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PRECISION ARC 5.0

OWNER'S MANUAL (OPERATIONS AND MAINTENANCE)

SERIAL # 58218

An innovated product of



Thermion®

The Original and Reliable

SILVERDALE, WASHINGTON, USA

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Declaration of Conformity for European Community

(CE) Products:

***NOTE:** *This information is provided for units with CE certification*

Manufacturer's Name: 
Manufacturer's Address: 5813 NE Minder Road
Poulsbo, Washington 98370
USA

Declares that the product: *PRECISION ARC 5.0*

Conforms to the following Directives and Standards:

Machinery Directive: 89/368/EEC
Low Voltage Directive: 73/23/EEC

This machinery must be connected to a CE certified power supply.

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Certified by: _____



Alan R. Rogers
President Thermion Inc.

The US Thermal-Spray Standards Program:

Thermal-spray standards in the United States are developed by several professional societies that include American Society for Testing and Measurement (ASTM) for test & measurements methods and composition specifications; American Welding Society (AWS) for feedstock, equipment acceptance, application process, training & certification; American Water Works Association (AWWA) for thermal-spray zinc potable water tank linings; International Association of Corrosion Engineers (NACE) for corrosion application processes and inspection; and Society of Protective Coatings (SSPC) for test & measurement methods, application specification & inspection in regards to protective coatings for the protection of steel.

US Published Standards:

AWS C2.16/C2.16M:2002, *Guide for Thermal-Spray Qualification.*

This standard contains the thermal sprayer (operator) performance qualification tests for thermal sprayers. Qualification tests are included for job knowledge, flame spraying, arc spraying, plasma spraying, and high velocity oxygen fuel (HVOF) spraying.

AWS C2.18-93, *Guide for the Protection of Steel with Thermal Sprayed Coatings of Aluminum and Zinc and Their Alloys and Composites.*

This guide sets forth recommended thermal-spray operator qualification procedures. It covers applicable documents relating to thermal-spray equipment consumables, and safety. It also contains operator qualification and coating analysis forms. Note: This standard is being incorporated into ANSI/AWS C2.18A-XX/SSPC CS 23.00A-XX/NACE TPC #XA, Guide for the Application of Thermal Spray Coatings (Metalizing) of Aluminum, Zinc, and Their Alloys & Composites for the Corrosion Protection of Steel, in preparation.

AWS C2.19-XX, *Machine Element Repair with Thermal Spray Coatings*, CD #3, May 5, 2000 (52 pages).

This standard covers thermal spray processes for machinery element repair of ferrous and non-ferrous substrates. Included are requirements for the qualification of thermal spray procedures and operators, requirements and guidance for use of thermal spray material and equipment, quality assurance requirements, and descriptions of applicable qualification tests. Note: The Navy (Charles Null, NAVSEA Code 05M2) requested AWS incorporate MIL-STD-1687A(SH) into an AWS standard, April 1998. (1998"present).

ANSI/AWS C2.20/C2.20M:2002, *Specification for Thermal Spraying Zinc Anodes on Steel Reinforced Concrete.*

Formatted as an industrial process instruction, this specification includes information on job safety, job descriptions, pass/fail job reference standards, feedstock materials, equipment, and a step-by-step process instruction for surface preparation, thermal spraying, and quality control. The specification also contains two annexes: Job Control Record and Portable Adhesion Testing This AWS standard is a specification for thermal spraying zinc anodes on steel reinforced concrete.

US Published Standards:

ANSI/AWS C2.21M/C2.21:2003, *Specification for Thermal Spray Equipment Acceptance Inspection.*

This standard specifies the thermal spray equipment acceptance requirements for plasma, arc-wire, flame-powder, -wire, -rod, and -cord, and high-velocity-oxygen-fuel (HVOF) equipment. Proof of suitability shall be provided by the equipment supplier. Example inspection reports are provided in four non-mandatory appendices.

SSPC-CS 23.00/AWS C2.23M/NACE No. 12, *Specification for the Application of Thermal Spray Coatings (Metalizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel*

This standard is a procedure for the application of metallic thermal spray coatings (TSC) of aluminum, zinc, and their alloys and composites for the corrosion protection of steel. Required equipment, application procedures, and in-process quality control (QC) checkpoints are specified.

AWS C2.25:2002, *Specification for Solid and Composite Wires, and Ceramic Rods for Thermal Spraying.*

This ANSI-approved standard provides the as-manufactured chemical composition classification requirements for ferrous and non-ferrous solid and composite wires and rods used in thermal spraying. The standard includes information on standard sizes, markings, manufacturing and packaging.

SSPC CS 23.00, *Guide for Thermal Spray Metallic Coating Systems.*

This guide covers the requirements of thermal-spray metallic coatings, with and without, sealers and topcoats, as a means to prevent the corrosion of steel surfaces. Types of metallic coatings include pure zinc, pure aluminum and zinc/aluminum alloy, 85% zinc/15% Aluminum by weight. Note: This standard is being incorporated into ANSI/AWS C2.18A-XX/SSPC CS 23.00A-XX/NACE TPC #XA, *Guide for the Application of Thermal Spray Coatings (Metalizing) of Aluminum, Zinc, and Their Alloys & Composites for the Corrosion Protection of Steel*, in preparation.

ASTM C 633, *Test Method for Adhesion or Cohesive Strength of Flame-Sprayed Coatings.*

This test method covers the determination of the degree of adhesion (bonding strength) of a coating to a substrate, or the cohesive strength of the coating in a tension normal to the surface. The test consists of coating one face of a loading fixture, and subjecting this assembly of coating and fixtures to a tensile load normal to the plane of the coating.

US Published Standards:

ASTM D 4541, *Test Method for Pull-Off Strength of Coating Using Portable Adhesion Testers.*

This test method covers a procedure for evaluating the pull-off strength (commonly referred to as adhesion) of a coating by determining either the greatest perpendicular force (in tension) that a surface area can bear before a plug of material is detached, or whether the surface remains intact at a prescribed force (pass/fail). Failure will occur along the weakest plane within the system comprised of the test fixture, adhesive, coating system, and substrate. This test method maximized tensile stress as compared to the shear stress applied by other methods, such as a scratch or knife adhesion, and the results may not be comparable. Further, pull-off strength measurements depend upon both material and instrumental parameters. Results obtained using different devices or results for the same coating on substrates having different stiffness may not be comparable.

MIL-STD-1687A(SH), *Thermal spray processes for naval ship machinery applications, 2/11/87.*

This standard covers thermal-spray processes for machinery element repair of ferrous and non-ferrous substrates. Included are requirements for the qualification of thermal spray procedures and operators, requirements and guidance for use of thermal spray material and equipment, quality assurance requirements, and descriptions of applicable qualification tests. Note: This standard is being revised.

MIL-STD-2138A(SH), *Metal Sprayed Coatings for Corrosion Protection Aboard Naval Ships.*

This standard covers the requirements for the use of metal-sprayed coatings (Aluminum) for corrosion control applications on board naval ships. This standard covers certification of facilities, certification of operators, application procedures, metal-spray procedures, and production quality assurance (including test procedures and records). Note: This standard is being incorporated into ANSI/AWS C2.18A-XX/SSPC CS 23.00A-XX/NACE TPC #XA, *Guide for the Application of Thermal Spray Coatings (Metalizing) of Aluminum, Zinc, and Their Alloys & Composites for the Corrosion Protection of Steel*, in preparation.

MIL-P-85856, *Powder Materials, 7 December 1988.*

This specification describes three (3) material categories for use in constructing thermal-spray coatings, consisting of metallic and/or non-metallic components. These powder materials may be suitable for application using either plasma arc or combustion gas (flame spray) techniques.

US Standards In-Preparation

ANSI/AWS C2.18B-93/SSPC CS 23.00B-XX/NACE TPC #XB, Specification for the Application of Thermal Spray Coatings (Metalizing) of Aluminum, Zinc, and Their Alloys & Composites for the Corrosion Protection of Steel, WD-2, February 25, 1999.

This standard is a specification for the application of thermal spray coating (TSC) systems for the corrosion protection specifies procedures for surface preparation and the application of the TSC with in-process quality control (QC) check points. Annexes provide amplifying information which include safety, job reference standards and job control record, selection of TSC's, TSC operator and inspector qualification, inspection, material and equipment, and maintenance and repair of TSC's. This standard may be used as a procurement document.

ANSI/AWS C2.22-9X, Guide for Metallographic Sample Preparation and Evaluation of Thermal Spray Coatings. Note: No comparable ISO standard. Inactive

This guide presents the recommend practices for the metallographic techniques and procedures for characterizing thermal spray coatings. Cutting, mounting, grinding, and polishing materials and procedures are summarized. Coating analysis covers the interpretation of the microstructure (percentage of porosity, oxides, and other phases) and the correlation of that information with the overall properties of the thermal spray coating by comparison with a standard using the Line-Intercept Method and the Grid Area Method.

SSPC/NACE/AWS Tri-Society on Corrosion Protection of Steel with Thermal Spray Coatings (TSTSC)

The SSPC/NACE/AWS Tri-Society on Corrosion Protection of Steel with Thermal Spray Coatings was formed November 1996, at the SSPC C.1.2.B meeting, Dallas, TX. Membership inducted from the AWS C2B, SSPC C2.1.B, and NACE T-6H-45 thermal spray committees on corrosion protection of steel. Two Task Groups were formed:

- TG-A, for developing a process specification for the protection of steel with thermal spray coatings of aluminum and zinc and their alloys. The scope of TG-A is to develop a process specification updating and merging the content AWS C2.18, SSPC CS 23.00, and MIL-STD-2138.
- TG-B, for developing a guide for the inspection of thermal spray coatings on steel. The TG-B inspection guide is a necessary complement to TG-A process specification.

ISO Standards of TC 107 SC 5, Thermal Spraying

(12 standards issued)

[ISO 2063:1991](#), Metallic and other inorganic coatings -- Thermal spraying -- Zinc, aluminum and their alloys. *Edition: 2 (monolingual) -- Number of pages: 10 --Price code: E -- ICS: [25.220.40](#) Descriptors: aluminum plating, classification, coatings, iron and steel products, metal coatings, metal spraying, protective coatings, specifications, tests, zinc coatings. Last updated on 1998-01-17.*

[ISO/DIS 14231](#), Thermal spraying -- Acceptance inspection of thermal spraying equipment. *Edition: 1 (monolingual) -- ICS: [25.220.20](#) Descriptors: acceptability, coating processes, coatings, equipment, inspection, quality control, specifications, spraying, thermal spraying -- Last updated on 1998-01-17.*

[ISO/DIS 14232](#), Thermal spraying -- Powders -- Composition -- Technical supply conditions. *Edition: 1 (monolingual) -- ICS: [25.220.20](#) -- Descriptors: certificates of conformity, chemical composition, chemical properties, classification, coating processes, coatings, delivery condition, designation, microstructure, physical properties, powdery materials, size classification, specifications, spraying, thermal spraying -- Last updated on 1998-01-17.*

[ISO/DIS 14916](#), Thermal spraying -- Determination of tensile adhesive strength. *Edition: 1 (monolingual) -- ICS: [25.220.20](#) Descriptors: adhesion tests, adhesive strength, coating processes, coatings, determination, spraying, tension tests, tests, thermal spraying -- Last updated on 1998-01-17*

[ISO/DIS 14917](#), Thermal spraying -- Terminology, classification. *Edition: 1 (monolingual) -- ICS: [01.040.25](#), [25.220.20](#) -- Descriptors: classification, coating processes, coatings, spraying, thermal spraying, vocabulary -- Last updated on 1998-01-17.*

[ISO/DIS 14918](#), Thermal spraying -- Approval testing of thermal sprayers. *Edition: 1 (monolingual) -- ICS: [25.220.20](#) -- Descriptors: coating processes, coatings, instructions, personnel, procedure, qualification, qualification approval, spraying, thermal spraying -- Last updated on 1998-01-17.*

[ISO/DIS 14919](#), Thermal spraying -- Wires, rods and cords for flame and arc spraying -- Classification -- Technical supply conditions. *Edition: 1 (monolingual)--ICS: [25.220.20](#) -- Descriptors: certificates of conformity, classification, coating processes, coatings, cordages, delivery condition, designation, diameters, dimensions, marking, metal bars, packaging, properties, specifications, spraying, thermal spraying, wire -- Last updated on 1998-01-17.*

[ISO/DIS 14920](#), Thermal spraying -- Spraying and fusing of thermally sprayed coatings of self-fluxing alloys. *Edition: 1 (monolingual) -- ICS: [25.220.20](#) -- Descriptors: coating processes, coatings, melting, specifications, spraying, thermal spraying -- Last updated on 1998-01-17.*

ISO Standards of TC 107 SC 5, Thermal Spraying

[ISO/DIS 14922-1](#), Thermal spraying -- Quality requirements of thermally sprayed structures -- Part 1: Guidance for selection and use. *Edition: 1 (monolingual) -- ICS: [25.220.20](#) -- Descriptors: coating processes, coatings, quality, rules (instructions), specifications, spraying, thermal spraying -- Last updated on 1998-01-17.*

[ISO/DIS 14922-2](#), Thermal spraying -- Quality requirements of thermally sprayed structures -- Part 2: Comprehensive quality requirements. *Edition: 1 (monolingual) -- ICS: [25.220.20](#) -- Descriptors: coating processes, coatings, inspection, personnel, qualification, quality, specifications, spraying, thermal spraying -- Last updated on 1998-01-17.*

[ISO/DIS 14922-3](#), Thermal spraying -- Quality requirements of thermally sprayed structures -- Part 3: Standard quality requirements. *Edition: 1 (monolingual) -- ICS: [25.220.20](#) -- Descriptors: coating processes, coatings, inspection, personnel, qualification, quality, specifications, spraying, thermal spraying -- Last updated on 1998-01-17.*

[ISO/DIS 14922-4](#), Thermal spraying -- Quality requirements of thermally sprayed structures -- Part 4: Elementary quality requirements. *Edition: 1 (monolingual) -- ICS: [25.220.20](#) -- Descriptors: coating processes, coatings, inspection, personnel, qualification, quality, specifications, spraying, thermal spraying -- Last updated on 1998-01-17.*

Important Safeguards and Symbols



WARNING! WATCH OUT! There are possible hazards with this procedure! The possible hazards are shown in the below symbols. Your end user (applicator, operator or helper) should read and understand these safeguards. The operator should read and understand the operating and installation instructions provided with this Thermion Arc Spray System.

The arc spray process and Thermion Arc Spray equipment share similarities with welding processes and equipment. Improper use or maintenance may cause serious injury or death. Your end user should have training or experience in safe practices for the arc spray process before operating the arc spray equipment.

WARNING-ELECTRIC SHOCK MAY KILL



DO NOT touch bare conductors or terminals when energized. DO NOT work in wet or damp areas. Wear dry insulated gloves and dry protective clothing. Remember that when the power source is on, the electrode (wire) is electrically hot. DO NOT touch the wire with bare skin while touching the electrical ground. Install and maintain your electrical equipment using the correct electrical code standards appropriate for your requirements. A certified electrician should always hook primary leads to the electrical grid source with the appropriate safety disconnects.

WARNING-ARC RAYS MAY INJURE EYES AND BURN SKIN



The arc spray process produces extreme heat and strong ultraviolet rays. Never try to arc spray without a welding helmet equipped with the proper lens. Protect helpers, observers and bystanders. Failure to protect may cause permanent damage to eyes. Also, protect skin from both arc rays and burns from heat. Always wear protective clothing which does not allow skin to become exposed.

WARNING-FUMES AND GASES MAY BE DANGEROUS TO YOUR HEALTH



Follow the precautions specified by the wire material manufacturers. Breathing any fumes created by the arc spray process may cause illness or death when there is not proper ventilation and protection. Keep your head out of the fumes. If ventilation is not adequate, wear approved respiratory protection.

WARNING-WIRE FEED ROLLS CAN INJURE



Keep clear of wire feed rolls, these gears are hazardous during operation. Keep clear of all moving parts, moving wire and rolling wire spools.

WARNING-NOISE CAN BE DAMAGING TO YOUR HEARING



Wear ear protection at all times. In some conditions, double ear protection may be required.

Warranty Information

A. Limited Warranty

- 1) Subject to the terms and conditions hereof, Thermion Inc. warrants to the user that all new and unused equipment furnished by Thermion Inc. is free from defect in workmanship and materials as of the time and place of delivery by Thermion Inc. or its agent. With respect to trade accessories or other items manufactured by others, such items are sold subject to the warranties of their respective manufacturers, if any.
- 2) Thermion Inc. will honor an original user's warranty claim on warranted equipment in the event of failure resulting from a defect for a period of 180 (one-hundred eighty) days from date of purchase.
- 3) Thermion Inc. will honor an original user's warranty claim on component and any defects in workmanship on the wire feed unit for a period of 180 (one-hundred eighty) days from date of purchase.

B. Express Warranty

Any express warranty not provided herein and any implied warranty, guarantee or representation as to performance, and any remedy for breach of contract which, but for this provision, might arise by implication, operation of the law, custom of trade or course of dealing, including any implied warranty of merchantability or of fitness for particular purpose, with respect to any and all equipment furnished by Thermion Inc. is excluded and disclaimed by Thermion Inc.

C. Consumer

Except as expressly provided by Thermion Inc. in writing, Thermion Inc. products are intended for purchase and use by commercial/industrial users and for operation by persons trained and experienced in the use and maintenance of thermal arc spray equipment and not for domestic use. Thermion Inc. warranties do not extend to, and no reseller is authorized to extend, Thermion Inc. warranties to any consumer.

Preface

This manual has been designed for experienced thermal arc spray operators and must be read completely before using the equipment. If you lack experience or are unfamiliar with the practices and safe operation of welding equipment, please consult your foreman. Do not attempt to install, operate, or perform maintenance on this equipment unless you are qualified and have read and understood this manual. If in doubt about installing or operating this equipment, contact your distributor.

For the safe and successful use of this equipment, be sure the information contained in this manual reaches the operator. Extra copies of this manual are available upon request. Specify your machine serial number.

This manual is divided into nine sections:

Section 1: Introduction

Section 2: Safety Measures

Section 3: System Assembly

Section 4: Controls

Section 5: Operation (General)

Section 6: Principles of Operation

Section 7: Liner Replacement

Section 8: Components Section

The information contained in this manual represents our best judgment; however, Thermion Inc. assumes no liability for its use.

Service Notice

If, after reading this manual and consulting with your distributor you have additional questions regarding the operation of this piece of equipment, please call, fax, or write:

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1 INTRODUCTION

1.1 GENERAL INFORMATION AND SAFETY

- A. General Information presented in this manual and in the power supply manual, and on labels, tags and plates provided on the unit pertains to equipment design, installation, operation, maintenance, and troubleshooting all of which should be read, understood, and followed for the safe and effective use of the equipment.
- B. The installation, operation, maintenance and troubleshooting of the arc spray equipment requires practices and procedures, which ensure personal safety and the safety of others. Therefore, this equipment is to be installed and operated only by qualified persons in accordance with the manual and all applicable codes.
- C. Safety instructions pertaining specifically to this equipment appear throughout this manual and the power supply manual, highlighted by signal words **DANGER**, **WARNING**, **CAUTION**, and **IMPORTANT**, which identify different levels of hazards.

DANGER: indicates an operational procedure, which if not followed, will cause **SEVERE** injury to the operator, service personnel or bystanders.

WARNING: statements include hookup, operating and maintenance instructions and procedures which, if not followed carefully, could result in **SEVERE** personal injury or damage to the equipment.

CAUTION: indicates an operation procedure, which, if not followed, may cause **MINOR** injury to the operator, service personnel and/or bystanders.

IMPORTANT: highlights instructions, which need special emphasis to obtain the most efficient and safe operation of this equipment.

1.2 RECEIVING AND HANDLING

Prior to operating this equipment, remove all packing material from around the unit and carefully inspect for any damage, which may have occurred during shipment. The purchaser must file any claims for loss or damage that may have occurred during transit with the carrier.

When requesting information concerning this equipment, model description and serial number of the equipment must be supplied.

1.3 GENERAL DESCRIPTION

Thermion Inc.'s Precision Arc Spray Machine is a push type arc spray system that has a patented feature, which controls arc shorting. This equipment is designed to spray most wires, i.e., stainless, low alloy steels, bronzes, aluminum, zinc, zinc-aluminum, babbitt, etc.

1.3.1 WIRE FEEDER

The feeder is compact with a carrying handle. The meters, dials, and switches are located on the front of the feed unit for ease of viewing and operation. The drive assembly is a six-roll heavy-duty drive unit. An Industrial Cart is available for easy mounting of the wire feed unit.

1.3.2 FRONT END ASSEMBLY

The Head and Trigger/Handle Assemblies combine to make a simple, durable, and lightweight Spray Gun. The patented combination leads carry the atomization air, spray wire, and power to the spray gun from the feeder. These three assemblies make up the Front End Assembly.

1.3.3 ARC SHORTING CONTROL

Arc spray systems typically have an inherent problem of arc shorting. This condition occurs on all systems; the larger the wire diameter, the more severe the problem. A patented feature of the Thermion Inc. system controls arc shorting. As the arc attempts to short, a sensor detects a change in arc conditions, and the patented feature compensates, recreating atomization.

1.3.4 REMOTE CONTROL OF POWER SOURCE

The standard Thermion Inc. system must include a welding-type power source. All functions of the system can be remotely controlled at the wire feeder; this allows the power supply to be located remote from the work area. Refer to your power supply manual for methods used to activate remote capabilities.

2 SAFETY MEASURES

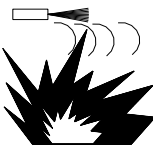


WARNING Arc spraying can be hazardous because it requires the use of electric voltages and currents, hoses under high pressure, and potentially irritating or toxic spray materials. It may involve air contaminated by dusts, fumes, etc. However, it can be a completely safe process when performed by a capable operator with proper understanding of arc spraying practices and knowledge of the equipment, one who takes care in operation and follows the recommended precautionary measures.

Dust, smoke and high intensity light (sun type rays) are created by performing thermal spraying, therefore action must be taken to provide protection to the environment, bystanders, or to nearby equipment.

2.1 REDUCTION OF FIRE AND EXPLOSIVE HAZARDS

WARNING Remember that the stream of sprayed metal is HOT. Point the gun away from yourself and away from materials that will burn. Carelessness in pointing the gun at paper, wood, or oily rags can result in fire.



CAUTION Be especially careful not to spray on the hoses when operating the gun. Hoses will burn. Keep them out of the way. All air lines, compressors, regulators, etc., should be inspected regularly for leaks and loose connections.

EQUIPMENT MAINTENANCE: Maintain the arc spray equipment in first-class

condition. Follow the maintenance recommendations in this Thermion Instruction Manual located in Sections 6.4-6.5.4.

2.1 REDUCTION OF FIRE AND EXPLOSIVE HAZARDS (CONTINUED)



DANGER: All dust, having considerable caloric value, can be explosive. This dust includes: flour, starch, hard rubber dust, wood flour, aluminum dust, and the dust of other metals. Aluminum and magnesium dusts are particularly hazardous. The greatest care should be used in handling them. To minimize the danger of a dust explosion in an arc spray booth or other confined spaces, prevent the accumulation of fumes and dust. Ventilation and good housekeeping in the work area is essential. Inspect and clean regularly to assure that there is no potentially dangerous accumulation of dust.

WARNING: The Control box is not an explosion proof enclosure and shall not be located in a dust environment. A suggested location is close to the power unit.

Dust Collectors must be suitable for metal spray dust. All closed collectors must be provided with blowout holes or relief panels. All fans, pipes, dust arresters and motors should be electrically grounded. Motors should be external to the dust system. When cleaning booths, pipes, etc., the ventilating fan should be kept running to prevent the accumulation of fumes or dust in the system. Non-sparking tools should be used in cleaning and repair operations.

When emptying the collector, all sources of ignition in the area should be eliminated.

When making repairs on the ventilating or dust collecting equipment, no welding or cutting should be done before the equipment is washed down and all metal dust removed.

2.2 REDUCTION OF RESPIRATORY HAZARDS



WARNING For shop work being performed by an operator without an air fed hood, a suitable spray booth and an adequate exhaust system are required to avoid the toxic or noxious effects of dust, fumes, and mists which may be generated by arc spraying. The following is for information only; your Governmental Safety and Health Agency should determine the actual requirements.

For ordinary arc spray work, air at a velocity of 200 FPM (1.0 m/s) should pass into the opening of the spray booth. With the arc spray gun at the booth opening, the exhaust system must be able to exhaust 200 CFM (0.1m³/s) of air for every square foot of booth opening. If the booth has an opening of four square feet, (.37 m²), a system that will exhaust 4 x 200 or 800 CFM (0.4 m³/s) should be provided. If there is any question as to the effectiveness of the ventilating and exhaust system or as to the presence of airborne particles, which the operator might inhale, consult a competent industrial hygienist.

Because any finely divided material may damage the respiratory system, respirators are recommended for all Thermal Spraying.

IMPORTANT: it is strongly recommended that complete and current information be obtained from your Governmental Health Agency.

2.2 REDUCTION OF RESPIRATORY HAZARDS (CONTINUED)

Some materials, such as beryllium, tellurium, and their oxides, are dangerous to the respiratory system and should not be used at all except under the supervision of a competent safety engineer.

BLASTING and SPRAYING both produce dust. Blasting of toxic materials should be considered to be hazardous, as is spraying such materials.

Completely sealed, mask-type, pressurized respirators are recommended for all applications of Thermal Spray. However, with proper ventilation that maintains proper threshold limits of hazardous material, element type filters of the proper type will protect satisfactorily.

2.3 THRESHOLD LIMITS FOR AIR CONCENTRATION OF HAZARDOUS MATERIAL

WARNING Obtain up to date, exact figures from your governmental health agency.

CERTAIN SOLVENTS: Certain solvents may decompose when exposed to ultra violet rays. Avoid exposing solvents, or parts when wet with solvent, to the radiation from the arc.



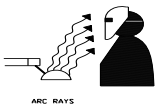
When the electric arc spray system is set up and operated in accordance with the instructions in this manual, the metalizing wires are electrically energized only when the gun is spraying. When the spray is shut off, electrical charge is removed from both metalizing wires.

DANGER If, while the gun is spraying, a person should touch both energized wires, or any part that the wire is in contact with, that person could receive an electrical shock, the volume and current of which are capable of developing a harmful or fatal electric shock or burns.

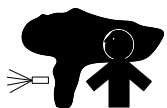


Do not clean the inside of the power supply unit with a wire brush or any other tool. Use clean, dry compressed air only.

2.4 PERSONAL PROTECTION



WARNING The electric arc generated at the front of the gun is very bright and emits ultraviolet light rays. The eyes and skin must be guarded against these rays. Standard air fed welding, or sand blasting, personal protection equipment fitted with a dark lenses, has proven to provide adequate protection for thermal spraying.



Possible allergic reaction of dust, fumes, and the like or other unknown causes of health impairment due to contact with the body cannot, in most cases, be predicted. To avoid such reaction, never permit spray dust to enter the eyes, mouth, cuts, scratches, or open wounds. After spraying, and especially before eating or handling foods, wash hands thoroughly. Wear fireproof or flame resistant protective clothing if available. Protect eyes, ears, and skin through use of gloves, facemask, ear and body protectors that are standard in the welding industry.

2.4.1 REDUCTION OF NOISE HAZARDS - EAR PROTECTION



Noise from a Thermion Inc. arc spray gun range between 80 and 120 decibels. At this level, most Governmental Health Agencies require ear protection and sometimes double ear protection.

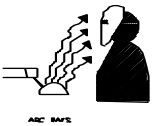


WARNING the noise made by the arc spray gun is loud enough to cause the operator discomfort and can cause hearing damage. Adequate protection should always be used.

The operator and other personnel close to the arc spray operation must be protected from excessive noise. If possible, the spray operation should be isolated. Hearing protection should be used. Do not rely on wads of cotton for hearing protection. They are ineffective against high-intensity noise.

Noise level at any location depends on factors such as equipment operating parameters, background noise, work area size, and wall, floor, and ceiling materials. To determine the exact noise level, it is necessary to measure the sound level to determine the method needed for adequate protection.

2.5 EYE PROTECTION (STANDARD WELDING SHIELDS AND LENS)



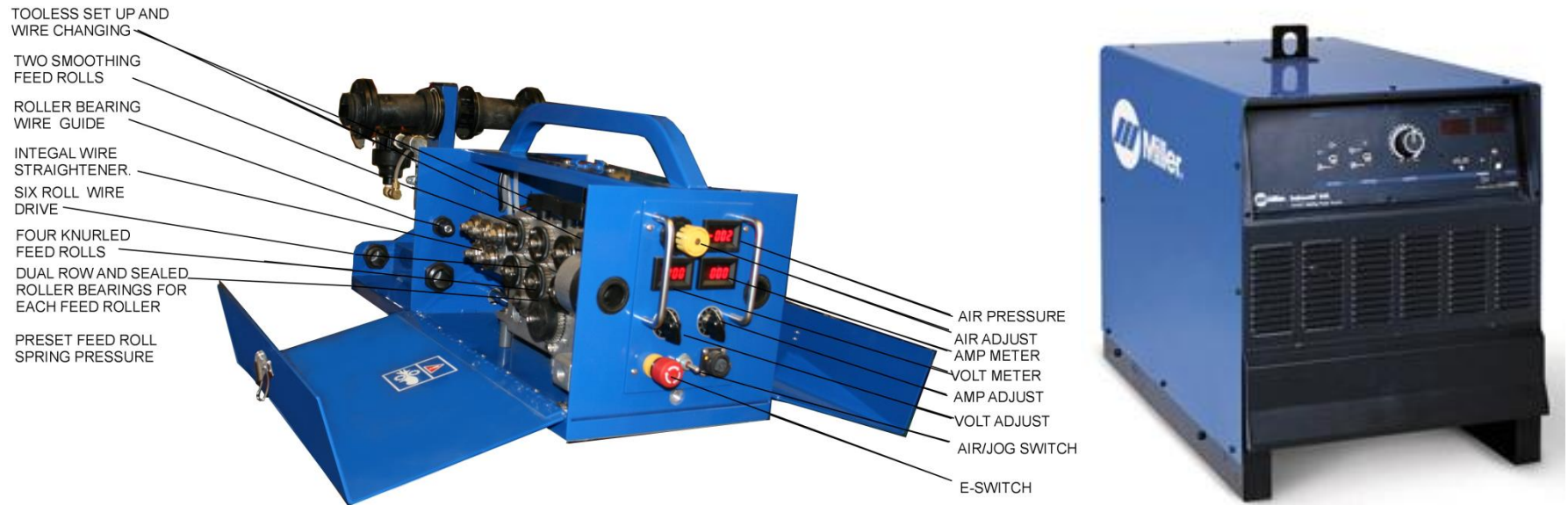
CAUTION the hardened green (Shade 9) lens is within the shade range recommended for arc spraying. However, the choice of lens shade may be based on visual sensitivity and sharpness (acuity) and may vary widely from one individual to another. Check with your Government Health Agency for current and complete shade number recommendations.

Always wear proper eye protection when operating or watching the arc spray operation. Inspect the lens and cover plates frequently. Lenses and cover plates that are scratched, pitted, or damaged can impair vision and seriously reduce protection.

2.6 ENVIRONMENT

DANGER The Thermal Spraying operation can produce materials that are hazardous for plants, animals, fish, or water quality. Precautions must be taken to prevent any danger to the environment. Collect all residues from the metal spray operation and dispose of as hazardous material or determine that it is safe to the environment prior to disposal.

3 SYSTEM ASSEMBLY DIAGRAMS



3.1 LOCATION

This arc spray system is designed for remote location operation; the feed unit can be located near the work site while the power supply can be located outside the dust environment. It can also be close coupled as shown above for shop work.

3.2 POWER SUPPLY

IMPORTANT Refer to manufacturer's instruction manual for hook up and operation requirements for the power supply and to select correct output cables in relation to power source location and work site distance, and operational amperage.

3.3 COMPONENT INTERCONNECTION



This system provides 110 Volt AC power to the feeder unit when the power supply is in ON position. Spray current is provided when the contactor is actuated via the Trigger.

WARNING All connections to the feeder from the power supply should be performed with the power supply OFF.

3.3.1 WIRE FEEDER HOOK UP TO POWER SUPPLY

Wire Feeder hook up to the power supply is performed by connecting the control lead and two welding cables.

3.3.2 FRONT END ASSEMBLY HOOK UP



WARNING Electric shock can kill. The power supply is energized by the Trigger. If the Trigger is off and the power supply is energized, a malfunction has occurred, and the problem requires immediate attention. The voltmeter is a good indicator for determining energized power; if voltage shows on the meter, the power supply is energized.

The gun leads are connected to the wire drive feed roll assembly. The Trigger is connected into a four-prong receptacle. This receptacle is low voltage, but avoid touching prongs.

3.3.3 HEAD TIP/AIR NOZZLE ALIGNMENT



Head Contact tip and air nozzle alignment are critical for proper operation. Refer to Section 6.2 – 6.3 to show proper alignment and arrangement for angle and fan spray heads.

IMPORTANT The contact tips must not touch each other or the center air nozzle.

3.3.4 SERVICE AIR

Clean dry air is used as the atomizing gas and coolant for gun leads. 65 cfm of air volume must be available; a 1/2" IPS minimum supply line at 120 PSI maximum should be used to supply this air volume. Optimum regulated air pressure for general purpose spraying should be 95 PSI. Lower air pressures can be used to obtain special high profile rough coatings, i.e., non-skid applications. Equipment comes equipped with 1/2" IPS line connection. Air supply lines shall be connected with industrial approved connectors. When using quick disconnect fittings and flexible hoses, safety pins and safety lanyards shall be used.

4 CONTROLS - START UP PROCEDURES:

Use these settings to initially start spraying then adjust to the desired voltage and amperage. See Section 8.2 for more information.



- A. **POWER SUPPLY:** The power supply must be set for remote operations and for gas metal arc welding, usually with all optional setting in the off position, i.e. pulsars, etc. The power supply voltage (for CV) or power (for CC) is controlled at the feeder.
- B. **SETTINGS ON FEEDER:** Voltage or power dial (left dial when looking at machine) set on 8, feed motor speed control (right dial) set on 4.
- C. **AIR SUPPLY:** 90 psi min., 65 CFM min.

Full control of all functions can be provided at the wire feeder. One multi-conductor lead provides the inter-connection from the power supply to the control box and from the control box to the feeder.

4.1 VOLTAGE

Voltage is controllable at the wire feeder. Voltage is an indicator of arc gap; the higher the voltage, the larger the distance between the two wires in the arc.

4.2 AMPERAGE

An amp meter is provided at the feeder for operator convenience. The amperage is controlled through the wire feed speed control, which is located on the wire feed unit.

4.3 WIRE INCH

An inching switch allows running the wire feed motor, feeding wire through the liner to the head without energizing air or the power supply.

4.4 FUSING

The wire feed system is dual-fused. An external fuse or breaker in the power supply protects the total system; while internal fuses that are located on the motor controller add additional protection to the controller.

4.5 HANDLE & TRIGGER ASSEMBLY

The Trigger is located on the Handle Assembly. This switch energizes the power supply contactor, turns on atomization air, and starts wire feed.



IMPORTANT The power leads must be connected to the wire feeder to start wire feed when using the Trigger. The inch switch will feed wire without the power lead connection.

4.6 AIR SWEEP/INCH*

The air sweep is for cleaning dust from the surface prior to arc spraying. The air is turned on with the trigger switch located on the spray head. When partially depressing the trigger switch the air will turn on, holding that position, the air will spray without feeding wire. The spray operation begins when the trigger switch is further depressed.

* Capabilities to inch the wire feed is provided at the feeder. The inch mode feeds wire with all other functions inactive.

4.7 WIRE RUNBACK

The wire runback feature creates a gap at the wire's end to aid arc starting. When the spraying is stopped, the wires are retracted on the end of the stopping sequence. A potentiometer (adjustment) located on the Control Box determines the amount of runback. Turning the potentiometer clockwise increases the amount of runback time. The runback time should be adjusted to create a 1/8" to 1/4" (3.2-6.4 mm) gap. Because of bends in combination leads caused by different job conditions, the amount of runback can vary with the increase in resistance in the liners. If the wires fail to gap, quickly actuating the trigger (on and off) will recycle the runback timer and provide the gap necessary for arc starting.

5 OPERATION (GENERAL)

5.1 POWER SUPPLY

Refer to the owner's manual for the welding power supply for operation and maintenance.

5.2 WIRE LOADING AND DRIVE ADJUSTMENT



IMPORTANT Lubrication, threading, and adjusting the feed roll pressures are important for smooth thermal spray operation. Proceed as follows:

1. With the front end leads removed from the feeder, hand feed the wire through the Wire Inlet Fairlead and push onto the feed rolls, assuring your fingers are free of the rolls, jog the wire through the rolls and out the front of the feeder. At this time, adjust the wire straightener roll so that the wire is somewhat straight as it comes from the feed rolls. The feed roll tensions are preset and should not need adjustment.
2. Round off the free end of the metalizing wire with a file prior to feeding into the liner. Sharp edges left on the wire will cut and damage liner.
3. Completely lubricate the inside of each liner prior to threading each spool of wire by disconnecting the leads from the wire feeder. Then spray a metalizing wire lubricant (WD-40) into the feeder end of the liner, using air to blow the lubricant through the liner. This lubricates the entire liner and clears excess lubricant. Lubricate each liner in this manner when loading additional spools of metalizing wire

6 PRINCIPLES OF OPERATION

With the system correctly connected and the power supply turned on, the operator turns on the main switch that energizes the wire feeder controls. The operator then loads the wire as explained in Section 5, adjusts the pressure regulator as specified in spray tables, sets the voltage and amperage potentiometers on approximate settings given in tables, and is ready to fire up.

Arc Control (Patented)

The arc voltage controls a sensor on the PC Board. The sensor operates from the power leads and if a voltage drop occurs, as happens when the wire shorts, the sensor slows or stops the wire from feeding. When the arc is reestablished wire feed is resumed at normal rate. This happens very fast and does not affect coating quality.

Low Energy High Deposition

The Thermion Precision Arc Model is capable of spraying 3/16" diameter aluminum, zinc, or zinc/aluminum wire. The amperage requirement for spraying this wire is 350-650 amps. At this energy level the spray rate can 63 lbs/hr for aluminum, 220 lbs/hr for zinc, and 150 lbs/hr for zinc/aluminum. Deposit efficiencies of more than 70% have been obtained with these materials. Also, the smoke generated can be considerably less than previously experienced using smaller diameter wire

SPRAY RATES

Wire Size	Material	AMPS	LBS/HR KGS/HR	Efficiency
1/8" (3.2mm)	Aluminum	200-450	28 lbs (13 kg)	62%
3/16" (4.8mm)	Aluminum	350-650	63 lbs (28.6 kg)	77%
1/8" (3.2mm)	85/15	200-450	75 lbs. (34 kg)	60%
3/16" (4.8mm)	85/15	350-650	150 lbs. (68 kg)	70%
1/8" (3.2mm)	Zinc	200-450	80 lbs. (36.4 kg)	58%
3/16" (4.8mm)	Zinc	350-650	220 lbs. (99.8 kg)	65%

6.1 OPERATING PARAMETERS

Operation:

Most materials will operate at a wide range of voltage and amperage settings, excessive amperage may burn out chemical elements critical for the device intended and provide poor deposit efficiency.

Wire Size:

The Precision Arc 5.0 can spray up to 3/16" diameter wire. 1/8" (3.2 mm) and 3/16" (4.8 mm) diameter aluminum and zinc are the optimum size for the Thermion equipment. 1/16" (1.6 mm) and 3/32" (2.4 mm) diameters are the most common used sizes of the hard wire types.

Voltage:

Voltage controls arc gap. Normal range for low melting, soft materials is between 24 and 32 volts. Normal range for higher temperature hard wires is 32 volts.

Amperage:

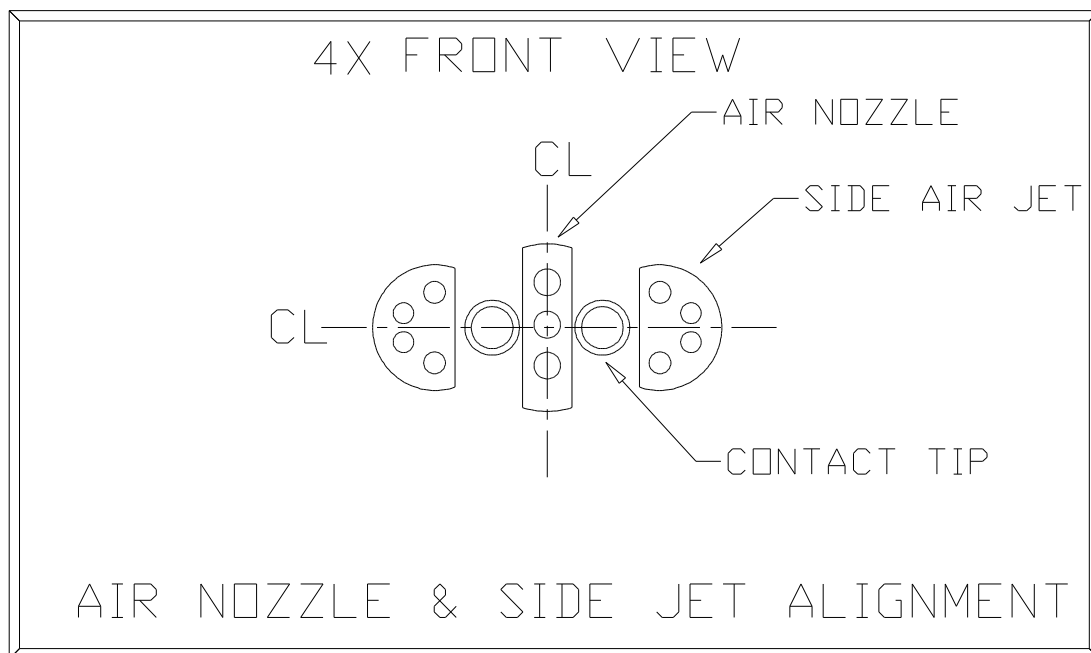
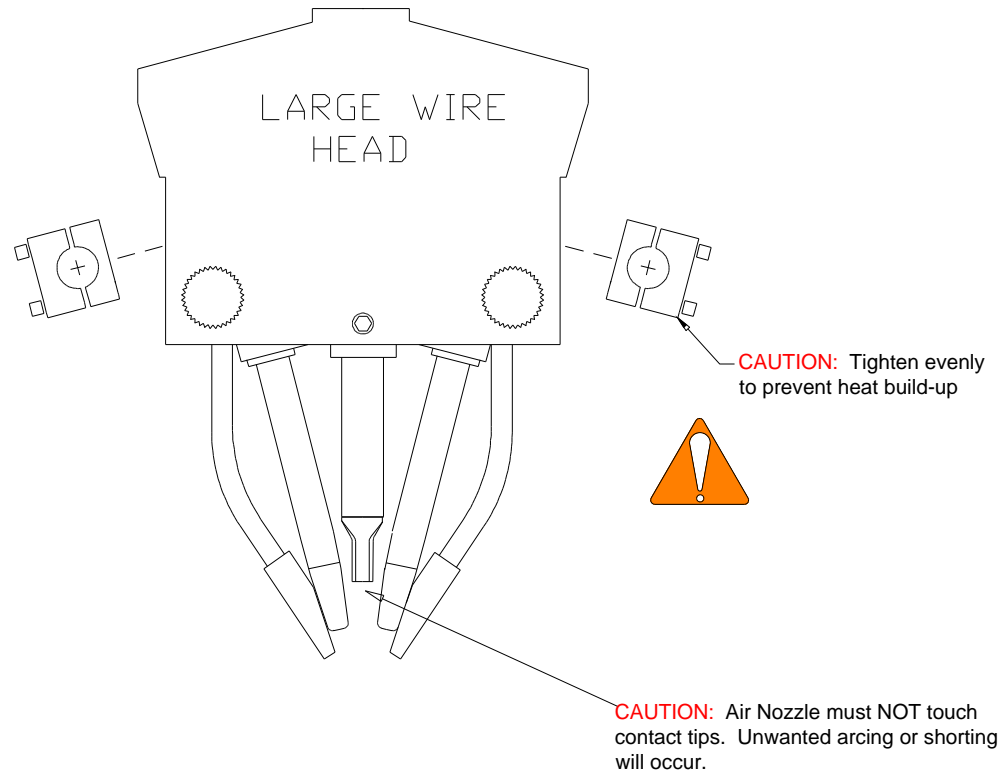
Amperage can be varied considerably for all materials. Non-alloyed materials, i.e. aluminum, zinc, tin, etc. can be operated without fear of de-alloying. However, this equipment runs 3/32" (2.4 mm) material best at 200-250 amps and 1/8" (3.2 mm) and 3/16" (4.8 mm) between 250 and 650 amps. Alloyed material of 1/16" (1.6 mm) and 3/32" (2.4 mm) size operates and maintains reasonable chemistry at 180-250 AMPS.

Adjusting Parameters:

Set the wire feeder volt meter on 80% & amp meter on 40%, start spraying at this setting and while machine is running, adjust amperage to desired setting, then lower voltage to minimum given in spray tables or until erratic arc is noticed. Then, raise voltage until arc smoothes out.

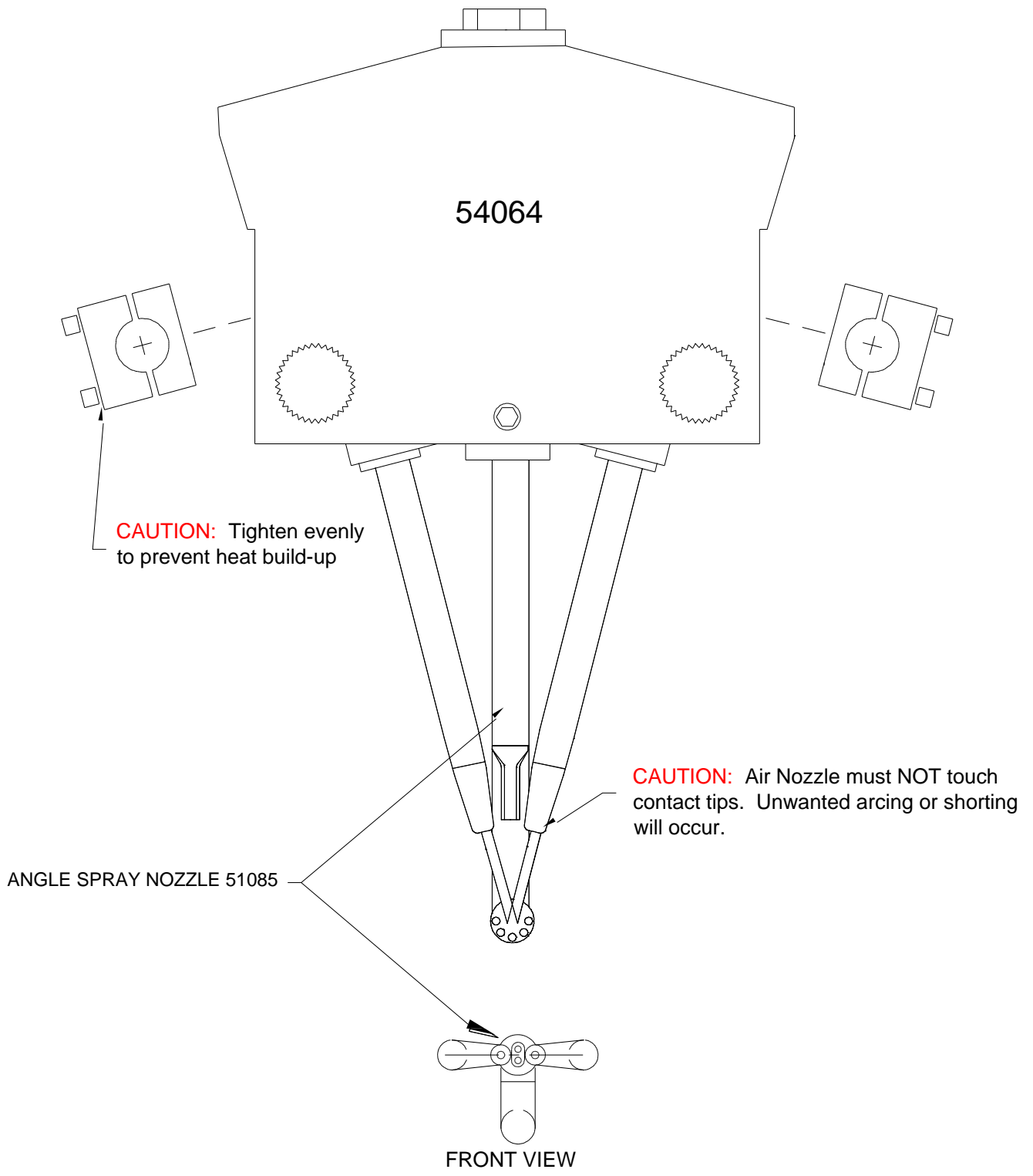
<u>Material</u>	<u>Size</u>	<u>Volts</u>	<u>Amps</u>	<u>Air Pressure</u>
Aluminum	3 mm - 4.8 mm (1/8" - 3/16")	32	350-650	90-110 PSI
Zinc	3 mm - 4.8 mm (1/8" - 3/16")	32	325-650	90-110 PSI
Zinc-Aluminum	3 mm - 4.8 mm (1/8" - 3/16")	32	300-650	90-110 PSI
Steels	1.6 mm - 2.4 mm (1/16" - 3/32")	32	200-250	90-110 PSI
Bronzes	1.6 mm - 2.4 mm (1/16" - 3/32")	32	200-250	90-110 PSI
400 Stainless	1.6 mm - 2.4 mm (1/16" - 3/32")	32	200-250	90-110 PSI
300 Stainless	1.6 mm - 2.4 mm (1/16" - 3/32")	32	200-250	90-110 PSI

6.2 AIR NOZZLE ALIGNMENT 3/16" (4.8 MM) WIRE HEAD

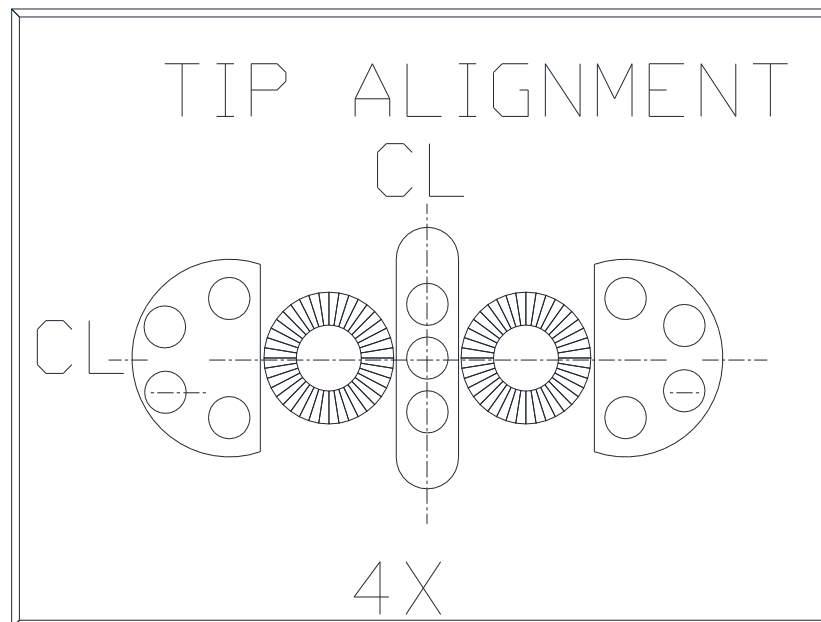
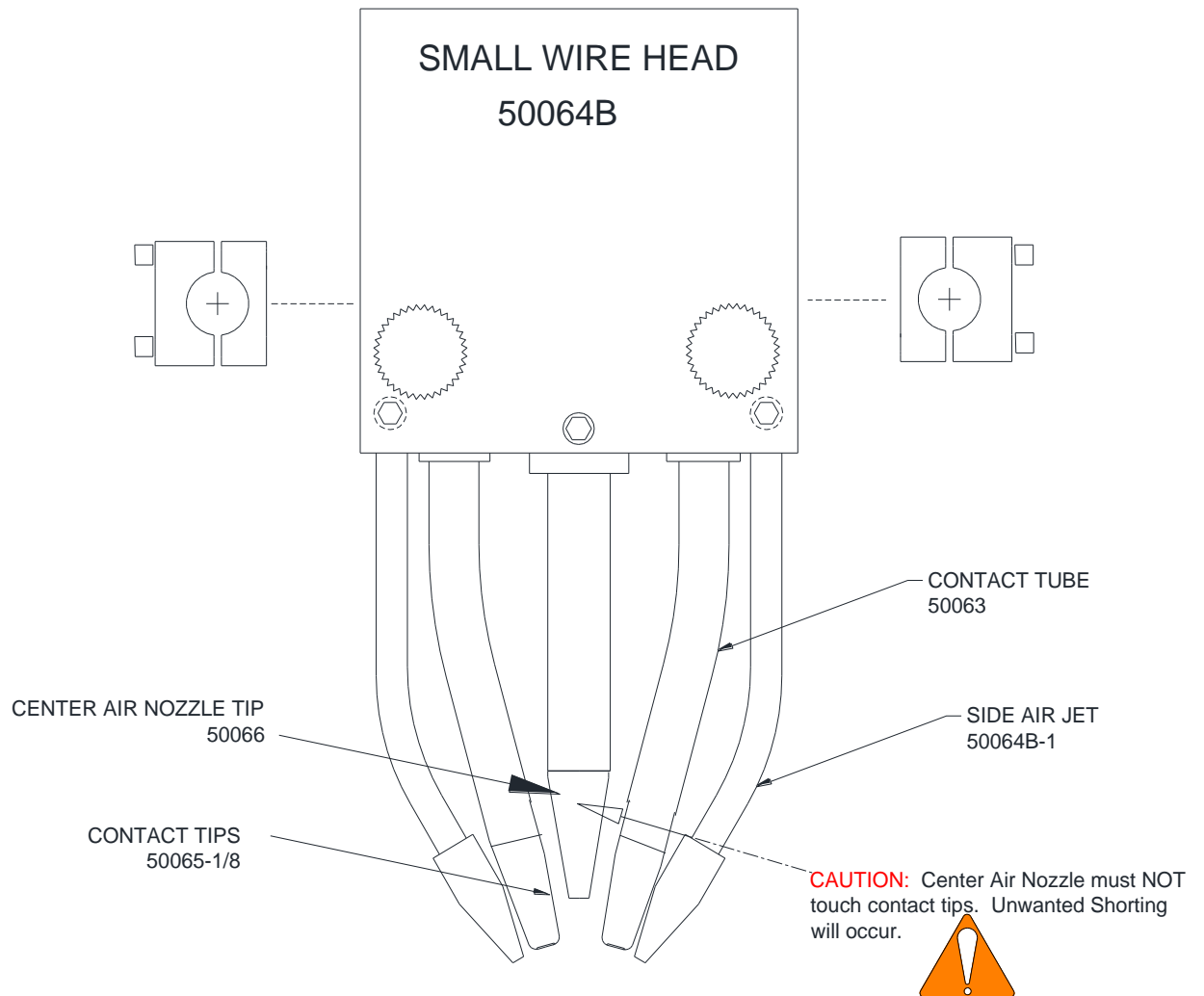


Align contact tips to maintain wires directly in center of air nozzle. Set contact tips prior to operation, perform spraying for a few minutes, then check wire position and realign if wire position has changed.

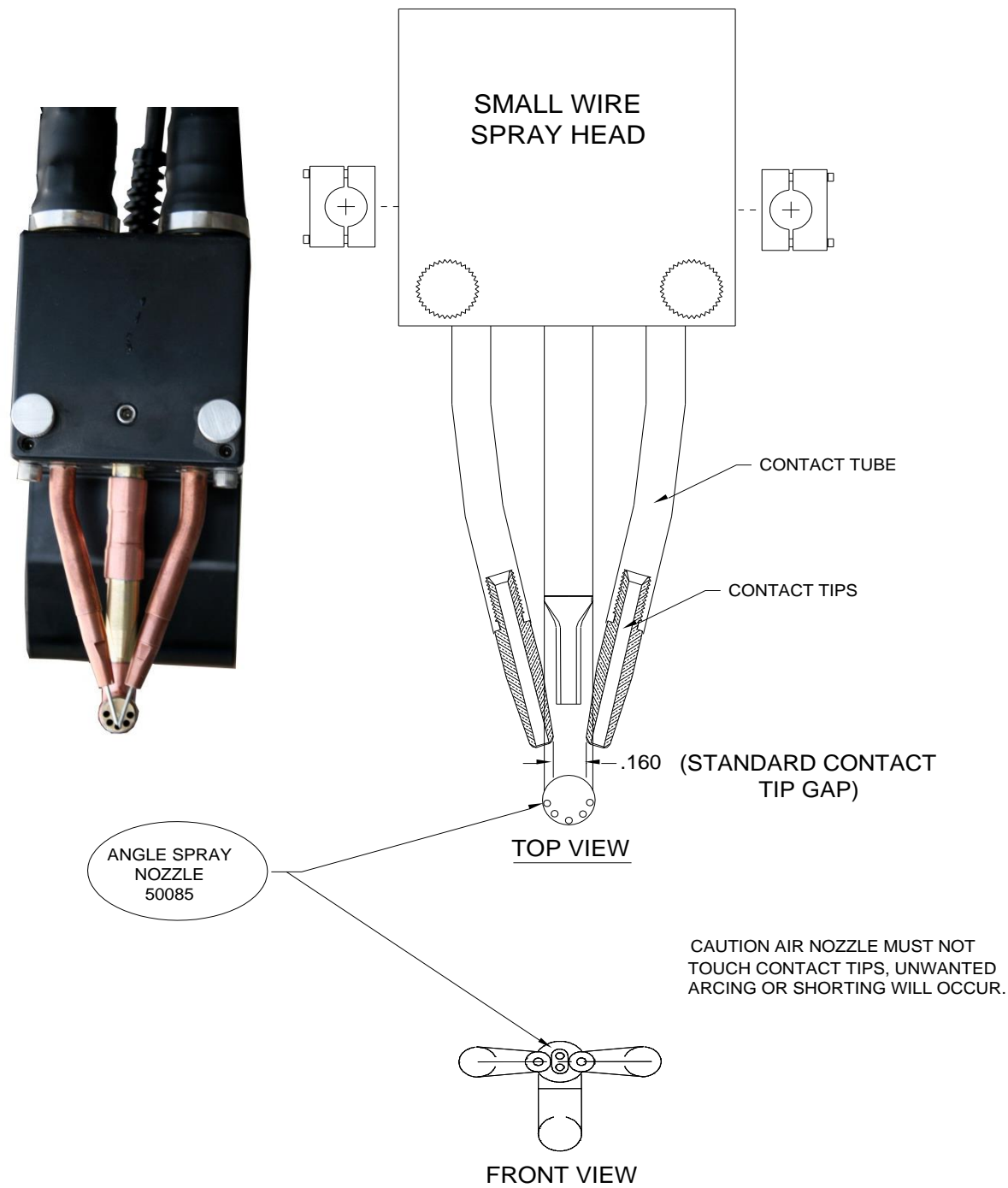
6.2.1 ANGLE SPRAY NOZZLE 3/16" (4.8 MM) WIRE HEAD



6.3 AIR NOZZLE ALIGNMENT $\leq 1/8"$ (3.2 mm) WIRE HEAD



6.3.1 ANGLE SPRAY NOZZLE $\leq 1/8"$ (3.2 mm) WIRE HEAD



ADJUST CONTACT TUBES TO ALLOW WIRE TO CONVERGE AS SHOWN IN THIS DRAWING. WHEN ADJUSTED CORRECTLY, THE ARC IS SMOOTH WITH A FINE, EVEN SPRAY

6.4 MAINTENANCE

6.4.1 SPRAY HEAD /PARTS MAINTENANCE:

1. **Spray Head:** The outer body of the spray head requires occasional cleaning to eliminate any possibility of metal dust that could cause arc shorting between the contact tubes. A small stiff brush or knife blade can be used to scrape off the accumulated metal dust, the head is made of a plastic material so do not scrape away head material. Daily cleaning is recommended, at this frequency all accumulated material can usually be wiped off with a rag, eliminating the possibility of head damage.
2. **Contact Tube / Tips:** During operations the wire will carry dust, dirt, lint, etc. into the liner system and it will accumulate behind the contact tip in the contact tube. This can cause enough friction to impair wire feed. Remove the contact tube from the head, then remove the tip from the contact tube. Clean the tip manually then use an air blow gun and clean the contact tube. In extremely dusty conditions this should be done once a day. These items are considered consumable parts and will require replacement due to wear.
3. **Air Nozzles:** The air nozzles do not normally require maintenance, except to keep alignment as shown in the prior sections of this manual. However, if the nozzles are aligned, and the spray is erratic or uneven, remove the air nozzles and with an air blow gun clean the holes by reverse blowing through the air jet holes. Visually inspect the nozzles for obstructions prior to reinstallation.

6.4.2 COMBINATION LEADS

Liners: The liners inside the combination leads are considered consumable parts and require periodic replacement due to wear or accumulation of dust or grit. The wear life can be extended by using methods to minimize the amount of dirt that gets into the system.

- ❖ Cover the wire during idle periods, especially if the equipment is going to be in the area during surface preparation.
- ❖ A wiper may be used on the wire prior to it going into the liners.
- ❖ Clean liners by spraying a solvent into the liner then blowing the material through the liner with a blow gun.

The liner replacement technique is important to insure that air flows correctly through the leads and into the spray head, refer to Section 7 for liner replacement technique.

O-Rings: The o-rings at each end of the leads should be inspected and replaced if damaged. If there is damage and part of the o-ring is missing, inspect the leads to ensure the missing piece is not causing blockage. Lubricate the o-rings and socket, with light grease, prior to insertion. The grease is necessary for a good air seal at both the feeder end and at the head.

6.4.3 FEEDER UNIT

The feeder unit, being low maintenance, mostly requires cleaning and periodic inspections. Keeping the feed rolls and gearing clean of dust and grit will extend life and provide better service. A daily cleaning with an air blow gun should be sufficient. During this cleaning, watch for any oil leaks from the motor. The motor will not require any oil fills unless it has leaked. Examine the feed gears to assure they align correctly and mesh over their full width. The feed gears roll on sealed bearings that are pre-lubricated and do not require maintenance.

6.4.4 CONTROL CABLES

The control cables require routine inspection for separation at the connectors and for cuts or breaks in the wire coverings. If any condition of abnormality is notice it must be remedied immediately.

CAUTION: when tightening cables, turn the connectors NOT the entire cable or the wires may disconnect and cause shorts.

6.5 MAINTENANCE SCHEDULE

6.5.1 CONSTANT OPERATIONAL CHECKS

1. AIR NOZZLES- At each shut down cycle examine air nozzles and remove any buildup.
2. AIR NOZZLE ADJUSTMENT- The side air jet nozzles may need adjustment periodically. Remove the nozzle from the head and place into a vise. By hand bend the nozzle tube to required fit. To get an even spray pattern the right and left tube should be close to the same fit. See Section 6.2 for alignment requirements.
CAUTION: do not bend the tube while it is in the head, the plastic head may break.
3. SPRAY TEXTURE- If the spray becomes course or rough, check contact tip and air nozzle alignment.
4. SPRAY PATTERN- If the spray pattern changes, check tip and air nozzle alignment.
5. ERRATIC WIRE FEED- Remove and clean contact tips and contact tubes. Lubricate liners from feeder to head. With the wire removed, spray WD-40 into liner at feeder end, then use an air hose to blow the lubricant through the liner to the head. Lubricate wire delivery tube from dispenser unit. Placing a wiper that can be soaked with lubricant at the dispenser will lubricate the wire and reduce friction in the delivery tube.
6. SHIELD- Clean shield as needed during operations. **CAUTION:** MAY BE HOT!
7. HEAD- Clean head as needed during operations. Metal dust can cause shorting between the contact tubes.



6.5.2 DAILY MAINTENANCE (8 HOURS)

1. SPRAY HEAD- Wipe off all dust particularly at the front between the contact tubes.
2. CONTACT TIPS- Remove and clean dust and lint from behind the tip, this can bind the wire and cause erratic feed.
3. CONTACT TUBES- When the tips are removed, inspect the internal bore and remove any debris.
4. LINERS- Lubricate with WD-40, or use a non-petroleum based material. Spray WD-40 into liners at feeder end, and then use an air hose to blow the lubricant through the liners.
5. FEED UNIT- Clean the inside of the wire feed unit. Blowing it down with air is usually all that is required. Wire brush & remove any embedded material.
6. FEED ROLL BEARINGS- Check each feed roll bearing (14 each) to make sure they roll free. Feed rolls with rough bearings may need replacement.

6.5.3 WEEKLY MAINTENANCE (40 HOURS)



CAUTION: Perform all electrical work with power secured.

1. CABLE CONNECTIONS- Check all electrical lead connections from power supply to wire feeder. The connections must fit firmly; a loose fit will cause the leads to heat up.
2. FEEDER CONNECTIONS- Check the fittings inside the feed unit, tighten all bolts that connect the current to the wire feed assembly.
3. POWER SUPPLY- Disconnect the power supply from the primary current. Remove the side covers then remove the dust from inside the machine with an air hose.

6.5.4 MONTHLY MAINTENANCE (160 HOURS)



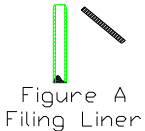
CAUTION: Perform all electrical work with power secured.

1. TIPS- Replace
2. CONTACT TUBE - Replace
3. LINERS- Replace
4. FEED ROLLS- Inspect the knurled surface for wear, replace if required
5. FEED ROLL BEARINGS- Inspect feed roll bearings; these bearings will eventually require replacement (usually more than 2000 hours of operation).
6. ELECTRICAL CONNECTIONS- Inspect power lead connections for oxidation, disconnect all fittings, sand clean with sandpaper or file, then re-connect or replace if necessary.

7 LINER REPLACEMENT

3/8" (9.5 mm) BLUE LINER FOR SPRAYING 1/8" (3.2 mm) WIRE 7/16" (11.1 mm) GREEN LINER FOR SPRAYING 3/16" (4.8 mm) WIRE

Refer to drawing in (SECTION 8.3) Disconnect leads (51062) liner assembly from wire feeder. Lay the liner assembly out flat and straight. Then remove liner nut (50109), insert (51019-1) and ferrule (51109-3), this will expose the liner and allow it to be removed by pulling the liner out of the liner assembly.



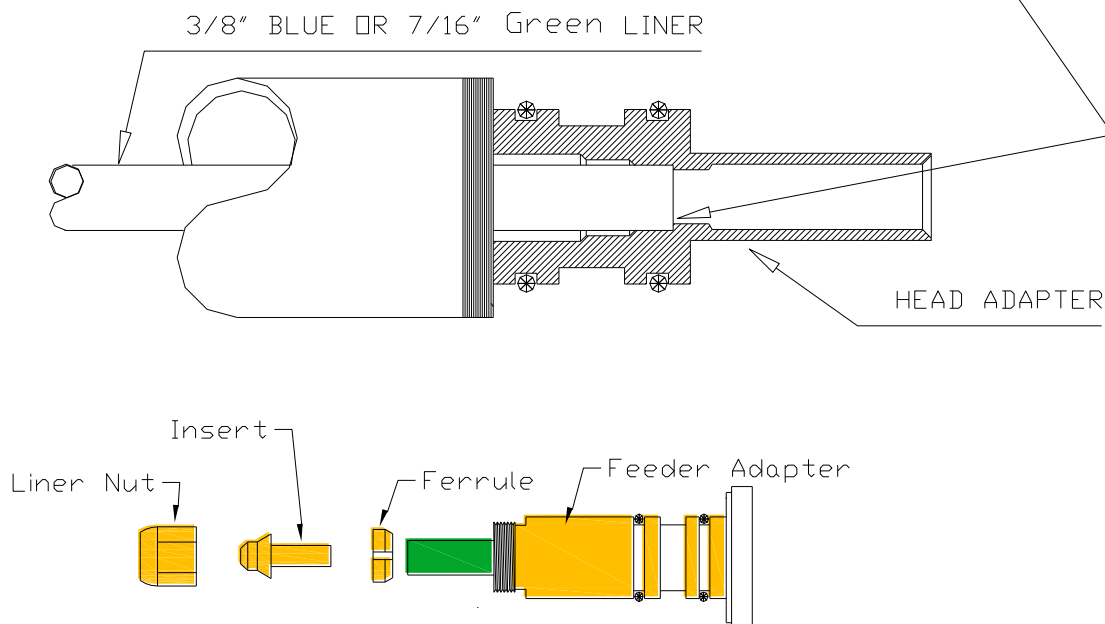
Replace the new liner by first rounding the edge of the tubing with a file, (figure A) then making sure the assembly is straight, push the liner through the assembly until it reaches the spray head adapter (51007). Verify the position by looking down the end of the spray head adapter - the liner should be visible about an inch and a quarter (32 mm) from the end.



IMPORTANT - The liner must be seated in this manner to allow smooth wire flow and an air seal.

Install ferrule and liner nut, then push liner into cable assembly, eliminating any slack, cut off liner about 1½" (37 mm) from end of feeder adapter fitting and replace liner insert and tighten the liner nut.

3/8" LINER (BLUE) AND 7/16" LINER (Green) MUST SEAT AT THIS POINT TO SEAL AIR AND PROVIDE SMOOTH WIRE FEED



7.1 INSTALLATION / REPLACEMENT SMALL WIRE LINERS

3/32" (2.4 mm) and Smaller Wire

A two-liner system (an outer and inner liner) is used when spraying the smaller wire diameters. The following instructions detail the liner change out process.

Refer to drawing in (SECTION 8.3.1)

Remove combination leads (50062-13 cable assembly) from wire feeder; Lay the cable assembly out flat and straight. Then remove liner nut (50109), insert (50018-A) and ferrule (51109-2), this will expose the existing liner to allow it to be removed by pulling the liner out of the cable assembly.

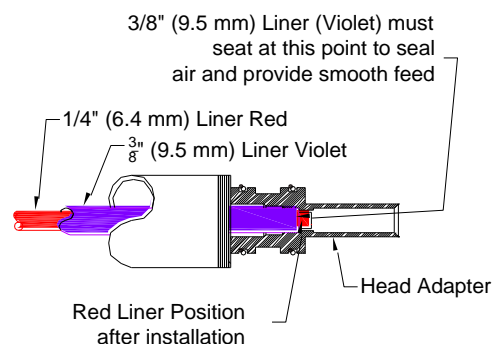
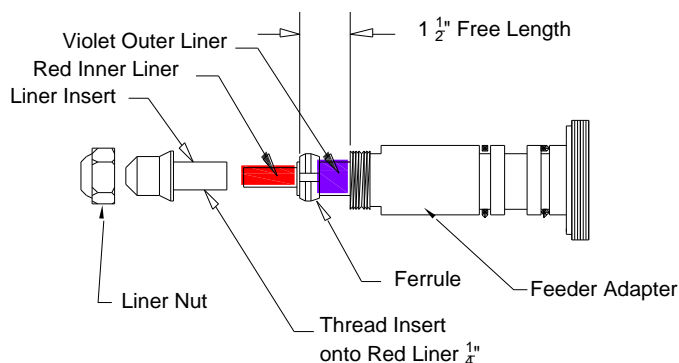
Replace/install the outer liner (**violet**) by first rounding the outer edge of the tubing with a file, (See Figure A) this will allow the liner to slide freely through the leads, then making sure the assembly is straight, push the liner through the assembly until it reaches and seats into the spray head adapter (51007). Replace ferrule and liner nut, then push liner into cable assembly, eliminating any slack, cut off liner about 1½" (37 mm) from end of feeder adapter fitting and replace liner insert and tighten the liner nut. Verify the position by looking down the end of the spray head adapter - the liner should be visible about an inch and a quarter (32 mm) from the end.

Figure A
Filing Liner



IMPORTANT - The liner must be seated in the spray head adapter (as shown below) to allow smooth wire flow and to obtain the required **air seal**.

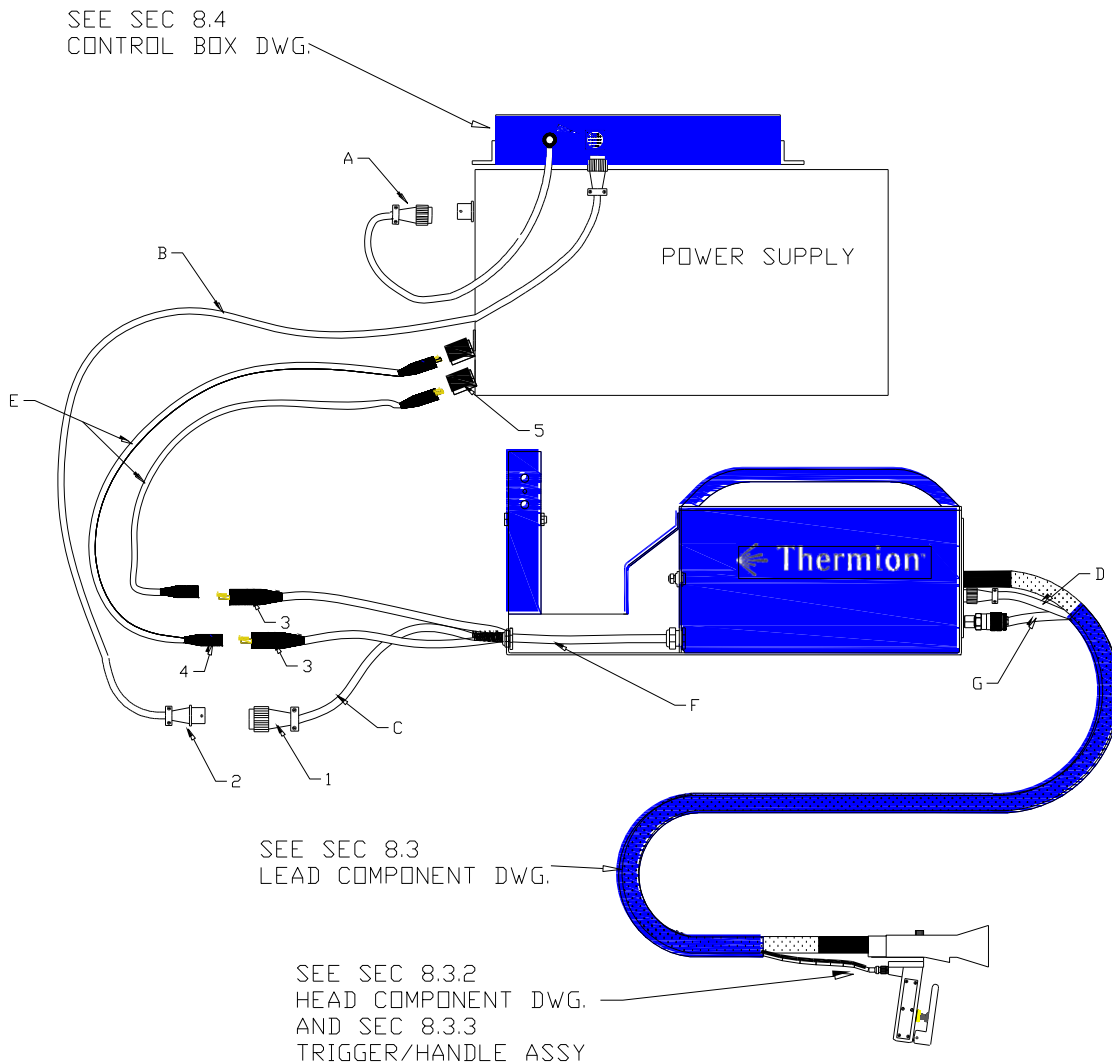
After the outer liner has been installed into both leads, place the head onto the leads. Now install the inner (red) liner by first, rounding the outer edge of the tubing with a file. Then push the red liner into the outer liner until it butts against the contact tube, mark the red liner where it is even with the purple liner, then pull it back and cut it off about 3/8" (9.5 mm) shorter than the mark. Now place the ferrule onto the purple hose, install the liner insert by threading onto the red hose, it should thread about ¼" (6.4 mm), now install all head parts and complete the head assembly.



8. COMPONENTS SECTION

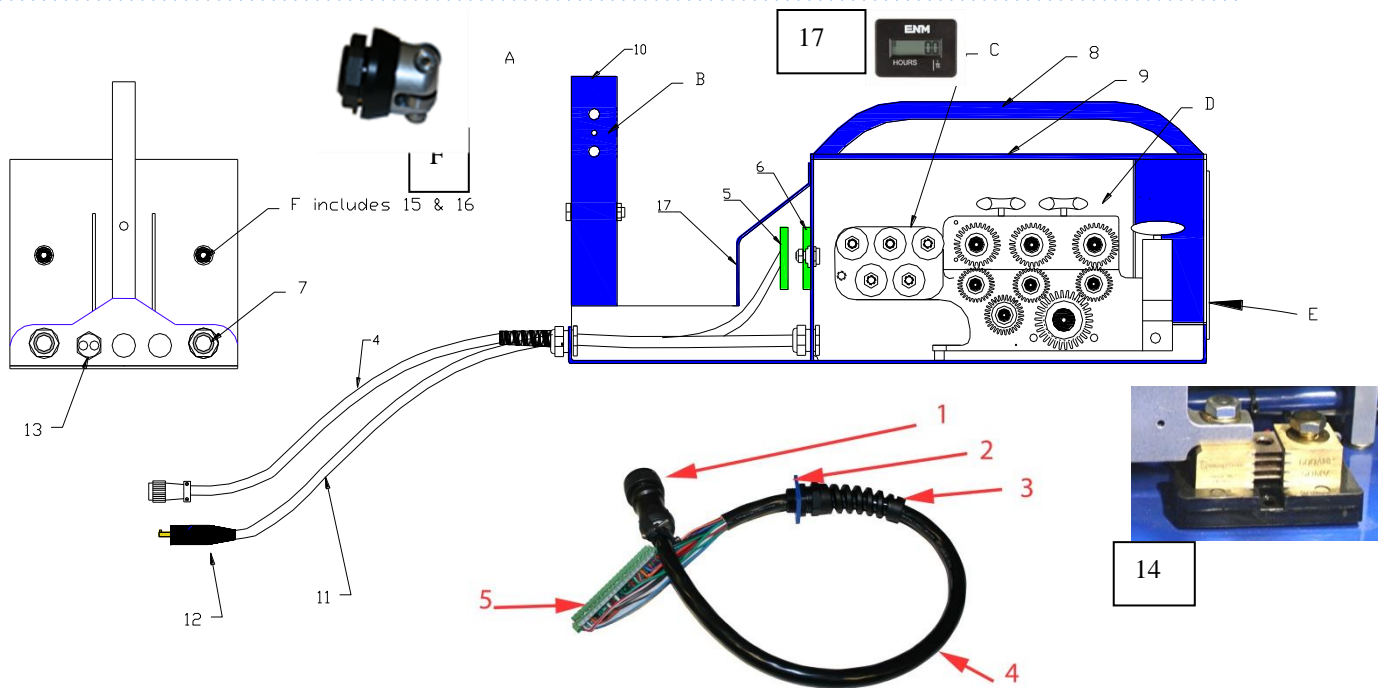
- 8.1 CABLE COMPONENTS
- 8.2 FEEDER COMPONENTS
 - 8.2.1 FEEDER/AIR COMPONENTS
 - 8.2.2 METER PANEL COMPONENTS
 - 8.2.3 WIRE DRIVE COMPONENTS
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 - 8.2.4.1 WITHOUT WIRE STRAIGHTENER ASSEMBLY
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 - 8.2.7 INDUSTRIAL CART ASSEMBLY
- 8.3 FRONT END ASSEMBLY
 - 8.3.1 COMBINATION LEAD COMPONENTS 3/16" (4.8 MM)
 - 8.3.1.1 COMBINATION LEAD COMPONENTS 1/8" (3.2 MM) WIRE
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 - 8.3.2 SPRAY HEAD COMPONENTS 3/16" (4.8 MM) WIRE
 - 8.3.2.1 ANGLE SPRAY HEAD COMPONENTS 3/16" (4.8 MM) WIRE
 - 8.3.2.2 JET FORCE NOZZLE & HEAD ASSEMBLY
 - 8.3.2.3 SPRAY HEAD COMPONENTS $\leq 1/8"$ (3.2 MM) WIRE
 - 8.3.2.4 ANGLE SPRAY HEAD COMPONENTS $\leq 1/8"$ (3.2 MM) WIRE
 - 8.3.3 HANDLE AND TRIGGER ASSEMBLY
- 8.4 CONTROL BOX
 - 8.4.1 SYSTEM WIRING
 - 8.4.2 PRECISION WIRE DISPENSER
- 8.5 GENERAL TROUBLESHOOTING

8.1 CABLE COMPONENTS



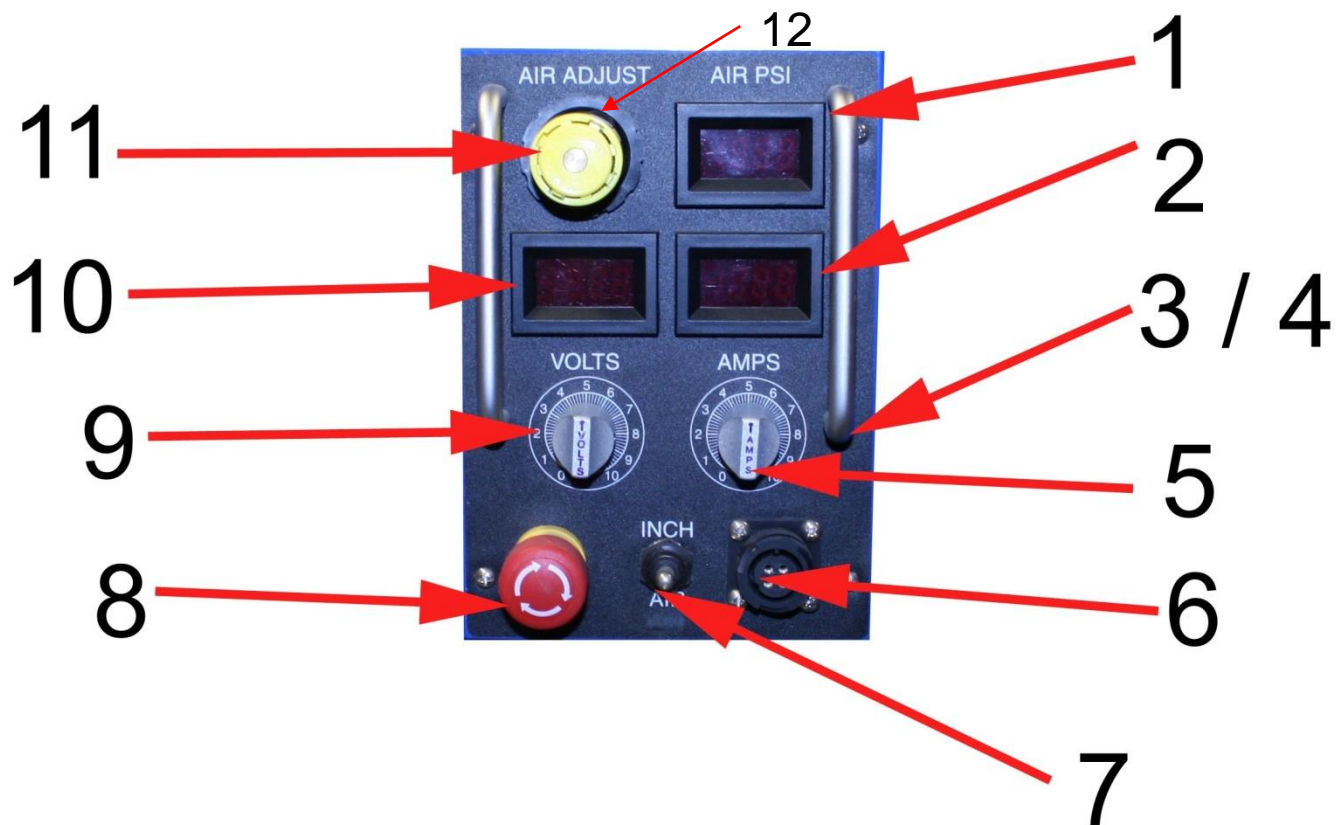
A	50058-M	POWER SUPPLY CORD (MILLER)
	50058-L	POWER SUPPLY CORD (LINCOLN)
B	51060-50	CONTROL CABLE STRETCH-OUT ASSEMBLY (INCLUDES 51057 AND 51059)
1	51057	CONNECTOR: 19 PIN MALE CONTROL CABLE
2	51059	19 PIN FEMALE CONNECTOR
C	58060-03	CABLE: FEEDER CONTROL PA 5
D	54012-23A Assy	CABLE: TRIGGER CORD 20' ASSEMBLY
E	54004-50	POWER CABLE ASSEMBLY: 50'
3	54004-1	CONNECTOR: MALE DINSE 4/0 POWER
4	54004-2	CONNECTOR: FEMALE DINSE 4/0 POWER
F	54004-3	POWER ASSEMBLY CABLE -3'
5	54004-4	FEMALE DINSE TO 1/2" LUG 45° TO WELDER
G	54064-21 Assembly	21' CENTER AIR HOSE ASSEMBLY
opt	AD-14M/L-Spade	MILLER CONTROL BOX TO LINCOLN WELDER

8.2 FEEDER COMPONENTS



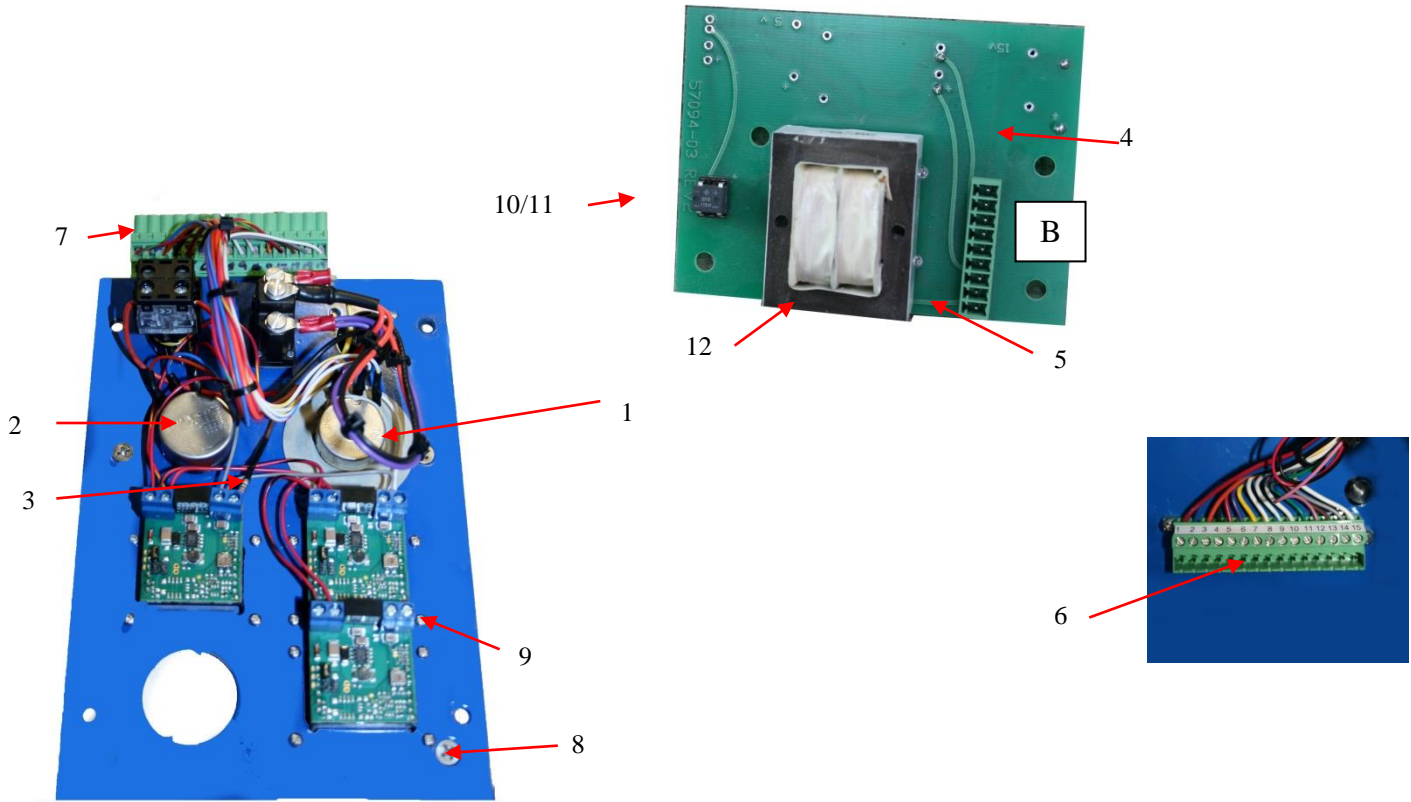
A	58036 ASSEMBLY	FEEDER ASSEMBLY
B	SEE SEC 8.2.6	SPINDLE ASSY
C	SEE SEC 8.2.4	STRAIGHTENER ASSY
D	SEE SEC 8.2.3	WIRE DRIVE ASSY
E	SEE SEC 8.2.1	METER PANEL ASSY
F	57956-3/16 ASSY	WIRE INLET FAIRLEAD ASSEMBLY W/BEARINGS
OR	51045-2	FRAME: BULKHEAD, WIRE INLET CORD GRIP
	51078-1	CABINET WIRE INLET GUIDE
1	51057	CONNECTR:19 PIN MALE (CONTROL CABLE)
2	58036-03	CONTROL CABLE BLANK
3	51045-3	CABLE: CORD GRIP 3/4" FLEX
4	58060-03	CABLE: FEEDER CONTROL PA 5
5	51117-A	CONTROL CABLE CONNECTOR CABLE SIDE
6	51116-A	CONTROL CABLE CONNECTOR FRAME SIDE
7	AA045-4	CABLE: CORD GRIP 1" DOME (WELD CABLE)
8	57036	FRAME: CABINET
9	57036-18	DOOR LATCH AND STRIKE
10	57036-01	FRAME: SPINDLE ARM PLUG
11	54004-3	POWER ASSEMBLY CABLE
	54004-39	POWER ASSEMBLY CABLE SHUNT SIDE
12	54004-1	WELDING CABLE CONNECTOR MALE
13	7807K44	AIR LINE CLAMP
14	57110	SHUNT
	92941A624	HHCS: 3/8"-16 x 1" BRASS
15	51045-2	BULKHEAD WIRE INLET CORD GRIP NUT
16	57956-1	WIRE INLET FAIRLEAD GRIP
17	51112-B	FRAME: HOUR METER, DIGITAL

8.2.1 METER PANEL COMPONENTS



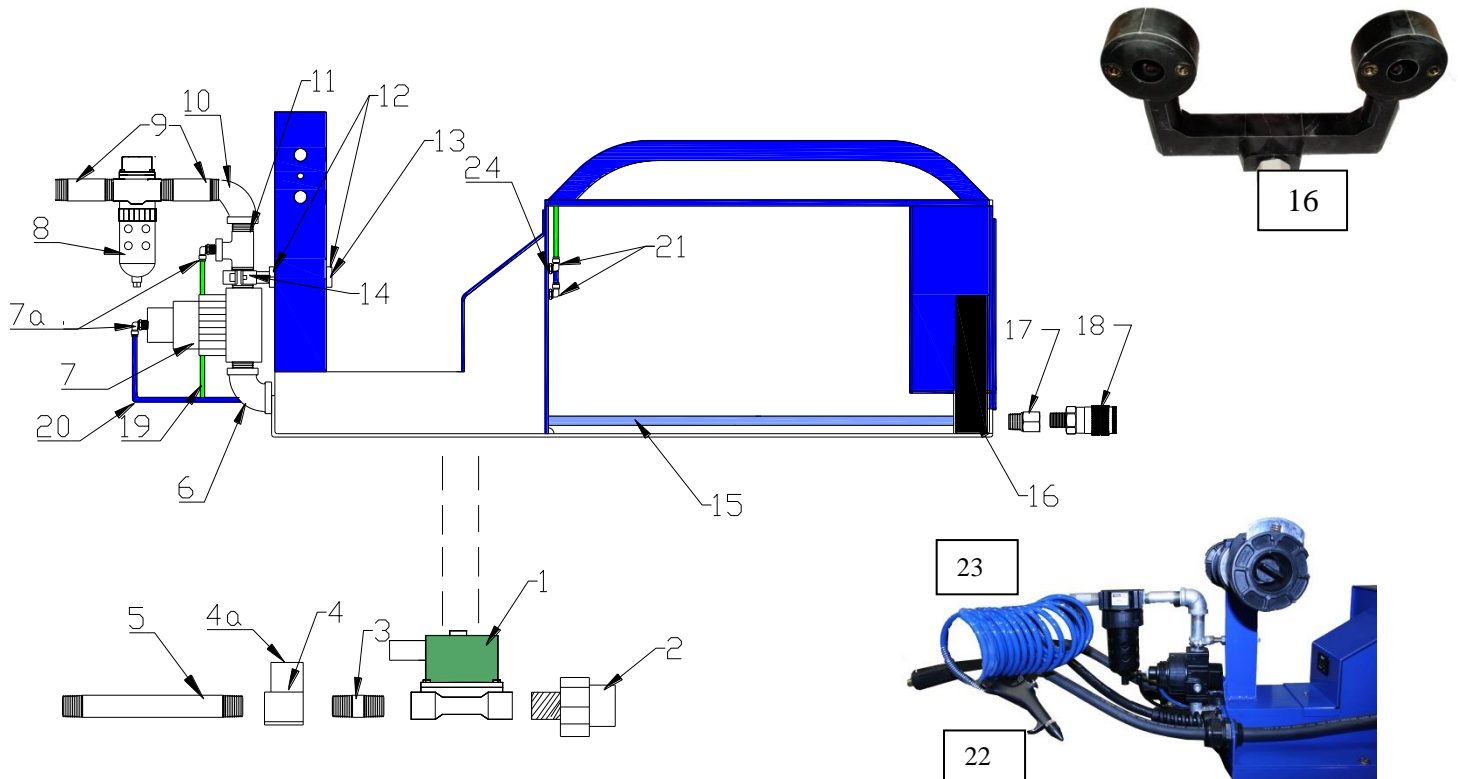
A	58094 ASSY	METER PANEL ASSEMBLY
1	57094-01-M	AIR REGULATOR METER
2	57094-01-M	METER PANEL: DIGITAL AMP METER
3	54094-2	METER HANDLES
4	54094-3	HANDLE STAND OFF
5	57022-A*	AMP KNOB
NS	3126A75*	SET SCREW FOR KNOBS
NS	57022-1*	DIAL KNOB NUT
6	54028	TRIGGER CORD SOCKET
7	50026	INCH/AIR SWITCH
8	54094-1 ASSEMBLY	METER PANEL: EMERGENCY SWITCH OFF ASSEMBLY
9	57022-V*	VOLT KNOB
10	57094-01-M V	METER PANEL: DIGITAL VOLT METER
11	56318	AIR REGULATOR PILOT
12	56318-1	MOUNTING NUT FOR PILOT
	58036-PC10B	METER PANEL BLANK

8.2.1.1 METER PANEL COMPONENTS BACK SIDE



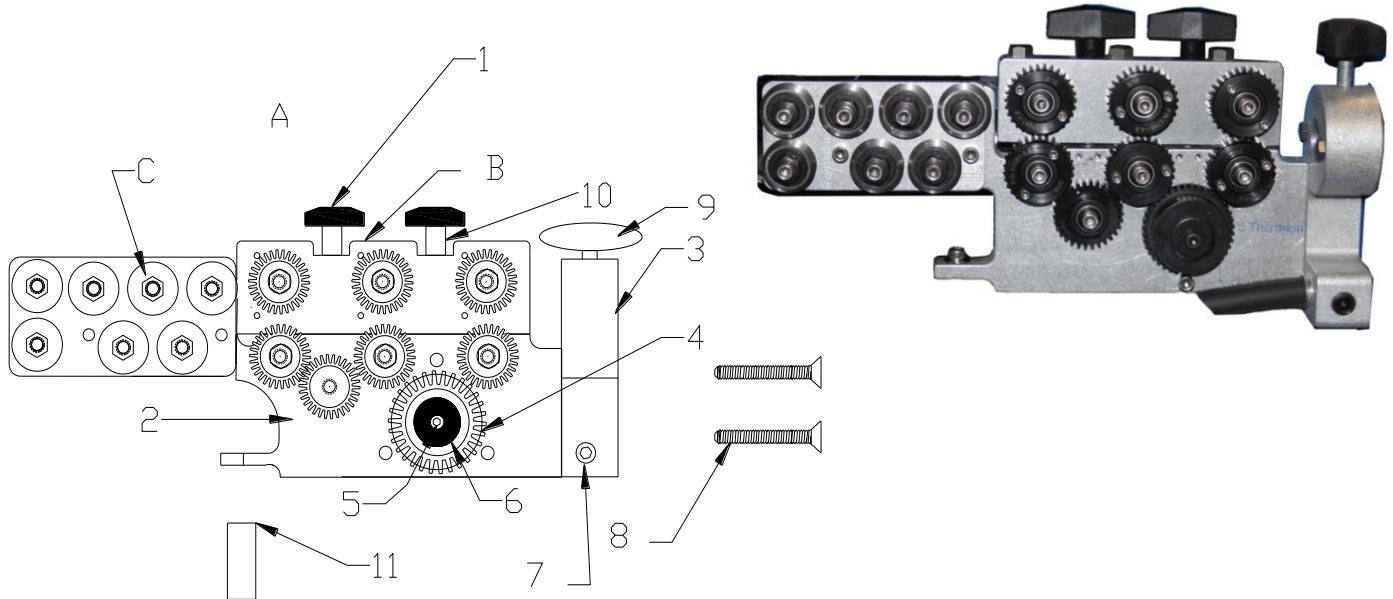
A	58094 ASSY	METER PANEL ASSEMBLY
B	57094-03A	PC BOARD ASSM, 15VDC POWER SUPPLY
1	50022	METER PANEL: SPEED CONTROL POT
2	50025	METER PANEL: VOLTAGE POT, 1K
3	57094-01-M V1	DIGITAL VOLT METER DIODE
4	57094-03	BLANK METER PCB
5	57094-04	DIGITAL METER PC BOARD PLUG 9 PIN
NS	57094-05	RATE METER POWER SUPPLY
NS	57094-05-5	DC-DC POWER SUPPLY
NS	57094-04-1	PCB PIN STRIP
6	51116	METER PANEL CONNECTOR, FEEDER SIDE
7	51117	METER PANEL CONNECTOR, METER PANEL SIDE
8	91771A198	SCREW: FHP 8-32X7/8" SS PA METER PANEL HANDLE MOUNTING SCREW
9	91772A078	PA DIGITAL METER COVER MOUNTING SCREW
10	50051	PCB BRIDGE RECTIFIER
11	50051-1	PCB BRIDGE RECTIFIER SOCKET
12	50052	PCB TRANSFORMER
NS	58033-1	METER PANEL AIR LINE INLET (GREEN)
NS	58033-2	METER PANEL: AIR LINE OUTLET (BLUE)
NS	5779K151	AIR: 5.0 FITTING SWIVEL 90 1/8"
NS	5779K109	AIR: PILOT REGULATOR 1/4" TUBE TO 1/4" NPT STRAIGHT
NS	5779K108	ADAPTER FOR 1/4" TUBE OD X 1/8" NPT MALE PIPE

8.2.3 FEEDER/AIR COMPONENTS



PART #	DESCRIPTION	12	91841A035	NUT: 3/8-16 MACHINE (SS)
1	AIR VALVE	13	95412A640	STUD: 3/8"-16 X 4" SS
2	ACETYL FITTING	14	54036-12	PIPE HANGER
3	1/2 IPS 2" NIPPLE	15	AA033-1	AIR LINE 16 1/4
4	TRANSDUCER ADAPTER	16	57036-10	AIR COLLAR ASSEMBLY
4a	BRASS PLUG	17	54036-2	JET QUICK CONNECT FITTING
5	1/2 IPS 5 1/2" LONG PIPE	18	54036-4	AIR COLLAR EXTENSION
6	1/2 ELBOW	NS	58094-12	TRANSDUCER
7	MAIN REGULATOR	19	58033-1	AIR LINE GREEN INLET
7a	SWIVEL 90 ELBOW FOR 1/4" TUBE OD X 1/4" NPT MALE	20	58033-2	AIR LINE BLUE OUTLET
8	AIR FILTER	21	5779K635	AIR: 90 DEG NYLON FEMALE
9	1/2 IPS 3" LONG PIPE	22	54307	AIR BLOW DOWN GUN
10	1/2 ELBOW	23	54307-1	AIR HOSE FOR INDUSTRIAL CART 12' COIL AIR (BLUE)
11	1/2 X 1/4 X 1/2 PIPE SIZE, INLINE REDUCING TEE	24	93960A180	1/2" CHROME WASHER

8.2.3 WIRE DRIVE COMPONENTS

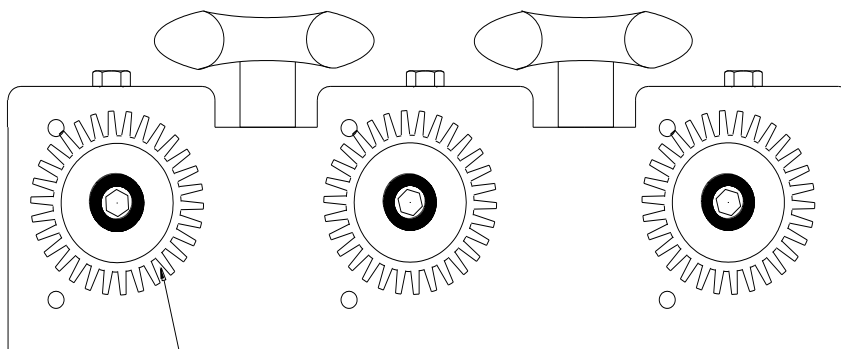
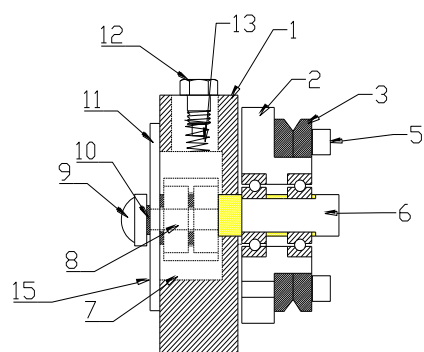
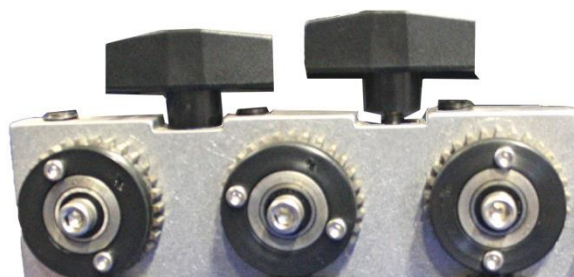
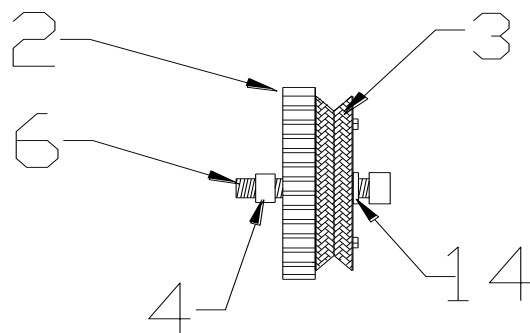


A	57900-6 ASSY	6 FEEDROLL WIRE DRIVE ASSEMBLY
	57900-6 ASSY RT	6 FEEDROLL WIRE DRIVE ASSEMBLY RIGHT
B	SEE SEC 8.2.3.1	UPPER DRIVE ASSEMBLY
C	SEE SEC 8.2.4	STRAIGHTENER ASSEMBLY
D	57913-20 ASSY	1.6 CENTER GUIDE ASSEMBLY
	57913-21 ASSY	2.3 CENTER GUIDE ASSEMBLY
1	57206	TOP PLATE CLAMP
2	57901-6	MAIN PLATE
3	57912	LEAD ADAPTER PLATE
4	57910	INSULATED GEAR
5	92196A539	INSULATED GEAR SCREW ¼-20 x 5/8"
6	92140A112	INSULATED GEAR WASHER
7	92765A650	SET SCREW: ½ -20 x 1" LEAD ADAPTER PLATE
8	92210A548	HEX FLAT HEAD CAP SCREW: ¼ -20 x 1 ¾
9	57207	LEAD CLAMP
10	57206-01	TOP PLATE CLAMP STUD ¼ -20 x 3
11	57901-6-1	WIRE DRIVE MAIN PLATE SIX ROLL SUPPORT
NS	57909-03	LOWER GEAR SPACER
NS	92196A544	LOWER GEAR SCREW SCREW: SHCS 1/4-20 x1 1/4"(ss)
NS	AA9515	FEED ROLLER PARTING SPRING

D



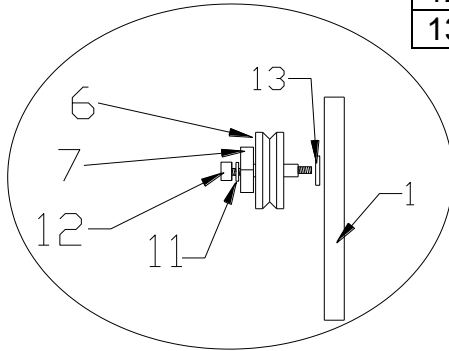
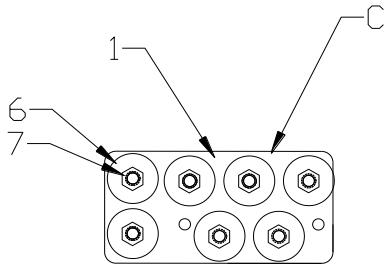
8.2.3.1 WIRE DRIVE UPPER PLATE ASSY



Front Gear uses smooth Feed Roll

B	57902-6	UPPER PLATE ASSEMBLY-FEED ROLLS SOLD SEPARATELY
1	57902-01-6	UPPER PLATE
2	57909	FEED GEAR ASSEMBLY
3	57081-4.8	FEED ROLLS 3/16"
3	57081-4.8S	FEED ROLLS 3/16" SMOOTH
3	57081-3.2	FEED ROLLS 1/8"
3	57081-3.2S	FEED ROLLS 1/8" SMOOTH
3	57081-2.3	FEED ROLLS 3/32"
3	57081-2.3S	FEED ROLLS 3/32" SMOOTH
3	57081-1.6	FEED ROLLS 1/16"
4	57909-03	SPACER
5	92196A149	FEED ROLL SCREW 6-32 X 9/16"
6	92196A544	TOP GEAR MOUNT SCREW: SHCS 1/4-20 X1 1/4"(SS)
7	57903-01	PIVOT
8	57903-05	PIVOT STUD
9	91855A311	PIVOT ACORN NUT
10	57903-03	PIVOT BEARING SPACER
11	57902-02-6	COVER PLATE
12	57904-B	SPRING SCREW
13	57902-07	PIVOT SPRING
14	94773A770	WIRE DRIVE FEED SCREW SPACER .256 ID .375 OD .060THICK
15	91099A252	SCREW: FHP 8-32X1/4 (18-8 SS) TOP PLATE, BACK COVER

8.2.4 WIRE STRAIGHTENER



C	57913A7-SET	1/8-3/16 STRAIGHTENER
	57913A7-R	RIGHT SIDE STRAIGHTENER
	57913A7-L	LEFT SIDE STRAIGHTENER
1	57913A7-3.16	1/8-3/16 STRAIGHTENER PLATE
6	54202	V-GROOVE ROLLER
7	54203-C	CAM ADJUST BUSHING
11	94773A770	SCREW SPACER
12	92196A542	V-ROLLER SCREW ¼ -20 x 1"
13	54202-S	V-ROLLER SPACER

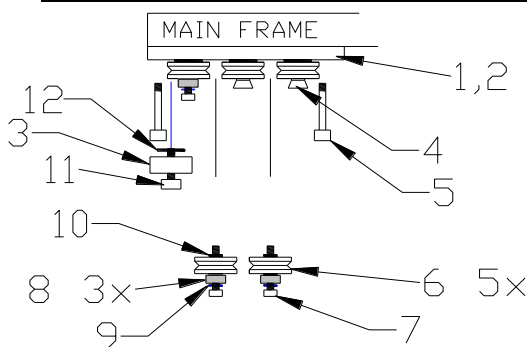
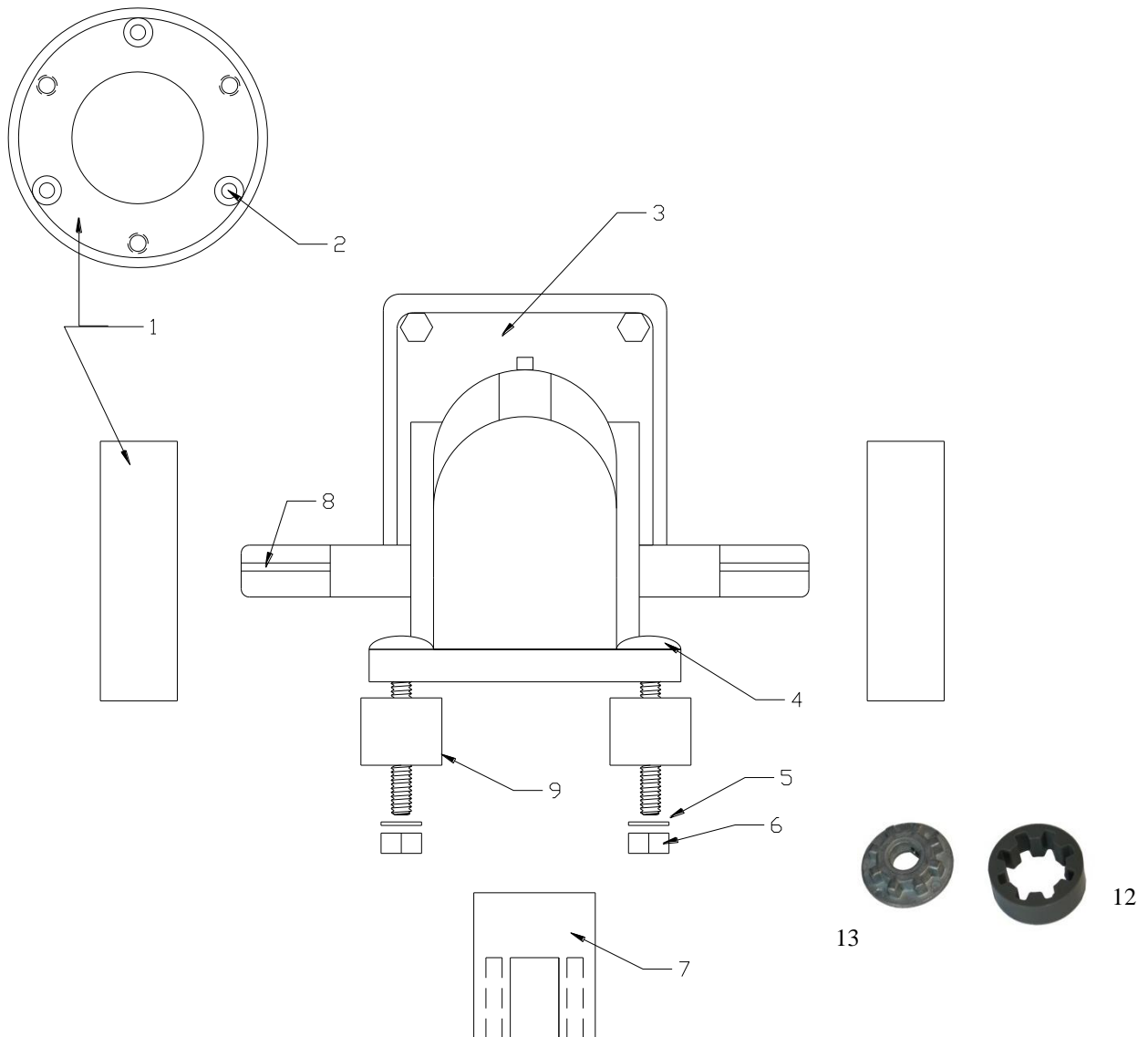


Photo shows 3/32
(1/16 has 3 cam bushings)



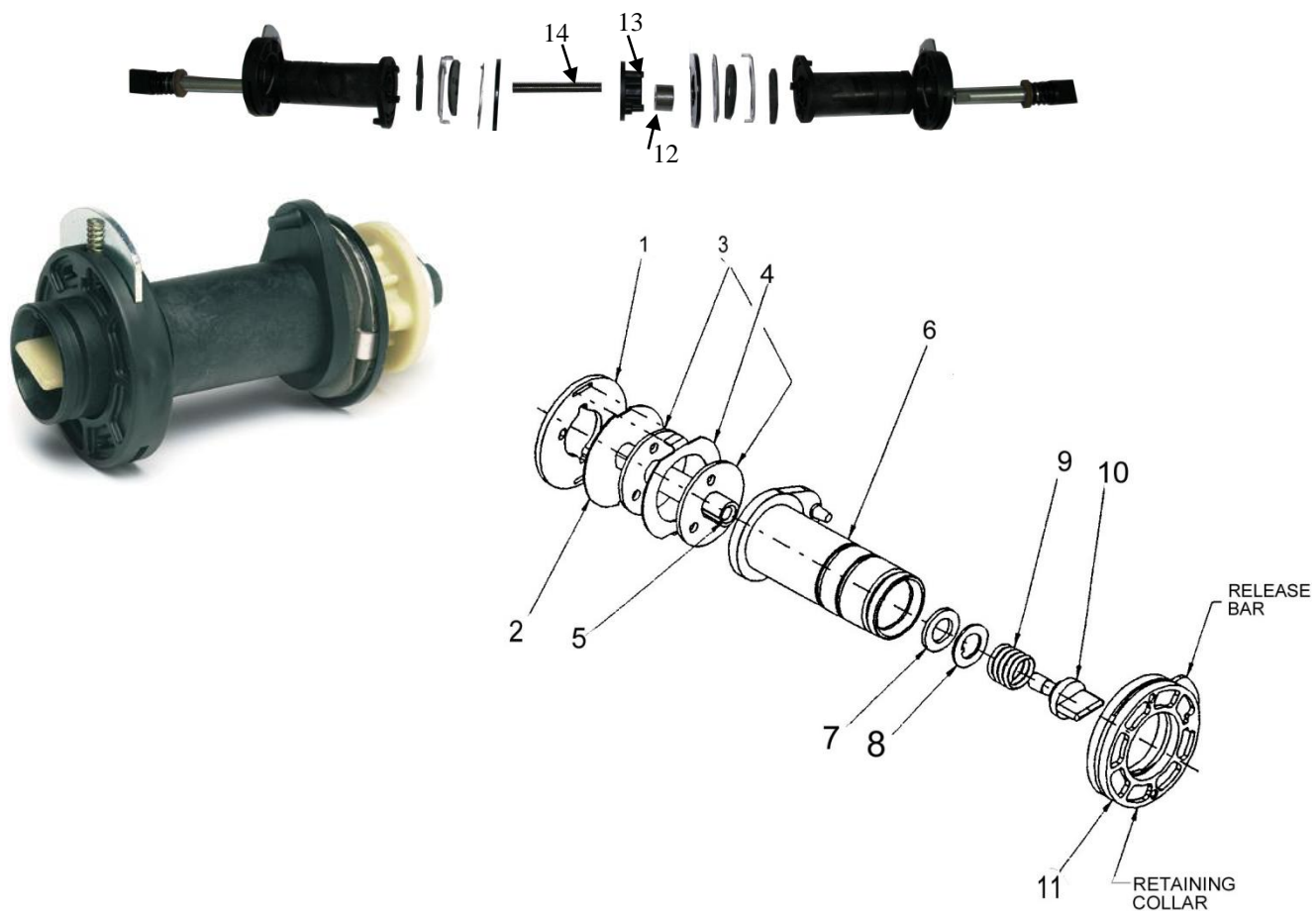
C	57913A-1/16 Set	1/16" WIRE STRAIGHTENER ASSEMBLY (BOTH SIDES)
	57913A-3/32 Set	3/32" WIRE STRAIGHTENER ASSEMBLY (BOTH SIDES)
1	57913A-01L	1/16" WIRE STRAIGHTENER BACK PLATE, AVD DRIVE, LEFT SIDE
	57913A-01R	1/16" WIRE STRAIGHTENER BACK PLATE, AVD DRIVE, RIGHT SIDE
2	57913A-02L	3/32" WIRE STRAIGHTENER BACK PLATE, AVD DRIVE, LEFT SIDE
	57913A-02R	3/32" WIRE STRAIGHTENER BACK PLATE, AVD DRIVE, RIGHT SIDE
3	57913A-11	STRAIGHTENER, FLAT GUIDE BEARING
4	57913A-04	TOP BEARING MT SCREW 8-32 x 5/8" FLAT SOCKET CAP SCREW
5	91251A540	ASSEMBLY MOUNT SCREW (SHCS ¼-20 x ¾")
6	57202	V-GROOVE ROLLERS
7	57913-07	STRAIGHTENER BX1: BEARING CAM BOLT, 6-32 x 3/4"
8	57203	V ROLLER CAM
9	57913-06	OUTER V ROLLER SPACER
10	57913-05	INNER V ROLLER SPACER#10 WASHER x .354 x .030"

8.2.5 MOTOR COMPONENTS



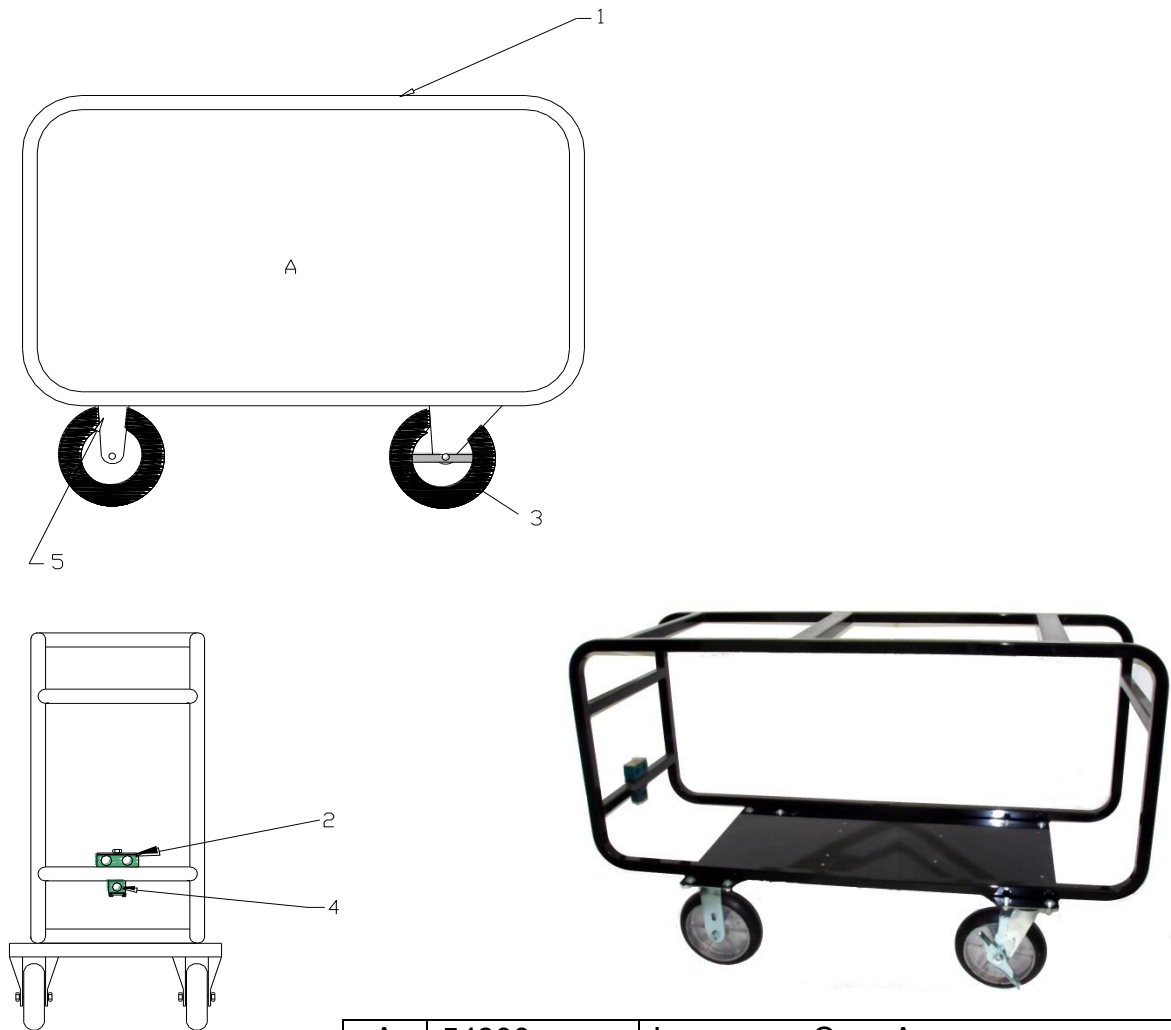
1	57901	MOTOR ADAPTOR .935 THICK
2	90316A247	SCREW: 10-24 X 1" FOR MOUNTING DRIVE ADAPTER
3	58035 ASSEMBLY	MOTOR
4	92356A591	MOTOR MOUNT BOLTS 5/16 X 2" CARRIAGE
5	98029A030	MOTOR MOUNT 5/16 WASHER
6	91845A030	MOTOR MOUNT 5/16-18 NUT
7	AA035-2	MOTOR MOUNT
8	54035-KEY	3/16 KEY
9	58034	MOTOR MOUNT .970" X 1" DIA
12	54035-1	COUPLING SLEEVE (PLASTIC)
13	54035-2	COUPLING (METAL)

8.2.6 WIRE SPINDLE ASSEMBLY



A	AA038	WIRE SPINDLE ASSEMBLY
1	S24622	ADAPTER PLATE
2	S23972	BRAKE PLATE
3	S17435-4	FRICTION WASHER
4	S23968	BRAKE PLATE LOCK
5	AA038-01	SPINDLE SHAFT
6	L10560	SPINDLE
7	S17435-3	FRICTION WASHER (CORK)
8	T12965-2	KEYED WASHER
9	T11862-14	COMPRESSION SPRING
10	T14813-B	THUMB SCREW
11	S23811	RETAINING COLLAR ASSEMBLY
12	S10918-42	BUSHING
13	AA038-02	SPINDLE SPACER
14	91565A728	SPINDLE JOINING STUD 1/2-13x4"
NS	T9967-10	ROLL PIN

8.2.7 INDUSTRIAL CART ASSEMBLY



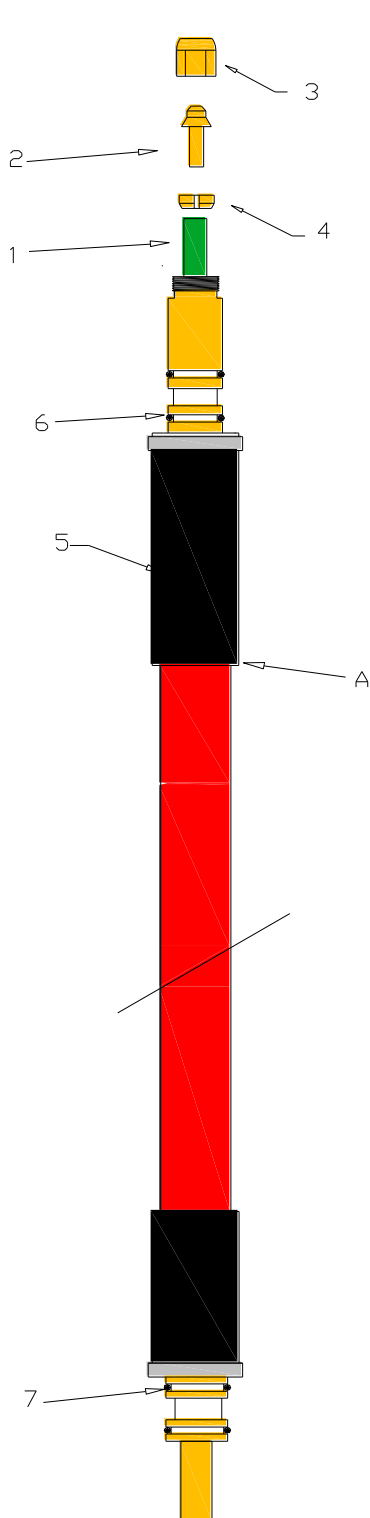
A	54300	INDUSTRIAL CART ASSEMBLY
1	54301	CART: FRAME
2	54305	CART: DUAL WELDING LEAD CLAMP
3	54303	CART: CASTER SWIVEL, FRONT
4	54306	CART: SINGLE WELDING LEAD CLAMP
5	54304	CART: CASTER RIGID, REAR
NS	54308	CART: INDUSTRIAL COVER (OPTIONAL)
NS	91845A030	INDUSTRIAL CART CASTER MOUNTING 5/16-18 NUT
NS	92240A583	INDUSTRIAL CART CASTER MOUNTING 5/16-18 x 1" BOLT
NS	93852A103	WASHER: 5/16" MS 813 CART CASTER MOUNTING
NS	9489T118	INDUSTRIAL CART CABLE HANGER SCREW: EYEBOLT 1/4-20 x 1.5"

8.3 FRONT END ASSEMBLY



A	54000-1-20	3/16 FRONT END ASSEMBLY 20'
	54000-1-18	3/16 FRONT END ASSEMBLY 18'
	54116-1/8	1/8 FRONT END ASSEMBLY
	50116-1/16	1/16 FRONT END ASSEMBLY
	54000-3.2	1/8 FRONT END ASSEMBLY 15'
1	See Sec 8.3.1	COMBINATION LEAD COMPONENTS
2	See Sec 8.3.2	HEAD ASSEMBLY
3	See Sec 8.3.3	TRIGGER ASSEMBLY
4	54064-1 Assembly	AIR HOSE ASSEMBLY
	54064-19 Assy	AIR HOSE ASSEMBLY 19'
5	51117-15	COMB LEAD: PROTECTIVE SLEEVE

8.3.1 LEAD COMPONENTS 3/16" (4.8 mm) WIRE



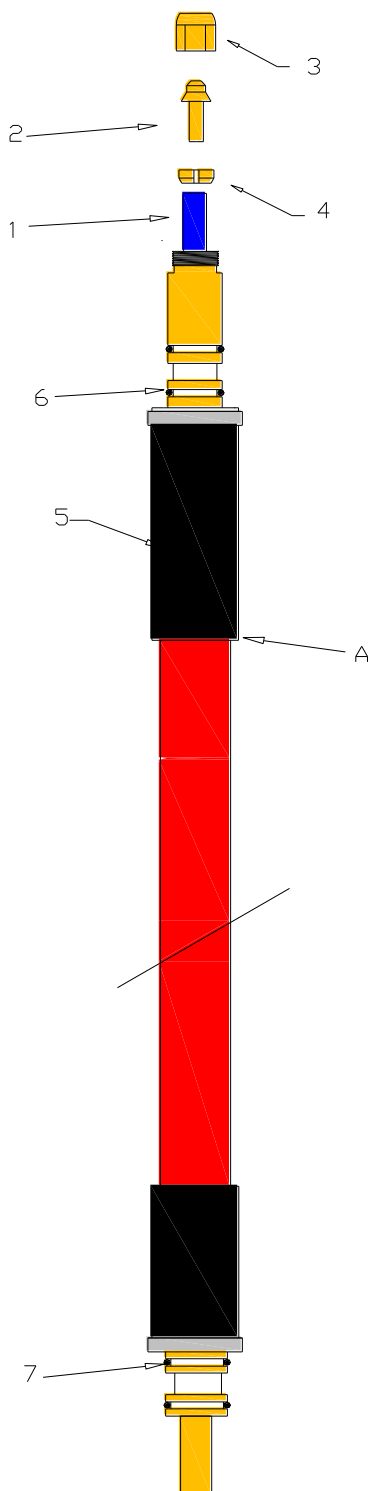
A	51062-20L1	COMBINATION LEAD: 20', w/GREEN LINER
	51062-18L2	COMBINATION LEAD: 18', w/GREEN LINER
1	51077-21	LINER, GREEN (21')
	51077-19	LINER, GREEN (19')
2	51109-1	LINER INSERT-3/16"
3	50109	LINER NUT
4	51109-3	FERRULE, 3/16" LINER
5	50062-3	COMB LEAD: SHRINK TUBE
6	51016	O-RING, HEAD ADAPTER
7	51014-1	O-RING, FEEDER ADAPTER

* Typically for spraying 1/8" solid and cored hard wires.

* Typically for spraying 3/16" soft wires, zinc, aluminum, 85/15



8.3.1.1 LEAD COMPONENTS (1/8" 3.2 MM) WIRE



A	50062-13L1	COMBINATION LEAD: 13', W/BUE LINER
	51062-15L1	COMBINATION LEAD: 15', W/BUE LINER
1	50078-14	LINER, BLUE (14')
	50078-16	LINER BLUE (16')
2	50109-1	LINER INSERT-1/8"
3	50109	LINER NUT
4	51109-2	FERRULE, 1/8" LINER
5	50062-3	COMB LEAD: SHRINK TUBE
6	51016	O-RING, HEAD ADAPTER
7	51014-1	O-RING, FEEDER ADAPTER

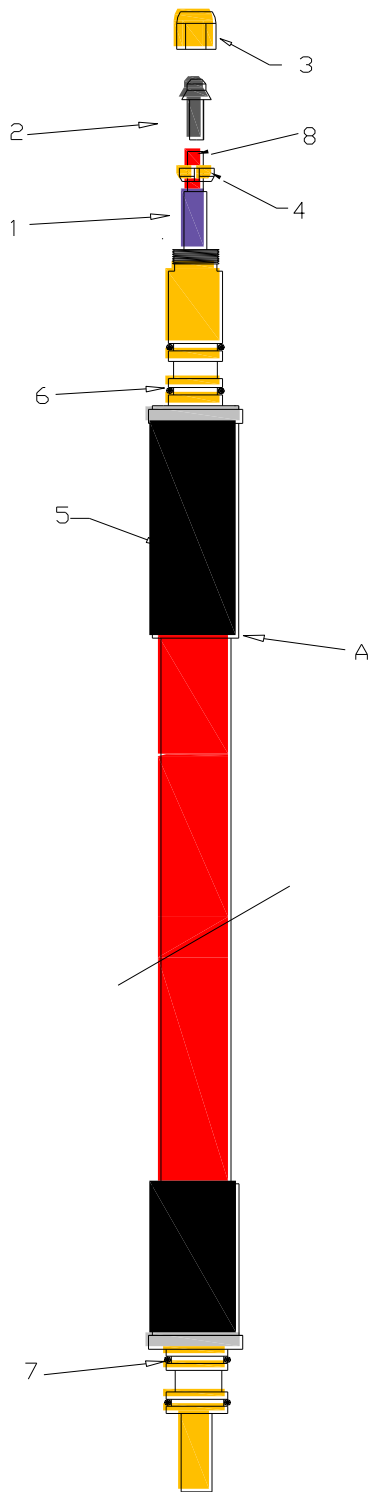
* Typically for spraying 3/32" solid and cored hard wires.

* Typically for spraying 1/8" soft wires, zinc, aluminum, 85/15



8.3.1.2 SMALL WIRE LEAD COMPONENTS

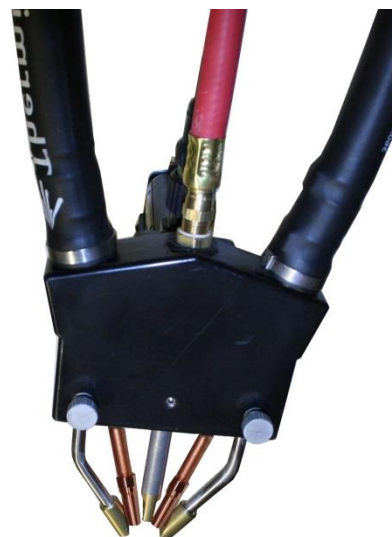
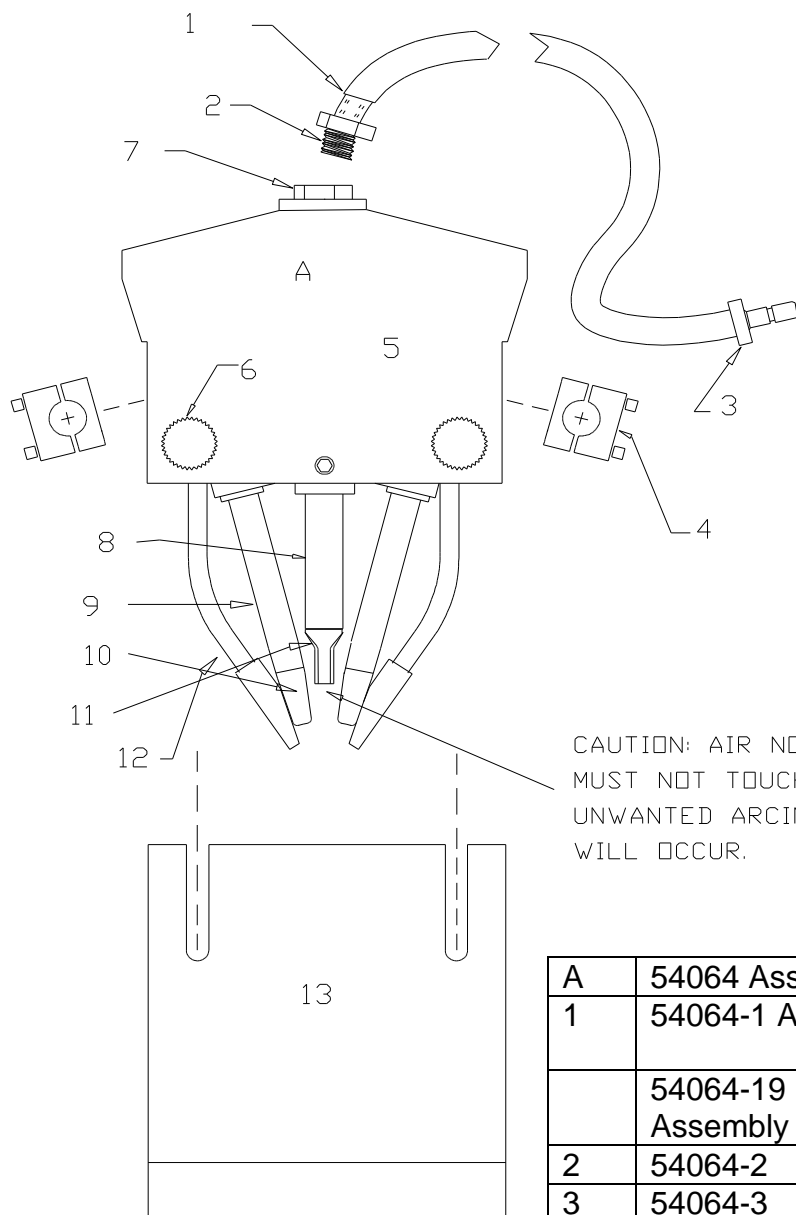
(3/32", 2.3 MM & SMALLER)



	PART #	DESCRIPTION
A	50062-13L2	COMBINATION LEAD: 13', w/DUAL LINER FOR USE WITH 3/32" & SMALLER WIRE
1	50018-14	LINER, VIOLET
2	50018-A	INSERT, 1/16
2	50018-B	INSERT, 3/32
3	50109	LINER NUT
4	51109-2	FERRULE, 1/8" LINER
6	51016	O-RING, HEAD ADAPTER
7	51014-1	O-RING, FEEDER ADAPTER
8	50019-14	LINER, RED



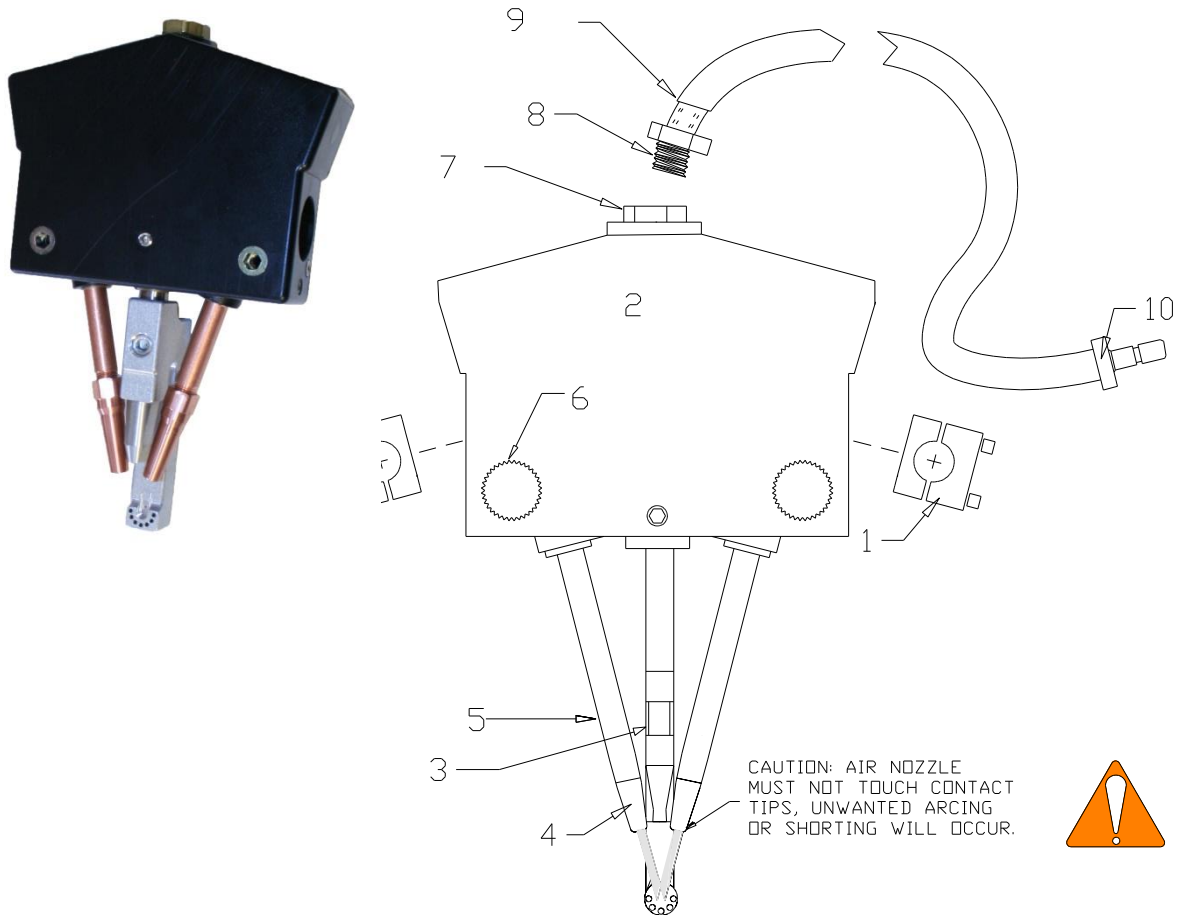
8.3.2 HEAD COMPONENTS 3/16" (4.8 MM) WIRE



CAUTION: AIR NOZZLE
MUST NOT TOUCH CONTACT TIPS,
UNWANTED ARCING OR SHORTING
WILL OCCUR.

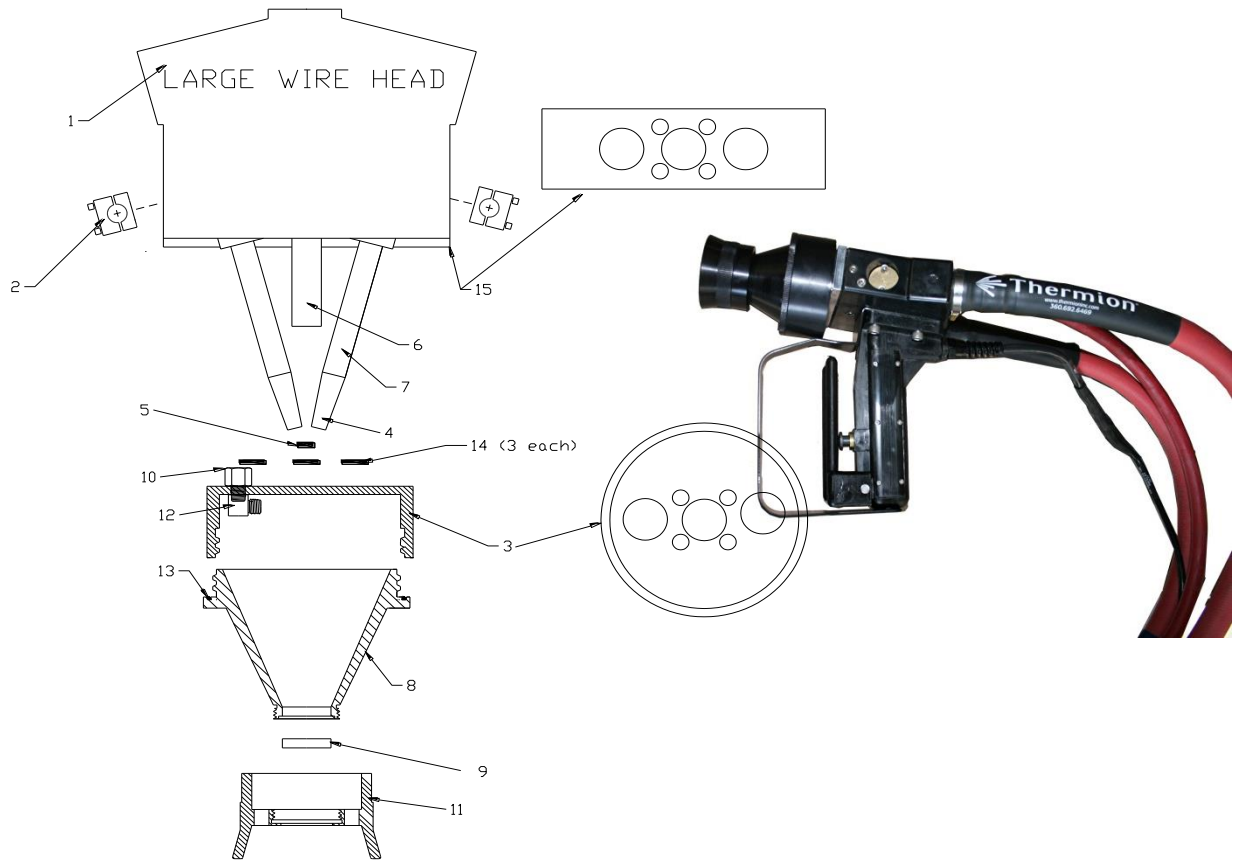
A	54064 Assy	HEAD ASSEMBLY
1	54064-1 Assembly	HEAD: CENTER AIR HOSE (PA) INCLUDES 54064-2 & 54064-3
	54064-19 Assembly	HEAD: CENTER AIR HOSE 19'
2	54064-2	COMB LEAD: HOSE TO HEAD NIPPLE
3	54064-3	COMB LEAD: HOSE TO QUICK DIS.
4	50005	HEAD: CONTACT TUBE CLAMP
5	54064	HEAD: PRECISION ARC
6	50080	HEAD: CLAMP, SHIELD
7	54064-5	HOSE TO HEAD ADAPTER
8	50066-1	HEAD: CENTER AIR NOZZLE, TUBE
9	51076 ET	HEAD: CONTACT TUBE - 3/16"
10	51065-3/16 IT	HEAD: TIP-3/16"
11	50066	HEAD: CENTER AIR NOZZLE, TIP
NS	50066-2	HEAD: CENTER AIR NOZZLE, O-RING
12	51064S-1	HEAD: .187 (4.8) SIDE AIR JET
13	51079	HEAD: SHIELD (LARGE)

8.3.2.1 ANGLE SPRAY HEAD COMPONENTS 3/16" (4.8 MM)



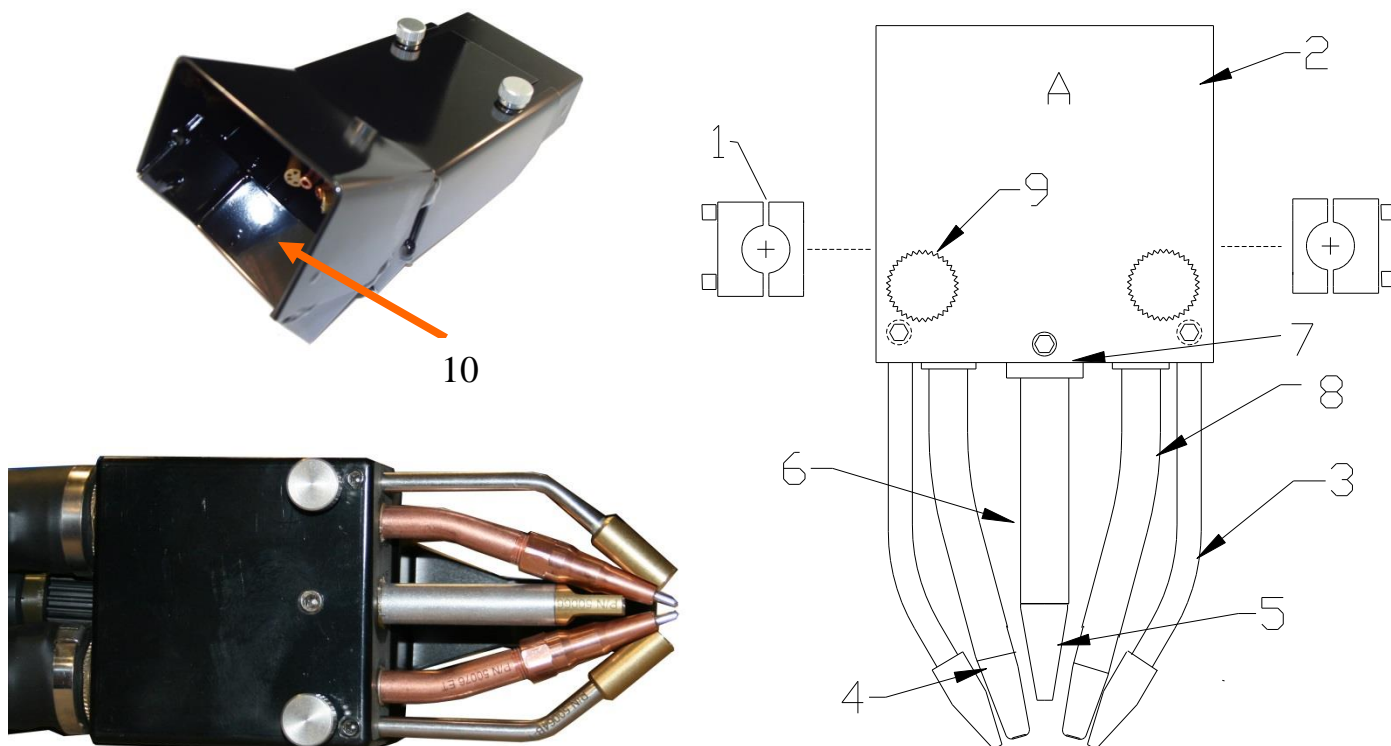
1	50005	HEAD: CONTACT TUBE CLAMP
2	54064	HEAD: LARGE WIRE (4.8 MM)
3	51085A Assy	HEAD: ANGLE SPRAY NOZZLE
4	51065-3/16 IT	HEAD: TIP CONTACT
5	51076 ET	HEAD: CONTACT TUBE
6	50080	HEAD: SHIELD CLAMP
7	54064-5	HOSE TO HEAD ADAPTER
8	54064-2	HOSE TO HEAD FITTING
9	54064-1 Assembly	CENTER AIR HOSE (INCLUDES 54064-2 & 54064-3)
10	54064-3	MALE QUICK DISCONNECT
NS	50064-2	HEAD: SIDE AIR JET PLUG

8.3.2.2 Jet Force Nozzle & Head Assembly



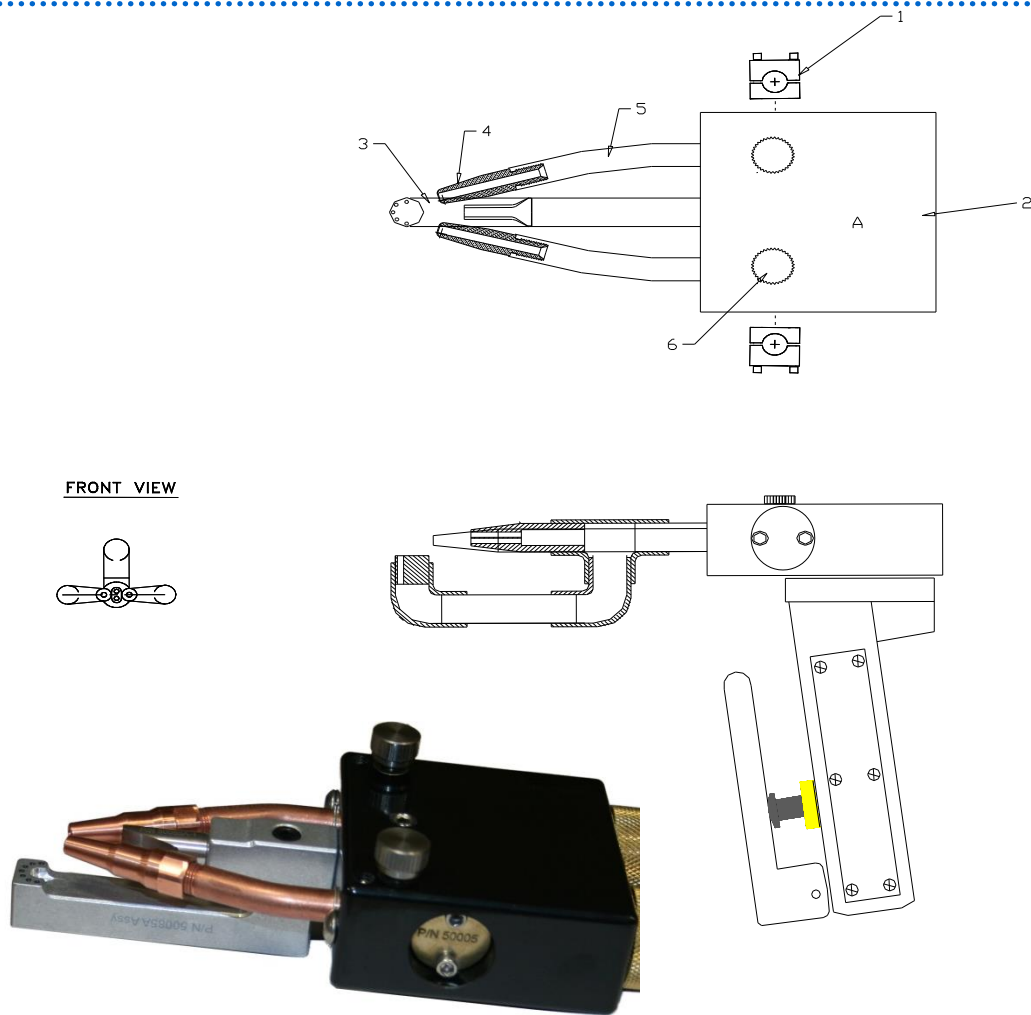
	PART #	DESCRIPTION
A	5751064J ASSEMBLY	JET SPRAY PRECISION ARC HEAD ASSEMBLY
1	51064	HEAD: LARGE WIRE (STANDARD)
2	50005	HEAD: CONTACT TUBE CLAMP
2A	92196A197	SCREW: SHCS 8-32 X 3/4
3	54064-564-1	HEAD: JET HOUSING BASE
4	50065-1/8 IT	HEAD: TIP 1/8" INTERNAL THREADS
5	AA564-16	HEAD: JET HOUSING BASE SM O-RING (014)
6	50066-1	HEAD: CENTER AIR NOZZLE, TUBE
7	57076 ET	HEAD: CONTACT TUBE 1/8" 3.2 FOR 4.8 HEAD
8	AA564-3	HEAD: JET HOUSING
9	AA564-4 1/8	HEAD: JET NOZZLE 1/8" (BEVEL FACING TIPS)
10	54064-564-2	JET FLOW AIR HOSE ADAPTER NUT
11	AA564-6	HEAD: JET NOZZLE CAP
12	AA564-7	HEAD: JET FLOW AIR ADAPTER
13	AA564-8	HEAD: JET O-RING (042)
14	AA564-14	HEAD: JET HOUSING BASE SM O-RING (017) (3 EACH)
NS	92196A540	SCREW: SHCS 1/4-20 X 3/4" (SS)
14	54064-564-17	ADAPTER PLATE

8.3.2.3 SPRAY HEAD COMPONENTS (<= 1/8" WIRE)



	Part #	DESCRIPTION
A	50064-B Assy	HEAD: ASSEMBLY OPEN NOZZLE
1	50005	HEAD: CONTACT TUBE CLAMP
2	50064-B	HEAD: FAN SPRAY HEAD
3	50064B-1	HEAD: SIDE AIR JET NOZZLE
4	50065-1/8 IT	HEAD: TIP 1/8"
	50065-1/16	HEAD: TIP 1/16"
	50065-3/32	HEAD: TIP 3/32"
5	50066	HEAD: CENTER AIR NOZZLE, TIP
6	50066-1	HEAD: CENTER AIR NOZZLE, TUBE
7	50066-2	HEAD: CENTER AIR NOZZLE, O-RING
8	50076	HEAD: CONTACT TUBE <1/8"
	50063 ET	HEAD: CONTACT TUBE 1/8"
9	50080	HEAD: SHIELD CLAMP
10	50079	HEAD: SHIELD (SEE PHOTO)

8.3.2.4 ANGLE SPRAY HEAD COMPONENTS $\leq 1/8"$ (3.2 mm)

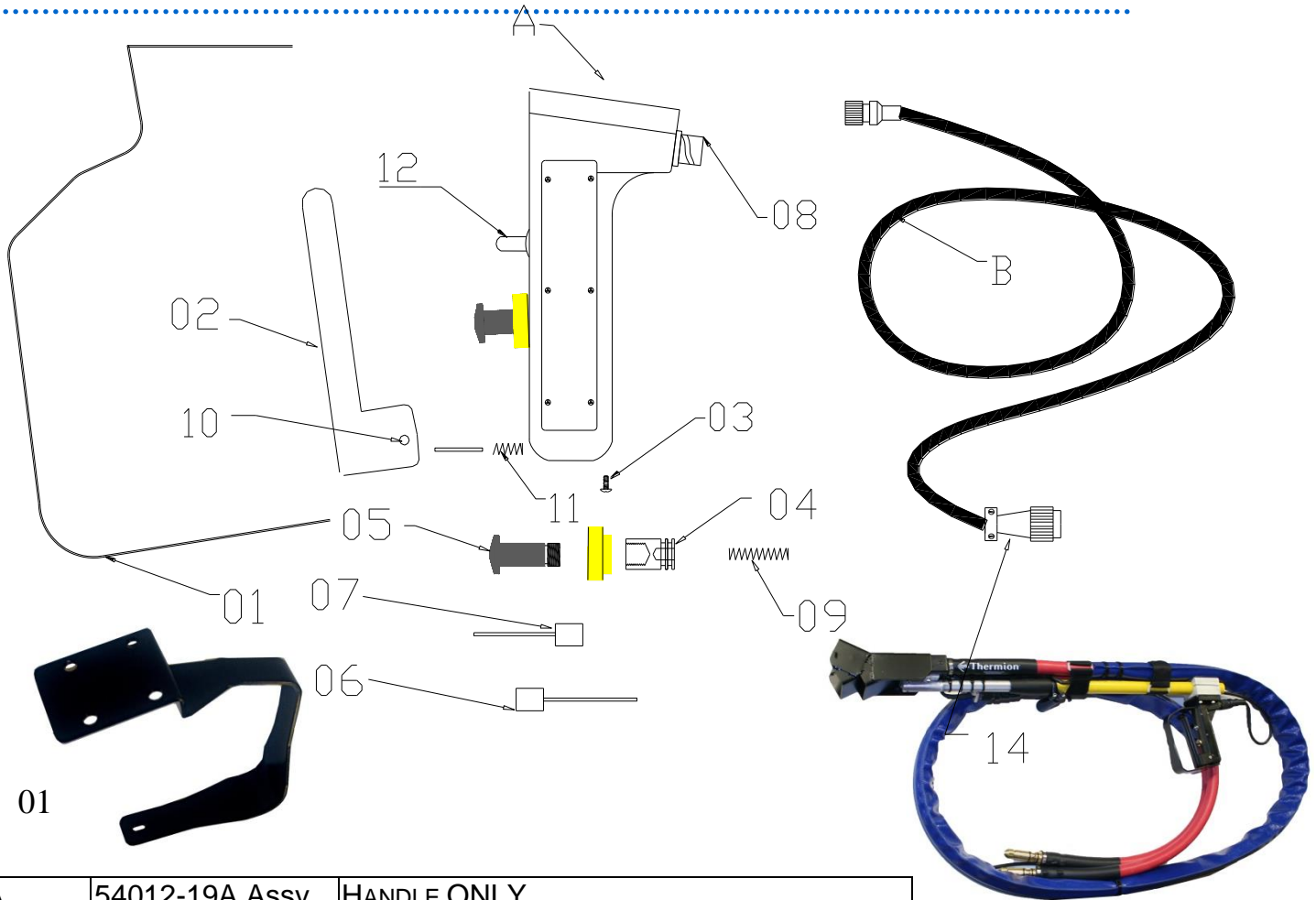


A	50064 Assy	HEAD ASSEMBLY
1	50005	HEAD: CONTACT TUBE CLAMP
2	50064-B	HEAD: SMALL WIRE .125" (3.2 mm)
3	50085A Assy	HEAD: ANGLE SPRAY NOZZLE
4	50065-1/8 IT	HEAD: TIP CONTACT 1/8
	50065-1/16	HEAD: TIP CONTACT 1/16
5	50076	HEAD: CONTACT TUBE $<1/8"$
	50063 ET	HEAD: CONTACT TUBE $1/8"$
6	50080	HEAD: SHIELD CLAMP
NS	50064-2	HEAD: SIDE AIR JET PLUG



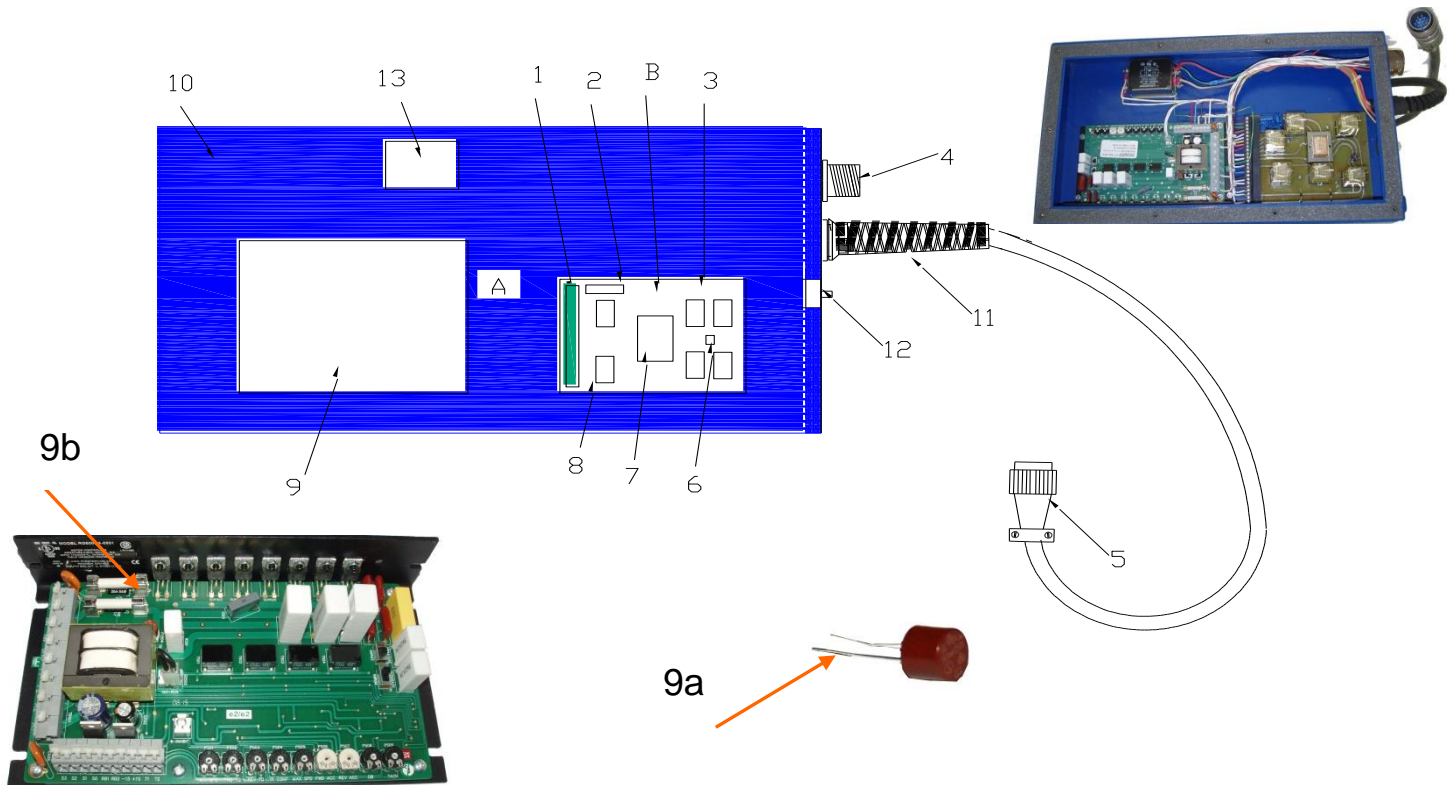
CAUTION: CENTER AIR NOZZLE MUST NOT TOUCH CONTACT TIP UNWANTED ARCING OR SHORTING WILL OCCUR

8.3.3 HANDLE AND TRIGGER



A	54012-19A Assy	HANDLE ONLY
01	57079	HEAD: SAFETY/HEAT SHIELD
02	54012-02	HANDLE: LEVER
03	91770A146	SCREW: THP 6-32 x 3/8" (SS) HEAT SHIELD MOUNTING SCREW
04	54012-04	HANDLE: CONTACT
05	54012-05	HANDLE: CONTACT PLUNGER
06	54012-06A	HANDLE: AIR SWITCH
	54012-06/07A RM	REPLACEMENT WIRE FOR SWITCHES
07	54012-07A	HANDLE: MAIN SWITCH
08	54012-19A	HANDLE: TRIGGER CORD RECEPTACLE
09	54012-17	HANDLE: PLUNGER SPRING
10	54012-10A	HANDLE: LEVER PIN
11	54012-17	LEVER SPRING
12	54012-24 ASSY	HANDLE: PLUNGER FOR SWITCHES
NS	91251A540	SCREW: SHCS 1/4-20x3/4 (AS) HANDLE TO HEAD SCREW
NS	54012-18S	CINCHING STRAPS FOR HANDLE EXTENSION
PHOTO	54012-18	36 INCH HANDLE EXTENSION

8.4 CONTROL BOX

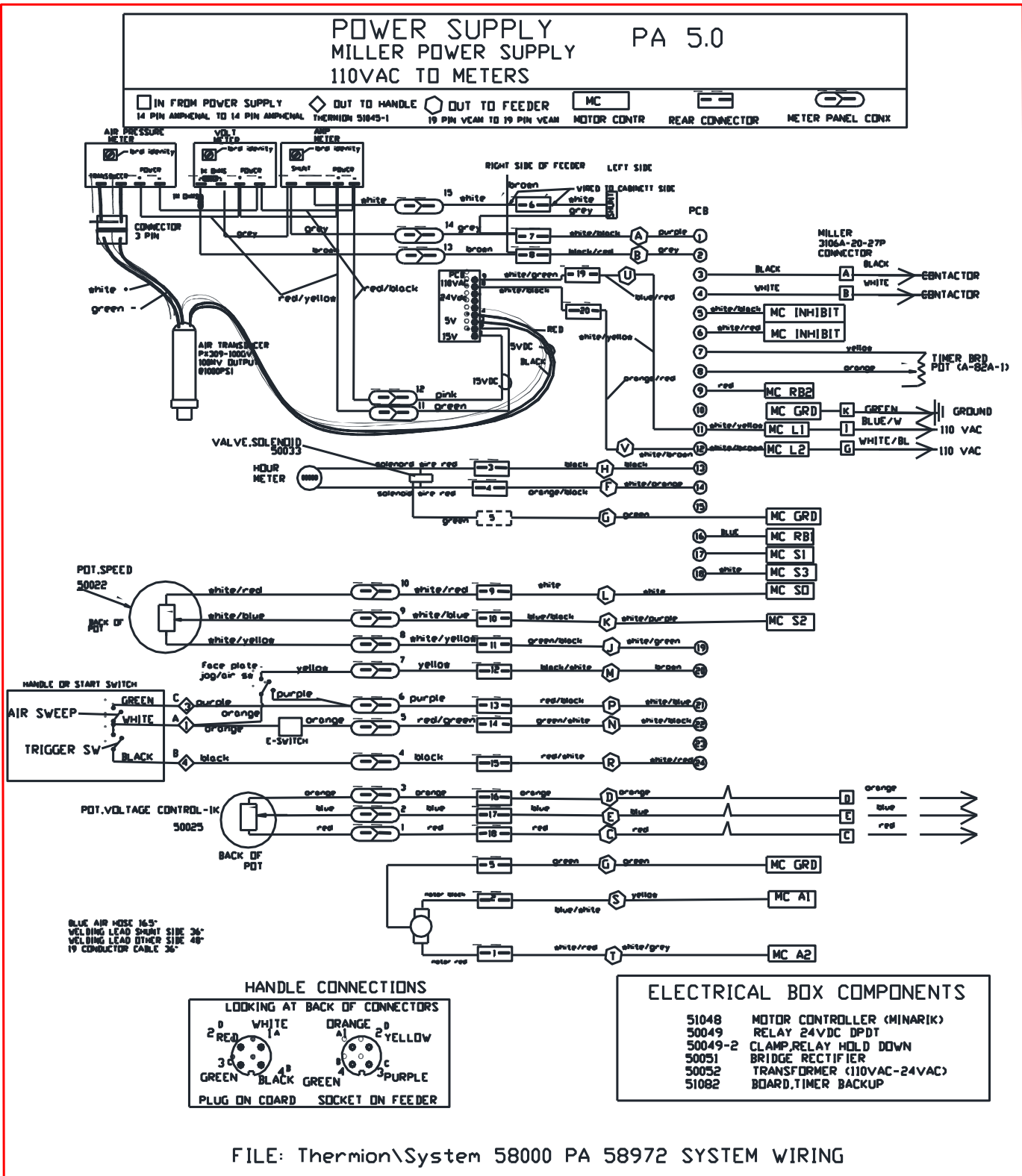


A	58097	CONTROL BOX ASSEMBLY
B	51072G-1	PCB: COMPLETE (WITH) RELAYS
1	50072-2	24 PIN WIRE CONNECTOR
2	51082	PCB: BACKUP TIMER BOARD
3	51072G	PCB: PCB, BLANK 51072G
4	51059-1 Assy	CONNECTOR: 19 PIN FEMALE (BM)
5	50058-M	POWER SUPPLY CORD (MILLER)
	50058-L	POWER SUPPLY CORD (LINCOLN)
6	50051	PCB: BRIDGE RECTIFIER (+ -)TOWARDS DIODES)
7	50052	PCB: TRANSFORMER
8	50049	PCB: RELAY, 51072G PCB (6 EACH)
NS	50049-2	PCB: RELAY, SPRING (6 EACH)
9	51048-A	MOTOR CONTROLLER
9a	51048-A1	CONTROL BOX: MOTOR CONTROLLER PICO FUSE
9b	51048-A2	CONTROL BOX: MOTOR CONTROLLER LINE FUSE
10	51097-RM	CONTROL BOX
11	50036-17	CABLE: CORD GRIP 1/2" FLEX
NS	91770A197	SCREW: THP 8-32X3/4 (18-8 SS) CONTROL BOX LID SCREW
12	51097-1	CONTROL BOX: BACK UP TIMER, POT
13	51097-2	CONTROL BOX: POWER FILTER

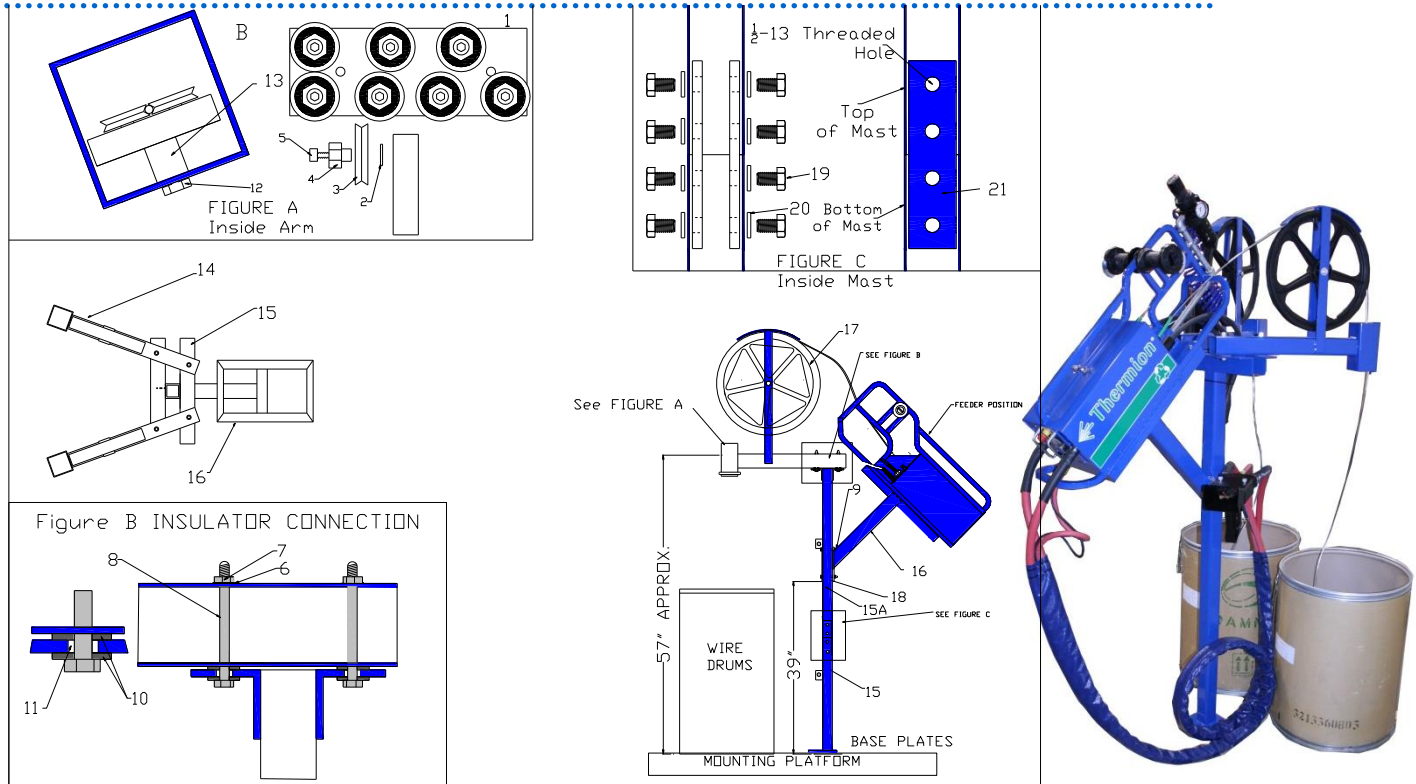


WARNING: Control box is not an explosion proof enclosure and shall not be located in a dust environment. A suggested location is close to the power unit.

8.4.1 SYSTEM WIRING

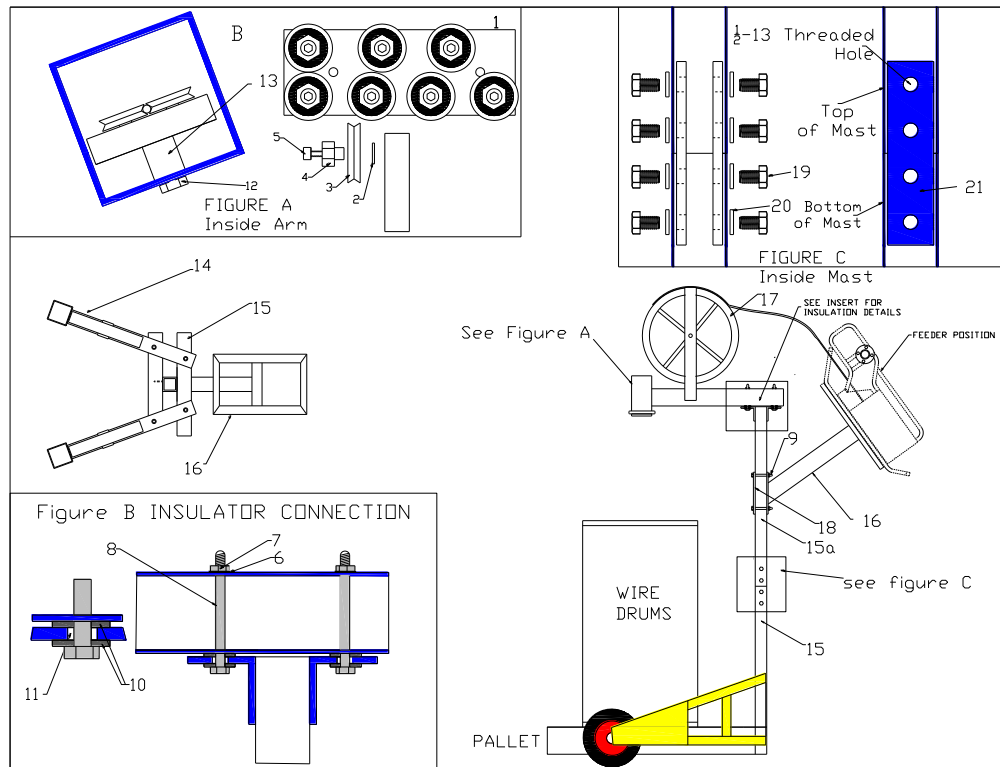


8.4.2 PRECISION WIRE DISPENSER (OPTIONAL)



A	541000, ASSY	PRECISION: WIRE DISPENSER	
B	54200 ASSY	PRECISION ARC WIRE STRAIGHTENER ASSY - INSTALLED BY THERMION	2
1	54201	STRAIGHTNER: ROLLER MOUNTING PLATE	2
2	54202-S	SPACER FOR V-GROOVED BEARING	14
3	54202	BEARING, V-GROOVED	14
4	54203-C	BEARING CAM ADJUSTER BUSHING	14
5	92196A544	STRAIGHTNER: ROLLER MOUNT SCREW	14
6	90108A033	WASHER: 1/2", ZN PLATED, FLAT	20
7	90473A223	NUT: 1/2-13, GR 2, ZN PLATED	10
8	91236A726	SCREW: HHCS 1/2-13 X 3 1/2 4 EA - ATTACH STRAIGHTENER ARM TO MAST 2 EA - ATTACH WHEEL TO ARM (INSTALLED BY THERMION)	6
9	91236A728	SCREW: HHCS 1/2-13 X 4 ATTACHES FEEDER MOUNT TO MAST	4
10	90132A553	WASHER: FIBER, 1/2" W 2 1/4" OD SEPARATES MAST FROM ARM	8
11	541107	PRECISION: WIRE ISOLATION DISC DISC (INSTALLED BY THERMION)	4
12	92198A546	SCREW: HHCS 1/4-20X1.5" (18-8) ATTACHES STRAIGHTENERS TO ARM - INSTALLED BY THERMION	4
13	50034	MOTOR MOUNT (1" Od X .313" Id X .834")	4
14	541101	PRECISION: WIRE DISP. STRAIGHTENER ARM	2
15	541103	PRECISION: WIRE DISPENSER MAST BASE	1
15A	541103A	PRECISION: WIRE DISPENSER MAST TOP	1
16	541102	PRECISION: FEEDER MOUNT ASSEMBLY	1
17	541104	PRECISION: WIRE DISPENSER WHEEL	2
18		FEEDER ARM MOUNT BRACKET	1
19	92240A710	SCREW: HHCS 1/2 -13 X 3/4"	8
20	90108A033	WASHER: 1/2", ZN PLATED, FLAT	8
21	541108	MAST CONNECTING BRACKET	2
NS	92240A548	FEEDER MOUNTING FASTENERS 1/4-20X1 3/4	4
NS	541105	PRECISION: WIRE DISP DRUM COVER	

8.4.2 PRECISION WIRE DISPENSER W/JACK (OPTIONAL)



A	541200, ASSY	PRECISION: WIRE DISPENSER	
B	54200 ASSY	PRECISION ARC WIRE STRAIGHTENER ASSY INSTALLED BY THERMION	2
6	90108A033	WASHER: 1/2", ZN PLATED, FLAT	20
7	90473A223	NUT: 1/2-13, GR 2, ZN PLATED	10
8	91236A726	SCREW: HHCS 1/2-13 X 3 1/2 4 EA - ATTACH STRAIGHTENER ARM TO MAST 2 EA - ATTACH WHEEL TO ARM (INSTALLED BY THERMION)	6
9	91236A728	SCREW: HHCS 1/2-13 X 4 ATTACHES FEEDER MOUNT TO MAST	4
10	90132A553	WASHER: FIBER, 1/2" W 2 1/4" OD SEPARATES MAST FROM ARM	8
11	541107	PRECISION: WIRE ISOLATION DISC (INSTALLED BY THERMION)	4
12	92198A546	SCREW: HHCS 1/4-20X1.5" (18-8) ATTACHES STRAIGHTENERS TO ARM - INSTALLED BY THERMION	4
13	50034	MOTOR MOUNT (1" Od X .313" Id X .834") INSTALLED BY THERMION	4
14	541101	PRECISION: WIRE DISP. STRAIGHTENER ARM	2
15	541103B	PRECISION: WIRE DISPENSER PALLET BASE	1
15A	541103A	PRECISION: WIRE DISPENSER MAST TOP	1
16	541102	PRECISION: FEEDER MOUNT ASSEMBLY	1
17	541104	PRECISION: WIRE DISPENSER WHEEL	2
18		PRECISION: FEEDER ARM MOUNT BRACKET	1
19	92240A710	SCREW: HHCS 1/2 -13 X 3/4" ATTACHES MAST TO BASE	8
20	90108A033	WASHER: 1/2", ZN PLATED, FLAT	8
21	541108	MAST CONNECTING BRACKET	2

8.5 GENERAL TROUBLESHOOTING

TROUBLE	POSSIBLE CAUSE	REMEDY
No feed, no air, with indicator light off	1. No 110 VAC to Feeder	1. Check Fuse/Breaker on Power Supply
No wire feed at motor jog sw with indicator light on, air turns on with trigger sw	1. Blown Fuse on Motor Controller 2. Defective Motor Controller	1. Replace Fuses. 2. Replace Motor Controller
No wire feed at motor jog, with indicator light on, no air with trigger sw, no air with air sweep sw	1. Loose Components Inside Electrical Box 2. Defective Relay Control Board	1. Inspect For Loose Components 2. Replace Relay Control Board
Wire feeds with motor Jog Switch, air turns on with Trigger Switch, no feed with Trigger Switch	1. Unconnected Power Cables 2. Power Supply Defective, Clue! No Voltage on Volt Meter or Low Open Circuit Voltage Reading 3. Loose Relay on Relay Control Brd	1. Connect Power Cables 2. Service Power Supply 3. Inspect For Loose Component
Wire feeds with Motor Jog, nothing on with Trigger Switch	1. Defective Trigger SW 2. Loose or Broken Wire Between Front Panel and Trigger SW	1. Replace Trigger SW 2. Replace Trigger SW and Cord Assembly or Repair Defective Part
Spraying begins then stops after a few minutes	1. Low Voltage 2. Dirty Liners 3. Debris behind air tips	1. Set Voltage to 29 or higher 2. Lubricate and Clean Liners
Spray pattern is rough, uneven, or odd shape	1. Low Air Pressure 2. Plugged Air Nozzles 3. Misaligned Air Nozzles 4. Defective Air Nozzles	1. Increase Air to Above 90 PSI 2. Clean Air Nozzles 3. Re-align Air Nozzles 4. Replace Air Nozzles
Wire Feed Motor runs hot	1. Excessive Friction in Liners	1. Clean and Lubricate Liners More Frequently
Power Leads heat up	1. Loose Connections 2. Oxidized Electrical Connections 3. Excessive Current	1. Clean and Tighten All Electrical Connections
Wire feeds, cannot get arc	1. Power Supply Defective	1. Service Power Supply
Wire feeds, unsteady spray	1. Loose Electrical Connection 2. Loose tips 3. Worn out or Loose Feed Rolls 4. Worn out Feed Roll Gears 5. Dirty Liners 6. Worn out Tips, Contact Tube 7. Head Built Up With Metal Dust. 8. Debris behind air tips 9. Debris behind contact tips or contact tubes	1. Clean and Tighten All Electrical Connections 2. Tighten Tips 3. Replace (or Tighten) Feed Rolls, 4. Repair or Replace Feed Roll Gears 5. Clean or Replace Liners 6. Replace Tips & Contact tube 7. Clean Metal Dust From Head
Air leaks at head	1. Broken O Ring 2. Dry O Rings 3. Liners Too Short 4. Hole In Liners	1. Replace O Ring 2. Lubricate O Rings 3. Replace Liner 4. Replace Liner

8.5 GENERAL TROUBLESHOOTING (CONTINUED)

TROUBLE	POSSIBLE CAUSE	REMEDY
Wire twists or spirals in liner	1. Low Voltage 2. Clogged Contact Tubes or Tips	3. Raise Voltage 4. Clean/Replace Tubes & Tips
Excessive dust and smoke	1. High Voltage	2. Lower Voltage
Slit spray pattern	1. Low Voltage 2. Air Nozzles Out of Alignment	1. Raise Voltage 2. Adjust Air Nozzles
Various functions operating on their own	1. Metal Dust in Switches or Connections	1. Replace Switches 2. Clean Between Pins of Control Cable Connections



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