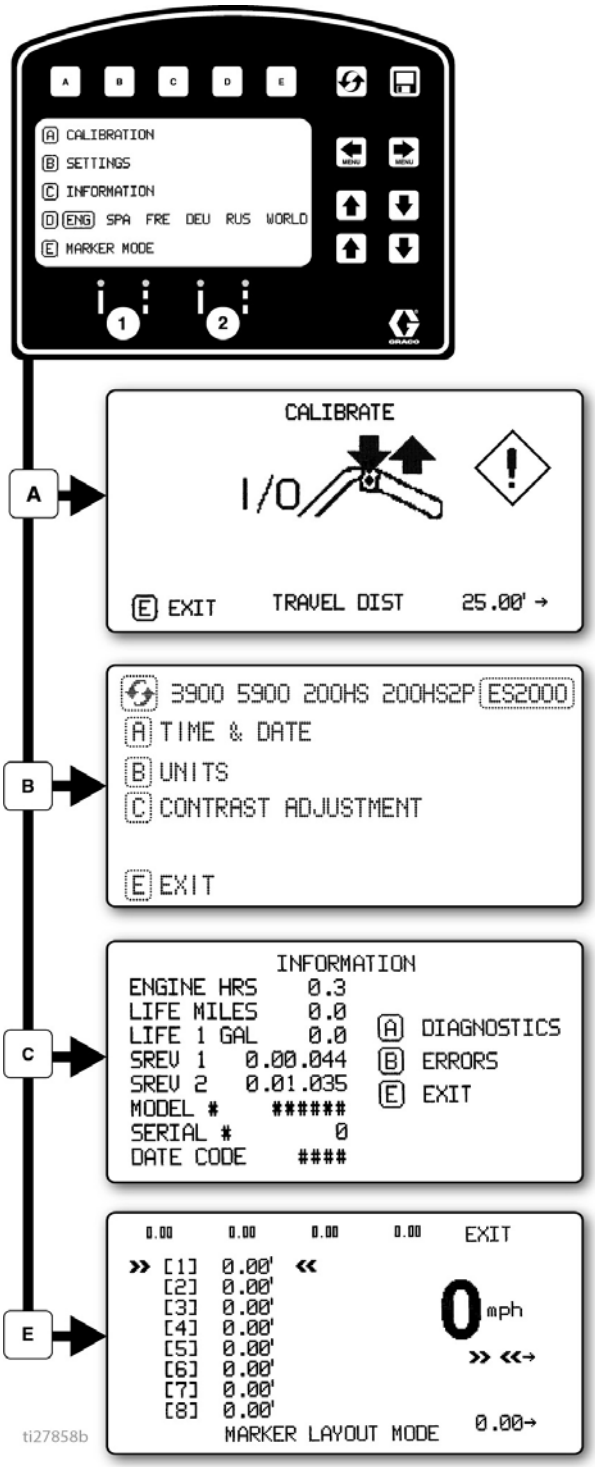


5. Press and release gun trigger control to start marking stall size dots. Press and release gun trigger control to stop marking.



Setup/Information

Use [MENU] [MENU] to select Setup/Information.



Press [D] to select Language.
See **Language**, page 31.

See **Calibration**, page 31.

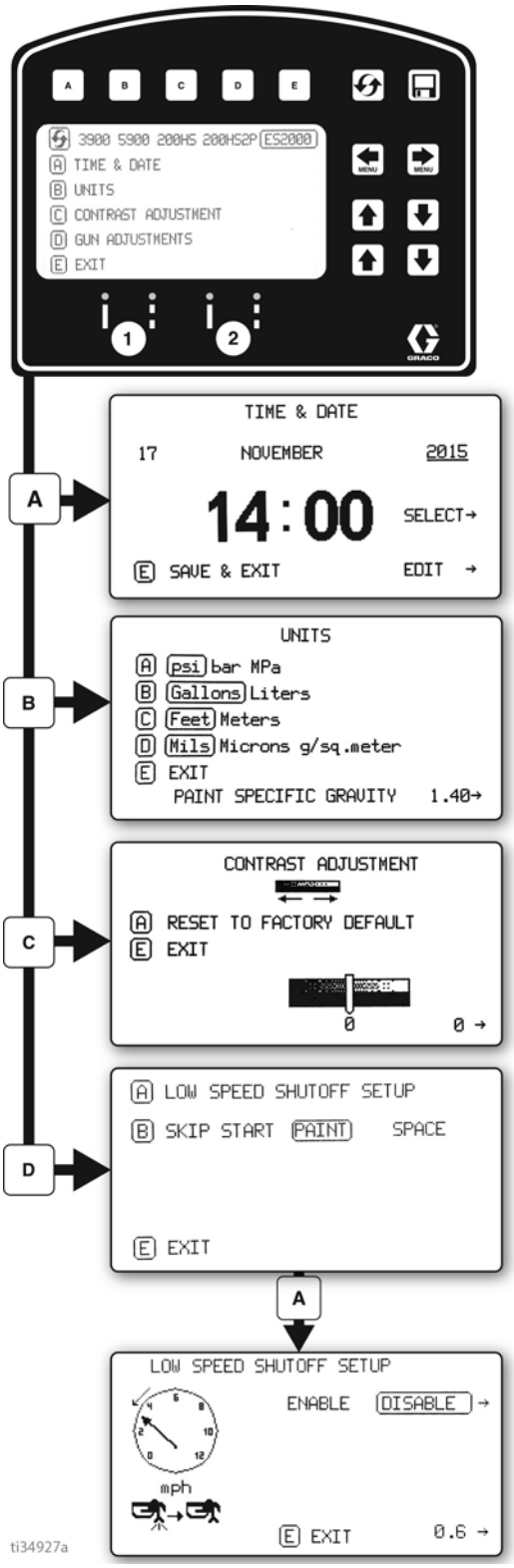
See **Settings**, page 49.

See **Information**, page 50.

See **Marker Layout Mode**, page 51.

Settings

Use [MENU] [MENU] to select Setup/Information. Press [B] to open Settings Menu.



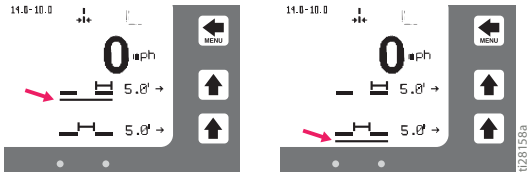
[Chooses the machine type.] Necessary for accurate gallon counting.

Use [▲▼] to set time and date. Needed for accurate Data Logging.

Set units with [A] [B] [C] [D]

Use [▲▼] to adjust screen contrast to the desired value.

For programmed skip lines, press [B] to choose:



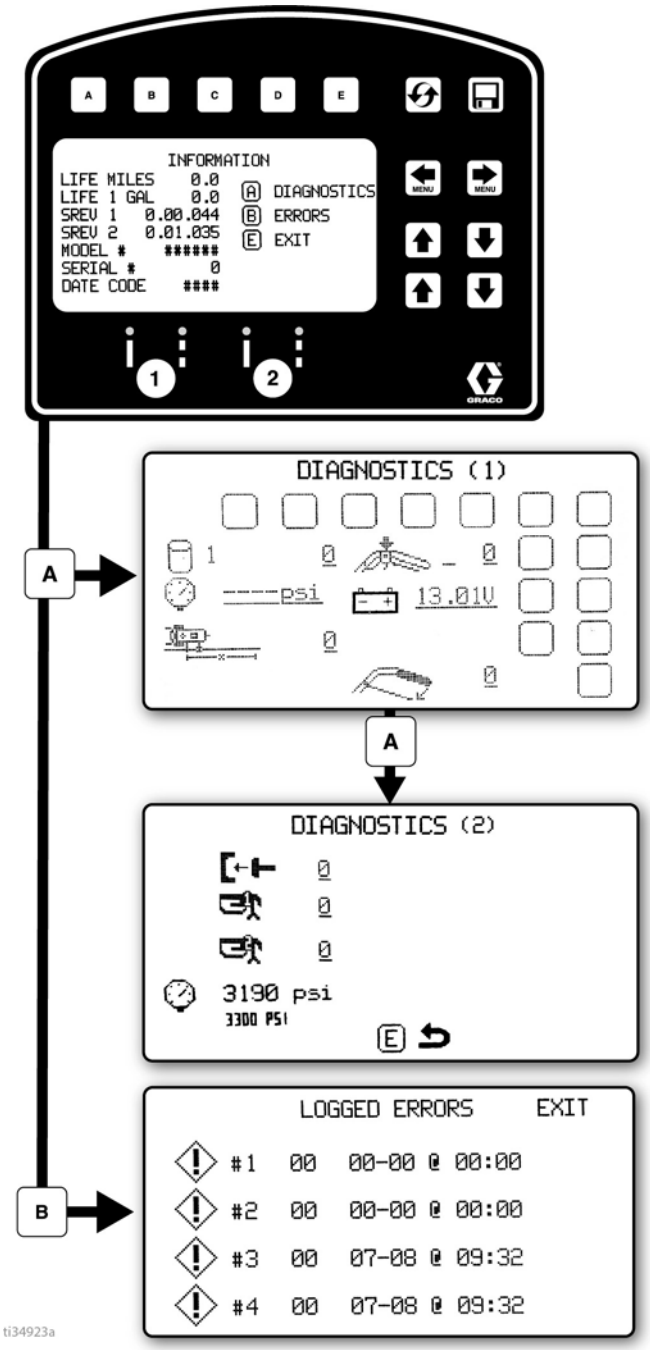
In Auto-mode, guns won't fire or will shut off if speed is below set value.

[MENU] [MENU] Enable or Disable Low Speed Shutoff

[▲▼] Adjust low speed setting.

Information

Use MENU MENU to select Setup/Information. Press C to open Information Menu.



Displays and logs life data and striper information.

View and test functionality of component

Stroke Counter

Touch Pad Buttons

Pressure Transducer

Distance Sensor

Battery Voltage

Logs last four error codes that occurred.

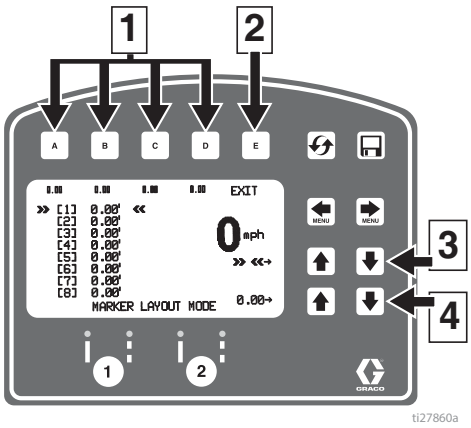
Code Description
02 = Over pressure
03 = No transducer detected

Reset error codes

Marker Layout Mode

The Marker Layout Mode feature sprays a dot or a series of dots to mark an area.

1. Use  to select Setup/Information. Press E to open Marker Layout Mode.



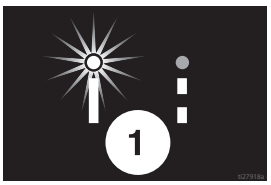
Ref.	Description
1	**Select** a “Favorite”, press for less than one second.
	Save a “Favorite”, press and hold for more than three seconds.
2	Exits and returns to Information Menu.
3	Select value to change.
4	Adjust spacing value.

2. Use arrow keys to set up a marker pattern.

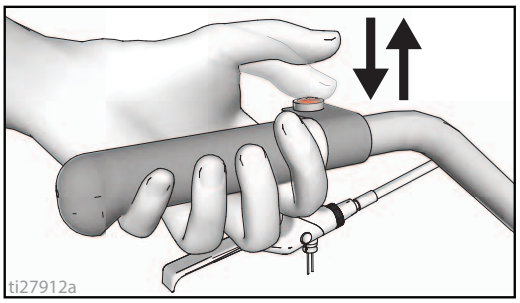
3. Marker layout example shows a typical lane layout for reflective markers. Set space sizes up to eight consecutive measurements. By leaving zeros in any space, Marker Layout Mode will skip to the next measurement in a continuous loop.

   Some other uses of Marker Layout Mode are:
   - Multiple spaced handicap stall layout
   - Double line stalls

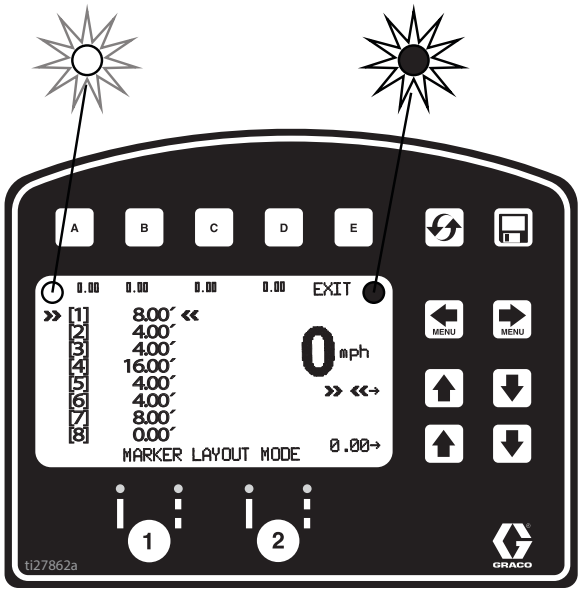
4. Set gun switch to skip line or solid line.

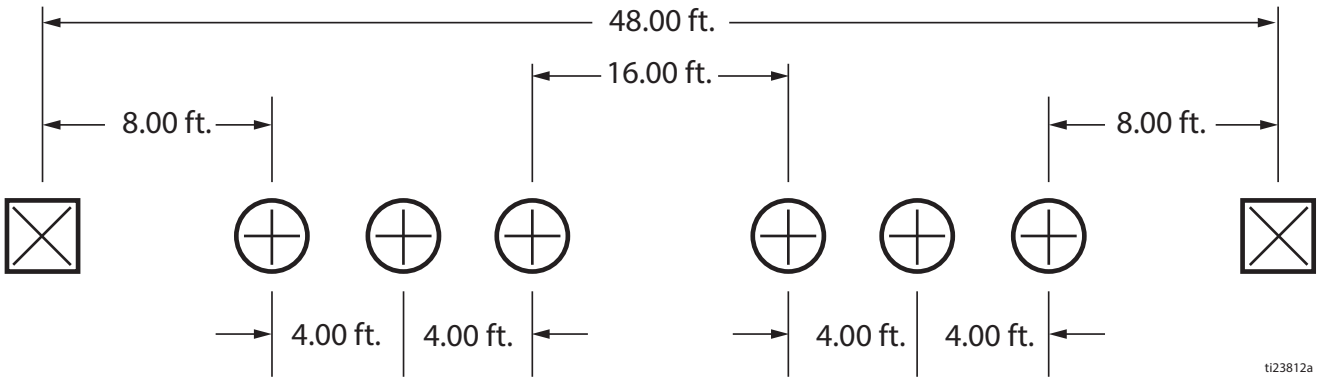


5. Press and release gun trigger control to start marking dots. Press and release gun trigger control again to stop.



An indicator before and after Marker Mode on the screen alternately flash when gun trigger control is pressed to signal mode is active.

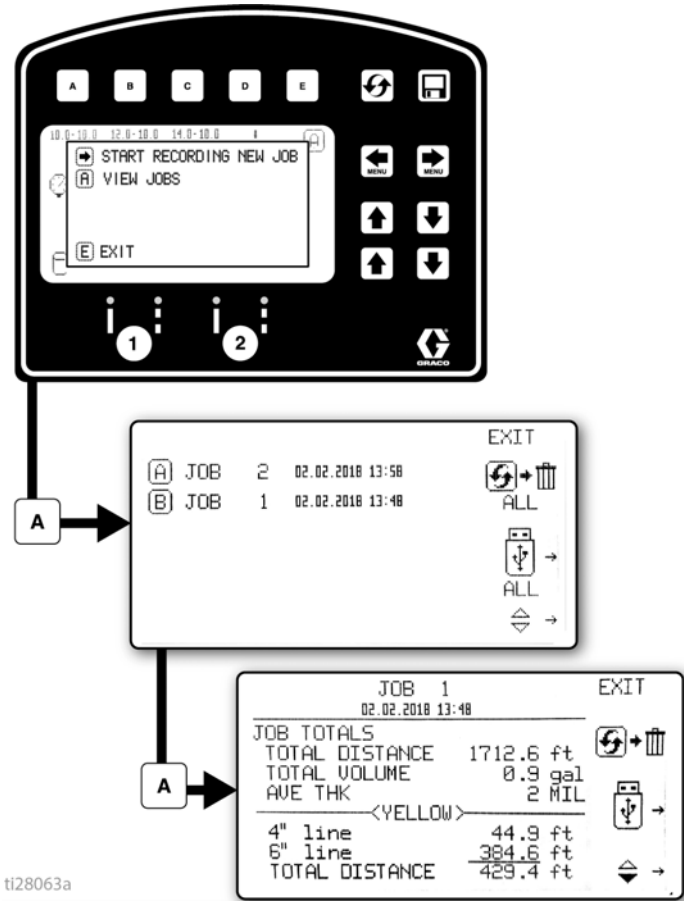




Data Logging

The LLV control is equipped with Data Logging, which allows the user to recall job data and export the data from the machine to a USB drive.

1. Press the to open the Data Logging pop up window.
2. Choose to start recording a new job or view jobs previously done.



Start recording a new job.

Erase all jobs

Export all jobs to USB

Erase jobs

Export job to USB

Job data is compiled while spraying. A summary of volume sprayed, distance sprayed and average mil thickness is displayed for the entire job. The job is also broken down by colors, line widths and stencil volume sprayed.

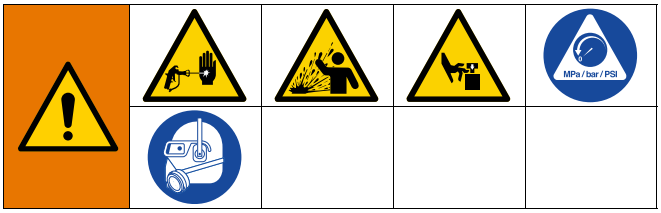
Maintenance

Routine maintenance is important to ensure proper operation of your sprayer. Maintenance includes performing routine actions which keep your sprayer in operation and prevents trouble in the future.

Activity	Interval
Inspect/clean sprayer filter, fluid inlet strainer, and gun filter.	Daily or each time you spray
Inspect motor shield vents for blockage.	Daily or each time you spray
Fill TSL by adding through TSL fill point.	Daily or each time you spray
Check hose for wear and damage.	Daily or each time you spray
Check gun safety for proper operation.	Daily or each time you spray
Check drain valve for proper operation.	Daily or each time you spray
Verify calibration.	Daily or each time you spray
Tighten nut under dust cover on front caster until spring washer bottoms out, then back off the nut 1/2 to 3/4 turn.	Once per year or as needed
Grease wheel bearings.	Once per month
Check caster wheel alignment.	Daily or each time you spray
Check sprayer stall. With sprayer gun NOT triggered, sprayer motor should stall and not restart until gun is triggered again. If sprayer starts again with gun NOT triggered, inspect pump for internal/external leaks and check prime valve for leaks.	Every 1000 gallons (3785 liters)
Throat packing adjustment When pump packing begins to leak after extended use, tighten packing nut down until leakage stops or lessens. This allows approximately 100 gallons of additional operation before a repacking is required. Packing nut can be tightened without 0-ring removal.	As necessary based on usage

Troubleshooting (ES 1000 & ES 2000)

Mechanical/Fluid Flow



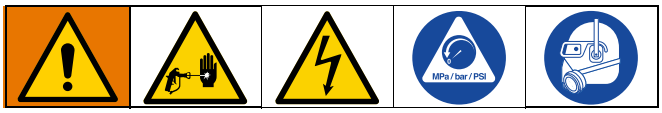
1. Follow **Pressure Relief Procedure**, page 16, before checking or repairing.
2. Check all possible problems and causes before disassembling the unit.

Problem	What to Check If check is OK, go to next check	What to Do When check is not OK, refer to this column
Control board status light is blinking or the light is off and there is power to the sprayer.	Fault condition exists.	Determine fault correction from page 56. Follow **Pressure Relief Procedure**, page 16.
Pump output is low	Spray tip worn.	Follow **Pressure Relief Procedure**, page 16, then replace tip. See separate gun or tip manual.
	Spray tip clogged.	Follow **Pressure Relief Procedure**, page 16. Check and clean spray tip.
	Paint supply.	Refill and reprime pump.
	Intake strainer clogged.	Remove and clean, then reinstall.
	Intake valve ball and piston ball are not seating properly.	Remove intake valve and clean. Check balls and seats for nicks; replace if necessary. See pump manual. Strain paint before using to remove particles that could clog pump.
	Fluid filter or tip filter is clogged or dirty.	Clean filter.
	Prime valve leaking.	Follow **Pressure Relief Procedure**, page 16, then repair prime valve.
	Verify pump does not continue to stroke when gun trigger is released. (Prime valve not leaking.)	Service pump. See pump manual.
	Leaking around throat packing nut which may indicate worn or damaged packings.	Replace packings. See pump manual. Also check piston valve seat for hardened paint or nicks and replace if necessary. Tighten packing nut/wet-cup.
	Pump rod damage.	Repair pump. See pump manual.
	Low stall pressure.	Turn pressure knob fully clockwise. Make sure pressure control knob is properly installed to allow full clockwise position. If problem persists, replace pressure transducer.
	Piston packings are worn or damaged.	Replace packings. See pump manual.
	O-ring in pump is worn or damaged.	Replace o-ring. See pump manual.
	Intake valve ball is packed with material.	Clean intake valve. See pump manual.
	Large pressure drop in hose with heavy materials.	Reduce overall length of hose.
	Check extension cord for correct size.	See **Extension Cords**, page 14.

Problem	What to Check If check is OK, go to next check	What to Do When check is not OK, refer to this column
Motor runs but pump does not stroke	Connecting rod assembly damaged.	Replace connecting rod assembly. See pump manual.
	Gears or drive housing damaged.	Inspect drive housing assembly and gears for damage and replace if necessary.
Excessive paint leakage into throat packing nut	Throat packing nut is loose.	Remove throat packing nut spacer. Tighten throat packing nut just enough to stop leakage.
	Throat packings are worn or damaged.	Replace packings. See pump manual.
	Displacement rod is worn or damaged.	Replace rod. See pump manual.
Fluid is spitting from gun	Air in pump or hose.	Check and tighten all fluid connections. Cycle pump as slowly as possible during priming.
	Spray tip is partially clogged.	Clear tip.
	Fluid supply is low or empty.	Refill fluid supply. Prime pump. See pump manual. Check fluid supply often to prevent running pump dry.
Pump is difficult to prime	Air in pump or hose.	Check and tighten all fluid connections. Cycle pump as slowly as possible during priming.
	Intake valve is leaking.	Clean intake valve. Be sure ball seat is not nicked or worn and that ball seats well. Reassemble valve.
	Pump packings are worn.	Replace pump packings. See pump manual.
	Paint is too thick.	Thin the paint according to supplier recommendations.
Sprayer operates for 5 to 10 minutes then stops	Pump packing nut too tight. When pump packing nut is too tight the packings on the pump rod restrict pump action and overloads the motor.	Loosen pump packing nut. Check for leaks around throat. If necessary, replace pump packings. See Pump manual.

Electrical (ES 1000)

Symptom: Sprayer does not run, stops running, or will not shut off.



1. Perform **Pressure Relief Procedure**, page 16.
2. Turn the ON/OFF switch **OFF** wait 30 seconds and then turn power back **ON** again (this ensures sprayer is in normal run mode).
3. Turn pressure control knob clockwise 1/2 turn.

Keep clear of electrical and moving parts during troubleshooting procedures. To avoid electrical shock hazards when covers are removed for troubleshooting, wait five minutes after disconnecting power cord for stored electricity to dissipate.

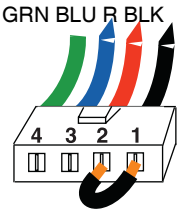
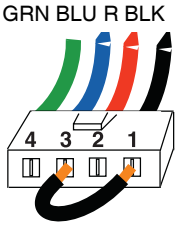
4. Remove control box cover to view control board status light. To determine which code (or any other code besides voltage supply) refer to the control board status light. Turn the ON/OFF switch **OFF**, remove the control cover then turn power back **ON**. Observe the status light. Blinking LED total count equals the error code (for example: two blinks equals CODE 02).

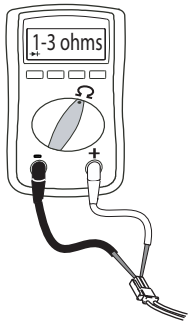
Error Code Messages

CODE	MESSAGE	ACTION
02	HIGH PRESSURE DETECTED - RELIEVE PRESSURE	Check for clogs. Use only Graco spray hoses, use a minimum of 50ft/15m.
03	PRESSURE TRANSDUCER NOT DETECTED	Check transducer connection.
05	MOTOR NOT SPINNING	Check for mechanical failure and check motor connections. Material may be too thick, thin material.
06	MOTOR OVERHEATED	Turn sprayer OFF. Check motor connections. Check shroud vents for blockage. Sprayer may take up to an hour to cool.

Problem	What to Check	How to check
Sprayer does not run at all AND Control board status light never lights	See flow chart, page 68.	
Sprayer does not shut off AND Control board status light blinks 2 times repeatedly	Control board.	Replace control board.

Problem	What to Check	How to check
Sprayer does not run at all AND Control board status light blinks 2 times repeatedly	Check transducer or transducer connections	Make sure there is no pressure in the system (see **Pressure Relief Procedure**, page 16). Check fluid path for clogs, such as clogged filter. Use airless paint spray hose with no metal braid. A small hose or metal braid hose may result in high-pressure spikes. Turn ON/OFF switch **OFF** and disconnect power to sprayer by unplugging power cord and disconnecting battery. Check transducer and connections to control board. Disconnect transducer from control board socket. Check that transducer and control board contacts are clean and secure. Reconnect transducer to control board socket. Connect power, turn ON/OFF switch **ON** and control knob 1/2 turn clockwise. If sprayer does not run properly, turn ON/OFF switch **OFF** and go to next step. Install new transducer. Connect power, turn ON/OFF switch **ON** and control knob 1/2 turn clockwise. Replace control board if sprayer does not run properly.
Sprayer does not run at all AND Control board status light blinks 3 times repeatedly	Check transducer or transducer connections (control board is not detecting a pressure signal).	Turn ON/OFF switch **OFF** and disconnect power to sprayer by unplugging power cord and disconnecting battery. Check transducer and connections to control board. Disconnect transducer from control board socket. Check to see if transducer and control board contacts are clean and secure. Reconnect transducer to control board socket. Connect power, turn ON/OFF switch **ON** and control knob to 1/2 turn clockwise. If sprayer does not run, turn ON/OFF switch **OFF** and go to next step. Connect a confirmed working transducer to control board socket. Turn ON/OFF switch **ON** and control knob to 1/2 turn clockwise. If sprayer runs, install new transducer. Replace control board if sprayer does not run. Check transducer resistance with an ohmmeter (less than 9k ohm between red and black wires and 3-6k ohm between green and yellow wires).

Problem	What to Check	How to check
Sprayer does not run at all AND Control board status light blinks 5 times repeatedly	Control is commanding motor to run but motor shaft does not rotate. Possibly locked rotor condition, an open connection exists between motor and control, there is a problem with motor or control board, or motor amp draw is excessive.	1. Remove pump and try to run sprayer. If motor runs, check for locked or frozen pump or drive train. If sprayer does not run, continue to step 2. 2. Turn ON/OFF switch **OFF** and disconnect power to sprayer by unplugging power cord and disconnecting battery. 3. Disconnect motor connector(s) from control board socket(s). Check that motor connector and control board contacts are clean and secure. If contacts are clean and secure, continue to step 4. 4. Set sprayer to OFF and spin motor fan 1/2 turn. Restart sprayer. If sprayer runs replace control board. If sprayer does not run, continue to step 5. 5. Perform Spin Test: Test at large 4-pin motor field connector. Disconnect fluid pump from sprayer. Test motor by placing a jumper across pins 1 & 2. Rotate motor fan at about 2 revolutions per second. A cogging resistance to motion should be felt at the fan. The motor should be replaced if no resistance is felt. Repeat for pin combinations 1 & 3 and 2 & 3. Pin 4 (the green wire) is not used in this test. If all spin test is positive, continue to step 6. **STEP 1:**  **STEP 2:**  **STEP 3:** 

Problem	What to Check	How to check
		6. Perform Field Short Test: Test at large 4-pin motor field connector. There should not be continuity from pin 4, the ground wire, and any of the remaining 3 pins. If motor field connector tests fail, replace motor. 7. Check Motor Thermal Switch: Unplug thermal wires. Set meter to ohms. Meter should read 100k ohms.  8. Reconnect motor connector(s) to control board socket(s). Connect power, turn ON/OFF switch **ON** and control knob to 1/2 turn clockwise. If motor does not run, replace control board.
Sprayer does not run at all AND Control board status light blinks 6 times repeatedly	Motor is hot or there is a fault in the motor thermal device.	Allow sprayer to cool. If sprayer runs when cool, correct cause of overheating. Keep sprayer in cooler location with good ventilation. Make sure motor air intake is not blocked. If sprayer still does not run, replace motor. **NOTE:** Motor must be cooled down for the test. 1. Check thermal device connector (yellow wires) at control board. 2. Disconnect thermal device connector from control board socket. Make sure contacts are clean and secure. Measure resistance of the thermal device. If reading is not correct, replace motor. **Check Motor Thermal Switch:** Unplug thermal wires. Set meter to ohms. Meter should read 100k ohms. 3. Reconnect thermal device connector to control board socket. Connect power, turn sprayer ON and control knob 1/2 turn clockwise. If sprayer does not run, replace control board.
Basic electrical problems	Motor leads are securely fastened and properly mated	Replace loose terminals; crimp to leads. Be sure terminal are firmly connected. Clean circuit board terminals. Securely reconnect leads.
	Motor armature commutator for burn spots, gouges or extreme roughness.	Remove motor and have motor shop resurface commutator if possible.
Inverter will not turn on during initial power up.	Batteries are not connected, loose battery-side connections	Check the batteries and cable connections. Check DC fuse and breaker.
	Low battery voltage below 10V	Charge the battery with external charger (not charger on board the unit).
No AC output voltage and indicator lights ON.	Output circuit breaker tripped	Check circuit breaker and reset if necessary, page 71.

Problem	What to Check	How to check
AC output voltage is low and the inverter turns loads OFF in a short time.	Low battery	Check the condition of the batteries and recharge if possible.
Charger is inoperative and unit will not accept AC.	AC voltage has dropped out-of-tolerance	Check the AC voltage for proper voltage and frequency.
Charger is supplying a lower charger rate.	Charger controls are improperly set.	Refer to the section on adjusting the “Charger Rate”
	Low AC input voltage.	Source qualified AC power.
	Loose battery or AC input connections.	Check all DC / AC connections.

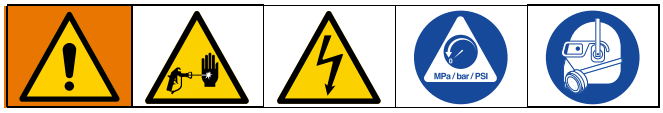
ES 2000 Troubleshooting

Problem	What to Check	How to check
Gallon (liter) counter not adding fluid volume.	Fluid pressure not high enough.	Must be over 800 psi (55 bar) for counter to add.
	Broken or disconnected pump counter wire, both pumps.	Check wires and connections. Replace any broken wires.
	Missing or damaged magnet.	Reposition or replace magnet on pump, see Parts manual (Pump parts) for magnet location.
	Bad sensor, both pumps.	Replace sensor.
Sprayer operates, but display does not.	Bad connection between control board and display.	Remove display and reconnect.
	Display damaged.	Replace display.
Distance not adding properly (Measure mode will be inaccurate and speed will be wrong).	Machine not calibrated.	Perform calibration procedure. See Operation manual.
	Rear tire pressure is too low or too high.	Adjust tire pressure to 55 +/- 5 psi (380 +/- 34kPa).
	Gear teeth missing or damaged (right side when standing on platform).	Replace distance gear/wheel hub.
	Distance sensor is loose or broken.	Reconnect or replace sensor.
Mils not calculating or calculates wrong.	Distance sensor.	See “Distance counter not operating properly”.
	Gallon counter.	See “Gallon (liter) counter not adding fluid volume.”
	Line width not entered.	Set line width on main striping screen.
	Bad or damaged control board.	Replace control board.
Fluid spray starts after spray icon is shown on display.	Interrupter.	Turn screw counterclockwise until spray icon synchronizes with fluid spray, page 24.
Spray icon does not show on display when fluid is sprayed.	Loose connector.	Check connector and reconnect.
	Interrupter is improperly positioned.	Turn screw counterclockwise until spray icon synchronizes with fluid spray, page 24.
	Reed switch assembly is damaged.	Replace reed switch assembly.
	Magnet on assembly is missing.	Replace reed switch assembly.
	Cut or sliced wire.	Replace distance sensor harness.
	Control board is damaged.	Replace control board.
	Display is damaged.	Replace display.

Problem	What to Check	How to check
Spray icon is always shown on display.	Interrupter is improperly positioned.	Turn screw clockwise until spray icon is synchronized with fluid spray, page 24.
	Reed switch assembly is damaged.	Replace reed switch assembly.
AUTO GUN MODE		
Auto Gun won't actuate when the red button is pressed.	Gun is not activated.	Press the 1 or 2 button on control to activate a gun.
	Cable is not adjusted properly.	Adjust Cable to properly actuate gun trigger, page 25.
	Not on main striping screen.	Go to main striping screen on control to Actuate Auto Guns.
	Low Speed Shut off is enabled.	Disable Low Speed Shutoff, see page 49.
	Battery Voltage is too low.	Check battery voltage on Diagnostic Screen, pages 37 & 50, or with Volt meter. If below 11.5V, charge battery or replace battery.
	Cable is not adjusted properly.	Adjust Cable to properly actuate gun trigger, page 25.
	Red button is broken.	Test button functionality in Diagnostic screen, page 50, replace if broken.
	Auto Gun Cable is broken or extremely kinked resulting in too much drag.	Replace Auto Gun Cable.
	Solenoid wire is disconnected or broke.	Check Wiring Diagram, pages 109 or 112, repair or replace wires if necessary.
	Fuse to battery is removed or blown.	Check and replace fuse.
	Solenoid is jammed.	Spray Lubrication on solenoid plunger.
	Solenoid is failed.	Check resistance across solenoid wires. Resistance should be between .2 and .26 ohms. If it's not, replace solenoid.
	Control board has failed.	Replace Control board.
Line Spacing is not accurate	Wrong line pattern loaded.	Reload the correct pattern.
	Machine is out of calibration.	Calibrate the machine, page 31 or 40.
Battery won't stay charged.	Accessories are left on and drain the battery when unit is not in use.	Turn off accessories when machine is not in use.
Auto Gun won't shut off	Cable is kinked.	Repair or replace cable.
	Solenoid is jammed.	Lubricate solenoid plunger, Check for solenoid damage.
	Needle in gun is clogged.	Clean out gun.
LAYOUT MODE		
No dots or poor dots in Layout and Marking Mode.	Too small of Dot setting.	Increase Dot size, page 44.
	Gun is not activated.	Press the 1 or 2 button on control to activate a gun.
	Cable is not adjusted properly.	Adjust Cable to properly actuate gun trigger, page 25.
	Tip clog.	Clear tip or Replace tip.
	Battery voltage is too low.	Charge battery or replace battery.
	Pump is not on, or pressure is not set.	Increase pressure to a minimum of 200 psi.

Electrical (ES 2000)

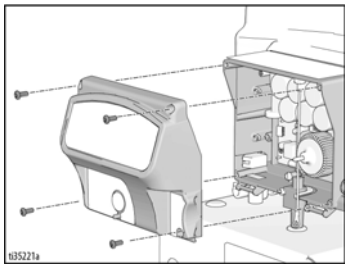
Symptom: Sprayer does not run, stops running, or will not shut off.



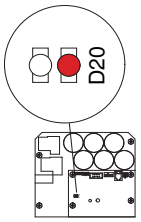
1. Perform **Pressure Relief Procedure**, page 16.
2. Set power switch OFF for 30 seconds and then ON again (this ensures sprayer is in normal run mode).
3. Turn pressure control knob clockwise 1/2 turn.

Keep clear of electrical and moving parts during troubleshooting procedures. To avoid electrical shock hazards when covers are removed for troubleshooting, wait five minutes after unplugging power cord for stored electricity to dissipate.

4. Remove control box cover to view control board status light. To determine which code refer to the control board status light. Turn the ON/OFF switch OFF, remove the control cover then turn power back ON. Observe the status light. Blinking LED total count equals the error code (for example: two blinks equals CODE 02).

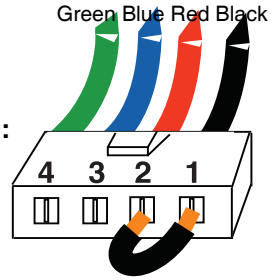
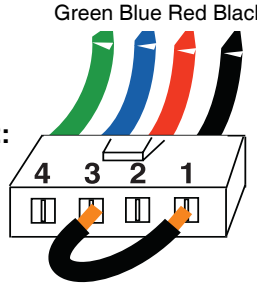
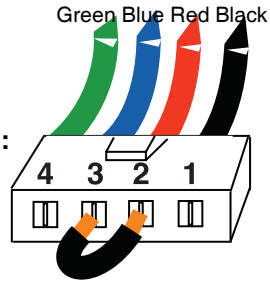


Control Board Status Light



TYPE OF PROBLEM	WHAT TO CHECK	HOW TO CHECK
Sprayer does not run at all Control board status light never lights	See flow chart, page 68.	
Sprayer does not run at all Control board status light blinks 2 times repeatedly	Check transducer or transducer connections	1. Make sure there is no pressure in the system (see **Pressure Relief Procedure**, page 16). Check fluid path for clogs, such as clogged filter. 2. Use airless paint spray hose with no metal braid 3/8 x 20' minimum. Smaller hose or metal braid hose may result in high-pressure spikes. 3. Set sprayer to OFF and disconnect power to sprayer. 4. Check transducer and connections to control board. 5. Disconnect transducer from control board socket. Check that transducer and control board contacts are clean and secure. 6. Reconnect transducer to control board socket. Connect power, set sprayer ON and control knob 1/2 turn clockwise. If sprayer does not run properly, set sprayer to OFF and go to next step. 7. Install new transducer. Connect power, set sprayer ON and control knob 1/2 turn clockwise. Replace control board if sprayer does not run properly.

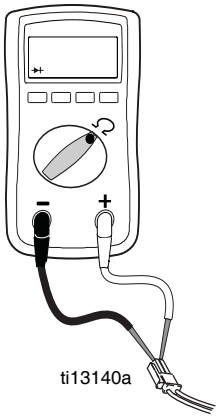
TYPE OF PROBLEM	WHAT TO CHECK	HOW TO CHECK
Sprayer does not run at all Control board status light blinks 3 times repeatedly	Check transducer or transducer connections (control board is not detecting a pressure signal).	1. Set sprayer to OFF and disconnect power to sprayer. 2. Check transducer and connections to control board. 3. Disconnect transducer from control board socket. Check to see if transducer and control board contacts are clean and secure. 4. Reconnect transducer to control board socket. Connect power, set sprayer ON and control knob to 1/2 turn clockwise. If sprayer does not run, set sprayer to OFF and go to next step. 5. Connect a confirmed working transducer to control board socket. 6. Set sprayer ON and control knob to 1/2 turn clockwise. If sprayer runs, install new transducer. Replace control board if sprayer does not run. 7. Check transducer resistance with ohmmeter (less than 9k ohm between red and black wires and 3-6k ohm between green and yellow wires).
Sprayer does not run at all Control board status light blinks 4 times repeatedly	Check voltage supply to the sprayer (control board is detecting multiple voltage surges).	1. Set sprayer to OFF and disconnect power to sprayer. 2. Locate a good voltage supply to prevent damage to electronics. 3. See **Inverter (ES 1000 & ES 2000)**, page 71.

TYPE OF PROBLEM	WHAT TO CHECK	HOW TO CHECK
Sprayer does not run at all Control board status light blinks 5 times repeatedly	Control is commanding motor to run but motor shaft does not rotate. Possibly locked rotor condition, an open connection exists between motor and control, there is a problem with motor or control board, or motor amp draw is excessive.	1. Remove pump and try to run sprayer. If motor runs, check for locked or frozen pump or drive train. If sprayer does not run, continue to step 2. 2. Set sprayer to OFF and disconnect power to sprayer. 3. Disconnect motor connector(s) from control board socket(s). Check that motor connector and control board contacts are clean and secure. If contacts are clean and secure, continue to step 4. 4. Set sprayer to OFF and spin motor fan 1/2 turn. Restart sprayer. If sprayer runs, replace control board. If sprayer does not run, continue to step 5. 5. **Perform Spin Test:** Test at large 4-pin motor field connector. Disconnect fluid pump from sprayer. Test motor by placing a jumper across pins 1 & 2. Rotate motor fan at about 2 revolutions per second. A cogging resistance to motion should be felt at the fan. The motor should be replaced if no resistance is felt. Repeat for pin combinations 1 & 3 and 2 & 3. Pin 4 (the green wire) is not used in this test. If all spin test is positive, continue to step 6. **STEP 1:**  **STEP 2:**  **STEP 3:** 

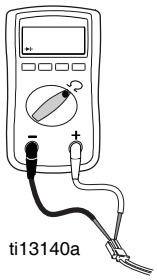
<table>
<tr><th>TYPE OF PROBLEM</th><th>WHAT TO CHECK</th><th>HOW TO CHECK</th></tr>
<tr><td>Sprayer does not run at all

Control board status light blinks 5 times repeatedly</td><td>Control is commanding motor to run but motor shaft does not rotate. Possibly locked rotor condition, an open connection exists between motor and control, there is a problem with motor or control board, or motor amp draw is excessive.</td><td>6. Perform Field Short Test: Test at large 4-pin motor field connector. There should not be continuity from pin 4, the ground wire, and any of the remaining 3 pins. If motor field connector tests fail, replace motor.

7. Check Motor Thermal Switch: Unplug thermal wires. Set meter to ohms. Meter should read the proper resistance for each unit (see table below).

<table><tr><th colspan="2">Resistance Table:</th></tr><tr><td>ES 2000</td><td>2k ohms</td></tr></table></td></tr>
</table>

<table>
<tr><th>TYPE OF PROBLEM</th><th>WHAT TO CHECK</th><th>HOW TO CHECK</th></tr>
<tr><td>Sprayer does not run at all
Control board status light blinks 6 times repeatedly</td><td>Allow sprayer to cool. If sprayer runs when cool, correct cause of overheating. Keep sprayer in cooler location with good ventilation. Make sure motor air intake is not blocked. If sprayer still does not run, follow Step 1.</td><td>NOTE: Motor must be cooled down for the test.
1. Check thermal device connector (yellow wires) at control board.
2. Disconnect thermal device connector from control board socket. Make sure contacts are clean and secure. Measure resistance of the thermal device. If reading is not correct, replace motor.
Check Motor Thermal Switch: Unplug thermal wires. Set meter to ohms. Meter should read the proper resistance for each unit (see table below).
 
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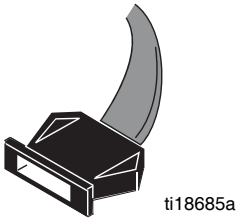
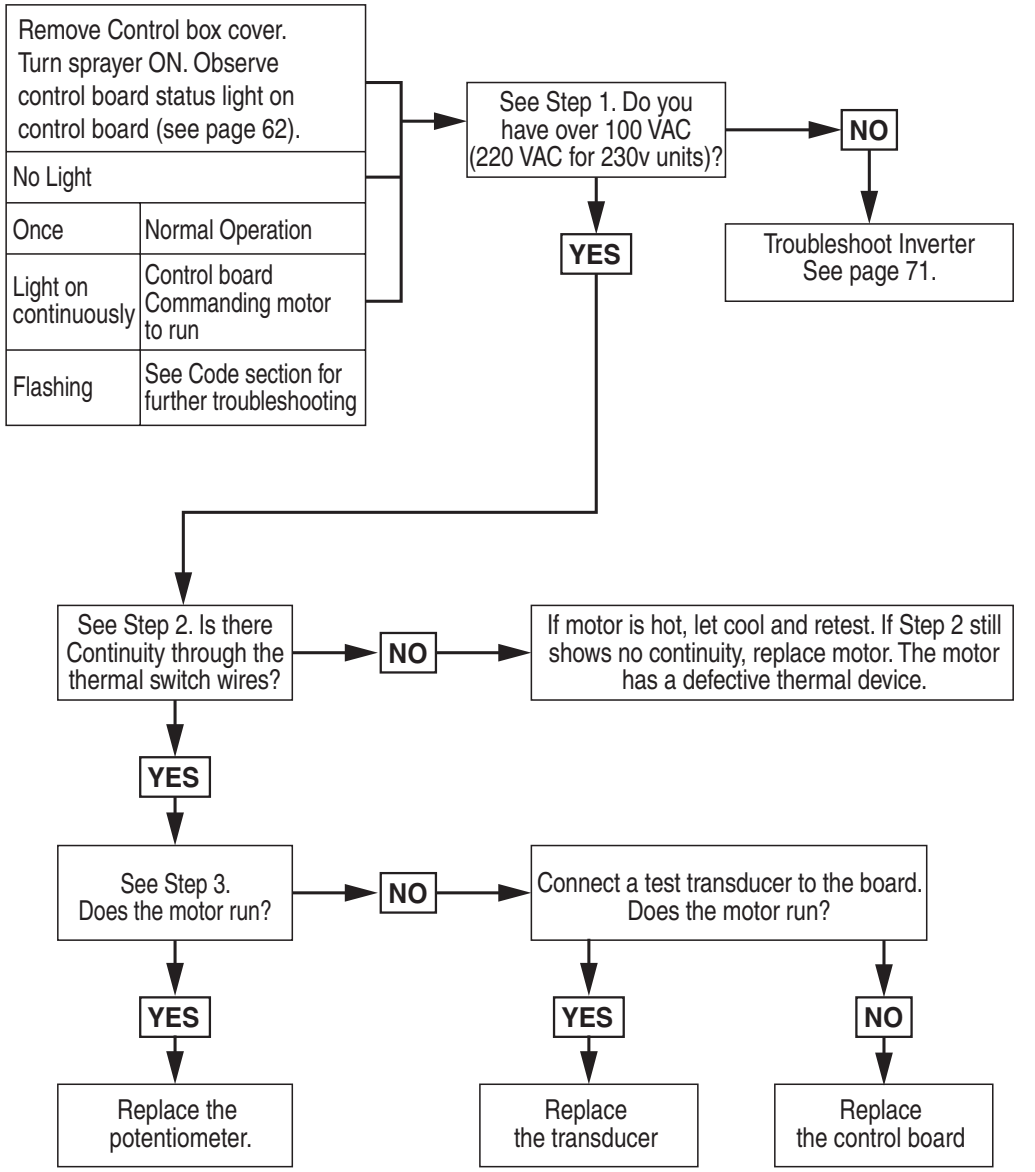
<table><tr><th colspan="2">Resistance Table:</th></tr><tr><td>ES 2000</td><td>2k ohms</td></tr></table>
3. Reconnect thermal device connector to control board socket. Connect power, turn sprayer ON and control knob 1/2 turn clockwise. If sprayer does not run, replace control board.</td></tr>
<tr><td>Sprayer does not run at all
Control board status light blinks 8 times repeatedly</td><td>Check voltage supply to the sprayer (incoming voltage too low for sprayer operation)</td><td>1. Set sprayer to OFF and disconnect power to sprayer.
2. Troubleshoot inverter.</td></tr>
<tr><td>Sprayer does not run at all
Control board status light blinks 10 times repeatedly</td><td>Check to see if control board is over heating.</td><td>1. Make sure motor air intake is not blocked.
2. Make sure fan has not failed.
3. Make sure control board is properly connected to back plate and that conductive thermal paste is used on power components.
4. Replace control board.
5. Replace motor.</td></tr>
<tr><td>Sprayer does not run at all
Control board status light blinks 12 times repeatedly</td><td>Excessive current protection enabled</td><td>1. Cycle power on and off.</td></tr>
<tr><td>Sprayer does not run at all
Control board status light blinks 15 times repeatedly</td><td>Check the connections above the motor</td><td>1. Set sprayer to OFF and disconnect power to sprayer.
2. Remove motor shroud.
3. Disconnect motor control and inspect for damage at connectors.
4. Reconnect motor control.
5. Turn power on. If code continues, replace motor.</td></tr>
</table>

TYPE OF PROBLEM	WHAT TO CHECK	HOW TO CHECK
Sprayer does not run at all Control board status light blinks 16 times repeatedly	Check the connections. Control is not receiving a motor position sensor signal	1. Turn power OFF. 2. Disconnect motor position sensor and inspect for damage at connectors.  ti18685a 3. Reconnect sensor. 4. Turn power ON. If code continues, replace motor.
Sprayer does not run at all Control board status light blinks 17 times repeatedly	Check voltage supply to the sprayer (sprayer plugged into wrong voltage)	1. Set sprayer to OFF and disconnect power to sprayer. 2. Locate a good voltage supply to prevent damage to electronics. 3. See **Inverter (ES 1000 & ES 2000)**, page 71.

Sprayer Will Not Run (ES 1000 & ES 2000)

(See following page for steps)



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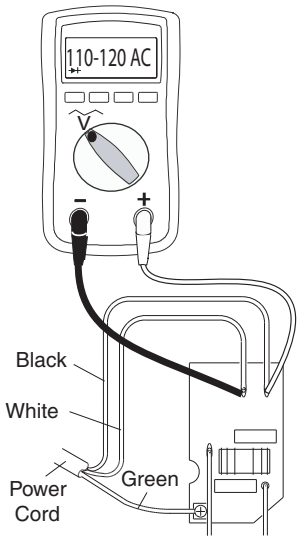
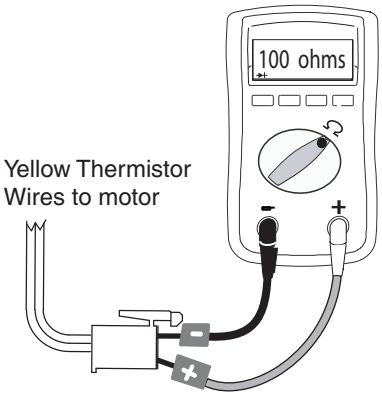
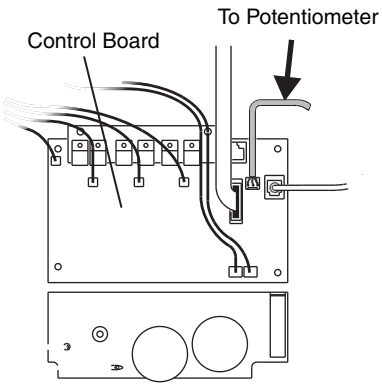
Step 1:
Plug Power cord in and turn switch ON. Connect probes to ontrol board. Turn meter to AC Volts.



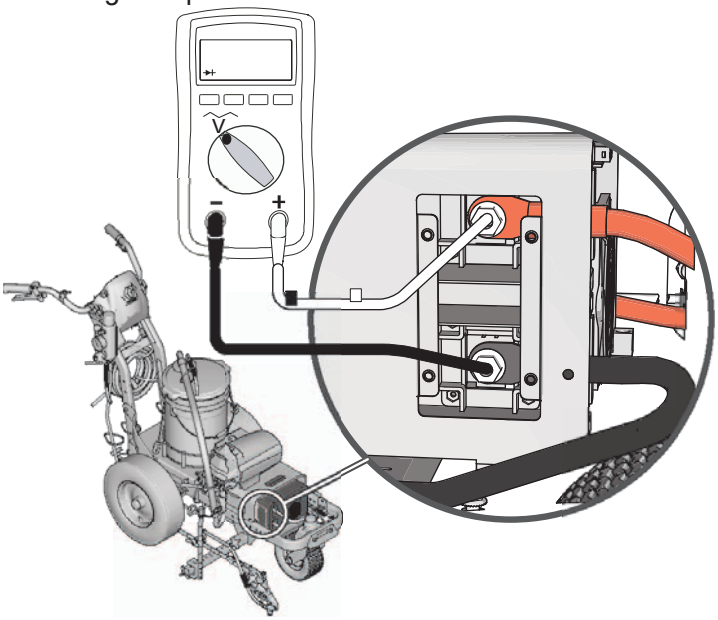
Step 2:
Check motor thermal switch. Unplug yellow wires. Meter should read 100 ohms. NOTE: Motor should be cool during reading.



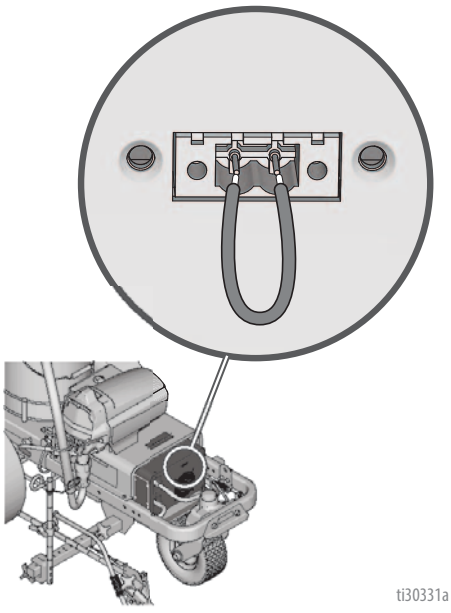
Step 3:
Disconnect potentiometer. Plug power cord in and turn switch ON.



Step 4:
Connect probes to positive and negative posts on inverter.



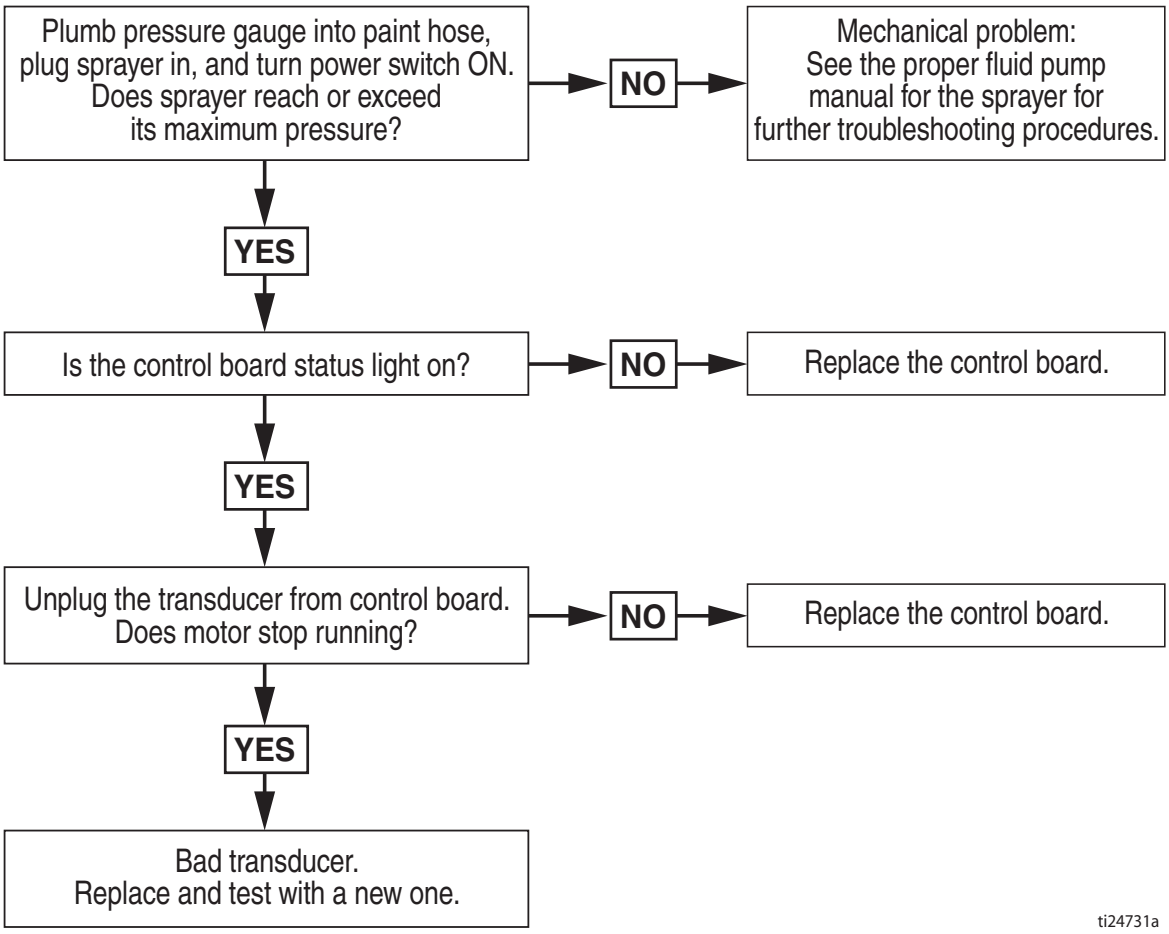
Step 5:
Connect jumper across pins 1 and 2



Sprayer Will Not Shut Off (ES 1000 & ES 2000)

1. Perform **Pressure Relief Procedure**, page 16. Leave prime valve open (down) and turn ON/OFF switch **OFF**.
2. Remove control box cover so the control board status light can be viewed if available.

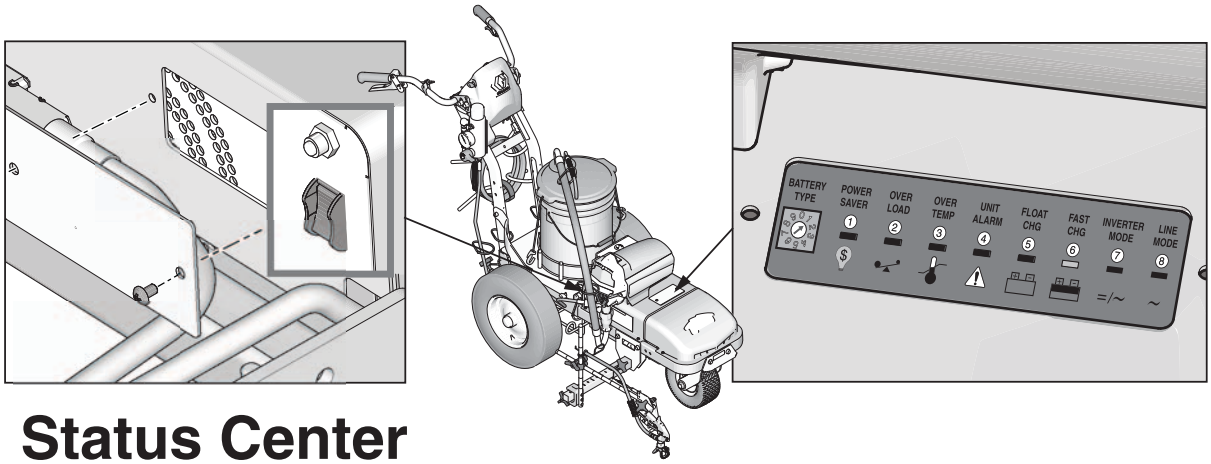
Troubleshooting Procedure



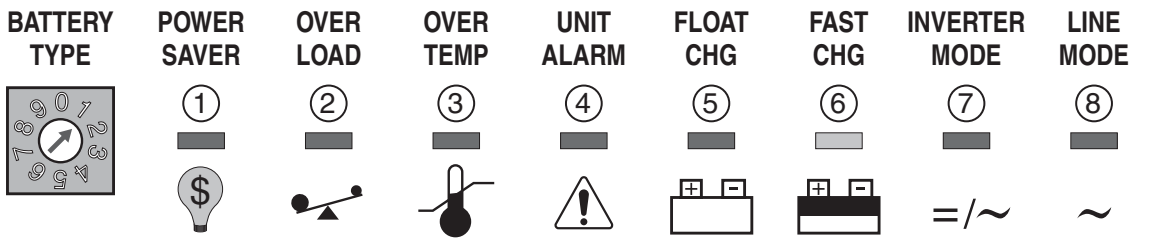
Inverter (ES 1000 & ES 2000)

The inverter has 2 circuit breakers, and an LED Status Center that communicates inverter operation status.

See chart below for different functions, alarms, and fault modes.



Status Center



Indication & Fault finding chart

Status	L.E.D.s Function	①	②	③	④	⑤	⑥	⑦	⑧	Alarm
Charge function	Constant current charge						on Flash		on	
	Constant voltage charge								on	
	Float					on			on	
	Standby								on	
Inverter mode	Inverter on							on		
Alarms	Battery low voltage				on			on		beep 0.5s every 5 s
	Battery high voltage				on			on		beep 0.5s every 5 s
	Over load (inverter mode)		on		on			on		beep 0.5s every 5 s
	Over temp (inverter mode)			on	on			on		beep 0.5s every 5 s
	Over temp (line mode)			on	on	on			on	beep 0.5s every 5 s
	Over charge				on	on			on	beep 0.5s every 5 s
Fault mode	Fan lock									beep continuous
	Battery high voltage							on		beep continuous
	Inverter mode overload		on							beep continuous
	Over temperature			on						beep continuous

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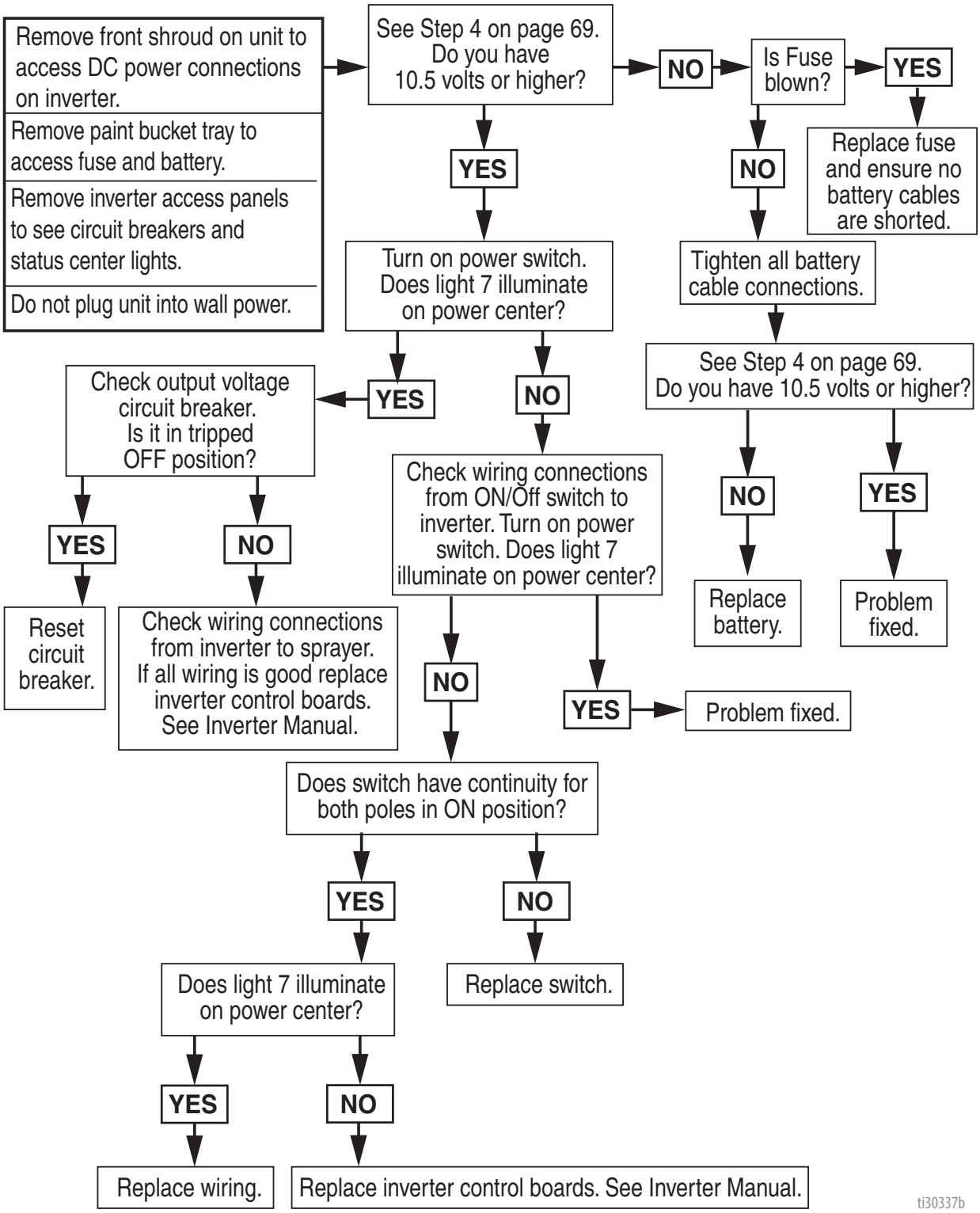
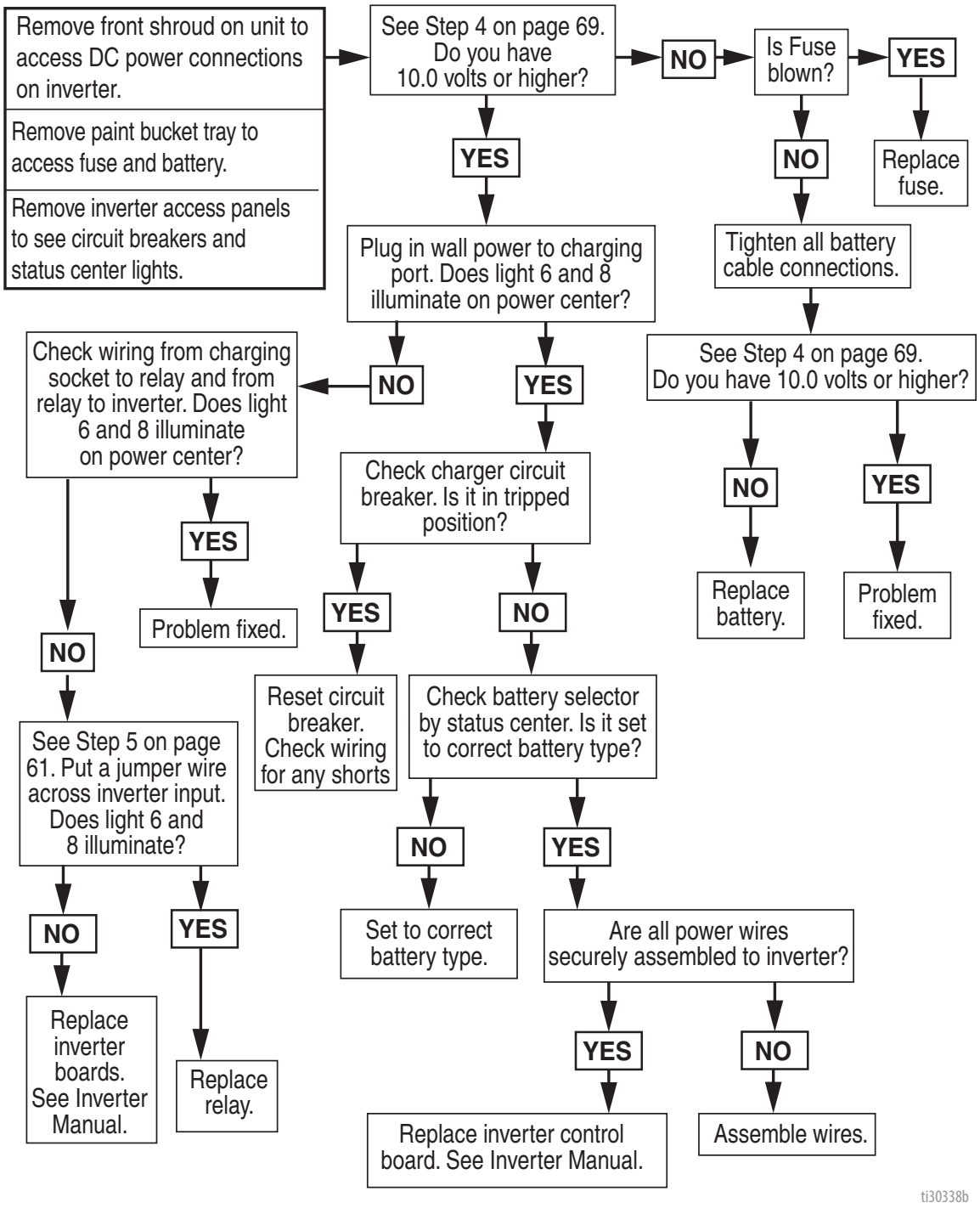
Sprayer does not have - 100 VAC for 120V units - 220 VAC for 230V units (ES 1000& ES 2000)

Troubleshooting Procedure:



Battery Will Not Charge (ES 1000 & ES 2000)

Troubleshooting Procedure:



Parts Drawing - ES 1000

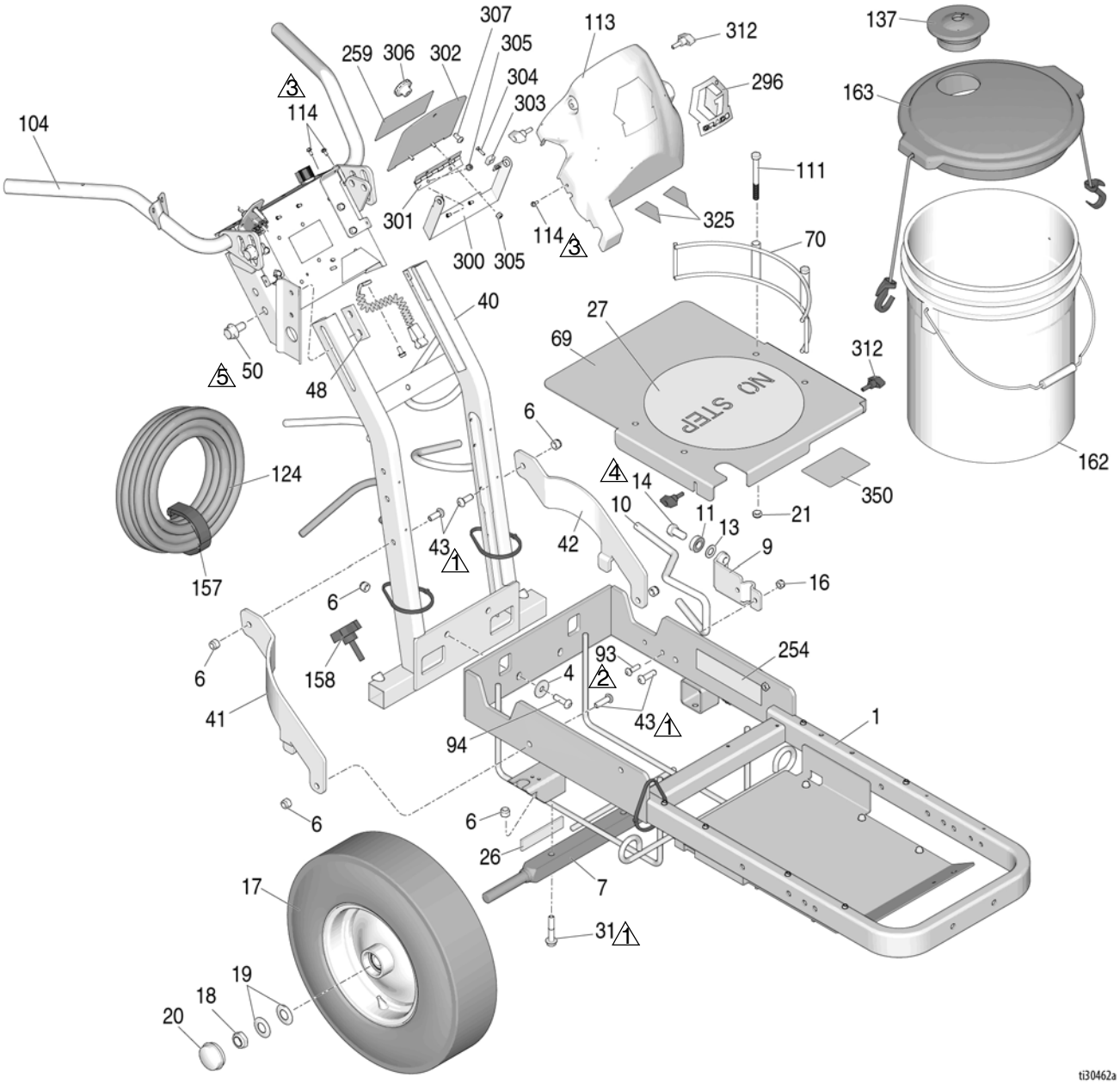
1 Torque to 17-23 ft-lbs (23.0-31.1 N·m)

2 Torque to 190-210 in-lbs (21.4-23.7 N·m)

3 Torque to 18-22 in-lbs (2.0-2.4 N·m)

4 Torque to 23-27 ft-lbs (31.1-36.6 N·m)

5 Torque to 45-55 ft-lbs (61.0-74.5 N·m)

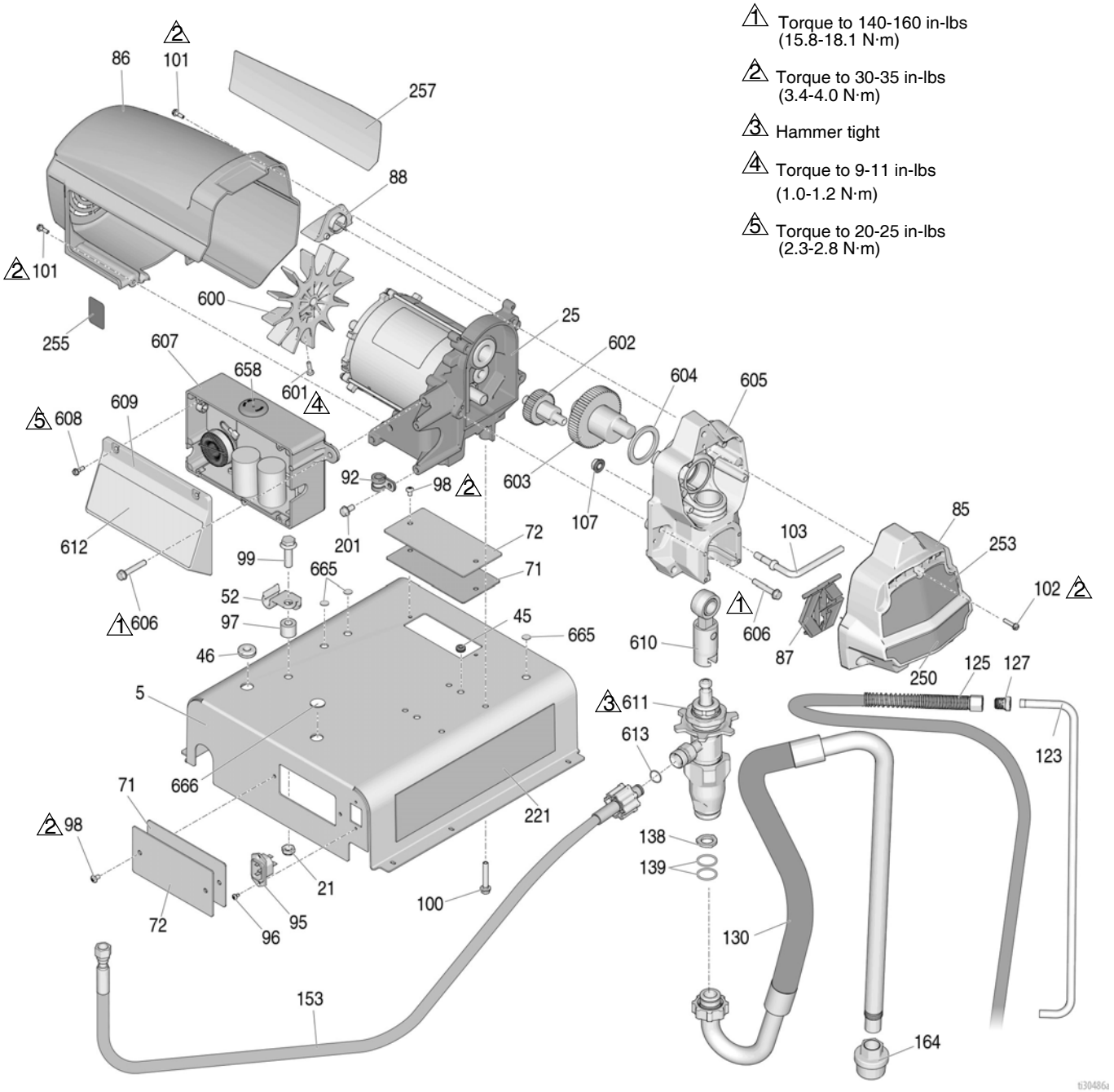


Parts List - ES 1000

Ref.	Part	Description	Qty
1	17N763	FRAME, linestriper	1
4	108851	WASHER, plain	4
6	101566	NUT, lock	12
7	193405	AXLE	1
9	198891	BRACKET	1
10	198930	ROD, brake	1
11	198931	BEARING	1
13	195134	SPACER, ball, guide	1
14	113961	SCREW, cap, hex hd	1
16	111040	NUT, lock, insert, nylock, 5/16	4
17	111020	WHEEL, pneumatic	2
18	112405	NUT, lock	3
19	112825	WASHER, belleville	6
20	114648	CAP, dust	2
21	125205	NUT, lock, nylon, 3/8-16	5
26	17P800	BUMPER	2
27	17P831	PAD, non-slip, no step	1
31	114982	SCREW, cap, flng hd	6
40	24Y665	FRAME, handle upright	1
41	15F576	BRACE, right	1
42	15F577	BRACE, left	1
43	128977	SCREW, cap, btn hd, 3/8 x 1	2
48	17J125	BRACKET, slide	2
50	17J136	SCREW, hex, flange head	4
69	17P305	PLATE, bucket holder	1
70	17N536	HOLDER, bucket	2
93	125112	SCREW, cap, btn hd, 5/16 x 1	2
94	129601	SCREW, cap, btn hd, 3/8 x 1.25	4
104	17N451	CONTROL, assembly, LL ES	1
111	867517	SCREW, hex head, 3/8-16 x 3.5”	4
113	17J135	COVER, control	1
137	278723	GASKET, pail	1
124	249080	HOSE, cpld, 1/4” x 50’	1
157	114271	STRAP, retaining	1
158	108471	KNOB, pronged	1
162	115077	PAIL, plastic	1
163	24U241	KIT, pail cover	1
254▲	17K396	LABEL, safety	1
259	17N740	LABEL, tool box	1
296	17K379	LABEL, console	1
300	17K235	BRACKET, access door	1
301	17K236	HINGE, access door	1
302	17K291	DOOR, access, painted	1
303	17K309	MAGNET, square	2
304	107070	SCREW, mach, flh	2
305	109466	NUT, lock, hex	4
306	17K320	KNOB, ribbed	1
307	112925	SCREW, cap	1
312	16W408	KNOB, t-handle, 1/4-20 thd stud	4
325	17K584	LABEL, wire cutout	2
350	25E266	LABEL, instruction, battery hookup	1

▲ *Replacement safety labels, tags, and cards are available at no cost.*

Parts Drawing - ES 1000

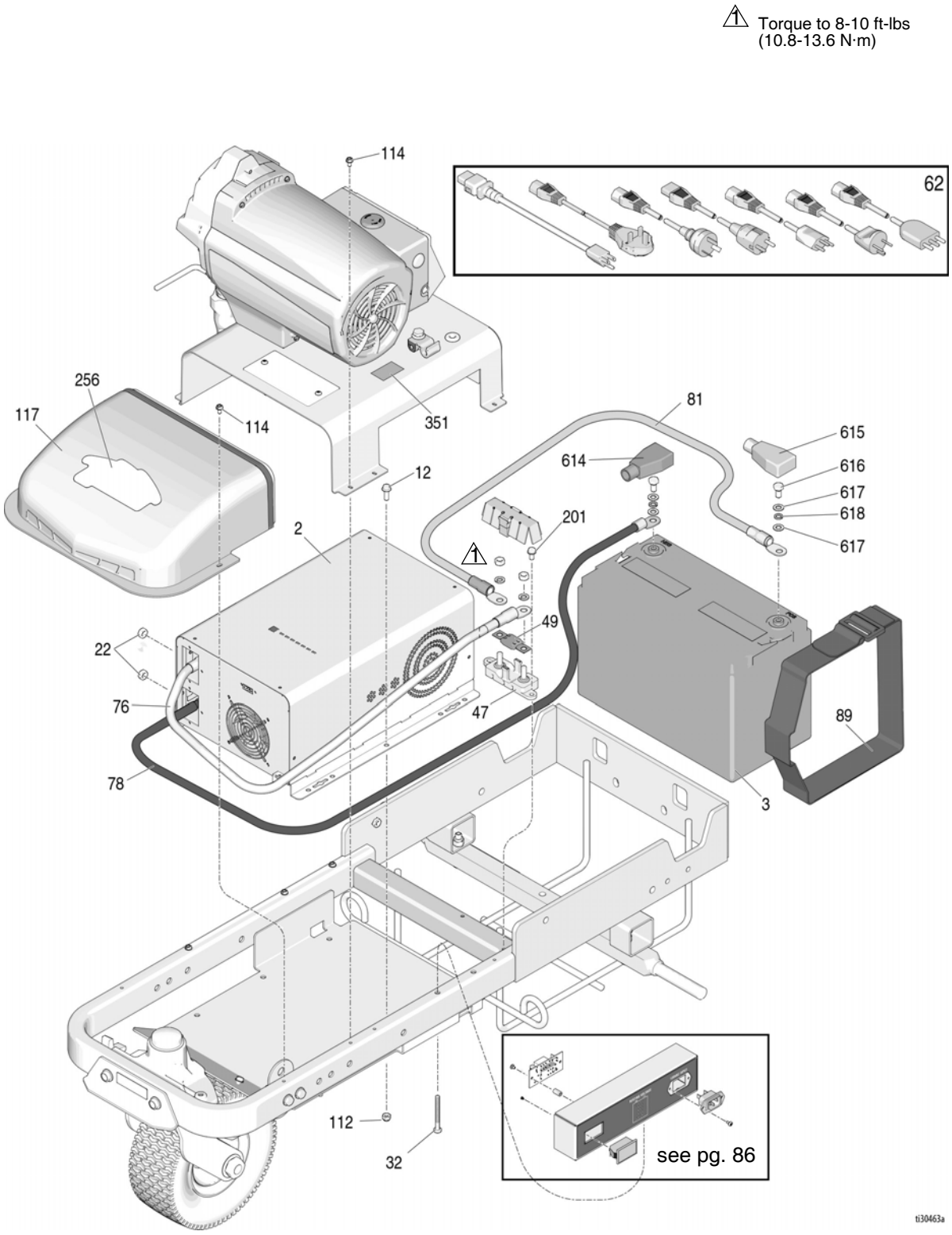


Parts List - ES 1000

Ref.	Part	Description	Qty
5	17P496	COVER, inverter	1
21	125205	NUT, lock, nylon, 3/8-16	1
25	24S022	MOTOR, electric	1
45	129604	GROMMET, rubber	2
46	17N444	GROMMET	1
52	278204	CLIP, drain line	1
71	17P506	GASKET, access port	2
72	17P497	COVER, access port	2
85	17C541	COVER, front	1
86	287900	SHIELD, motor (includes 101)	1
87	17C483	COVER, PC pro pump rod	1
88	15G447	PLUG, shield	1
91	17N989	WIRE, jumper, 18 awg, white	1
92	125220	CLAMP, cushion, support	1
95	114064	PLUG, inlet	1
96	15W998	SCREW, mach	2
97	129627	SPACER, nylon	1
98	108795	SCREW, mach	4
99	111193	SCREW, cap	1
100	117493	SCREW, mach, hex washer hd	4
101	117501	SCREW, mach, slot hex wash hd	4
102	127914	SCREW, mach, slot hex wash hd	3
103	17P888	GUIDE, hose	1
107	110996	NUT, hex, flange head	1
123	16X071	TUBE, drain line	1
125	248008	HOSE, cpld, 1/4” x 44”	1
126	15F624	NUT, cable, gun	2
127	196180	BUSHING	1
130	17M875	HOSE, suction	1
137	278723	GASKET, pail	1
138	115099	WASHER, garden	1
139	117559	O-RING	2
153	17N217	HOSE, coupled	1
164	187651	STRAINER, 3/4-16 unf	1
201	107254	SCREW, thd forming	5
221▲	17N658	LABEL, warning	1
250	17N730	LABEL, front, bottom	1
253	17N729	LABEL, front, brand	1
255▲	195793	LABEL, warning	1
257	17N731	LABEL, side	1
600	15D088	FAN, motor	1
601	115477	SCREW, mach	1
602	249194	GEAR, reducer	1
603	24X020	GEAR, crankshaft	1
604	180131	BEARING, thrust	1
605	24W817	HOUSING, drive	1
606	117493	SCREW, mach	7
607a	25M490	BOX, control, 120V	1
607b	25M491	BOX, control, 230V	1
608	117501	SCREW, mach	4
609	277229	COVER, control	1
610	24W640	ROD, connecting	1
611	24Z731	PUMP, displacement	1
612	17C964	LABEL, smart control	1
613	16H137	O-RING	1
665	131737	PLUG, sheet metal	3
666	126044	PLUG, cap, .75 dia.	1

▲ *Replacement safety labels, tags, and cards are available at no cost.*

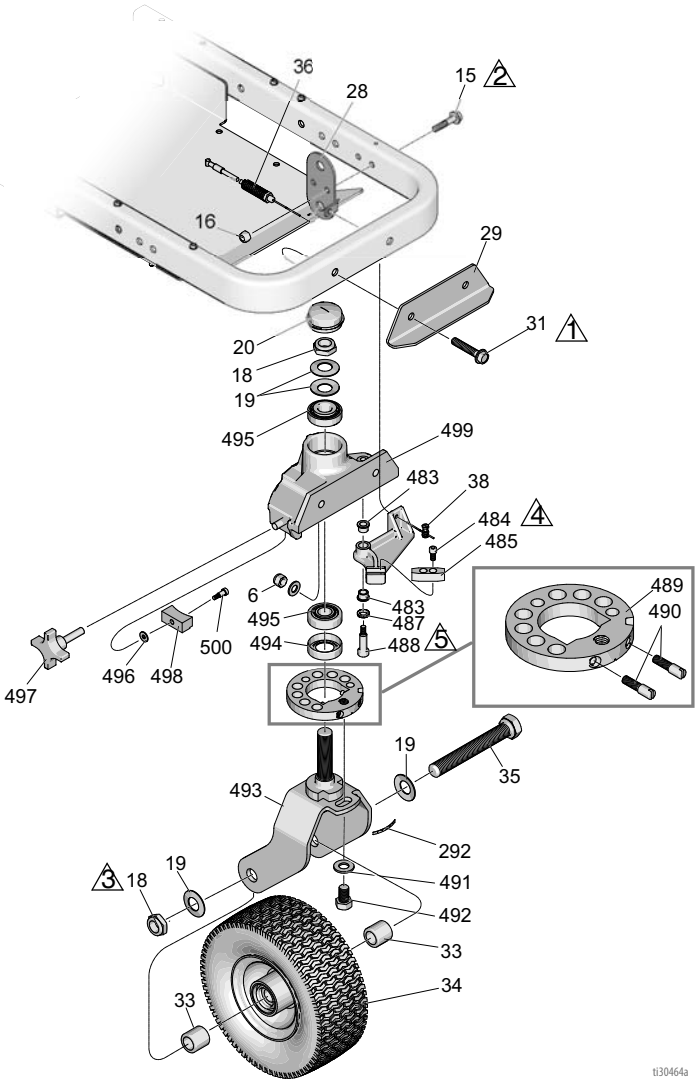
Parts Drawing - ES 1000



Parts List - ES 1000

Ref.	Part	Description	Qty
2a	25N794	INVERTER, power supply, 120V	1
2b	25N793	INVERTER, power supply, 230V	1
3	25C772	BATTERY	1
12	113796	SCREW, flanged, hex hd	6
22	16A390	NUT, hex, flanged	2
32	113469	SCREW, cap, hex hd	2
44	17N921	BOX, voltage meter, 120V	1
47	17N816	HOLDER, fuse	1
49	131738	FUSE, 300, amp	1
62		CORD, power	1
	17N758	US	
	17R033	AUSTRALIA	
	17R034	CEE 7/7	
	17R035	SWITZERLAND	
	17R036	DENMARK	
	17R037	ITALY	
	17S135	CORD, IEC, UK/IRELAND	
76	17M321	CABLE, red, dia .625 x 3 ft (includes 615)	1
78	17M323	CABLE, black, dia .625 x 3.5 ft w/ cover (includes 614)	1
81	17M322	CABLE, red, dia .625 x 2 ft w/ cover	1
89	129629	STRAP, retaining	1
112	102040	NUT, lock, hex	6
114	128978	SCREW, mach, slot hex wash hd	8
117	17P562	COVER, front, LL ES	1
201	107257	SCREW, hhd forming	2
256	17P202	LABEL, logo	1
614	129545	COVER, black	1
615	129546	COVER, red	1
616	108768	SCREW	2
617	104572	WASHER, lock	2
618	108788	WASHER, flat	4
351	17Y815	LABEL, notice, water	1

Parts Drawing - ES 1000



1 Torque to 17-23 ft-lbs (23.0-31.1N·m)

2 Torque to 190-210 in-lbs (21.4-23.7 N·m)

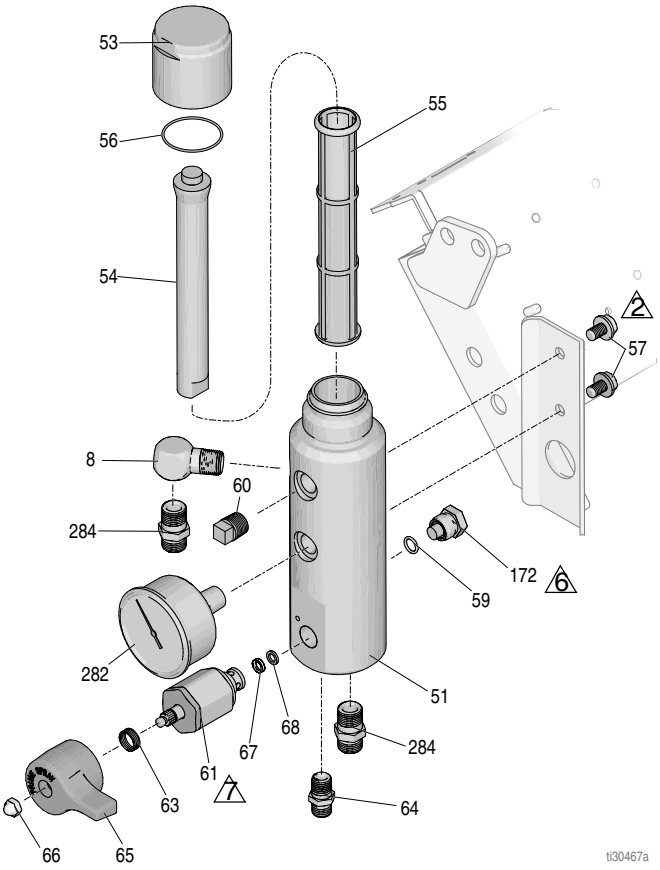
3 Torque to 23-27 ft-lbs (31.1-36.6 N·m)

4 Torque to 60-80 in-lbs (6.7-9.0 N·m)

5 Torque to 17-23 ft-lbs (23.0-31.1 N·m)

6 Torque to 35-45 ft-lbs (47.4-61.0 N·m)

7 Torque to 365-385 in-lbs (41.2-43.4 N·m)



Parts List - ES 1000

Swivel Wheel Assembly

Ref.	Part	Description	Qty
6*	101566	NUT, lock	2
8	196179	FITTING, elbow, street	1
15	112960	SCREW, cap, flng hd	2
16	111040	NUT, lock, insert, nylock, 5/16	2
18*‡	112405	NUT, lock	2
19*‡	112825	WASHER, belleville	4
20*‡	114648	CAP, dust	1
28‡	15F910	BRACKET, cable	1
29	240991	BRACKET, caster, front	1
31	114982	SCREW, cap, flng hd	2
33*‡	193658	SPACER, seal	2
34*	114549	WHEEL, pneumatic	1
35*	113471	SCREW, cap, hex hd	1
36	241105	CABLE	1
38‡	114802	STOP, wire	1
292*‡	17H489	LABEL, disk adjustment	1
483*‡	114548	BEARING, bronze	2
484*‡	110754	SCREW, cap, sch	2
485*‡	193662	STOP, wedge	1
487*‡	15J603	SPACER, round	1
488*‡	120476	BOLT, shoulder	1
489*‡	17H486	DISK, adjuster, assembly	1
490*‡	17G762	SCREW, disk adjuster	2
491*‡	113962	WASHER	1
492*‡	114681	SCREW, cap, hex hd	1
493*‡	17H485	FORK	1
494*‡	113484	SEAL, grease	1
495*‡	113485	BEARING, cup/cone	2
496*‡	112776	WASHER, plain	1
497*‡	181818	KNOB, pronged	1
498*‡	193661	JAW	1
499*‡	15G952	CASTER	1
500*‡	108483	SCREW, shoulder	1

** Included in Swivel Wheel Repair Kit 240719*

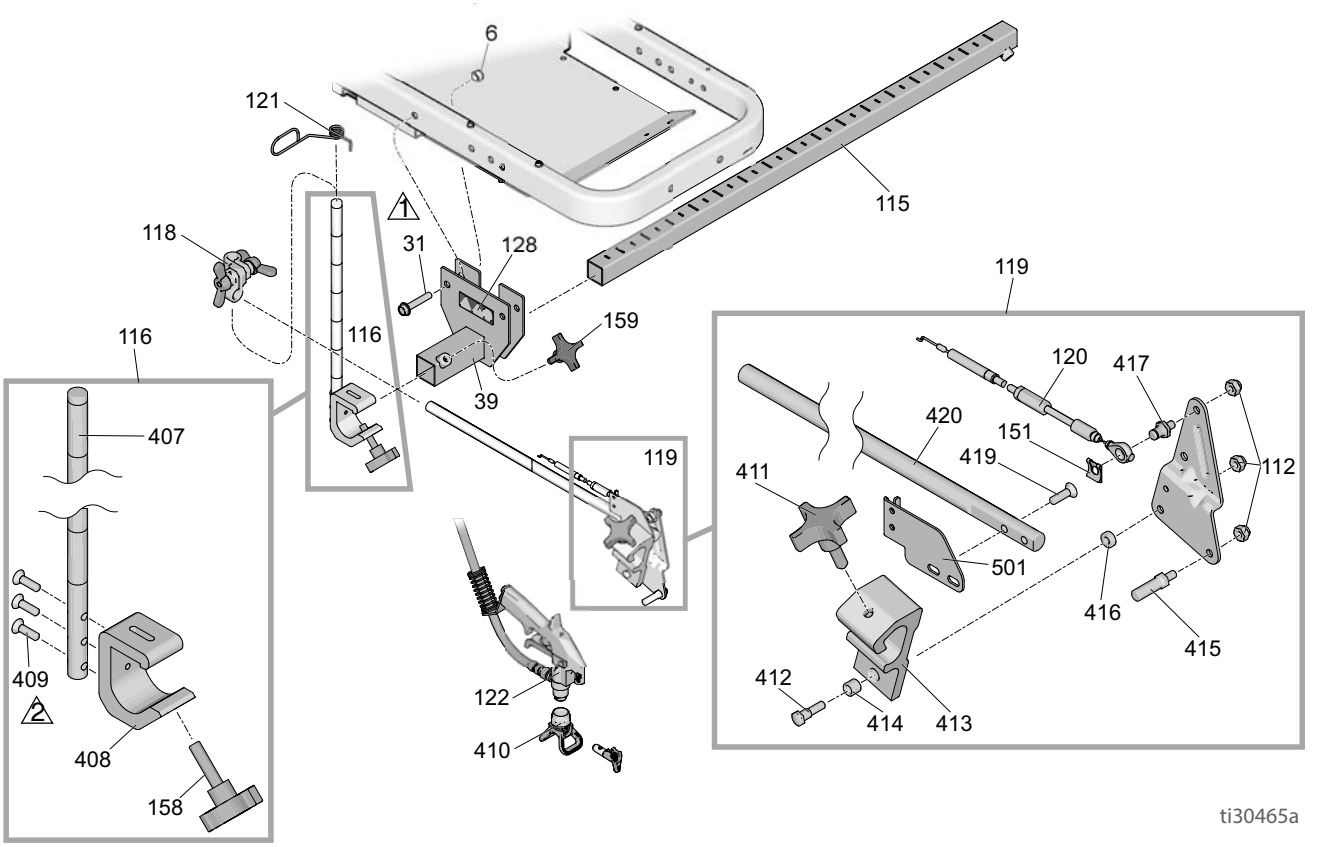
‡ Included in Swivel Wheel Repair Kit 241105

Filter

Ref.	Part	Description	Qty
51	17K166	MANIFOLD, filter	1
53	17E680	CAP, filter	1
54	15C766	TUBE, diffusion	1
55	243984	FILTER, fluid	1
56	117285	PACKING, o-ring	1
57	111801	SCREW, cap, hex hd	2
59	111457	PACKING, o-ring	1
60	15G331	PLUG, pipe	1
61†	287879	VALVE, drain, assy	1
63†	114708	SPRING, compression	1
64	196181	FITTING, nipple	1
65†	15G563	HANDLE, valve	1
66†	116424	NUT, cap	1
67†	193709	SEAT, valve	1
68†	193710	SEAL, seat valve	1
172	17R281	TRANSDUCER	1
282	868015	GAUGE, pressure, 0-5000 psi	1
284	196177	ADAPTER, nipple	2

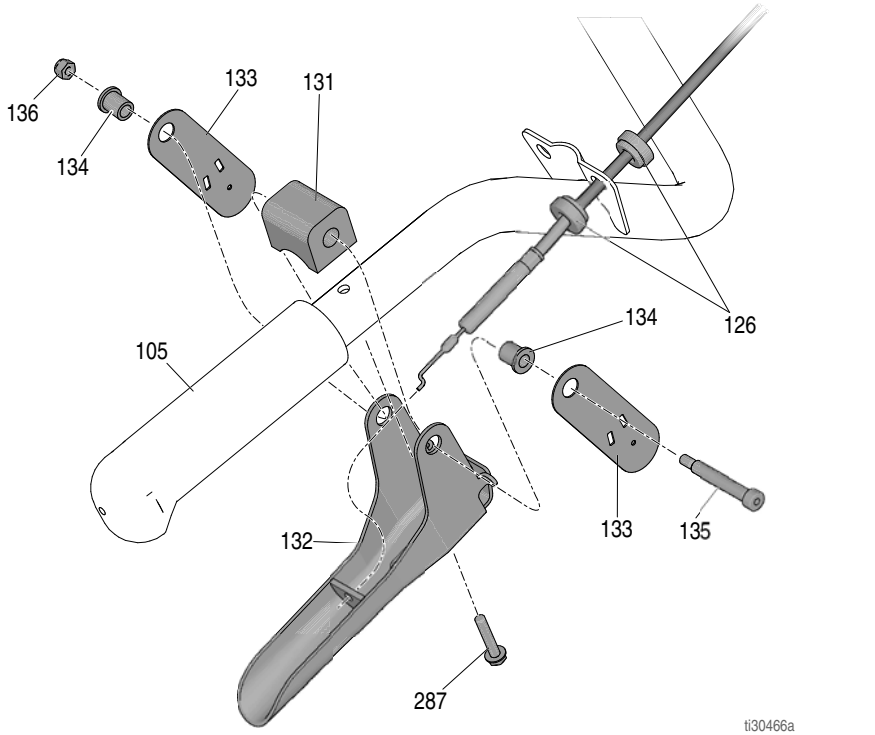
† Included in Prime Valve Repair Kit 245103

Parts Drawing - ES 1000



1 Torque to 17-23 ft-lbs (23.0-31.1 N·m)

2 Torque to 145-155 in-lbs (16.3-17.5 N·m)



Parts List - ES 1000

Gun Holder and Arm

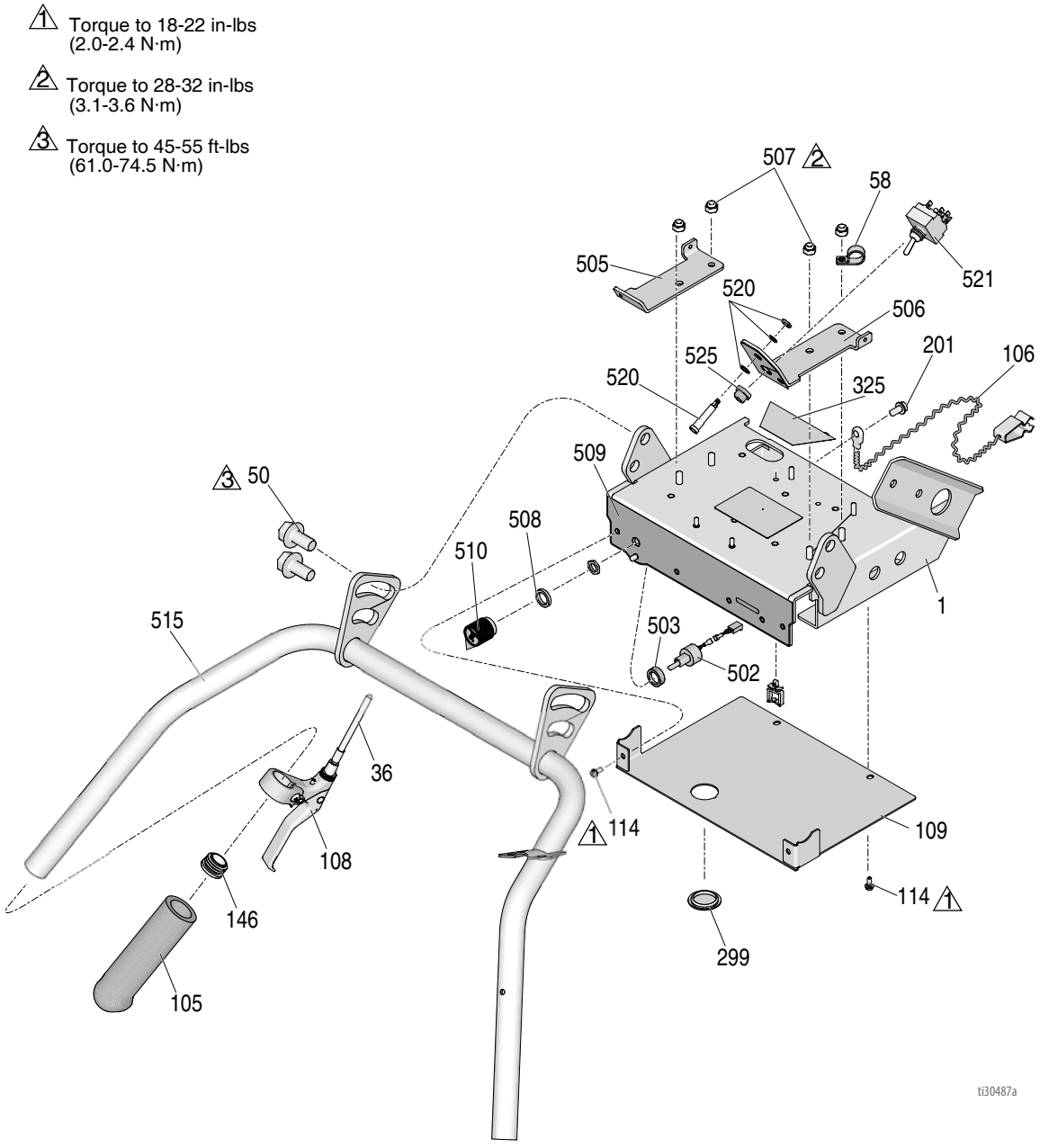
Ref.	Part	Description	Qty
6	101566	NUT, lock	2
31	114982	SCREW, cap, flng hd	2
39	17N447	BRACKET, gun arm	1
112	102040	NUT, lock, hex	3
115	17J407	ARM, extension, bar, weldment	1
116	17J424	BAR, heigh adjustment, assy	1
118	24Y645	KIT, clamp	1
119	25A528	BAR, gun holder	1
120	287696	CABLE, gun	1
121	188135	GUIDE, cable	1
122	235457	GUN, flex, basic	1
128▲	16P136	LABEL, safety, warning, iso	1
151	126111	RETAINER, cir-clip, external, 8mm	1
158	108471	KNOG, pronged	1
159	111145	KNOB, pronged	1
407	17J139	BAR, gun, height, adjustment	1
408	17J153	BRACKET, gun, holder	1
409	113428	SCREW, mach, hex hd	3
410	243161	GUARD	1
411‡	15F750	KNOB, holder, gun	1
412	17J575	FASTENER	1
413‡	15F216	HOLDER, gun	1
414‡	119664	BEARING, sleeve	1
415	15F209	STUD, pull, trigger	1
416	17J576	SPACER	1
417	17H673	STUD, cable	1
418	15F214	ACTUATOR, lever	1
419	119647	SCREW, cap, socket	2
420	17J145	ARM, holder, gun	1
501	15F213	BRACKET, cable	1
504	LL5317	STRIPING TIP	1
	LL5319	STRIPING TIP	1

▲ *Replacement safety labels, tags, and cards are available at no cost.*
‡ *Included in Gun Holder Repair Kit 287569*

Gun Trigger

Ref.	Part	Description	Qty
105	114659	GRIP, handle	2
126	15F624	NUT, cable, gun	2
131	198896	BLOCK, mounting	1
132	245676	HANDLE	1
133	198895	PLATE, lever, pivot	2
134	111017	BEARING, flange	2
135	116941	SCREW, shoulder	1
136	129476	NUT, lock w/ nylon insert	1
287	128803	SCREW, thd forming, hex washer	1

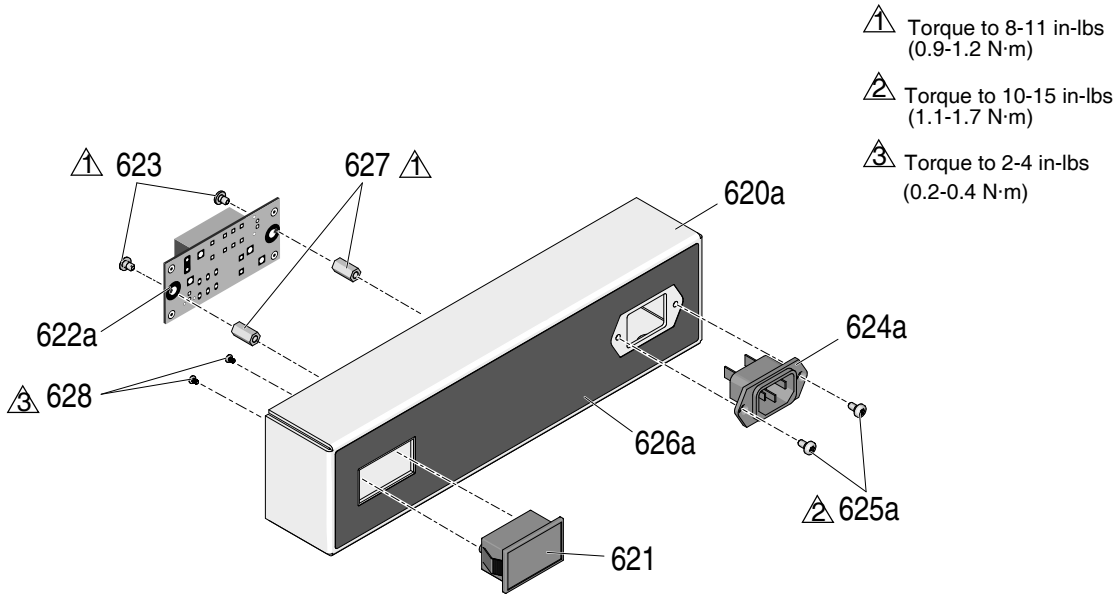
Parts Drawing - ES 1000



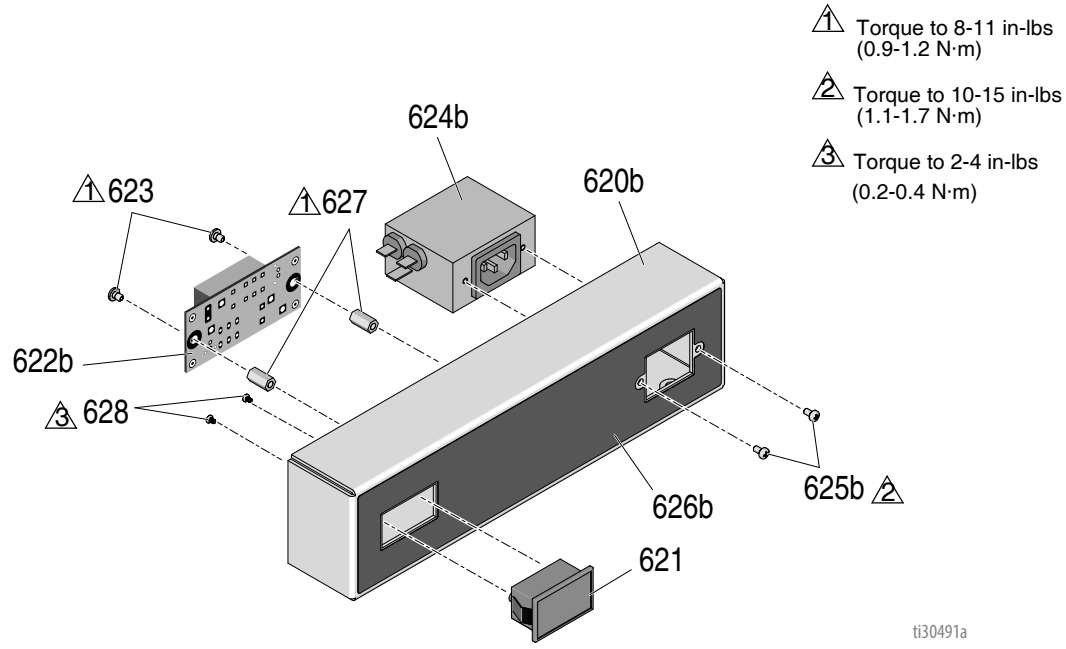
Parts List - ES 1000

Ref.	Part	Description	Qty
36	241105	CABLE	1
50	17J136	SCREW, hex, flange hd	4
58	113491	CLAMP, wire	1
105	114659	GRIP, handle	1
106	237686	GROUNDING, clip	1
108	194310	LEVEL, actuator	1
109	17J123	PLATE, cover	1
114	128978	SCREW, mach, slot hex wash hd	8
146	120151	PLUG, tube	2
299	17K310	PLUG, button	1
325	17K584	LABEL, wire cutout	1
501	24Y642	PLATE, control, Weldment	1
502	17N443	POTENTIOMETER	1
503	198650	SPACER, shaft	1
505	17J126	BRACKET, shroud	1
506	17N419	BRACKET, switch	1
507	102040	NUT, lock, hex	4
508	15C973	GASKET	1
509	17N416	LABEL, control	1
510	116167	KNOB, potentiometer	1
515	24Y641	BAR, handle	1
520	17N435	INDICATOR, LED, panel mount	1
521	17N418	SWITCH, toggle	1
525	195428	BOOT, toggle	1

Voltage Meter Box, 120V (ES1000 & ES2000)



Voltage Meter Box, 230V (ES1000 & ES2000)



Parts List

Voltage Meter Box, 120V

Ref.	Part	Description	Qty
620a	17R015	PANEL, box, meter, voltage, 120V	1
621	17N638	METER, volt, digital	1
622a	25M487	KIT, repair, board, relay, 120V	1
623	104714	SCREW, mach, pnh	2
624a	114064	PLUG, inlet	1
625a	15W998	SCREW, mach, torix	2
626a	17N659	LABEL, battery, 120V AC	1
627	129510	FASTENER, threaded hex standoff	2
628	129696	SCREW, pan head, phillips	2

Voltage Meter Box, 230V

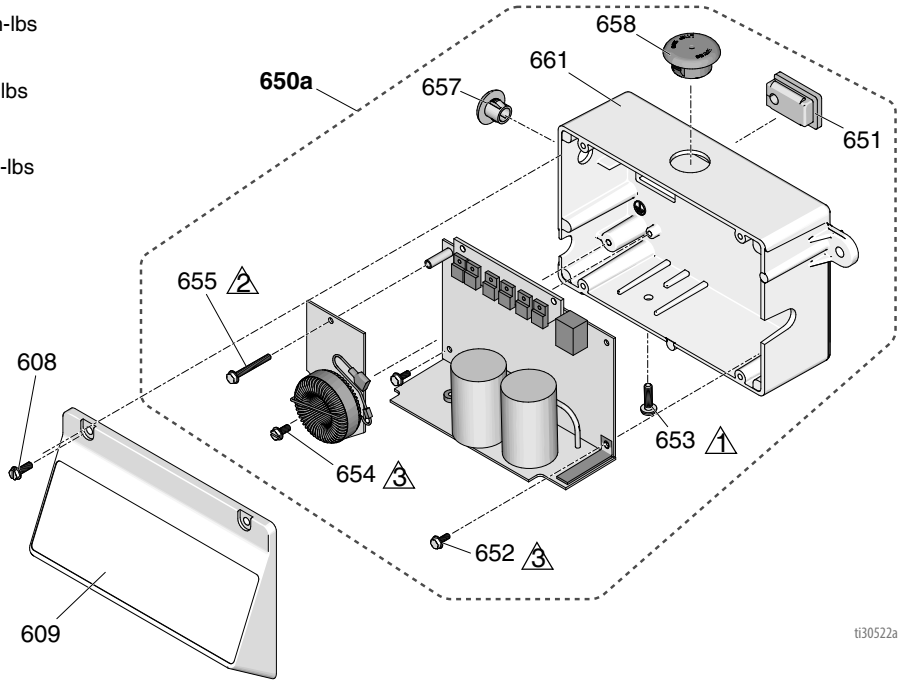
Ref.	Part	Description	Qty
620b	17N929	PANEL, box, meter, voltage, 230V	1
621	17N638	METER, volt, digital	1
622b	25M489	KIT, repair, board, relay, 230V	1
623	104714	SCREW, mach, pnh	2
624b	129649	FILTER, inlet	1
625b	119912	SCREW, mach, phillips	2
626b	17N753	LABEL, battery, 230V AC	1
627	129510	FASTENER, threaded hex standoff	2
628	129696	SCREW, pan head, phillips	2

Control Box, 120V (ES 1000)

1 Torque to 20-25 in-lbs (2.3-2.8 N·m)

2 Torque to 12±2 in-lbs (1.4 ± 2 N·m)

3 Torque to 30-35 in-lbs (3.4-3.9 N·m)

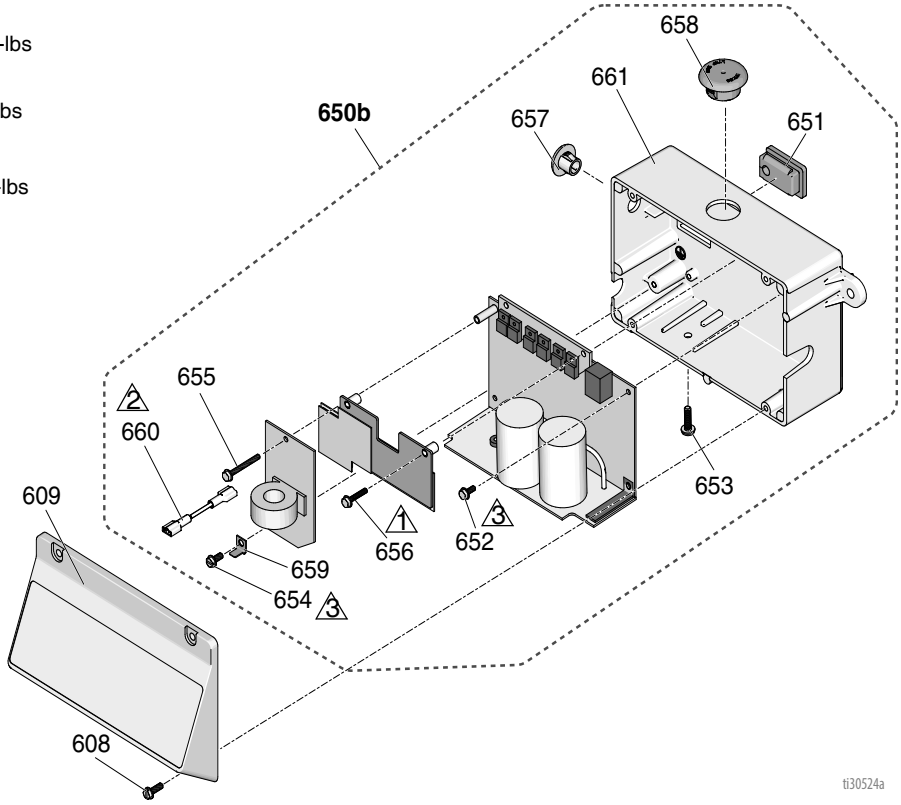


Control Box, 230V (ES 1000)

1 Torque to 20-25 in-lbs (2.3-2.8 N·m)

2 Torque to 12±2 in-lbs (1.4 ± 2 N·m)

3 Torque to 30-35 in-lbs (3.4-3.9 N·m)



Parts List

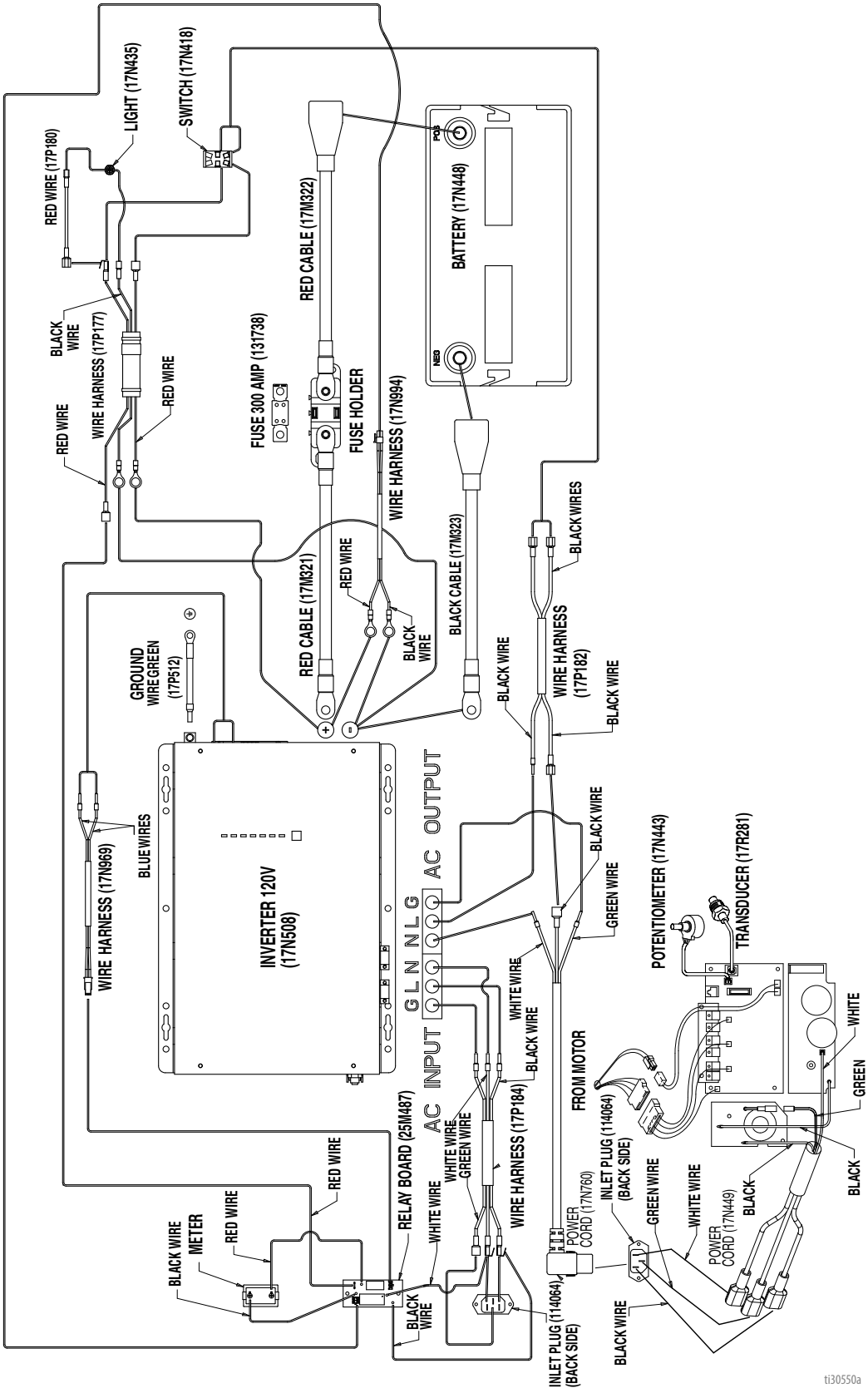
Control Box, 120V (ES 1000)

Ref.	Part	Description	Qty
608	117501	SCREW, mach, slot hex wash hd	4
609	277229	COVER, control	1
650a	25M490	BOX, control board, 120V, includes 651, 652, 653, 654, 655, 657, 658	1
651	15G562	BUSHING, control box	1
652	120405	SCREW, mach, hex washer hd	2
653	120165	SCREW, mach, phillips, pan hd	1
654	123850	SCREW, tapping, slot hex wash hd	1
655	120406	SCREW, mach, hex, wash hd	1
657	16Y457	PLUG, molded	1
658	17N560	PLUG	1
661	17N559	BOX, control	1

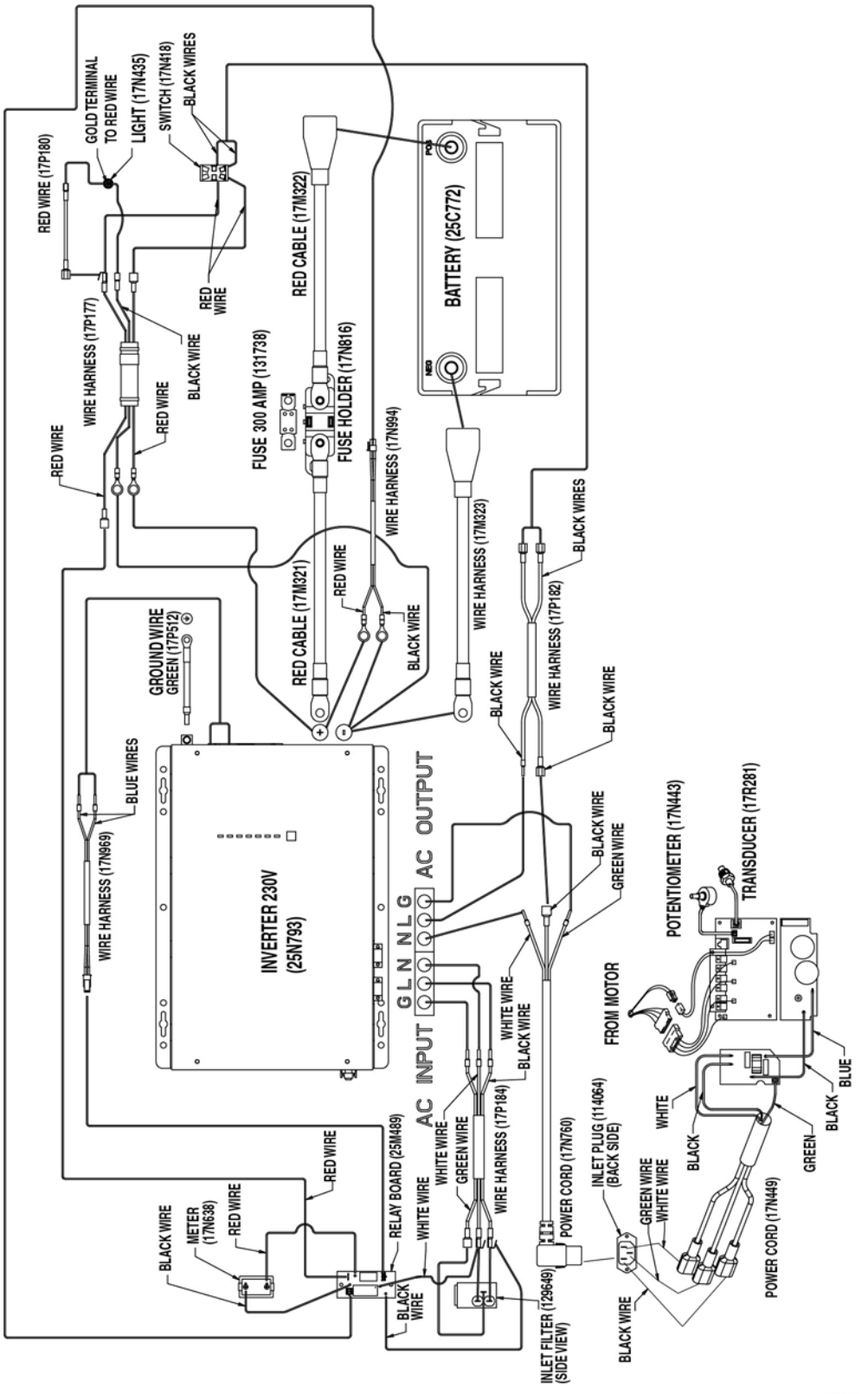
Control Box, 230V (ES 1000)

Ref.	Part	Description	Qty
608	117501	SCREW, mach, slot hex wash hd	4
609	277229	COVER, control	1
650b	25M491	BOX, control board, 230V, includes 651, 652, 653, 654, 655, 656, 657, 658, 659, 660	1
651	15G562	BUSHING, control box	1
652	120405	SCREW, mach, hex washer hd	2
653	120165	SCREW, mach, phillips, pan hd	1
654	123850	SCREW, tapping, slot hex wash hd	1
655	120406	SCREW, mach, hex, wash hd	1
656	128038	SCREW, mach, hex wash	2
657	16Y457	PLUG, molded	1
658	17N560	PLUG	1
660	17P859	WIRE, jumper	1
661	17N559	BOX, control	1

Wiring Diagram - 120V (ES 1000)

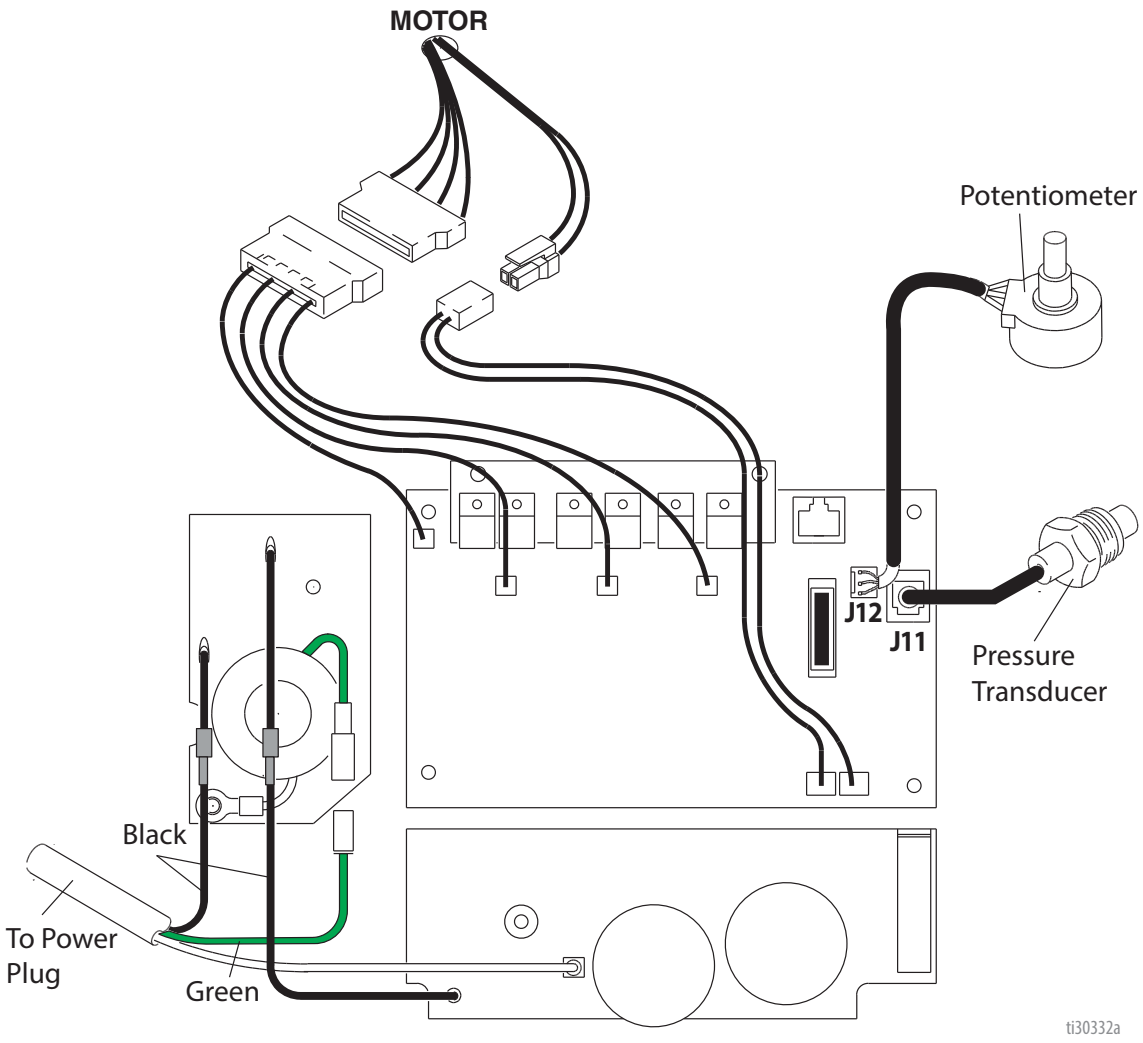


Wiring Diagram - 230V (ES 1000)



Control Board Wiring Diagram

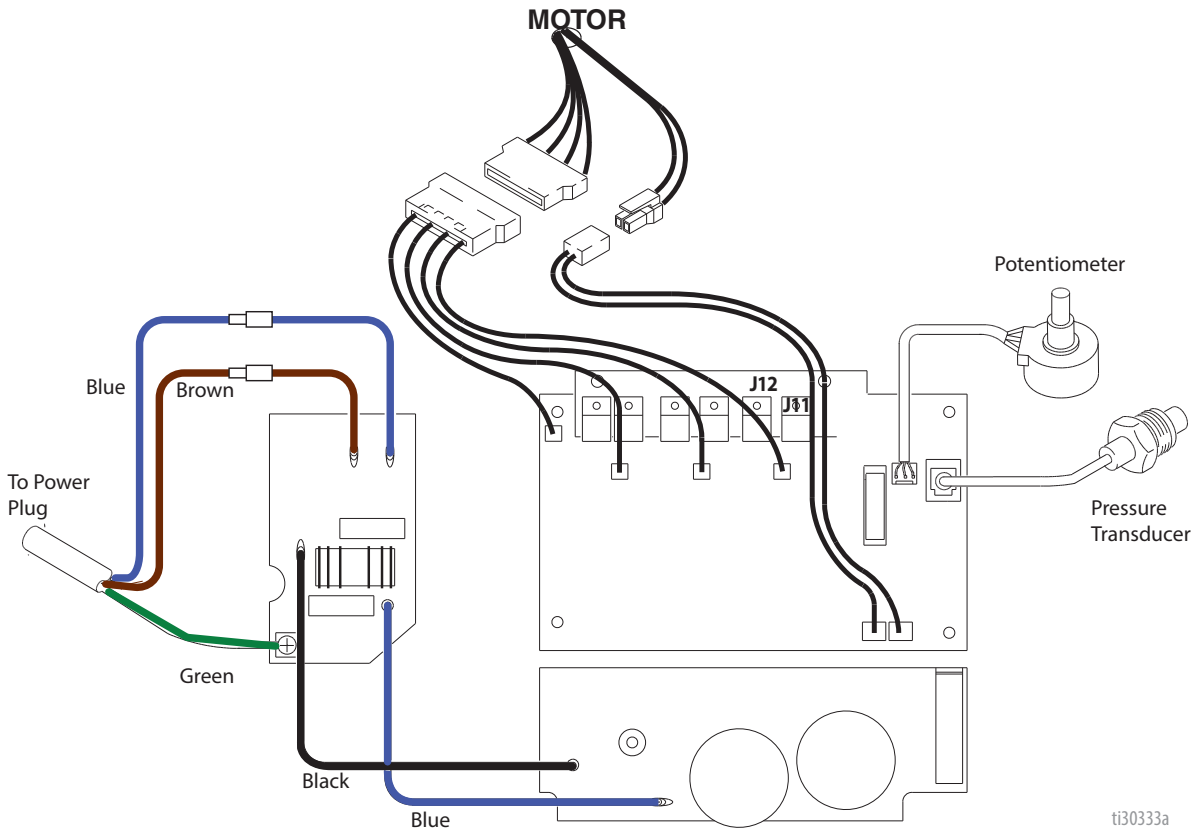
110/120V (ES 1000)



230V (ES 1000)

NOTICE

Heat from inductor coil of filter board may destroy wire insulation that comes in contact with it. Exposed wires could cause shorts and component damage. Bundle and tie loose wires so none lay in contact with inductor coil on the filter board.



Parts Drawing - ES 2000

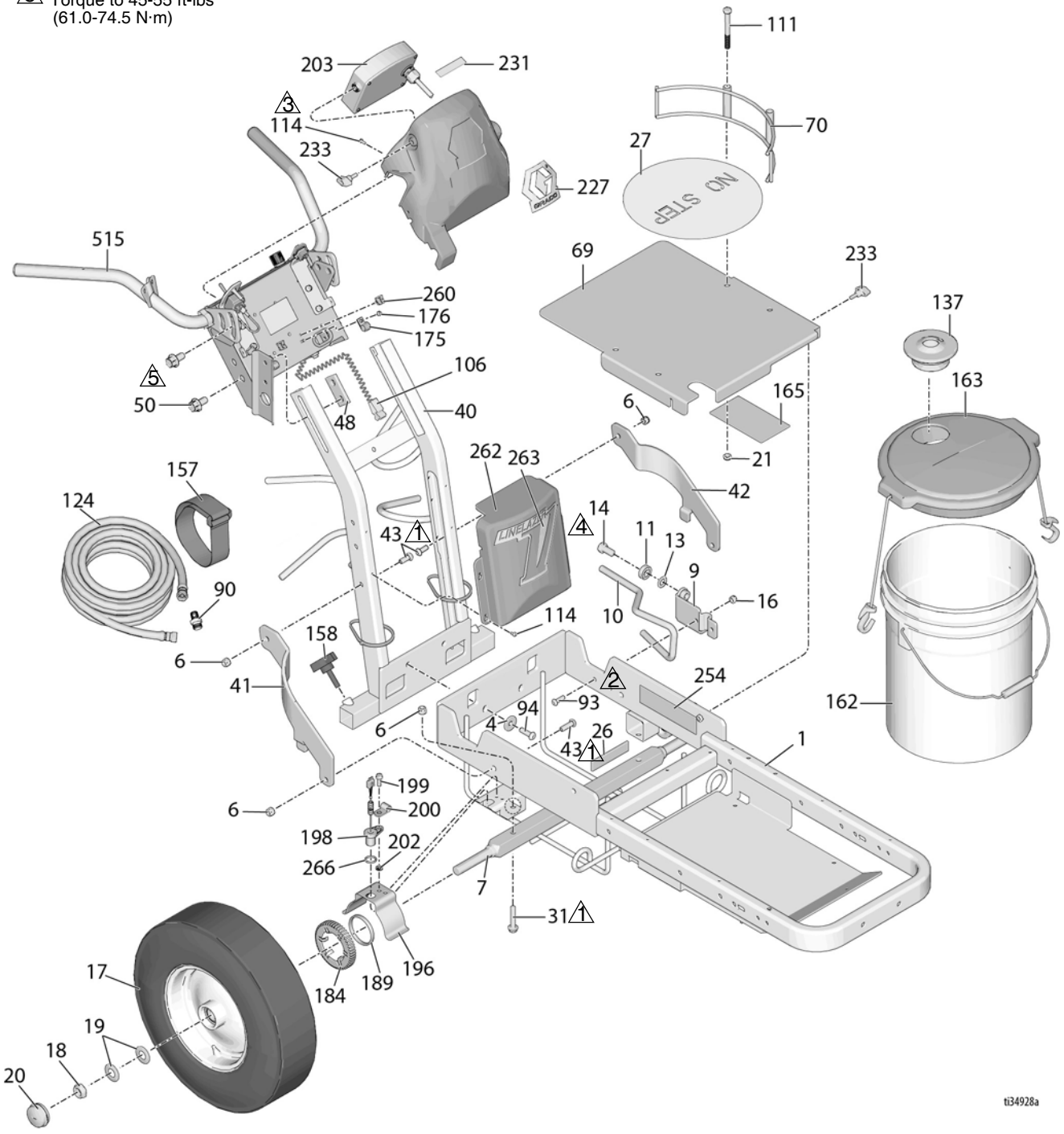
1 Torque to 17-23 ft-lbs (23.0-31.1 N·m)

2 Torque to 190-210 in-lbs (21.4-23.7 N·m)

3 Torque to 18-22 in-lbs (2.0-2.4 N·m)

4 Torque to 23-27 ft-lbs (31.1-36.6 N·m)

5 Torque to 45-55 ft-lbs (61.0-74.5 N·m)

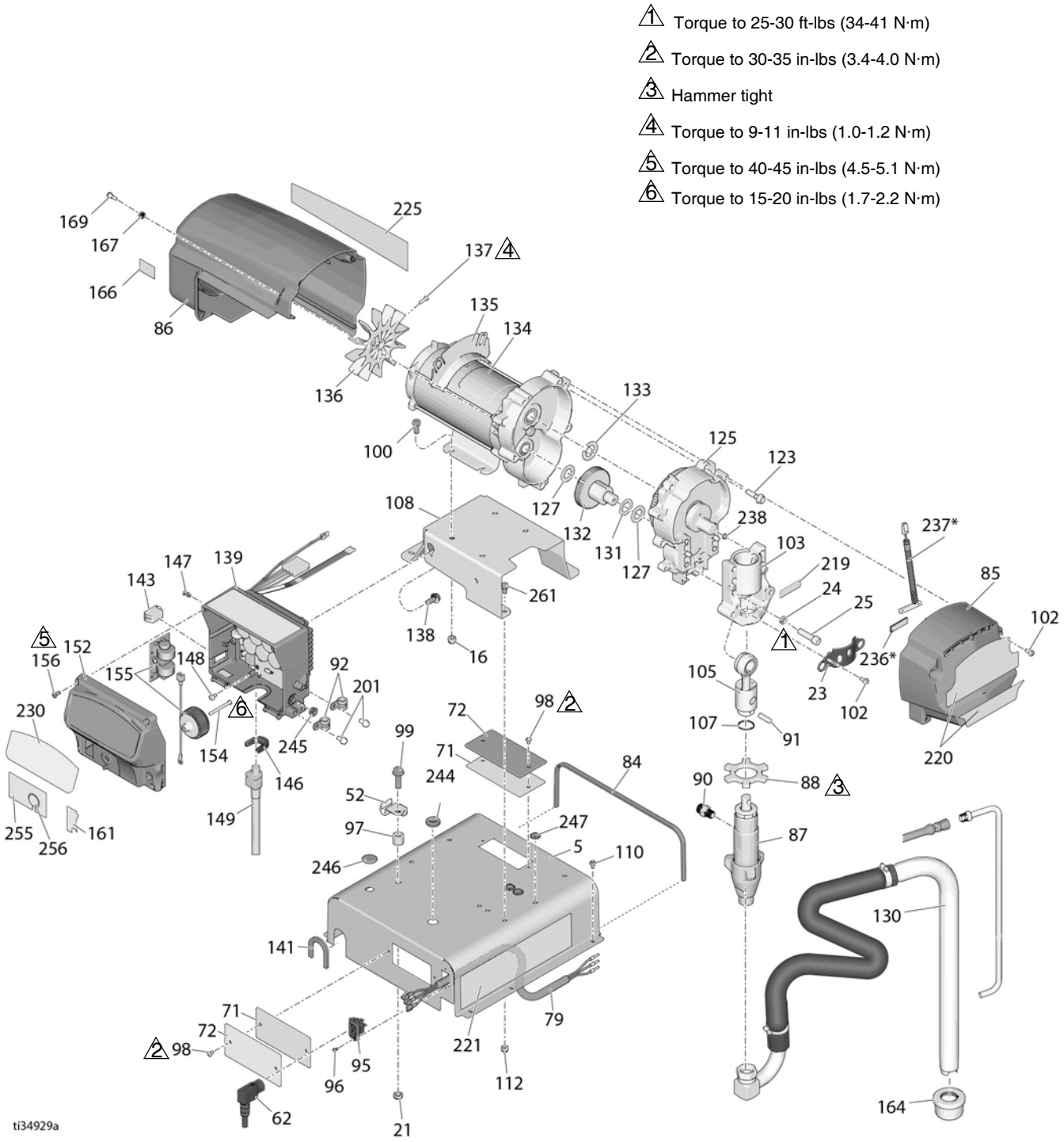


Parts List - ES 2000

Ref.	Part	Description	Qty
1	17N763	FRAME, linestriper	1
4	108851	WASHER, plain	4
6	101566	NUT, lock	12
7	193405	AXLE	1
9	198891	BRACKET	1
10	198930	ROD, brake	1
11	198931	BEARING	1
13	195134	SPACER, ball, guide	1
14	113961	SCREW, cap, hex hd	1
16	111040	NUT, lock, insert, nylock, 5/16	4
17	255162	WHEEL, pneumatic (includes 184 and 189)	2
18	112405	NUT, lock	3
19	112825	WASHER, belleville	6
20	114648	CAP, dust	2
21	125205	NUT, lock, nylon, 3/8-16	5
26	17P800	BUMPER	2
27	17P831	PAD, non-slip, no step	1
31	114982	SCREW, cap, flng hd	6
40	24Y665	FRAME, handle upright	1
41	15F576	BRACE, right	1
42	15F577	BRACE, left	1
43	128977	SCREW, cap, btn hd, 3/8 x 1	2
48	17J125	BRACKET, slide	2
50	17J136	SCREW, hex, flange head	4
69	17P305	PLATE, bucket holder	1
70	17N536	HOLDER, bucket	2
90	196176	ADAPTER, nipple	1
93	125112	SCREW, cap, btn hd, 5/16 x 1	2
94	129601	SCREW, cap, btn hd, 3/8 x 1.25	4
106	237686	CLIP, grounding	1
111	867517	SCREW, hex head, 3/8-16 x 3.5”	4
137	278723	GASKET, pail	1
124	124884	HOSE, cpld, 3/8 x 22’	1
157	114271	STRAP, retaining	1
158	108471	KNOB, pronged	1
162	115077	PAIL, plastic	1
163	24U241	KIT, pail cover	1
165	25E266	LABEL, hookup, battery	1
175	128856	CLAMP, cable, nylon	2
176	115483	NUT, lock	2
180▲	222385	LABEL, safety, medical alert (not shown)	1
184	15J575	GEAR, signal	1
189	15K700	RING, sensor gear	1
196	15J088	SHIELD, distance sensor	1
198	15K357	SENSOR, distance	1
199	260212	SCREW, hex washer hd	1
200	108868	CLAMP, wire	1
202	15K452	SPACER, round, .500 OD	1
203	25N791	KIT, repair, display	1
227	17K379	LABEL, console	1
229▲	17A134	LABEL, safety, medical alert (not shown)	1
231	17P925	LABEL, A+ Service	1
233	16W408	KNOB, t-handle, 1/4-20 thd stud	4
254▲	17K396	LABEL, safety	1
260	114687	CLIP, retainer	2
262	17K377	COVER, battery	1
263	17K378	LABEL, brand, LLV	1
266	155500	PACKING, o-ring	1
515	24Y641	BAR, handle	1

▲ *Replacement safety labels, tags, and cards are available at no cost.*

Parts Drawing - ES 2000

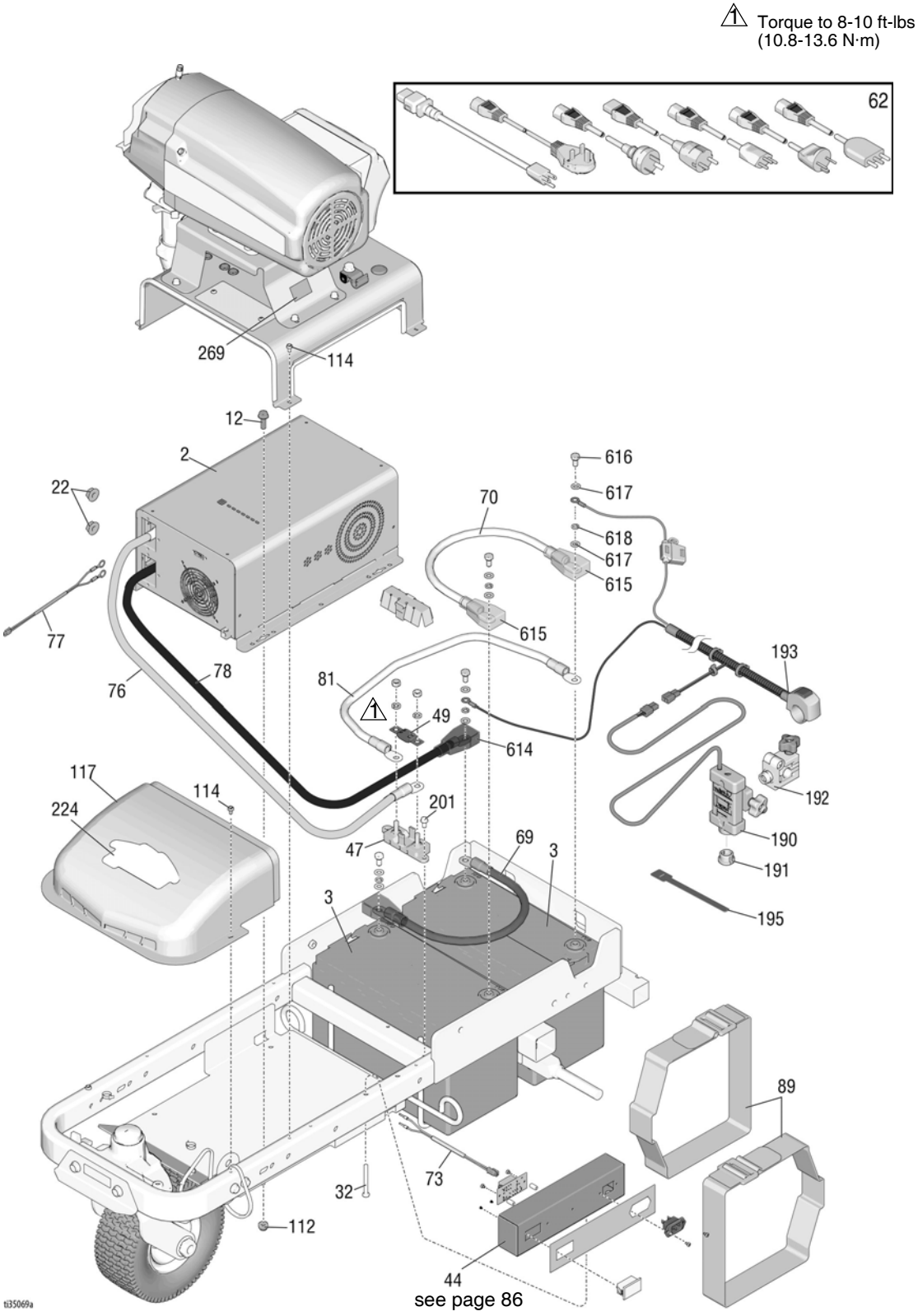


Parts List - ES 2000

Ref.	Part	Description	Qty
5	17P496	COVER, inverter	1
16	111040	NUT, lock, 5/16	4
21	125205	NUT, lock, nylon, 3/8-16	1
23	16X770	SHEILD, pump rod	1
24	106115	WASHER, lock	4
25	110141	SCREW, cap, sch	4
52	278204	CLIP, drain line	1
71	17P506	GASKET, access port	2
72	17P497	COVER, access port	2
79	17P184	HARNESS, wire	1
84	129628	TRIM, edge, rubber foam	1
85	16X224	COVER, front	1
86	15C775	SHIELD, motor, painted	1
87	277069	PUMP, displacement	1
88	17A257	NUT, jam, pump	1
90	196176	ADAPTER, nipple	2
91	176818	PIN, pump, connecting rod	1
92	125220	CLAMP, cushion	2
95	114064	PLUG, inlet	1
96	15W998	SCREW, mach	2
97	129627	SPACER, nylon	1
98	108795	SCREW, mach	4
99	111193	SCREW, cap	1
100	100057	SCREW, cap, hex hd	4
102	118444	SCREW, mach, slot hex wash hd	6
103	240523	HOUSING, bearing	1
105	241008	KIT, rod, connecting	1
107	176817	SPRING, retaining	1
108	17Y020	PLATE, mount	1
110	113974	SCREW, mach, slotted hex wash hd	8
112	102040	NUT, lock, hex	9
123	15C753	SCREW, mach, hex wash hd	5
125	287284	KIT, housing, drive	1
127	114672	WASHER, thrust	2
130	24V567	HOSE, suction, set	1
131	114699	WASHER, thrust	1
132	287289	KIT, gear, combination (incldues 127 and 131)	1
133	116191	WASHER, thrust	1
134	24A701	MOTOR, electric	1
135	278075	BRACKET, wire	1
136	15D088	FAN, motor	1
137	115477	SCREW, mach, torx	1
138	117791	SCREW, cap	2
139		CONTROL, board (includes 143, 146, 147, 148)	1
	24P847	120V Models	
	24P848	230V Models	
141	17R051	TRIM, edge protection, 4.25”	1
143	16T483	PLUG, hole, switch	1
146	16T547	ADAPTER, cord	1
147	16T482	RIVET, snap (120V only)	2
148	114391	SCREW, grounding	1
149		CORD, power	1
	17X916	(120V only)	
	17Y139	(230V only)	
152	16X161	COVER, control, ultra, std	1
154	16U215	SCREW, machine, flat head	1
155	15H063	COIL, filter (120V)	1
	25B130	BOARD, filter (230V)	1
156	16V095	SCREW, mach, pnh, torx	4
161	16Y788	LABEL, elec, std	1
164	187147	STRAINER, 3/4-16 unf	1
166	16D576	LABEL, made in USA	1
167	276980	GROMMET, cover	2
169	119250	SCREW, shoulder	2
201	107257	SCREW, thread forming	2
219	187437	LABEL, torque	1
220	17Y011	LABEL, LL ES 2000, front shroud	1
221▲	17N658	LABEL, warning	1
225	17Y012	LABEL, LL ES 2000, side shroud	1
230	16Y785	LABEL, brand, elec, std	1
236	115711	TAPE, foam, 1/2” wide *(needed if replacing 237)	1
237	17J237	SWITCH, reed *(also order 236 if replacing 237)	1
238	119875	MAGNET, disc, 0.38	1
244	130758	GROMMET, push in	1
245	130759	GROMMET, push in	1
246	130760	PLUG, button, 5/8 ID	1
247	131737	PLUG, sheet metal	3
255	25E264	LABEL, cover, control	1
256	25E265	LABEL, cover, round	1
261	113161	SCREW, flange, hex hd	5

▲ *Replacement safety labels, tags, and cards are available at no cost.*

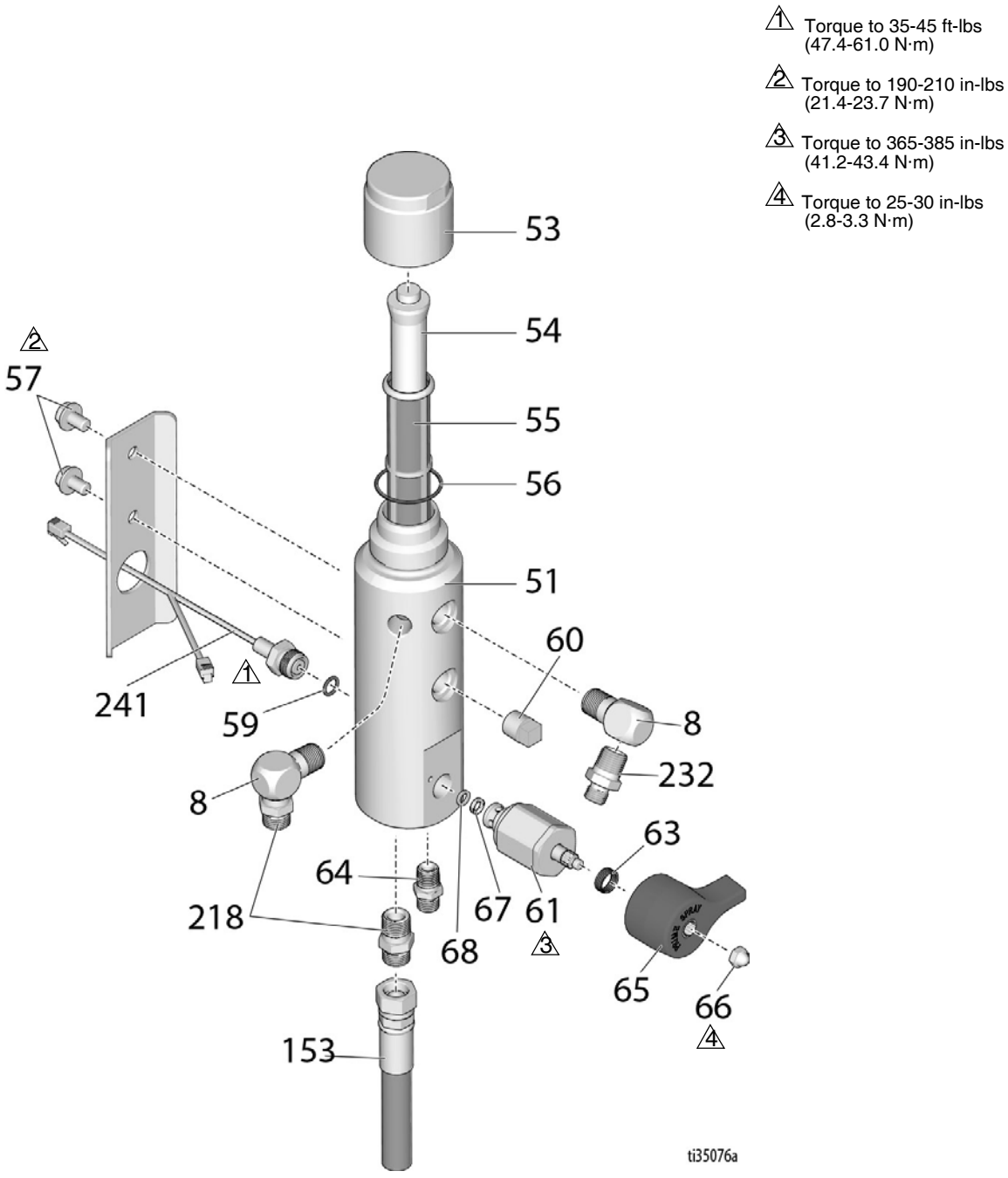
Parts Drawing - ES 2000



Parts List - ES 2000

Ref.	Part	Description	Qty
2	25N794	INVERTER, power supply, 120V	1
	25N793	INVERTER, power supply, 230V	1
3	25C772	BATTERY	2
12	113796	SCREW, flanged, hex hd	4
22	16A390	NUT, hex, flanged	2
32	113469	SCREW, cap, hex hd	2
44	17N921	BOX, voltage meter, 120V	1
	17N922	BOX, voltage motor, 230V	1
47	17N816	HOLDER, fuse	1
49	131738	FUSE, 300, amp	1
62		CORD, power	1
	17N758	US	
	17R033	AUSTRALIA	
	17R034	CEE 7/7	
	17R035	SWITZERLAND	
	17R036	DENMARK	
	17R037	ITALY	
	17S135	CORD, IEC, UK/IRELAND	
69	17P545	CABLE, black, dia .625 x 1 ft (includes 614)	1
70	17P455	CABLE, red, dia .625 x 1 ft (includes 615)	1
73	17N969	HARNESS, wire (relay to inverter)	1
76	17M321	CABLE, red, dia .625 x 3 ft (includes 615)	1
77	17N994	HARNESS, wire, volt motor power	1
78	17M323	CABLE, black, dia .625 x 3.5 ft w/ cover (includes 614)	1
81	17M322	CABLE, red, dia .625 x 2 ft w/ cover (includes 615)	1
89	129629	STRAP, retaining	2
112	102040	NUT, lock, hex	6
114	128978	SCREW, mach, slot hex wash hd	2
117	17P562	COVER, front, LL ES	1
190	17H714	MODULE, LazerGuide 1700	1
191	128917	SHIELD, paint, laser module	1
192	128865	BRACKET, mounting, laser	1
193	17P947	SWITCH, on/off, laser	1
195	128854	STRAP, cable, velcro	1
201	107257	SCREW, hhd forming	2
224	17P202	LABEL, LL ES, logo	1
269	17Y815	LABEL, notice, water	1
614	129545	COVER, black	1
615	129546	COVER, red	1
616	108768	SCREW	4
617	104572	WASHER, lock	4
618	108788	WASHER, flat	8

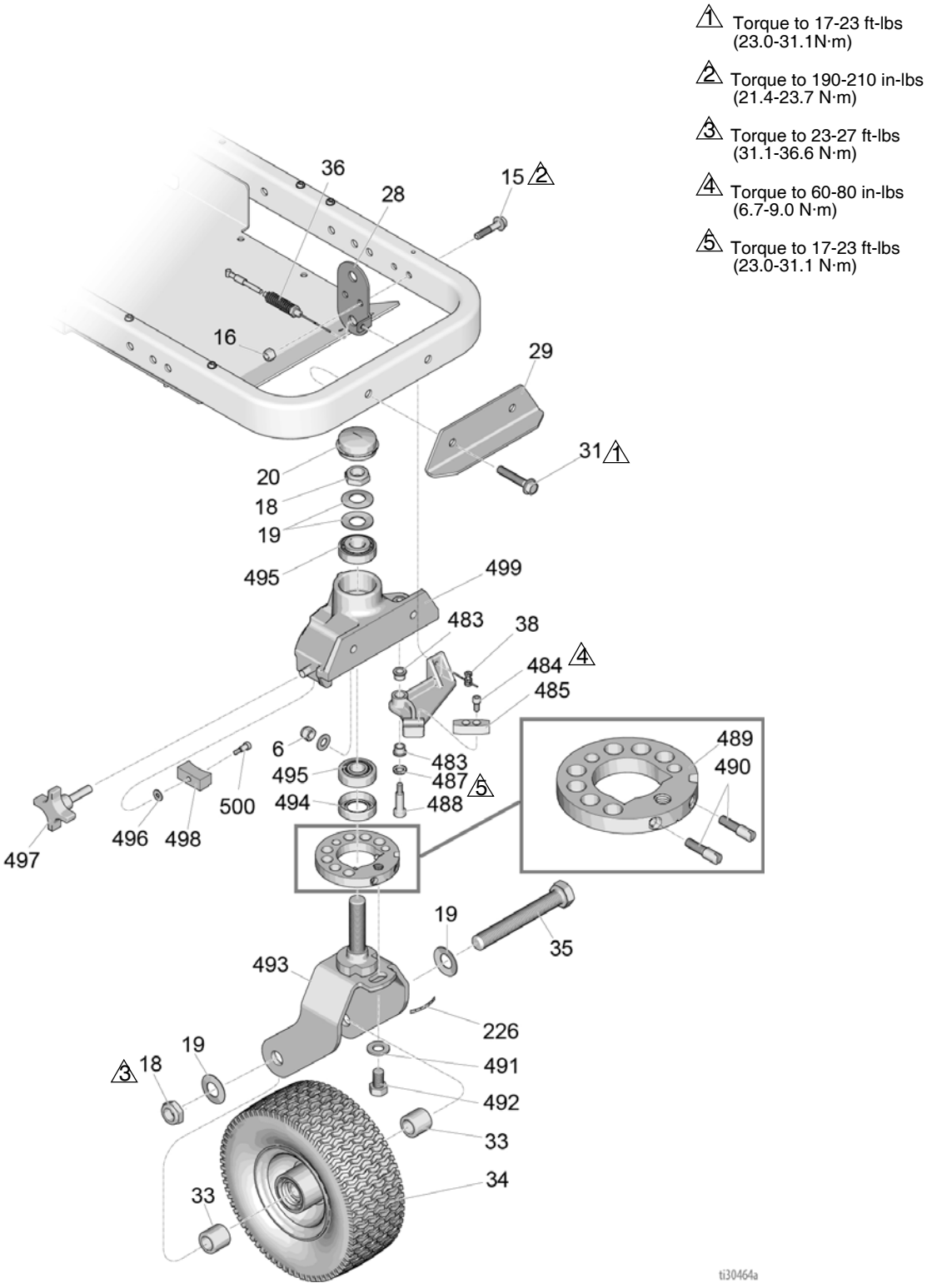
Parts Drawing - ES 2000



Parts List - ES 2000

Ref	Part	Description	Qty
8	196179	FITTING, elbow	2
51	17K166	MANIFOLD	1
53	287285	CAP, filter (includes 54, 56)	1
54	15C766	TUBE, diffusion	1
55	25A465	FILTER, fluid	1
56	117285	PACKING, o-ring	1
57	111801	SCREW, cap, hex hd	2
59	111457	O-RING	1
60	15G331	PLUG, pipe	2
61	245103	VALVE, drain, assy (includes 63, 65, 66, 67, 68)	1
63	114708	SPRING, compression	1
64	196181	FITTING, nipple	1
65	15G563	HANDLE, valve	1
66	116424	NUT, cap	1
67	193709	SEAT, valve	1
68	193710	SEAL, seat, valve	1
153	245226	HOSE, coupled, 3/8” x 3’	1
218	196178	ADAPTER, nipple	2
232	196177	ADAPTER, nipple	1
241	17Y099	TRANSDUCER, pressure	1

Parts Drawing - ES 2000



Parts List - ES 2000

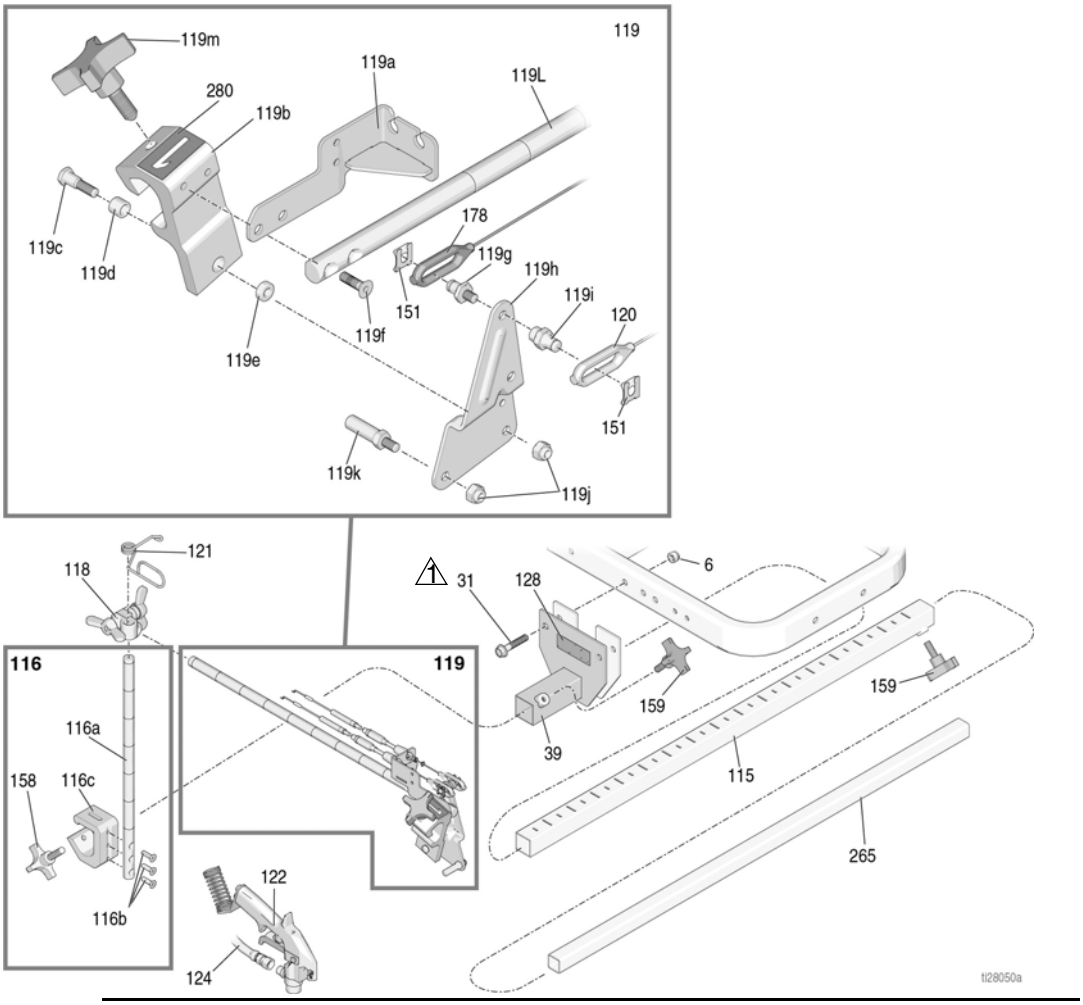
Swivel Wheel Assembly

Ref.	Part	Description	Qty
6*	101566	NUT, lock	2
15	112960	SCREW, cap, flng hd	2
16	111040	NUT, lock, insert, nylock, 5/16	2
18*‡	112405	NUT, lock	2
19*‡	112825	WASHER, belleville	4
20*‡	114648	CAP, dust	1
28‡	15F910	BRACKET, cable	1
29	240991	BRACKET, caster, front	1
31	114982	SCREW, cap, flng hd	2
33*‡	193658	SPACER, seal	2
34*	114549	WHEEL, pneumatic	1
35*	113471	SCREW, cap, hex hd	1
36	241105	CABLE	1
38‡	114802	STOP, wire	1
226*‡	17H489	LABEL, disk adjustment	1
483*‡	114548	BEARING, bronze	2
484*‡	110754	SCREW, cap, sch	2
485*‡	193662	STOP, wedge	1
487*‡	15J603	SPACER, round	1
488*‡	120476	BOLT, shoulder	1
489*‡	17H486	DISK, adjuster, assembly	1
490*‡	17G762	SCREW, disk adjuster	2
491*‡	113962	WASHER	1
492*‡	114681	SCREW, cap, hex hd	1
493*‡	17H485	FORK	1
494*‡	113484	SEAL, grease	1
495*‡	113485	BEARING, cup/cone	2
496*‡	112776	WASHER, plain	1
497*‡	181818	KNOB, pronged	1
498*‡	193661	JAW	1
499*‡	15G952	CASTER	1
500*‡	108483	SCREW, shoulder	1

* *Included in Swivel Wheel Repair Kit 240719*

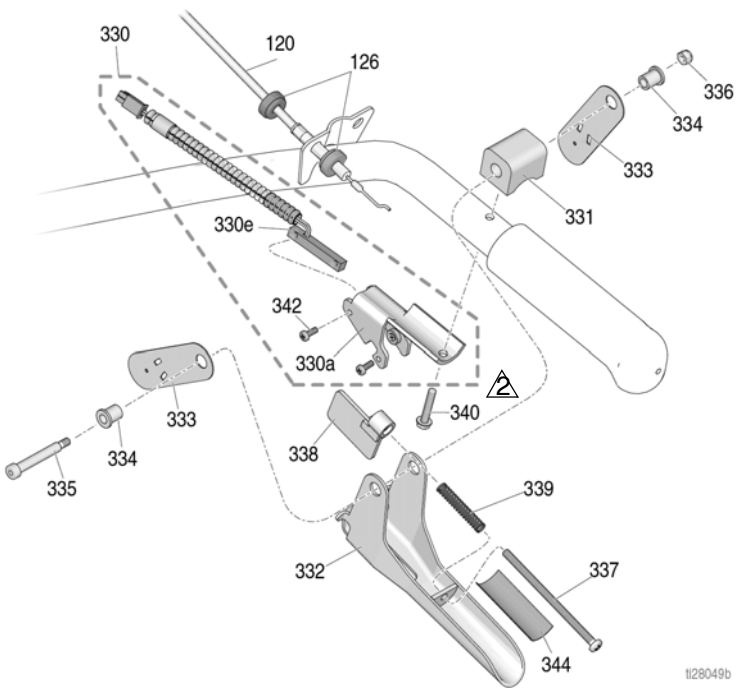
‡ *Included in Swivel Wheel Repair Kit 241105*

Parts Drawing - ES 2000



1 Torque to 17-23 ft-lbs (23.0-31.1 N·m)

2 Torque to 18-22 in-lbs (2.0-2.4 N·m)



Parts List - ES 2000

Gun Holder and Arm

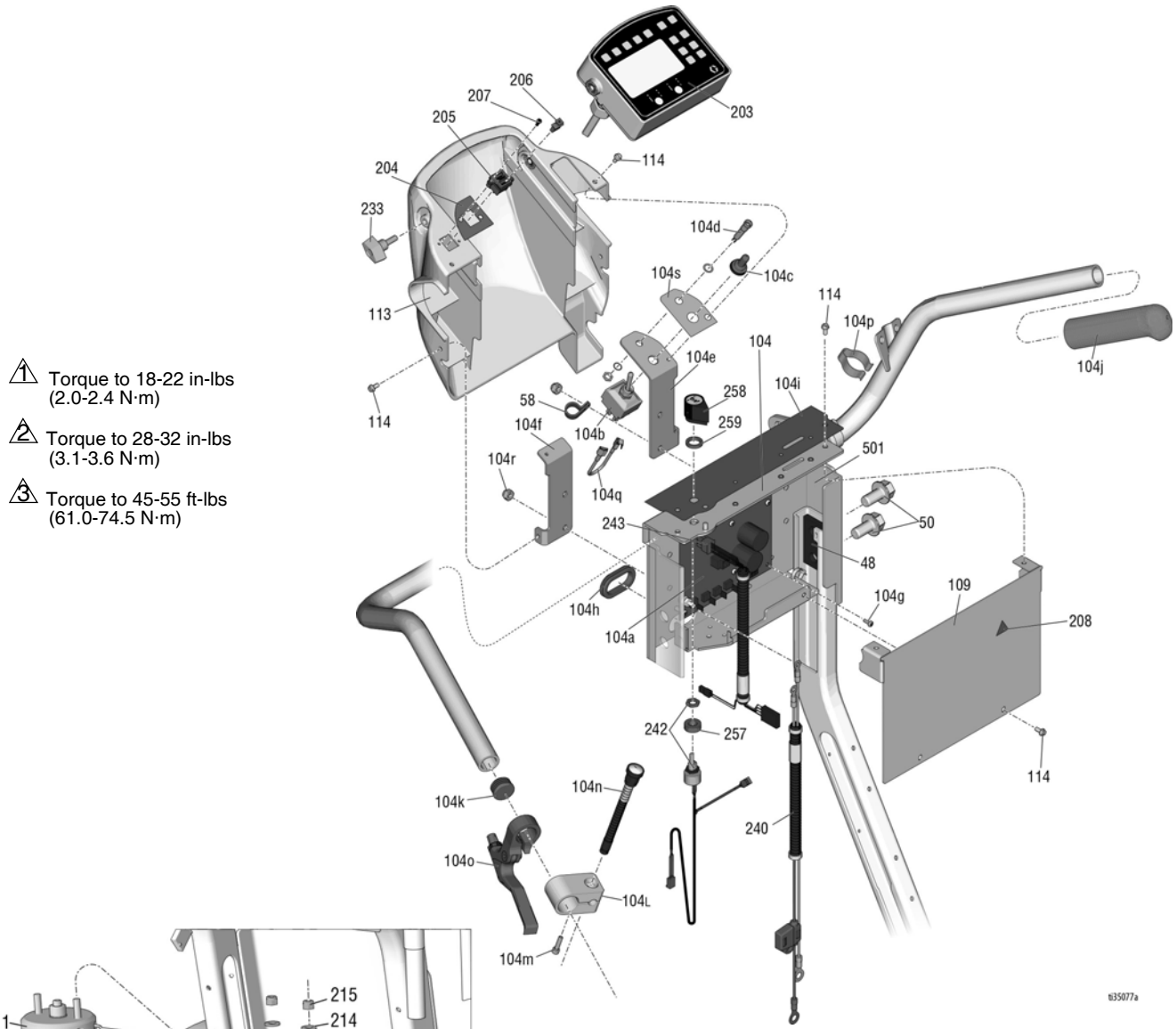
Ref	Part	Description	Qty
6	101566	NUT, lock	2
31	114982	SCREW, cap, flng hd	2
39	17H528	BRACKET, gun arm	1
115	17J407	ARM, extension, bar	1
116	17J424	BAR, height adjustment, assy	1
116a	17J139	BAR, gun, height, adjustment	1
116b	113428	SCREW, mach, hex, hd	3
116c	17J153	BRACKET, gun holder	1
118	24Y645	KIT, clamp, double wing nut	1
119	25A529	ARM, gun holder, linelazer (includes 151)	1
119a	24Y919	BRACKET, cable	1
119b*	15F216	HOLDER, gun	1
119c	17J575	FASTENER, special	1
119d*	119664	BEARING, sleeve	1
119e	17J576	SPACER, special	1
119f	119647	SCREW, cap, socket	2
119g	17H673	STUD, cable, gun	1
119h	15F214	LEVER, actuator	1
119i	17H674	ADAPTER, cable, gun	1
119j	102040	NUT, lock hex	2
119k	15F209	STUD, pull, trigger	1
119l	17J145	ARM, holder, gun	1
119m*	15F750	KNOB, holder, gun	1
120	25A488	CABLE, gun, manual (includes 126, 151)	1
121	188135	GUIDE, cable	1
122	248157	GUN, flex, basic	1
128▲	16P136	LABEL, safety, warning, iso	1
145	245733	KIT, repair, trigger handle (includes 132, 137, 138, 139	1
151	126111	RETAINER, circlip, external, 8mm	2
158	108471	KNOB, pronged	1
159	111145	KNOB, pronged	2
178	25A487	CABLE, gun, automatic (includes 151, 212, 213)	1
265	17J408	ARM, extension, third gun	1
280	17C043	LABEL, number “1”	1
	17C046	LABEL, number “2”	1

* *Included in Gun Holder Repair Kit 287569*
▲ *Replacement safety labels, tags, and cards are available at no cost.*

Gun Trigger

Ref	Part	Description	Qty
120	25A488	CABLE, gun, manual (includes 126, 151)	1
124	245798	HOSE, coupled 1/4” x 7’	1
126	15F624	NUT, cable, gun (knurled)	2
330	25A636	BRACKET, trigger w switch	1
330a	276907	BRACKET, magnet	1
330e	17J237	SWITCH, reed	1
331	198896	BLOCK, mounting	1
332	245676	HANDLE	1
333	198895	PLATE, lever, pivot	2
334	111017	BEARING, flange	2
335	116941	SCREW, shoulder, skt hd	1
336	116969	NUT, lock	1
337	112381	SCREW, mach, pan head	1
338	117268	BRACKET, interrupter	1
339	117269	SPRING	1
340	128803	SCREW, thd forming, hex washer	1
342	117317	SCREW, plastine, pan head	2
344	17K587	LABEL, notice, adjustment	1

Parts Drawing - ES 2000

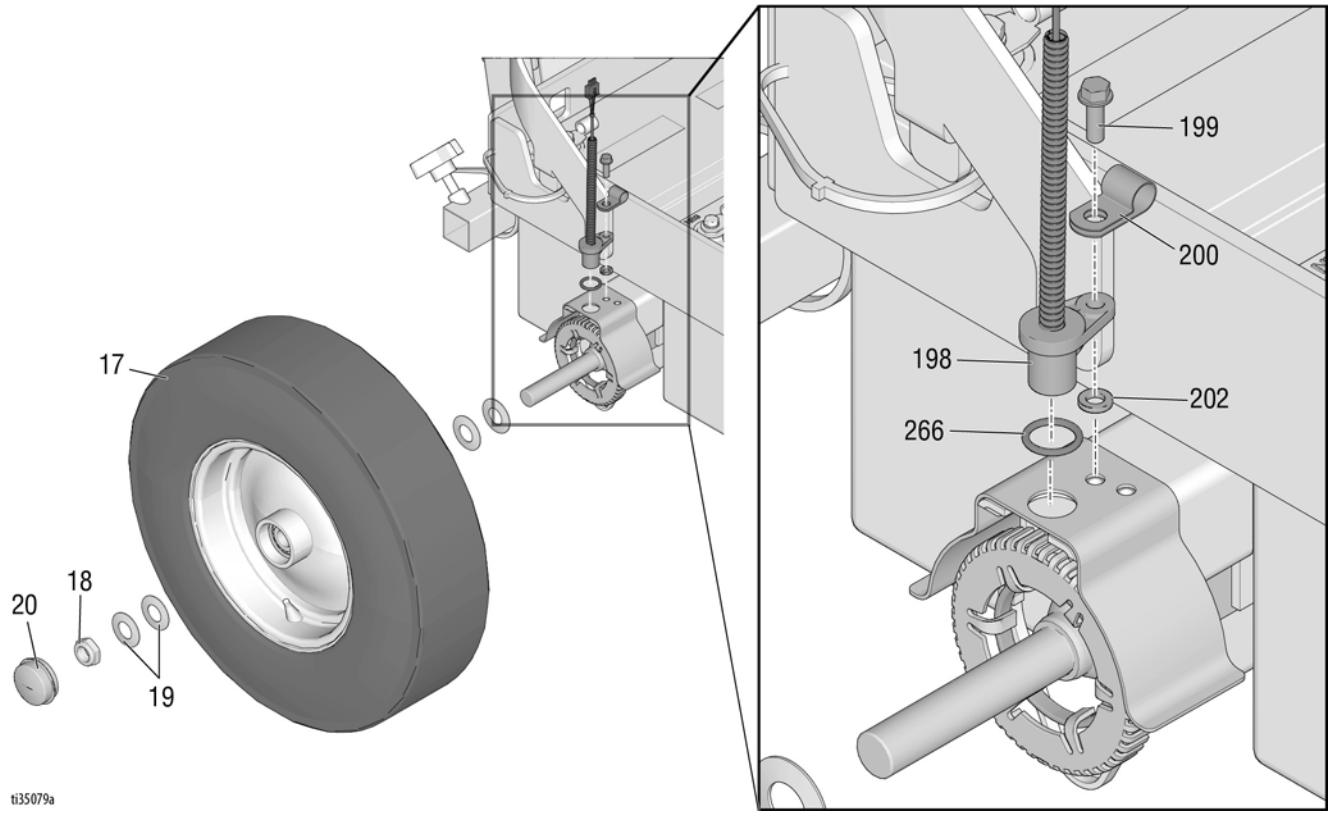


Parts List - ES 2000

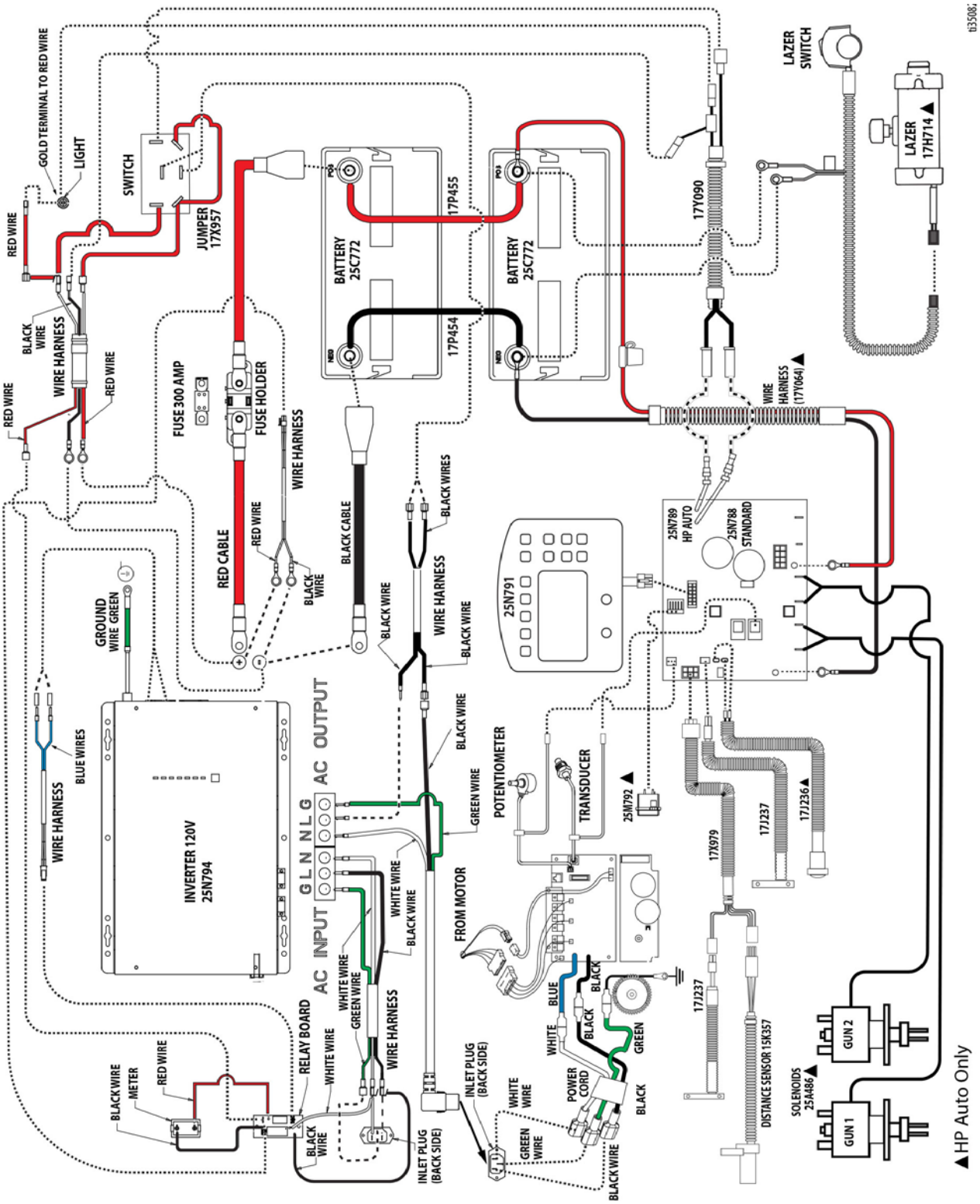
Ref.	Part	Description	Qty
48	17J125	BRACKET, slide	2
50	17J136	SCREW, hex, flange hd	4
58	113491	CLAMP, wire	1
104		CONTROL, auto, assembly	1
104a	25N788	KIT, repair, main board (standard)	1
	25N789	KIT, repair, main board (HP Auto)	1
104b	131716	SWITCH, toggle, 3 PST	1
104c	131717	BOOT, toggle	1
104d	17N435	INDICATOR, LED	1
104e	17N419	BRACKET, switch	1
104f	17J126	BRACKET, shroud	1
104g	120593	SCREW, mach	4
104h	17H701	GROMMET, oval	1
104i	25E273	LABEL, instructions	1
104j	114659	GRIP, handle	2
104k	120151	PLUG, tube	2
104l	15K162	BLOCK	1
104m	C20004	SCREW, cap	1
104n	17J236	SWITCH, push button	1
104o	194310	LEVER, actuator	1
104p	178342	CLIP, spring	4
104q	17X957	WIRE, jumper	1
104r	102040	NUT, lock hex	4
104s	17N632	LABEL, switch	1
109	17J123	PLATE, cover	1
113	17J135	COVER, control (Standard units)	1
	17U517	COVER, control (HP Auto units)	1
114	128978	SCREW, mach, slot hex wash hd	8
178	25A487	KIT, repair, gun cable, auto	2
201	107257	SCREW, thd forming	6
203	25N791	BOX, control assy	1
204	17V520	LABEL, USB	1
205	17Z084	BOARD, assy, USB (includes 204, 206, 207)	1
206	131718	COVER, dust, USB	2
207	17V519	SCREW, pan head, #4-40 x 5/16”	2
208	189930	LABEL, caution	1
209	15H108	LABEL, safety, warning, pinch	1
210	24Y777	BRACKET, solenoid, weldment	1
211	25A486	KIT, repair, solenoid	2
212	128711	PIN, clevis, 5/16 dia.	2
213	15R598	CLIP, cotter, hairpin	2
214	110755	WASHER, plain	4
215	121114	NUT, hex, self locking	4
216	17H650	COVER, solenoid	1
217	128712	CAP, round, vinyl	2
233	16W408	KNOB, t-handle, 1/4-20 thd stud	2
240	17Y064	HARNESS, wiring, battery, HP auto	1
242	17Y142	POTENTIOMETER	1
243	17X979	HARNESS, wiring, wheel/pump	1
257	198650	SPACER, shaft	1
258	116167	KNOB, potentiometer	1
259	15C973	GASKET	1
501	24Y642	PLATE, control, Weldment	1

Distance Sensor Replacement (ES 2000)

1. Remove wheel (17) from LineLazer.
2. Remove screw (199), wire clamp (200) and distance sensor (198).
3. Roll o-ring (266) onto distance sensor (198), then install using wire clamp (200) and screw (199)
4. Install wheel (17) on LineLazer.

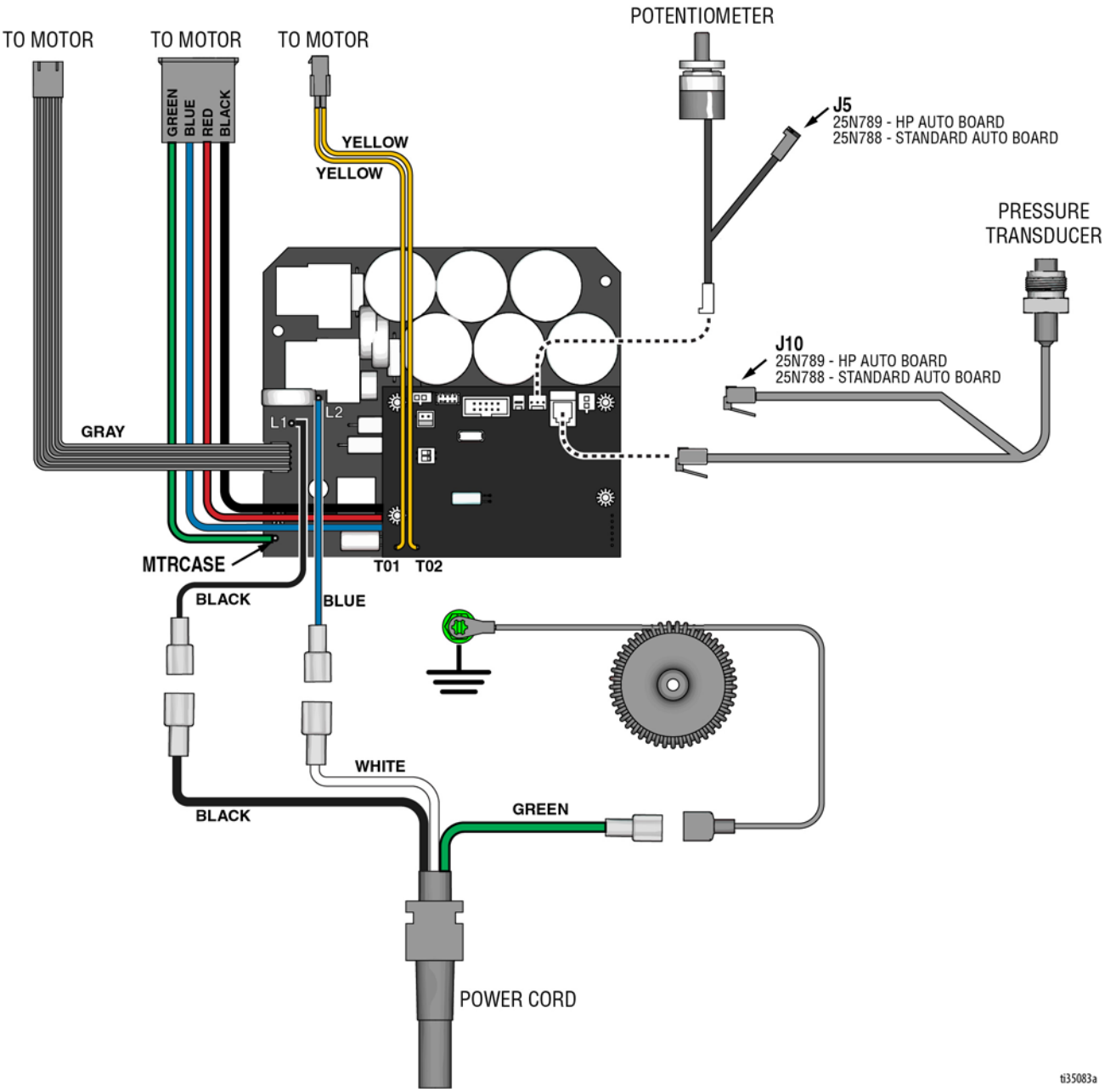


Wiring Diagram - 120V (ES 2000)



Control Board Wiring Diagram

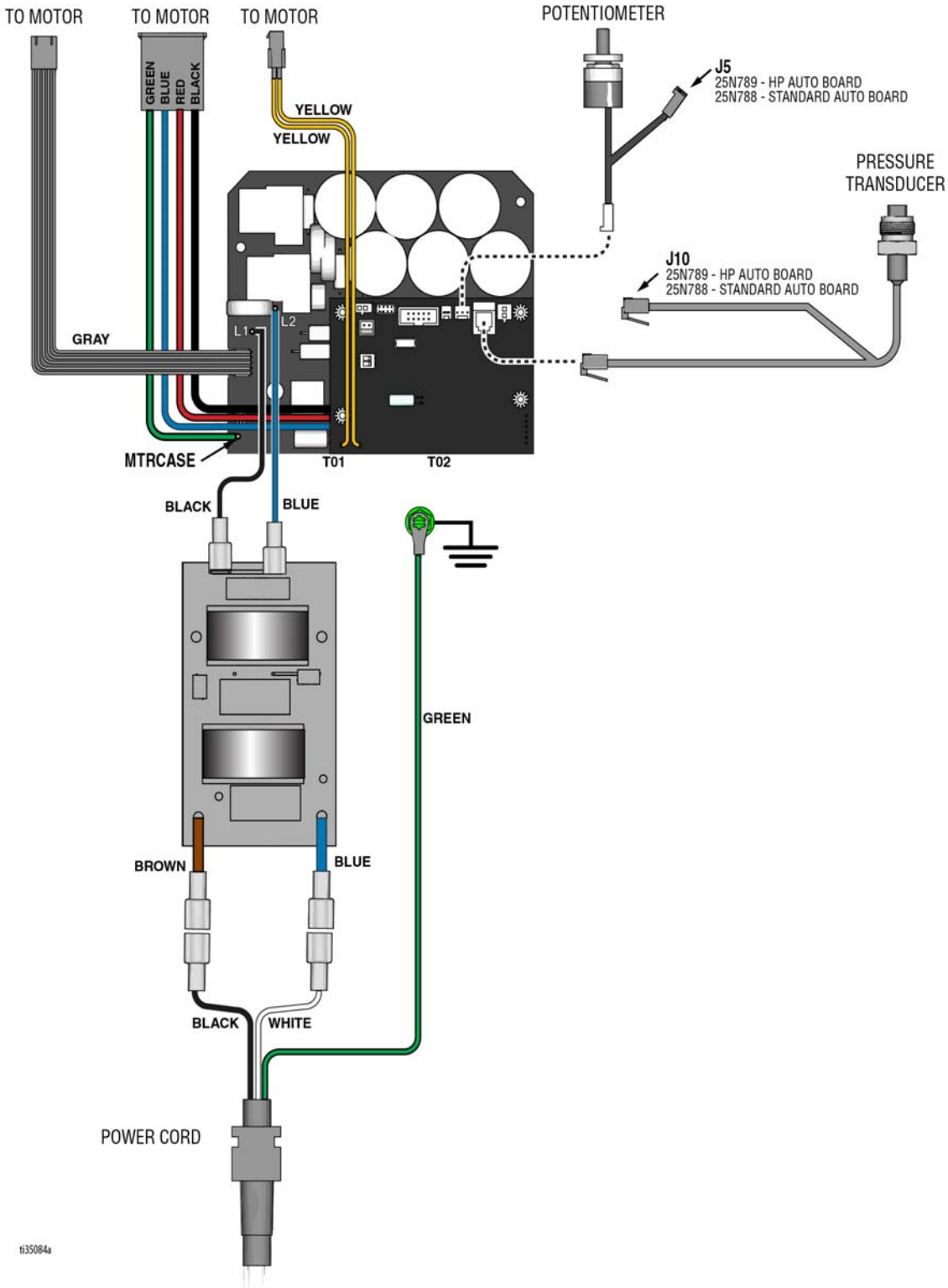
110/120V (ES2000)



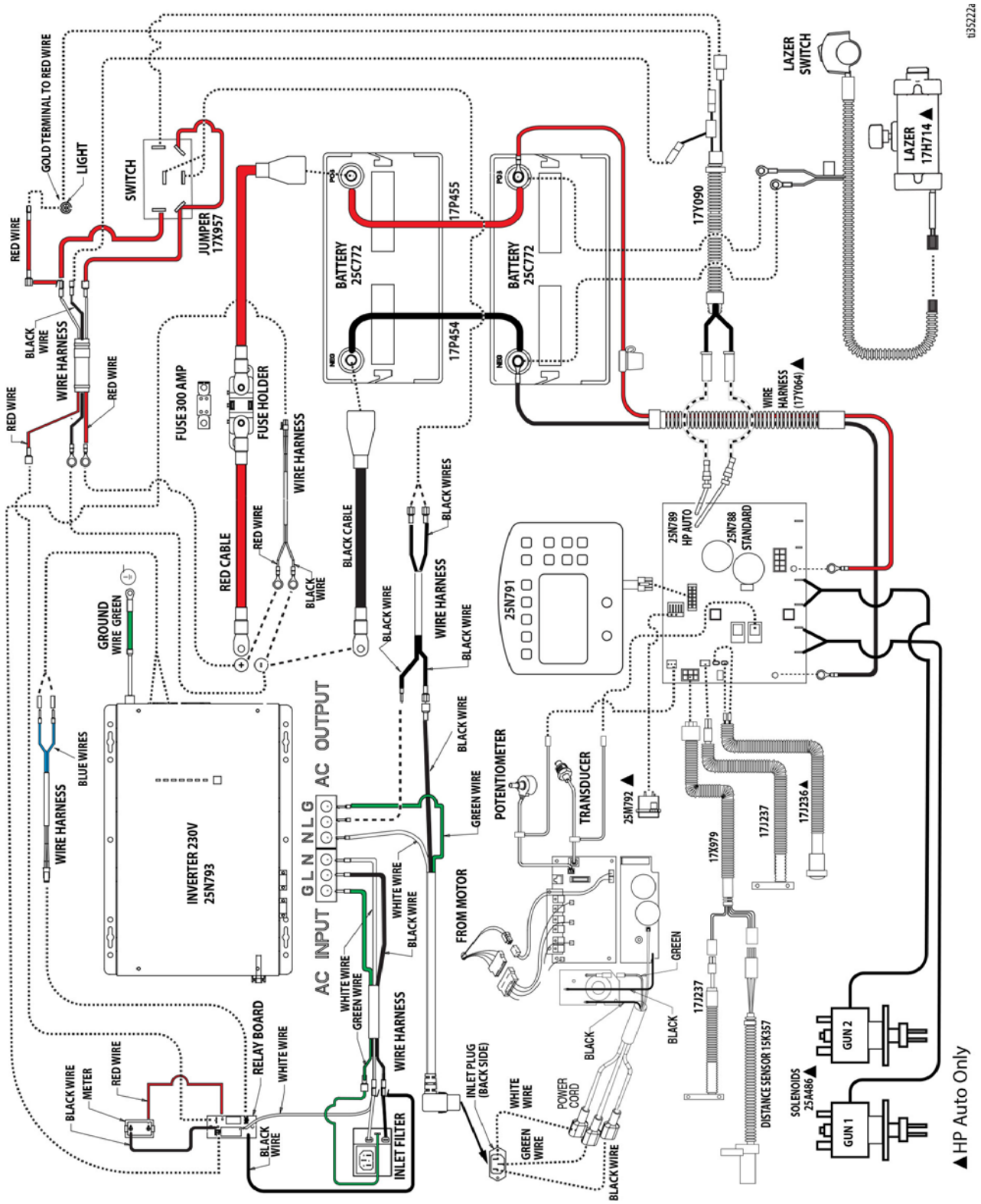
230V (ES2000)

NOTICE

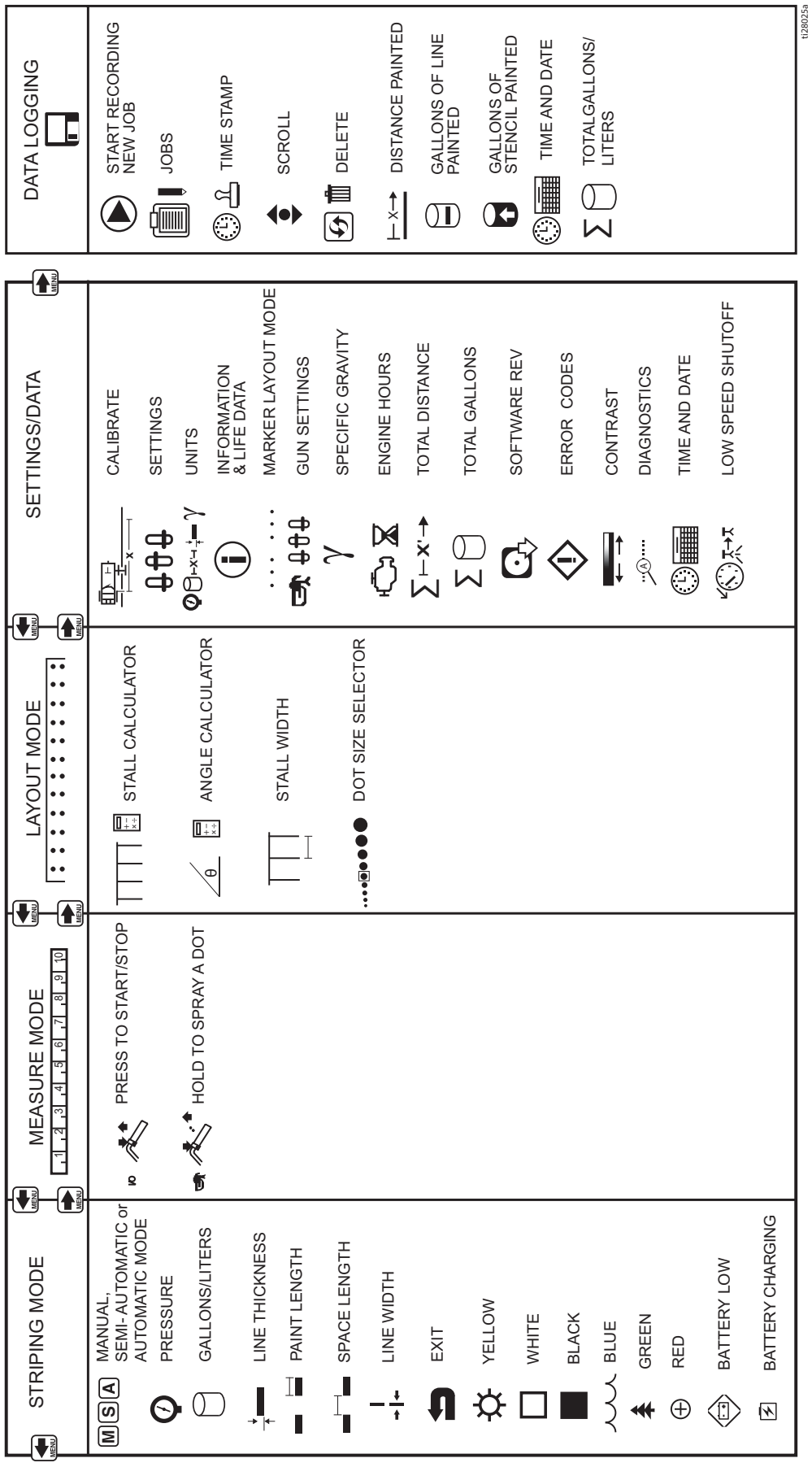
Heat from inductor coil of filter board may destroy wire insulation that comes in contact with it. Exposed wires could cause shorts and component damage. Bundle and tie loose wires so none lay in contact with inductor coil on the filter board.



Wiring Diagram - 230V (ES 2000)



World Key Symbol



Technical Specifications

LineLazer ES 2000		
	U.S.	**Metric**
Dimensions		
Height (with handle bar down)	Unpackaged - 44.5 in. Packaged - 53.0 in.	Unpackaged - 113.03 cm Packaged - 134.62 cm
Width	Unpackaged - 34.25 in. Packaged - 39.0 in.	Unpackaged - 86.99 cm Packaged - 99.06 cm
Length	Unpackaged - 68.75 in. Packaged - 75.0 in.	Unpackaged - 174.63 cm Packaged - 190.5 cm
Weight (dry - no paint)	Unpackaged - 481 lbs Packaged - 578 lbs	Unpackaged - 218 kg Packaged - 262 kg
Noise (dBa)		
Sound Power per ISO 3744 (@ 3.1 ft):	91.0 dBA	
Sound Pressure per ISO 3744 (@ 3.1 ft):	82.0 dBA	
Vibration (m/s^2) (8 hours daily exposure)		
Right-hand (per ISO 5349)	0.631	
Left-hand (per ISO 5349)	0.781	
Maximum Delivery	1.1 gpm	4.2 lpm
Maximum Tip Size 1 gun	.033	
Inlet paint strainer	16 mesh	1190 micron
Outlet paint strainer	50 mesh	297 micron
Pump inlet size	1 in. NSPM (m)	
Pump outlet size	3/8 NPT (f)	
Maximum working pressure	3300 psi	228 bar, 22.8 MPa

Wetted Parts: PTFE, Nylon, polyurethane, V-Max, UHMWPE, fluoroelastomer, acetal, leather, tungsten carbide, stainless steel, chrome plating, nickel-plated carbon steel, ceramic

CALIFORNIA PROPOSITION 65

WARNING: This product can expose you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

LineLazer ES 1000 with 1 battery		
	U.S.	**Metric**
Dimensions		
Height (with handle bar down)	Unpackaged - 44.5 in. Packaged - 53.0 in.	Unpackaged - 113.03 cm Packaged - 134.62 cm
Width	Unpackaged - 34.25 in. Packaged - 39.0 in.	Unpackaged - 86.99 cm Packaged - 99.06 cm
Length	Unpackaged - 68.75 in. Packaged - 75.0 in.	Unpackaged - 174.63 cm Packaged - 190.5 cm
Weight (dry - no paint)	Unpackaged - 340 lbs Packaged - 437lbs	Unpackaged - 154 kg Packaged - 198 kg
Noise (dBa)		
Sound Power per ISO 3741:	89.8 dBA	
Sound Pressure per ISO 3741:	85.3 dBA	
Vibration (m/s^2) (8 hours daily exposure)		
Right-hand (per ISO 5349)	1.85	
Left-hand (per ISO 5349)	0.90	
Maximum Delivery	0.6 gpm	2.3 lpm
Maximum Tip Size 1 gun	.025	
Inlet paint strainer	16 mesh	1190 micron
Outlet paint strainer	60 mesh	297 micron
Pump inlet size	1 in. NSPM (m)	
Pump outlet size	1/4 NPT (f)	
Maximum working pressure	3300 psi	228 bar, 22.8 MPa

Wetted Parts: PTFE, Nylon, polyurethane, V-Max, UHMWPE, fluoroelastomer, acetal, leather, tungsten carbide, stainless steel, chrome plating, nickel-plated carbon steel, ceramic

LineLazer ES 1000 & ES 2000		
DC Input		
Nominal Input Voltage	12.0Vdc	
Minimum Start Voltage	10.0Vdc	
Low Battery Alarm	11.0Vdc	
Low Battery Trip	10.5Vdc	
High Voltage Alarm & Fault	16.0Vdc	
High DC Input Recovery	15.5Vdc	
Low Battery Voltage Recovery	13.0Vdc	
Idle Consumption-Search Mode	60W	
Charge		
Input Voltage Range	100~135VAC / 194~243 VAC;	
Input Frequency Range	50/60Hz	
Output Voltage	Depends on battery type (see chart below)	
Charger Breaker Rating (230Vac)	10A	
Charger Breaker Rating (120Vac)	20A	
Max Charger Rate	30 amps	
Over Charge Protection	15.7V for 12Vdc	
Battery Type	Fast Vdc	Float Vdc
Gel U.S.A.	14.0	13.7
A.G.M 1	14.1	13.4
A.G.M 2 (Graco Supplied)	14.6	13.7
Sealed Lead Acid	14.4	13.6
Gel Euro	14.4	13.8
Open Lead Acid	14.8	13.3
LiFePO4	14.4	14.4
De-sulphation	15.5 (4 hrs then OFF)	
Bypass & Protection		
Nominal Voltage	120Vac	230Vac
Low Voltage Trip	90V±4%	184V±4%
Low Voltage re engage	100V±4%	194V±4%
High Voltage Trip	140V±4%	253V±4%
High Voltage re engage	135V±4%	243V±4%
Max Input AC Voltage	150VAC	270VAC
Nominal Input Frequency	50Hz or 60Hz (Auto detect)	
Low Freq Trip	Wide: 40±0.3Hz for 50Hz/60Hz	
Low Freq re engage	Wide: 45±0.3Hz for 50Hz/60Hz	
High Freq Trip	Wide: No up limit for 50Hz/60Hz	
High Freq re engage	Wide: No up limit for 50Hz/60Hz	
Output Short circuit protection	Circuit Breaker	
Bypass Breaker Rating (230Vac)	20A	
Bypass Breaker Rating (120Vac)	30A	
Batteries		

LineLazer ES 1000 & ES 2000		
Nominal Battery Pack Voltage	12 VDC	
Quantity	ES 1000: 1 or 2	ES 2000: 2
Type	Deep Cycle Absorbent Glass Mat (AGM)	
Voltage (Nominal)	12 VDC	
Dimensions	12.99” x 6.73” x 8.46”	330 mm x 171 mm x 220 mm
Capactiy (Nominal, 20hr rate)	100 Amp-hour	
Maximum Charging Current	67.5 Amps	
Battery Temperature		
Operating	-4-140°F	-20-60°C
Charging	14-140°F	-10-60°C
Storaging	-4-140°F	-20-60°C

End of Product Life

At the end of the product’s useful life, dismantle and recycle it in a responsible manner.

- Perform the **Pressure Relief Procedure**.
- Drain and dispose of fluids according to applicable regulations. Refer to the material manufacturer’s Safety Data Sheet.
- Remove motors, batteries, circuit boards, LCDs (liquid crystal displays), and other electronic components. Recycle according to applicable regulations.
- Do not dispose of batteries or electronic components with household or commercial waste.

- Deliver remaining product to a recycling facility.

Graco Standard Warranty

Graco warrants all equipment referenced in this document which is manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

GRACO MAKES NO WARRANTY, AND DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IN CONNECTION WITH ACCESSORIES, EQUIPMENT, MATERIALS OR COMPONENTS SOLD BUT NOT MANUFACTURED BY GRACO. These items sold, but not manufactured by Graco (such as electric motors, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

Graco Information

For the latest information about Graco products, visit www.graco.com.

For patent information, see www.graco.com/patents.

TO PLACE AN ORDER, contact your Graco distributor or call 1-800-690-2894 to identify the nearest distributor.

Original instructions. This manual contains English. MM 3A4603
Graco Headquarters: Minneapolis
International Offices: Belgium, China, Japan, Korea

GRACO INC. AND SUBSIDIARIES • P.O. BOX 1441 • MINNEAPOLIS MN 55440-1441 • USA

www.graco.com
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