

# *Synergic 7F and Synergic 7FH*

**IM539**

October, 1999

Semiautomatic Wire Feeders or Controls with code numbers 10189, 10190 & 10191

## **Safety Depends on You**

Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation ... and thoughtful operation on your part.

**DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.

## **OPERATOR'S MANUAL**



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# WARNING

ARC WELDING can be hazardous.

**PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.**

Read and understand the following safety highlights. For additional safety information it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting - ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A **Free** copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

**BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.**



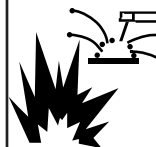
## ELECTRIC SHOCK can kill.

- 1.a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
- 1.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.  
  
**In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:**
  - Semiautomatic DC Constant Voltage (Wire) Welder.
  - DC Manual (Stick) Welder.
  - AC Welder with Reduced Voltage Control.
- 1.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".
- 1.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.
- 1.e. Ground the work or metal to be welded to a good electrical (earth) ground.
- 1.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
- 1.g. Never dip the electrode in water for cooling.
- 1.h. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
- 1.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.
- 1.j. Also see Items 4.c. and 6.



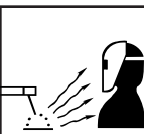
## FUMES AND GASES can be dangerous.

- 3.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and below Threshold Limit Values (TLV) using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.**
- 3.b. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
- 3.c. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.
- 3.d. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices. MSDS forms are available from your welding distributor or from the manufacturer.
- 3.e. Also see item 7b.



## WELDING SPARKS can cause fire or explosion.

- 4.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.
- 4.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.
- 4.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- 4.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned." For information purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1 from the American Welding Society (see address above).
- 4.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.



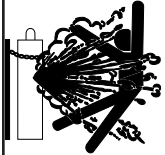
## ARC RAYS can burn.

- 2.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.
- 2.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- 2.c. Protect other nearby personnel with suitable non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.

4.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

4.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

4.h. Also see item 7c.



### CYLINDER may explode if damaged.

5.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

5.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

5.c. Cylinders should be located:

- Away from areas where they may be struck or subjected to physical damage.
- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

5.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.

5.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

5.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

5.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.



### FOR ELECTRICALLY powered equipment.

6.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

6.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.

6.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.



### FOR ENGINE powered equipment.

7.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.



7.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.



7.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

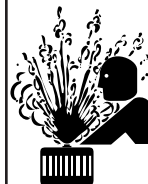


7.d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

7.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

7.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

7.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.



7.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.



### ELECTRIC AND MAGNETIC FIELDS may be dangerous

8.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines.

8.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

8.c. Exposure to EMF fields in welding may have other health effects which are now not known.

8.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

8.d.1. Route the electrode and work cables together - Secure them with tape when possible.

8.d.2. Never coil the electrode lead around your body.

8.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

8.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

8.d.5. Do not work next to welding power source.

## PRÉCAUTIONS DE SÛRETÉ

Pour votre propre protection lire et observer toutes les instructions et les précautions de sûreté spécifiques qui paraissent dans ce manuel aussi bien que les précautions de sûreté générales suivantes:

### Sûreté Pour Soudage A L'Arc

1. Protégez-vous contre la secousse électrique:
  - a. Les circuits à l'électrode et à la pièce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vêtements mouillés. Porter des gants secs et sans trous pour isoler les mains.
  - b. Faire très attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher métallique ou des grilles métalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
  - c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état de fonctionnement.
  - d. Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
  - e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
  - f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces précautions pour le porte-électrode s'appliquent aussi au pistolet de soudage.
2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas où on recoit un choc. Ne jamais enrouler le câble-électrode autour de n'importe quelle partie du corps.
3. Un coup d'arc peut être plus sévère qu'un coup de soleil, donc:
  - a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
  - b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l'arc.
  - c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.
4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protéger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.
5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans latéraux dans les

zones où l'on pique le laitier.

6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d'incendie dû aux étincelles.
7. Quand on ne soude pas, poser la pince à un endroit isolé de la masse. Un court-circuit accidentel peut provoquer un échauffement et un risque d'incendie.
8. S'assurer que la masse est connectée le plus près possible de la zone de travail qu'il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaînes de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'échauffement des chaînes et des câbles jusqu'à ce qu'ils se rompent.
9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particulièrement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumées toxiques.
10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgène (gas fortement toxique) ou autres produits irritants.
11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

## PRÉCAUTIONS DE SÛRETÉ POUR LES MACHINES À SOUDER À TRANSFORMATEUR ET À REDRESSEUR

1. Relier à la terre le chassis du poste conformément au code de l'électricité et aux recommandations du fabricant. Le dispositif de montage ou la pièce à souder doit être branché à une bonne mise à la terre.
2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.
3. Avant de faire des travaux à l'intérieur de poste, la débrancher à l'interrupteur à la boîte de fusibles.
4. Garder tous les couvercles et dispositifs de sûreté à leur place.

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# Thank You

for selecting a **QUALITY** product by Lincoln Electric. We want you to take pride in operating this Lincoln Electric Company product ••• as much pride as we have in bringing this product to you!

## **Please Examine Carton and Equipment For Damage Immediately**

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, Claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

Please record your equipment identification information below for future reference. This information can be found on your machine nameplate.

Code Number \_\_\_\_\_

Serial Number \_\_\_\_\_

Model Name \_\_\_\_\_

Date of Purchase \_\_\_\_\_

Whenever you request replacement parts for or information on this equipment always supply the information you have recorded above.

**Read this Operators Manual completely** before attempting to use this equipment. Save this manual and keep it handy for quick reference. Pay particular attention to the safety instructions we have provided for your protection. The level of seriousness to be applied to each is explained below:

### **WARNING**

This statement appears where the information **must** be followed **exactly** to avoid **serious personal injury** or **loss of life**.

### **CAUTION**

This statement appears where the information **must** be followed to avoid **minor personal injury** or **damage to this equipment**.

## GENERAL DESCRIPTION

The Synergic 7F is a semiautomatic constant speed wire feeder designed specifically for use with the Power Wave™ type power sources. This boom or fixture mounting wire feeder consists of a Synergic 7F Control Box and the choice of the standard Synergic 7F or High Speed Synergic 7FH wire feed unit and connecting cable assemblies. A serial communication link is supplied through the input control cable of the Synergic 7F enabling information to be shared between the power source and wire feeder control. The 4-Roll Synergic 7F wire feed units comes factory equipped with gas solenoid valve with gas fittings and standard Lincoln gun connector and connector for an optional dual procedure gun switch. Control includes a 3-1/2 digit LED display with rotating knob encoder controls for setting the wire feed speed and voltage. A tactile-feel keypad provides selection of operating mode, function selection, timer selection and crater fill selection and parameter adjustment. Two keys provide Cold Feed and Gas Purge functions.

The unit has 3 operating modes: 2-step trigger, 4-step trigger and spot. Three functions can be selected: Volts or Trim Preset/arc (memory) voltmeter, Run-in speed and weld speed (IPM or m/min.). In addition, when 4-step trigger mode is selected, crater fill WFS is also adjustable. In addition, when 4-step trigger mode is selected, crater fill WFS is also adjustable. Up to three timers are available depending on the mode: preflow, postflow and spot, and 5 acceleration rates are selectable.

The K678-1 Synergic 7F control may be used with either of the two available 4-roll wire feed units.

Ordering Information	Model	Drive	Speed Range IPM (m/m)	Wire Size Range IN. (MM)
K679-1	Synergic 7F	4-Roll	50 - 770 (1.25 - 19.5)	.025 - 3/32 (0.6 - 2.4)
K679-2	Synergic 7FH	4-Roll	80 - 1200 (2.00 - 30.5)	.025 - .045 (0.6 - 1.2)

The feeder to control cable assemblies are available in two types:

K680-"L" Includes a control cable with a 14-pin MS style connector on each end, and a 4/0 weld cable. Available in lengths "L" of 16ft (4.9m) or 25ft (7.6m).

K681-"L" Same as above but does not include weld cable available in lengths "L" of 12ft (3.6m), 16ft (4.9m) or 25ft (7.6m).

## RECOMMENDED PROCESSES AND EQUIPMENT

The Synergic 7F wire feed unit has the following wire feeding capabilities:

- Feeds .025 - 1/16" (0.6-1.6mm) solid wire for gas-metal-arc processes.
- Feeds .045 - 3/32" (1.2-2.4mm) cored wire for Outershield GMA or Innershield processes up to 5/64" (2.0 mm).

The Synergic 7FH wire feed unit has the following wire feeding capabilities:

- Feeds .025 - .045" (0.6-1.2mm) solid wire for gas-metal-arc processes.
- Feeds .045 - (1.2mm) cored wire for Outershield GMA or Innershield processes.

Recommended power sources are The Lincoln Electric Company Synergic type Power Wave power sources with 42V AC auxiliary power, and a 14-pin connector receptacle.

## STANDARD FEATURES

### Wire Feed Features:

**Wire Drive Unit** - Incorporates low voltage permanent magnet motor and highly efficient two-reduction spur gearbox with insulated mounting bracket for mounting and operation in any position. The non-fluid lubricant won't leak.

**"Quick Release" Wire Feed System** - Provides a completely tool-less means for releasing and opening the idle roll pressure arm, precisely adjusting the idle roll pressure and changing the incoming and outgoing guide tubes.

**Drive Rolls and Guide Tubes** - Provide long life, positive feeding and precise alignment of electrode. Minimizes "birdnest" or mill-thru of wire if properly set. (Ordered separately.)

**Tachometer Feedback** - Provides proper wire feed acceleration and speed accuracy, independent of fluctuations in line voltage and wire loading, for reliable arc starting and weld consistency.

**Run-in Speed Setting** - Allows the arc striking speed "Run-in" to be adjusted independently of the weld feed speed for starting optimization.

**Cold Feed Speed** - Provides cold feed speed adjustment independent of weld, run-in and crater speed.

**Adjustable Acceleration** - Provides front panel selection of 5 acceleration rates. This feature in combination with Run-in Speed provides the ability to easily optimize starting on any process or procedure.

**Solid-State Dynamic Braking** - Quickly stops wire feed motor to minimize wire overrun during weld termination. Solid-state design requires no maintenance.

**Crater Fill** - Provides crater feed speed adjustment (in 4-step trigger mode) independent of weld, cold feed, or run-in speeds.

**Solid-State Overload Protection** - No circuit breaker to reset. Front panel display indicates time remaining before automatic reset.

**Gas Solenoid Valve** - Complete with inlet fittings for easy installation of gas is standard on Synergic 7F models. Also available as an option (K659-1) a Gas Guard regulator for flow surge suppression.

**English/Metric Speed Display** - Provides front panel selection of speed display in units of IPM or M/M.

**4-Roll Drive** - Both models employ 4-Roll Drive, with 2 driven rolls, providing optimal feeding force for problem feeding situations, with low wire deformation for improved feeding of soft wires.

### **Control Features:**

**Microcomputer Based Control** - Provides precise setting and display of all parameters and precision timing functions. Optimizes wire drive control for crisp acceleration and smooth response with precise repeatability. Allows synergic control of various welding processes by communicating information over a serial link to the compatible power source.

**Display and Indicator Lights** - Wide temperature range, long life, 3-1/2 digit 7-segment LED display with .56" (14.2mm) character height permits easy viewing even from long gun cable distances. Individual red indicator lights are high intensity LED's for viewing at almost any angle.

**Encoder Controls** - Rotating encoders provide continuous knob control for setting both Wire Feed Speed and Volts/Trim procedures.

**Keypad** - Consists of 7 membrane keys with tactile-feel embossed domes. All keys are generously spaced to provide easy selection, even if wearing welding gloves.

**2-Step or 4-Step Trigger Modes** - Unit operates only when trigger is pressed in 2-Step mode (normal) operation. 4-Step Trigger Mode eliminates the need to hold the gun trigger closed while welding.

Both models have user selectable 4-step with crater fill, or as shipped, 4-step with current interlock.

**Gas Preflow and Postflow Timers** - Allows setting of shielding gas preflow time (0-2.5 seconds) before welding arc starts, and gas postflow time (0-9.9 seconds), after welding arc stops.

**Crater Fill** - Allows setting of crater fill WFS (when 4-step with crater fill trigger mode is selected), independent of weld, cold feed, and run-in speeds.

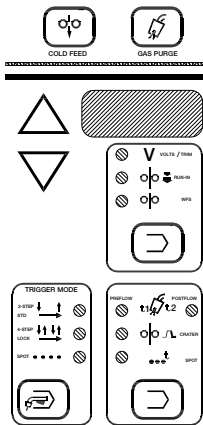
**Spot Mode** - Allows a single timed weld cycle each time the gun trigger is held closed. Duration (0.2-9.9 seconds) is set by the Spot ON timer.

**Digital "Memory" Voltmeter** - Displays arc voltage from 0 to 80V DC, when welding gun trigger is activated, with automatic polarity indication for positive or negative electrode. The last welding voltage monitored at end of weld is displayed for 5 seconds after weld has stopped. This allows checking actual voltage after weld has stopped.

**Power-down Save** - All settings, including mode, Run-in speed, cold feed speed, crater speed, weld speed, timers, English-Metric units and acceleration are automatically saved when power is removed. This feature does not require batteries and when power is restored it will automatically return all settings to the state they were in when power was removed. However, the power source may overwrite any or all of these parameters after Power-Up Recall is complete.



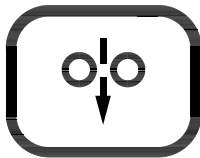
# KEYPAD AND DISPLAY DESCRIPTION



**Keypad** - Seven key, membrane type with “snap” tactile feel and embossed domes. Long life design. Spatter resistant surface.

**Display** - 3-1/2 digit 7-segment LED with (+) or (-) polarity indicators. .56” (14.2mm) character height. Displays arc voltage in volts, wire speed in IPM or m/m and all timers in seconds.

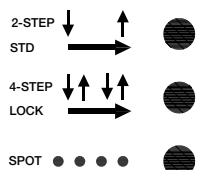
**Indicator Lights** - Extra bright red LED’s for viewing at almost any angle. Always indicates the mode being used and which function or timer is being displayed. A function and a timer light will never be on at the same time since they can only be displayed one at a time.



Cold Feed key energizes the wire feeder but not the power source or solenoid valve. Cold feed speed is adjustable and is displayed only while pressing Cold Inch, and the last speed selected is stored in memory for next Cold feeding.



Gas Purge key energizes the solenoid valve but not the wire feeder or power source.



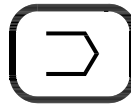
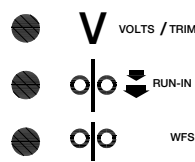
Mode Select key enables operator to choose mode of operation shown by the indicator lights. Pressing key causes mode lights to sequence (top to bottom) starting from the current indicated selection.



**Top Light** - Indicates 2-step (standard) trigger mode.

**Middle Light** - Indicates 4-step (lock) trigger mode. This mode may be selected to include crater fill or weld current interlock.

**Bottom Light** - Indicates spot weld mode.

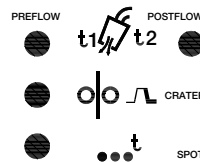


Function Select key enables operator to choose which function will be displayed as shown by the appropriate indicator light. Pressing the key causes lights to sequence (top to bottom) starting from the current indicated position. The function displayed will be adjustable with the rotating encoders or arrow keys.

**Top Light** - Indicates display of preset voltage or percent trim when not welding and arc voltage while welding (as indicated by top light “blinking”). The power source automatically determines whether preset voltage or percent trim will be displayed, and adjustable with Volts/Trim rotating encoder control.

**Middle Light** - Indicates Run-in speed is being displayed. As shipped, these models are setup for a 50 IPM (1.27m/min) fixed run-in speed with display function deactivated. They may be user-selected to activate or deactivate adjustable Run-in display.

**Bottom Light** - Indicates Weld Feed Speed (WFS) is being displayed, and is adjustable with the Wire Feed Speed rotating encoder control.



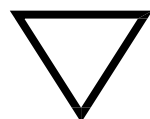
Timer/Crater Select key enables operator to choose spot or gas timers, or crater speed as indicated by the appropriate light. Pressing the key causes lights to sequence (left to right, top to bottom) starting from the current indicated selection. Any parameter not available in the mode selected is skipped over.

**Top Left Light** - indicates preflow time is being displayed in seconds.

**Top Right Light** - indicates postflow time is being displayed in seconds.

**Middle Light** - indicates Crater Feed Speed is being displayed. This display will only occur if 4-step mode with crater fill is selected.

**Bottom Light** - indicates spot on time is being displayed in seconds.



Increase arrow key increases the setting of the parameter selected to be displayed. Arrow keys do not function for Wire Feed Speed or Volts/Trim settings, which are adjusted using the rotating encoder knobs.

Decrease arrow key decreases the setting of the parameter selected to be displayed. Arrow keys do not function for Wire Feed Speed or Volts/Trim settings, which are adjusted using the rotating encoder knobs.

## OPTIONAL FEATURES

### DRIVE ROLL AND GUIDE TUBE KITS:

#### Steel Wire Sizes:

#### 4-Roll

* .068 - 3/32" (1.7 - 2.4mm) Cored	KP655-3/32
* 1/16" (1.6mm) Cored or Solid	KP655-1/16
.045 - .052" (1.2 - 1.4mm) Solid	KP655-052S
.045 - .052" (1.2 - 1.4mm) Cored	KP655-052C
.035" (0.9-1.0mm) Cored	KP655-035C
.035" (0.9-1.0mm) Solid	KP655-035S
.030" (0.8mm) Solid	KP655-030S
.023" (0.6mm) Solid	KP655-025S

#### Aluminum Wire Sizes:

1/16" (1.6mm)	KP656-1/16A
	KP647-1/16A**
3/64" (1.2mm)	KP656-3/64A
	KP647-3/64A**
.040" (1.0mm)	KP647-040A**
.035" (0.9mm)	KP656-035A

Drive rolls for only cored electrode sizes are stencilled with a "C" suffix to the wire sizes.

Drive rolls for only solid electrode sizes are stencilled with an "S" suffix to the wire sizes.

Drive rolls for aluminum wire sizes are stencilled with an "A" suffix to the wire sizes.

\* Not for Synergic 7H model.

\*\* For use with Binzel European guns. Installation instructions are included with these kits.

### INPUT CABLE ASSEMBLIES:

**K649** - (Used with Power Wave 450/500) Consists of an 8-conductor control cable with 14-pin control cable plug and a 4/0 (107 mm<sup>2</sup>) electrode cable with Twist-Mate™ connector. It is rated at 500 amps, 60% duty cycle and is available in lengths of 7 ft. (2 m), 17 ft (5 m), 25 ft (7.6 m), 33 ft (10 m), and 50 ft (15 m).

**K648** - (Used with Power Wave 450) Consists of an 8-conductor control cable with a 14-pin plug and a 4/0 (107 mm<sup>2</sup>) electrode cable with stud terminal. It is rated at 500 amps, 60% duty cycle and is available in lengths of 7 ft (2 m), 17 ft (5 m), 25 ft (7.6 m), 33 ft (10 m) and 50 ft (15 m).

**K651** - (Used with Power Wave 350) Consists of an 8-conductor control cable with 14-pin control cable plug and a 2/0 (67 mm<sup>2</sup>) electrode cable with Twist-Mate™ connector. It is rated at 350 amps, 60% duty cycle and is available in lengths of 7 ft. (2 m), 17 ft (5 m), 33 ft (10 m), and 50 ft (15 m).

**K642** - (Control Cable only) Consists of an 8-conductor control cable with 14-pin control cable plug, without electrode cable, and is available in lengths of 7 ft (2 m), 17 ft (5 m), 25 ft (7.6 m), 33 ft (10 m) and 50 ft (15 m).

**K643** (Control Cable Extension) Consists of an 8-conductor control cable with 14-pin connectors on each end for extending the control cable between the power source and the control cable. Available in lengths of 17 ft (5m), 25 ft (7.6m), 33 ft (10m), and 50 ft (15m).

### WIRE REEL ASSEMBLY:

**K299** - Wire reel assembly for customer mounting. Includes 50 - 60 lb wire reel spindle shaft, adjustable brake, insulation and mounting hardware.

### READI-REEL ADAPTERS:

**K363P** - Adapts Lincoln Read-Reel coils of electrode 30 lb (14 kg) and 22 lb (10 kg) to a 2" (51mm) spindle. Durable molded plastic one piece construction. Designed for easy loading; adapter remains on spindle for quick changeover. (used with K162H)

**K438** - Adapts Lincoln Read-Reel coils of electrode 50-60 lb (22.7-27.2 kg) to a 2" (51mm) spindle. (used with K162H).

### SPINDLE ADAPTERS:

**K162H** - Spindle for mounting Read-Reels and 2" (51mm) I.D. spools with 60 lb (27.2 kg) capacity. The shaft for the standard wire coils is removed from the mounting framework and the K162H is installed in its place. Includes an easily adjustable friction brake for control of overrun.

When used with Read-Reels a Read-Reel adapter is required.

**K435** - Permits 14 lb (6 kg) Innershield coils to be mounted on 2" (51mm) O.D. spindles. For use with optional K162H adapter.

**K468** - Permits 8" (203mm) O.D. spools to be mounted on 2" (51mm) O.D. spindles. For use with optional K162H adapter.

### GUN AND CABLE ASSEMBLIES:

The following Lincoln gun and cable assemblies are compatible with both the Synergic 7F and Synergic 7FH Wire Feed units:

**K126** - Innershield® gun and cable assemblies are rated at 350 amps, 60% duty cycle. Maximum wire size for Synergic 7F models is 5/64" (2.0 mm). Not recommended for Synergic 7FH models. (Consult sales specifications for appropriate models).

**K115** - Innershield gun and cable assemblies are rated at 450 amps, 60% duty cycle. Maximum wire size for Synergic 7F models is 5/64" (2.0 mm). Not recommended for Synergic 7FH models. (Consult sales specifications for appropriate models).

**K470** - Magnum 300 GMAW gun and cable assemblies are rated for 300 amps, 60% duty cycle. (Consult sales specifications for appropriate models).

**K471** - Magnum 400 GMAW gun and cable assemblies are rated for 400 amps, 60% duty cycle. (Consult sales specifications for appropriate models).

**K497** - Magnum 200 GMAW gun and cable assemblies are rated 200 amps, 60% duty cycle. (Consult sales specifications for appropriate models).

K541 - Magnum 400 Short Neck GMAW gun and cable assemblies are rated 400 amps, 60% duty cycle. (Consult sales specifications for appropriate models).

K598 - Magnum 550 GMAW gun and cable assemblies are rated 550 amps, 60% duty cycle. (Consult sales specifications for appropriate models).

K206\* - Innershield Linconditioner gun and cable assemblies are rated 350 amps, 60% duty cycle. Maximum size for Synergic 7F Wire Feed unit is 5/64" (2.0 mm). Not recommended for Synergic 7FH Wire Feed unit. (Consult sales specifications for appropriate models).

K289\* - Innershield Linconditioner gun and cable assemblies are rated 500 amps, 60% duty cycle. Maximum size for Synergic 7F Wire Feed unit is 5/64" (2.0 mm). Not recommended for Synergic 7FH Wire Feed unit. (Consult sales specifications for appropriate models).

K309\* - Innershield Linconditioner gun and cable assemblies are rated 250 amps, 60% duty cycle. Maximum size for Synergic 7F Wire Feed unit is 5/64" (2.0 mm). Not recommended for Synergic 7FH Wire Feed unit. (Consult sales specifications for appropriate models).

The following Lincoln gun and cable assemblies are equipped with a Fast-Mate™ connector. They can be used with Synergic 7F Wire Feed unit by installing a K489-2 Fast-Mate adapter kit.

K684 - Magnum "Super Cool" FM water cooled GMAW gun and cable assemblies are rated 450 amps, 100% duty cycle (CO<sub>2</sub>). (Consult sales specifications for appropriate models).

K498 - Magnum 200 FM GMAW gun and cable assemblies are rated for 200 amps, 60% duty cycle. (Consult sales specifications for appropriate models).

K534 - Magnum 250L FM GMAW gun and cable assemblies are rated for 250 amps, 30% duty cycle. (Consult sales specifications for appropriate models).

K478 - Magnum 300 FM GMAW gun and cable assemblies are rated for 300 amps, 60% duty cycle. (Consult sales specifications for appropriate models).

K479 - Magnum 400 FM GMAW gun and cable assemblies are rated for 400 amps, 60% duty cycle. (Consult sales specifications for appropriate models).

K556 \* - GMAW process Magnum 400XA X-TRACTOR gun and cable assemblies are rated at 400 amps, 60% duty cycle. (Consult sales specifications for appropriate models).

K566 \* - GMAW process Magnum 250XA X-TRACTOR gun and cable assemblies are rated 250 amps, 60% duty cycle. (Consult sales specifications for appropriate models).

**\* K179 type vacuum unit not recommended for use with Synergic 7F.**

## MISCELLANEOUS OPTIONS:

K682 Water Connection Kit - Includes water cooled gun tube fittings and self-sealing outlet and inlet quick-connectors for mounting onto the Synergic 7F Wire Drive mounting bracket.

K659-1 - (Gas Guard Regulator) Adjustable flow regulator with removable adjustor key for CO<sub>2</sub> and Argon blend gases. Mounts onto Wire Drive gas inlet, and reduces gas waste and arc start "blow" by reducing surge caused by excess pressure in supply hose.

K683-1 - (Dual Procedure Switch) Kit includes gun switch and mountings for Lincoln Innershield and Magnum guns with 15 ft (4.6 m) control cable and 3-pin plug.

# SPECIFICATIONS FOR SYNERGIC 7F AND SYNERGIC 7FH

	<b>CONTROL</b>	<b>WIRE FEED - (4 - ROLL)</b>	
Model	<b>SYNERGIC 7F</b>	<b>SYNERGIC 7F</b>	<b>SYNERGIC 7FH</b>
Type	K678-1	K679-1	K679-2
Wire Speed Range: IPM M/M		50 - 770 1.25 - 19.5	80 - 1200 2.00 - 30.5
Wire Size Capabilities: Solid Electrodes  Cored Electrodes	.025 - 1/16" 0.6 - 1.6mm  .045 - 3/32" 1.2 - 2.4mm	.025 - 1/16" 0.6 - 1.6mm  .045 - 3/32" 1.2 - 2.4mm	.025 - .045" 0.6 - 1.2mm  .045" 1.2mm
Input Power:	40-42 V ± 10% 50/60 Hz 4.0 Amps		
Temperature Rating: Operating Storage	-20°C to +40°C -40°C to +40°C		
Dimensions: Height Width Depth	13.31" (338.1 mm) 10.32" (262.1 mm) 6.16" (156.5 mm)	11.25" (285.8 mm) 7.16" (181.9 mm) 8.06" (204.7 mm)	
Weight	13.25 lbs (6.0 Kg)	16.5 lbs (7.5 Kg)	

# INSTALLATION

## Safety Precautions

### WARNING



#### **ELECTRIC SHOCK can kill.**

- Do not touch electrically live parts such as output terminals or internal wiring.
- When inching with gun trigger, electrode and drive mechanism are “hot” to work and ground.
- Turn OFF welding power source before installing or changing drive roll and/or guide tubes.
- Welding power source must be connected to system ground per the National Electrical Code or any applicable local codes.
- Only qualified personnel should perform this installation.

Observe all additional Safety Guidelines detailed throughout this manual.

## INSTALLATION OF THE SYNERGIC 7F COMPONENTS

### Mounting the Wire Feed Unit (K679-1 or -2)

Mount the wire feed unit by means of the insulated mounting bracket attached to the bottom of the gearbox. Reference L9777 dimension print at the rear of this manual to find the size and location of the mounting holes. The gearbox assembly is electrically “hot” when the gun trigger is pressed. Therefore, make certain the gearbox does not come in contact with the structure on which the unit is mounted.

The wire feed unit should be mounted so that the drive rolls are in a vertical plane so dirt will not collect in the drive roll area. Position the mechanism so it will point down at about a 45° angle so the wire feed gun cable will not be bent sharply as it comes from the unit.

### Mounting the Control Box (K678-1)

The same control box is used for both the Synergic 7F and Synergic 7FH wire feed units and contains two keyhole slots and one slot for mounting. Reference M17740 dimension print in the rear of this manual for size and location of these slots. Mount the box at some convenient location close to the wire feed unit which will enable the desired control cable assembly to reach between the control box and the wire feed unit.

- a) Drill the required holes in the mounting surface, partially install 1/4-20 screws.

- b) Open the control box door by removing the two door screws.
- c) Mount the box.
- d) Tighten the screws.
- e) Close the control box door and replace the door screws.

### Connecting Wire Feed Unit to Control Box

The Feeder to Control cable assemblies are available in two types:

**K680-”L”** Includes a control cable with 14-pin MS-style connectors on each end, and a 4/0 weld cable to route between the Wire Drive and the Control Box. Available in lengths “L” of 16ft. (4.9m) and 25ft. (7.6m).

**K681-”L”** Same as K680, but does not include weld cable. Available in lengths “L” of 12ft. (3.6m), 16ft. (4.9m) and 25ft. (7.6m).

1. Making certain the cables are protected from any sharp corners which may damage their jackets, mount the cable assembly along the boom so the end with the female MS-style connector pins is at the wire feed unit.
2. Connect the 14-socket cable connector to the receptacle on the back of the wire feed unit connection box.
3. At the same end, connect the electrode lead to the connection stud of the brass gun connection block on the front of the wire feed unit.
4. At the control box end, connect the 14-pin connector of the cable to the mating receptacle on the bottom of the control box.

### Electrode Routing

The electrode supply may be either from reels, Readi-Reels, spools or bulk packaged drums or reels. Observe the following precautions:

1. The electrode must be routed to the wire feed unit so that the bends in the wire are at a minimum, and also that the force required to pull the wire from the reel into the wire feed unit is kept at a minimum.
2. The electrode is “hot” when the gun is energized and must be insulated from the boom and structure.
3. If more than one wire feed unit shares the same boom, their wire and reels must be insulated from each other and insulated from their mounting structure.

## Wire Feed Drive Roll and Guide Tube Kits

**NOTE:** The maximum sizes the Synergic 7F will feed satisfactorily are the 3/32" (2.4mm) cored and 1/16" (1.6mm) solid electrodes. The maximum sizes the synergic 7FH will feed satisfactorily are the .045 (1.2mm) cored and .045" (1.2mm) solid electrodes.

The electrode sizes that can be fed with each roll and guide tube are stencilled on each part. Check the kit for proper components.

### Steel Wire Sizes:

	<b>4-Roll</b>
* .068 - 3/32" (1.7 - 2.4mm) Cored	KP655-3/32
* 1/16" (1.6mm) Cored or Solid	KP655-1/16
.045 - .052" (1.2 - 1.4mm) Solid	KP655-052S
.045 - .052" (1.2 - 1.4mm) Cored	KP655-052C
.035" (0.9-1.0mm) Cored	KP655-035C
.035" (0.9-1.0mm) Solid	KP655-035S
.030" (0.8mm) Solid	KP655-030S
.023" (0.6mm) Solid	KP655-025S

### Aluminum Wire Sizes:

1/16" (1.6mm)	KP656-1/16A KP647-1/16A**
3/64" (1.2mm)	KP656-3/64A KP647-3/64A**
.040" (1.0mm)	KP647-040A**
.035" (0.9mm)	KP656-035A

Drive rolls for only cored electrode sizes are stencilled with a "C" suffix to the wire sizes.

Drive rolls for only solid electrode sizes are stencilled with an "S" suffix to the wire sizes.

Drive rolls for aluminum wire sizes are stencilled with an "A" suffix to the wire sizes.

\* Not for Synergic 7H model.

\*\* For use with Binzel European guns. Installation instructions are included with these kits.

## PROCEDURE TO INSTALL DRIVE ROLL AND GUIDE TUBES

### **WARNING**



#### **ELECTRIC SHOCK can kill.**

- Do not touch electrically live parts such as output terminals or internal wiring.
- When inching with gun trigger, electrode and drive mechanism are "hot" to work and ground.
- Turn OFF welding power source before installing or changing drive roll and/or guide tubes.
- Welding power source must be connected to system ground per the National Electrical Code or any applicable local codes.
- Only qualified personnel should perform this installation.

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**Observe all additional Safety Guidelines detailed throughout this manual.**

### **Standard 4-Roll Kits (KP571 and KP572)**

- 1) Turn off welding power source.
- 2) Release both quick release levers by sliding the levers sideways into the open positions.
- 3) Remove hex screw & clamping collar from the drive shaft closest to the incoming side of the feeder.
- 4) Install drive roll onto keyed shaft. Double grooved drive rolls are to be installed with side stencilled for correct wire size facing out and with slotted spacer on top of roll. Two piece drive rolls use a spacer between the rolls for .068" (1.7mm) and larger wire sizes. (Do not exceed the maximum wire size rating of the wire drive.) Replace collar and tighten clamping screw.
- 5) Back out the set screw for the middle guide tube. Install the middle guide tube and slide it up against the drive roll. **DO NOT TIGHTEN THE MIDDLE GUIDE AT THIS TIME.**
- 6) Install the outgoing drive roll following the same procedure as steps 3 & 4.
- 7) Center the middle guide between the two drive rolls and tighten in place.

- 8) Back out the screws for the incoming and outgoing guide tubes.
- 9) Install the longer guide tube in the rear hole near the incoming drive roll. Slide the tube in until it almost touches the roll. Tighten in place.
- 10) Install the remaining guide tube in the front hole. Be certain that the proper plastic insert is used. Fine wire chisel point tube must have largest radius next to drive roll. Tighten in place.
- 11) Re-latch both quick release levers.
- 12) To start new electrode, straighten the first 6" (150mm) and cut off the first 1" (25mm). Insert free end through the incoming tube. Press gun trigger & push wire into the drive roll.

TO SET IDLE ROLL PRESSURE: See Idle Roll Pressure Setting, in Operating Instructions section.

## Gun and Cable Assemblies with Standard L. E. Connections

### GMAW Guns

An expanding line of Magnum gun and cable assemblies are available to allow welding with solid and cored electrodes using the GMAW process. See the appropriate Magnum literature for descriptions of the 200 to 550 ampere air cooled gun and cables that are available. Gun cable lengths range from 10 ft (3.0m) to 25 ft (7.6m) and feed electrode sizes .025" (0.6mm) to 5/64" (2.0mm). The entire line of Magnum Fast-Mate gun and cable assemblies can also be used by installing a K489-2 Fast-Mate adapter kit.

### INNERSHIELD Guns

K126 and K115 gun and cable assemblies are available to allow welding with Innershield electrodes. Gun cable lengths range from 10 ft. (3.0 m) to 15 ft. (4.5 m). The 350 ampere K126 with Synergic 7F will feed electrode sizes .062" (1.6 mm) to 5/64" (2.0 mm). The 450 ampere K115 with Synergic 7F will feed 5/64" (2.0 mm) electrode.

Three smoke extraction gun and cable assemblies are available, 250 ampere K309, 350 ampere K206 and the 500 ampere K289. All gun and cable lengths are 15 ft. (4.5 m). Both the K206 and K309 with Synergic 7F will feed electrode sizes .062" (1.6 mm) to 5/64" (2.0 mm). K289 with Synergic 7F will feed 5/64" (2.0 mm) electrode. These guns require the use of the K184 vacuum unit for use with Synergic 7F.

## Gun Cable Connection:

Lay the cable out straight. Insert the connector on the welding conductor cable into the brass conductor block on the front of the Synergic 7F gearbox. Make sure it is all the way in and tighten the hand wheel. Keep this connection clean and bright. Connect the trigger control cable polarized plug into the mating 5 cavity receptacle on the front of the Synergic 7F Wire Feed Unit.

### For GMA Gun Cables:

Install the barbed fitting and union nut to the 5/8-18 female inert gas fitting on the front of the Synergic 7F wire drive. Connect the 3/16" I.D. gas hose from the gun cable to the barbed fitting. When the gun is to be removed, this fitting can be easily detached by loosening the union nut.

## Gun and Cable Assemblies with Fast-Mate Connections (Requires K489-2 Fast-Mate Adapter Kit)

### GMAW Guns

An expanding line of Magnum Fast-Mate™ air cooled and water cooled gun and cable assemblies are available to allow welding with solid and cored electrodes using the GMAW process. See the appropriate Magnum literature for descriptions of the 200 to 400 ampere air cooled gun and cables that are available, as well as the Magnum "Super Cool" 450 ampere water cooled gun and cable. Gun cable lengths range from 10 ft (3.0m) to 25 ft (7.6m) and feed electrode sizes .025" (0.6mm) to 5/64" (2.0mm).

An expanding line of Magnum X-Tractor gun and cable assemblies provides fume extraction capability for welding with solid and cored electrodes using the GMAW process. See the appropriate Magnum literature for descriptions of the 250 to 400 ampere air cooled gun and cables that are available. Gun cable lengths range from 10 ft (3.0m) to 15 ft (4.5m) and feed electrode sizes .035" (0.9mm) to 1/16" (1.6mm). These guns require the use of either the K173-1 or K184# vacuum units.

# Requires S14927-8 connector hose and an S20591 hose adapter.

## Gun Cable Connections: Wire Feeder to Gun

- a. Check that the drive rolls, feeder guide tubes and gun connector guide tube are appropriate for the electrode size being used. If necessary, change them per section on Wire Feed Drive Roll and Guide Tube Kits.
- b. Connect gun to gun connector making sure all pins and gas tube line up with appropriate holes in connector. Tighten gun by turning large nut on gun clockwise.

## Synergic 7F Water Connections (for Water-Cooled Guns)

The Synergic 7F models must have a K682-2 Water Connection Kit installed. (see section under Electrical Installation; Water Connection Kit.

- 1) Using hose clamps provided with the K682-2 Kit, connect appropriate water hoses to the coolant inlet and outlet fittings on the back of the K682-2 Kit. Connect the other ends of the hoses to the appropriate ports on the water cooling units.
- 2) In the event the water line fittings on your water-cooled gun are incompatible with the female quick connects on the front of the K682-2 Kit, male quick connects are provided with the kit for installation on 3/16" I.D. hose (Customer to provide appropriate clamps). The feeder connectors self seal when disconnected.

## GMAW Shielding Gas

### **WARNING**



#### **CYLINDER may explode if damaged.**

- Keep cylinder upright and chained to support.
- Keep cylinder away from areas where it may be damaged.
- Never lift welder with cylinder attached.
- Never allow welding electrode to touch cylinder.
- Keep cylinder away from welding or other live electrical circuits.



#### **BUILDUP OF SHIELDING GAS may harm health or kill.**

- Shut off shielding gas supply when not in use.

SEE AMERICAN NATIONAL STANDARD Z-49.1, "SAFETY IN WELDING AND CUTTING" PUBLISHED BY THE AMERICAN WELDING SOCIETY.

Customer must provide a cylinder of shielding gas, a pressure regulator, a flow control valve, and a hose from the flow valve to the gas inlet fitting of the Synergic 7F Wire Feed Unit.

Connect a supply hose from the gas cylinder flow valve outlet to the 5/8-18 female inert gas fitting on the back panel of the Synergic 7F or, if used, on the inlet of the Gas Guard regulator. (See Below).

**Gas Guard Regulator** - The Gas Guard Regulator is an optional accessory (K659-1) on these models.

Install the 5/8-18 male outlet of the regulator to the 5/8-18 female gas inlet on the back panel of the Synergic 7F. Secure fitting with flow adjuster key at top. Attach gas supply to 5/8-18 female inlet of regulator per instructions in the Gas Connections Section.



## Electrical Installation

### WARNING



#### **ELECTRIC SHOCK can kill.**

- Do not touch electrically live parts such as output terminals or internal wiring.
- When inching with gun trigger, electrode and drive mechanism are “hot” to work and ground.
- Turn OFF welding power source before installing or changing drive roll and/or guide tubes.
- Welding power source must be connected to system ground per the National Electrical Code or any applicable local codes.
- Only qualified personnel should perform this installation.

Observe all additional Safety Guidelines detailed throughout this manual.

#### **Input Cable: Synergic 7F Control to Power Wave Synergic Type Power Sources**

**K648** - (Used with Power Wave 450) Consists of an 8-conductor control cable with a 14-pin plug and a 4/0 (107 mm<sup>2</sup>) electrode cable with stud terminal. It is rated at 500 amps, 60% duty cycle and is available in lengths of 7 ft (2 m), 17 ft (5 m), 25 ft (7.6 m), 33 ft (10 m) and 50 ft (15 m).

**K649** - (Used with Power Wave 450/500) Consists of an 8-conductor control cable with a 14-pin control cable plug and a 4/0 (107mm<sup>2</sup>) electrode cable with Twist-Mate™ connector. It is rated at 500 amps, 60% duty cycle and is available in lengths of 7 ft (2 m), 17 ft (5 m), 25 ft (7.6 m), 33 ft (10 m) and 50 ft (15 m).

**K642 (Control Cable Only)** - Consists of an 8 conductor control cable with a 14-pin control cable plug, without electrode cable, and is available in lengths of 7 ft (2 m), 17 ft (5 m), 25 ft (7.6 m), 33 ft (10 m) and 50 ft (15 m).

**K643 (Control Cable Extension)** - Consists of an 8 conductor control cable with 14-pin connectors on each end for extending the control cable between the power source and the control cables. Available in lengths of 17 ft (5 m), 25 ft (8 m), 33 ft (10 m) and 50 ft (15 m).

**With input power disconnected from the power source,** install the input cable per connection diagram M17770 in the rear of this manual and follow exactly the instructions on the diagram or perform the following:

- 1) Connect the end of the control cable with the 14-pin cable plug to the mating receptacle on the power source.
- 2) Connect the electrode lead of that same cable end to the power source output terminal of the desired polarity.
- 3) Connect the 14-socket plug of the control cable to the mating receptacle on the bottom of the control box.
- 4) If not using a single continuous electrode cable from the Power Source to Wire Feed Unit, bolt the electrode lead from the power source to the electrode lead to the wire feed unit using the nut and bolt supplied with the K680 Control to Feed Unit cable assembly.

#### **Work Cable**

Connect a work lead of sufficient size and length (per the following table) between the proper output terminal on the power source and the work. Be sure the connection to the work makes tight metal-to-metal electrical contact.

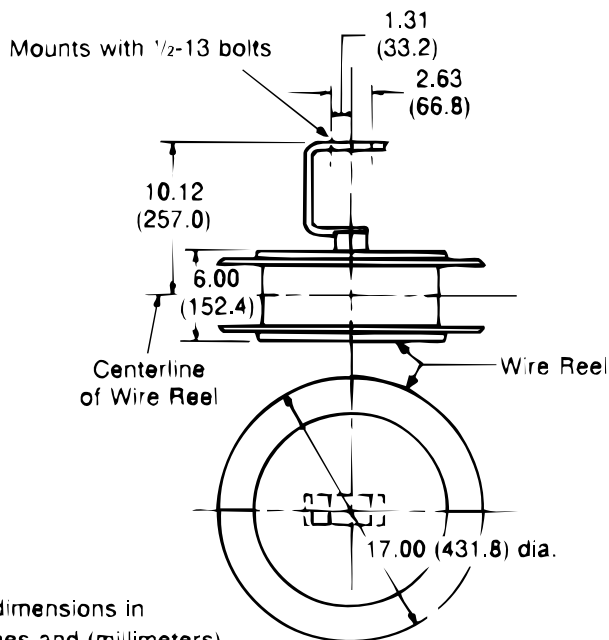
Current 60% Duty Cycle	Copper Work Cable Size, AWG *
	Up to 100 ft Length (30m)
300 Amps	00 (67 mm <sup>2</sup> )
400 Amps	000 (85 mm <sup>2</sup> )
500 Amps	000 (85 mm <sup>2</sup> )

\* For pulse welding applications, the next larger cable size is recommended.

## OPTIONAL FEATURES INSTALLATION

**K648 or K649 Input Cable Assembly** - See Electrical Installation section for instructions.

**K299 50-60 Lb. Wire Reel for Customer Mounting** - The K299 is available for use with the Synergic 7F Wire Feed Models. The reel for 50 or 60 pound coils is shipped with the needed mounting shaft, hardware, and insulation. Shaft mounting hole requirements are shown below:



All dimensions in inches and (millimeters).

**K683-1 - Dual Procedure Switch** Dual Procedure Switch mounts to gun with appropriate bracket, provided, per the installation instructions included with the kit. 3-pin switch cord plug connects to 3-pin remote receptacle on the front panel of the Synergic 7F Wire Feed Unit.

**K682-2 Water Connection Kit** - Install to either side of Wire Feed Unit mounting bracket per instructions shipped with kit.

**K659-1 Gas Guard Regulator** - Adjustable flow regulator with removable adjustor key for CO<sub>2</sub> and Argon blend gases. Mounts onto Wire Feed Unit inlet and reduces gas waste and arc start "blow" by reducing surge caused by excess pressure in supply hose. ( See Shielding Gas Connections for instructions).

# OPERATING INSTRUCTIONS

## Safety Precautions

### WARNING



#### **ELECTRIC SHOCK can kill.**

- Do not touch electrically live parts such as output terminals or internal wiring.
- When inching with gun trigger, electrode and drive mechanism are “hot” to work and ground.
- Turn OFF welding power source before installing or changing drive roll and/or guide tubes.
- Welding power source must be connected to system ground per the National Electrical Code or any applicable local codes.
- Only qualified personnel should perform this installation.

Observe all additional Safety Guidelines detailed throughout this manual.

### Duty Cycle

The Synergic 7F models are rated at 60% duty cycle \* for a maximum current of 600 amps.

\* Based on a 10 minute time period (6 minutes on, and 4 minutes off).

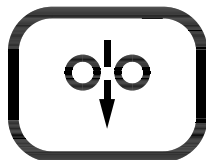
## KEYPAD SETUP AND OPERATION

### Power-Down Save

Power to the Synergic 7F is supplied and controlled from the power source. The Synergic 7F automatically senses the loss of power when the power source is turned off.

Procedure settings, including mode, crater speed, cold feed speed, run-in speed, weld speed, timers and acceleration are automatically saved when power is removed. Arc Voltage setting is retained by the synergic power source. This feature does not require batteries and when power is restored it will automatically return all settings to the state they were in when power was removed. The power source may automatically overwrite any or all of these settings following power-up recall.

### Operation Keys



COLD FEED

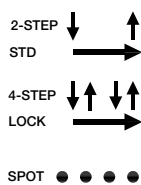
Cold Feed key energizes the wire feeder but not the power source or solenoid valve. This cold feed speed is digitally displayed and is adjustable (with “Arrow keys”) only while pressing the Cold Feed Key. The last setting is held in memory for next Cold Inch feeding.



GAS PURGE

Gas Purge key energizes the solenoid valve but not the wire feeder or power source.

## Mode Selection



- Mode Select key enables operator to choose mode of operation shown by the indicator lights. Pressing key causes mode lights to sequence (top to bottom) starting from the current indicated position.



### Top Light - Indicates 2-Step (Standard) Trigger Mode.

1. Trigger closure energizes the solenoid valve, then the wire feeder and the power source after Prewflow time (See Timer/ Crater Section).
2. Releasing the trigger turns off the wire feeder and power source and then the solenoid valve after Postflow time.

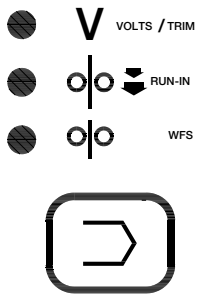
Middle Light - Indicates 4-Step (Lock) Trigger Mode. These models have selectable 4-step with crater fill or, as shipped, 4-step with current interlock. (See 4-step trigger mode selection for method of switching).

The 4-step modes function as follows:

1. Trigger closure energizes the power source and wirefeeder after the preflow time.
2. Trigger release enables 4-step lock, leaving the feeder and power source as in step 1.
  - a) 4-step with current interlock will only lock if weld current is flowing. Breaking weld arc stops wire feed and power source output.
  - b) 4-step with crater fill will lock without welding.
3. Closing the trigger a second time continues welding.
  - a) 4-step with current interlock continues welding without changing the settings from step 2.
  - b) 4-step with crater fill continues welding but changes to the crater settings.
4. Releasing the trigger turns off wirefeeder and power source and then gas solenoid after postflow time.

Bottom Light - Indicates Spot Weld Mode. Trigger closure energizes the solenoid valve, then wire feeder and the power source. The spot on timer starts when current flows. The wire feeder and power source then solenoid valve are all turned off when the spot on timer times out even through the trigger is still closed.

## Display Control Keys



The function select, timer/crater select, arrow keys and rotational encoders all effect the display. Pressing the function select key will cause a function to be displayed. Pressing the timer/crater select key will cause a timer or crater feed speed to be displayed. Whichever is pressed last is the one that will be displayed since they cannot be displayed simultaneously. Only one function or timer indicator light can be on at one time and therefore it always indicates what is being displayed. The arrow keys allow you to adjust the Run-in speed timer or crater speed being displayed. The encoder knobs allow rotational adjustment of weld wire feed speed and Arc Volts/Trim.

Function Select key enables operator to choose which function will be displayed as indicated by the appropriate light. Pressing the key causes lights to sequence (top to bottom) starting from the current indicated position. If a timer or crater speed is being displayed when the Function Select key is pressed, then the indicator light of the last function selected before the timer/crater key was chosen will come on and become the starting point for the sequencing.

**Top Light** - indicates Voltmeter Function has been selected and arc voltage (in volts) will be displayed along with electrode polarity when the trigger has been pressed. When the trigger is not pressed, this will serve as a preset voltage/trim function and the preset voltage/trim will be displayed. The top light "blinks" when arc voltage is being displayed and stays lit when preset voltage/trim is displayed. The last welding voltage displayed before the weld is terminated, will continue to be displayed for 5 seconds after welding to permit operator monitoring.

The preset voltage/trim may be adjusted, using the Volts/Trim encoder knob. The synergic preset voltage/trim level may be adjusted within the range

synergically set by the power source for the process and weld Feed Speed being used.

The power source automatically determines whether preset voltage or percent trim will be displayed. Preset voltage is indicated by one digit only to the right of the decimal point, while percent trim always displays two digits to the right of the decimal point.

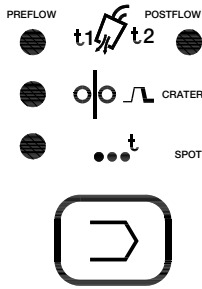
**Middle Light** - Indicates Run-In Speed Function has been selected and the Run-In speed setting is being displayed in IPM or m/m (see section for English or Metric display).

As shipped these models are setup for min. rated fixed Run-In speed with display function deactivated. They may be user-selected to activate or deactivate adjustable Run-In display. (See section for selection of Run-In and resetting fixed Run-In speed).

Wire will be fed at the Run-In speed rate until arc current begins to flow. Once arc current flows, wire will be fed at the Weld speed rate. Decreasing Run-In speed below its lower limit (using the down arrow key) causes the display to read "- - -". This indicates that the Run-In speed will be kept the same as the weld speed setting. You can reset a different Run-In speed simply by pressing the up arrow key.

The Run-In speed will also be the same as the weld speed setting if rapid restrike welding applications are used, where the arc is restruck in a fraction of a second after the previous welding arc was stopped.

**Bottom Light** - Indicates Weld Feed Speed (WFS) Function has been selected and the weld speed setting is being displayed in IPM or M/M (see section for English or Metric speed display). The range of Weld Feed Speed is synergically set by the power source for the process being used, and is adjustable using the Wire Feed Speed encoder knob on the front of the Synergic 7F Control.



**Timer/Crater Select** - key enables operator to choose crater speed, spot or gas timers as indicated by the appropriate light. Pressing key causes lights to sequence (left to right, top to bottom) starting from the current indicated position. Any parameter not available in the mode selected is skipped over. If a function is being displayed when the Timer/Crater Select key is pressed, then the light of the last parameter selected before the function was chosen will come on and become the starting point for the sequencing.

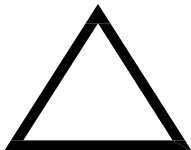
**Top Left Light** - indicates preflow time is being displayed in seconds. This is the time the shielding gas flows before the wire feed and power source are activated.

**Top Right Light** - indicates postflow time is being displayed in seconds. This is the time the shielding gas flows after the wire feed and power source are deactivated.

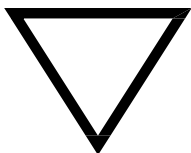
**Middle Light** - indicates that crater feed speed is being displayed. Crater speed is only available when 4-step trigger with crater fill is selected. It is activated by Step 3 and deactivated by Step 4 of the 4-step sequence. (See 4-step trigger mode selection section).

**Bottom Light** - indicates spot on time is being displayed in seconds.

**NOTE:** if unit is not in spot mode then this light will be skipped over in the selection sequence.



**Increase Arrow** - key increases the setting of the parameter selected to be displayed, except Wire Feed Speed and Volts/Trim which are controlled by the encoder knobs.

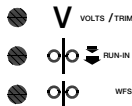


**Decrease Arrow** - key decreases the setting of the parameter selected to be displayed, except Wire Feed Speed and Volts/Trim which are controlled by the encoder knobs.

Arrow key adjustments use the "Accelerating Digit" method for setting changes, where holding the arrow key causes setting change rate to accelerate from slow to fast. Releasing arrow key resets to slow setting change.



GAS PURGE

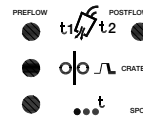


## Acceleration Selection

Pressing both the Gas Purge key and then function select key at the same time causes the acceleration setting to be displayed. The display will indicate "A-X" where X will be a number from 1 through 5 with 5 being the fastest acceleration. This number can be adjusted using the arrow keys. To exit this function, press both these keys again or press any other key except the arrow keys.



GAS PURGE

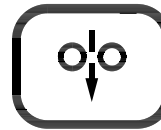


## Selection of English or Metric Speed Display Units

Pressing both the Gas Purge key and then timer select key at the same time causes the speed display units to toggle between IPM (no decimal point displayed) and m/m (a decimal point displayed). If the speed display units were IPM, then they will change to m/m. If the speed display units were m/m, then they will change to IPM. If the display is showing the volts/trim or one of the timers when the keys are pressed, the display will be changed to weld speed to indicate the selected speed display units.



GAS PURGE



COLD FEED

## Run-In Selection

Pressing both the Gas Purge and Cold Feed keys at the same time causes Run-In function to toggle on or off, as indicated by the Run-In indicator light turning on or remaining off in the function select sequence.

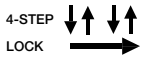
As shipped, the Run-In function is off with a fixed setting of min. rated speed. Therefore, the Run-In indicator light will not sequence with the function select key, but the fixed setting will still be used for actual Run-In speed.

Activation of adjustable Run-In speed using the above dual key press, will permit Run-In speed to be adjusted with the arrow keys and the Run-In indicator light will return to function key sequence. Re-pressing the above dual key again removes the Run-In light from the function key sequence, but replaces the fixed Run-In speed with the adjusted Run-in speed setting, until readjusted.



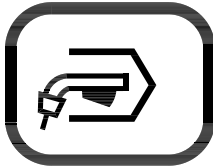
## 4-Step Trigger Mode Selection

### GAS PURGE



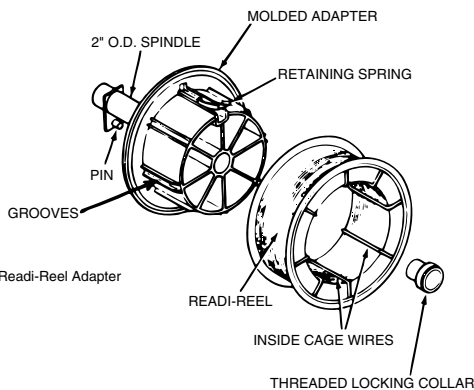
Pressing both the Gas Purge key and then the Trigger mode select key while the 4-step mode light is on will toggle the 4-step trigger mode between:

- 4-step with current interlock (as shipped) and
- 4-step with crater fill.



(See Mode Selection and Display Control Keys sections).

Brake Holding Pin  
(Must engage hole in adapter rib)



Installation of K363-P Read-Reel Adapter

## Wire Reel Loading - Read-Reels and Spools (Using K162H Spindle Kit with 2" (51mm) spindle)

### TO MOUNT A 30 LB (14 KG) READI-REEL PACKAGE USING THE MOLDED PLASTIC K363-P TYPE ADAPTER:

- 1) Make certain that the threaded locking collar is tight and securely locks the adapter on the spindle (see figure above).
- 2) Rotate the spindle and adapter so the retaining spring is at the 12 o'clock position.
- 3) Position the Read-Reel so that it will rotate in a clockwise direction when feeding (wire is to be de-reeled from bottom of the coil).
- 4) Set one of the Read-Reel inside cage wires on the slot in the retaining spring tab.
- 5) Lower the Read-Reel to depress the retaining spring and align the other inside cage wires with the grooves in the molded adapter.
- 6) Slide cage all the way onto the adapter until the retaining spring "pops up" fully.

## ⚠ WARNING

Check to be sure the Retaining Spring has fully returned to the locking position and has SECURELY locked the Read-Reel Cage in place. Retaining Spring must rest on the cage, not the welding electrode.

- 7) To remove Read-Reel from Adapter, depress retaining spring tab with thumb while pulling the Read-Reel cage from the molded adapter with both hands. Do not remove adapter from the spindle.

### To Mount 10 to 44 lb (4.5-20kg) Spool (12"/300mm Diameter): (Requires installation of 2" (51mm) spindle K162H Kit. For 8" (200mm) spools, a K468 spindle adapter must be used.)

- 1) Remove the locking collar on the 2" (51mm) diameter spindle.
- 2) Place the spool on the spindle making certain the brake holding pin enters one of the holes in the back side of the spool. Be certain the wire comes off the reel in a clockwise direction when de-reeled from the bottom of the coil.
- 3) Replace and tighten the locking collar.

## Feeding Electrode and Brake Adjustment

- 1) Turn the Read-Reel or spool until the free end of the electrode is accessible.

## ⚠ WARNING

When feeding with the gun trigger, the electrode and drive mechanism are always "HOT" to work and ground and could remain "HOT" several seconds after the gun trigger is released.

- 2) While tightly holding the electrode, cut off the bent end and straighten the first 6" (150mm). Cut off the first 1" (25mm). (If the electrode is not properly straightened, it may not feed or may not go into the outgoing guide tube causing a "birdnest".)
- 3) Insert the free end through the incoming guide tube.
- 4) Press the Cold Inch key or the gun trigger and push the electrode into the drive roll.
- 5) Feed the electrode through the gun.
- 6) Adjust the brake tension with the thumbscrew on the spindle hub, until the reel turns freely but with little or no overrun when wire feeding is stopped. Do not overtighten.

## Wire Reel Loading - 50-60lb (22.7-27.2kg) Coils (K299 Wire Reel Mounting Kit)

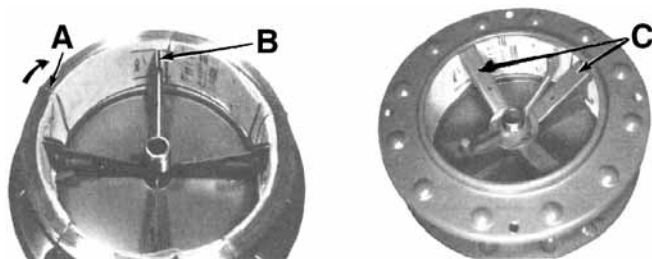
### Adjustable Wire Reel Brake

The mount for standard 50-60 lb (22.7-27.2 kg) electrode coils includes a two-position brake assembly. Generally the brake should be at the inner position (nearest to the wire reel shaft) for wire feed speeds below 400 in/min. (10m/m). It should be at the outer position for the faster wire speeds often used when feeding small diameter electrode.

To adjust the brake position, remove the wire reel. Pull the cotter pin that holds the brake shoe to the arm, move the shoe and replace the cotter pin. Do not bend the cotter pin - it is held in place by a friction fit.

### To Mount a 50-60lb (22.7-27.2kg) Coil:

- 1) To remove the wire reel from its shaft, grasp the spring loaded knob and pull it out. This straightens the knob so it seats into the shaft when released. Remove the reel.
- 2) Lay the reel flat on the floor, loosen the spinner nut and remove the cover plate.
- 3) Before cutting the tie wires, place the coil of electrode on the reel so it unwinds as the reel rotates clockwise.
  - a) Be sure the coil is placed so the spring loaded arms will not interfere with the later removal of the coil tie wires (see illustration below).
  - b) When loading .030-.045" (0.8-1.2mm) electrode, be certain the coil is placed on the reel so the spring loaded arms are at the center of the slots in the cardboard coil liner. This provides the positive compression of the coil sides needed for trouble-free wire feeding (see illustration).
  - c) Put the cover plate on the reel so that the four arms of the cover straddle and are in line with the spring loaded arm of the reel proper.



- 4) Tighten the cover as much as possible by hand. **DO NOT** hammer on the spinner nut arms.
- 5) Cut and remove only the tie wire holding the free end of the coil. Insert the free end into one of the holes in the cover and secure it by bending it back. Cut and remove the remaining tie wires.

### **⚠ CAUTION**

Always be sure the free end of the coil is securely held while the tie wires are being cut and until the wire is feeding through the drive rolls. Failure to do this will result in "backlashing" of the coil, which may tangle the wire. A tangled coil will not feed so it must either be untangled or discarded.

- 6) Replace the reel on the wire feeder. Grasp the shaft knob, pull it out and swing it across the reel hub, locking the reel in place.

### Feeding Electrode

- 1) Turn the reel until the free end of the electrode is accessible. While tightly holding the electrode, cut off the bent end.
- 2) Straighten the first 6" (150mm) and cut off the first 1" (25mm). Insert the free end through the incoming guide tube. Press the Cold Inch key or the gun trigger and push the electrode into the drive roll. Feed the electrode through the gun. (If the electrode is not properly straightened, it may not feed or may not go into the outgoing guide tube causing a "birdnest".)

### **⚠ WARNING**

When feeding with the gun trigger, the electrode and drive mechanism are always "HOT" to work and ground and could remain "HOT" several seconds after the gun trigger is released.

## Wire Loading of 13-14lb (6kg) Innershield Coils

Requires use of K162H Spindle Kit and K435 14 Lb. Coil Adapter.

## Idle Roll Pressure Setting

The idle roll pressure is set at the factory, backed out three turns from full pressure on 4-roll feeders. This is an approximate setting. For small wire sizes and aluminum wire up to 9 or 10 turns out may be required to minimize "birdnesting". The optimum idle roll pressure varies with type of wire, surface condition, lubrication, and hardness. The optimum idle roll setting can be determined as follows:

- 1) Release the incoming idle roll pressure arm, then press end of gun against a solid object that is electrically isolated from the welder output and press the gun trigger for several seconds.
- 2) If the wire "birdnests", jams, or breaks at the drive roll, the idle roll pressure is too great. Back the pressure setting out 1/2 turn, run new wire through gun, and repeat above steps.
- 3) If the only result is drive roll slippage, disengage the gun locking nut, and pull the gun cable forward about 6" (150mm). There should be a slight waviness in the exposed wire. If there is no waviness, the pressure is too low. Increase the pressure setting 1/4 turn, reconnect the gun, tighten the locking nut, and repeat the above steps.
- 4) After the outgoing pressure is set, determine how many turns away from full pressure the setting is. Set both idle roll tensions to this setting. Engage both idle rolls before welding. In most applications, best wire feeding will occur when both idle roll pressures are set the same.

## Gas Guard Regulator Setting (Optional K659-1)

- 1) With the gas supply shut off, the Gas Guard regulator flow adjusting key should be set to maximum (full clockwise) which is rated to be 60 SCFH (28 lts/ min).
- 2) Adjust gas supply flow rate for a level higher than will be required, then adjust Gas Guard flow adjusting key counterclockwise to the desired gas flow rate.



## Making a Weld

- 1) Use only Power Wave model “synergic” power sources.
- 2) Properly connect the electrode and work leads for the correct electrode polarity.
- 3) Use Mode Selection key to set desired operating mode. (Refer to Mode Selection section.)
- 4) Use Function Select and Arrow keys to set desired Run-in and encoder knob to set Weld Feed Speeds. (Set for each procedure if using optional Dual Procedure Switch).
- 5) Adjust the voltage or percent trim, if desired, (for each procedure if using the optional Dual Procedure Switch) using the encoder knob in “Volts/Trim” function (refer to Volts/Trim section). The final setting can be adjusted according to the desired arc voltage while welding.
- 6) Use Timer/Crater Select and Arrow keys to set desired timers, or crater speed if 4-step trigger with Crater fill has been selected. (Refer to the Timer/Crater section).
- 7) Feed the electrode through the gun and cable and then cut the electrode within approximately .38” (9.5mm) of the end of the contact tip for solid wire, and within approximately .75” (19mm) of the extension guide for cored wire.
- 8) Connect work cable to metal to be welded. Work cable must make good electrical contact to the work. The work must also be grounded as stated in “Arc Welding Safety Precautions”.

### **WARNING**



When using an Open Arc process, it is necessary to use correct eye, head, and body protection

- 9) If used, be sure shielding gas valve is turned on.
- 10) Position electrode over joint. End of electrode may be lightly touching the work.
- 11) Lower welding helmet, close gun trigger and start welding. Hold the gun so the contact tip to work distance gives the correct electrical stickout as required for the procedure being used.
- 12) To stop welding, release the gun trigger and then pull the gun away from the work after the arc goes out and Postflow time, if used, is over.

13) If necessary to optimize arc starting, adjust wire speed acceleration, and/or Run-In speed. (See the appropriate sections for adjusting procedures).

## Wire Reel Changing

At the end of a coil, remove the last of the old electrode coil from the conductor cable by either pulling it out at the nozzle end of the gun or by using the following procedure:

- 1) Cut the end of the electrode off at the gun end. Do not break it off by hand because this puts a slight bend in the wire making it difficult to pull it back through the nozzle.
- 2) Disconnect the gun cable from the gun connector on the Synergic 7F Wire Feed Unit and lay the gun and cable out straight.
- 3) Using pliers to grip the wire, pull it out of the cable from the connector end.
- 4) After the electrode has been removed, reconnect the gun cable to the Synergic 7F.

Load a new reel of electrode per the instructions in the Wire Reel Loading sections.

## Wire Feed Overload Protection

The Synergic 7F has solid-state overload protection of the wire drive motor. If the wire drive motor becomes overloaded for an extended period of time, the protection circuitry turns off the power source, wire feed and solenoid and then displays H30. This indicates the wire drive motor is overloaded and the number indicates the time remaining in seconds before the unit will automatically reset. The number continues to decrement every second until it reaches 0. At that time, the unit resets automatically and the previous display will return indicating the unit is ready to operate again. Overloads can result from improper tip size, liner, drive rolls, or guide tubes, obstructions or bends in the gun cable, feeding wire that is larger than the rated capacity of the feeder or any other factors that would impede normal wire feeding. (See section on Avoiding Wire Feeder Problems.)

## Explanation of Prompting and Error Messages

<u>Display</u>	<u>Prompt or Error</u>
HI	Indicates arc voltage is above 80V DC.
---	Indicates selected Run-In speed will be the same as the weld speed. To enter a different Run-In speed simply press the increase arrow key with Run-In selected.
HXX	Indicates wire feed overload. XX indicates time remaining in seconds before unit resets automatically. See sections on Routine Maintenance, Periodic Maintenance, and Troubleshooting Guide Problem 17.
EP	Indicates problem in EPROM assembly. See Troubleshooting Guide Problem 17.
uP	Indicates problem in microprocessor RAM. See Troubleshooting Guide Problem 17.
EXX	Indicates various system problems. XX will be a number from 01 to 10. Turn off power to feeder. Wait 5 seconds. Turn power back on. If error persists, see section on Troubleshooting Guide Problem 17. If error does not reoccur, be sure to check all wire feed speed, acceleration, and timer settings before you proceed.
Er	EEPROM error. Usually occurs at power-up. Indicates one or more of the recalled settings is out of acceptable limits. Press any key to return to normal operation. Be sure to check all wire feed speed, acceleration, and timer settings before you proceed.

# MAINTENANCE

## Safety Precautions

### WARNING



#### **ELECTRIC SHOCK can kill.**

- Do not touch electrically live parts such as output terminals or internal wiring.
- When inching with gun trigger, electrode and drive mechanism are “hot” to work and ground.
- Turn OFF welding power source before installing or changing drive roll and/or guide tubes.
- Welding power source must be connected to system ground per the National Electrical Code or any applicable local codes.
- Only qualified personnel should do maintenance or troubleshooting work.

Observe all additional Safety Guidelines detailed throughout this manual.

## Routine Maintenance

### Drive Rolls and Guide Tubes

After feeding every coil of wire, inspect the drive roll section. Clean it as necessary. Do not use a solvent for cleaning the idle roll because it may wash the lubricant out of the bearing. The driver roll and guide tubes are stamped with the wire sizes they will feed. If a wire size other than that stamped on the roll(s) is to be used, the roll(s) and guide tubes must be changed.

The drive rolls for .035” (0.9mm) through .052” (1.3mm) cored electrode and 1/16” (1.6mm) through 3/32” (2.4mm) electrode have a double set of teeth so they can be reversed for additional life. Drive rolls for .023” (0.6 mm) through .052” (1.3 mm) solid electrodes and aluminum sizes have no teeth, but use two grooves so they also can be reversed for additional life.

See section on Wire Feed Drive Roll and Guide Tube Kits for roll changing instructions.

## Wire Reel Mounting - 50 (22.7kg) and 60lb (27.2kg) Coils

To prolong the life of the reel shaft, periodically coat it with a thin layer of grease.

No maintenance of the two-position adjustable brake is needed. If the brake shoe wears through to the metal, replace the brake assembly.

## Wire Reel Mounting - REDI-REELS and 10 through 30lb (4.5-14kg) Spools

No routine maintenance required. Do not lubricate 2” (51mm) spindle.

## Avoiding Wire Feeding Problems

Wire feeding problems can be avoided by observing the following gun handling procedures:

- Do not kink or pull cable around sharp corners.
- Keep the electrode cable as straight as possible when welding or loading electrode through cable.
- Do not allow dolly wheels or trucks to run over cables.
- Keep cable clean by following maintenance instructions.
- Use only clean, rust-free electrode. The Lincoln electrodes have proper surface lubrication.
- Replace contact tip when the arc starts to become unstable or the contact tip end is fused or deformed.
- Do not use excessive wire spindle brake settings.

## Periodic Maintenance

### Wire Drive Motor and Gearbox

Every year inspect the gearbox and coat the gear teeth with a moly-disulfide filled grease. Do not use graphite grease.

Every six months check the motor brushes. Replace them if they are less than 1/4” long.

### Gun and Cable Maintenance

See appropriate Operator’s Manual.

# TROUBLESHOOTING GUIDE

## WARNING



### **ELECTRIC SHOCK can kill.**

- Do not touch electrically live parts such as output terminals or internal wiring.
- When inching with gun trigger, electrode and drive mechanism are “hot” to work and ground.
- Turn OFF welding power source before installing or changing drive roll and/or guide tubes.
- Welding power source must be connected to system ground per the National Electrical Code or any applicable local codes.
- Only qualified personnel should do maintenance or troubleshooting work.

---

**Observe all additional Safety Guidelines detailed throughout this manual.**

## WARNING

This Troubleshooting Guide is designed to be used by the machine Owner/Operator. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety, please observe all safety notes and precautions detailed in the Safety Section of this manual to avoid electrical shock or danger while troubleshooting this equipment.

## CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your local Authorized Field Service Facility for technical troubleshooting assistance before you proceed.

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## PROBLEMS

PROBLEM	POSSIBLE CAUSE	WHAT TO DO
<p>1. Rough wire feeding or wire not feeding but drive rolls turning.</p>	<ul style="list-style-type: none"> <li>a. Gun cable kinked and/or twisted.</li> <li>b. Wire jammed in gun and cable.</li> <li>c. Incorrect position of drive rolls with grooves.</li> <li>d. Drive rolls loose.</li> <li>e. Gun cable dirty.</li> <li>f. Worn drive roll.</li> <li>g. Electrode rusty and/or dirty.</li> <li>h. Worn nozzle or cable liner.</li> <li>i. Partially flashed or melted contact tip.</li> <li>j. Incorrect idle roll pressure.</li> <li>k. Improper liner, tip or guide tube.</li> </ul>	<ul style="list-style-type: none"> <li>a. Inspect gun cable and replace if necessary.</li> <li>b. Remove wire from gun and cable feed in new wire. Note any obstructions in gun and cable. Replace gun and cable if necessary.</li> <li>c. See Wire Feed Drive Roll and Guide Tubs Kits section for proper installation of drive roll.</li> <li>d. Remove, clean, install and tighten.</li> <li>e. Clean cable or replace liner.</li> <li>f. Replace.</li> <li>g. Replace.</li> <li>h. Replace.</li> <li>i. Replace contact tip.</li> <li>j. Set idle roll pressure per section on Idle Roll Pressure Setting.</li> <li>k. Install proper equipment.</li> </ul>
<p>2. Variable or "hunting" arc.</p>	<ul style="list-style-type: none"> <li>a. Wrong size, worn and/or melted contact tip.</li> <li>b. Worn work cable or poor work connection.</li> <li>c. Loose electrode connections.</li> <li>d. Wrong polarity.</li> <li>e. Problem with serial communications in control cable.</li> </ul>	<ul style="list-style-type: none"> <li>a. Replace tip - remove any spatter on end of tip.</li> <li>b. Inspect - Repair or replace as necessary.</li> <li>c. Be sure electrode lead is tight in wire feeder contact block, gun nozzle and gun tip tight.</li> <li>d. Check connection at output studs for polarity required by welding process.</li> <li>e. Make sure control cable connections are tight. Check for consistent WFS. Make sure parameters on Power Source display, such as WFS, match those on wire feeder display, if not, try changing Synergic 7F control board. If problem persists refer to Power Source trouble shooting information.</li> </ul>

## PROBLEMS

PROBLEM	POSSIBLE CAUSE	WHAT TO DO
<p>3. Poor arc striking with sticking or “blast-offs”, weld porosity, narrow and ropy looking bead, or electrode stubbing into plate while welding.</p>	<p>a. Improper procedures or techniques.</p> <p>b. Improper gas shielding.</p>	<p>a. See “Gas Metal Arc Welding Guide” (GS-100).</p> <p>b. Clean gas nozzle. Make certain that gas diffuser is not empty or turned off. Make certain gas flow rate is proper.</p> <p>Remove gun liner and check rubber seal for any sign of deterioration or damage. Be sure set screw in brass connector is in place and tightened against the liner bushing.</p>
<p>4. Tip seizes in diffuser.</p>	<p>a. Tip overheating due to prolonged or excessive high current and/or duty cycle welding.</p>	<p>a. Do not exceed current and duty cycle rating of gun.</p> <p>A light application of high temperature antiseize lubricant (such as Lincoln E2607 Graphite Grease) may be applied to tip threads.</p>
<p>5. Unit shuts off while welding and “HXX” appears on display.</p>	<p>a. See Problem 1.</p> <p>b. Defective wire feed motor or gearbox.</p>	<p>a. Correct problems causing motor overload.</p> <p>b. Replace.</p>
<p>6. Drive roll does not turn although arc voltage is present and solenoid is on.</p>	<p>a. Defective Wire Feed Unit to Control box cable or harnessing.</p> <p>b. Defective wire feed motor or control PC board.</p>	<p>a. Remove Wire Feed Unit to Control Box Cable and Check A to A and B to B for continuity. If there is no continuity in either or both cases, replace cable. Otherwise, check Harnessing from A and B of MS connector on control box to control board and A and B at Wire Feed Unit MS connector to Motor leads for continuity. If harnessing is O.K. proceed to b.</p> <p>b. Set Run-In speed to maximum. Disconnect wire drive plug P5 from PC board. Measure voltage across pin 1(+) of J5 and pin 2 (-) of J5 on PC board with trigger closed. If voltage is <math>\geq 24V</math> DC, then replace motor assembly. If <math>\leq 24V</math> DC, replace Control PC board (see Procedure for Replacing PC Boards).</p>

## PROBLEMS

PROBLEM	POSSIBLE CAUSE	WHAT TO DO
<p>7. No control of wire feed.</p>	<p>a. Defective Wire Feed Unit to Control box cable or harnessing.</p> <p>b. Defective wire feed motor tach or control PC Board.</p> <p>c. Problem with serial communications in input control cable.</p>	<p>a. Remove Control Box to Wire Feed Unit Cable and Check F to F, G to G and H to H for continuity. If any of the continuity tests fail, replace cable. Otherwise check related harnesses for continuity (Refer to Wiring Diagram). If continuity checks O.K. on harnessing, proceed to b.</p> <p>b. Measure voltage across pin 2 (+) of J3 and pin 3 (-) of J3 on PC board with motor running. If voltage is 1.5-3.5V then replace control PC board (see Procedure for Replacing PC Boards). If not, then replace tachometer.</p> <p>c. See 2e.</p>
<p>8. No wire feed, solenoid, or arc voltage. LED display indicated Synergic 7F has input power.</p>	<p>a. Faulty gun or gun trigger switch.</p> <p>b. Defective Control Box to Wire Feed Unit Cable or harness wiring &amp; connections.</p> <p>c. Defective control PC board or gun connector.</p>	<p>a. Remove gun. Check continuity between trigger pins with trigger closed. If no continuity repair or replace gun.</p> <p>b. Replace gun. Remove plug from J1 on control board. Check that there is continuity between plug pins 2 and 8 when trigger is closed and no continuity when trigger is open. If the continuity tests pass proceed to c. If not, check I to I and J to J in cable. If this continuity test fails, replace cable. Otherwise check wiring harnesses and proceed to c. if no harness problem is encountered.</p> <p>c. Remove gun. Check voltage across trigger sockets on gun connector.</p> <p>If voltage is <math>&gt; \pm 11V</math> DC, then gun is defective.</p> <p>If voltage is <math>&lt; \pm 11V</math> DC, then check the voltage across pin 2 (+) and pin 8 (-) of connector J1 on control PC board.</p> <p>If the voltage is still <math>&lt; \pm 11V</math> DC, then replace control PC board, otherwise, replace gun connector. (See Procedure for Replacing PC boards.)</p>

## PROBLEMS

PROBLEM	POSSIBLE CAUSE	WHAT TO DO
<p>9. Wire feed motor runs and solenoid turns on but no arc voltage is present.</p>	<p>a. Power source is defective.</p> <p>b. Input cable is defective.</p> <p>c. Control PC Board is defective.</p>	<p>a. Disconnect input cable from power source and place a jumper across sockets C &amp; D of 14-socket receptacle at power source. If no arc voltage is present then power source is defective.</p> <p>b. Disconnect input cable from power source and check continuity between socket C of 8-socket plug and pin C of 14-pin plug of the input cable and socket D of 8-socket plug and pin D of 14-pin plug of the input cable. Replace cable if no continuity.</p> <p>c. Replace Control PC board. (See Procedure for Replacing PC boards).</p>
<p>10. Speed does not change when weld current flows.</p>	<p>a. Run-In and weld speeds are set to the same value or Run-In is set to - - -.</p> <p>b. Power source may be defective or there may be a control cable problem with the serial communications - see problem 2e.</p>	<p>a. Set Run-In and weld speeds to desired settings.</p> <p>b. Check input control cable per problem 2e. If this is O.K. then replace Control PC board. (See Procedure for Replacing PC boards.)</p>
<p>11. Voltmeter does not function or read properly when arc voltage is present.</p>	<p>a. See problem 2e, also 67 electrode sensing lead or connections may be intermittent.</p>	<p>a. Check continuity from brass block on wire feed unit to pin-F on input connector at control box. Otherwise, replace Control PC board. (See Procedure for Replacing PC Boards.)</p>
<p>12. Arrow keys do not change WFS or Volts/Trim.</p>	<p>a. This is normal as only WFS and Volts/Trim knobs will adjust these settings.</p>	<p>a. Refer to Operations Section of this manual.</p>
<p>13. Purge key does not turn on solenoid but trigger closure does.</p>	<p>a. Defective keypad or Display PC Board is defective.</p>	<p>a. Check continuity between sockets 5 and 1 of keypad connector when purge key is closed. If not, then replace keypad, otherwise replace Display PC board. (See Procedure for Replacing PC boards.)</p>



## PROBLEMS

PROBLEM	POSSIBLE CAUSE	WHAT TO DO
14. Cold Feed key does not turn on wire feed motor but trigger closure does.	a. Defective keypad or Display PC board is defective.	a. Check continuity between sockets 4 and 1 of keypad connector when Cold Feed key is closed. If not, then replace keypad, otherwise, replace Display PC board. (See Procedure for Replacing PC boards).
15. Display and/or indicator lights do not change when the arrow or select keys are pressed.	a. Defective keypad or Display PC board.	a. Ring out keypad. Replace if defective. If not, then replace Display PC board. (See Procedure for Replacing PC boards.)
16. Display does not change when WFS and/or Volts/Trim knobs are turned.	<p>a. Make sure that the function select key has been pressed to light the LED corresponding to the Volts/Trim or WFS display depending on which knob you are attempting to adjust.</p> <p>b. Broken harness wire(s) or harness disconnected from encoder boards(s) or control board.</p> <p>c. Defective Encoder boards and/or control board.</p>	<p>a. Press the function key to light the LED next to the display function that corresponds with the knob to be adjusted.</p> <p>b. Check harness connections to encoder and control boards and continuity between corresponding harness leads in P2 and P17. (Refer to wiring diagram).</p> <p>c. If b. is not the problem and neither the WFS or Volts/Trim knobs are properly adjusting then replace the control board. If one of the two knobs are properly adjusting, plug the P17 harness from the working board into the nonfunctional board. If the previously nonfunctional board is now working, replace the control board. Otherwise replace the nonfunctional encoder board. (See procedure for replacing PC boards).</p>
17. Display is blank.	<p>a. Power source is OFF.</p> <p>b. Feeder supply fuse or circuit breaker at power source is blown or tripped.</p> <p>c. Display or Control PC board is bad.</p>	<p>a. Turn ON power source.</p> <p>b. Check input cable and feeder unit for short in 41 and 42 circuit. Check for shorted motor. Replace fuse or reset circuit breaker.</p> <p>c. Observe LED mounted on Control PC board. It should blink on and off at a controlled rate of 1 second ON and 1 second OFF. If so, then replace Display PC board. If not, replace Control PC board. (See Procedure for Replacing PC boards.)</p>

## PROBLEMS

PROBLEM	POSSIBLE CAUSE	WHAT TO DO
<p>18. Dual Procedure is not functioning when using the remote dual procedure switch.</p>	<p>a. Gun has not been selected at the control box.</p> <p>b. Faulty Remote Dual Procedure Switch.</p> <p>c. Faulty Local Dual Procedure Switch.</p> <p>d. Defective Control Box to Wire Feed Unit cable, associated harness wiring, or control board.</p> <p>e. Problems with serial communications.</p>	<p>a. Set dual procedure switch at control box to the gun position. Refer to operating instructions.</p> <p>b. Remove switch. Check continuity between switch pins with switch closed and no continuity with switch open. If it fails a continuity test, repair or replace switch.</p> <p>c. Refer to Problem 19, Local Dual Procedure Switch.</p> <p>d. With switch installed disconnect J2 plug from control board. Check continuity between P2 pins 4 and 6 with the remote switch closed, and no continuity with the remote switch open. If a continuity test fails, replace or repair the damaged harness or cable. Otherwise replace control board. (See procedure for replacing PC boards).</p> <p>e. Make sure input cable connections are tight. Make sure parameters on Power Source display, such as WFS match those on wire feeder display, if not, try changing Synergic 7F control board. If problem persists, refer to Power Source Troubleshooting information. (See procedure for replacing PC boards).</p>
<p>19. Dual Procedure is not functioning when using the local dual procedure switch.</p>	<p>a. Faulty Local Dual Procedure Switch or control board.</p> <p>e. Problems with serial communications.</p>	<p>a. Disconnect harness plug from J2 on the control board. Check that there is continuity between plug pins 7 and 11 when local DPS is in position "A" but not when in "Gun" or "B". Now check that there is continuity between plug pins 11 and 12 when local DPS is in position "B" but not when in "Gun" or "A". If any of these continuity tests fail repair or replace switch or switch harness to correct the problem, Otherwise, replace control board. (See procedure for replacing PC boards).</p> <p>b. Make sure input cable connections are tight. Make sure parameters on Power Source display, such as WFS match those on wire feeder display, if not, try changing Synergic 7F control board. If problem persists, refer to Power Source Troubleshooting information. (See procedure for replacing PC boards).</p>

## PROBLEMS

PROBLEM	POSSIBLE CAUSE	WHAT TO DO
20. Wire feed speed is consistent and adjustable, but operates at the wrong speed.	a. Defective gearbox ratio sensing or control board.	a. Remove control board plug from J5. Check that if you have a high speed Wire Feed Unit that you have continuity between plug P5 pins 4 and 6. Likewise if you have a standard speed Wire Feed Unit you should not have continuity between P5 pins 4 and 6. If the continuity test fails, refer to wiring diagram and correct the problem in the J13 to J5 jumper sensing system. Otherwise replace control board.
21. Display shows any of the following:  <b>HI</b>	a. Voltmeter function is selected and arc voltage is > 80V DC.	a. Normal operation. Voltmeter only reads 0-80V DC.
<b>---</b>	a. Run-In speed is selected but is disabled.	a. Run-In speed is now = weld speed. To re-enable Run-In speed simply press the increase arrow key.
<b>HXX</b>	a. See problem 5 or see section on Safety Precautions.	a. XX indicates time in seconds before unit will automatically reset.
<b>Er</b>	a. EEPROM error.	a. Parameter recalled at power-up was out of range. Press any key to reset. Check all settings before proceeding to weld. If this condition persists then replace control PC board. (See Procedure for Replacing PC boards.)
<b>EXX</b>	a. Where XX is a number from 1-10. System error.	a. Turn off power to feeder. Wait 5 seconds. Turn power back on. If EXX is displayed again then replace control PC board. (See Procedure for Replacing PC boards.)
<b>EP</b>	a. EPROM checksum error.	a. Turn off power to feeder. Wait 5 seconds. Turn power back on. If EP is displayed again then replace EPROM assembly. If problem still persists then replace Control PC board. (See Procedure for Replacing PC boards.)
<b>uP</b>	a. Microprocessor RAM error.	a. Turn off power to feeder. Wait 5 seconds. Turn power back on. If uP is displayed again, then replace control PC board. (See Procedure for Replacing PC boards.)

## Procedure for Replacing PC Boards

### **WARNING**



#### **ELECTRIC SHOCK** can kill.

- Have a qualified individual install and service this equipment.
- Turn the power source input power off at the disconnect switch before working on this equipment.
- Do not touch electrically hot parts.

Before replacing a PC board which is suspected of being defective, visually inspect the PC board in question for any electrical or mechanical damage to any of its components and conductors on the back of the board.

a. If there is no visible damage to the PC board, install a new one and see if this remedies the problem. If the problem is remedied, reinstall the old PC board to see if the problem still exists. If it does no longer exist with old PC board:

1. Check the PC board harness connector pins for corrosion, contamination, or looseness.

2. Check leads in the plug harness for loose or intermittent connection.

b. If PC board is visibly damaged electrically, before possibly subjecting the new PC board to the same cause of failure, check for possible shorts, opens, or grounds caused by:

1. Frayed or pinched lead insulation.

2. Poor lead termination, such as a poor contact or a short to adjacent connection or surface.

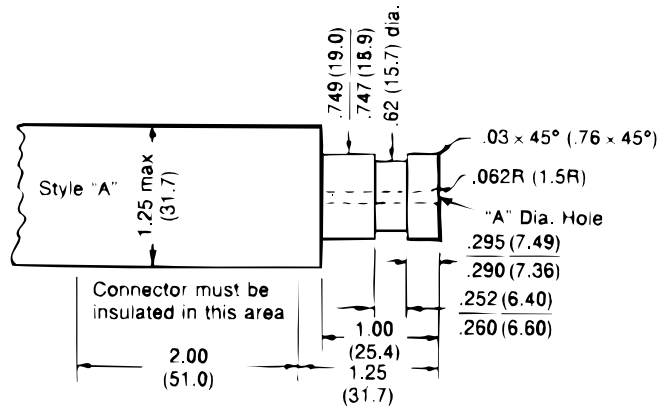
3. Shorted or open motor leads, or other external leads.

4. Foreign matter or interference behind the PC boards.

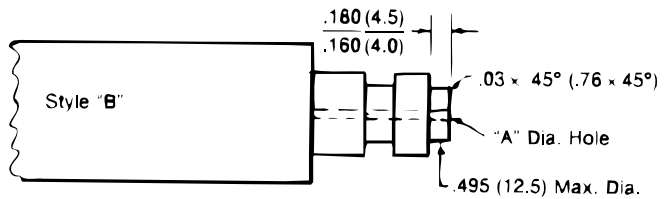
c. If PC board is visibly damaged mechanically, inspect for cause, then remedy before installing a replacement PC board.

If there is damage to the PC board or if replacing PC board corrects problem, return it to the local Lincoln Electric Field Service Shop.

## Gun Cable Connector Requirements to Permit Proper Connection to Wire Feed Units



### Connector for 1/16 - 5/64" (1.6 - 2.0 mm) Wire



### Connector for .023 - .052" (19.0 / 18.9 mm) Wire (For all other dimensions, See Diagram above).

**NOTE:** Connector part with .749/.747 (19.0/18.9 mm) diameter should be made from brass if it is to be part of the welding current carrying circuit.

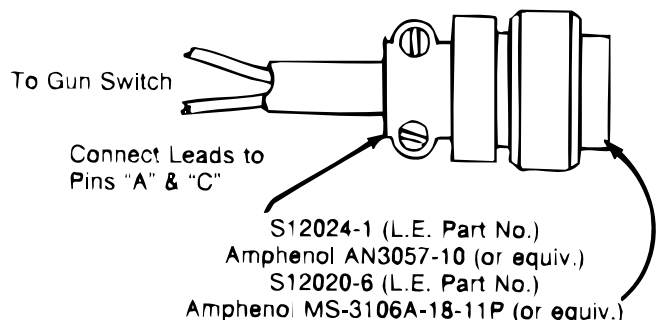
Wire Size in. (mm)	"A" Diameter Hole to be Concentric to .749/.747 (19.0/18.9 mm) Diameter Within .008 (.20) F.I.M.
.068- 5/64 (1.7-2.0)	.125 [1/8 (3.2 mm) Drill]
1/16 (1.6)	.078 [5/64 (2.0 mm) Drill]
.045 & .052 (1.1 & 1.3)	.062 [1/16 (1.6 mm) Drill]
.023-.035 (0.6-0.9)	.055 [(1.4 mm) #54 Drill]

All dimensions in inches and (millimeters)

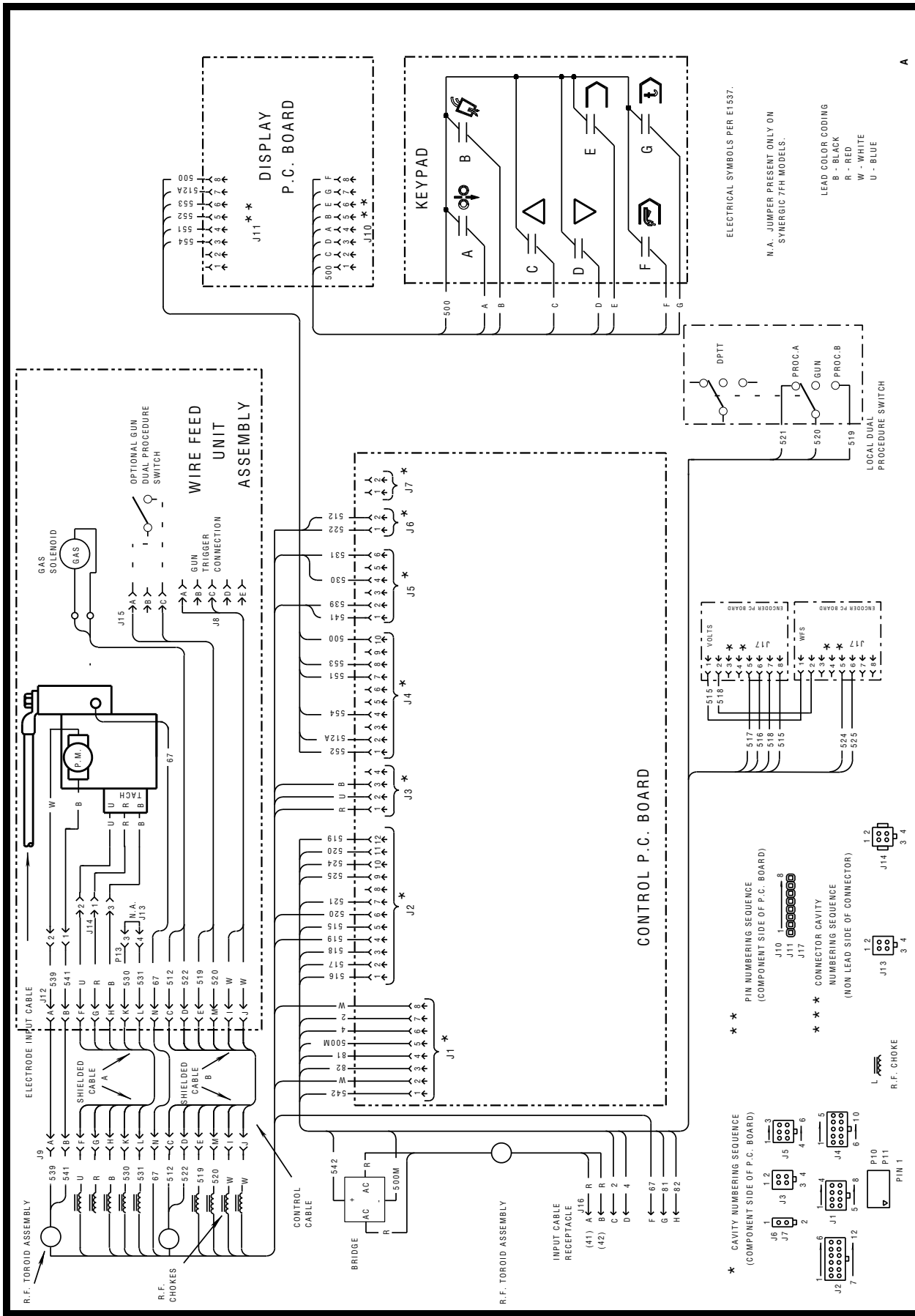
## Switch Requirements

1/2 Amp AC 24 Volts - Inductive

1/2 Amp DC 24 Volts - Inductive



# WIRING DIAGRAM SYNERGIC 7F



CLEVELAND, OHIO U.S.A.

L9778

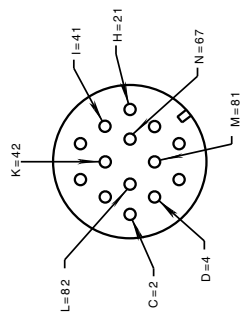
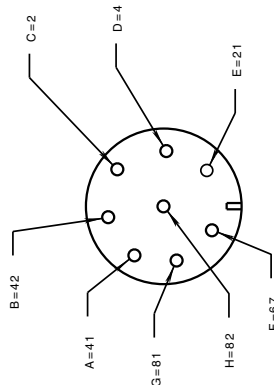
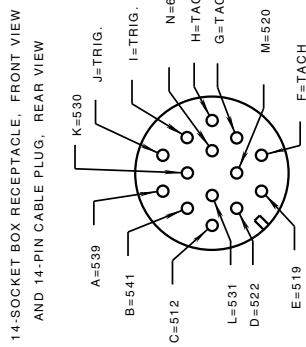
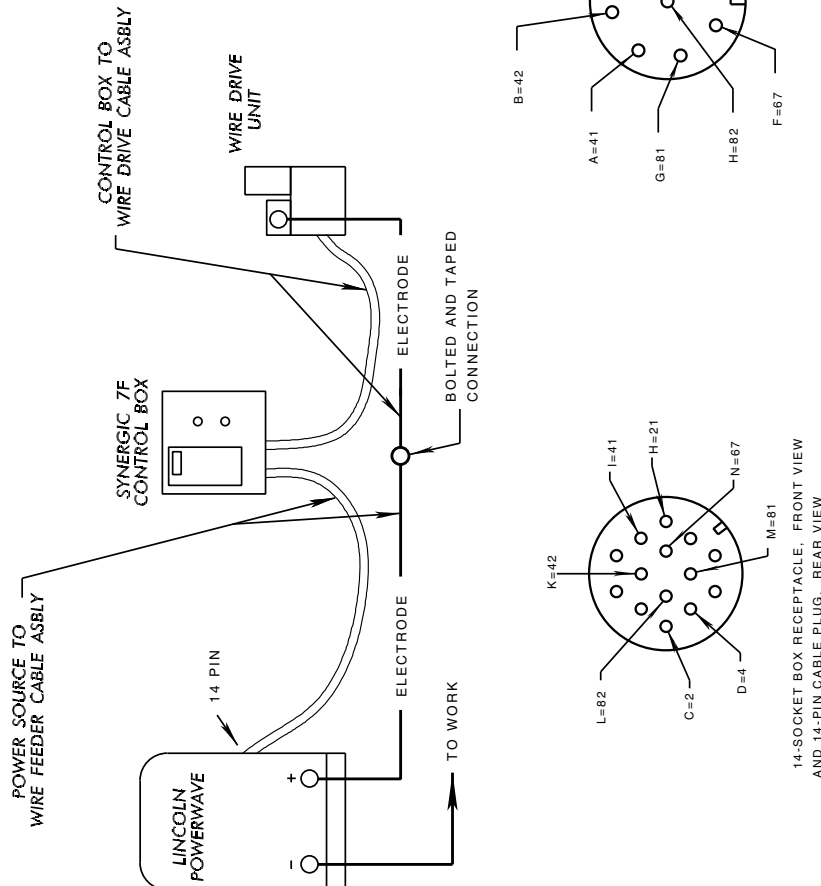
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The specific diagram for a particular code is pasted inside the machine on one of the enclosure panels. If the diagram is illegible, write to the Service Department for a replacement. Give the equipment code number..

# INPUT CONNECTION DIAGRAM



- Turn OFF the power switch on the Welding Power Source before connecting the wire feeder.
- Only qualified persons should install, use or service this machine.

**WARNING**  
ELECTRIC SHOCK CAN KILL



CONTROL BOX TO WIRE DRIVE CABLE	
14 PIN PLUG	14 PIN PLUG
PIN#	LEAD
A	539
B	541
C	512
D	522
E	519
F	TACH
G	TACH
H	TACH
I	GUN TRIGGER
J	GUN TRIGGER
K	530
L	531
M	520
N	67
	FUNCTION
	MOTOR
	MOTOR
	SOLENOID
	SOLENOID
	GUN DUAL PROC. SWITCH
	TACH
	TACH
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	GUN TRIGGER
	GEAR BOX SENSE
	GEAR BOX SENSE
	GUN DUAL PROC. SWITCH
	ELECTRODE

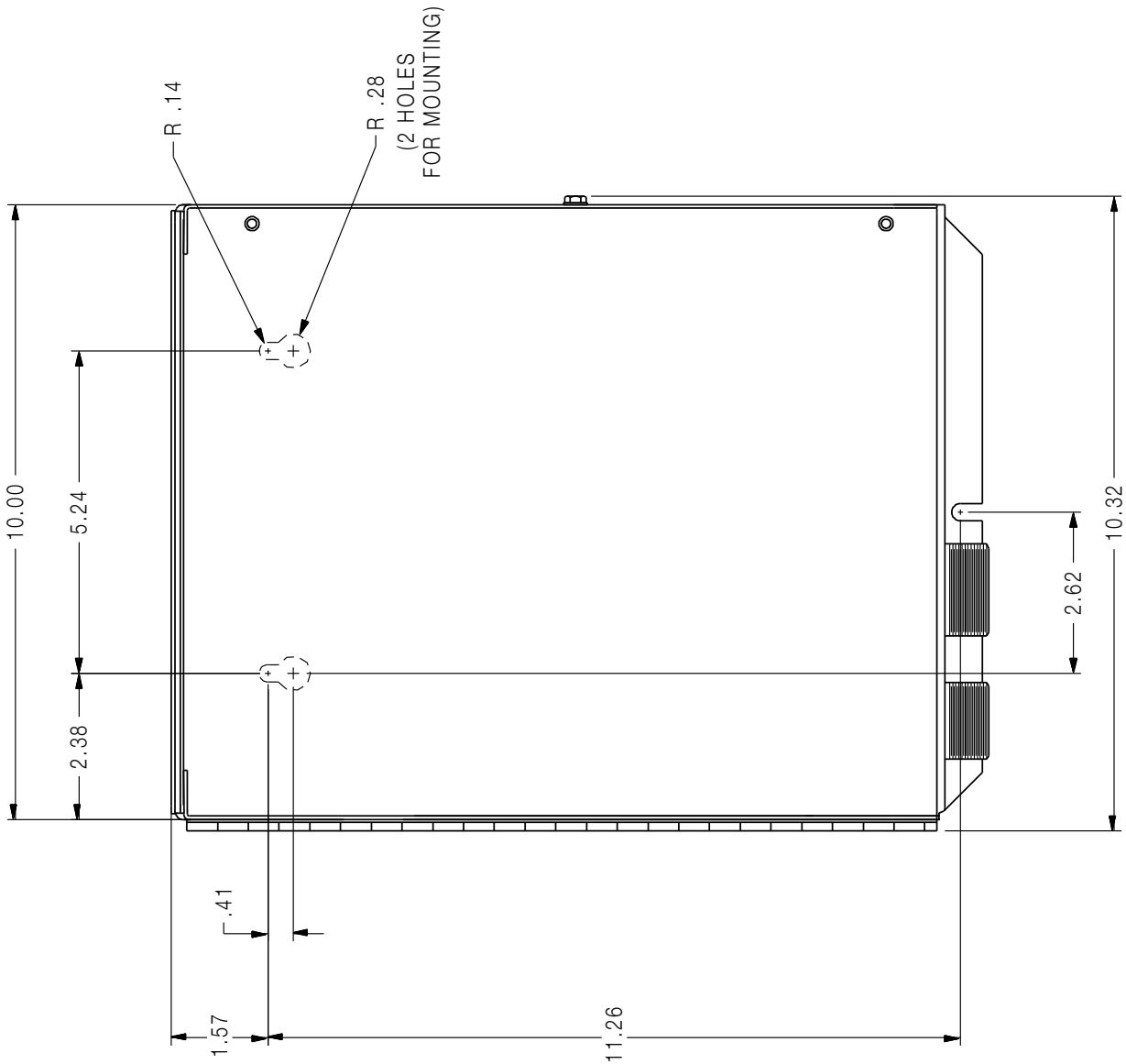
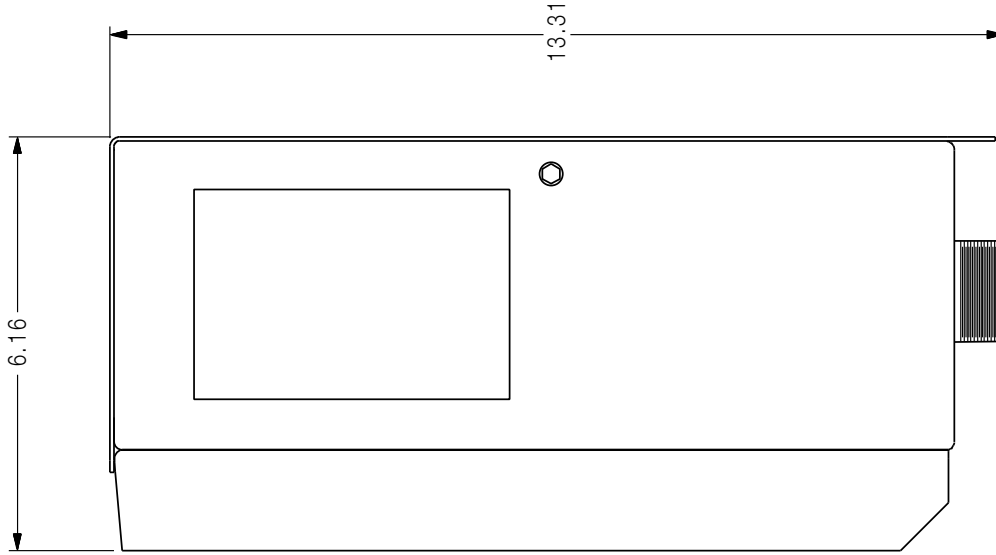
N.A. WELDING CABLE MUST BE SIZED FOR CURRENT AND FUTURE DUTY CYCLE OF APPLICATION.  
 N.B. DIAGRAM SHOWS ELECTRODE POSITIVE. TO CHANGE POLARITY, TURN POWER "OFF", REVERSE ELECTRODE AND WORK CABLES AT POWER SOURCE AND SET-UP PROCEDURE ON POWER SOURCE TO PROPER POLARITY. N.C. PINS NOT LISTED ARE NOT CONNECTED IN CABLE.

POWER SOURCE TO WIRE FEEDER CABLE	
14 PIN PLUG	8 PIN PLUG
PIN#	LEAD
C	2
D	4
H	21
I	41
K	42
L	82
M	81
N	67
	FUNCTION
	TRIGGER CIRCUIT
	TRIGGER CIRCUIT
	WORK
	42V AC
	42V AC
	+SERIAL COMM LOOP
	-SERIAL COMM LOOP
	ELECTRODE

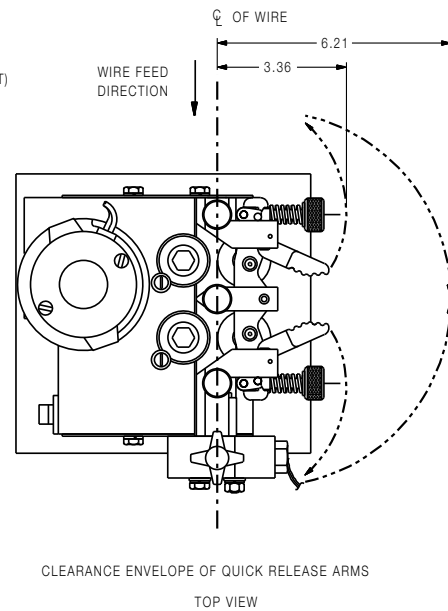
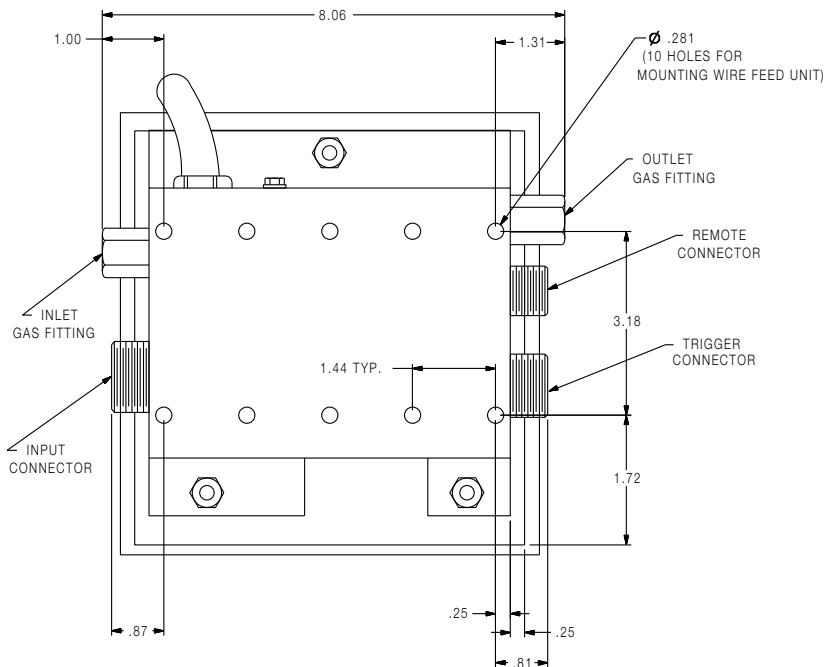
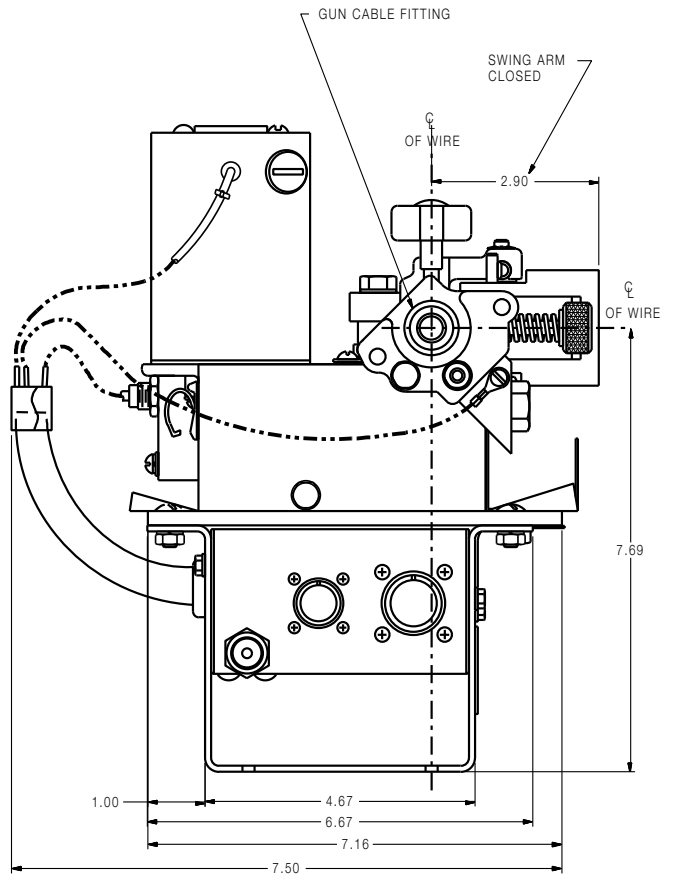
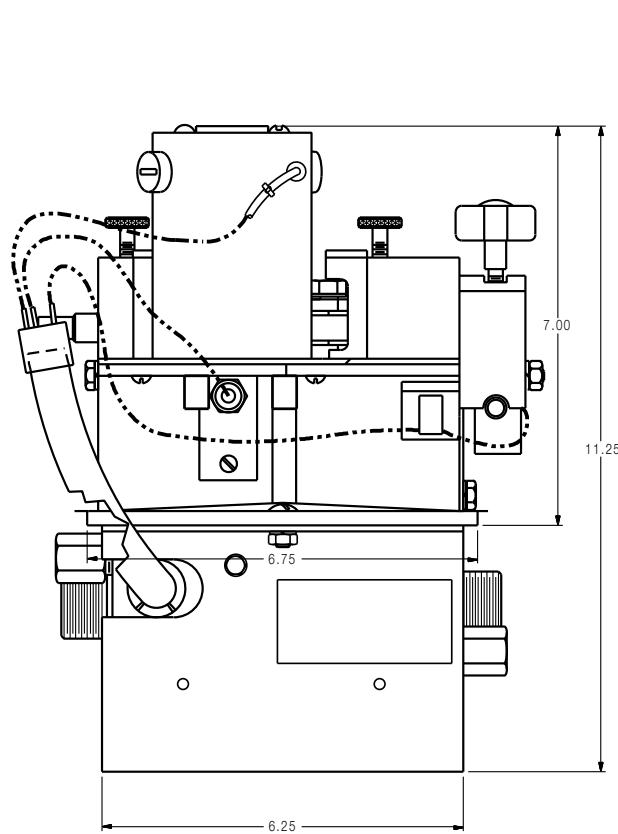
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# CONTROL BOX DIMENSION PRINT



# WIRE FEED UNIT DIMENSION PRINT



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Cleveland, Ohio 44117-1199.

and ask for bulletin ED-80 or call 216-383-2259 and ask for the Welding School Registrar.

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<b>WARNING</b>	<ul style="list-style-type: none"> <li>Do not touch electrically live parts or electrode with skin or wet clothing.</li> <li>Insulate yourself from work and ground.</li> </ul>	<ul style="list-style-type: none"> <li>Keep flammable materials away.</li> </ul>	<ul style="list-style-type: none"> <li>Wear eye, ear and body protection.</li> </ul>
Spanish <b>AVISO DE PRECAUCION</b>	<ul style="list-style-type: none"> <li>No toque las partes o los electrodos bajo carga con la piel o ropa mojada.</li> <li>Aislese del trabajo y de la tierra.</li> </ul>	<ul style="list-style-type: none"> <li>Mantenga el material combustible fuera del área de trabajo.</li> </ul>	<ul style="list-style-type: none"> <li>Protéjase los ojos, los oídos y el cuerpo.</li> </ul>
French <b>ATTENTION</b>	<ul style="list-style-type: none"> <li>Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension.</li> <li>Isolez-vous du travail et de la terre.</li> </ul>	<ul style="list-style-type: none"> <li>Gardez à l'écart de tout matériel inflammable.</li> </ul>	<ul style="list-style-type: none"> <li>Protégez vos yeux, vos oreilles et votre corps.</li> </ul>
German <b>WARNUNG</b>	<ul style="list-style-type: none"> <li>Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung!</li> <li>Isolieren Sie sich von den Elektroden und dem Erdboden!</li> </ul>	<ul style="list-style-type: none"> <li>Entfernen Sie brennbares Material!</li> </ul>	<ul style="list-style-type: none"> <li>Tragen Sie Augen-, Ohren- und Körperschutz!</li> </ul>
Portuguese <b>ATENÇÃO</b>	<ul style="list-style-type: none"> <li>Não toque partes elétricas e electrodos com a pele ou roupa molhada.</li> <li>Isole-se da peça e terra.</li> </ul>	<ul style="list-style-type: none"> <li>Mantenha inflamáveis bem guardados.</li> </ul>	<ul style="list-style-type: none"> <li>Use proteção para a vista, ouvido e corpo.</li> </ul>
Japanese <b>注意事項</b>	<ul style="list-style-type: none"> <li>通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。</li> <li>施工物やアースから身体が絶縁されている様にして下さい。</li> </ul>	<ul style="list-style-type: none"> <li>燃えやすいものの側での溶接作業は絶対にしてはなりません。</li> </ul>	<ul style="list-style-type: none"> <li>目、耳及び身体に保護具をして下さい。</li> </ul>
Chinese <b>警告</b>	<ul style="list-style-type: none"> <li>皮肤或湿衣物切勿接触带电部件及焊条。</li> <li>使你自己与地面和工件绝缘。</li> </ul>	<ul style="list-style-type: none"> <li>把一切易燃物品移离工作场所。</li> </ul>	<ul style="list-style-type: none"> <li>佩戴眼、耳及身体劳动保护用具。</li> </ul>
Korean <b>위험</b>	<ul style="list-style-type: none"> <li>전도체나 용접봉을 젖은 헝겍 또는 피부로 절대 접촉치 마십시오.</li> <li>모재와 접지를 접촉치 마십시오.</li> </ul>	<ul style="list-style-type: none"> <li>인화성 물질을 접근시키지 마십시오.</li> </ul>	<ul style="list-style-type: none"> <li>눈, 귀와 몸에 보호장구를 착용하십시오.</li> </ul>
Arabic <b>تحذير</b>	<ul style="list-style-type: none"> <li>لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الألكترود بجلد الجسم أو بالملابس المبللة بالماء.</li> <li>ضع عازلا على جسمك خلال العمل.</li> </ul>	<ul style="list-style-type: none"> <li>ضع المواد القابلة للاشتعال في مكان بعيد.</li> </ul>	<ul style="list-style-type: none"> <li>ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.</li> </ul>

**READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCTION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.**

**SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.**

**LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.**

**LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.**

			
<ul style="list-style-type: none"> <li>● Keep your head out of fumes.</li> <li>● Use ventilation or exhaust to remove fumes from breathing zone.</li> </ul>	<ul style="list-style-type: none"> <li>● Turn power off before servicing.</li> </ul>	<ul style="list-style-type: none"> <li>● Do not operate with panel open or guards off.</li> </ul>	<b>WARNING</b>
<ul style="list-style-type: none"> <li>● Los humos fuera de la zona de respiración.</li> <li>● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases.</li> </ul>	<ul style="list-style-type: none"> <li>● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio.</li> </ul>	<ul style="list-style-type: none"> <li>● No operar con panel abierto o guardas quitadas.</li> </ul>	Spanish <b>AVISO DE PRECAUCION</b>
<ul style="list-style-type: none"> <li>● Gardez la tête à l'écart des fumées.</li> <li>● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail.</li> </ul>	<ul style="list-style-type: none"> <li>● Débranchez le courant avant l'entretien.</li> </ul>	<ul style="list-style-type: none"> <li>● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.</li> </ul>	French <b>ATTENTION</b>
<ul style="list-style-type: none"> <li>● Vermeiden Sie das Einatmen von Schweißrauch!</li> <li>● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes!</li> </ul>	<ul style="list-style-type: none"> <li>● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)</li> </ul>	<ul style="list-style-type: none"> <li>● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!</li> </ul>	German <b>WARNUNG</b>
<ul style="list-style-type: none"> <li>● Mantenha seu rosto da fumaça.</li> <li>● Use ventilação e exaustão para remover fumo da zona respiratória.</li> </ul>	<ul style="list-style-type: none"> <li>● Não opere com as tampas removidas.</li> <li>● Desligue a corrente antes de fazer serviço.</li> </ul>	<ul style="list-style-type: none"> <li>● Mantenha-se afastado das partes moventes.</li> <li>● Não opere com os painéis abertos ou guardas removidas.</li> </ul>	Portuguese <b>ATENÇÃO</b>
<ul style="list-style-type: none"> <li>● ヒュームから頭を離すようにして下さい。</li> <li>● 換気や排煙に十分留意して下さい。</li> </ul>	<ul style="list-style-type: none"> <li>● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切ってください。</li> </ul>	<ul style="list-style-type: none"> <li>● パネルやカバーを取り外したままで機械操作をしないで下さい。</li> </ul>	Japanese <b>注意事項</b>
<ul style="list-style-type: none"> <li>● 頭部遠離煙霧。</li> <li>● 在呼吸區使用通風或排風器除煙。</li> </ul>	<ul style="list-style-type: none"> <li>● 維修前切斷電源。</li> </ul>	<ul style="list-style-type: none"> <li>● 儀表板打開或沒有安全罩時不準作業。</li> </ul>	Chinese <b>警告</b>
<ul style="list-style-type: none"> <li>● 얼굴로부터 용접가스를 멀리하십시오.</li> <li>● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시오.</li> </ul>	<ul style="list-style-type: none"> <li>● 보수전에 전원을 차단하십시오.</li> </ul>	<ul style="list-style-type: none"> <li>● 판넬이 열린 상태로 작동치 마십시오.</li> </ul>	Korean <b>위험</b>
<ul style="list-style-type: none"> <li>● ابعء رأسك بعيداً عن الدخان.</li> <li>● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها.</li> </ul>	<ul style="list-style-type: none"> <li>● اقطع التيار الكهربائي قبل القيام بأية صيانة.</li> </ul>	<ul style="list-style-type: none"> <li>● لا تشغل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه.</li> </ul>	Arabic <b>تحذير</b>

**LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.**

使う機械や溶材のメーカーの指示書をよく読み、まず理解して下さい。そして貴社の安全規定に従って下さい。

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이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

اقرأ بتمعن وافهم تعليمات المصنع المنتج لهذه المعدات والمواد قبل استعمالها واتبع تعليمات الوقاية لصاحب العمل.



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