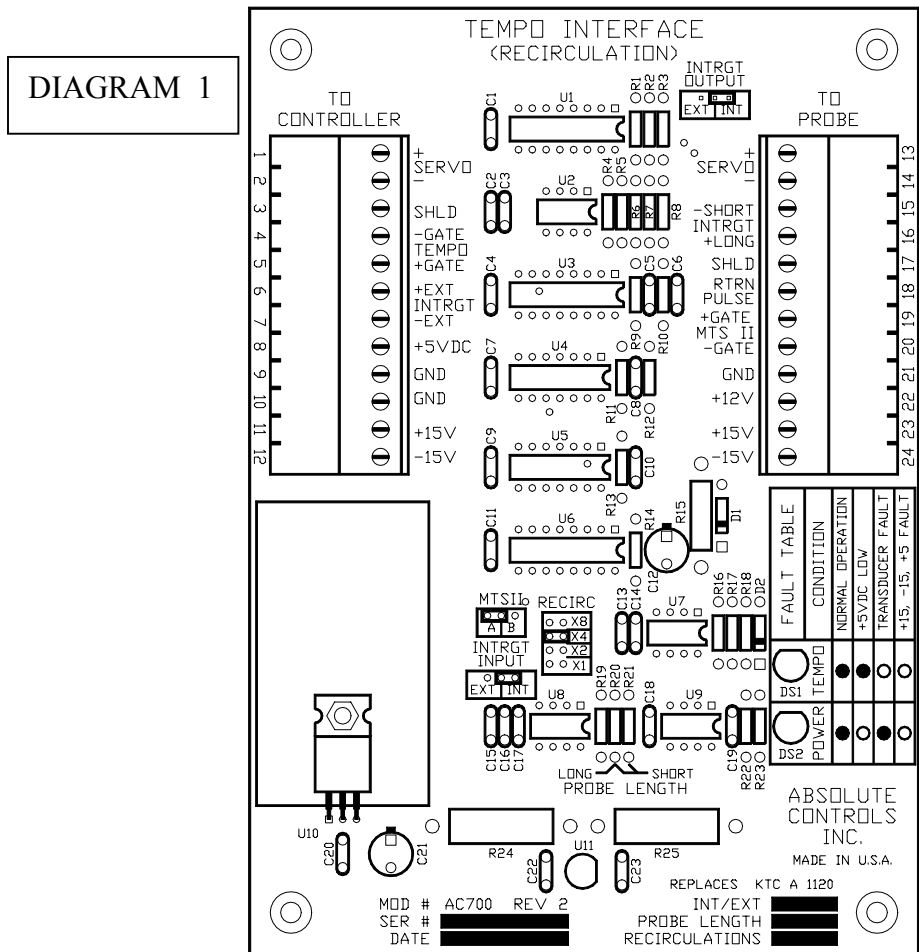


AC700 REV II RECIRCULATION BOARD

The AC700 REV II Recirculation board, pictured below in Diagram 1, gives the user interfacing flexibility that no other **DIB** circuitry has offered. Whether the user has **MTS® I, II** or **LP Temposonics®** probes, interfacing is easily accomplished by on-board jumper settings and board connections. Wire connections have been improved considerably with quality terminal blocks featuring reinforced pin construction and high gripping ability. This greatly reduces the number of broken connector pins and connectors unplugging in harsh environments. Also, the **AC700** is built from printed circuit laminate that is 50% thicker than standard boards, which prevents flexing in high vibration environments. The integrated circuits are soldered directly into the PCB to prevent contact problems associated with IC sockets.



The **AC700** also has terminals for servo valve connection, which makes hookup to the board easy using just one cable. The servo signals are routed straight through the board. Jumper cables for servo valves are available from **Paw-Taw-John Services, Inc.**TM

The **AC700** incorporates state-of-the-art technology to provide:

- * Improved 5V regulation (for systems only providing +/-15 volts)
- * Driver/receiver buffering (permits greater distances to probe)
- * Probe short circuit protection
- * Greater isolation (ideal for MTS® II probes with Personality Modules)
- * Status LEDs show probe operating status
- * Jumper options permit flexibility of applications and installations
- * On board LED **Truth Table** (for sensor troubleshooting-made-easy)

GLOSSARY OF TERMS

DPM MTS® Digital Personality Module. The DPM is mounted inside the MTS® II probe housing and is configurable for all digital applications.

DIB MTS® Digital Interface Box. Usually known as the “silver box”, this is also used for interfacing digitally to host computer systems.

NEUTERED MTS® probes that have no personality modules mounted inside the probe head (Blue Cap).

EXPLANATION OF BOARD TERMS

MTS® II A-B This jumper is used to configure the **AC700** for probes with or without DPMs. Jumper **A** is used with MTS® I, II and LP neutered probes. Jumper **B** is used with MTS® II probes configured with DPM's.

INTRGT INPUT The user can set the interrogation source for the AC700 circuits to either Internal or External. The **EXT** jumper is used when external interrogation is required for MTS® I and MTS® II neutered probes. Also, **EXT** is jumpered if an MTS® II probe has a DPM requiring external interrogation. The **INT** jumper would be used for an MTS® Linear Position (LP) probe.

INTRGT OUTPUT This output jumper permits selection of the type of interrogation required by the probe. The **EXT** jumper is used for MTS® II probes configured with DPM's and requiring external interrogation. Most other probe types will require the jumper be set to **INT**. (Note: if no jumper is present. the board will be internally jumpered to **INT**.)

RECIRC The **RECIRC** jumper selects the number of recirculations required for a specific application. This jumper is typically set to **X4**.

PROBE LENGTH Resistors **R20** and **R21** are used to set timing for the **AC700**. Probe lengths of 12” or less require both resistors be installed. Probe lengths of 12.1” or more require that **R21** be removed.

POWER REQUIREMENTS

It is extremely important to provide sufficient power to ensure accurate and reliable performance from a **Temposonics®** probe and the associated **AC700**. One can determine the total power required by picking the current for the **AC700** and **MTS®** probe configuration to be used from Tables 1 and 2.

The **AC700** can operate in two modes. If an external 5VDC supply is available, much less current is required from the +15VDC supply. If +5VDC is not available from the system, the **AC700** is equipped with a +5VDC regulator that draws its power from the +15VDC. Also, in the case of the **MTS® I**, the **AC700** produces the +12VDC from the +15VDC supplied to it. Choose the values from the tables below.

MTS® I, II and **LP** probes draw differing amounts of current. Total system current for the **MTS® II** probe and the **AC700** is found by adding the currents of corresponding voltages found in Tables 1 and 2. In the case of the **MTS® I**, the +15VDC and +12VDC currents must be added to the +15VDC current required for the **AC700** to get the total +15VDC draw.

AC700 POWER REQUIREMENTS						
External +5V Supplied				No External +5V		
<i>Voltage</i>	<i>Current</i>	<i>Tolerance</i>	<i>Voltage</i>	<i>Current</i>	<i>Tolerance</i>	
+15 VDC	50 mA	+14.25 to +15.75 VDC	+15 VDC	275 mA	+14.25 to +15.75 VDC	
-15 VDC	25 mA	-14.25 to -15.75 VDC	-15 VDC	25 mA	-14.25 to -15.75 VDC	
+5 VDC	200 mA	+4.75 to +5.25 VDC				

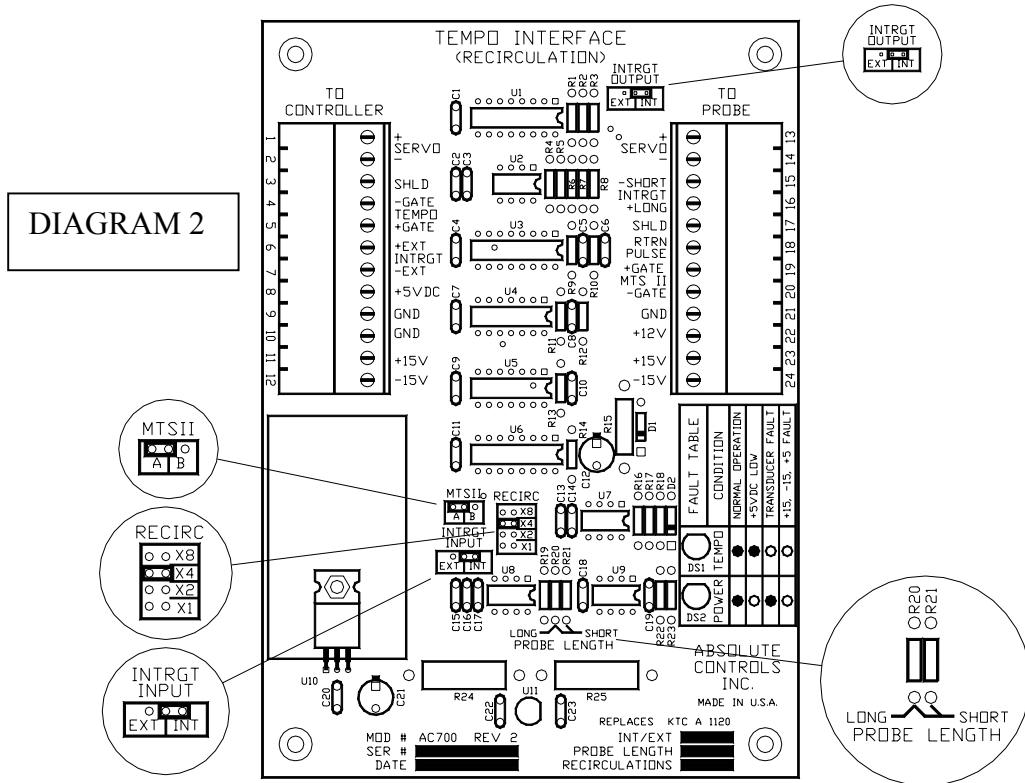
TABLE 1

TEMPOSONICS PROBE POWER REQUIREMENTS						
MTS I Probes			MTS II Probes			
<i>Voltage</i>	<i>Current</i>	<i>Tolerance</i>	<i>Voltage</i>	<i>Current</i>	<i>Tolerance</i>	
+15 VDC	5 mA	+14.25 to +15.75 VDC	+15 VDC	150 mA	+14.25 to +15.75 VDC	
-15 VDC	20 mA	-14.25 to -15.75 VDC	-15 VDC	100 mA	-14.25 to -15.75 VDC	
+12 VDC	25 mA	+4.75 to +5.25 VDC				

TABLE 2

MTS® LP probes require a voltage of 15 – 24 VDC and use a maximum current of 100 mA.

PROBE JUMPER OPTIONS



AC700 PROBE JUMPER OPTIONS						
PROBE MODEL	INTERROGATION REQUIREMENT	INTRGT OUTPUT	MTS II	RECIRC	INTRGT INPUT	PROBE LENGTH
MTS I	External	INT	A	Note 1	EXT	Npte 2
MTS I	Internal	INT	A	Note 1	INT	Npte 2
MTS II (Neutered Ver.)	External	INT	A	Note 1	EXT	Npte 1
MTS II (Neutered Ver.)	Internal	INT	A	Note 1	INT	Npte 2
MTS II (w/ DPM Inst.)	External	EXT	B	Note 3	EXT	Npte 2
MTS II (w/ DPM Inst.)	Internal	INT	B	Note 3	Npte 4	Npte 2
MTS LP PROBE	Internal	INT	A	Note 3	INT	Npte 2

JUMPER NOTES (Reference Table 3)

NOTE 1 Recirculations are determined by the user. The type of computer interface dictates the number of recirc's. The board is shipped jumpered to the X4 setting.

- NOTE 2** For probe lengths of 12” or less, R20 and R21 are both installed. For probe lengths of 12.1” or more, R21 is removed.
- NOTE 3** This jumper has no effect for MTS® II probes with DPM’s installed.
- NOTE 4** This jumper has no effect for MTS® II probes with DPM’S and using internal interrogation.

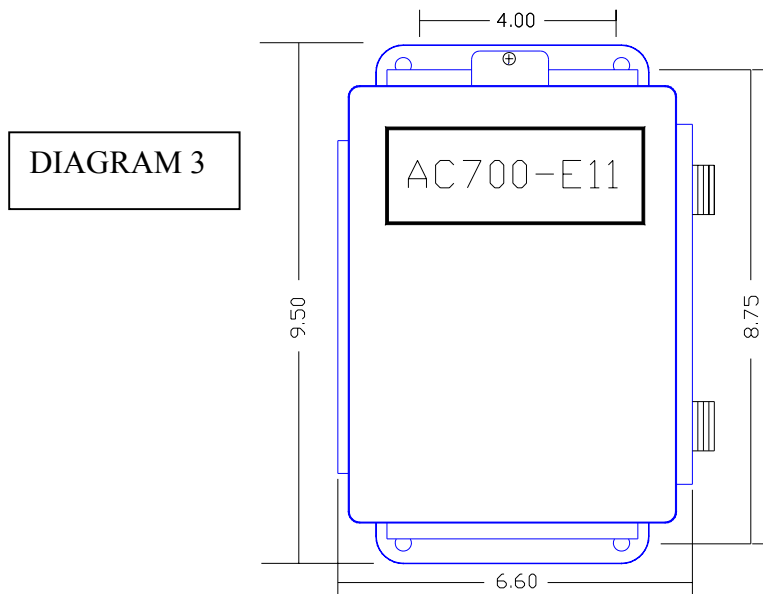
AC700 INSTALLATION AND WIRING

MOUNTING THE AC700

Two variations of the **AC700** are available from Paw-Taw-John Services, Inc.™ The board can be mounted in a NEMA 4 enclosure with prewired output connectors (identified as the **AC700-E11**) or the circuit board module alone (**AC700**) can be mounted in user equipment enclosures.

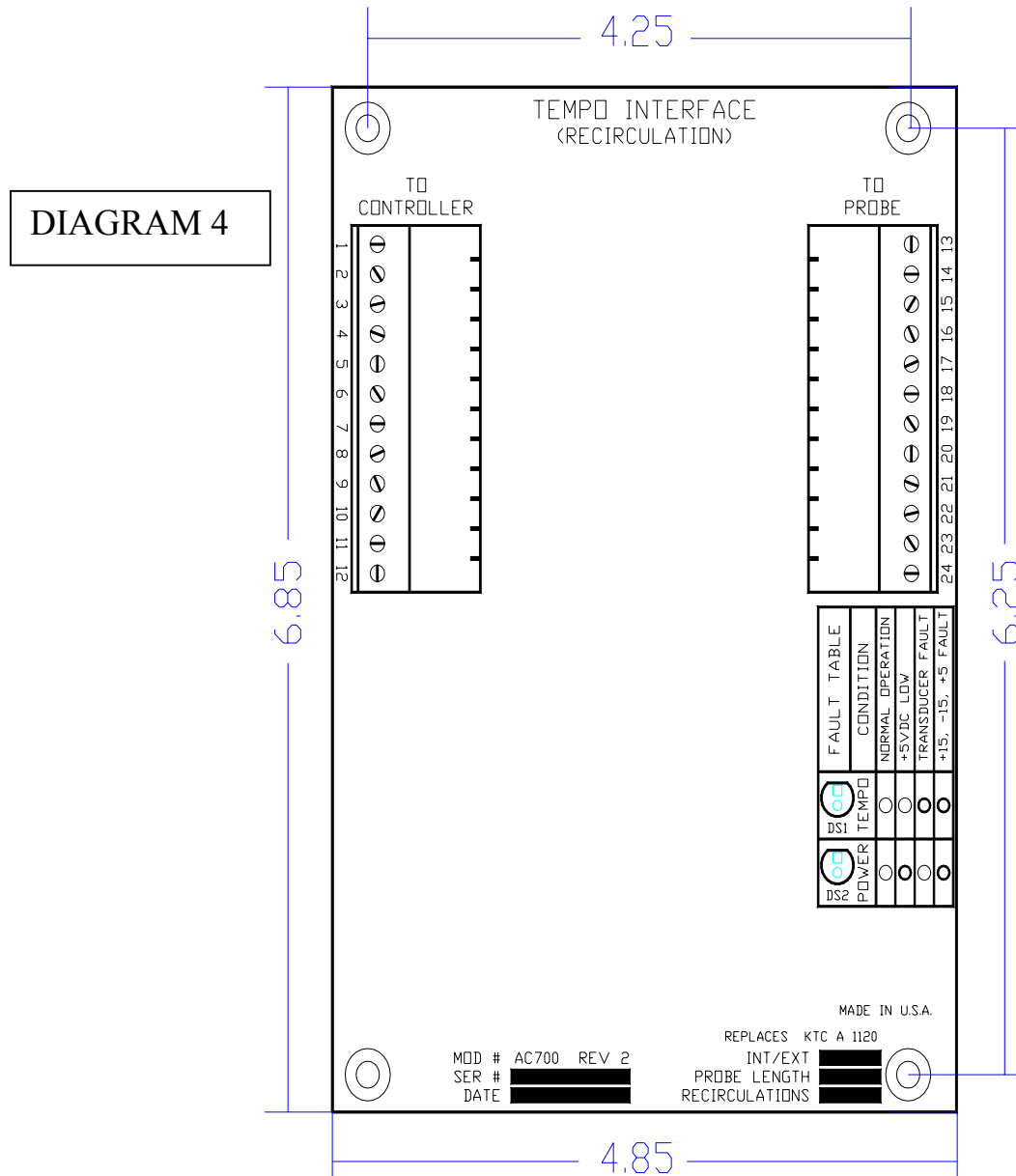
AC700-E11

The **AC700-E11** is ideal for high vibration or dirty environments, but must be securely mounted using 1/4" mounting hardware. When choosing a location for the enclosure, allow 3 to 5 inches on either side for cable/connector access. Dimensions are provided in Diagram 3 for mechanical layout and planning. Holes for conduit or connectors must be drilled into the input side of the housing for input electrical connections.



AC700 (PCB Version)

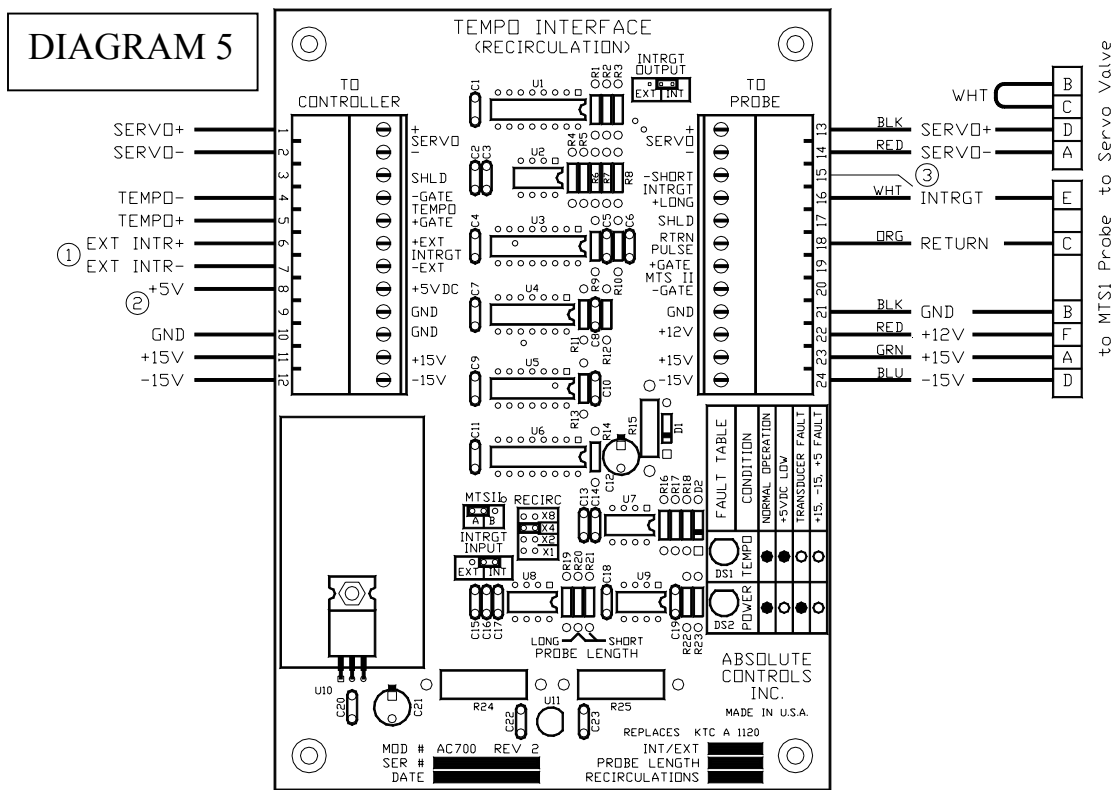
For applications where suitable protection can be provided, the **AC700** may be mounted within other types of enclosures or within other equipment's enclosures. PCB size and mounting centers are dimensioned in Diagram 4. Mounting should be with four **#8-32** screws at the four locations provided and into suitable threaded stand-offs. This is necessary to prevent the PCB solder connections from shorting out to the enclosure.



WIRING FOR MTS® I PROBES

When using the AC700-E11, note that a 4-pin connector is prewired for the Servo valve output and a 6-pin connector for the Temposonics® probe output. Diagram 5 includes connector pin designations and internal wire colors, as well as PCB terminal numbers and functions.

Use suitable wire (18 to 20 gauge paired, shielded cable) and follow appropriate wiring practices in making connections to connectors and terminal blocks. All wiring on the left side of the AC700 connects to servo controller and power supplies and is provided by the installer at the time of installation.



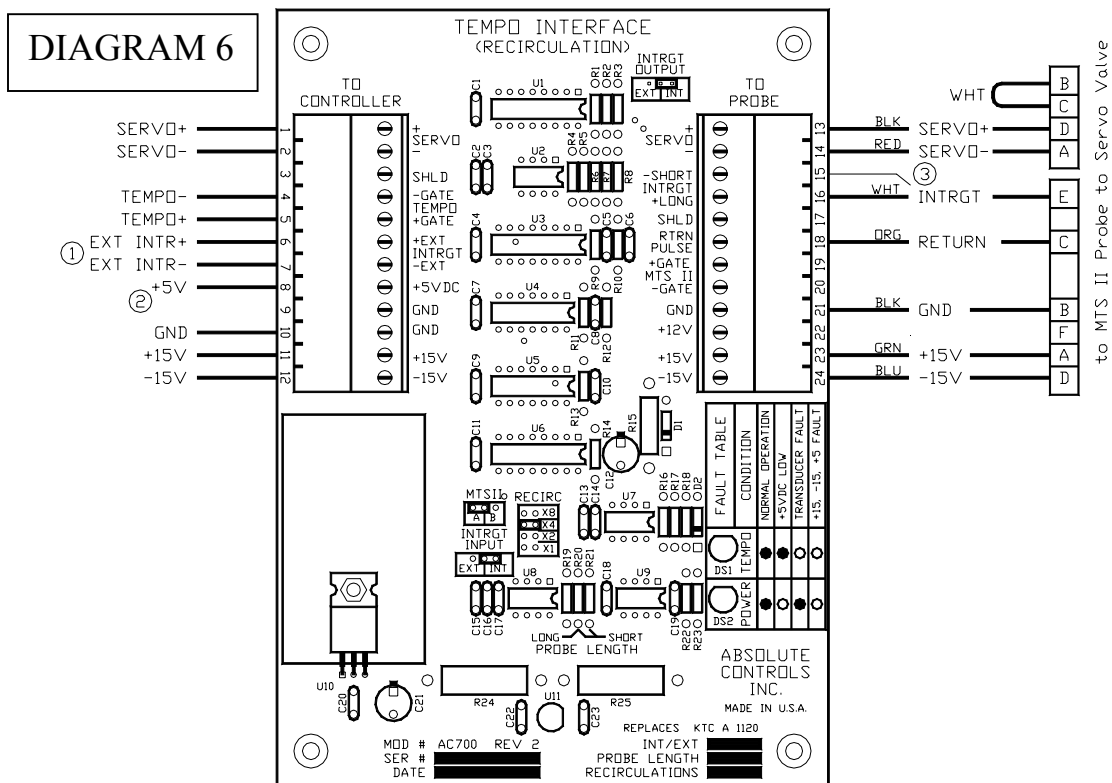
WIRING NOTES

- NOTE 1** Connect terminals 6 and 7 to external interrogation source if used. Make no connections if internal interrogation is required.
- NOTE 2** Connect terminal 8 to +5VDC if 5VDC power is available. Make no connection if 5VDC is not available. 5VDC will be provided by the regulator on the AC700.
- NOTE 3** Connect probe interrogation wire to terminal 15 for probes 12" and under. Connect probe interrogation wire to terminal 16 for probes 12.1" and over.

WIRING FOR MTS® II (NEUTERED) PROBES

When using the AC700-E11, note that a 4-pin connector is prewired for the Servo valve output and a 6-pin connector for the Temposonics® probe output. Diagram 6 includes connector pin designations and internal wire colors, as well as PCB terminal numbers and functions.

Use suitable wire (18 to 20 gauge paired, shielded cable) and follow appropriate wiring practices in making connections to connectors and terminal blocks. All wiring on the left side of the AC700 connects to servo controller and power supplies and is provided by the installer at the time of installation.



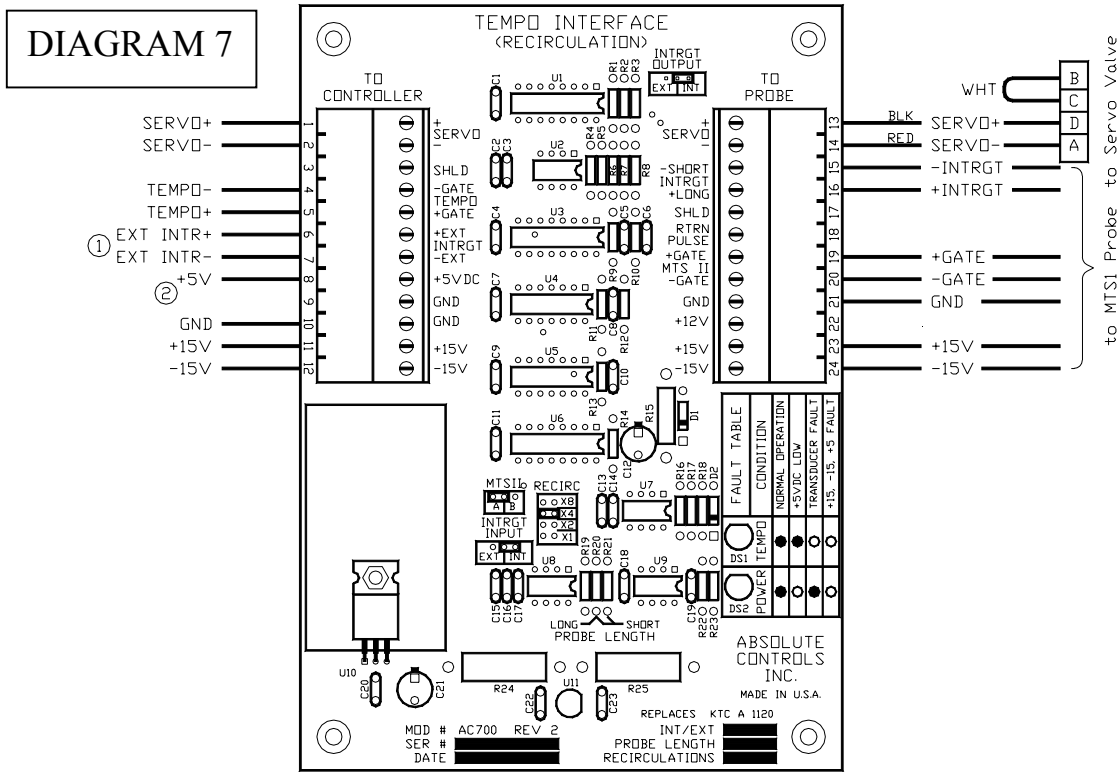
WIRING NOTES

- NOTE 1** Connect terminals 6 and 7 to external interrogation source if used. Make no connections if internal interrogation is required.
- NOTE 2** Connect terminal 8 to +5VDC if 5VDC power is available. Make no connection if 5VDC is not available. 5VDC will be provided by the regulator on the AC700.
- NOTE 3** Connect probe interrogation wire to terminal 15 for probes 12" and under. Connect probe interrogation wire to terminal 16 for probes 12.1" and over.

WIRING FOR MTS II (With DPM) PROBES

When using the AC700-E11, note that a 4-pin connector is prewired for the Servo valve output and a 6-pin connector for the Temposonics® probe output. Diagram 7 includes connector pin designations and internal wire colors, as well as PCB terminal numbers and functions.

Use suitable wire (18 to 20 gauge paired, shielded cable) and follow appropriate wiring practices in making connections to connectors and terminal blocks. All wiring on the left side of the AC700 connects to servo controller and power supplies and is provided by the installer at the time of installation. Wiring to the right side of the AC700 connects to the servo valve and MTS® II probe and may be provided by the installer if the AC700 is prewired to a special order connector.



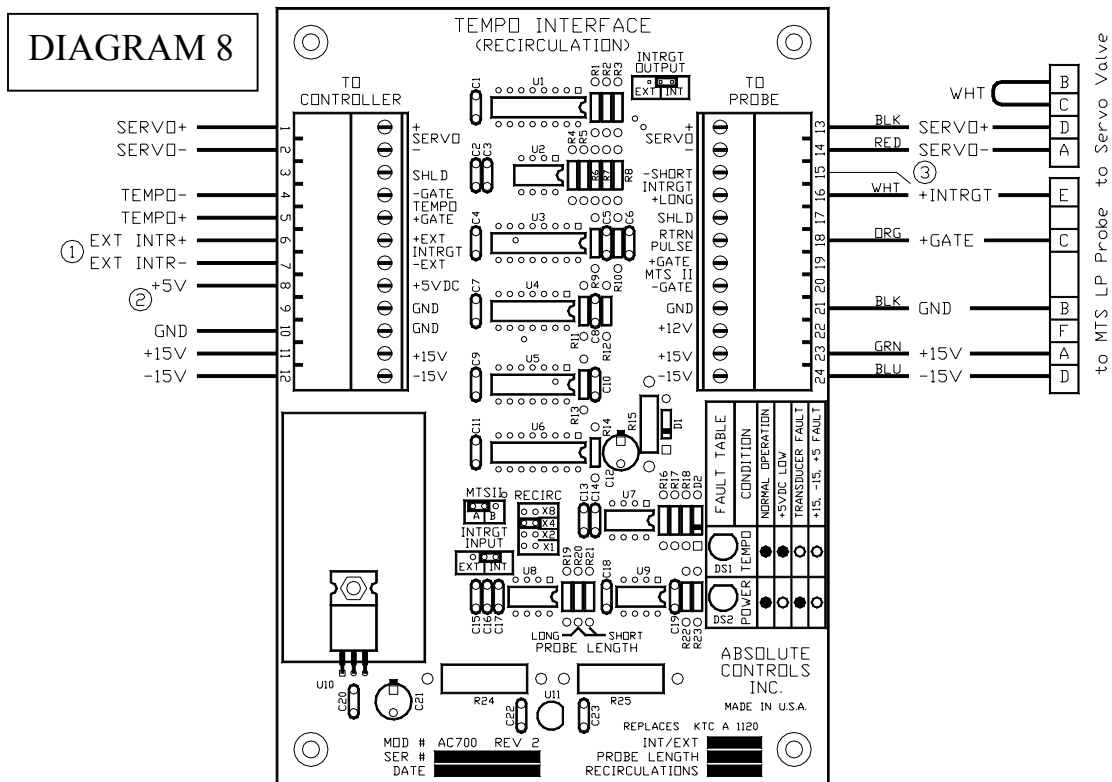
WIRING NOTES

- NOTE 1** Connect terminals 6 and 7 to external interrogation source if used. Make no connections if internal interrogation is required.
- NOTE 2** Connect terminal 8 to +5VDC if 5VDC power is available. Make no connection if 5VDC is not available. 5VDC will be provided by the regulator on the AC700.

WIRING FOR MTS LP PROBES

When using the AC700-E11, note that a 4-pin connector is prewired for the Servo valve output and a 6-pin connector for the Temposonics® probe output. Diagram 8 includes connector pin designations and internal wire colors, as well as PCB terminal numbers and functions.

Use suitable wire (#16AGW is preferable) and follow appropriate wiring practices in making connections to connectors and terminal blocks. All wiring on the left side of the AC700 connects to servo controller and power supplies and is provided by the installer at the time of installation.



WIRING NOTES

- NOTE 1** Connect terminals 6 and 7 to external interrogation source if used. Make no connections if internal interrogation is required.
- NOTE 2** Connect terminal 8 to +5VDC if 5VDC power is available. Make no connection if 5VDC is not available. 5VDC will be provided by the regulator on the AC700.
- NOTE 3** Connect probe interrogation wire to terminal 15 for probes 12" and under. Connect probe interrogation wire to terminal 16 for probes 12.1" and over.

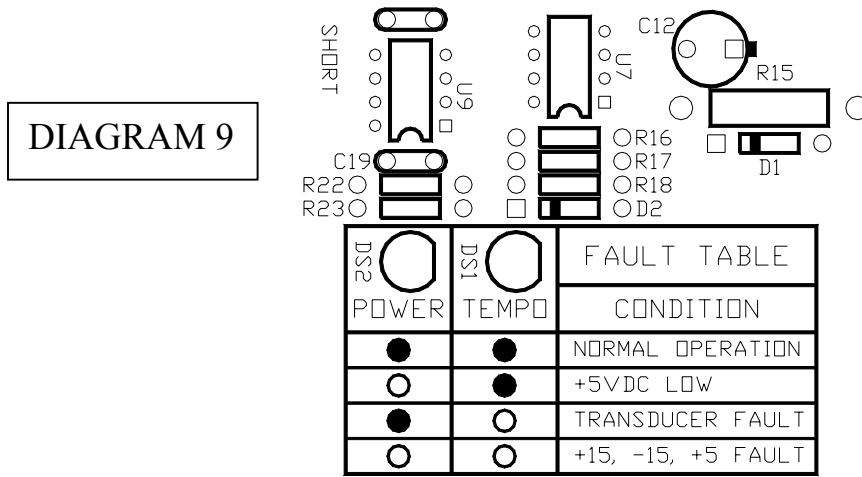
SERVO VALVE CONNECTIONS

For wiring convenience the **AC700** provides terminations for the servo valve drive signals. If cabling permits the servo valve signals to be run with the Tempo signals from the controller, the servo wires should be connected to terminals 1 and 2. The servo valve cable then would terminate at the Servo Connector or terminals 13 and 14.

If it is not practical or convenient to route servo valve drive signals with Tempo signals, the servo signals may be routed and connected directly between the controller and servo valve. In this case no terminations would exist in the **AC700** at terminals 1, 2, 13, or 14.

EXPLANATION OF ON BOARD FAULT TABLE

The Fault Table (see diagram 9) is located at the bottom right of the circuit board. Two LEDs, one red and one yellow, are used as indicators for status of the **AC700** and MTS probe. Both LEDs **must** be on for operation.



The red LED displays the status of the power to the board. If +15, -15, or +5 VDC are not present, or are too low, the LED will go out. If the +5 VDC is below +4.7 VDC the LED will also go out. With this indication, the +5VDC supply needs to be adjusted above +4.75 VDC.

The yellow LED displays the status of the signal loop between the probe and the **AC700**. If this LED goes out the probe is generally bad.

Please refer to the troubleshooting section of this manual for solutions to problems that may be encountered.

TROUBLESHOOTING

WARNING:
ALL LOCAL LOCKOUT AND SAFETY REQUIREMENTS MUST BE FOLLOWED

When instructed to make voltage measurements below, use a suitable VOM meter or DVM. Take care to observe polarity as required by meter.

AC700 INDICATION

POSSIBLE SOLUTIONS

Red and Yellow LED's off

Measure voltages at the "TO CONTROLLER" input connector.

+15VDC pin 9 (gnd) to pin 11.

-15VDC pin 9 (gnd) to pin 12.

+5VDC pin 9 (gnd) to pin 8.

If any of these voltages are not present or are out of tolerance, check power supplies and wiring.

Red LED off, Yellow on

+5VDC is too low. Measure +5VDC from pin 9 (gnd) to pin 8. Adjust voltage to power supply specifications.

Red LED on, Yellow off

Check voltages on "TO PROBE" connector. For MTS® I probe, +12VDC, -15VDC, and +15VDC are needed. For MTS II® probe, only -15VDC and +15VDC are needed. Refer to MTS® probe power requirements.

+15VDC pin 21(gnd) to pin 23

-15VDC pin 21(gnd) to pin 24

+12VDC pin 21(gnd) to pin 22

If +15VDC or -15VDC are too low, replace probe.

If +12VDC is not present, replace probe.

Check wiring to probe.

If situation still exists, replace AC700 card.

Red LED on, Yellow LED intermittent

When cabling to probe is moved and this condition occurs, check wiring to probe. Replace cable if applicable. Replace probe.

For further assistance in installation or troubleshooting, please contact Paw-Taw-John Services, Inc.™ at (208)-687-1478.

PAW-TAW-JOHN SERVICES, INC.™
18125 N. RAMSEY ROAD

**RATHDRUM, IDAHO 83858
(208)-687-1478**

PRODUCT WARRANTY

Paw-Taw-John Services, Inc.™ (Seller) warrants product(s) of its manufacture to be free of defects in material and workmanship for a period of 90 days from date of shipment from Seller's facility. Seller's only obligation under this warranty is to furnish an equivalent product(s) by form fit and function, return shipping prepaid, for any product(s) returned, shipping prepaid, to Seller's facility and found to contain a liable defect within the warrantee period.

Paw-Taw-John Services, Inc.™ shall accept liability only if the product(s):

- 1) are erected, tested, and operated in a manner approved by, or in accordance with instructions provided by seller,
- 2) have not been subjected to electrical or mechanical misuse or abuse or accident,
- 3) have been used for the purpose for which the goods were designed,
- 4) have not been altered or repaired by persons other than seller in any respect which in the judgment of seller affects the condition or operation of the product(s).

This warranty constitutes **Paw-Taw-John Services, Inc.™** entire and only warranty. There are no other warranties, expressed or implied in law or in fact including implied warranties of fitness and merchantability. **Paw-Taw-John Services, Inc.™** will not be liable for compensatory or incidental damages caused by defects and will not be responsible for costs or repairs done by others.

Returned goods must be carefully packed, preferably using the original shipping carton and packaging material. Product(s) should be returned prepaid to:

Paw-Taw-John Services, Inc.™
18125 N. Ramsey Road
Rathdrum, ID 83858
(208) 687-1478

System, item sold: _____

Buyer/authorized agent signature, company name and date of acknowledgment of Product Warranty.

Seller/authorized agent signature, and date.

Paw-Taw-John Services, Inc.™

PAW-TAW-JOHN SERVICES, INC.™
18125 N. RAMSEY ROAD

**RATHDRUM, IDAHO 83858
(208)-687-1478**

SALE AGREEMENT TERMS AND CONDITIONS

1. General. Any order resulting from a Quotation shall not constitute a contract until such order has been accepted either in writing or payment by terms. Such acceptance is conditioned upon Buyer's acceptance of the express terms and conditions set forth in quotes, invoices, or attached contracts. The order of precedence of all terms and conditions in the agreement are those designated: (1) in body of a contract, (2) in body of a quotation and (3) those herein. PAW-TAW-JOHN SERVICES, INC.™ rejects the inclusion of any different or additional terms proposed by Buyer in any order resulting from the Quotation and if such different or additional terms are so included in such order, Buyer agrees that a binding contract of sale will result including only the terms stated herein, unless PAW-TAW-JOHN SERVICES, INC.™ agrees in writing to accept such different or additional terms. By accepting PAW-TAW-JOHN SERVICES, INC.™ quotes, proposals or any other PAW-TAW-JOHN SERVICES, INC.™ document marked as PAW-TAW-JOHN SERVICES, INC.™ Proprietary or Confidential, Recipient (Buyer) agrees to the terms of item 2 below.

2. PROPRIETARY DATA RIGHTS. PAW-TAW-JOHN SERVICES, INC.™ and Buyer agree that all technical manuals, computer software, and any other medium are for use by Buyer only and will not be used or given to any other party for use.

3. GOVERNING LAW. The laws of the State of Idaho USA shall govern this Agreement, except that its conflict of law rules shall not apply.

4. DEFINITIONS as used herein: (1) **Product** shall mean any hardware, software, services, and documentation purchased from PAW-TAW-JOHN SERVICES, INC.™ For purposes of this Agreement, the term “**sale**” or “**purchase**” will be understood to mean “**license**” whenever used in connection with such software or documentation; (2) **Computer Software** shall mean computer or processor programs and computer data bases, including software embedded in semiconductor chips, and all other forms of software. “**Computerized industrial control system**” will refer to item 8.

5. LIABILITIES. Buyer agrees to use system hardware and software in a safe manner using all safety precautions, local lockout procedures, and follow all local or ruling government authority procedures to prevent personal injury or equipment damage. Buyer also agrees to free PAW-TAW-JOHN SERVICES, INC.™ of any responsibility from personal or equipment damage suits as a result of misuse or non-compliance of safety procedures specified in tech manuals, local or ruling government authority.

6. NATURE OF BREACH. PAW-TAW-JOHN SERVICES, INC.™ liability for breach of warranty under the terms set forth herein shall arise only after Buyer's notice to

PAW-TAW-JOHN SERVICES, INC.™ of the claims breach, and such notice must be given within thirty (30) days after discovery thereof.

7. INSTALLATION, REPAIR, TESTING, TRAINING OF EQUIPMENT. Buyer agrees that all hands on installation and repair work will be done by competent personnel and that PAW-TAW-JOHN SERVICES, INC.™ personnel will only perform a supervisory service for the installation, and/or repair, and/or testing, and/or training for the computerized industrial control system.

8. SYSTEM SOLD

BUYER (Company name, address, date, and owner/acting agent signature)

SELLER (owner/acting agent signature, date)

PAW-TAW-JOHN SERVICES, INC.™

PAW-TAW-JOHN SERVICES, INC.™
18125 N. RAMSEY ROAD

**RATHDRUM, IDAHO 83858
(208)-687-1478**

SERVICE AGREEMENT

1. SCOPE. This service agreement is good for a 2-year period. The agreement starts at the beginning of the issuing date of the Purchase Order. At the end of this time frame, _____ can enter into an extension of the service agreement for one a (1) year period. This extension must be requested within thirty (30) days of expiration of the service agreement, requested in writing by the authorized agent for the Canadian Company and only for the equipment sold.

2. SYSTEM TO BE SERVICED.

Henceforth, referred to as “computerized industrial control system”.

3. SERVICES RENDERED. PAW-TAW-JOHN SERVICES, INC.™ agrees to visit the computerized industrial equipment site once a year. PAW-TAW-JOHN SERVICES, INC.™ personnel will supervise testing, and/or repair of all firmware, software, and software upgrades of the computerized industrial control system.

4. PROGRAM CHANGES. Program changes will be considered as service repairs and must be checked by PAW-TAW-JOHN SERVICES, INC.™ personnel.

5. SERVICE FEES. Fee’s to be determined at time of request and in writing sent by FAX or mail.

6. SEVERABILITY. The terms of this agreement can be terminated at anytime. Termination of this agreement must be submitted in writing to PAW-TAW-JOHN SERVICES, INC.™ at the address displayed at the top of this document.

Acknowledgment of Service Agreement.

BUYER (Company name, address, and owner/acting agent signature)

SELLER

PAW-TAW-JOHN SERVICES, INC.™