OPERATING AND MAINTENANCE

INSTRUCTION MANUAL

FOR

TUBEMASTER DIGITAL POWER SOURCE (MODEL 514C)

WATER CIRCULATOR (MODEL 904A)

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This document is based on the latest design version at the time of publication. Some deviations in actual operation, from this document, are possible depending on the production generation of a particular machine.

CHANGE HISTORY

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INTRODUCTION

The Tubemaster, Model 514C, is a digital power source designed to be used with Magnatech Tubemaster 800 Series®, Redhead®, E-Head®, 424/425/426® model Weld Heads. Internal memory and removable data media used for program transfer are solid state.

Weld heads from certain other manufactures may be operated by the Tubemaster power supply. All Arc Machines Inc. (AMI) Weld Heads are supported with the use of adaptor cables, Magnatech Part # 105660-1.

The Power Source can be operated from the front panel, with a switch pad mounted on the Weld Head (800 Series heads only), or with a remote pendant.

After receiving your system, please take an inventory of parts using the packing list, or the general inventory list detailed in Section 6.0, *Tubemaster Welding System – Model 514C Component Inventory*.

The 514C is equipped with an Advanced Help feature to allow problem diagnostics in the field. Please contact Magnatech for the Advanced Help Manual for Operator Usage or the Advanced Help Manual for Technician Usage.

READ AND OBSERVE WARNINGS BEFORE PROCEEDING WITH INSTALLATION!

1.0 TECHNICAL SUPPORT

Now that you have purchased a Magnatech product, our goal is to provide prompt service and technical support. If technical assistance is needed following equipment delivery, please contact us and our staff will take every measure to resolve the issue.

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2.0 MAGNATECH LIMITED WARRANTY FOR THE MODEL 514C TUBEMASTER

Effective November 2008

GENERAL:

Magnatech warrants equipment that it manufactures to be free from defects from material and workmanship under normal use and service for the periods defined below. This Warranty shall apply to the Original Purchaser only, and is not transferable. All warranty time periods start on the date that the equipment was delivered to the original retail purchaser. Our sole obligation under this warranty is limited to repairing or replacing the defective part or parts, which in our judgment show evidence of such defects. All warranty repair work shall be accomplished at the factory and Magnatech assumes no obligation to perform warranty service at a customer's facility. This warranty is given in lieu of and to the exclusion of any and all other warranties, express or implied. Specifically, and without limiting the generality of the above disclaimer, Magnatech disclaims any warranty of merchantability or fitness for any particular purpose as to any and all goods sold to the Buyer (whether for the ultimate use of the Buyer, or any other person) pursuant to the purchase order, contract or in connection there with.

COVERED COMPONENTS:

A. 1 Year – Parts and Labor

- ☐ All Magnatech Power Sources/Controllers
- ☐ All Model Water Circulators (with exception of Pump)
- ☐ All Weld Heads

B. 6 Months

- ☐ Switches

C. 3 Months – Parts and Labor

- ☐ Torch Cable Assemblies
- ☐ Relays
- ☐ Batteries

EXCLUDED COMPONENTS:

Magnatech Limited Warranty shall not apply to:

1. Equipment Supplied Not Manufactured by Magnatech. With respect to standard equipment supplied by Magnatech as part of a complete welding system, Magnatech extends the same warranty as offered by the individual manufacturer of this standard equipment if any. In many instances such items are warranted directly by the manufacturer, and Magnatech may, from time to time, inform the customers of such warranty coverage; however, Magnatech does not guarantee the accuracy of completeness of its information regarding such warranties.
2. Expendable Items. This warranty does not cover certain items considered expendable and certain high wear items offered herein. Expendable items consist of welding torch components, wire feed conduits, motor brushes, fuses, bulbs and filters.
3. Modification And Misuse. This warranty does not apply to products which have been modified in any way by any party other than Magnatech; nor to products which have not been installed and operated in accordance with applicable industry standards; or to products which have been used other than under usual conditions for which they are designed; nor to products that have not received proper care, protection and maintenance under supervision of competent personnel.

UTILIZATION FOR INTENDED PURPOSE ONLY:

The Tubemaster, Pipemaster, and Pipeliner systems are intended to be used SOLELY for GTAW or GMAW/FCAW orbital welding applications. Any other use is deemed to be “not for the intended purpose” and the manufacturer shall not be liable for any damage resulting there from.

Utilization for the intended purpose includes:

- observance of all instructions in the operating manual
- performance of all prescribed inspection and maintenance work

Magnatech products are intended for purchase and use by commercial/industrial users and persons trained and experienced in the use and maintenance of welding equipment.

PERFORMANCE OF WARRANTY REPAIRS – LOCATION:

Magnatech ‘s obligation under this warranty shall be limited to the repair or replacement, at its option, of any goods or any components or parts thereof sold by Magnatech to Buyer that prove to be defective upon Magnatech ‘s examination. Returned goods shall be delivered F.O.B. Magnatech‘s plant, East Granby, Connecticut, USA, at Buyer's risk and expense.

DISCLAIMER:

Magnatech shall not be otherwise liable for any damages including but not limited to incidental damage, consequential damage, or special damages, whether such damages result from negligence, breach of warranty, or the result of repair and replacement activity, including, but not limited to any losses due to downtime or loss of use. Magnatech shall not be held liable for any lost profit or other damage, delay or loss which may result directly or indirectly from the adjustment, alteration, repair, maintenance, operation, or interruption thereof, of any said equipment.

There are no warranties of fitness for any particular purpose of said equipment or any other warranties (expressed, implied or statutory) concerning the performance capabilities thereof. Magnatech shall not be liable for any consequential, indirect or incidental losses or damages incurred as the result of any breach of warranty or as a result of any repair or replacement activity, including, but not limited to any losses due to down time or loss of use. Magnatech shall not be liable for any losses, injuries or damages sounding in tort, whether for the negligence of Magnatech or its agents, officers or employees or in a strict liability theory.

To the extent permitted by law, the remedies provided herein are the sole and exclusive remedies. In no event shall Magnatech be liable for direct, indirect, special incidental or consequential damages (including loss of profit), whether based on contract, tort, or any legal theory.

Any express warranty not provided herein and any implied warranty guaranty or representation as to performance, and any remedy for breach of contract tort or any other legal theory 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 fitness for particular purpose, with respect to any and all equipment furnished by Magnatech is excluded and disclaimed by Magnatech.

2.1 Magnatech Product Warranty Registration

Please complete following information and mail/fax/email to Magnatech. This will allow us to ensure correct replacement parts are supplied, service bulletins reach the correct person and provide a contact person for service.

Date Purchased: _____

Company Name: _____

Contact Name: _____

Dealer: _____

Address: _____

City: _____

State: _____ Zip: _____

Email: _____

Phone: _____ Fax: _____

UPGRADE/SERVICE

Contact Name: _____

Address: _____

City: _____

State: _____ Zip: _____

Email: _____

Phone: _____ Fax: _____

Product Name: _____

S/N: _____

Product Name: _____

S/N: _____

Product Name: _____

S/N: _____

3.0 REFERENCE DOCUMENTS

Referenced standards and regulations may be purchased from the originating organization (AWS, ANSI, NFPA, etc.). See also Section 5.5, *Principle Safety Standards* for ordering information.

3.1 Standards

AWS F3.M/F3.2	Ventilation Guide for Weld Fume
ANSI Z49.1	Safety in Welding, Cutting, and Allied Processes
ANSI/ISEA Z87.1	American National Standard for Occupational and Educational Personal Eye and Face Protection Devices
ANSI Z41.1	Men's Safety-Toe Footwear
AWS F4.1	Safe Practices for The Preparation Of Containers and Piping for Welding and Cutting
OSHA Standard 29 CFR, Part 1910, Subpart Q	Welding, Cutting And Brazing
NFPA 51B	Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 70	National Electrical Code
CGA P-1	Safe Handling of Compressed Gases in Cylinders
CSA W117.2	Safety in Welding, Cutting and Allied Processes
Miller 215 994 C	Guidelines for Gas Tungsten Arc Welding (GTAW)
DHHS (NIOSH) Publication No. 94-110	Applications Manual for the Revised NIOSH Lifting Equation

3.2 Regulations (Repairs and Maintenance)

The owner/operator is obliged to have the power supply checked for proper condition by a trained electrician after any alterations, installations of additional components, modification, repairs, care and maintenance, and in any case at least every twelve (12) months.
In the course of such inspection, the following regulations must be observed (as a minimum):

ANSI/IEC 60974-1	Arc Welding Equipment – Part 1: Welding Power Sources
VBG 4, 5	National Regulations for Safety and Accident Prevention
VBG 15, 33/49	Welding, Cutting and Allied Processes
VDE 0701-1	Repair, Modification and Inspection of Electrical Appliances; General Requirements
VDE 0702-1	Repeat Tests on Electrical Appliances

4.0 SAFETY INSTRUCTIONS AND WARNINGS FOR OPERATION OF ARC WELDING EQUIPMENT

4.1 Important Notice

The nature of the GTAW process creates some potential hazards. In accordance and compliance with the international safety regulations, the "exclamation symbol" indicates that this equipment is to be considered "Hazardous" UNTIL an operator has been made aware of these potential hazards by READING THIS MANUAL.

The "lightening flash" symbol indicates that there are potential electrical hazards. The display of these symbols make it the OPERATOR'S RESPONSIBILITY TO INSURE THAT HE HAS READ AND/OR BEEN MADE AWARE OF ALL OF THE SAFETY RELATED ITEMS CONTAINED IN THIS MANUAL.

READ AND UNDERSTAND THESE INSTRUCTIONS BEFORE INSTALLING, OPERATING OR SERVICING MAGNATECH EQUIPMENT OR AUXILIARY EQUIPMENT SUPPLIED AS PART OF THE WELDING SYSTEM.

4.2 Owner/Operator Obligations

4.2.1 Safety Precautions (General)

The owner/operator must ensure that people working with the system:

- ✓ Are familiar with the basic regulations on workplace safety and accident prevention and who have been instructed in how to operate the equipment.
- ✓ Have read and understand` the sections on safety and the warnings contained in this manual.
- ✓ Keep a copy of the instruction manual at the welding location at all times.
- ✓ Insure that the workplace and the equipment are always kept clean.
- ✓ Only operate the power supply if all the protective features are fully functional. Before switching the power to the system “ON”, ensure that no one will be injured.
- ✓ At least once per week, check the system for any damage that may be visible from the outside, and check that all the safety features work correctly.
- ✓ Use only original parts purchased from the manufacturer.
- ✓ Do not make alterations or modifications to the power supply without first getting permission from the manufacturer.

  Immediately replace any components that are not in perfect condition.

Welding products and welding processes can possibly cause serious injury or death, and damage to other equipment if the operator does not strictly observe all safety rules and take precautionary actions.

Safe practices are outlined in the ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*. See Section 5.0, *Safety Precautions* for other guides and publications for what you should learn before operating this equipment.

4.2.2 Calibration of Power Supply

In view of international standards, regular calibration is advisable. Magnatech recommends a 12 month calibration interval. For more information, please contact Magnatech.

4.2.3 Shock Prevention

Bare conductors or terminals in the output circuit, or ungrounded, electrically live equipment can fatally shock a person. To protect against shock, have a competent electrician verify that the equipment is adequately grounded, do not make contact with terminals and parts that are electrically HOT.

4.2.4 Installation and Grounding of Electrically Powered Equipment

Electrical equipment must be installed and maintained in accordance with NFPA 70, *National Electrical Code* , and local codes. A power disconnect switch must be located at the equipment. Check equipment nameplates for voltage and phase requirements. The electrical circuit powering the Tubemaster and commercial power source must be properly grounded to building ground.

Do not remove a ground prong from any plug. Use correct mating receptacles. Check ground for electrical continuity before using equipment.

If extension cables are used, ensure they are adequate for the rated current and a ground.

4.2.5 Weld Head and Power Supply Interconnect Cables

Inspect cables often for damage to insulation. Replace or repair cracked or worn cables immediately. Do not use a welding current in excess of rated cable capacity, as the cable will overheat.

4.2.6 Service and Maintenance

Shut OFF all power at the disconnect switch or line breaker before inspecting or servicing the equipment. Unplug the input power cord. If the equipment is wired directly to an electrical box, lock the switch OFF (or remove line fuses) so that power cannot be turned ON accidentally. Disconnect power to equipment if it is to be left unattended or out of service.

4.2.7 Fuse and circuit Breakers

Replace fuses and circuit breakers with equivalent sizes.

4.3 Burn Prevention

The welding arc emits high-energy radiation in the infrared and ultraviolet range. This energy penetrates lightweight clothing and is reflected from light-colored surfaces. The arc rays can injure the eyes permanently and burn the skin, just as in “sunburn”. Never look at an electric arc without eye protection.

4.3.1 Protective Clothing

Wear gloves, suitable long sleeved shirts/jackets, safety shoes, welding helmet, and other articles needed to shield the skin and to prevent injury from arc burns. Wear earplugs if welding overhead or in a confined space. Wear a hard hat if others are working above you.

4.3.2 Eye Protection

Protect your eyes and Head by wearing a welding helmet fitted with a double lens; use a clear lens outside and a colored, welding filter inside. Use a filter suitable for the amperage level being used for a specific task.

Always lower the helmet before striking the arc. Wear safety glasses with side shields under the helmet to protect the eyes from flying particles and side arc flashes when the helmet is up.

Protect the eyes of other people in the area by use of opaque, non-reflecting and nonflammable screens around your welding station. Allow good air circulation, especially at floor level. Do not permit anyone to view the arc unless he uses a correct hand shield, or helmet.

4.3.3 Hazards from Flying Sparks

Move all combustible objects well away from the welding location. Welding must NEVER be performed on pipes that have been used for transmission of flammable gases, fuels, mineral oils etc.

4.4 Toxic Fume Prevention

Breathing the fumes created during welding or cutting can cause illness or death if adequate ventilation is not provided. Provide ventilation in accordance with ANSI Z49.1, Safety in Welding, Cutting, and Allied Processes.

Some fume sources are:

4.4.1 Weldments

Metals containing lead, cadmium, zinc, mercury and beryllium can produce harmful toxic fumes when welded or cut. Arc welding of stainless steels can produce hazardous fumes. Adequate local exhaust ventilation must be used for the operator and persons in the area.

4.4.2 Coated Weldments

Do not weld on pipes or tubes that have coatings that emit toxic fumes when heated.

4.4.3 Welding Area

Do not weld in locations close to chlorinated vapors coming from degreasing, cleaning or spraying operations. The heat and rays from the arc react with the vapors to form highly toxic PHOSGENE. Work in a confined space only if it is being adequately ventilated, and if ventilation is not adequate, wear an air-supplied respirator (see AWS F3.2M/F3.2, Ventilation Guide for Weld Fume).

4.5 Compressed Gas Cylinder Handling

Follow precautions below and those outlined in CGA Standard P-1, Safe Handling of Compressed Gases in Containers.

Handle carefully to prevent damage. Keep away from welding cables or other electrical circuits. Use only cylinders with name of gas marked on them; DO NOT rely on color identification. Close valves on empties and return promptly. Secure cylinders so they cannot be knocked over. Keep temperature below 55º C (130º F).

4.5.1 Pressure Regulators

Use the correct regulator for the gas and cylinder being used. Remove any suspected faulty regulator and return to manufacturer's service center for repair.

4.6 Equipment Warning Labels

Inspect all precautionary labels on the equipment.

4.7 Inspection

Frequently inspect all components for damage.

Check the Controller, Head and power source frequently for damage, and immediately replace any components that are not in perfect condition.

Do not make alterations or modifications to the Weld Head, Controller, or power supply without first getting permission from the manufacturer.

4.8 Spares and Expendable Parts

Use only original spares and expendable parts. With parts purchased from other suppliers, there is no certainty that these parts have been designed and manufactured to cope with the operation and safety requirements that will be made of them.

When ordering spare parts, please give the exact description and the relevant part number, as given in the spare parts list. Please also give the serial number of your machine.

4.9 Safety Precautions in Normal Operation

Only operate the power supply if all its protective features are fully functional. Before switching power on to the power supply ensures that nobody can be injured. At least once a week, check the power supply for any damage that may be visible from the outside, and check that the safety features all function correctly.

4.10 Turn Power Off Before Connecting/Disconnecting Cables

Turn the Main Power Switch of both Controller and power supply off before connecting or disconnecting any cables to prevent possible damage to the electrical circuitry.

5.0 SAFETY PRECAUTIONS

The following section is referenced from Miller 215 994 C, *Guidelines for Gas Tungsten Arc Welding (GTAW)*.

5.1 Symbol Usage

DANGER! – Indicates a hazardous situation which, if not avoided, will result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

Indicates a hazardous situation which, if not avoided, could result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

Notice – Indicates statements not related to personal injury

Indicates special instructions

This group of symbols means Warning! Watch Out! ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

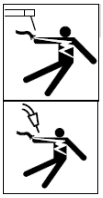
5.1.1 Arc Welding Hazards

The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in Section 5.5, *Principle Safety Standards*. Read and follow all Safety Standards.

Only qualified persons should install, operate, maintain, and repair this unit.

During Operation, keep everybody, especially children, away.

5.1.2 Electric Shock



ELECTRIC SHOCK CAN KILL

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not us AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.

Electric Shock (cont'd)

- Additional safety precautions are required when any of the following electrically hazardous conditions are present: 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; or when there is a high risk of unavoidable or accidental contact with the workpiece or ground. For these conditions, use the following equipment in order presented: 1) a semiautomatic DC constant voltage (wire) welder, 2) a DC manual (stick) welder, or 3) an AC welder with reduced open-circuit voltage. In most situations, use of a DC, constant voltage wire welder is recommended. And, do not work alone!
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910, 147 (see Section 5.5, *Principle Safety Standards*).
- Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
- Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet,
- When making input connections attach proper grounding conductor first – double-check connections.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- Frequently inspect input power cord for damage or bar wiring – replace cord immediately if damaged – bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or poorly spliced cables.
- Do not drape cables over your body.
- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Do not touch electrode holders connected to two welding machines at the same time since double open-circuit voltage will be present.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal. Disconnect cable for process not in use.

  SIGNIFICANT DC VOLTAGE exists in inverter welding power sources AFTER removal of input power

- Turn off inverter, disconnect input power, and discharge input capacitors according to instructions in Maintenance Section before touching any parts.

5.1.3 Hot Parts

HOT PARTS CAN BURN

- Do not touch hot parts bare handed.
- Allow cooling period before working on gun or torch.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.

5.1.4 Fumes and Gases

FUMES AND GASES CAN BE HAZARDOUS

Welding procedures and gases. Breathing these fumes and gases can be hazardous to your health.

- Keep your head out of the fumes. Do not breathe the fumes.
- If inside, ventilate the area and/or use local forced ventilation at the arc to remove welding fumes and gases.
- If ventilation is poor, wear an approved air-supplied respirator.
- Read and understand the Material Safety Data Sheets (MSDSs) and the manufacturer's instructions for metals, consumables, coatings, cleaners, and degreasers.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watch person nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

5.1.5 Arc Rays

ARC RAYS CAN BURN EYES AND SKIN

Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

- Wear an approved welding helmet fitted with a proper shade of filter lenses to protect your face and eyes when welding or watching (see ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes* and Z87.1, *Safe Practice for Occupational and Educational Eye and Face Protection* listed in Section 5.5, *Principle Safety Standards*).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash, glare and sparks; warn others not to watch the arc.
- Wear protective clothing made from durable, flame-resistant material (leather, heavy cotton, or wool) and foot protection.

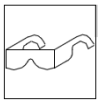
5.2 Welding

WELDING CAN CAUSE FIRE OR EXPLOSION

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.

- Remove all flammables within 35 ft (10.7m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Do not weld where flying sparks can strike flammable material.
- Protect yourself and others from flying sparks and hot metal.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared according to AWS F4.1, *Safe Practices for the Preparation of Containers and Piping for Welding and Cutting* (see Section 5.5, *Principle Safety Standards*).
- Do not weld where the atmosphere may contain flammable dust, gas, or liquid vapors (such as gasoline).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock, sparks, and fire hazards.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.
- After completion of work, inspect area to ensure it is free of sparks, glowing embers, and flames.
- Use only correct fuses or circuit breakers. Do not oversize or bypass them.
- Follow requirements in OSHA 1910.252 (a) (2) (iv) *Welding, Cutting, and Brazing, General Requirements* and NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work* for hot work and have a fire watcher and extinguisher nearby.

5.2.1 Flying Metal or Dirt



FLYING METAL OR DIRT CAN INJURE EYES

- Welding, chipping, wire brushing, and grinding causes sparks and flying metal. As welds cool, they can throw off slag.
- Wear approved safety glasses with side shields even under your welding helmet.

5.2.2 Buildup of Gas

BUILDUP OD GAS CAN INURE OR KILL

- Shut off shielding gas supply when not in use.
- Always ventilate confined spaces or use approved air-supplied respirator.

5.2.3 Electric and Magnetic Fields (EMF)

ELECTRIC AND MAGNETIC FIELDS (EMF) CAN AFFECT IMPLANTED MEDICAL DEVICES

- Wearers of Pacemakers and other Implanted Medical Devices should keep away!
- Implanted Medical Device wearers should consult their doctor and the device manufacturer before going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations.

5.2.4 Noise

Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.

5.2.5 Cylinders

CYLINDERS CAN EXPLODE IF DAMAGED

Compressed gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

- Protect compressed gas cylinders from excessive heat, mechanical shocks, physical damage, slag, open flames, sparks, and arcs.
- Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- Keep cylinders away from any welding or other electrical circuits.
- Never drape a welding torch over a gas cylinder.
- Never allow a welding electrode to touch any cylinder.
- Never weld on a pressurized cylinder – explosion will result.
- Use only correct compressed gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
- Turn face away from valve outlet when opening cylinder valve.
- Keep protective cap in place over valve except when cylinder is in use or connected for use.
- Use the right equipment, correct procedures, and sufficient number of persons to lift and move cylinders.
- Read and follow instruction on compressed gas cylinders associated equipment, and Compressed Gas Association (CGA) publication P-1, *Safe Handling of Compressed Gases in Containers* listed in Section 5.5, *Principle Safety Standards*.

5.3 Additional Symbols for Installation, Operation and Maintenance

5.3.1 Fire or Explosion Hazard

- Do not install or place unit on, over, or near combustible surfaces.
- Do not install unit near flammables.
- Do not overload building wiring – be sure power supply system is properly sized, rated, and protected to handle this unit.

5.3.2 Falling Equipment

FALLING EQUIPMENT CAN INJURE

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use equipment of adequate capacity to lift and support unit
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.
- Keep equipment away from moving vehicles when working from an aerial location.
- Follow the guidelines in the Applications Manual for the Revised NIOSH Lifting Equation (Publication No. 94 – 110) when manually lifting heavy parts or equipment.

5.3.3 Overuse

OVERUSE CAN CAUSE OVERHEATING

- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before starting to weld again.
- Do not block or filter airflow to unit.

5.3.4 Static (ESD)

STATIC (ESD) CAN DAMAGE PC BOARDS

- Put on grounded wrist strap BEFORE handing boards or parts.
- Use proper static-proof bags and boxes to store, move, or ship PC boards.

5.3.5 Moving Parts

MOVING PARTS CAN INJURE

- Keep away from moving parts.
- Keep away from pinch points such as drive rolls.

5.3.6 Welding Wire

WELDING WIRE CAN INJURE

- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people, or any metal when threading welding wire.

5.3.7 Battery Explosion

BATTERY EXPLOSION CAN INJURE

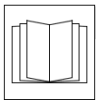
- Do not use welder to charge batteries or jump start vehicles unless it has a battery charging feature designed for this purpose.

5.3.8 Moving Parts

MOVING PARTS CAN INJURE

- Keep away from moving parts such as fans.
- Keep all doors, panels, covers, and guards closed and securely in place.
- Have only qualified persons removed doors, panels, covers, or guards for maintenance and troubleshooting as necessary.
- Reinstall doors, panels, covers, or guards when maintenance is finished and before reconnecting input power.

5.3.9 Read Instructions



- Read and follow all labels and the Owner's Manual carefully before installing, operating, or servicing unit. Read the safety information at the beginning of the manual and in each section.
- Use only genuine replacement parts from the manufacturer.
- Perform maintenance and service according to the Owner's Manuals, industry standards, and national, state, and local codes.

5.3.10 H.F. Radiation

H.F. RADIATION CAN CAUSE INTERFERENCE

- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.

5.3.11 Arc Welding

ARC WELDING CAN CAUSE INTERFERENCE

- Electromagnetic energy can interfere with sensitive electronic equipment such as computers and computer-driven equipment such as robots.
- Be sure all equipment in the welding area is electromagnetically compatible.
- To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor.
- Locate welding operation 100 meters from any sensitive electronic equipment.
- Be sure this welding machine is installed and grounded according to this manual.
- If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.

5.4 California Proposition 65 Warnings

Welding or cutting equipment produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.58 et seq.)

This product contains chemicals, including lead, known to the state of California to cause cancer, birth defects, or other reproductive harm. *Wash hands after use.*

5.5 Principal Safety Standards

Safety in Welding, Cutting, and Allied Processes, ANSI Standard Z49.1, is available as a fee download from the American Welding Society at http://www.aws.org or purchased from Global Engineering Documents (phone: 1-877-413-5184), website: www.global.ihs.com).

Safe Practices for the Preparation of Containers and Piping for Welding and Cutting, American Welding Society Standard AWS F4.1, from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.org and www.sparky.org).

Safe Handling of Compressed Gases in Containers, CGA P-1, from compressed Gas Association, 14501 George Carter Way, Suite 103, Chantilly, VA 20151 (phone: 703-788-2700, website: www.cga-net.com).

Safety in Welding, Cutting, and Allied Processed, CGA Standard W117.2, from Canadian Standards, Association, Standards Sales, 5060 Spectrum Way, Suite 100, Ontario, Canada L4W 5NS (phone: 800-463-6727, website: www.csa-international.org).

Safe Practice for Occupational and Educational Eye and Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 25 West 43rd Street, New York, NY 10036 (phone: 212-642-4900, website: www.ansi.org).

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, NFPA Standard 51B, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.org).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 19+10, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 (phone: 1-866-512-1800) (there are 10 OSHA Regional Offices – phone for Region 5, Chicago, is 312-353-2220, website: www.osha.gov).

Applications Manual for the Revised NIOSH Lifting Equation, The National Institute for Occupational Safety and Health (NIOSH), 1600 Clifton Rd, Atlanta, GA 30333 (phone: 1-800-2324636, website: www.cdc.gov/NIOSH).

5.6 EMF Information

Electric current flowing through any conductor causes localized electric and magnetic fields (EMF). Welding current creates an EMF field around the welding circuit and welding equipment. EMF fields may interfere with some medical implants, (e.g. pacemakers). Protective measures for persons wearing medical implants have to be taken. For example, restrict access for passers – by or conduct individual risk assessment for welders. All welders should use the following procedures in order to minimize exposure to EMF fields form the welding circuit:

- Keep cables close together by twisting or taping them, or using a cable cover.
- Do not place your body between welding cables. Arrange cables to one side and away from the operator.
- Do not coil or drape cables around your body.
- Keep head and trunk as far away from the equipment in the welding circuit as possible.
- Connect work clamp to workpiece as close to the weld as possible.
- Do not work next to, sit or lean on the welding power source.
- Do not weld whilst carrying the welding power source or wire feeder.

About Implanted Medical Devices:

Implanted Medical Device wearers should consult their doctor and the device manufacturer before performing or going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations. If cleared by your doctor, then following the above procedures is recommended.

6.0 TUBEMASTER WELDING SYSTEM – MODEL 514C COMPONENT INVENTORY

6.1 Component Inventory

Each Tubemaster 514C comes equipped with the following:

Table 1 - Component Inventory

Quantity	Component	Part Number	Nomenclature	
1	Power Source	1000577	Assembly, Tubemaster Model 514C	
1	Input Power Cable	104265-2 104625-1	115V *or* 230V	Cord, Power (115V) Cord, Power (230V)
1	Controller and Gas Hose	103404-GHGHB-10	Hose & Fitting Assembly, Gas Hose Assembly, Supply (Model 514) (10 FT)	
Installed	QC Software	51773	Diskonkey Classic	

6.2 Options

Table 2 - Options

Component	Part Number
Work Cable 8M, 25 ft	102293-2-25
Water Circulator Model 904A	105646-1
Circulator Coolant Fluid	1001661
Printer, Installed	514P
Data Key	51773
Printer Paper Rolls	41004
Wire Feed Upgrade Kit	514WF
Miller Electric Cart with Bottle Rack	042934
Extension Cable Set, 8M, 25 ft	104619-25
Extension Cable Set, 8M, 50 ft	104619-50
Shipping Case, Power Source	41014
Shipping Case, 904A Water Circulator	41015

*Only required for use with certain Weld Head models

7.0 DESCRIPTION AND OPERATION OF CONTROLS – POWER SUPPLY AND PENDANT

7.1 Front Panel Controls

The power source Front Panel, shown in Figure 1, *Front Panel of Power Source*, provides the controls necessary to develop, save, and call up welding programs. Programming is time based.

Each program typically consists of 4 levels, with the option to include more if needed. Any and all welding parameters may be changed at each level. Downslope will occur following completion of the final level time period.

While welding, the operator can immediately override the welding parameters within preset limits.

The LCD Display presents instructions and information in a logical fashion to enable the operators to rapidly become productive with the equipment.

Figure 1 - Front Panel of Power Source

Front Panel Key

A. *LCD Display* - A color LCD Display is used to indicate upslope, running, and downslope parameters, copy function, operator override limits and other status features. When power is first applied to the microprocessor, approximately 12 seconds is required for the microprocessor to properly boot. During this time, the display will remain blank.
B. *Cursor Up Switch* - Moves the cursor up the display.
C. *Cursor Down Switch* - Moves the cursor down the display.
D. *Emergency Stop Switch* - Used to immediately terminate the weld cycle and all the Weld Head functions.

Attention: In non-welding operation, this switch is used as an "Escape" back to the Start Up screen/Main Menu.

E. *Start Weld/Start Downslope* - Used to start a weld, or to initiate downslope if a weld is in progress.
F. *Enter Switch* - Enters the item highlighted by the cursor.
G. *USB Port* - A standard digital Data Key connects to the USB Port. This allows program transfer between power sourced, program archiving, and QC program downloading. Weld parameters can be downloaded for subsequent print out on a PC equipped with a printer.
H. *Soft Keys (Four)* - Used to select menu items. These items/functions change depending on operation mode (i.e., setup, programming, operation).
I. *Rotary Encoder* - Used to increase/decrease any parameter that has been selected.

7.2 Rear Panel

All connections are made on the rear panel, shown in Figure 2, *Rear Panel*. The following connectors, fittings, and devices are located there.

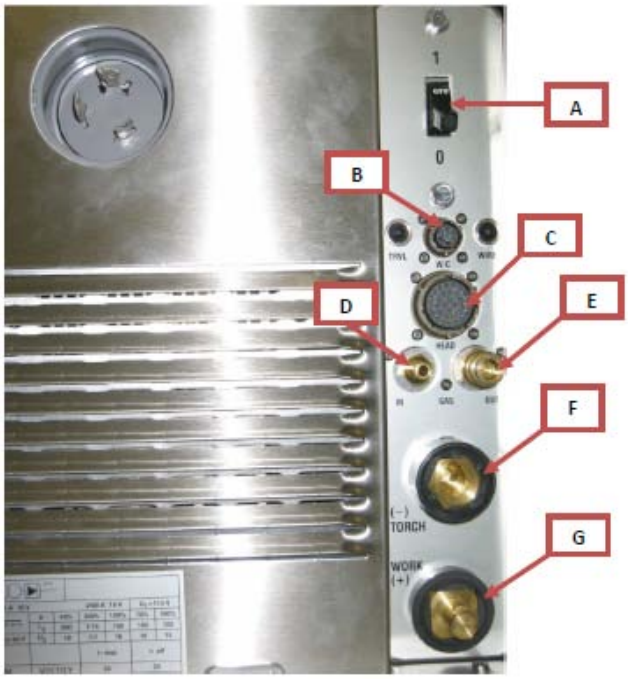


Figure 2 - Rear Panel

A. Power On/Off
B. Water Circulator Power/Flow Switch Electrical Connector
C. Weld Head Electrical Connector
D. Gas In (input from bottle) Quick Disconnect Coupling
E. Gas Out (to Head) Quick Disconnect Coupling
F. Torch (-) Connector
G. Work (+) Connector

7.3 Water Circulator Connector

A connector is provided on the Tubemaster to provide power to the optional Water Circulator (see Section 8.0, *Model 904A Water Circulator*). A second purpose of this connector is to provide water flow switch protection. (A water flow switch is mounted in the water circulator.)

Attention: If the water circulator is not to be used with the system, contact Magnatech to order a special jumper plug to bypass the water flow switch protection.

The water flow switch is factory calibrated. Interruption in, or insufficient water flow (less than .12 GPH), will result in termination of welding and a warning message on the display.

7.4 Gas Flow Switch

The Tubemaster Power Source is equipped with a gas flow switch that is factory preset. Shielding gas must be flowing to the Weld Head in order to be able to initiate a welding arc. If gas flow to the Weld Head is insufficient, depressing the START WELD switch will not initiate a welding arc. If the gas flow is interrupted during welding, the flow switch will immediately cause the arc to be extinguished. If gas flow is interrupted, a warning message will be displayed.

8.0 MODEL 904A WATER CIRCULATOR

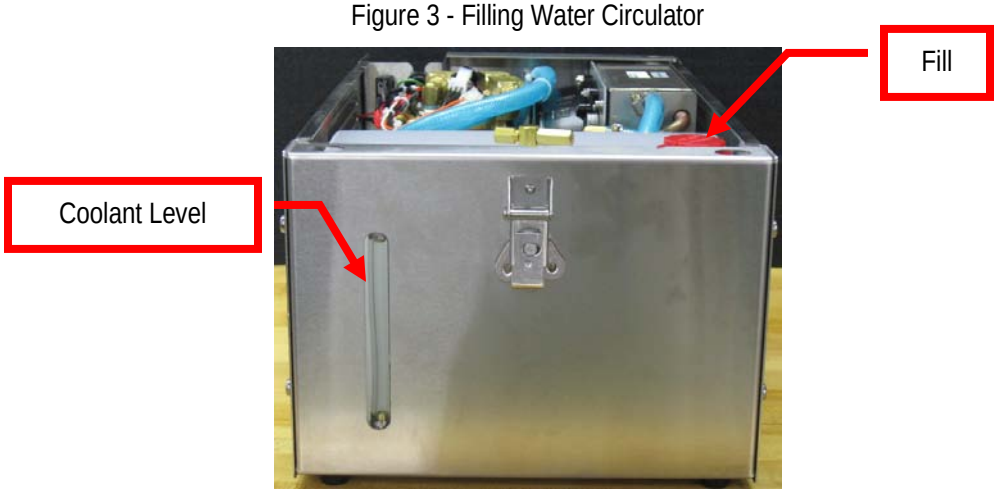
A radiator-type water circulator (i.e. water to air heat exchanger) can be optionally provided by Magnatech as an integral part of the welding system. The circulator is attached directly beneath the Tubemaster Power Source by two cam-lock type latches. Only safe 24 DC voltage is present in the water circulator.

8.1 Filling Water Circulator with Coolant

Fill the water tank with 5 liters (1.25 gallons) of Magnatech torch coolant fluid, P/N 1001661, or equivalent. This will provide freezing protection to -10° C (14° F). If this is unavailable, use standard ethylene glycol antifreeze) mixed 3 parts water to 1 part antifreeze (See Figure 3, *Filling Water Circulator*).

Attention: A special mix allowing lower temperature use is available. Distilled or demineralized water is strongly recommended to prevent bacterial and fungal growth. The amount of cooling fluid required will depend on the cable length of the Weld Head. Normally, 5 liters (1.25 gallons) will be sufficient. (It will be necessary to check the level of coolant after several minutes of first turning on power to top off the coolant level as required.)

Figure 3 - Filling Water Circulator



8.2 Connecting Water Circulator to the Tubemaster

1. Connect the circulator to the Tubemaster Power Source using the cam-lock latches.
2. An interconnect cable provides power to the circulator, as well as to provide the water flow switch signal to the Tubemaster. Connect the cable to the receptacle marked “WC” on the power source to the unmarked receptacle on the water circulator.

8.3 Operation of the Water Flow Switch

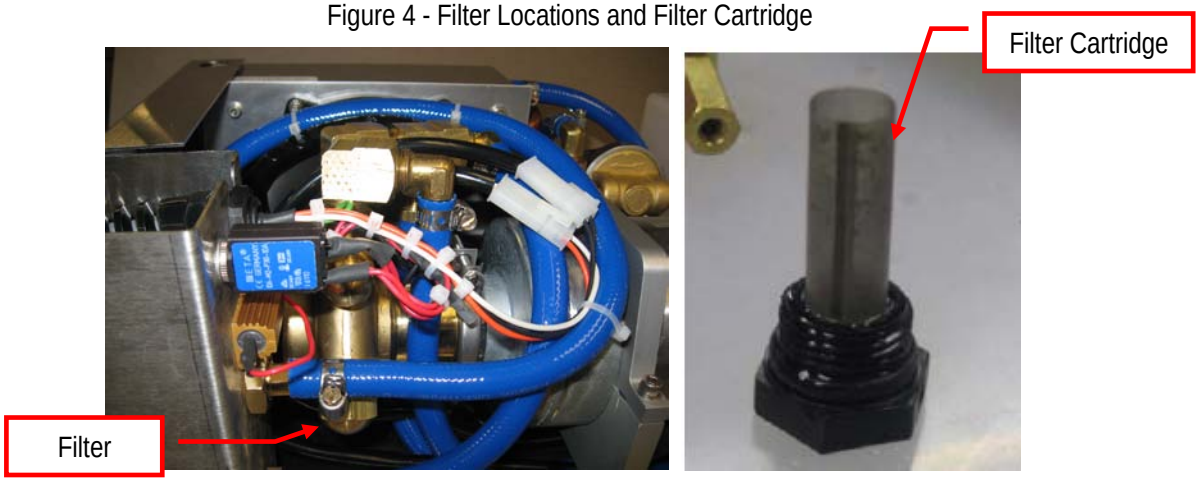
The water flow switch has a factory preset trip point that is not adjustable (0.15 GPM or 19 oz/min.) The flow switch is connected in series with the power supply contactor and start weld circuit. If the flow is above the trip point, the flow switch completes the circuit with a simple internal switch closure. If the flow drops below the preset point, this circuit is interrupted. Completing the circuit allows a relay to be energized in the Tubemaster. This relay is used to energize the power supply contactor. Therefore, a "low flow" situation will cause immediate drop out of the power supply contactor without any downslope of welding current.

If there is inadequate water flow to actuate the switch, a welding arc cannot be initiated. Pushing the **Start Weld** switch will cause pre-purge to occur. At the point in time that the arc should be initiated, the starting sequence will be interrupted and a warning will be displayed.

8.4 Periodically Clean the Filter

A filter is provided on the pump inlet. Periodically inspect and replace the cartridge type filter element (see Figure 4, *Filter Locations and Filter Cartridge*).

Figure 4 - Filter Locations and Filter Cartridge



8.5 Circuit Breaker

A circuit breaker mounted on the rear panel protects internal circuitry and components (see Figure 5, *Circuit Breaker*).

8.6 Shipment of Water Circulator

When shipping the system, be certain that the water is drained out of the water circulator.

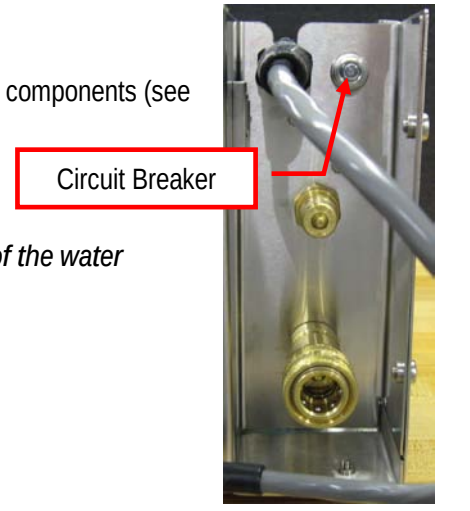
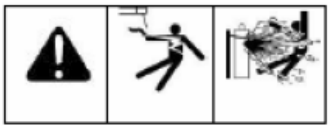


Figure 5 - Circuit Breaker

9.0 INSTALLATION TO ELECTRICAL AND GAS SERVICES-WELD HEAD CONNECTION

INSPECT ALL PRECAUTIONARY LABELS ON THE EQUIPMENT



9.1 General Assembly Instructions

It is not always possible to install the Tubemaster in optimal environments for electrical equipment. As much as possible, avoid locations exposed to high humidity, dust, high ambient temperatures and corrosive fumes.

Adequate air circulation is needed at all times. Make sure that ventilation openings are unobstructed and provide a clearance of approximately 30cm (12") around the unit of free air space.

9.2 Connecting Power Source to Input Power

DO NOT PROCEED FURTHER UNTIL YOU HAVE CAREFULLY READ ALL CAUTIONS COVERED IN THIS SECTION!

9.2.1 Power Cords

The power source can be operated on any input voltage from 100 to 230 VAC, single phase, 50 – 60 Hz.

The Tubemaster comes equipped with a 2.4MM (8') input power cord.

- For 115V: Power Cord 104265-2 with connector
- For 115/230V Power Cord 104265-1 without connector

Wire an appropriate connector to the end of the 115/230V power input cable. Please note that the green/yellow wire is "ground". Always connect the Tubemaster to line using a fused disconnect switch.

It is important that the equipment be grounded, not only for human safety, but for the suppression of electrical "noise" generated by the arc plasma. A chassis ground to earth provides a path to shunt off this energy so that the circuitry including the two microprocessors can correctly recognize signal information from the background noise.

9.2.2 Extension Cables

In order to be sure there is no input voltage reduction or "sag" due to undersized conductors, use these established guidelines for selecting power source extension cords:

- 115 VAC Input requires #10 AWG and can be up to 15m (50') Long
- 230 VAC Input requires #12 AWG and can be up to 24m (80') Long
- If the distance between the controller and the AC source is greater than 80', use #10 AWG @ 230V for a length of up to 150'.

9.2.3 Filters

Filters are provided to keep the incoming AC power "clean" for the circuitry; however, there can be cases where the source is shared with equipment (Universal motors used in grinders, facers, and cutters) that can potentially interfere. If this becomes a question, move the Tubemaster to its own branch circuit or another isolated outlet.

9.3 Connecting Tubemaster Power Source to Gas Supply

Connect the inlet gas hose provided to the brass quick-disconnect coupling on the rear panel of the Tubemaster marked "Gas In". A pressure regulator/flow meter of appropriate flow rating should be used (customer provided). Inlet pressure should not be below 100 psi.
An internal gas solenoid is mounted within the Tubemaster. Control circuitry sequences pre and post purge time periods with the operation of the Weld Head.

9.3.1 Compressed Gas Cylinder Handling

Following precautions below and those outlined in CGA Standard P-1, *Safe Handling of Compressed Gases in Containers*.

- Cylinders - Handle carefully to prevent damage. Keep away from welding cables or other electrical circuits. Use only cylinders with name of gas marked on them; DO NOT rely on color identification. Close valves on empties and return promptly. Secure cylinders so they cannot be knocked over. Keep temperature below 54°C (130° F).
- Pressure Regulators - Use the correct regulator for the gas and cylinder at hand. Remove any suspected faulty regulator and return to manufacturer's service center for repair.

9.4 Install Interconnect Power Cable – Tubemaster to Water Circulator

ATTENTION: Turn the Main Power Switch OFF before connecting or disconnecting any cables at the rear of the power source to prevent possible damage to the electrical circuitry.
If the water circulator is to be used, connect the detachable cable provided between the quick disconnect couplings marked "WC" on the power source and the connector on the water circulator.

9.5 Connect Weld Head

ATTENTION: Turn the Power Switch OFF before connecting or disconnecting any cables at the rear of the power source to prevent possible damage to the electrical circuitry.

1. Connect the head control cable at the end of the head umbilical assembly to the receptacle on the panel marked “Weld Head”.
2. Connect the gas hose of the Weld Head to the quick disconnect coupling marked "Gas Out".
3. Connect the Weld Head power cable to the negative (-) terminal of the power module
4. Connect the water hoses of the torch cable to the two (2) water fittings on the rear panel of the water circulator. The two quick disconnects are “sexed” and cannont be incorrectly installed.
5. Connect the Weld Head "work" cable to the positive (+) terminal of the Tubemaster (C and 800 Series Heads only).
   A separate work cable will be required when using any of the Redhead, E-Head and any Tubesheet Weld Head model.

9.6 Ready for Welding - PowerSwitch on

1. Turn the Power Switch to the "ON" position.
2. The pump in the water circulator should self prime, and water should flow through the torch cable.
3. Using the “soft key” purge switch on the LCD, manually purge the torch cable gas hoses for several minutes.
4. The system is now ready for welding. Consult the Weld Head manual for a description of Weld Head operation.

10.0 TUBEMASTER SPECIFICATIONS

Input Voltage	115 VAC	230 VAC
Input Amperage Requirements (100% duty cycle)	23 Amps	29.7 Amps
Output at 100% Duty Cycle	125 Amps	150 Amps
Maximum Output	200 Amps	200 Amps
KVA/KW at 100% Duty Cycle	2.6	2.6
Output at 60% Duty Cycle	175 Amp	175 Amp
KVA/KW at 60% Duty Cycle	4	4
Open Circuit Voltage (max)	80V	80V
Type of Cooling	Air-F	Air-F

Table 3 - Tubemaster Specifications

11.0 FAULT CONDITIONS

Certain fault conditions will cause the arc to be immediately terminated or prevent arc strike during weld initiation. Examples of faults that will cause this to occur are:

- Insufficient water flow
- Insufficient gas flow
- Arc voltage too high
- Arc voltage too low
- Contact of tungsten with work piece
- Any arc outage

12.0 MAIN MENU

12.1 Start-up

When the control is first turned on the main display will remain off except for backlighting. After approximately 12 seconds the model, S/N, software release date, and last calibration date will appear on the display.

12.2 Main Screen/Main Menu

Four keys allow access to:

- *Library* – Access to library of existing procedures
- *Help* – Detailed explanation of highlighted item
- *Menu* – Provides access to various functions and system configuration
- *New* – Create a new weld program

12.2.1 Library Soft Key

Programs are listed. Use the up/down cursor to scroll through programs. Select program using Select soft key. The following choices are displayed:

- Weld Number XX
- Run
- Review Parameters
- Review Notes
- Edit Weld

Once again, scroll through the list. Select the desired choice.

12.2.2 Menu Soft Key

Use the Up/Down cursor and select various software accessories:

- Maintenance Menu
- Copy Welds
- Delete Welds
- Print Welds
- QC Set-up
- Options

12.2.3 New Soft Key

Allows procedure creation using either auto program or standard manual entry.

12.3 Navigating

Four controls are used to select and proceed through a task. (See Section 12.2, *Main Screen/Main Menu*)

The item selected is highlighted in red. To select an item, use the Up/Down keys to highlight selection in red (move the cursor) the desired item.

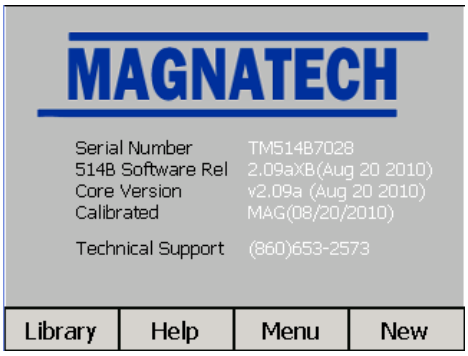
To change a numerical value, select Yes/No, or select an item from a drop down menu, use the Rotary Encoder.

To move to the next screen, press the Next soft key.

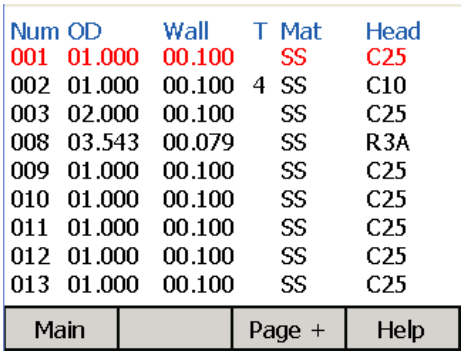
Certain items are selected using the Enter switch: for example, selecting the digit to be changed (00.00) or using the text labeling subroutine.

13.0 LIBRARY – TO RUN, REVIEW, AND EDIT EXISTING PROGRAM

Figure 6 - Main Menu Screen



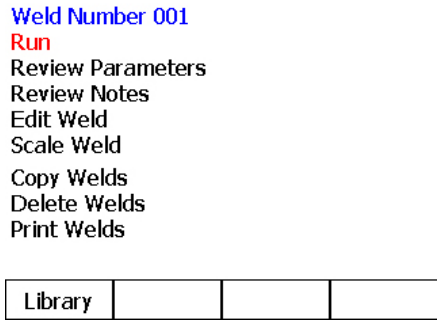
Press **Library** soft key. Move cursor to desired program and press **Select** soft key.



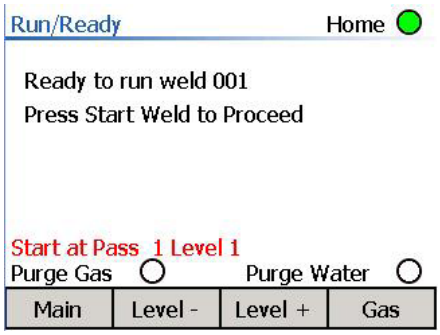
Note: Only **Weld Numbers** 001 to 099 are used for programs to be stored in internal memory. **Weld Number** 100 and above are used when exporting weld programs to a data key for transfer to other power source.

13.1 To Run a Weld

1. Move cursor to **Run** (now highlighted in red). Press **Select** soft key.



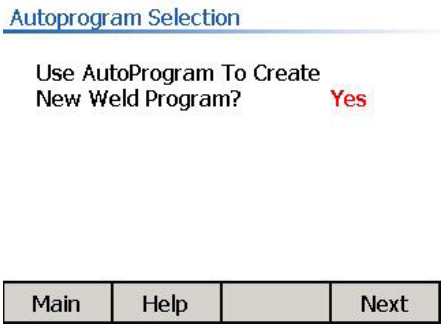
Note: Selection of **Review Parameters**, **Review Notes**, and **Edit Weld** mode are also chosen using cursor and **Select**.



2. Press **Start Weld** to initiate weld or press **Purge** soft key to pull in gas solenoid if a longer purge time is desired. (For example, to purge gas lines when first connecting a Weld Head to power source.)

14.0 USING AUTO PROGRAM

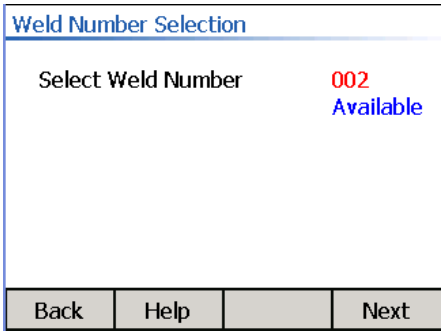
With **Auto Program**, certain defaults are automatically selected. For example, four levels are always used. If the user wishes to change these defaults, he must edit the weld program after it is generated.



Select **Yes** with **Rotary Encoder**. Press **Next**.

If **Password Protection** has been applied, you will be asked for your password to continue.

Select Weld Number using **Rotary Encoder**. Press **Next** when finished. Use **Back** to move to prior screen.



Use the cursor to select each line (highlighted in red). Use the **Rotary Encoder** to select **Head Model**, and **Material**. Use the **Enter** switch and **Rotary Encoder** to select and change each digit of **OD** and **Wall Thickness**. Press **Next** when finished.

Note: Certain head models from other manufactures are supported by the **Auto Program** function.

Use cursor to select line, **Rotary Encoder** to modify

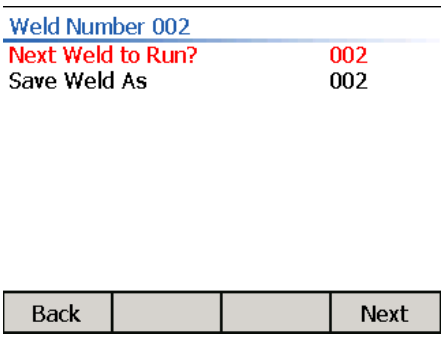
Next Weld to Run - two possible choices:

1. Repeat the weld program. At the completion of a weld, the same program will automatically be loaded, eliminating the need to enter the **Weld Number** again.
2. Run a different weld program. Press **Next** when finished.

14.1 Override Limit Function

The welder may override any of the pre-programmed values, but only within limits that may be defined during programming. The percentage of override limits can be individually programmed for each parameter between 0-100% of the programmed value. Welders can be given sufficient override capacity to compensate for tube fit variations, for example, but be prevented from modifying the original program outside of specified heat input limitations, for example. The override limits are saved with each weld thus allowing for different override values based on which weld is being run.

Use Cursor to select line, **Rotary Encoder** to modify.

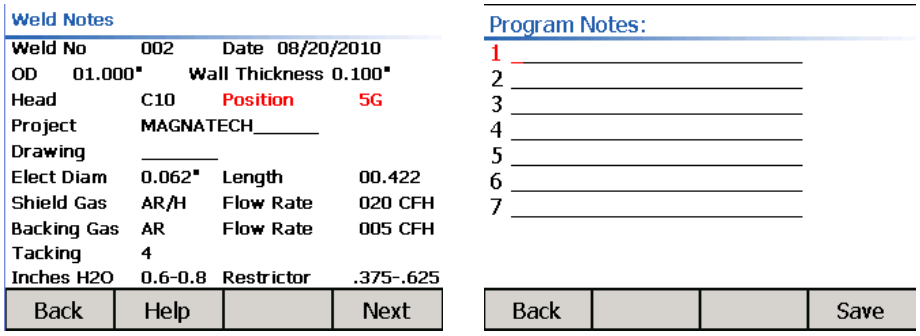


14.2 Program Information

1. Use cursor to select item, **Rotary Encoder** to modify.

Note: Certain items have been previously selected and cannot be changed (i.e., **Weld No.**, **Data**, **OD**, etc.). The cursor will bypass these items.

Note: To add description under **Project** and **Drawing**, see Section 15.0, *Alphanumeric Labeling*.

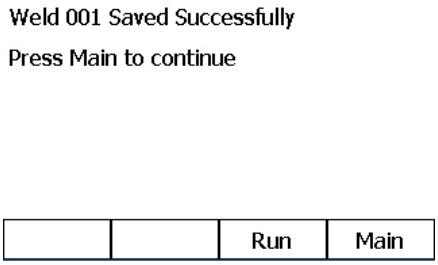


2. Record notes

Use cursor to select line for additional notes. Select **Save** if all program selections completed (or **Back** to make corrections).

14.3 Completion of Programming

Press Main to exit out to Main Menu.

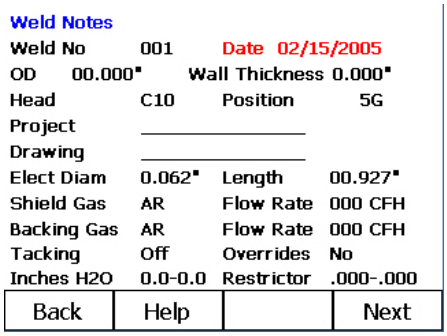


15.0 ALPHANUMERIC LABELING

15.1 Using the Floating Keyboard

The keyboard is accessible any time the currently highlighted line requires keyboard input; such as the Password Entry screen, the Program Notes screen, or any other text entry line.

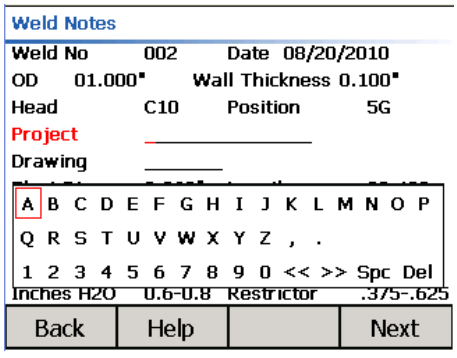
Use the cursor to select the item to be labeled.



15.2 Entering Text

Pressing the Enter key on a text entry line will display the floating keyboard. The Rotary Encoder knob can be used to select the desired letter or number. Pressing the Enter key again will insert the selected number into the line.

The Left (shown as <<) and Right (shown as >>) keys will move the highlighted character to the left or right along the line. Replacing a letter already typed can be accomplished by moving the highlighted character (cursor) to the letter and using the Rotary Encoder knob along with the enter key to replace the letter chosen.



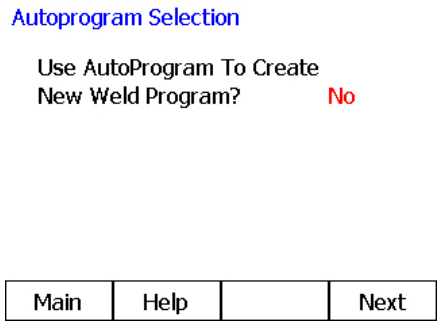
The Delete key (shown as Del) can be used to erase a line. Deletion is done to the last character of the line, and will only work if the selected character is the final character in the line. Pressing the Delete key on the last character of the line will erase it from the line.

To end text entry and move to the next line on the screen, simply press either the Up or Down keys.

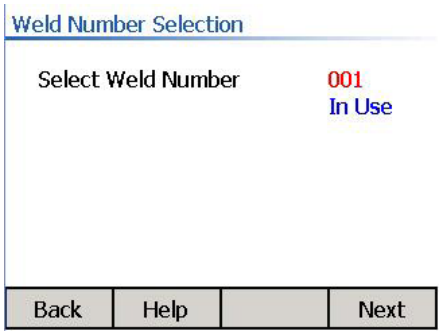
16.0 MANUAL PROGRAMMING

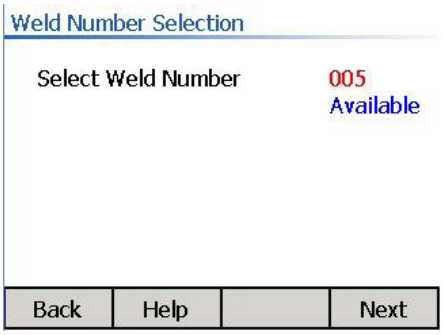
Manual programming is done using the same techniques as Auto Program, except the user can select each parameter and technique to be used. If **Password Protection** has been applied, you will be asked for your password to allow you to continue.

1. Select **No** with **Rotary Encoder**. Press **Next**.

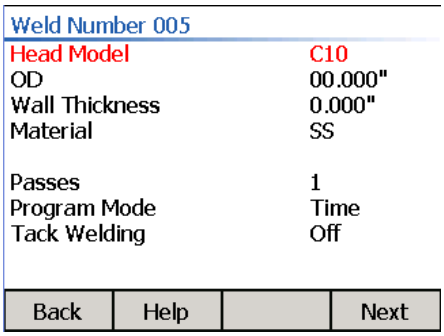


2. Select **Weld Number** with **Rotary Encoder**. Press **Next**.



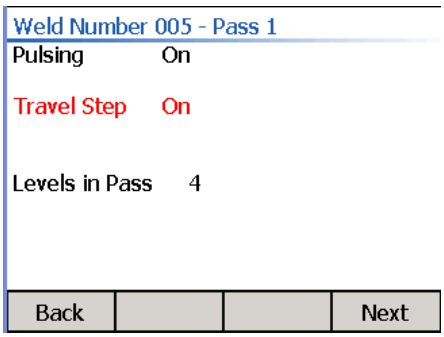


All information is input exactly as in Autogen, except the number of **Passes** and **Levels** are user selected. Move the cursor to the desired line and use the **Rotary Encoder** or **Enter** switch plus **Rotary Encoder** for **OD** and **Wall Thickness**. The Autotack program can be turned on, if required (see Section 18.0, *Autotack*) using the **Rotary Encoder**. Press **Next**.



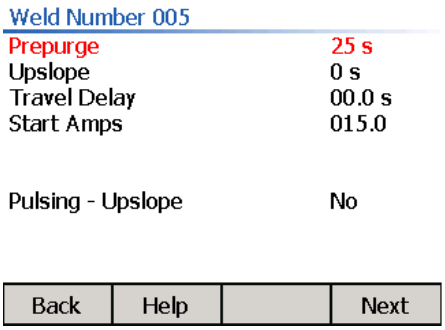
16.1 Pulsing Levels

Pulsed or non-pulsed current can be selected. Move the cursor and Rotary Encoder to change selections. Pulsing varies the current between high and low values.



16.2 RPM Step

RPM Step can be turned on/off. This function indexes tungsten rotation with pulsed current. Tungsten will rotate during low current pulse and stop on high current plus (or be set to run at a percentage of low current speed). Press Next.

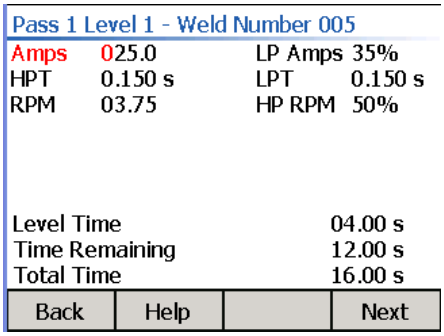


16.3 Pre-purge – Upslope Screen

Move the cursor and enter values with the Rotary Encoder. Press Next when finished.

- Pre-purge – Time period gas flows at weld start before arc ignition (seconds).
- Upslope – Time period in seconds that weld current ramps up from start amps value to level 1 value.
- Travel Delay – Delay period (seconds) beginning at end of upslope before rotation begins. Used to establish penetration.
- Start Amps – Current level at which arc is initiated.

Note: All terms and abbreviations are defined in Section 23, *Terms and Definitions* and Section 24, *Acronyms.*



16.3.1 Pass Level Screens

16.3.1.1 Pass 1, Level 1

Move the cursor and enter values with the Rotary Encoder.

Amps - Current at each level (using pulsed current, this is high pulse current).

Wire - Filler Wire Feed Rate (in IPM or CM per minute). (Will not be displayed unless Weld Head is equipped with wire feeder.)

RPM - Rotation Speed

LP Amps - Low Pulse Amperage - Shown as percentage of high pulse current.

HPT - High Pulse Time Period, in seconds.

LPT - Low Pulse Time Period, in seconds.

HP RPM - Rotation speed on High Current Pulse (shown only when RPM STEP is turned ON). Can be set at any percentage from 0 - 99 of the Low Pulse Speed listed RPM.

LP Wire - Wire Step Function - Index of wire feed with pulsed current. Wire feed can either be turned off during low pulse, or set to feed at some percentage of high pulse wire speed.

Level Time - Time duration that these parameters will be active in seconds.

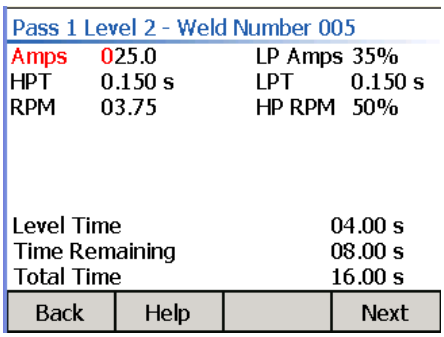
Time Remaining - As the tube size is input, selection of RPM automatically calculates Total (weld) Time. Time Remaining is automatically calculated once Level Time is input.

Total Time - Total time for weld in seconds. Enter values and press Next soft key to go to Level 2

Attention: Automatic parameter carry down through levels.

The software of the Tubemaster makes it very easy to copy parameters from one level to the next by merely pressing the Next level switch. This facility can result in unwanted changes if care is not taken when changing parameters at one specific level.

Example: You wish to change the amperage originally programmed in Level 4 of a one pass weld. However, other parameter changes occur in a subsequent level, such as level 5 or 6. If you make the change in amperage in Level 4 and press Next, you will automatically copy all of the Program Level 4 values into Level 5. Therefore, it is necessary to note any other changes that are occurring in subsequent levels within the pass before modifying any parameter in that pass. Please note that this is only true for Level parameters within any given pass. For a multi-pass weld, once you move to a subsequent pass, the parameters will not be copied from the previous pass.

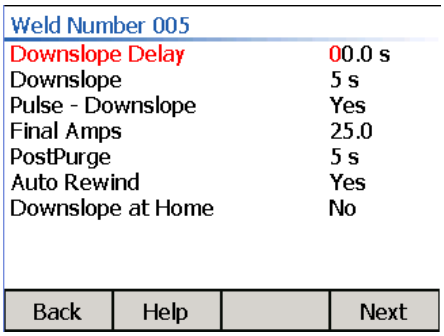


16.3.1.2 Pass 1, Level 2

Move the cursor and enter values with the Rotary Encoder and press Next, or if no change is necessary, press Next.

16.3.1.3 Pass 1, Level 3 to Final Level

Continue moving through the screens for each Level and change parameters as needed.



16.4 Downslope Screen

Move the cursor and enter values with the Rotary Encoder. Press Next when complete.

Downslope Delay - Downslope of weld current will occur immediately at the tie-in of the start location. If an overlap of the weld bead is desired, set the desired seconds of Downslope Delay.

Downslope - Downslope or current taper time period in seconds.

Wire Stop Delay - (For use with Weld Heads with wire feeders only.) Wire feed is normally terminated at the initiation of Downslope. The wire stop delay feature delays the termination of wire feed for an adjustable period (in seconds) after Downslope is initiated. It is useful when welding crack-sensitive materials such as alloys with high nickel content.

Pulsing Downslope - Choice of pulse current or steady state current during downslope period (Yes or No).

Final Amps - Weld current level just prior to arc termination.

Post-purge - Time period gas flows after arc termination (seconds).

Auto Rewind - If this feature is "switched on" (by selecting Yes on the display), it will cause the Weld Head to automatically rewind at completion of a weld and come to a halt at the starting rotational position. Post-purge will also occur simultaneously with auto rewind.

ATTENTION: Turn the Auto rewind function off when using Redhead model Weld Heads. Pre-wrap the torch cable manually prior to welding using the clutch.

Downslope At Home - If this function is left off, program downslope will occur at the time out (completion) of the final level. If this function is turned On with the Rotary Encoder, program downslope will begin exactly as the Home position switch is actuated. (If starting from Home position, this will be one 360° revolution, then Downslope will still occur at 360° Home.

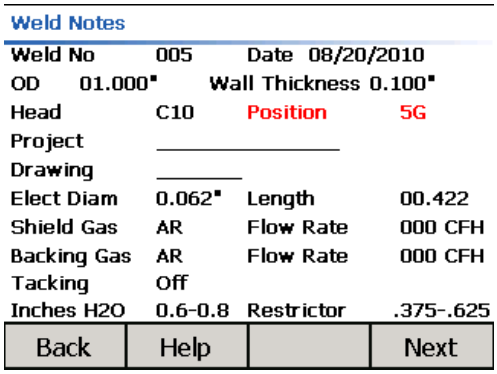
ATTENTION: This may override Level Times. For example, if only one Level of 15 seconds is programmed, for a 1 RPM weld (requiring 60 seconds), the weld will still be made with downslope at Home, even though there was inadequate time to complete the weld in the Total Level Times. If the Level Times are longer than 360°, then Downslope will still occur at 360° Home.

16.5 Parameter Override Screen

Use cursor to select line, **Rotary Encoder** to modify.

16.6 Override Limit Function

The welder may override any of the preprogrammed values, but only within limits that may be defined during programming. The percentage of override limits can be individually programmed for each parameter between 0-100% of the programmed value. Welders can be given sufficient override capacity to compensate for tube fit variations, for example, but be prevented from modifying the original program outside of specified heat input limitations, for example. The override limits are saved with each weld thus allowing for different override values based on which weld is being run.



16.7 Program Information

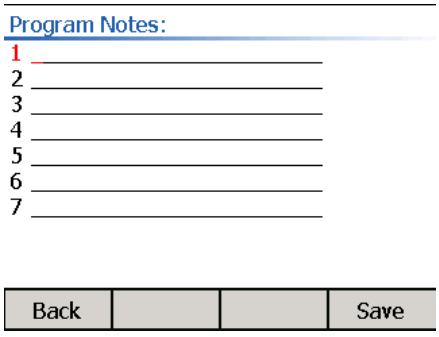
1. Use cursor to select item, **Rotary Encoder** to modify.

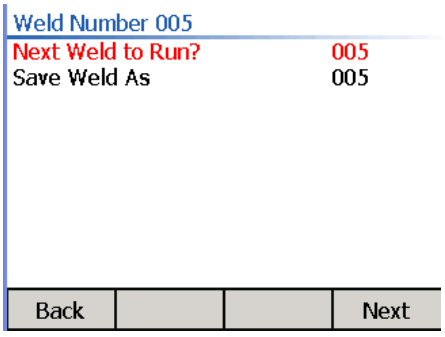
Note: Certain items have been previously selected and cannot be changed (i.e., **Weld No.**, **Data**, **OD**, etc.). The cursor will bypass these items.

Note: To add description under **Project** and **Drawing**, see Section 15.0, *Alphanumeric Labeling*.

2. Record Notes

Use cursor to select line for additional notes. **Save** if all program selections completed (or **Back** to make corrections).





Use cursor to select line, **Rotary Encoder** to modify.

3. Next Weld to Run - Two possible choices:

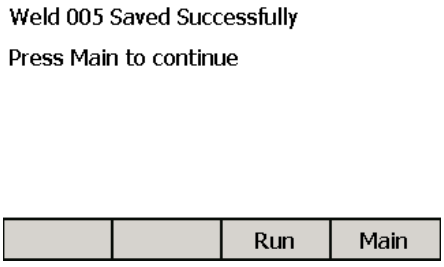
   a. Repeat the weld program. At the completion of a weld, the same program will automatically be loaded, eliminating the need to enter the **Weld Number** again.

   b. Run a different weld program. Press **Next** when finished.

16.8 Completion of Programming

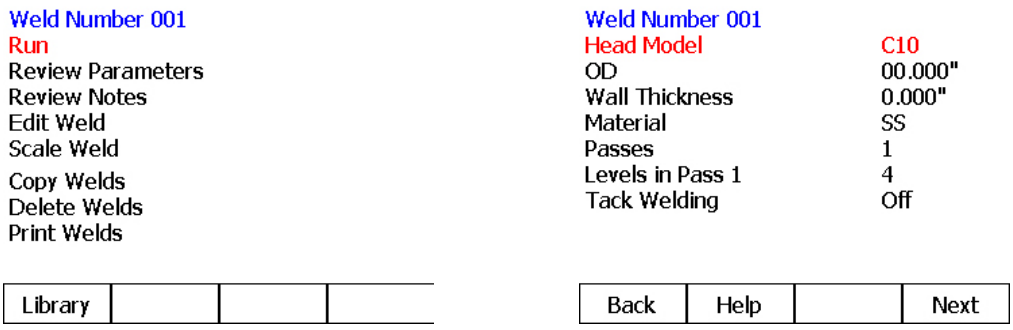
Press Main to exit out to Main Menu.

Press Run to immediately weld with new program.



16.9 Editing a Weld Program

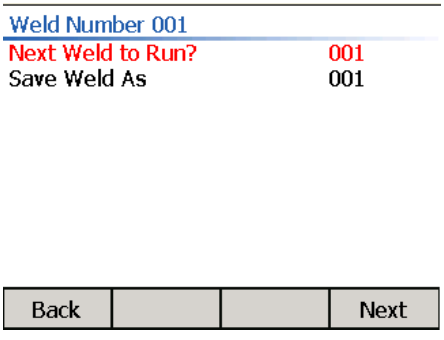
Move cursor to Edit. Press Select.



Use cursor to select item. Modify with Rotary Encoder.

Note: Certain items may not be modified. The cursor will bypass these items.

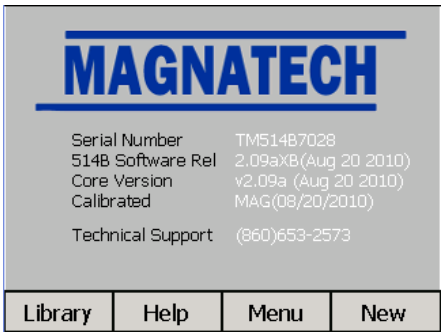
Use Next to move through Levels, editing them as you go.

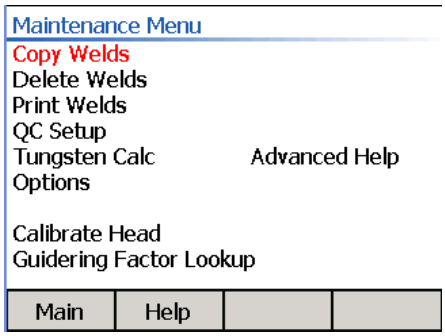


The edited weld will overwrite the original program if the same Weld Number is selected. To create a new program, select an unused program number.

17.0 MENU

From the Main Menu screen, press Menu soft key. This will open the Maintenance Menu screen. Most functions will be password protected if this option is selected.





17.1 Copy Welds (Power source Internal Memory)

It is frequently desirable to copy an existing weld program as a starting point for creating a new weld program for a different tube size, using the editing feature.

From the Maintenance Menu screen, Select Copy Welds and press the Enter key. Enter the desired program numbers for Source Weld and Destination Weld, then press Copy soft key. The Copy function allows the user to copy a weld program within the power source's internal memory. (For example, an existing Weld Number 2 could be copied to Weld Number 10, assuming no program number 10 exists.) The program will not be deleted from Weld Number 2; two copies of the program now exist.

Note: When performing a Copy or Transfer to a destination program of the same number, the new file will not write over the existing file. The existing file may be deleted, or select an unused destination program number.

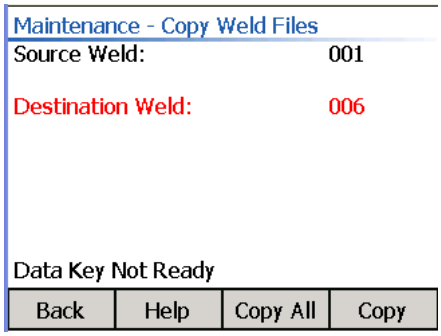
Weld Numbers 1-99 are files stored in the internal memory of the Power Source.

17.2 Copy/Transfer Files to Data Key*

(*These are the actual weld programs, not print files. These are special file types formatted for the welding control system, not man readable files. Transferring program text files on the Data Key is covered in Section 17.5, *Transfer Print Files to Data Key*.)

To Transfer a weld program from internal memory to a Data Key (USB Flash Drive), or vice versa, install a Data Key in the USB connector on the front of the power source.

The Data Key will require approximately 1 minute to initialize, at which time, the LCD on the side of the key will slowly pulse. When it is ready, it will blink rapidly 5 times. To transfer a weld program; from the Maintenance Menu screen, select Copy Welds and press the Enter key. Enter the desired program numbers for Source Weld and Destination Weld, then press Copy soft key. Weld programs 100 and above, indicate a program to be stored (or presently stored) on the Data Key.



Note: When performing a Copy or Transfer to a destination program of the same number, the new file will not write over the existing file. The existing file may be deleted, or select an unused destination program number.

Until the Data Key has finished initializing, a message will appear on the display "Data Key Not Ready". If no Data Key is installed, the ERROR message will also be displayed.

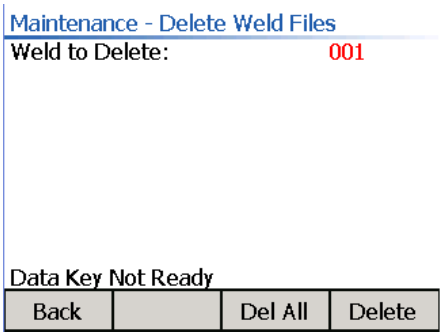
17.3 Delete Welds

The Delete function is used to remove unwanted programs from memory.

From the Maintenance Menu screen, select Delete Welds and press the Enter key. Use the Rotary Encoder to select a weld program. Press Delete soft key.

This feature can also be used to Delete welds from a Data Key, if the key has been installed and initialized. Program on the Data Key will be numbered 100 and higher.

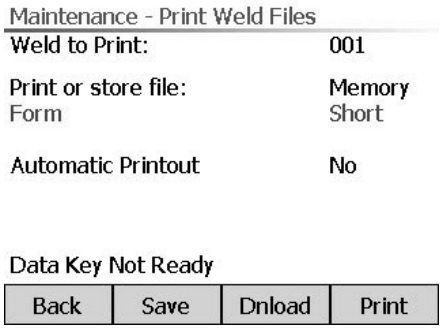
Note: Only existing weld programs are displayed in the Delete screen.



17.4 Print Welds

The Print Weld Files screen allows printing to the built-in paper tape printer and/or an internal memory location. Printing to the printer will provide an immediate hard copy of the weld program. Printing weld programs to memory may be performed one or more times over a period of time, and then downloaded to the Data Key for storage or transferring to other electronic media. The contents of memory will be deleted.

From the Maintenance Menu screen, select Print Welds.



Select Weld To Print. Using Rotary Encoder, enter the Weld Number to print. Select Print or Store File. Use Rotary Encoder to select: Memory, Printer, or Both. Select Short Form (parameters only) or Long Form (parameters, as well as all procedure information and notes). To save settings that have been changed on the Maintenance - Print Weld Files screen, press the Save soft key.

Definitions:

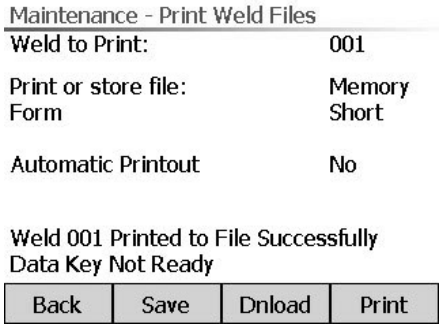
Memory - Internal Memory

Print - Transfer files for printing to integral printer, or Transfer to Data Key for printing using a PC.

Automatic Printout - Set to Yes, the printout will automatically occur following each weld.

17.5 Transfer Print Files to Data Key

The Data Key can be used to transfer or move files to a standard PC equipped with a printer, for subsequent printout. Select the Weld Number to transfer, and use the Rotary Encoder to select Print to Memory, Print, or Both. Press Print soft key. A screen will then state that the weld has been successfully saved to memory. One or more welds can be stored for subsequent printing. (A Data Key does not have to be installed at this time.)



To Transfer a Weld Program from internal memory to a Data Key, install a Data Key in the USB connector at top of Pendant. The Data Key will require approximately 1 minute to initialize, at which time the LCD on the side of the key will slowly pulse. When it is ready, it will blink rapidly 5 times. If no Data Key is installed, or it has not yet finished initializing, an error message will appear on the display. Press the Dnload soft key to download all stored print files to the Data Key.

Attention: Dnload will delete these programs from memory.

The Data Key print files can be opened up in any text editor, such as Microsoft® Word, Microsoft® Notepad, or Microsoft® Excel.

Attention: If an error message is showing, you must return to the Main Menu, and reenter the print screen. "Error" will change to "Dnload". If the Data Key is installed and initialized prior to entering the print screen, this step will not be required.

17.6 QC Settings and Printout (C-Heads & 800 Series Heads Only – Not Available for Other Models)

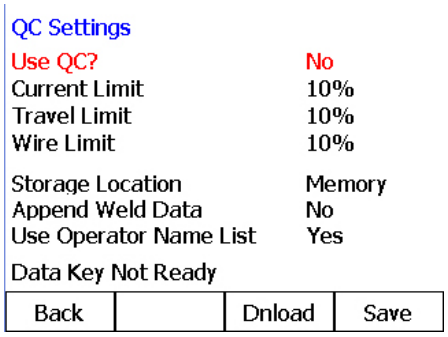
The Tubemaster QC/Error Reporting program provides an immediate unambiguous report following weld completion that a weld was or was not made within user definable acceptable limits. It is not a complex data-logging program and does not require interpretation of chart/graphical printouts of the entire weld. (See typical report.)

The following information is printed out.

- Weld ID Number
- Date
- Time
- Operator's Name
- Acceptable Weld Made Within Preset Limits

OR

- Weld Made Outside of Acceptable Limits
- Function Deviating (for example, High Pulse Current)
- Maximum Deviation
- Elapsed Time at Maximum Deviation
- Location of Deviation in Weld (for example, Level:3)



The program does not report all deviations for any one function - only the maximum deviation and its duration for each function.

The QC program neither alerts the operator during the weld cycle, nor does it automatically terminate welding if a deviation from limits occurs for three reasons:

- The typical work piece welded with the Tubemaster generally cannot be repaired. If defective, it will generally be cut out.
- Interrupting the weld cycle before completion will frequently result in a situation preventing repairs - for example, crater cracking caused by abrupt interruption of the weld current, or distortion caused by a partially completed weld.
- The Welding QC/Inspection personnel may wish to make a final decision whether or not to declare the weld fit for service following additional testing such as radiographic and ultrasonic inspection. Although the weld parameters have deviated from defined limits, it does not automatically mean the weld is defective. The QC limits may have been purposefully conservatively set, and a slight deviation may be acceptable.

To set the window of acceptable values for each parameter, use the Up/Down cursor and Rotary Encoder to select items. Alarm value is programmed value +/- programmed percentage.

ATTENTION: QC cannot be used when using Tack Welding.

ATTENTION: Default Current Alarm is 10%. For programs with current levels below 10 amps, set alarm window at 10% or above.

Select Storage Location: File (internal memory), Printer, Both.

If Printer or Both is selected, it will automatically print out the report (assuming an integral printer is installed). If File is selected, the QC reports will be stored.

17.7 Transfer QC Files to Data Key

The Data Key can be used to transfer or move files to a standard PC equipped with a printer, for subsequent printout. The Rotary Encoder should be set to File, or Both.

To Transfer a Weld Program from internal memory to a Data Key, install a Data Key in the USB front panel connector.

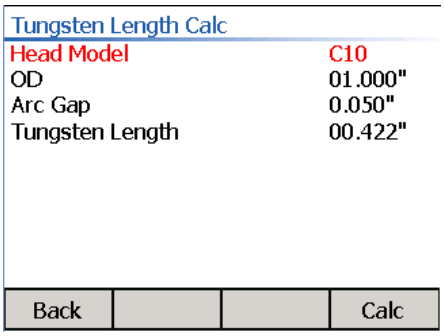
The Data Key will require approximately 1 minute to initialize at which time, the LCD on the side of the key will slowly pulse. When it is ready, it will blink rapidly 5 times. If no Data Key is installed, or it has not yet finished initializing, an error message will appear on the display. Press the Dump soft key to download all stored QC files to the Data Key.

Attention: Dump will delete these programs from memory.

The Data Key QC files can be opened up in any text editor, such as Microsoft® Word, Microsoft® Notepad, or Microsoft® Excel.

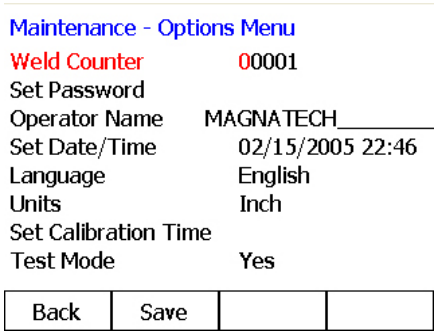
17.8 Tungsten Length Calc.

To determine the optimum cut length for tungsten, refer to this screen. For 800 Series Heads, tungsten length will be calculated based on tube OD.



17.9 Maintenance - Option Menu

Attention: Any changes made on this screen will become active immediately, but will be lost when the power is switched off. To maintain desired changes, use the **Save** soft key after all changes are made on the screen.

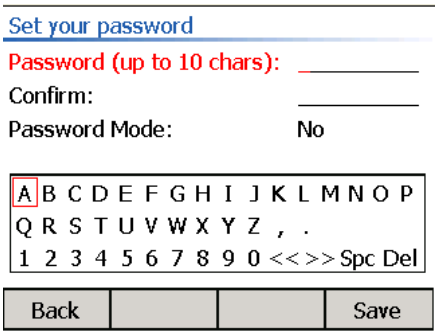


17.9.1 Setting the Weld Counter

At the completion of each weld, the actual parameters run, along with that particular **Weld ID Number**, **Operator Name**, **Time** and **Date** will be stored, and can be printed out. The **Weld Number** will sequentially increase by one digit each weld. The **Weld Counter** can be set/reset to any specific number using the **Rotary Encoder**.

17.9.2 Set Password

Press **Enter** switch. The password screen will appear. Press the **Enter** switch. An alphanumeric pop-up field will appear. Enter a password up to 10 characters using the technique described in Section 15.0, *Alphanumeric Labeling*. Confirm password, press **Save** soft key.



17.9.3 Operator Name

An Operator Name can be entered using the technique described in Section 15.0, *Alphanumeric Labeling*.

17.9.4 Set Date/Time

Enter switch causes Date/Time field to appear. Set Date/Time.

17.9.5 Set Language

Rotary Encoder scrolls through choices.

17.9.6 Units

Rotary Encoder scrolls between *Standard* and *Metric*.

17.9.7 Test Mode

Use Rotary Encoder to select Yes, if Test Mode is to be used. The Test Mode of operation allows simulation of an actual weld with sequencing through the weld program and simultaneous rotation of the Weld Head. Using this function the rotation of the tungsten electrode can be observed in conjunction with the change of the various levels of the program on the display. It is a useful diagnostic tool if a suspected malfunction is occurring during the weld mode. The service technician can operate the system in a simulated weld mode without the need to worry about the presence of an arc.

In Test Mode, the contactor signal to the power supply is disabled - preventing initiation of high frequency and a welding arc. Exit out of the Options Menu. Select a program to run. (TEST MODE will appear prominently on screen). Press Start Weld. Following the pre-purge and current upslope time interval, the rotation motor on the Weld Head will become operational. It will continue operation until termination of the current downslope. If the auto rewind function has been programmed to occur, this will take place following completion of the simulated weld. The gas solenoid will be pulled in during pre-purge, welding, and post-purge.

Please note that for Weld Head models equipped with a filler wire feeder, the filler wire feed motor will be disabled during Test Mode.

17.10 Calibrate Head

The 514C software allows users to calibrate the travel speed for many types of Weld Heads. Certain Weld Heads also have wire feed capability. Many of the heads supported by the 514C software utilize built-in encoders for motor control while others use a tachometer. The encoder-based heads offer better control of the travel and wire motors and therefore little or no adjustment will be required during the calibration process. Tachometer-based heads will typically require adjustment each time they are calibrated. Magnatech recommends that the travel speed and wire feed rate be checked once daily to ensure accuracy.

Table 4, *Weld Head & Feedback* specifies each type of Weld Head currently supported by the 514C software and the type of feedback that is used.

Table 4 - Weld Head & Feedback

Weld Head	Type of Feedback
810, 820, 830, 840, 860	Encoder
C10, C25, C35, C45	Encoder
C10T, C25T, C35T, C45T	Tachometer
R1, R1A, R2, R2A, R3, R3A	Encoder
424, 430	Tachometer
441	Encoder
Arch Machines, Inc. Model Heads *Shown with the prefix "A" when using the 514C*	
82000, 84000	Tachometer
9250, 9500, 9750, 92500, 93500	Tachometer

To calibrate the head, press the **Menu** soft key in the **Main Menu**, bringing you into the **Maintenance Menu**. Once in the **Calibrate Head** menu:

1. First select the model of the head to be calibrated (**Note**: Use the **Up/Down** soft keys to navigate within the menu and the **Enter** key to make a selection).

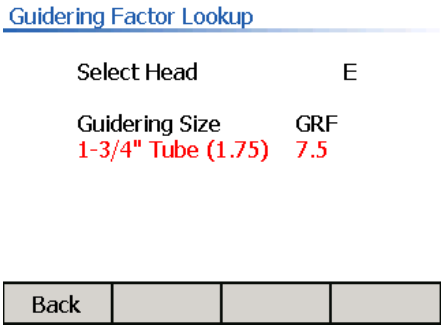
If this is the first time calibrating a particular head or you see a "calibration out of range" error message, press the **Default** key after selecting the head to install a factory loaded correction factor.

2. Select whether it is the *Travel Speed* or the *Wire Feed Rate* that will be calibrated.
3. For travel calibrations, choose the desired **Distance to Travel** or Desired **RPM** by rotating the dial and pressing the **Enter** soft key. (**Note**: For the 441 Weld Head the pipe OD as well as the **Guide Ring Factor** will also need to be entered).
4. Similarly, for wire calibrations adjust the **Amount to Run** by rotating the dial and pressing **Enter**.
5. Press **Run** and measure the actual amount traveled or actual run time (or the length of wire).
6. Enter the measured value and press **Save**.

Repeat this process until the desired accuracy is achieved, then press the **Back** key to return to the **Maintenance Menu**.

17.11 Guide Ring Factor Look-Up (Only for E-Head, Model 441)

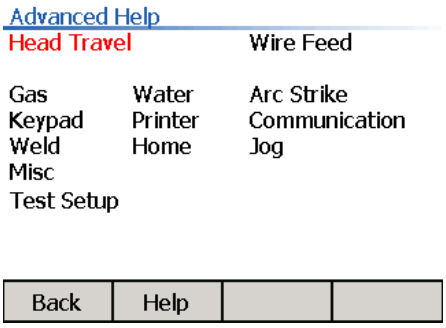
To compensate for the fact that the E-Head is mounted and rotating on the guide ring, which is larger in diameter than the tube or pipe, entering the factor for a specific guide ring allows the Tubemaster to display actual rotation at the pipe surface. The factor is etched on each guide ring, or may be found in this look up table.



Once you enter the OD, wall thickness & material the Tubemaster will automatically choose the correct Guide Ring Factor (GRF) based on the OD. If the OD is not standard tube or pipe size,(i.e. 2.333 instead of 2.375) the system will default to 8.0 for the GRF. If your OD is not standard or you are using an oversized guide ring, you must change the GRF to obtain the correct travel speed.

17.12 Advanced Help

This feature allows the user to diagnose problems which may result from an external situation (i.e. empty gas bottle), or an internal situation (i.e. the head control cable damaged or not connected). Advanced Help provides assistance for the operator as well as for a competent electric repair technician.



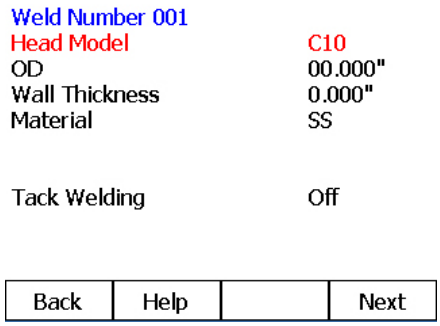
Note: Additional service manuals are available from the factory

- Advanced Help – For Operator Use
- Advanced Help – For Technician Use

18.0 AUTOTACK

Tack welding is useful when welding larger diameter tubes, which Autotack will automatically generate a tack welding program. Select 4 or 8 equally spaced tacks. Tacking parameters will penetrate approximately 70% of the tube wall. If the intention is to make the weld immediately following tacking, set the welding program as the "Next Weld to Run" and the program will be loaded automatically.

ATTENTION: Do not use QC with Autotack.



19.0 PRINTER OPERATION/MAINTENANCE

An optional printer is available for printing weld programs. The printout also allows other data on the weld program to be printed. The printout lists all weld parameters for each level in the program selected.

The printer is mounted in the front panel of the Tubemaster. The printouts will remain stable for at least seven (7) years, making them suitable for archival purposes. The printer is supplied with DC power by the Tubemaster.

19.1 Installing Paper in the Printer

Open the hinged plastic covers over the paper roll. Push the Paper Feed switch to remove the remaining paper from the printer. Cut the end of the paper on the new roll to remove any ragged edges. Insert the tip of the paper into the insertion slot and press the Paper Feed switch.

Note: The roll should be oriented so that the paper is feeding off the bottom of the roll. Keep the Feed Switch depressed until the paper comes out of the paper cutter. A red line will appear when the remaining supply of paper on the roll becomes low. Lower the plastic covers. This printer uses Thermal Paper P/N 41004.

19.1.1 Cleaning the printer

The surface of the printer can be cleaned using a soft dry cloth or a soft cloth with a neutral detergent. Do not clean using any solvents. Never wet the inside of the printer.

20.0 FACTORY AND FIELD CALIBRATION

Magnatech calibrates each system using instrumentation traceable to National Standards (NIST). All instruments are checked for accuracy by independent laboratories at scheduled intervals. We recommend that equipment be recalibrated every twelve (12) months.

The user may recalibrate the power source and Weld Heads providing he has instruments available (with traceable calibration). Contact the factory.

21.0 ERROR MESSAGES

Certain internal and external problems will result in error messages being displayed, and in some cases further actions. For example, if the operator attempts to start a weld without the flow of shielding gas, pressing the start weld switch will result in an error message. The weld start sequence will be terminated. If gas flow is interrupted during the weld sequence, welding will be terminated, and the indicated error message will be displayed “Weld Aborted: Check Gas Supply”.

22.0 UPDATING SOFTWARE

The 514C now allows a complete software upgrade of both the main computer (Bitsy XB) and the core microprocessor (Rabbit Processors) via the Data Key or thumb-drive. This software can be sent as an e-mail attachment.

Please contact Magnatech’s service department for upgrade information. Please have the serial number of your unit, as well as the software release number, and the core version number handy.

23.0 TERMS AND DEFINITIONS

Backing Gas	Flow rate for ID purge of tube
Backing Gas Flow Rate	Flow rate in CFH or LPM
Downslope at Home	A switch signals each 360º rotation of the Weld Head. The weld can be programmed to downslope after timeout of all levels, or when this switch is contacted.
Elect Diam	Diameter of tungsten electrode (inches or mm)
Final Amps	Weld current level just prior to arc ignition.
Length	Tungsten electrode (inches or mm)
Levels in Pass 1	The number of parameter levels the user wants to use in programming each 360º rotation.
LP RPM	Rotation speed on low current pulse (shown only when RPM Step is turned on). Can be set at any percentage from 0-99.
Material	Tube material composition
Passes	The number of 360º rotations around the tube.
Position	Gravity position (orientation of weld joint with respect to gravity)
Post-purge	Time period gas flows after arc termination (seconds).
Pre-purge	Time period gas flows at weld start before arc ignition (seconds)
Pulsing Downslope	Choice of pulse current or steady state current during downslope period (Yes or No).
Pulsing Levels	Pulsed current
RPM Step	Rotation step function, Index of torch rotation with pulsed current. Can be turned off (RPM Step No.). When turned on (RPM Step Yes), torch will rotate forward during low pulse time period and stop during high pulse time period.
Shield Gas	Gas type used for torch
Shield Gas Flow Rate	Flow rate in CFH or LPM
Start Amps	Current level at which arc is initiated
Tack Welding	Use of a small number of spot or tack welds around tube to maintain alignment prior to start of weld program.
Tacking	Use of a small number of spot or tack welds around tube to maintain alignment prior to start of weld program
Travel Delay	Delay period (seconds) beginning at end of upslope before rotation begins. Used to establish penetration.
Upslope	Time period in seconds that weld current ramps up from start amps value to level 1 value
Wall Thickness	Dimension of tube wall (inches or mm)
Wire Start Delay	Delay period (seconds) beginning at end of upslope before wire feeding is initiated.
Wire Stop Delay	Filler wire feed normally terminated immediately at downslope initiation. Wire stop delay will cause wire feed to continue during a portion of downslope period (seconds).

24.0 ACRONYMS

AC	Alternating Current
A/R	As Required
AGC	Arc Gap Control
ANSI	Association of National Standards Institute
AVC	Arc Voltage Control
AWS	American Welding Society
C	Celsius
CCW	Counter Clockwise
CGA	Compressed Gas Association
CFH	Cubic Feet per Hour
CSA	Canadian Standards Association
DC	Direct Current
DHHS	Department of Health and Human Services
EMF	Electromagnetic Field
ESD	Electrostatic Discharge
F	Fahrenheit
FCAW	Flux-Cored Arc Welding
GMAW	Gas Metal Arc Welding
GPH	Gallons per Hour
GPM	Gallons per Minute
GRF	Guide Ring Factor
GTAW	Gas Tungsten Arc Welding
H.F.	High-Frequency
HPT	High Pulse Time period, in seconds
I.D.	Inside Diameter
IEC	International Electrotechnical Commission
IPM	Inches per Minute
LCD	Liquid-Crystal Display
LPM	Liters per Minute
LPT	Low Pulse Time period, in seconds
MIG	Metal Inert Gas
MSDS	Material Safety Data Sheet
NEMA	National Electrical Manufacturers Association
NIOSH	National Institute for Occupational Safety and Health
NPFA	National Fire Prevention Association
O.D.	Outside Diameter
OSHA	Occupational Safety and Health Administration
PQR	Procedure Qualification Record
PSI	Pounds per Square Inch
RPM	Rotations per Minute
TIG	Tungsten Inert Gas
UOM	Unit of Measure
USB	Universal Serial Bus
VAC	Voltage Alternating Current
VBG	Verband der Berufsgenossenschaften (Federation of Trade Associations)
VDE	Verband deutscher Elektroingenieure (Association of German Electrical Engineers)
WPS	Welding Procedure Specification

APPENDIX A

BILLS OF MATERIALS/DRAWINGS

Part Number	Nomenclature
A1. Tubemaster Model 514CPower Source	
514C Key Sheet	Model 514C – Tubemaster Key Sheet
104265-1	Power Cord (230V)
1000576	Chassis Assembly, Rear, Model 514C, Tubemaster
1000577	Tubemaster Assembly, Model 514C
1001552	Chassis Assembly, Rear , Model 514C, Tubemaster w/Out EMI Filter Kit
1001553	Tubemaster Assembly, Model 514C w/Out EMI Filter Kit
1001745	Chassis Assembly, Front, Model 514C, Tubemaster
1000577-SCH	Model 514C Tubemaster Schematic
A2. Water Cooler Model 904A	
1000422	Radiator & Fan Assembly, Water Cooler Model 904A
105646-1	Water Cooler Assembly, Model 904A
105655-1	Pump & Fittings Assembly, 904A Water Cooler
105657-1	Flow Switch, Valve & Fittings Assembly, 904A Water Cooler
104500-SCH	Water Cooler with Integral Flow Switch Schematic

REVISION HISTORY			
REV.	CHANGE DESCRIPTION	DATE	BY
AA	INITIAL RELEASE (ECO 10125)	2011-03-28	IE
AB	ADDED:104623-4 AND 104623-5 (ECO 10183)	2011-07-06	IE
AC	REMOVED: 104500-1 AND 104636, ADDED: 514C0J0AN0 AND 514C0K0AN0 (ECO 10516)	2012-11-30	IE

KEY SHEET

MAGNATECH LLC
EAST GRANBY, CT 06026

DESCRIPTION

MODEL 514 C - TUBEMASTER

DRAWN BY: I.E.

DATE: 2012-11-30

SHEET 1 OF 3

SIZE	DRAWING NO.	REV
A	514 C KEY SHEET	AC

REV	PART NUMBER	DESCRIPTION	QTY	
AA	**514C0J0A00**	**MODEL 514 C, TUBEMASTER – 115 VAC**	**1**	
	1000577	TUBEMASTER ASSEMBLY – MODEL 514 C		1
	104265-2	POWER CORD ASSEMBLY – 115 VAC		1
	103404-GHGHB-10	HOSE AND FITTINGS ASSEMBLY – #21FQD x 1/4ID x "B" RH MALE, 10 Ft.		1
	51773	USB FLASH DRIVE		1
AA	**514C0K0A00**	**MODEL 514 C, TUBEMASTER – 230 VAC**	**1**	
	1000577	TUBEMASTER ASSEMBLY – MODEL 514 C		1
	104265-1	POWER CORD ASSEMBLY – 230 VAC		1
	103404-GHGHB-10	HOSE AND FITTINGS ASSEMBLY – #21FQD x 1/4ID x "B" RH MALE, 10 Ft.		1
	51773	USB FLASH DRIVE		1
AA	**514C0J0AN0**	**MODEL 514 C, TUBEMASTER – 115 VAC, WITHOUT EMI FILTER KIT**	**1**	
	1001553	TUBEMASTER ASSEMBLY – MODEL 514 C, WITHOUT EMI FILTER KIT		1
	104265-2	POWER CORD ASSEMBLY – 115 VAC		1
	103404-GHGHB-10	HOSE AND FITTINGS ASSEMBLY – #21FQD x 1/4ID x "B" RH MALE, 10 Ft.		1
	51773	USB FLASH DRIVE		1
AA	**514C0K0AN0**	**MODEL 514 C, TUBEMASTER – 230 VAC, WITHOUT EMI FILTER KIT**	**1**	
	1001553	TUBEMASTER ASSEMBLY – MODEL 514 C, WITHOUT EMI FILTER KIT		1
	104265-1	POWER CORD ASSEMBLY – 230 VAC		1
	103404-GHGHB-10	HOSE AND FITTINGS ASSEMBLY – #21FQD x 1/4ID x "B" RH MALE, 10 Ft.		1
	51773	USB FLASH DRIVE		1

OPTIONS

PART NUMBER	DESCRIPTION	QTY
NONE		
104623-1	PENDANT KIT - MODEL 514, R-HEAD	1
104623-2	PENDANT KIT - MODEL 514, E-HEAD	1
104623-3	PENDANT KIT - MODEL 514, C-HEAD	1
104623-4	PENDANT KIT - MODEL 514, AMI FUSION WELD HEAD	1
104623-5	PENDANT KIT - MODEL 514, TACH. C-HEAD	1
104619-25	EXTENSION CABLE ASSEMBLY - 25 Ft.	1 Max.
41004	PRINTER PAPER, ROLL	1
102293-2-25	WORK CABLE ASSEMBLY – 25 Ft., FEMALE (NOT REQ'D WITH C-HEADS)	1
41014	SHIPPING CASE WITH FOAM - MODEL 514	1
104637-1	JUMPER ASSEMBLY, WATER FLOW SWITCH - FOR MODEL 514	1
105646-1	WATER COOLER - MODEL 904 A	1
41015	SHIPPING CASE WITH FOAM - MODEL 904	1
7-2850	COOLANT, PREMIXED - DEIONIZED WATER / ETHYLENE GLYCOL	1 Gal.
105240-1	T I G HAND TORCH KIT - 514 TUBEMASTER	1

MAGNATECH LIMITED PARTNERSHIP
EAST GRANBY, CONNECTICUT 06026

01/07/10

BILL OF MATERIALS

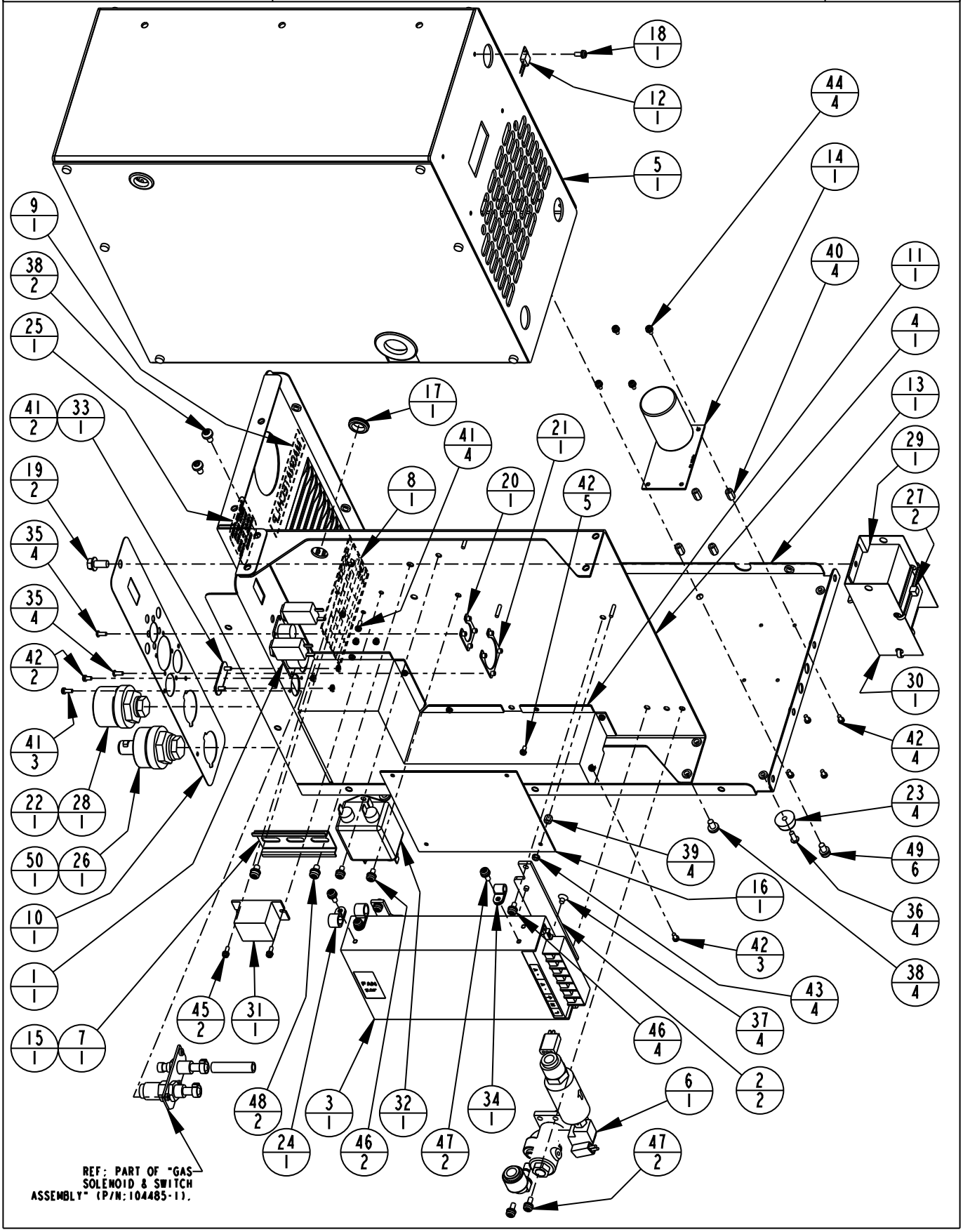
POWER CORD ASSEMBLY

104265-X

PART NUMBER	DESCRIPTION	QUANTITY USED
104265-1	230 VAC Power Cord Assembly	1
51571	Power Connector	1
51617	Power Cord (10# AWG/3)	10’
51618	Ferrule	6
104265-2	115 VAC Power Cord Assembly	1
51571	Power Connector	1
51641	Power Cord (#14 AWG/3)	10’
50068	115 VAC Plug	1

	CHANGE DESCRIPTION	BY	DATE
	IN ASSEMBLY 104265-1, PART 51618 WAS (3) (ECO #10003)	IE	01/07/10
			05/03/02
	INITIAL RELEASE		11/05/01

MAGNATECH LIMITED PARTNERSHIP EAST GRANBY, CT 06026 USA	CHASSIS ASSEMBLY, REAR MODEL 514 C, TUBEMASTER 1000576	Sht 1 of 2 1000576 Rev. AC



MAGNATECH LIMITED PARTNERSHIP
EAST GRANBY, CT 06026 USA

CHASSIS ASSEMBLY, REAR
MODEL 514 C, TUBEMASTER
1000576

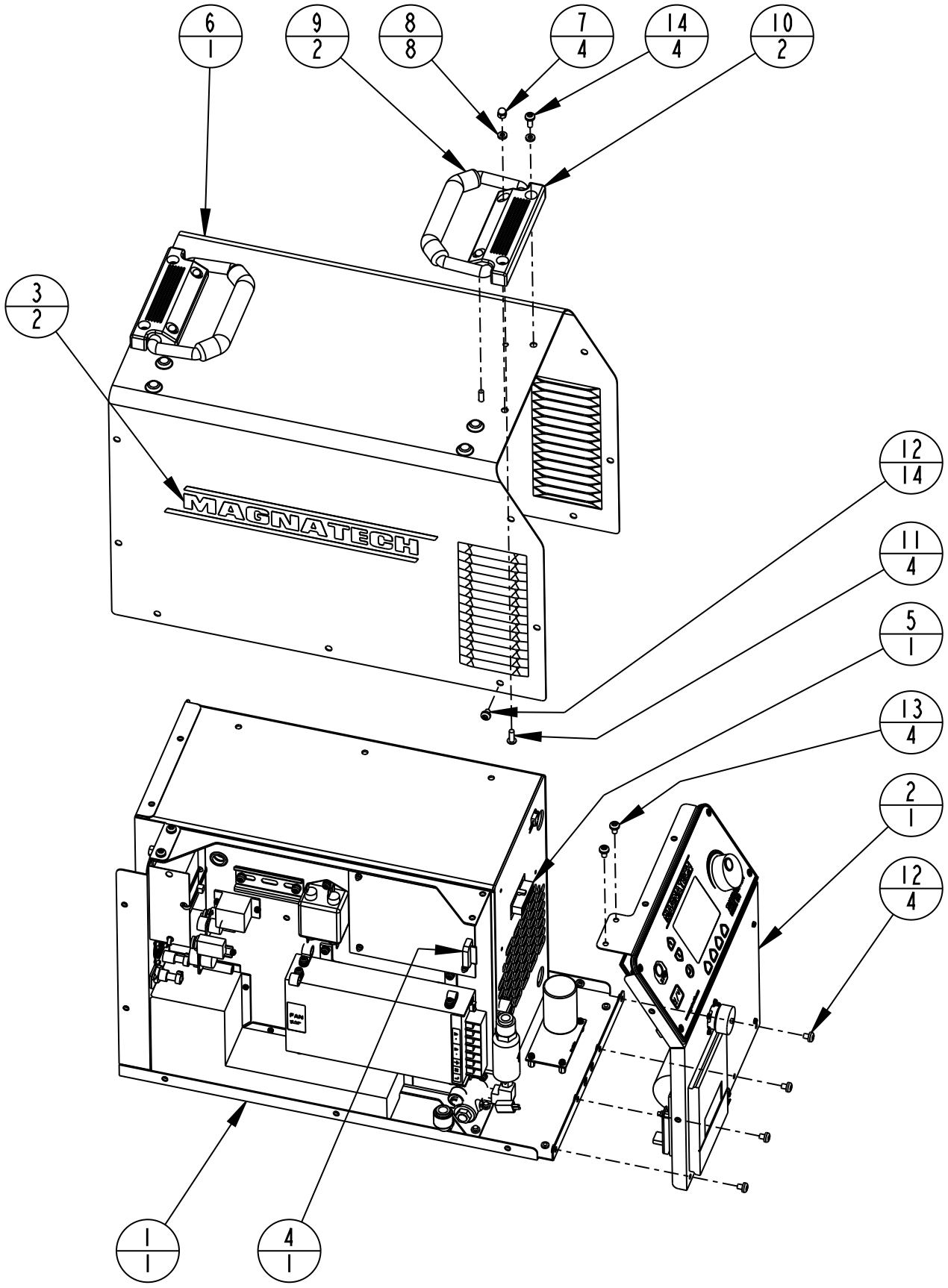
1000576
Rev. AC

#	PART #	DESCRIPTION	QTY	TYPE
1	1000246	CONTROL CHASSIS WIRING HARNESS - MODEL 514 C	1	ASSEMBLY
2	1000553	PLATE, MOUNTING - DC POWER SUPPLY, 514 C	2	PART
3	1000575	POWER SUPPLY WITH POWER CABLE ASSEMBLY - 300 W, TM MODEL 514 C	1	ASSEMBLY
4	104470-1	CHASSIS W/ INSERTS, CONTROL - TUBEMASTER, MODEL 514	1	ASSEMBLY
5	104483-2	WELDING P/S W/ PIGTAILS - MODEL 514A	1	ASSEMBLY
6	104485-1	GAS SOLENOID & SWITCH ASSY - MODEL 514	1	ASSEMBLY
7	104489-1	DIN RAIL ASSEMBLY - MODEL 514 TUBEMASTER	1	ASSEMBLY
8	104498-1	LABEL, POWER INPUT - MODEL 514	1	PART
9	104498-2	POWER RATING LABEL - MODEL 514	1	PART
10	104516-1	LABEL, REAR SERVICES - MODEL 514	1	PART
11	104661-1	EMI SHIELD W/ INSERTS - 514/515	1	ASSEMBLY
12	104843-1	THERMOSTAT ASSEMBLY, 45 C - (PIGTAIL NOT SHOWN)	1	ASSEMBLY
13	104941-1	CHASSIS BASE W/ INSERTS - MODEL 514, TUBEMASTER	1	ASSEMBLY
14	105374	PC BOARD, POWER DISTRIBUTION - MODEL 514	1	ASSEMBLY
15	105377-1	WIRE LIST TO TUBEMASTER ASSEMBLY - MODEL 514 A, 104942-1	1	ASSEMBLY
16	105535	DRIVER PCB ASSY - MODEL 514 B	1	ASSEMBLY
17	10557	GROMMET, RUBBER - 1/21D X 5/8 X 1/16	1	PART
18	11224	SCREW, PNHDPHIL SEMS - #6-32 X 5/16, EXT, 18-8	1	PART
19	11232	SCREW, HXHDSL - 1/4-20 X 1/2, SELF TAP	2	PART
20	11253-10-M3	NUT PLATE, CONNECTOR - #10, M3	1	PART
21	11253-18-M3	NUT PLATE, CONNECTOR - #18, M3	1	PART
22	11277	WASHER, FLAT - 3/8 X 3/4 OD, BRASS	1	PART
23	25030	FOOT, PLASTIC - 3/4 DIA X 3/8 HIGH	4	PART
24	3778	CLAMP, CABLE - 3/8	1	PART
25	41016	LABEL, WHITE ON RED VINYL - ''TURN OFF...''	1	PART
26	51039	CURRENT PLUG, MALE - PANEL MOUNT	1	PART
27	51297-C101	TIE WRAP, NYLON - .14 X 5-1/2	2	PART
28	51318	CURRENT PLUG, FEMALE - PANEL MOUNT	1	PART
29	51577	SWITCH, TOGGLE - 40A-600V AC, 2 POL	1	PART
30	51616	INSULATOR, SWITCH - POWER	1	PART
31	51720	RELAY, FLANGE MOUNT - 10 AMP	1	PART
32	51795	RFI FILTER, POWER LINE - 3A, COM/DIFF MODE	1	PART
33	80048-SS	KEEPER, LATCH - SMALL, SS	1	PART
34	8077	CLAMP, CABLE - 1/4	1	PART
35	M102-03C-08-3	SCREW, BUTHD - M3 X .50 X 8MM	8	PART
36	M102-04C-10-3	SCREW, BUTHD - M4 X .70 X 10MM	4	PART
37	M103-04C-06-3	SCREW, FLHDSOC - M4 X .70 X6MM	4	PART
38	M113-05C-08-8	SCREW, PANHD PHIL - M5 X 8MM, 18-8 SS	6	PART
39	M20026	STANDOFF, HEX F/F - M3 X 6MM PLTD BRASS	4	PART
40	M20033	STANDOFF, HEX F/F - M3 X 10MM PLTD BRASS	4	PART
41	M20035	SCREW, PNHDPHIL SEMS - M3 X 8, INT, 18-8	9	PART
42	M20036	SCREW, PNHDPHIL SEMS - M3 X 6, INT, 18-8	14	PART
43	M20037	NUT, SEMS HEX - M3, STEEL, ZINC	4	PART
44	M20039	SCREW, PNHDPHIL DBL SEMS - M3 X 6, W/S-F 6mm ZN	4	PART
45	M20040	SCREW, PNHDPHIL DBL SEMS - M3 X 8, W/S-F 6mm ZN	2	PART
46	M20041	SCREW, PNHDPHIL DBL SEMS - M4 X 8, W/S-F 8mm ZN	6	PART
47	M20042	SCREW, PNHDPHIL DBL SEMS - M4 X 10, W/S-F 8mm ZN	4	PART
48	M20043	SCREW, PNHDPHIL DBL SEMS - M5 X 8, W/S-F 10mm ZN	2	PART
49	M20058	SCREW, PNHDPHIL DBL SEMS - M5 X 10, W/S-F 10mm ZN	6	PART
50	M20072	WASHER, FLAT - M12, DIN 125, BRASS	1	PART

NOTES:
1. DISCARD THE ORIGINAL FLAT WASHERS PROVIDED WITH CURRENT PLUGS P/N: 51039 AND 51318.

REV.	CHANGE DESCRIPTION	DATE	BY
AC	REMOVED 11256, 10604 AND 10945-1 ; ADDED NOTES (ECO # 10488)	1E	08/22/12
AB	REMOVED 10945 ; ADDED: 11277, M20072 AND 10604 (ECO #10394)	1E	05/11/12
AA	INITIAL RELEASE	1E	03/28/11

MAGNATECH LIMITED PARTNERSHIP EAST GRANBY, CT 06026 USA	TUBEMASTER ASSEMBLY MODEL 514 C 1000577	Sht 1 of 2 1000577 Rev. AD



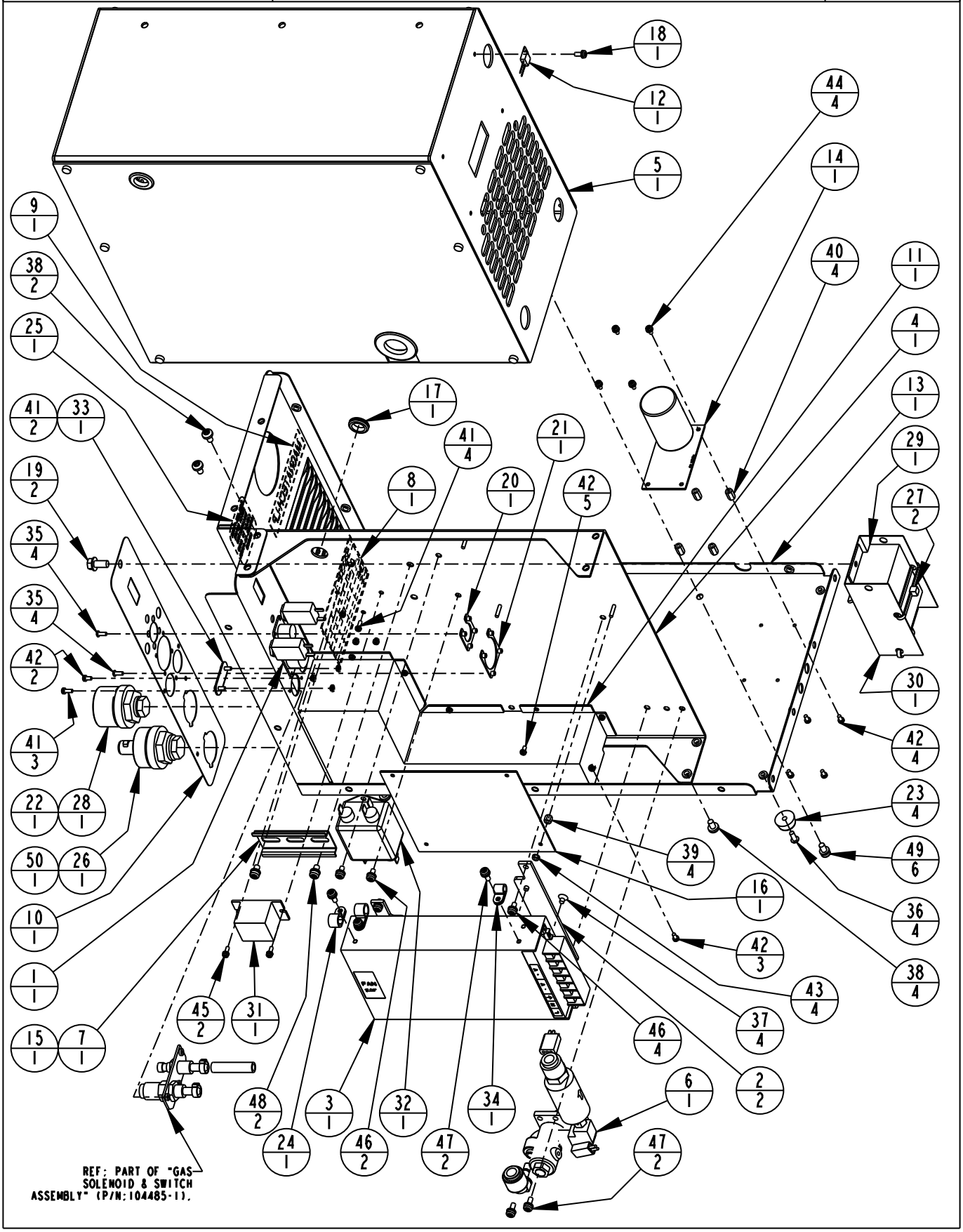
MAGNATECH LIMITED PARTNERSHIP
EAST GRANBY, CT 06026 USA

TUBEMASTER ASSEMBLY
MODEL 514 C
1000577

#	PART #	DESCRIPTION	QTY	TYPE
1	1000576	CHASSIS ASSEMBLY, REAR - MODEL 514 C, TUBEMASTER	1	ASSEMBLY
2	1001745	CHASSIS ASSEMBLY, FRONT - MODEL 514 C, TUBEMASTER	1	ASSEMBLY
3	1001770	LABEL, "MAGNATECH" LOGO - RED CUT VINYL, 12 x 1-3/4	2	PART
4	104491-1	CABLE ASSEMBLY, RIBBON - 20 PINS, DRIVER TO CONTROL	1	ASSEMBLY
5	104499-1	HARNESS, POWER SOURCE CONTROL - MODEL 514	1	ASSEMBLY
6	104945-1	COVER, TUBEMASTER - MODEL 514	1	PART
7	11231	HEX NUT, ACORN - M5, SS	4	PART
8	11252	WASHER, SEALING - #10 X 3/8OD	8	PART
9	80096	HANDLE, OVER-MOLDED -	2	PART
10	80097	SADDLE, CLAMP - HANDLE	2	PART
11	M102-05C-14-C	SCREW, BUTHD - M5 X .80 X 14MM	4	PART
12	M113-05C-06-8	SCREW, PANHD PHIL - M5 X 6MM, 18-8 SS	18	PART
13	M113-05C-08-8	SCREW, PANHD PHIL - M5 X 8MM, 18-8 SS	4	PART
14	M113-05C-12-8	SCREW, PANHD PHIL - M5X12MM, 18-8 SS	4	PART

REV.	CHANGE DESCRIPTION	BY	DATE
AD	CHANGED APPEARANCE BECAUSE OF NEW SIDE LABELS AND NEW FRONT PANEL KEYPAD. (ECO # 10772)	IE	08/01/13
AC	1001770 WAS 41013 (ECO # 10768)	IE	07/30/13
AB	1001745 WAS 104944-2 (ECO # 10716)	IE	05/22/13
AA	INITIAL RELEASE (ECO # 10125)	IE	03/28/11

MAGNATECH LIMITED PARTNERSHIP EAST GRANBY, CT 06026 USA	CHASSIS ASSEMBLY, REAR MODEL 514 C, TUBEMASTER WITHOUT EMI FILTER KIT 1001552	Sht 1 of 2 1001552 Rev. AA



MAGNATECH LIMITED PARTNERSHIP
EAST GRANBY, CT 06026 USA

CHASSIS ASSEMBLY, REAR
MODEL 514 C, TUBEMASTER WITHOUT EMI FILTER KIT
1001552

1001552
Rev. AA

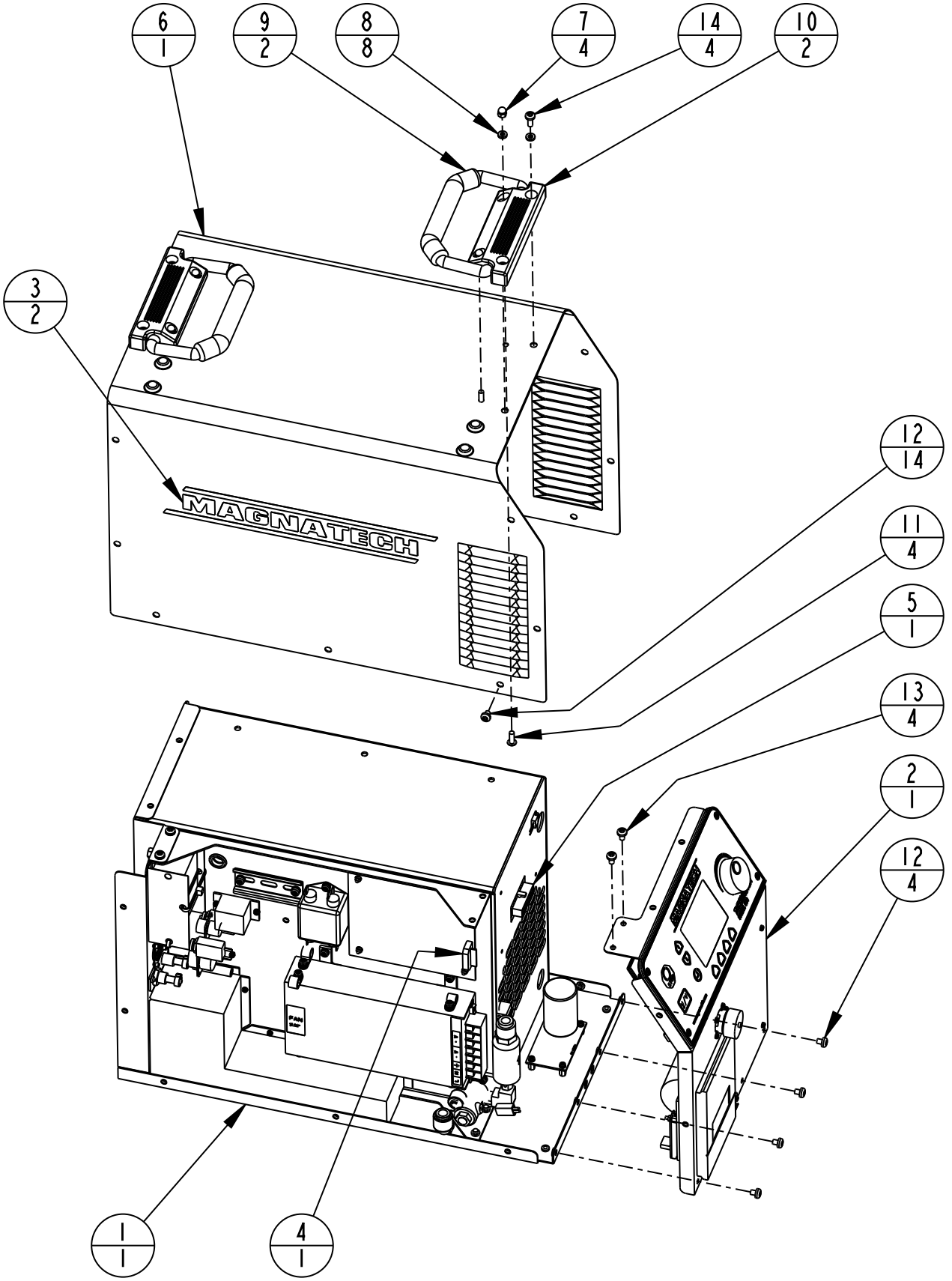
#	PART #	DESCRIPTION	QTY	TYPE
1	1000246	CONTROL CHASSIS WIRING HARNESS - MODEL 514 C	1	ASSEMBLY
2	1000553	PLATE, MOUNTING - DC POWER SUPPLY, 514 C	2	PART
3	1000575	POWER SUPPLY WITH POWER CABLE ASSEMBLY - 300 W, TM MODEL 514 C	1	ASSEMBLY
4	104470-1	CHASSIS W/ INSERTS, CONTROL - TUBEMASTER, MODEL 514	1	ASSEMBLY
5	104483-4	WELDING P/S W/ PIGTAILS - MODEL 514 C W/OUT EMI FILTER KIT	1	ASSEMBLY
6	104485-1	GAS SOLENOID & SWITCH ASSY - MODEL 514	1	ASSEMBLY
7	104489-1	DIN RAIL ASSEMBLY - MODEL 514 TUBEMASTER	1	ASSEMBLY
8	104498-1	LABEL, POWER INPUT - MODEL 514	1	PART
9	104498-2	POWER RATING LABEL - MODEL 514	1	PART
10	104516-1	LABEL, REAR SERVICES - MODEL 514	1	PART
11	104661-1	EMI SHIELD W/ INSERTS - 514/515	1	ASSEMBLY
12	104843-1	THERMOSTAT ASSEMBLY, 45 C - (PIGTAIL NOT SHOWN)	1	ASSEMBLY
13	104941-1	CHASSIS BASE W/ INSERTS - MODEL 514, TUBEMASTER	1	ASSEMBLY
14	105374	PC BOARD, POWER DISTRIBUTION - MODEL 514	1	ASSEMBLY
15	105377-1	WIRE LIST TO TUBEMASTER ASSEMBLY - MODEL 514 A, 104942-1	1	ASSEMBLY
16	105535	DRIVER PCB ASSY - MODEL 514 B	1	ASSEMBLY
17	10557	GROMMET, RUBBER - 1/21D X 5/8 X 1/16	1	PART
18	11224	SCREW, PNHDPHIL SEMS - #6-32 X 5/16, EXT, 18-8	1	PART
19	11232	SCREW, HXHDSL - 1/4-20 X 1/2, SELF TAP	2	PART
20	11253-10-M3	NUT PLATE, CONNECTOR - #10, M3	1	PART
21	11253-18-M3	NUT PLATE, CONNECTOR - #18, M3	1	PART
22	11277	WASHER, FLAT - 3/8 X 3/4 OD, BRASS	1	PART
23	25030	FOOT, PLASTIC - 3/4 DIA X 3/8 HIGH	4	PART
24	3778	CLAMP, CABLE - 3/8	1	PART
25	41016	LABEL, WHITE ON RED VINYL - ''TURN OFF...''	1	PART
26	51039	CURRENT PLUG, MALE - PANEL MOUNT	1	PART
27	51297-C101	TIE WRAP, NYLON - .14 X 5-1/2	2	PART
28	51318	CURRENT PLUG, FEMALE - PANEL MOUNT	1	PART
29	51577	SWITCH, TOGGLE - 40A-600V AC, 2 POL	1	PART
30	51616	INSULATOR, SWITCH - POWER	1	PART
31	51720	RELAY, FLANGE MOUNT - 10 AMP	1	PART
32	51795	RFI FILTER, POWER LINE - 3A, COM/DIFF MODE	1	PART
33	80048-SS	KEEPER, LATCH - SMALL, SS	1	PART
34	8077	CLAMP, CABLE - 1/4	1	PART
35	M102-03C-08-3	SCREW, BUTHD - M3 X .50 X 8MM	8	PART
36	M102-04C-10-3	SCREW, BUTHD - M4 X .70 X 10MM	4	PART
37	M103-04C-06-3	SCREW, FLHDSOC - M4 X .70 X6MM	4	PART
38	M113-05C-08-8	SCREW, PANHD PHIL - M5 X 8MM, 18-8 SS	6	PART
39	M20026	STANDOFF, HEX F/F - M3 X 6MM PLTD BRASS	4	PART
40	M20033	STANDOFF, HEX F/F - M3 X 10MM PLTD BRASS	4	PART
41	M20035	SCREW, PNHDPHIL SEMS - M3 X 8, INT, 18-8	9	PART
42	M20036	SCREW, PNHDPHIL SEMS - M3 X 6, INT, 18-8	14	PART
43	M20037	NUT, SEMS HEX - M3, STEEL, ZINC	4	PART
44	M20039	SCREW, PNHDPHIL DBL SEMS - M3 X 6, W/S-F 6mm ZN	4	PART
45	M20040	SCREW, PNHDPHIL DBL SEMS - M3 X 8, W/S-F 6mm ZN	2	PART
46	M20041	SCREW, PNHDPHIL DBL SEMS - M4 X 8, W/S-F 8mm ZN	6	PART
47	M20042	SCREW, PNHDPHIL DBL SEMS - M4 X 10, W/S-F 8mm ZN	4	PART
48	M20043	SCREW, PNHDPHIL DBL SEMS - M5 X 8, W/S-F 10mm ZN	2	PART
49	M20058	SCREW, PNHDPHIL DBL SEMS - M5 X 10, W/S-F 10mm ZN	6	PART
50	M20072	WASHER, FLAT - M12, DIN 125, BRASS	1	PART

NOTES:

1. DISCARD THE ORIGINAL FLAT WASHERS PROVIDED WITH CURRENT PLUGS P/N: 51039 AND 51318.

REV.	CHANGE DESCRIPTION	DATE	BY
AA	INITIAL RELEASE (ECO # 10516)	IE	11/30/12

MAGNATECH LIMITED PARTNERSHIP EAST GRANBY, CT 06026 USA	TUBEMASTER ASSEMBLY MODEL 514 C WITHOUT EMI FILTER KIT 1001553	Sht 1 of 2 1001553 Rev. AD



MAGNATECH LIMITED PARTNERSHIP
EAST GRANBY, CT 06026 USA

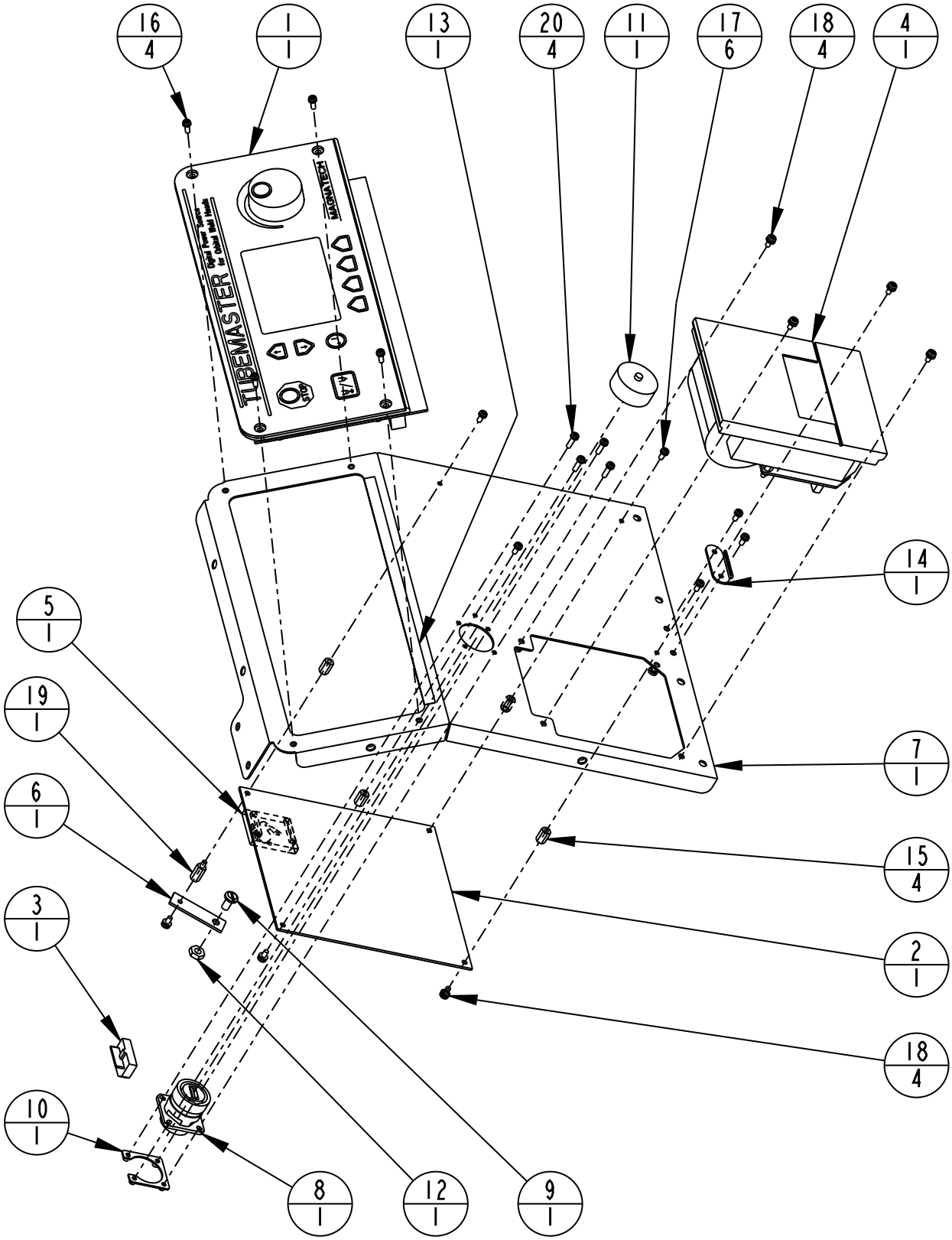
TUBEMASTER ASSEMBLY
MODEL 514 C WITHOUT EMI FILTER KIT
1001553

Sht 2 of 2
1001553
Rev. AD

#	PART #	DESCRIPTION	QTY	TYPE
1	1001552	CHASSIS ASSEMBLY, REAR - MODEL 514 C, TUBEMASTER WITHOUT EMI FILTER KIT	1	ASSEMBLY
2	1001745	CHASSIS ASSEMBLY, FRONT - MODEL 514 C, TUBEMASTER	1	ASSEMBLY
3	1001770	LABEL, "MAGNATECH" LOGO - RED CUT VINYL, 12 x 1-3/4	2	PART
4	104491-1	CABLE ASSEMBLY, RIBBON - 20 PINS, DRIVER TO CONTROL	1	ASSEMBLY
5	104499-1	HARNESS, POWER SOURCE CONTROL - MODEL 514	1	ASSEMBLY
6	104945-1	COVER, TUBEMASTER - MODEL 514	1	PART
7	11231	HEX NUT, ACORN - M5, SS	4	PART
8	11252	WASHER, SEALING - #10 X 3/8OD	8	PART
9	80096	HANDLE, OVER-MOLDED -	2	PART
10	80097	SADDLE, CLAMP - HANDLE	2	PART
11	M102-05C-14-C	SCREW, BUTHD - M5 X .80 X 14MM	4	PART
12	M113-05C-06-8	SCREW, PANHD PHIL - M5 X 6MM, 18-8 SS	18	PART
13	M113-05C-08-8	SCREW, PANHD PHIL - M5 X 8MM, 18-8 SS	4	PART
14	M113-05C-12-8	SCREW, PANHD PHIL - M5X12MM, 18-8 SS	4	PART

REV.	CHANGE DESCRIPTION	BY	DATE
AD	CHANGED APPEARANCE BECAUSE OF NEW SIDE LABELS AND NEW FRONT PANEL KEYPAD. (ECO # 10772)	IE	08/01/13
AC	1001770 WAS 41013 (ECO # 10768)	IE	07/30/13
AB	1001745 was 104944-2 (ECO # 10716)	IE	05/22/13
AA	INITIAL RELEASE (ECO # 10516)	IE	11/30/12

MAGNATECH LIMITED PARTNERSHIP EAST GRANBY, CT 06026 USA	CHASSIS ASSEMBLY, FRONT MODEL 514 C, TUBEMASTER 1001745	Sht 1 of 2 1001745 REV. AA



MAGNATECH LIMITED PARTNERSHIP
EAST GRANBY, CT 06026 USA

CHASSIS ASSEMBLY, FRONT
MODEL 514 C, TUBEMASTER
1001745

Sht 2 of 2
1001745
REV. AA

#	PART #	DESCRIPTION	QTY	TYPE
1	1001718	FRONT PANEL ASSEMBLY - MODEL 514	1	ASSEMBLY
2	104474	CONTROL PCB ASSY - MODEL 514	1	ASSEMBLY
3	104490-1	CABLE ASSEMBLY, RIBBON - 16 PINS, SUPERVISOR TO CONTROL	1	ASSEMBLY
4	104496-1	PRINTER & PCB ASSY - MODEL 514	1	ASSEMBLY
5	104576-2	RABBIT MODULE, PROGRAMMED - 514 B	1	ASSEMBLY
6	104638-1	PLATE, RETENTION - RABBIT PCB	1	PART
7	104943-1	FRONT CHASSIS W/ INSERTS - 514 TUBEMASTER	1	ASSEMBLY
8	104946-1	CONNECTOR & PIGTAIL ASSY, USB - MODEL 514, TUBEMASTER	1	ASSEMBLY
9	10844	SCREW, PANHD SL - #10-32 X 3/8, NYLON	1	PART
10	11253-14-M3	NUT PLATE, CONNECTOR - #14, M3	1	PART
11	51917	COVER, CONNECTOR - USB, W/ LANYARD	1	PART
12	5818	NUT, HEX - #10-32	1	PART
13	5973-C20	TAPE, KAPTON - 3/4 X 2MIL	1	PART
14	80048-SS	KEEPER, LATCH - SMALL, SS	1	PART
15	M20033	STANDOFF, HEX F/F - M3 X 10MM PLTD BRASS	4	PART
16	M20035	SCREW, PNHDPHIL SEMS - M3 X 8, INT, 18-8	4	PART
17	M20036	SCREW, PNHDPHIL SEMS - M3 X 6, INT, 18-8	6	PART
18	M20039	SCREW, PNHDPHIL DBL SEMS - M3 X 6, W/S-F 6mm ZN	8	PART
19	M20046	STANDOFF, M/F - M3 X 12MM, 6MM HEX	1	PART
20	M20059	SCREW, PNHDPHIL SEMS - M3 X 10, INT, 18-8	4	PART

REV.	CHANGE DESCRIPTION	BY	DATE
AA	INITIAL RELEASE (ECO # 10716)	IE	05/22/13

LET.	CHANGE RECORD	DATE	BY
AA	CHANGED TO PN 1000243 POWER SUPPLY	3/18/11	DJR

C1
0.1 uf

MOV3 V33A5

MOV1 V33A5

MOV2 V33A5

CB1 0.6 A

CB2 0.6 A

J1
KPT18-32S

DRIVERP2 DRIVERJ2

DRIVERP3 DRIVERJ3

MOTOR DRIVE PCB
PN 105535

DRIVERJ1 20

PN 104491-1

20 CONTJ5

CONTP2 CONTJ2

J2
KPT10-6S

GAS FLOW SWITCH SW2

GASP1 SOLP SOL1

ASS'Y # 104485-1

INT1 GASP2

RL1 RLSPDT PN 51720

CHASSIS

THP1 THJ1 THERMOSTAT T1

CONTP7 CONTJ7 MILLERP1

POWER SOURCE
PN 104483-1
ELECTRODE (−)
ARC STARTER
WORK (+)

LINE1 LINE2 AC1

SCH1000577
REV. AA

BITSY + CPU
PN 104482-1

DISPLAY
PN 51682

SUPERJ1 SUPERJ4 SUPERJ5 SUPERJ3 SUPERP2

CONTROL PANEL
PN 104467-1

ENCODER
PN 51727

SUPERJ7 SUPERJ6

SUPERJ10 PN 104490 CONTP1

SUPERVISOR PCB
PN 104473

CONTROL PCB
PN 104474

SUPERJ9 DEBUG PORT

SUPERJ11 SUPERP12 P11

SUPERJ12 SUPERP8

CONTJ3 CONTJ4 RABP1 RABP2

RABBIT PCB
PN 104576-1

CONTJ8 PORGRAM PORT

CONTJ6 CONTP6

PRP3 PRP2

PRINTER OPTION

PN 104577
PRINTER PC BOARD

PN 51783
PRINTER

USB1 USB

PN 104493-1

24 VDC POWER SUPPLY
PN 10000243

P100

POWDISTJ1 POWDISTP1

POWDISTJ2 POWDISTP2

D1 PX6A03

C2 1000 uf

TBRED TBBLK

PN 105374

GND

SW1 POWER SWITCH
PN 51577

TB1-3 TB1-4

F1 4 A PN 50669

F2 4 A PN 50669

LINE FILTER

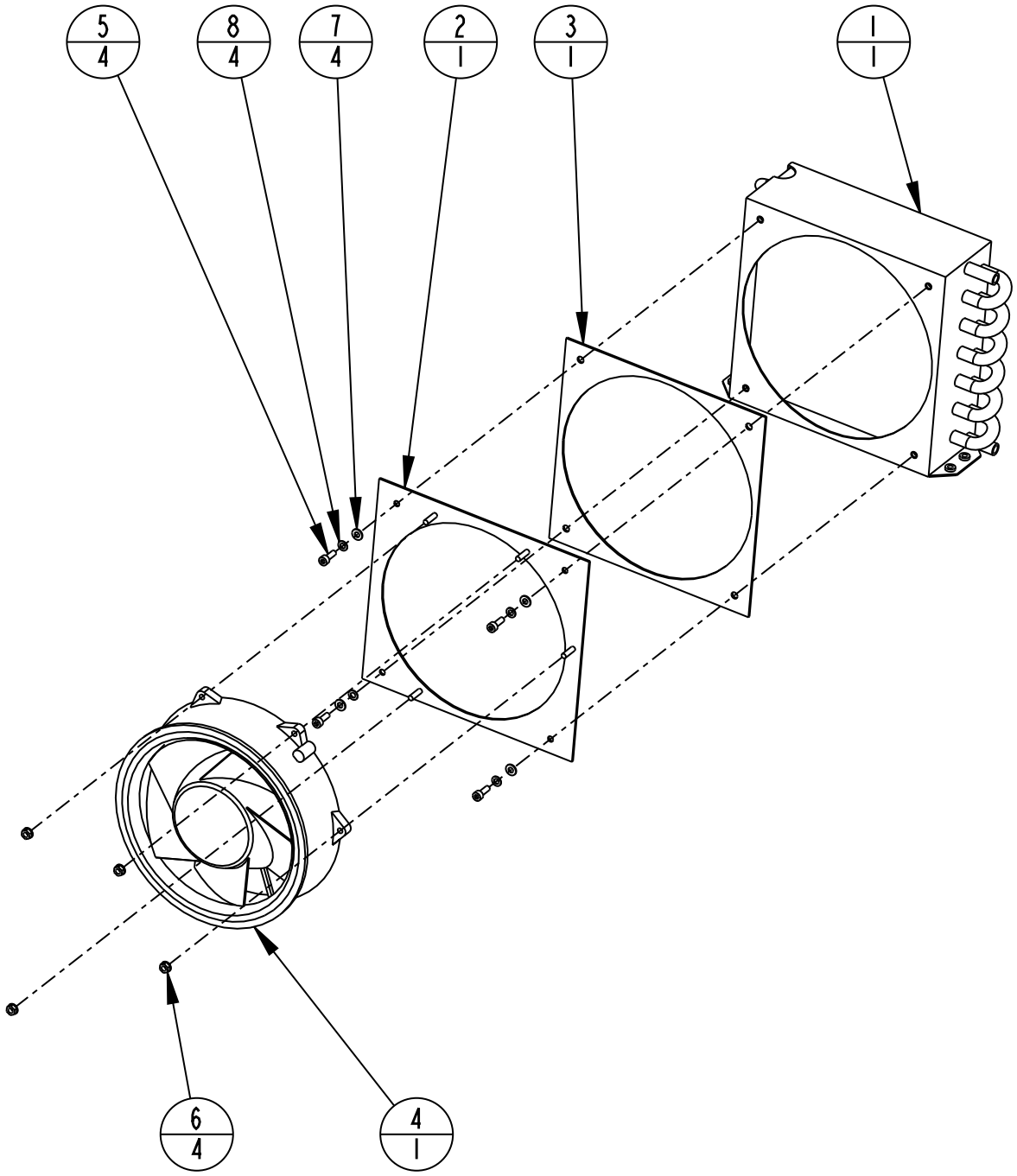
BLK WHT GRN

DESIGNATES TWISTED PAIR

MAGNATECH — LIMITED PARTNERSHIP
BRADLEY PARK , EAST GRANBY,CONN

Date 3/18/11	Title MODEL 514 C TUBEMASTER SCHEMATIC	
		Drawn by DJR
		Revised
Filename MAIN514B.SCH	Sheet of	Number SCH1000577 Rev AA

MAGNATECH LIMITED PARTNERSHIP EAST GRANBY, CT 06026 USA	RADIATOR AND FAN ASSEMBLY WATER COOLER MODEL 904 A 1000422	Sht 1 of 2 06-Dec-10 1000422-PL Rev. AA



MAGNATECH LIMITED PARTNERSHIP
EAST GRANBY, CT 06026 USA

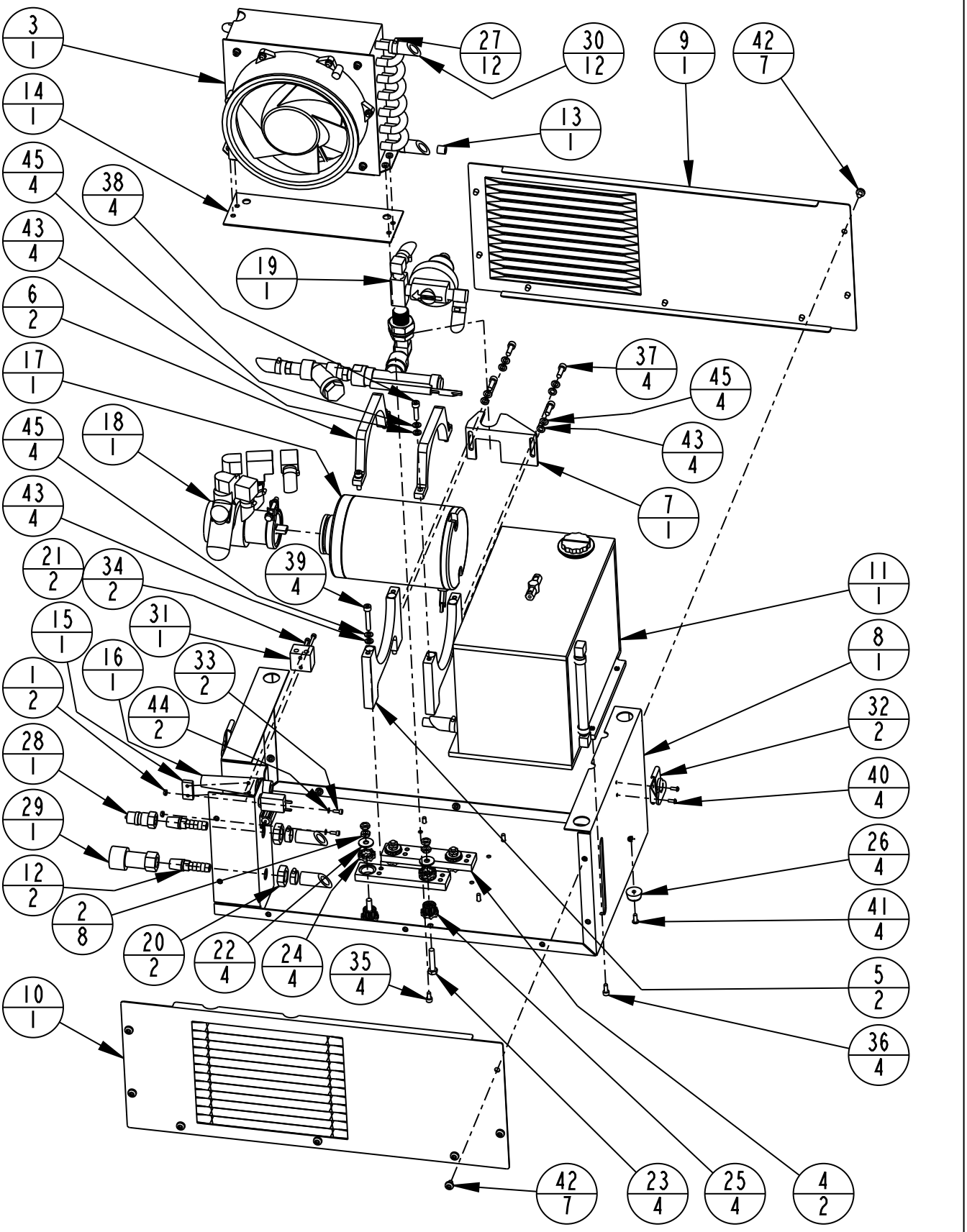
RADIATOR AND FAN ASSEMBLY
WATER COOLER MODEL 904 A
1000422

Sht 2 of 2
06-Dec-10
1000422-PL
Rev. AA

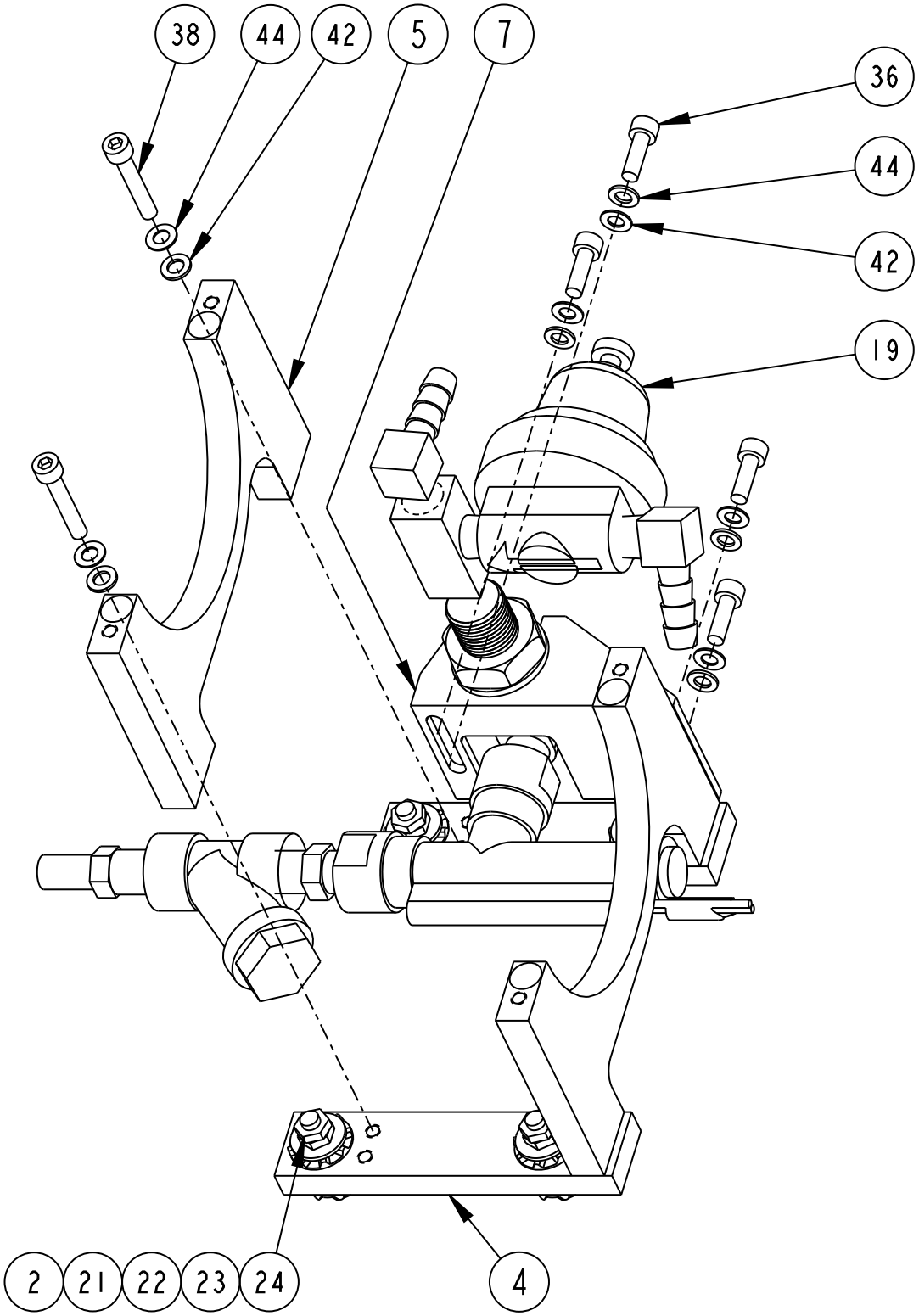
#	PART #	DESCRIPTION	QTY	TYPE
1	104479-1-C1	HX COIL W/ INSERTS - WATER COOLER	1	ASSEMBLY
2	104765-1	ADAPTOR PLATE W/ INSERTS - 904 ALT FAN	1	ASSEMBLY
3	104949-1	FAN DAMPER-GASKET - 904 AND 905	1	PART
4	105647-1	FAN AND PIGTAIL ASSEMBLY - 904 A WATER COOLER	1	ASSEMBLY
5	M101-04C-12-3	SCREW, SHC - M4.0 X .70 X 12MM	4	PART
6	M20051	NUT, SEMS HEX - M4, SS	4	PART
7	M501-04C-FA-3	WASHER, FLAT - M4, DIN 125A	4	PART
8	M503-04C-FJ-S	WASHER, LOCKING - INT M4, DIN 6797-J4	4	PART

	INITIAL RELEASE (ECO # 10099)	IE	12/06/10
	CHANGE DESCRIPTION	BY	DATE

MAGNATECH LIMITED PARTNERSHIP EAST GRANBY, CT 06026 USA	WATER COOLER ASSEMBLY MODEL 904 A 105646-1	Sht 1 of 3 20-May-11 105646-1-PL REV. AB



MAGNATECH LIMITED PARTNERSHIP EAST GRANBY, CT 06026 USA	WATER COOLER ASSEMBLY MODEL 904 A 105646-1	Sht 2 of 3 20-May-11 105646-1-PL REV. AB



MAGNATECH LIMITED PARTNERSHIP
EAST GRANBY, CT 06026 USA

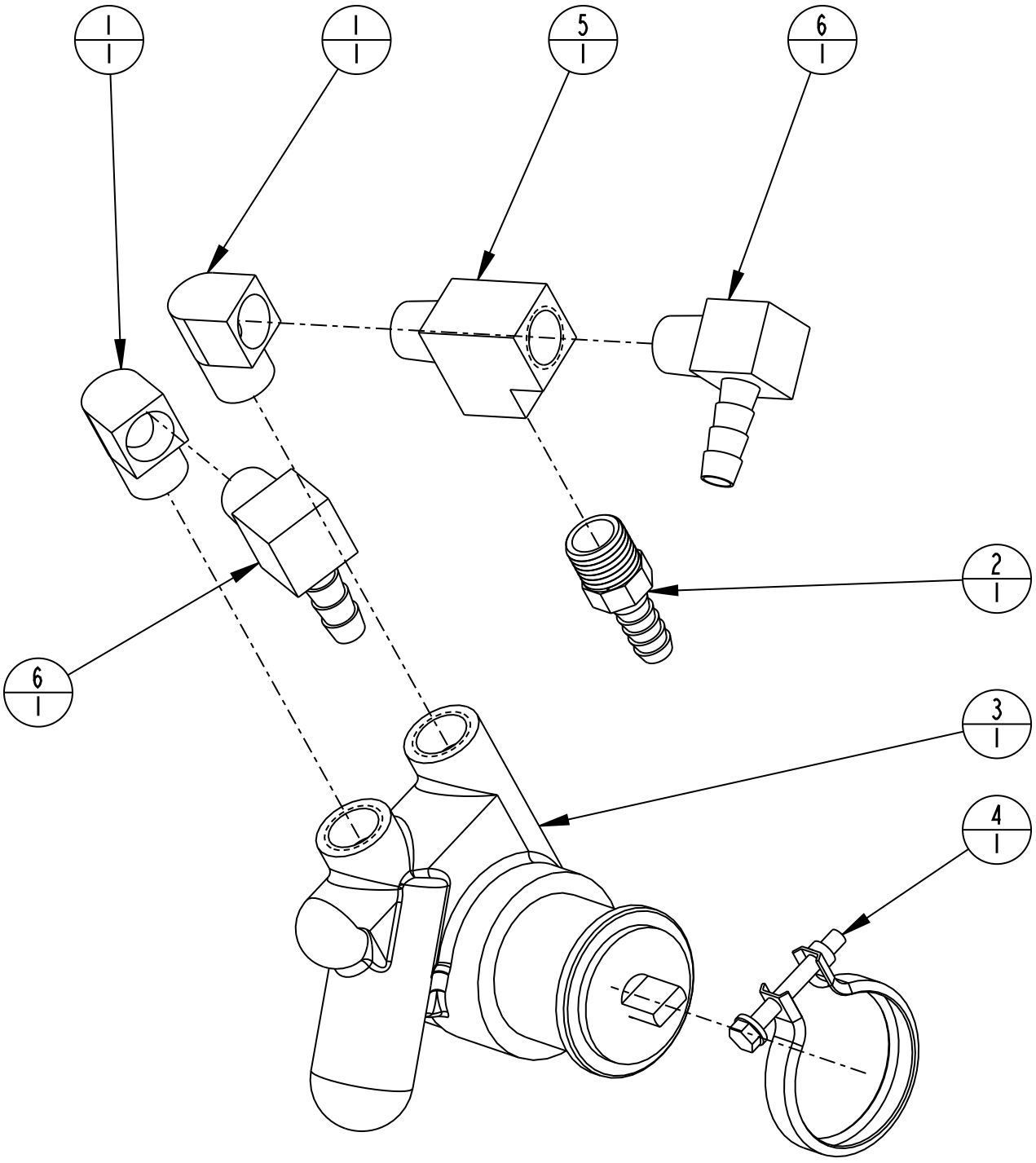
WATER COOLER ASSEMBLY
MODEL 904 A
105646-1

Sht 3 of 3
20-May-11
105646-1-PL
REV. AB

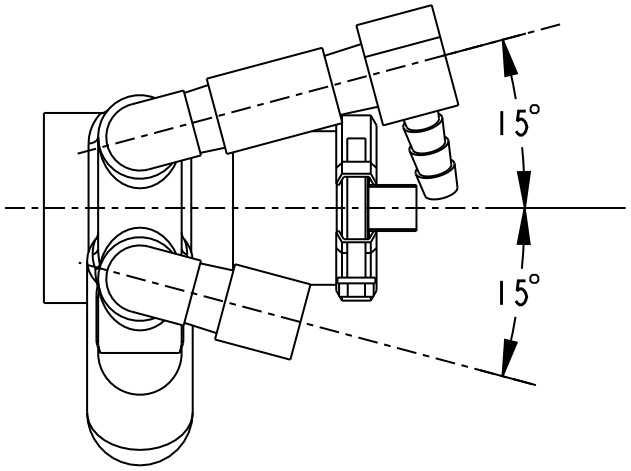
#	PART #	DESCRIPTION	QTY	TYPE
1	1000365	NUT, SEMS HEX - M3, 18-8 SS	2	PART
2	1000366	NUT, HEX - M6, 18-8 SS, DIN 439B	8	PART
3	1000422	RADIATOR AND FAN ASSEMBLY - WATER COOLER MODEL 904 A	1	ASSEMBLY
4	1000423	PLATE, BASE - 904 A WATER COOLER	2	PART
5	1000425	MOTOR BRACKET, LOWER - 904 A WATER COOLER	2	PART
6	1000426	MOTOR BRACKET, UPPER - 904 A WATER COOLER	2	PART
7	1000432	MOUNTING BRACKET, SWITCH AND FITTINGS - 904 A WATER COOLER	1	PART
8	104472-1	CHASSIS BASE W/ INSERTS - WATER COOLER, MODEL 904	1	ASSEMBLY
9	104501-1	PANEL, SIDE - 904 WC, RIGHT/OUTLET	1	PART
10	104502-1	PANEL, SIDE - 904 WC, LEFT/INLET	1	PART
11	104543-1	TANK & FITTINGS ASSEMBLY - 904 WATER COOLER	1	ASSEMBLY
12	104550-1	ADAPTOR, BULKHEAD - 1/4 MNPT X 3/8 BARB	2	PART
13	104639-1	ORIFICE, BACKPRESSURE - .125 DIA	1	PART
14	104950-1	WATER COOLER DAMPER-GASKET - MODEL 904	1	PART
15	105598-1	BACKING PLATE - MOTOR STRIP - 905 A WATER COOLER	1	PART
16	105648-1	HARNESS ASSEMBLY - 904 A WATER COOLER	1	ASSEMBLY
17	105654-1	MOTOR AND PIGTAIL ASSEMBLY - 904 A WATER COOLER	1	ASSEMBLY
18	105655-1	PUMP AND FITTINGS ASSEMBLY - 904 A WATER COOLER	1	ASSEMBLY
19	105657-1	FLOW SWITCH,VALVE AND FITTINGS ASSEMBLY - 904 A WATER COOLER	1	ASSEMBLY
20	10641	NUT, HEX - 9/16-18 JAM	2	PART
21	11270	WASHER, FLAT - .12 ID X .22 OD X .031 THK, NYLON	2	PART
22	11300	WASHER, FLAT - M6, DIN 9021 (FENDER)	4	PART
23	11306	SCREW, HEXHD - M6 X 30, 18-8 SS	4	PART
24	21229	FINGER-FLEX BUSHING - SAFETY MOUNTING, SMALL	4	PART
25	21230	FINGER-FLEX BUSHING - SAFETY MOUNTING, BIG	4	PART
26	25030	FOOT, PLASTIC - 3/4 DIA X 3/8 HIGH	4	PART
27	38182	CLAMP, HOSE - 7/32 - 5/8	12	PART
28	38515	QUICK DISCONNECT, MALE - ISO7241/1-B-04, FNPT, VALVED	1	PART
29	38516	QUICK DISCONNECT, FEMALE - ISO7241/1-B-04, FNPT, VALVED	1	PART
30	38545	HOSE, BLUE, 3/8 I.D. - LENGTH-A/R	12	PART
31	51982	TERMINAL BLOCK - TWO CONNECTION, CERAMIC	1	PART
32	80047-SS	LATCH, TWIST & LOCK - SMALL, SS	2	PART
33	M101-03C-08-3	SCREW, SHC - M3.0 X .50 X 8MM	2	PART
34	M101-03C-20-3	SCREW, SHC - M3.0 X .50 X 20MM	2	PART
35	M101-04C-08-3	SCREW, SHC - M4.0 X .70 X 8MM	4	PART
36	M101-04C-10-3	SCREW, SHC - M4.0 X .70 X 10MM	4	PART
37	M101-05C-16-3	SCREW, SHC - M5.0 X .80 X 16MM	4	PART
38	M101-05C-20-3	SCREW, SHC - M5.0 X .80 X 20MM	4	PART
39	M101-05C-30-8	SCREW, SHC - M5.0 X .80 X 30MM	4	PART
40	M102-03C-08-3	SCREW, BUTHD - M3 X .50 X 8MM	4	PART
41	M102-04C-10-3	SCREW, BUTHD - M4 X .70 X 10MM	4	PART
42	M113-05C-06-8	SCREW, PANHD PHIL - M5 X 6MM, 18-8 SS	14	PART
43	M501-05C-FA-3	WASHER, FLAT - M5, DIN 125A	12	PART
44	M503-03C-FJ-S	WASHER, LOCKING - INT M3, DIN 6797-J3	2	PART
45	M503-05C-FJ-S	WASHER, LOCKING - INT M5, DIN 6797-J5	12	PART

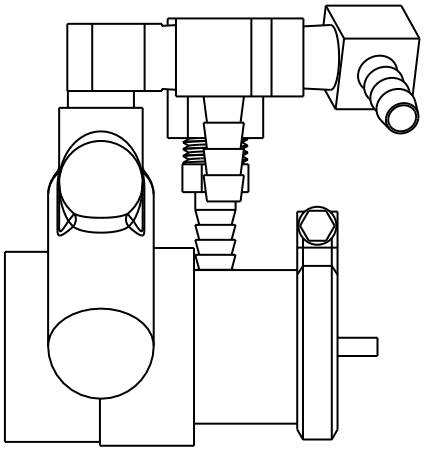
	CHANGE DESCRIPTION	BY	DATE
	ADDED: 11270 (2) (ECO # 10158)	IE	05/20/11
	INITIAL RELEASE (ECO #10099)	IE	12/06/10

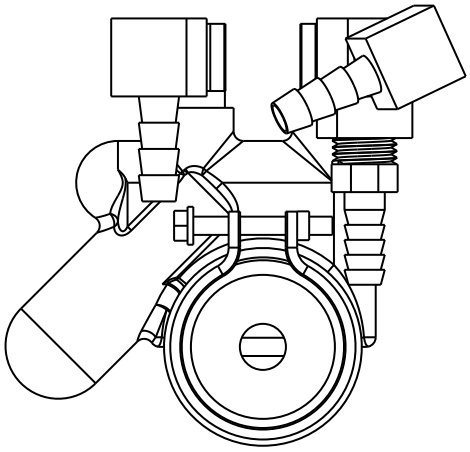
MAGNATECH LIMITED PARTNERSHIP EAST GRANBY, CT 06026 USA	PUMP AND FITTINGS ASSEMBLY 904 A WATER COOLER 105655-1	Sht 1 of 3 20-May-11 105655-1-PL REV. AB

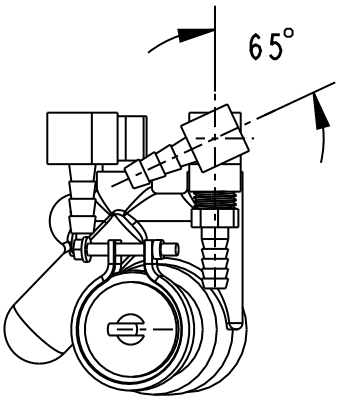


MAGNATECH LIMITED PARTNERSHIP EAST GRANBY, CT 06026 USA	PUMP AND FITTINGS ASSEMBLY 904 A WATER COOLER 105655-1	Sht 2 of 3 20-May-11 105655-1-PL REV. AB









MAGNATECH LIMITED PARTNERSHIP
EAST GRANBY, CT 06026 USA

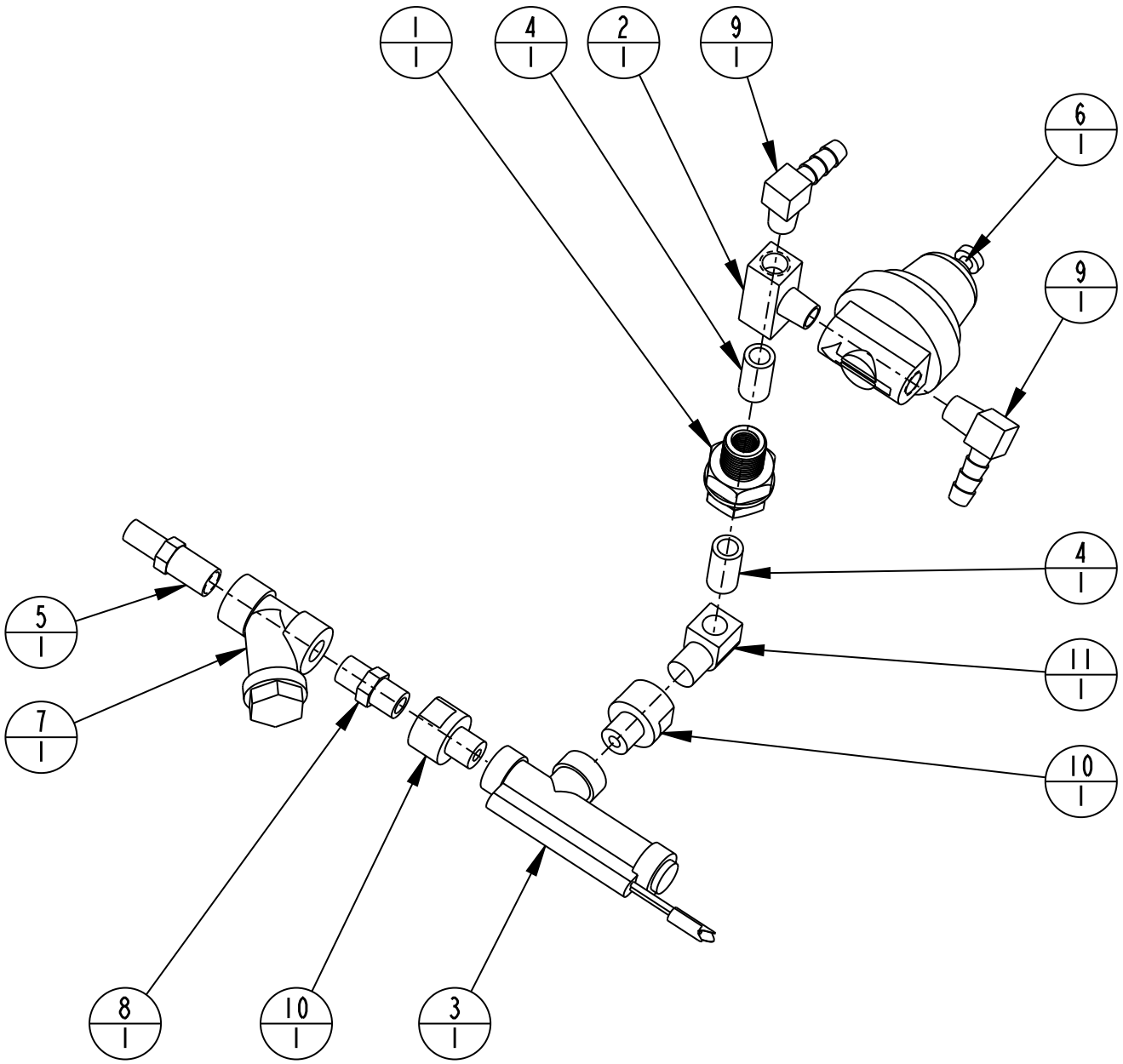
PUMP AND FITTINGS ASSEMBLY
904 A WATER COOLER
105655-1

20-May-11
105655-1-PL
Rev. AB

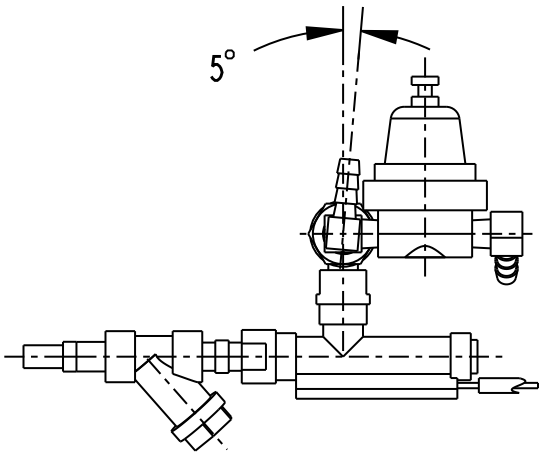
#	PART #	DESCRIPTION	QTY	TYPE
1	1000434	FITTING, STREET ELBOW - 3/8 NPT, BRASS	2	PART
2	1000435	FITTING, HOSE ADAPTOR - 3/8 NPT TO 3/8 BARB	1	PART
3	38452	"PROCON " VANE PUMP - 99 GPH, 100 PSI, 3/8 FNPT PORTS	1	ASSEMBLY
4	38453	CLAMP, V-BAND - PROCON	1	PART
5	38567	MALE RUN TEE - 3/8 NPT	1	PART
6	38574	ANGLED HOSE BARB - 3/8 HOSE TO 3/8 NPT	2	PART

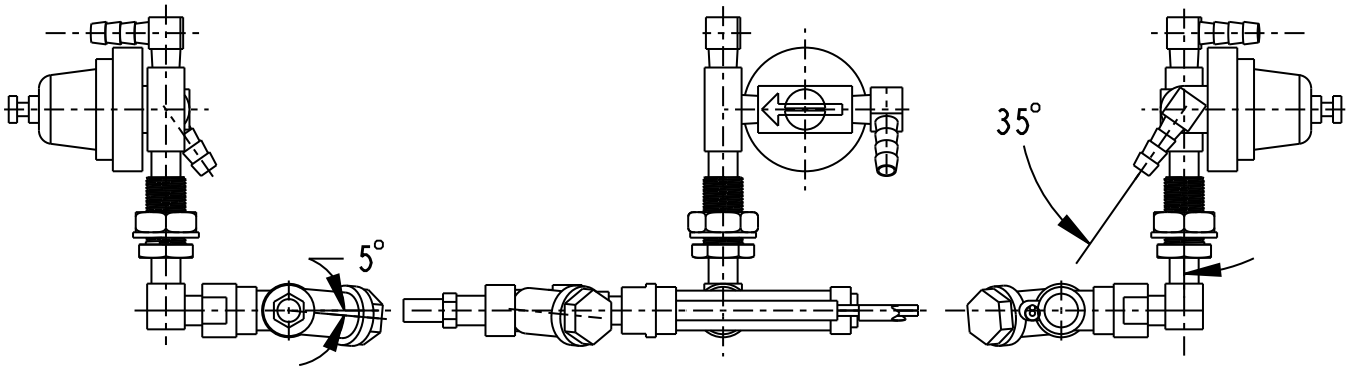
	CHANGE DESCRIPTION	BY	DATE
	THE POSITION OF THE STREET ELBOW WAS 10 °; ADDED 38453 (ECO # 10158)	IE	05/20/11
	INITIAL RELEASE (ECO # 10099)	IE	12/06/10

MAGNATECH LIMITED PARTNERSHIP EAST GRANBY, CT 06026 USA	FLOW SWITCH, VALVE AND FITTINGS ASSEMBLY 904 A WATER COOLER 105657-1	Sht 1 of 3 20-May-11 105657-1-PL REV. AB



MAGNATECH LIMITED PARTNERSHIP EAST GRANBY, CT 06026 USA	FLOW SWITCH, VALVE AND FITTINGS ASSEMBLY 904 A WATER COOLER 105657-1	Sht 2 of 3 20-May-11 105657-1-PL REV. AB





MAGNATECH LIMITED PARTNERSHIP EAST GRANBY, CT 06026 USA	FLOW SWITCH, VALVE AND FITTINGS ASSEMBLY 904 A WATER COOLER 105657-1	Sht 3 of 3 20-May-11 105657-1-PL REV. AB

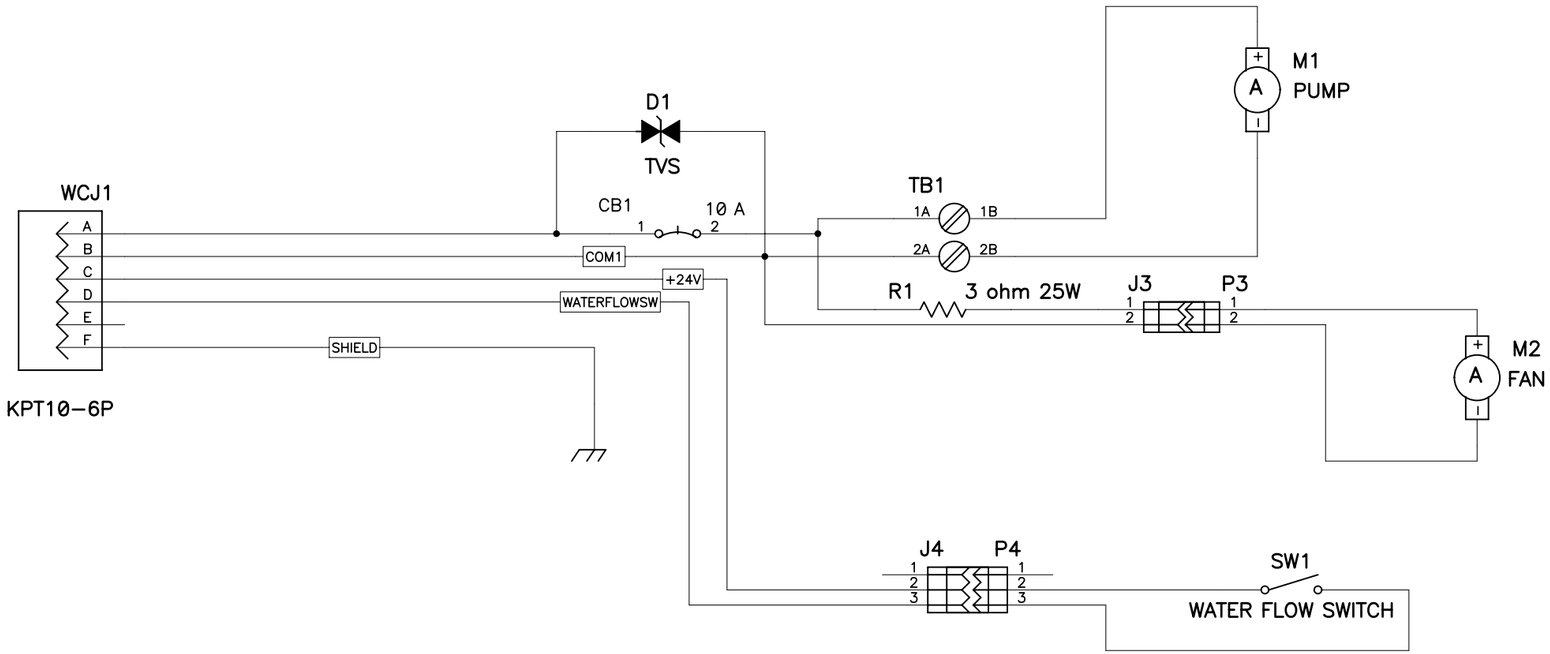
#	PART #	DESCRIPTION	QTY	TYPE
1	1000417	PANEL MOUNT COUPLING - 1/4 NPTF AND 3/4 -16 UNF, BRASS	1	ASSEMBLY
2	1000418	MALE RUN TEE - 1/4 NPT	1	PART
3	105656-1	FLOW SWITCH & PIGTAIL ASSEMBLY - 904 A WATER COOLER	1	ASSEMBLY
4	38242	NIPPLE, PIPE - 1/4 CLOSE, BRASS	2	PART
5	38353	FITTING, BARB - 1/4 MNPT X 3/8 BARB, PVDF	1	PART
6	38449	VALVE, BYPASS - 80 PSI	1	PART
7	38459	FILTER, 100 MESH - ACETAL, 1/4 FNPT	1	PART
8	38461	FITTING, NYLON - CLOSE NIPPLE, 1/4 NPT	1	PART
9	38571	ANGLED HOSE BARB - 3/8 HOSE TO 1/4 NPT	2	PART
10	51510	ADAPTOR, FLOW SWITCH - 9/16-18 UNF-1/4 NPT	2	PART
11	5645	FITTING, STREET EL - 1/4 NPT, BRASS	1	PART

	CHANGE DESCRIPTION	BY	DATE
	CHANGED POSITION OF THE ANGLED HOSE BARB P/N: 38571-2 PLCS. (ECO # 10158)	IE	05/20/11
	INITIAL RELEASE (ECO # 10099)	IE	12/06/10

104500-SCH REV. AA

LET.	CHANGE RECORD	DATE	BY
A	ADDED TVS (D1)	4/11/06	DJR
AA	CB1 was 51757, NOW IS 52334. ADDED R1, TB1. SAME FOR 904A & 905A	8/28/09	JLS

ECO10777



MAGNATECH – LIMITED PARTNERSHIP BRADLEY PARK, EAST GRANBY, CONN			
	Title WATER COOLER WITH INTEGRAL FLOW SWITCH		
Date 8/28/09			
	WATER COOLER MOD. 904A AND 905A SCHEMATIC Sheet 1 of 1	Drawn by DJR Revised JLS	
FILENAME 104500-SCH_AA		Number 104500-SCH	Rev AA