

# **OPERATOR'S MANUAL AND SAFETY INSTRUCTIONS**

**WITH INSTALLATION, TROUBLESHOOTING,  
INSPECTION AND MAINTENANCE INSTRUCTIONS**

**TM-100 SERIES**

**TM-100V SERIES**

**TM-200V SERIES**

**Microprocessor Controlled  
Chuck Control**



**O.S. WALKER**

Rockdale Street, Worcester, MA 01606 (508)-853-3232 FAX (508)-852-8649  
3508 Glenridge Drive, Chino Hills, CA 91709 (909)-597-4785 FAX (909)-597-0581  
901 Arvin Avenue, Stoney Creek, Ontario, L8E5N9 Canada (905)-643-3338  
In Canada: 1-800-267-4678 FAX (905)-643-6111

[www.walkermagnet.com](http://www.walkermagnet.com)  
Email: [info@walkermagnet.com](mailto:info@walkermagnet.com)

**! DANGER**

**Never attempt to operate this control until you have read and understand this OPERATOR'S MANUAL.**

# TABLE OF CONTENTS

1 INTRODUCTION.....	1-1
2 SAFETY INSTRUCTIONS .....	2-1
2.1 GENERAL SAFETY RULES .....	2-1
2.2 RECOGNIZE SAFETY INFORMATION.....	2-2
2.2.1 Ways to Avoid a Reduction of Holding Capacity.....	2-2
2.3 ADDITIONAL WARNINGS.....	2-3
2.4 DESIGNATED PERSON .....	2-3
3 INSTALLATION .....	3-1
3.1 MOUNTING THE CHUCK CONTROL & CONNECTING ELECTRICAL POWER .....	3-1
3.1.1 Optional Remote Unit .....	3-1
3.1.2 Main Chuck Control Unit.....	3-1
3.1.3 Connecting the Chuck .....	3-2
3.1.4 Connecting the AC Input voltage.....	3-2
3.1.5 Connecting the Transformer (When Used) .....	3-3
3.1.6 Transformer Wiring Diagram .....	3-3
3.1.7 Energizing the System.....	3-3
3.2 CONTROL MOUNTING GUIDELINES .....	3-4
4 OPERATING INSTRUCTIONS .....	4-1
4.1 IMPORTANT FACTS ABOUT MAGNETIC HOLDING .....	4-1
4.1.1 Surface Conditions .....	4-1
4.1.2 Workpiece Thickness .....	4-1
4.1.3 Portion of the Chuck Surface In Contact With the Workpiece.....	4-1
4.1.4 Workpiece Material.....	4-2
4.2 FULL HOLDING .....	4-2
4.3 RELEASE .....	4-2
4.4 VARIABLE.....	4-2
4.5 CONTROL PROTECTION .....	4-3
4.6 GROUNDING & SHIELDING .....	4-3
4.7 MULTI-CHUCK APPLICATIONS.....	4-4
5 INSPECTION & MAINTENANCE .....	5-1
5.1 DAILY INSPECTION.....	5-1
5.2 HAVING A PROBLEM WITH YOUR CHUCK CONTROL? .....	5-1
5.3 DIAGRAMS .....	5-3
5.3.1 Main PC Board .....	5-3
5.3.2 System Wiring Diagram TM-100V – with Variable DC Power.....	5-4
5.3.3 System Wiring Diagram TM-100 - with out Variable DC Power.....	5-5
5.3.4 System Wiring Diagram TM-100V-4 – with Variable DC Power.....	5-6
5.3.5 System Wiring Diagram TM-100-4 – with out Variable DC Power.....	5-7
5.3.6 System Wiring Diagram TM-200V.....	5-8
5.3.7 Pendant Dimensions .....	5-9
6 REPLACEMENT PARTS LIST .....	6-1
6.1 TM CONTROLS .....	6-1
7 RETURN AND REPAIR INSTRUCTIONS.....	7-1

# 1 INTRODUCTION

Thank you for purchasing this O.S. Walker Chuck Control. If used and maintained properly, it should serve you for many years. However, if installed and used improperly, it can be rendered inefficient and unsafe. Therefore, it is absolutely essential that anyone who uses this control or is responsible for its application be trained on how to use it correctly.

**Read this manual carefully to learn how to operate and maintain your chuck control. Failure to do so could result in serious injury, or even death, to yourself and others.**

**This manual should be considered a permanent part of your control and should always be available to all operators and remain with the control if it is re-sold.**

**NOTE: Before using chuck control, record this data from the nameplate for future use in obtaining service.**

**MODEL NO. \_\_\_\_\_, PART NO. \_\_\_\_\_, SERIAL NO. \_\_\_\_\_**

To request additional copies of this manual, call 1-800-962-4638 in the USA;

In Canada: 905-643-3338; In Europe: 31-4973-83835

## 2 SAFETY INSTRUCTIONS

### 2.1 General Safety Rules

Following these simple rules can help to avoid accidents:

# DANGER

- **Never** attempt to operate this control and your magnetic chuck until you read and understand this operator's manual.
- **Never** disconnect a magnetic chuck from the control's DC power source while it is energized! Electrical arcing will occur and may cause serious injury or death.
- **Only** qualified personnel shall make adjustments within the control while it is energized!
- **Never** operate the control and chuck until it has been verified that a proper electrical ground for the control and Chuck has been established.
- **Never** operate damaged or malfunctioning controls or magnetic chucks.

Remember, proper knowledge and techniques in the use of this equipment are the responsibility of the operator. Be sure to read and understand the instructions and safety warnings contained in this manual before using your chuck control and magnetic chuck.

If you do not understand everything in this manual contact O.S. Walker for assistance before using the equipment.

**CALL 1-800-W-MAGNET** IN THE USA  
(In Canada call 905-643-3338; In Europe 31-4973-83835)

## 2.2 Recognize Safety Information



This is the safety alert symbol. When you see this symbol on your magnet or in this manual, be alert to the potential for personal injury. Follow recommended precautions and safe operating practices at all times.

**! DANGER**

Red Background, White Letters

**! WARNING**

Orange Background, Black Letters

**! CAUTION**

Yellow Background, Black Letters

This indicates a situation in which a hazard is imminent and will result in a high probability of serious injury or death.

This indicates a potentially hazardous situation, which could result in some probability of serious injury or death.

This indicates a potentially hazardous situation, which could result in minor injury or moderate injury.

**These are  
Hazard  
Seriousness  
Signal  
Words**

### 2.2.1 Ways to Avoid a Reduction of Holding Capacity

**! WARNING**

#### **To Avoid any Reduction of Holding Capacity:**

- The holding surface of the chuck and the contact area of the workpiece where it will contact the chuck must be clean, smooth, flat, and free of nicks and burrs.
  - The surface of the workpiece must contact equal areas of the chuck's opposite polarity, major magnetic poles.
  - The load must be low carbon steel such as SAE 1020.
  - The chuck control must provide "FULL" power to the chuck, that is, maximum output voltage.
  - The workpiece thickness must be at least equal or greater than the width of the chuck's major magnetic poles.
  - The temperature inside the chuck control enclosure must not be greater than 104° Fahrenheit (40° Celsius), nor the temperature of the chuck must not be greater than 110° F (43° C).
  - Repair of this chuck control should only be done by the O. S. Walker Co.\*
- If you have any difficulty holding a work piece, DON'T attempt to machine it! Call the O.S. Walker Co. for advice at 1-800-962-4638.

## 2.3 Additional Warnings

### WARNING

- Disassembly or repair of this chuck control can result in reduced holding power and/or cause an unsafe condition. Therefore, any time the control is disassembled or repaired it should be thoroughly inspected and re-tested for proper electrical grounding and power output.
- Modification of any operating circuits and electrical safety grounding can reduce the chuck control's effectiveness and/or cause an unsafe condition.
- Repair of this chuck control should only be done by the O. S. Walker Co.\*

## 2.4 Designated Person

\* Walker replacement parts may be installed by a **\*\*Designated Person**.

**\*\* Designated Person** - A person selected or assigned by the employer as being competent to replace specific parts listed in this manual and is able to verify the proper functioning of the specific replacement parts and the entire product after the completion of the installation.

### WARNING

#### ELECTRICAL GROUNDING

Because the O. S. Walker Co. does not know the specifics of each application and installation of these products and the electromagnetic device to which they are attached, it can only warn the installer and user that the electrically conductive body of the electromagnetic device **MUST** be connected to a proper electrical ground.

According to ANSI/NFPA 79 1997 (an American National Standard) "Electrical Standard for Industrial Machinery":

- Section 19.3 Equipment Grounding: The machine and all exposed noncurrent-carrying conductive parts, material, and equipment, including metal mounting panels that are likely to become energized and are mounted in nonmetallic enclosures, shall be effectively grounded.
- Section 19.2.4 Grounding Conductors: It shall be permissible to use machine members or structural parts of the electrical equipment in the grounding circuit provided that the cross-sectional area of these parts is at least electrically equivalent to the minimum cross-sectional area of the copper conductor required.
- Section 19.6.1 Continuity of the Grounding Circuit: The continuity of the grounding circuit shall be ensured by effective connections through conductors or structural members.
- Section 19.6.3 Continuity of the Grounding Circuit: Moving machine parts, other than accessories or attachments, having metal-to-metal bearing surfaces shall be considered as bonded. Sliding parts separated by a non-conductive fluid under pressure shall not be considered as bonded.

**PRIOR TO ENERGIZING THE ELECTROMAGNETIC DEVICE, CHECK ALL THE ELECTRICAL CONNECTIONS AND CONFIRM THAT THE METAL BODY OF THE ELECTROMAGNETIC DEVICE IS ELECTRICALLY GROUNDED.**

## 3 INSTALLATION

### WARNING

- All electrical chassis must be safety grounded.
- Check that all sources of power are disconnected, locked out and tagged "Out of Service" prior to beginning installation.
- Only qualified personnel should install this chuck control unit.

Prior to beginning, thoroughly plan your installation. Read this manual completely. An installation parts list is included below to aid in your planning.

1. Mounting hardware for the control and the remote.
2. Conduit and associated hardware for AC input, chuck output and remote.
3. Pendant cable: 10-conductor #24 AWG cable.
4. Chuck cable: 12 gauge Brad Harrison molded cable assembly.
5. Optional Remote: 14-conductor #24 shielded cable.

### **3.1 Mounting the Chuck Control & Connecting Electrical Power**

#### **3.1.1 Optional Remote Unit**

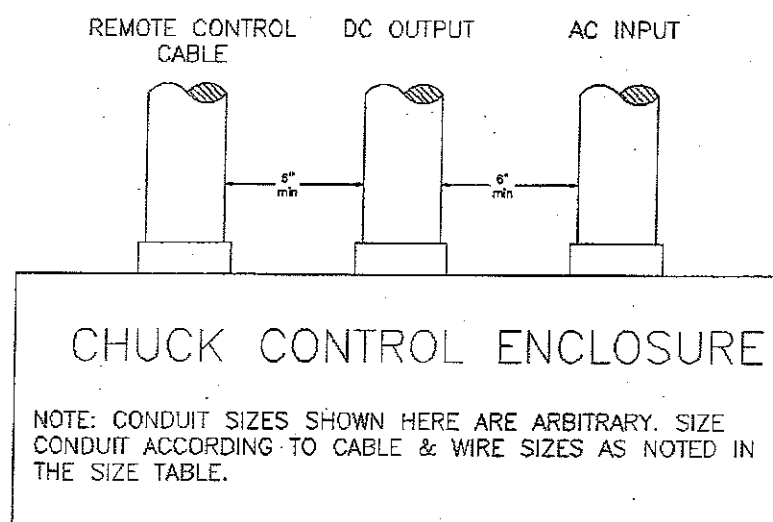
If mounting the optional remote unit, select a location that is both safe and convenient for the machine operator. Typically, it is mounted in close proximity to the machine controls. It is important to keep the remote unit within twelve (12) feet of the main control enclosure and away from exposure to any fluids.

It is recommended that shielded cable be used for the remote unit wiring and that the conduit be run six (6) inches from all other parallel conduit runs. The remote unit wiring must include a ground wire that is connected to the chassis of the remote control and to the chassis of the main enclosure. The length of cable that is used should not exceed twelve (12) feet. It is recommended to use 14-conductor #24 AWG shielded cable for connecting the remote unit.

#### **3.1.2 Main Chuck Control Unit**

Select a location for mounting the main chuck control enclosure. It must be located in a well-ventilated area. To ensure proper operation, ambient temperature at the main chuck control location must not be higher than 104° Fahrenheit outside the enclosure.

Three conduits must be routed from the main chuck control enclosure; remote control cable, AC input and DC output. Conduit sizing should be determined in accordance with all NFPA/NEC, state and local regulations by the qualified person installing the system. The remote control cable must be kept a minimum of six (6) inches from high voltage cables such as the AC input. The DC output also must be kept at least six (6) inches from high voltage AC wiring. Refer to Figure 3-1.



**Figure 3-1 Chuck Control Enclosure**

**MAINTAIN A SIX (6) INCH SEPARATION BETWEEN PARALLEL RUNS OF REMOTE CONTROL CABLE AND OTHER HIGH VOLTAGE WIRING.**

### **3.1.3 Connecting the Chuck**

The DC output to the chuck must include a ground wire that is connected to the safety ground lug on the chuck and to the chassis of the chuck control. It is recommended that the conduit for the DC output not be routed near high voltage AC wires. Many chucks are installed on machines with moving tables. Choose a means of wiring the chuck that allows adequate freedom of movement over the full range of table travel. Because of the short duration of the pulse, we recommend 12 Ga. hook-up cable.

### **3.1.4 Connecting the AC Input voltage**

Standard AC input voltage for the TM Chuck controls is 208, 240 and 480 VAC, using two (2) phases of a three (3) phase line, and the AC safety ground connection. If an input voltage other than the above is required, a dedicated transformer will be required (see 3.1.5).

The Chuck control requires the following current capacity for each of the AC input voltage listed above that is rated:

- 208 VAC @ 60 amperes
- 240 VAC @ 60 amperes
- 480 VAC @ 30 amperes



Each Chuck control should be connected to a circuit dedicated to that control. The main circuit protection for these voltages should be time delay fuses such as:

Gould TSRXXR where XX is the ampere rating of the fuse

Bussmann FRS-R-XX where XX is the ampere rating of the fuse

### 3.1.5 Connecting the Transformer (When Used)

The input transformer can be used with most input voltages between; 208 and 480 VAC. Refer to the transformer wiring diagrams Figure 3-2. **Note** that for 600 VAC operations the transformer is a dedicated type.

### 3.1.6 Transformer Wiring Diagram

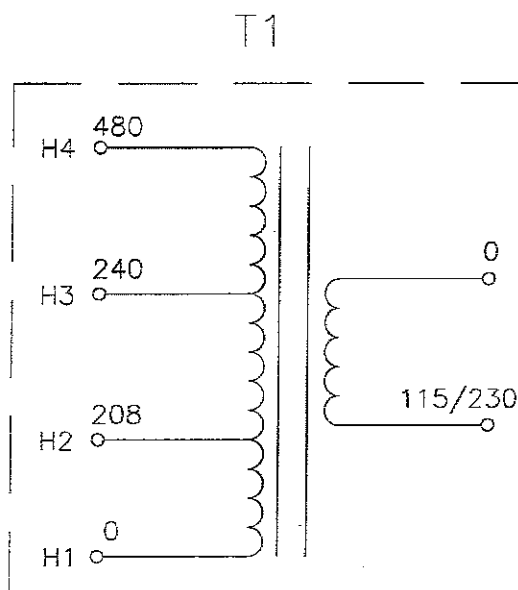


Figure 3-2 Transformer Wiring Diagram

### 3.1.7 Energizing the System

Inspect the conduit and wire installation. Verify that all wiring connections are correct and secure, paying particular attention to the ground connections. Thoroughly read the "Operating Instructions" section four (4) prior to energizing any equipment.

Close all breakers and disconnects upstream of the chuck control. Close the door (on models equipped with enclosures) and put the chuck control disconnect switch in the "ON" position. When power is first applied, the chuck control will initialize itself in the "Release Mode". The "Release" indicator light on the remote unit will be lit and the current sense and part release relays will be open. The system is ready for operation. No power is applied to the chuck.

### **3.2 Control Mounting Guidelines**

1. When any control (power section) is removed from its original enclosure or shipped without an enclosure and installed in a customer supplied enclosure, the following specifications must be met:
  - a. The air surrounding the panel on which the parts are located should not exceed 120° Fahrenheit.
  - b. The air temperature must be measured:
    - 1) With the control in the Full holding position;
    - 2) After the control has been in operation for 30 minutes; and
    - 3) With the chuck holding the largest load to be used.
2. When any control (power section) is to be placed in a secondary enclosure while still in its original enclosure, the following specifications must be met:
  - a. With the control (power section) mounted in its original enclosure and then mounted in a secondary enclosure, the air surrounding the original enclosure should not exceed 104° Fahrenheit.
  - b. The air temperature must be measured:
    - 1) With the control in the Full holding position;
    - 2) After the control has been in operation for 30 minutes; and
    - 3) With the chuck holding the largest load to be used.

## 4 OPERATING INSTRUCTIONS

### 4.1 Important Facts about Magnetic Holding

Workpiece characteristics must be considered in order to determine the magnetic holding attraction that a magnetic chuck can provide.

This is true for all magnetic chucks because they all operate using the same fundamental laws of physics. Magnetic power is often pictured as lines of magnetic force flowing from north to south pole. Anything that limits the flow of these magnetic lines of force obviously reduces the magnets holding capacity. There are many important factors that limit the flow of these lines of force.

#### 4.1.1 Surface Conditions

Magnetic lines of force do not flow easily through air. They need iron in order to flow freely; therefore, anything that creates a space or an air gap between the magnet and the workpiece limits the flow of magnetic lines of force and, thus, reduces the holding capacity of a magnetic chuck.

- **Magnetic Chuck Surface Condition** – The holding surface of a magnetic chuck must be clean, smooth, flat, and free of nicks or burrs in order to minimize the air gap between the chuck holding surface and the Workpiece. All Walker chucks are designed with soft, low carbon steel magnetic poles in the top plate in order to maximize the holding capacity; therefore, special care must be taken to protect these areas.
- **Workpiece Surface Condition** – The holding capacity of the chuck will be reduced if certain surface conditions exist. A rough surface finish on the workpiece creates an air gap as also foreign materials like dirt, paint, rust, paper, and rags.

#### 4.1.2 Workpiece Thickness

The greater the number of lines of magnetic force flowing from a magnet into the workpiece the greater the effectiveness of the magnetic chuck. The thicker the workpiece, the more lines of magnetic force are able to flow. After a certain thickness of the workpiece, no additional lines of force will flow because the magnet has reached its full capacity.

- Thin workpieces mean less iron available, and thus fewer lines of magnetic force flow from the magnet into the workpiece. Therefore, the chuck holding capacity is reduced.
- Typically, the minimum thickness of a workpiece required to reach full holding capacity is the same as the thickness of the chuck major magnetic steel poles.

#### 4.1.3 Portion of the Chuck Surface In Contact With the Workpiece

The full surface of the chuck top plate must be covered by the workpiece to achieve the maximum holding capacity. The surface of the workpiece must contact equal areas of the chuck opposite polarity major magnetic poles to obtain maximum holding force.

#### **4.1.4 Workpiece Material**

Low carbon steel such as SAE 1020 steel, are nearly as good conductors of magnetic lines of force as pure iron. However, many other alloys contain non-magnetic materials, which reduce the ability of magnetic lines of force to flow. An alloy such as SAE 300 series stainless steel is almost as poor a conductor of magnetic lines of force as air.

Type 416 stainless steel is considered magnetic, but it contains enough chromium so that a magnet can develop only about one half as much magnetic force as it can on an SAE 1020 steel workpiece. Also, because of the carbon content, the force developed on typical cast iron is less than one half that developed on SAE 1020 steel. (Chilled cast iron further reduces the force to less than one quarter.)

Additional concerns regarding Magnetic Holding should be forwarded to O. S. Walker, Inc.

The O. S. Walker Microprocessor Chuck Control, model TM, uses a remote unit that can select the following functions: Full Holding, Release, and Variable Holding.

#### **4.2 Full Holding**

(Green Push-Button)

In the Full holding position, a single pulse is supplied from the control to the chuck when this function is selected. As soon as 300 amps is reached the pulse is turned off. The indicator lamp for the Full holding position is **ON** when this function is selected.

#### **4.3 Release**

(Red Push-Button)

Selecting the Release function initiates an automatic release cycle. During the release cycle the output voltage polarity produced by the control is reversed and applied to the chuck until 300 Amps is reached.

The Release indicator lamp will turn **ON** to show that release is taking place, and will remain **OFF** when the cycle is complete.

**NOTE 1:** When releasing hard tool-steel, e.g. 4130, it may be necessary to cycle Release twice to remove the residual magnetism in the work-piece. This will not harm the control or the chuck. The operator can experiment with the number of cycles for optimum release.

**NOTE 2:** When releasing from variable the amperage is 300 amps irrespective of the variable knob position.

#### **4.4 Variable**

(White Push-Button)

Selecting variable generates a pulse of varying amperage amplitude dependant on the position of the variable knob. The variable indicator lamp will turn **ON** to show that the control is in variable mode.

## 4.5 Control Protection

If the control is switched into sudden high power operation with too large a load, the AC fuse may blow before the electronic protective circuits can function.

If the chuck control is overloaded by a short circuit or a chuck too large for this control's rating, the control will sense this condition and will attempt to protect itself, disabling all modes. This will be indicated by the flashing of the **Full** and **Release** indicator lamps simultaneously. This will continue until AC power is removed from the control and the problem is corrected.

If the controller senses too little current, the **Full** and **Release** indicator lamps will flash alternately. The controller can be re-energized. If the lamps continue to flash, consult the troubleshooting guide.

The logic section of the main pc board is protected by a .125A fuse in location F1. This fuse will blow if a problem occurs in the logic section.

If AC power is interrupted while the control is running, the control returns to the mode of operation selected just prior to loss of power. This allows easy resumption of machining after an AC line dropout without the need to re-energize the chuck.

## 4.6 Grounding & Shielding

### **WARNING**

All electrical chassis must be connected to a proper electrical ground.

The chuck control's DC power output leads **MUST BE SEPARATELY ROUTED** from other power leads in the machine. They must not be routed in the same wire bundle with 400V or other high voltage leads. If the control has, LOW VOLTAGE signal leads wire through the machine, these **MUST BE SEPARATELY ROUTED** in their own SHIELDED WIREWAY and the shield grounded to the machine chassis. Low voltage signals must not be routed with high voltage or high power cables through any part of the machine, or electromagnetic interference may result.

## 5 INSPECTION & MAINTENANCE

### 5.1 Daily Inspection

- Check the physical condition of the power cords, indicating lamps, switches, and the control enclosure. If any deficiencies are observed, contact your supervisor or O.S. Walker.
- Check the integrity of the enclosure by inspecting for dust, debris, and fluid. Make necessary repairs.
- Keep the outside of the enclosure free of dust and debris.

### 5.2 Having a Problem with your Chuck Control?

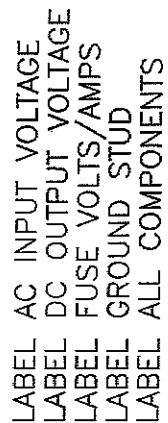
Problem	Probable Cause	Solution
1. The Full and Release lights are flashing simultaneously	The load is drawing excessive current and the control unit has protected itself by disabling all operating modes.	<b>BEFORE PROCEEDING, DE-ENERGIZE THE CONTROL UNIT.</b>
		a) Verify the chuck power rating does not exceed the control's power rating.
		b) Disconnect the chuck from the control unit and verify that the chuck's coil windings are not shorted.
		c) Repair/replace where required.
		d) With the load disconnected, re-energize equipment and cycle through all operating modes, verifying proper operation.
		e) Repeat step d. with the load reconnected.
2. None of the control unit lights are illuminated and it does not respond to any operating mode	Input voltage is too low or wired incorrectly. Remote unit is not properly wired.	f) Having successfully completed the above and unit does not function properly, contact O.S. Walker, Inc.
		a) Verify the input voltage to the control unit (see Installation section 3).
		<b>BEFORE PROCEEDING, DE-ENERGIZE THE CONTROL UNIT.</b>
		b) Verify that all fuses are good (see Standard Interface Diagram section 5.3 for location). Use only exact replacement fuses to avoid damaging unit or causing a safety hazard.
		c) Verify the wiring between the control unit and the remote unit (see Standard Interface Diagram section 5.3).
		d) Having successfully completed the above and the unit does not function properly, contact O.S. Walker, Inc.

<p>3. The fuse in the control unit blows when any of the control modes are selected.</p>	<p>Excessive current draw is causing fuse to blow before electronic protective circuits have time to react.</p>	<p><b>BEFORE PROCEEDING, DE-ENERGIZE THE CONTROL UNIT.</b></p> <p>a) Visually inspect chuck cable and connections for pinches or other damage.</p> <p>b) Check chuck cable and connections for shorts with ohmmeter.</p> <p>c) Replace any questionable equipment.</p> <p>d) Use only exact replacement fuses to avoid damaging the unit or causing a safety hazard.</p> <p>e) Re-energize equipment and cycle through all operating modes, verifying proper operation, with the load disconnected.</p> <p>f) Repeat step e. with the load connected.</p> <p>g) Having successfully completed the above and the unit does not function properly, contact O.S. Walker, Inc.</p>
<p>4. The Full and Release lamps are flashing alternately.</p>	<p>Insufficient current to the chuck has been sensed.</p>	<p>a) Re-energize the chuck to see if problem persists.</p> <p><b>BEFORE PROCEEDING, DE-ENERGIZE THE CONTROL UNIT.</b></p> <p>b) Check chuck cable for poor connections or broken wires.</p> <p>c) Check chuck for open windings.</p> <p>d) Re-energize control unit and energize the chuck.</p> <p>e) If lights are still flashing remove power to the control and contact O.S. Walker, Inc.</p>

#### **4.7 Multi-Chuck Applications**

The illuminated push-buttons pulse to indicate current is being delivered to the chuck. When the illuminated push-button switches to a steady glow the cycle is finished and the cable can be safely disconnected from one chuck (and installed on another chuck). The control does not need to be cycled to energize or de-energized the subsequent chuck(s), merely select the function needed and press its corresponding push-button. The illuminated push-button will pulse to indicate proper functioning.





## TABLE OF FIGURES

FIGURE 3-1 CHUCK CONTROL ENCLOSURE.....	3-2
FIGURE 3-2 TRANSFORMER WIRING DIAGRAM.....	3-3
FIGURE 5-1 MAIN PC BOARD.....	5-3
FIGURE 5-2 SYSTEM WIRING DIAGRAM TM-100V.....	5-4
FIGURE 5-3 SYSTEM WIRING DIAGRAM TM-100.....	5-5
FIGURE 5-4 SYSTEM WIRING DIAGRAM TM-100V-4.....	5-6
FIGURE 5-5 SYSTEM WIRING DIAGRAM TM-100-4.....	5-7
FIGURE 5-6 SYSTEM WIRING DIAGRAM TM-200V.....	5-8
FIGURE 5-7 PENDENT WITH VARIABLE.....	5-9
FIGURE 5-8 PENDANT NON VARIABLE.....	5-10