START•ALL SERIES

Troubleshooting Guide for Hydraulic Units

Goodall® By VANAIR®

We Start Engines™

SAFETY PRECAUTIONS AND INSTRUCTIONS

SIGNAL WORDS

Safety messages are provided throughout this manual to help prevent personal injury and equipment damage. All safety messages are introduced by a signal word indicating the hazard level.

DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury to the operator or bystanders.

WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to the operator or bystanders.

CAUTION Indicates a potential hazardous situation which, if not avoided, may result in moderate or minor injury to the operator or bystanders.

NOTICE Indicates a situation which, if not avoided, may result in damage to Start•All unit components.

This symbol, in combination with other safety and control symbols, points out important safety information that, if not followed, could endanger personal safety and/or damage to property.

SAFETY AND CONTROL SYMBOLS

WARNING

CARBON MONOXIDE

Can cause severe nausea, fainting, or death.

The exhaust system must be leakproof and routinely inspected.

WARNING

ACCIDENTAL STARTING

Accidental starting can cause severe injury or death.

WARNING

SULFURIC ACID IN BATTERIES.
Can cause severe injury or death.

Wear protective goggles and clothing. Battery acid may cause blindness and burn skin.

WARNING

Engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

SAFETY PRECAUTIONS AND INSTRUCTIONS

⚠ WARNING ⚠

Read And Adhere To All Safety Warnings Before Operating Any Mechanical Equipment.

⚠ DANGER ⚠

Explosive gases are produced during the boosting and charging process. The smallest spark can ignite these explosive gases. To avoid battery explosion and serious personal injury, follow these important safety precautions when boosting a battery:

- Always wear safety equipment such as goggles, gloves, ear plugs and head protection at all times when operating the Start•All.
- Keep flames, cigarettes, and other ignition sources away from the battery.
- Avoid contact with metal objects such as tools and jewelry that could cause sparks.
- Never lean over the battery during charging, testing, or boosting.
- Check the battery for low water level or frozen conditions. NEVER BOOST A FROZEN BATTERY; rupture or explosion could occur, causing serious personal injury.
- Vehicle owner's manual may indicate further precautions which also should be followed when attempting to boost a vehicle.

⚠ POISON ⚠

Battery Acid Causes Severe Burns. Avoid Contact With Skin, Eyes, Or Clothing.

⚠ CAUTION ⚠

When Start•All is not in use, keep all switches in the OFF position.

- Always keep cable clamps separate so they do not come in contact with each other. The clamps could short circuit, creating arcing or sparking, which may cause damage.
- Periodically inspect cables for cracking or abrasion; this may cause the copper to become exposed, which could cause sparking or arcing during operation.

⚠ WARNING ⚠

NEVER TOUCH HOT SURFACES AND AVOID HOT GASES.

NOTE:

Since there are many variations in the circumstances surrounding the installation, operation, and maintenance of this Start•All unit, we cannot possibly anticipate or provide advice or safety messages to cover every situation.

PLEASE NOTE: THIS TROUBLESHOOTING GUIDE HAS BEEN DESIGNED TO TEST YOUR START•ALL UNIT IN THE ORDER WRITTEN. IT IS NECESSARY TO FOLLOW THE TROUBLESHOOTING STEPS IN ORDER FROM BEGINNING TO END. FAILURE TO DO SO WILL RESULT IN FALSE READINGS AND MAY CAUSE DELAYS IN THE TROUBLESHOOTING PROCESS.

TOOLS REQUIRED FOR THE JOB

Digital Volt Ohm Meter/Multi Meter
(2) Jumper Wires that are 6-12" long, 14 gauge or better wire, with clamps at both ends
12 volt battery or jump pack that is in good working order
Set of jumper cables (if using a 12 volt battery for testing)

GENERAL INSPECTION

- Inspect the cable/clamp assembly; look for cuts, abrasions or breaks in the cable
- Check for worn jaws on clamp ends
- Check for excessive corrosion on all terminal end connections
- Check for proper belt tension. Belts should deflect approximately 3/8" under light finger pressure

NOTICE For Proper Testing Procedure And To Ensure Proper Output Of The Generators, Please Do The Test With The Generators On The Machine (**Not Being Benched Tested**).

TESTING THE GENERATORS

1. Inspect the generator for a solder ring, solder flakes or drops inside the generator housing just behind the brushes. If a ring of solder is found near the brush plate, the generator needs to be replaced; the generators have been overheated. If no solder ring is found, each generator needs to be tested.

NOTICE **When Testing The 79-406/79-510 Isolated Ground Generator, The Stud On The Bottom Of The Generator Must Be Grounded By Running A Jumper Wire From The Stud To A Good Ground Connection (Such As A Generator Mounting Bolt). These Isolated Ground Generators Are Only Used On 12/24 Volt Single Cable Starting Units. (Fig. 1)**

2. Remove all the wires from the generators and label them for re-installation. Install a bypass lead between the field post (small terminal on top of the generator) and armature post (large terminal on top of the generator). (FIG. 2)
3. Attach the positive probe from a volt meter to the armature post, and the negative probe to a good ground connection (such as a generator mounting bolt).
4. With the flow control at maximum, the voltage should read **22-28 VOLTS** on the volt meter. If the voltage reads below 22, check the brushes for excessive wear. Brush length should be a minimum of ½". If brushes are less than ½", replace the brushes. Retest generator to confirm 22-28 volts until all generators pass the test.
5. If little or no voltage is present, replace or rebuild the generator.
6. Test the remaining generators by following the above steps for each generator. If all generators perform satisfactorily, reconnect the wires to each of the generators. **DO NOT HOOK UP THE VOLTAGE CONTROL WIRES AT THIS TIME.**

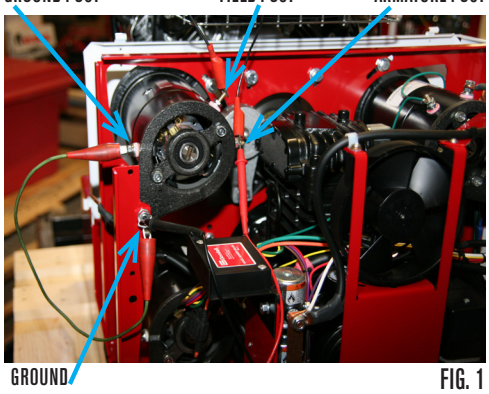

FIG. 1

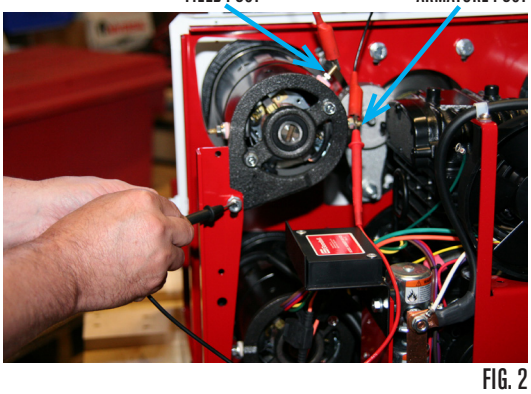

FIG. 2

TESTING THE SOLENOID(S) 77-181S1

1. Remove all the wires from each solenoid, and label for re-installation. **Failure to do so could result in permanent damage to the voltage control.**
2. Apply 12 volt power to the small studs on each solenoid. The solenoid should engage, and you will hear the contact closing. With power still applied to the small terminals on the solenoid, measure the resistance between the larger terminals. The reading should be near zero ohms. If the solenoids do not engage, or if the reading between the large terminals is high, the solenoid should be replaced. (FIG. 3)
3. It is also possible to have a shorted solenoid. With no power applied to the solenoid, measure the resistance between the large terminals. The reading should be open; if the reading is near zero ohms, replace the solenoid. (FIG. 4)
4. Do not install the voltage control wires on solenoids until voltage control module has been tested. Install all other wires to correct location on the solenoids, and proceed to test the voltage control.

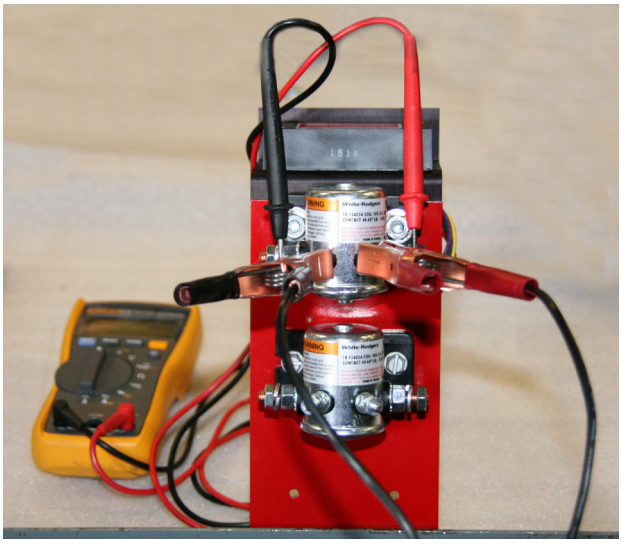

FIG. 3

FIG. 4

TESTING THE 890-635S VOLTAGE CONTROL

IF YOUR UNIT HAS THE TWO WIRE 70-600-K VOLTAGE CONTROL, YOU WILL NEED TO CALL GOODALL MFG AT 800-328-7730 FOR AN UPGRADE KIT.

1. Confirm the fuse on the orange wire is not open. If open, replace with a 30 amp fuse (FIG. 5). If the fuse is not open, proceed to the next step.
2. Disconnect all wires coming from the voltage control. Disconnect the connector on the orange wire. (FIG. 6)
3. Place a jumper wire across the field and armature terminals on any generator. The field terminal is smaller and has green wires attached. The armature terminal is larger and has heavy gauge wires attached. (FIG. 7)
4. Place a jumper wire between the small solenoid terminal containing the brown wire and a ground on the Start•All (such as a generator mounting bolt).
5. Place a jumper wire between the switch side connector in the orange wire and the field post on any one of the generators. (FIG. 8)
6. Connect a digital voltmeter to the battery clamps and set to DC voltage scale.
7. Make sure the boosting switch is in the “OFF” position. Start and run the unit at 3/4 flow.
8. Move the switch to the 12V position (FIG. 9) and increase the flow control to maximum flow.
9. You should see raw voltage of 28V or higher.

NOTICE If you have 22-28V with the voltage control, replace the voltage control module.

ILLUSTRATIONS ON NEXT PAGE

FIG. 5

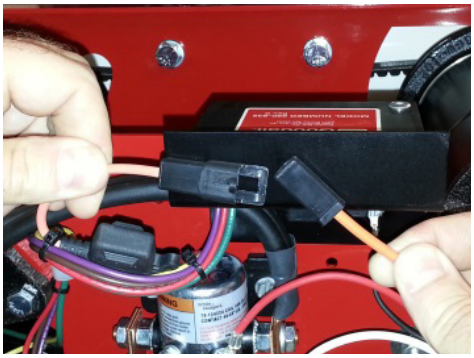

FIG. 6

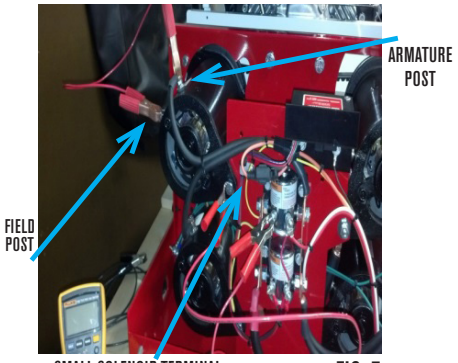

FIG. 7

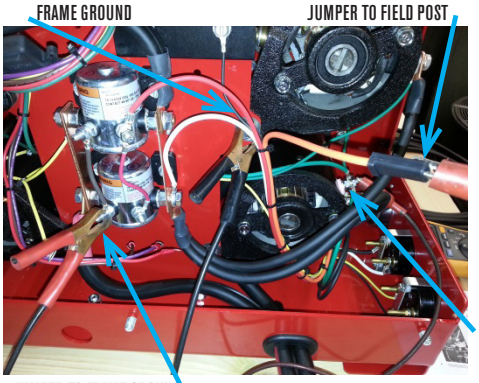

FIG. 8

FIG. 9

NOTICE **Using The Start•All For Boosting With The Voltage Control Bypassed Should Be Avoided, Due To The Possibility Of Excessive Voltage Being Created.**

FIXING REVERSE POLARITY GENERATORS

(ONLY USED IF REVERSE POLARITY IS SUSPECTED)

If your unit is continually blowing the 30 amp fuse in the voltage control line, you could have reversed/negative polarity generator. To fix this, you must have either a 12 volt jump pack or a 12 volt battery with jumper cables. Do the procedure on the far left generator and then repeat the same step on the one right next to it. **The 12 volt jump pack or 12 volt battery has to be in good working condition.**

WHEN USING A 12 VOLT JUMP PACK

1. Put the negative clamp to a good ground on the unit.
2. Turn the jump pack on while holding onto the positive cable. Scratch it across the field post on the generator, which is the smaller of the two posts on top of the generator. **It is normal to see sparks while doing this.** Do not attach the positive cable clamp to the field post as this may cause damage to the generator. You must scratch is across the field post.
3. Once you have done this a few times, you will have reversed the polarity back to positive in all of the generators, as long as all the wires have been hooked back up correctly.

WHEN USING A 12 VOLT BATTERY (WILL ALSO REQUIRE A SET OF JUMPER CABLES)

1. Hook the jumper cables up to the battery with the black clamp on the negative and the red clamp on the positive. **Do not let the other ends touch, or there will be severe sparking that could cause damage.**
2. With the other end of the cables, take the negative black clamp and put it on a good ground on the unit.
3. Scratch the positive red clamp across the field post of the generator, which is the smaller of the two posts on top of the generator. **It is normal to see sparks while doing this.** Do not attach the positive cable clamp; you must scratch it across the field post.
4. Once you have done this a few times, you will have reversed the polarity back to positive in all of the generators, as long as the wires have been hooked back up correctly.

12 VOLT BLUE LABEL VOLTAGE CONTROL SWITCH TESTS

To prevent unintended current paths while testing the switch, disconnect all wires coming from the switch.
Label all wires to enable correct re-connect later.

CHECK THE "OFF" POSITION

1. With the switch in the **"OFF"** position, check for continuity between any combinations of the red, blue, black and green wires.
2. Is there continuity present?
   a. If **YES** - The switch has an internal short. Replace switch assembly.
   b. If **NO** - This portion of the switch is working correctly. Proceed to 'Check the "ON" Position' section.

CHECK THE "ON" POSITION

1. Move the switch to the **"ON"** position and check for continuity between the red and black wires coming from the switch.
2. Is there continuity present between red and black wires?
   a. If **YES** - This portion of the switch is working correctly. Proceed to 'Check the Switch Lugs' section.
   b. If **NO** - This portion of the switch is not working correctly. Replace switch assembly.

CHECK THE SWITCH LUGS

1. Check for continuity between the switch lug with two blue wires and the switch lug with one blue wire.
2. Is there continuity between the two switch lugs?
   a. If **YES** - This portion of the switch is working correctly. Proceed to 'Check the "Energize" Position' section.
   b. If **NO** - This portion of the switch is not working correctly. Replace switch assembly.

CHECK THE "ENERGIZE" POSITION

1. Move the switch to the **"ENERGIZE"** position and check for continuity between the black and green wires coming from switch.
2. Is there continuity present between the black and green wires?
   a. If **YES** - This portion of the switch is working correctly.
   b. If **NO** - This portion of the switch is not working correctly. Replace switch assembly.

12/24V BLUE LABEL VOLTAGE CONTROL SWITCH TESTS

In the "ON" position, the switch connects the Armature output to the orange wire on the regulator and the appropriate solenoids for the selected voltage. This test is performed with an ohmmeter or continuity tester.

CHECK THE "OFF" POSITION

1. With the switch in the **"OFF"** position, check for continuity between any combination of the red, blue, black and purple wires.
2. Is there continuity present?
   a. If **YES** - The switch has an internal short. Replace switch assembly.
   b. If **NO** - This portion of the switch is working correctly. Proceed to 'Check the "ON" Position for 12V Side' section.

CHECK THE "ON" POSITION FOR 12V SIDE

1. Move the switch to the **"12V"** position.
2. Measure for continuity between the red and black wires coming from the switch.
3. Is there continuity between the red and black wires?
   a. If **YES** - This portion of the switch is working correctly. Proceed to the 'Check the Switch Lugs' section.
   b. If **NO** - This portion of the switch is not working correctly. Replace switch assembly.

CHECK THE SWITCH LUGS

1. Check for continuity between the switch lug with two blue wires and the switch lug with one blue wire.
2. Is there continuity between the two switch lugs?
   a. If **YES** - This portion of the switch is working correctly. Proceed to the 'Check the "ON" Position for 24V Side' section.
   b. If **NO** - This portion of the switch is not working correctly. Replace switch assembly.

CHECK THE "ON" POSITION FOR 24V SIDE

1. Move the switch to the "24V" side.
2. Measure for continuity between the purple and black wires coming from the switch.
3. Is there continuity between the purple and black wires?
   a. If YES - This portion of the switch is working correctly. Proceed to the 'Check Wire Continuity' section.
   b. If NO - This portion of the switch is not working correctly. Replace switch assembly.

CHECK WIRE CONTINUITY

1. Measure for continuity between blue and black wires coming from the switch.
2. Is there continuity between the blue and black wires?
   a. If YES - This portion of the switch is working correctly. Proceed to Energize Button Test.
   b. If NO - This portion of the switch is not working correctly. Replace switch assembly.

ENERGIZE BUTTON TEST

On 12/24V Start•All units, there is a red momentary-contact pushbutton switch labeled "ENERGIZE". Pressing the energize button connects the engine-starting battery through a resistor and diode to the field terminal of each generator. The purpose of this circuit is the feed a small amount of current to the generator field coil if the switch is set to either "12V" or "24V" so that the generator output will build up to the point that the regulator takes over control of the generator field current.

CHECK THE ENERGIZE BUTTON

1. With the engine key in the "ON" position, use the voltmeter to check the voltage between the wire coming from the engine battery and the frame ground.
2. Does the voltage measure at least 12V?
   a. If YES - Voltage coming from the engine battery is good.
   b. If NO - Ensure that engine starting battery is good and fully charged. Repair/replace wire from battery if necessary.

12/24 VOLT RED LABEL VOLTAGE CONTROL SWITCH TESTS

In the "ON" position, the switch connects the Armature output to the orange wire on the regulator and the appropriate solenoids for the selected voltage. This test is performed with an ohmmeter or continuity tester.

CHECK THE "OFF" POSITION

1. With the switch in the **"OFF"** position, check for continuity between any combination of the red, orange, black and purple wires.
2. Is there continuity present?
   a. If **YES** - The switch has an internal short. Replace switch assembly.
   b. If **NO** - This portion of the switch is working correctly. Proceed to 'Check the "ON" Position for 12V Side' section.

CHECK THE "ON" POSITION FOR 12V SIDE

1. Move the switch to the "12V" position.
2. Measure for continuity between the red and black wires coming from the switch.
3. Is there continuity between the red and black wires?
   a. If **YES** - This portion of the switch is working correctly. Proceed to the 'Check Continuity on Orange/Black Wires (1)' section.
   b. If **NO** - This portion of the switch is not working correctly. Replace switch assembly.

CHECK CONTINUITY ON ORANGE/BLACK WIRES (1)

1. Measure for continuity between the orange and black wires coming from the switch.
2. Is there continuity between orange and black wires?
   a. If **YES** - This portion of the switch is working correctly. Proceed to 'Check the "ON" Position for 24V Side' section.
   b. If **NO** - This portion of the switch is not working correctly. Replace switch assembly.

CHECK THE "ON" POSITION FOR 24V SIDE

1. Move the switch to the "24V" side.
2. Measure for continuity between the purple and black wires coming from the switch.
3. Is there continuity between the purple and black wires?
   a. If YES - This portion of the switch is working correctly. Proceed to 'Check Continuity on Orange/Black Wires (2)' section.
   b. If NO - This portion of the switch is not working correctly. Replace switch assembly.

CHECK CONTINUITY ON ORANGE/BLACK WIRES (2)

1. Measure for continuity between the orange and black wires coming from the switch.
2. Is there continuity between orange and black wires?
   a. If **YES** - This portion of the switch is working correctly. Proceed to Energize Button Test.
   b. If **NO** - This portion of the switch is not working correctly. Replace switch assembly.

ENERGIZE BUTTON TEST

On 12/24V Start•All units, there is a red momentary-contact pushbutton switch labeled "ENERGIZE". Pressing the energize button connects the engine-starting battery through a resistor and diode to the field terminal of each generator. The purpose of this circuit is the feed a small amount of current to the generator field coil if the switch is set to either "12V" or "24V" so that the generator output will build up to the point that the regulator takes over control of the generator field current.

CHECK THE ENERGIZE BUTTON

1. With the engine key in the "ON" position, use the voltmeter to check the voltage between the wire coming from the engine battery and the frame ground.
2. Does the voltage measure at least 12V?
   a. If YES - Voltage coming from the engine battery is good.
   b. If NO - Ensure that engine starting battery is good and fully charged. Repair/replace wire from battery if necessary.

FOR TECHNICAL SERVICE, PLEASE CONTACT US DIRECTLY AT:

GOODALL MFG
800-328-7730

HAVE THE MODEL NUMBER AND SERIAL NUMBER AVAILABLE BEFORE CALLING

SERIAL NUMBER LOCATIONS

When calling for technical support, it is important to provide the serial number of the Start•All unit. The serial number will be a silver and red foil tag located on the Start•All. The most common location for the serial number on hydraulic units is shown below; keep in mind the actual location may vary depending on the specific model you have.

MAINTENANCE LOG

LIMITED WARRANTY

Goodall products are warranted to the original purchaser against failure due to defective material and/or workmanship for a period of one (1) year from the date or purchase, except for gasoline engines, hydraulic motors and flow control valve, which are warranted solely by the manufacturer of such items.

This warranty does not cover any product worn out or altered, used for a purpose other than for which it is intended or used in a manner inconsistent with any instruction regarding its use. The exclusive remedy for any product found to be defective under this warranty is limited to the repair, or replacement of the defective product without charge, and Goodall shall not be liable for any consequential or incidental damages, including labor charges.

In order to qualify for this warranty, all returns must receive prior authorization from the factory and be returned directly to the Goodall factory (or authorized service center) postage or freight prepaid. Goodall will make final determination of defects. No agent, employee, or representative of Goodall has any authority to bind to any affirmation, representation or warranty concerning Goodall products, except as stated herein.

Many issues can be solved by calling the Goodall Technical Support Department. Before calling, please have the model number and serial number for the unit available. The Technical Support Department can be reached by calling 1-800-328-7730 and requesting the Technical Support Department.

The warranty card included with your purchase must be completed and returned to Goodall to remain eligible for warranty consideration. Please have your serial number available when calling Goodall.

Purchase Date: _____ / _____ / _____

Serial Number: _____

FORM 804
Rev.2017_A

CALL TOLL FREE 1-800-328-7730

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