

# *Electrofusion* *System* ISO 9000 Certified Company

**TRAINING AND  
INSTALLATION  
MANUAL**



**The** information contained herein is technical data and specifications for the DAEYOUN / MTD Electrofusion System. Operation of the DAEYOUN / MTD Electrofusion System should be done by qualified operating personnel only.

This publication was written to assist in the training of personnel in the appropriate procedures and operating techniques for joining polyethylene pipe with the DAEYOUN / MTD Electrofusion System. This manual is designed as a training and installation guide and should be used solely for this purpose. Permanent field installation should be done only by properly trained operators who have been certified in accordance with the requirements of the Department of Transportation.

The recommended joining procedures for the DAEYOUN / MTD Electrofusion System detailed in this manual have been qualified in accordance with D.O.T. 192.283.

Operators should study this manual and follow all procedures prior to field operation of the DAEYOUN / MTD Electrofusion System.

Technical data and procedures contained herein are based upon documented testing performed by DAEYOUN's Quality Control Department, but operator should not rely upon it completely due to variations in field conditions. These guidelines are given and accepted at operator's risk. DAEYOUN Co., Ltd. makes no guarantee of fusion results and assumes no liability in connection with its published guidelines. The integrity of the polyethylene piping system is the final responsibility of the operator. This publication is a training and installation manual only and is not a recommendation to infringe on any patents.



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# MTD TRI FUSION Universal Processor

The DAEYOUN / MTD Electrofusion System is an automatic universal system for joining plastic pipe that consists of DAEYOUN / MTD Electrofusion fittings and the MTD TRI FUSION processor.

The MTD TRI FUSION processor is designed to provide control of time, temperature, current and joining pressure during the entire fusion process. Fusion results are achieved in one of three modes (Resistor, Barcode & Manual). If any discrepancies in electrical specification, voltage, or fitting connection occur, the MTD TRI FUSION processor will automatically terminate the fusion cycle and alert the operator of the problem on the LCD screen.

The MTD TRI FUSION processor provides additional security by monitoring and storing fusion results retrievable in field utilizing the internal paper printer.

MTD TRI FUSION processor includes:

### Field Operations

User prompts are simple, resulting in greater ease of use and reduced operator dependency. The processor's computerized technology is designed to detect bad fusions and will document on internal paper printer.

### Self-Diagnostic

MTD TRI FUSION processor performs self-diagnostic checks automatically during start-up. If any critical functions are found to be in error, an error code message indicating service is needed is displayed and processor will not allow operation to continue.

### Memory

200 fusions can be stored in memory. Fittings are given I.D. numbers. The number is incremented for every attempted fusion whether successful or unsuccessful.

### Data Storage

MTD TRI FUSION processor stores date, time, temperature, company name, operator's name, fusion number, fitting ID, manufacturer, fitting diameter, specified fusion time, actual fusion time, input voltage, output current. Processor records fusion voltage and current in 10% increments during entire fusion process and documents fusion approval or failure.

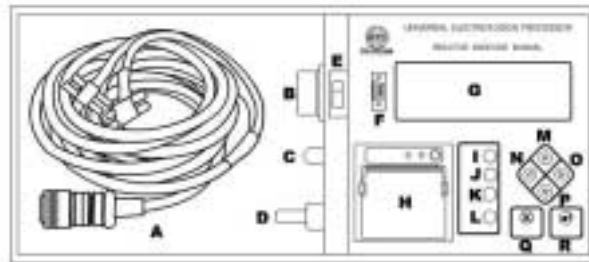
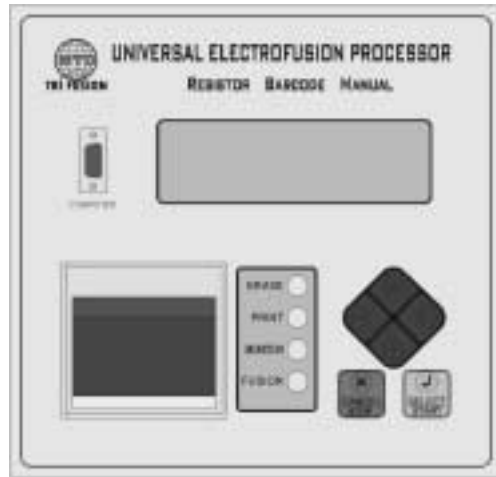
Stored data can be retrieved automatically in the field with internal paper printer or downloaded to PC.

# MTD TRI FUSION Universal Processor Specifications

SPECIFICATIONS			
Input Voltage	85 to 150 VAC; 49.2 to 70.8 HZ	Continuous Output Voltage	40 ± 0.2 Volts
Input Current	80 Amps maximum	Output Current	80 Amps maximum (automatically limited by processor)
Circuit Breaker	Resettable Breaker	Operating Temperature Range	-10°F (-23°C) to 120°F (49°C)
Maximum Input power	5.0 KVA (@115V)	Maximum Output power	3400W
Fusion Data Storage	200 Fusions	Fusion Data Print	Built - in Printer (1.5sec / print)
Dimension	22" Long X 10" Wide X 12" High (Aluminum carrying case for processor)		
Weight	36 lbs. Including carrying case & leads		
Electrical Lead	15ft, 30 Amp, 5.5sq, 125 Volt, Twist Lock Plug		
Dedicated Lead	25ft, 30 Amp, 5.5sq, Dedicated 4.7mm		
Universal Lead with 4 built - in Connectors	25ft, 30 Amp, 5.5sq (2.2mm, 3.0mm, 4.0mm and 4.7mm)		
Barcode Reader	Optional with Dedicated and Universal Leads		
Maintain calibration interval	2 years		
Warranty	1 year (extended warranty optional)		

# MTD TRI FUSION UNIVERSAL PROCESSOR OPERATIONS

## MTD TRI FUSION Universal Processor Operating Features



A. Storage for fusion/electric leads	J. Print Button
B. Output Fitting Lead	K. Monitor Button
C. Temperature Sensor	L. Fusion Button
D. Input Electric Power Lead	M. Up Key
E. Power/Circuit Protector Switch	N. Left Key
F. Serial Port	O. Right Key
G. LCD Display	P. Down Key
H. Built-in Printer	Q. Cancel/Stop Key
I. Erase Button	R. Select/Start Key

### 1. Field Operation

MTD TRI FUSION processor performs self-diagnostic checks automatically during start-up. If any critical functions are found to be in error, an error code message indicating service is needed is displayed and processor will not allow operation to continue, otherwise processor will continue into operational mode.

LCD display will guide the operator through steps required for Electrofusion process described in detail in MTD TRI FUSION Processor Operation Manual.

### 2. Data Retrieval for Fusion Results

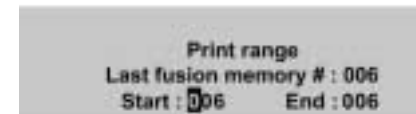
Stored data can be retrieved from the MTD TRI FUSION processor in the field immediately after fusion with the internal paper printer or downloaded into personal computer. Data retrieval via computer does require a MTD TRI FUSION software package.

#### Internal Printer Instructions

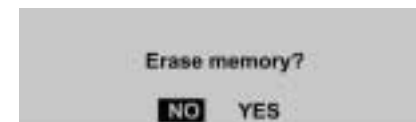
Operator press [PRINT]. Next screen will appear.



Operator can select last fusion (LAST), all fusions up to 200 (ALL) or specified fusion range between 1 and 200 (SET). Input fusion memory number from Start to End and press [Start].



#### Erase Fusion Results Memory



This message will appear when the processor stores 200 fusions. Operator can download on paper or computer prior to erasing the memory. Select [Yes] or [No] and press [Start].

# Error Messages

## 3. Diagnostic Operation

The MTD TRI FUSION processor automatically performs self-diagnostics which detects functional faults.

Do not attach fitting until prompted by processor.

Diagnostic tests performed are listed below.

TEST
SRAM
Storage
LCD Display
A/D Converter
A/D Converter Latch
D/A Converter
Start Button
Stop Button
Alarm
Generator Voltage
Tests
Magnetic Contactor
Built-in Printer

Error Messages	Description / Trouble shooting
Fitting not recognize by processor. Contact MTD.	This message appears in case there is a bar code which is not supported by the processor or when fusion time is exceeded.
Backup battery low.	This message appears when the battery for DATA storage is low. It informs operator to replace the battery (AA 3.6V). Replace the battery.
This processor is powered by 110V only. Check input voltage. Current input voltage: 000V	Inlet power for the processor ranges from 85V to 150V. Message will be displayed when processor is out of this range.
Check EF leads to fitting connection.	Check if EF leads are connected properly to EF fitting. Re-connect the leads as required and then re-start fusion.
Processor leads disconnected during fusion. Restart fusion.	This message is shown when the processor leads are disconnected during the fusion. Check connection and re-start fusion.
Over current Replace the fitting.	This message is shown when the processor senses an over current condition during the fusion. Cut out fitting and replace it.
Memory capacity exceeded. Erase after printing.	This message will appear when the processor stores 200 fusions. Operator can download on paper or computer prior to erasing the memory.
Wrong barcode read.	This message is shown when a wrong bar code is read or when bar code reader fails. Rescan fitting.
Switch leads if not connected properly.	In the RESISTOR MODE, this message informs operator to connect resistor lead to resistor terminal in the resistor mode (Red to Red).
Maintenance Required	This message is shown when the processor has been in service for greater than two years since its last calibration. Contact M.T.Deason Co., Inc. 1-800-633-7131, <a href="http://www.mtdtrifusion.com">www.mtdtrifusion.com</a>

# Electrical Requirements

## Power table

Minimum Power (KVA) for Daeyoun MTD TRI FUSION EF Fittings		
Fitting Type	Fitting Size	Min. Power (KVA)
Couplings	1/2" CTS thru 1 1/4" IPS	1.00
	2" IPS thru 4" IPS	2.50
	6" IPS thru 16" IPS	5.00
Tees	1/2" CTS thru 1 1/4" CTS	1.00
	2" IPS thru 4" IPS	2.50
	6" IPS thru 8" IPS	5.00
Elbows	2" IPS thru 4" IPS	2.50
	6" IPS - 8" IPS	5.00
Reducers	3/4" x 1/2" CTS	1.00
	2" x 1 1/4"	1.50
	4" x 2" IPS	2.50
	6" x 4" IPS	3.50
	8" x 6" IPS	5.00
Tapping Tees & Branch Saddles	1 1/4" thru 6"	1.00
	8" thru 12"	2.50
End Caps	2"	1.50
	4"	2.50
	6"	3.50
	8"	5.00
POLYTAPP Valves	2"	1.50
	4"	2.50
	6"	3.50

When using processor with other manufacturers' fittings, be sure to check for manufacturer's recommended minimum power (KVA).

## Extension Cord Info

Extension cords are not recommended for use with the MTD TRI FUSION processor. However, if it is necessary to utilize an extension cord, the following is recommended.

Cord Length	Wire Gage
25ft.	#10/3 Wire (6mm <sup>2</sup> )
50ft.	# 8/3 wire (10mm <sup>2</sup> )

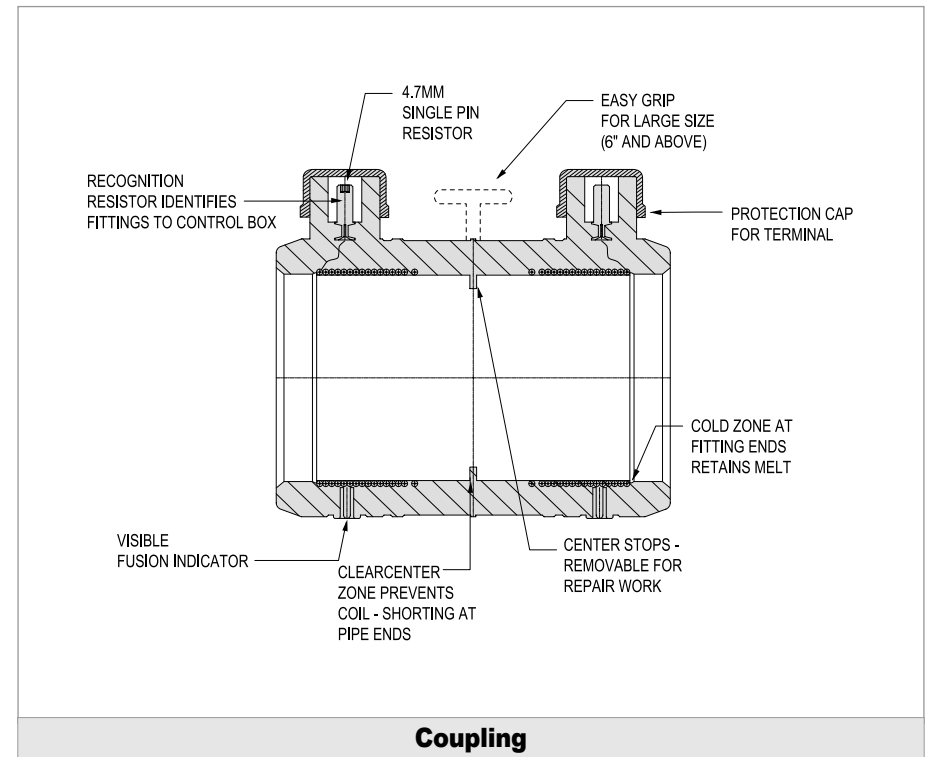
## Pigtails (30 amp Twist lock to 15 Amp Standard Plug Adapter)

Pigtails are not recommended for field installations except on fitting sizes 2" and smaller. Pigtail adaptors are recommended only for demonstration and training purposes.

# RESIN SPECIFICATIONS

Properties	Test methods	Units	Values
Density	ASTM D 792	Kg/m <sup>3</sup>	959
Melt index	ASTM D 1238	g/10min	0.45
Tensile strength at yield	ASTM D 638	MPa	25
Elongation at Break	ASTM D 638	%	> 600

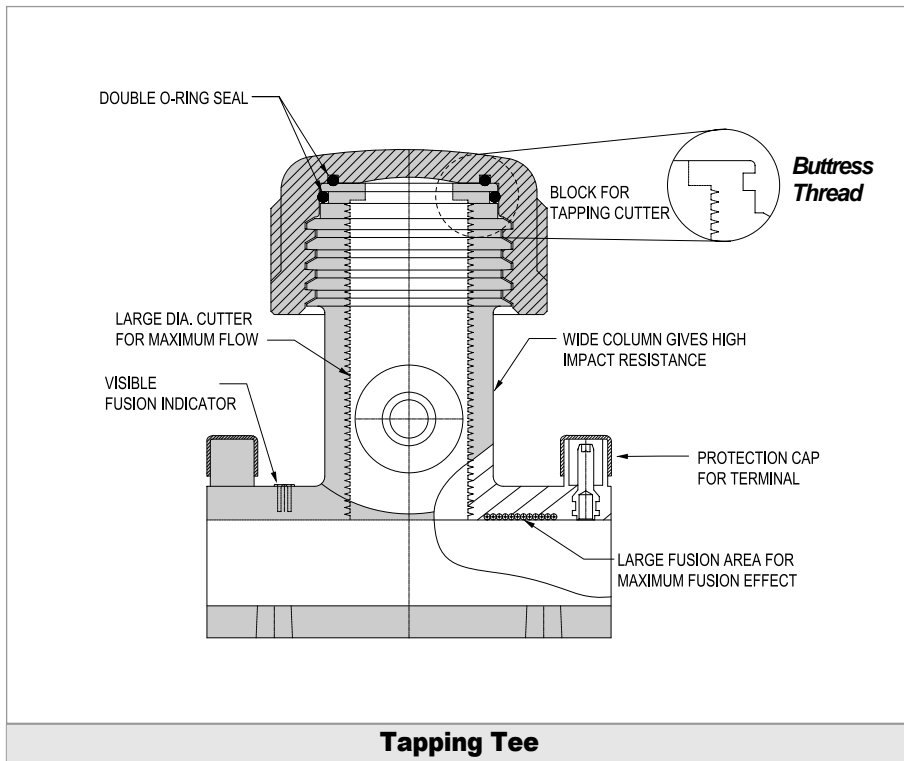
## Fitting Diagrams :



**Coupling**

# Joining Procedures for Couplings, Tees, Elbows, Reducers, Caps

Joining procedures describe the steps necessary to join similar or dissimilar polyethylene piping materials with the DAEYOUN / MTD Electrofusion System.



## Performance Testing:

DAEYOUN / MTD Fittings achieve the following performance test results.

Temperature	Internal Pressure	Hours to Failure
176°F (80°C)	130 PSI	1000+
68°F (20°C)	275 PSI	2500+

Saddle Impact: Falling Weight 10 lb. from 7 ft.

Safe Operation Temperature: -10°F to 120°F (-23°C to 49°C)

Safe Operation Pressure: 125 PSI

Compliance with Standards: DAEYOUN / MTD Electrofusion fittings meet the requirements of ASTM F1055, ASTM D1248, ASTM D2513, ASTM D3350, D3261.



1. Make sure pipe is cut square.

2. Remove any burrs or shavings from the pipe ends.

3. Clean pipe ends inside and out with a clean lint free cloth to remove dirt or contaminants.

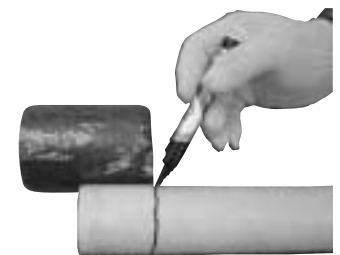
The Electrofusion process requires good preparation (cleaning & scraping) prior to beginning.

4. Mark the area to be scraped with a permanent marker.



5. Make sure scraping has removed all contaminants.

After scraping do not handle fusion area of pipe with your hands to avoid recontamination. If the scraped area becomes contaminated clean with a clean lint free towel and 70 % minimum concentration of isopropyl alcohol.



6. DAEYOUN / MTD Couplings are designed with a center line mark on exterior of Coupling. This mark should be utilized to mark the pipe ends to predetermine the stab depth of the

pipe when inserted into the coupling.

7. Insert pipe into fitting until pipe end meets with the stops in the ID of the fitting.

Check mark for proper stab depth.



8. Place coupling in clamping device to prevent movement during fusion process. (Clamps are not required on 6" and larger couplings)

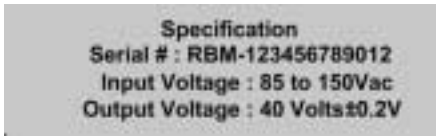


9. The MTD TRI FUSION Universal processor must be connected to an adequate AC power source (110

Volt).

Note: If utilizing a generator, the generator must be running and Auto throttle in off position prior to plugging in the processor.

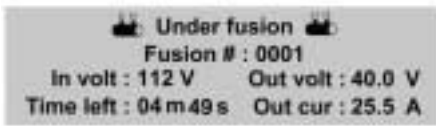
Electrical Requirements are listed on page



10. The MTD TRI FUSION processor will automatically run a quick diagnostic check of its operational functions (voltage in put/ output, etc.). When diagnostic check is complete "Ready for Operation" will appear on the visual display.



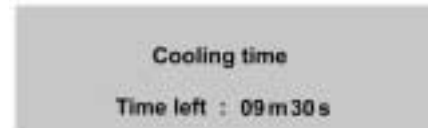
11. Follow instructions in the MTD TRI FUSION Universal Operation Manual for use in the Resistor, Barcode or Manual mode.



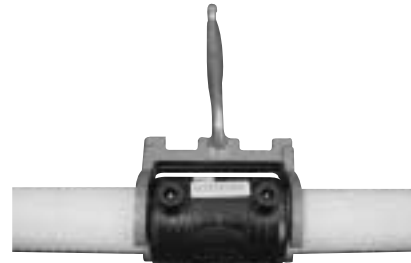
12. Select fusion mode and press start.



13. When the fusion cycle is complete, "Fusion Complete and Recommended Cooling Time" will appear on the visual display.



14. See MTD TRI FUSION Manual for cooling mode instructions. After choosing cooling mode, clamping device should remain in place during recommended cooling time. Electrofusion joint should not be subject to stress until total cooling time has elapsed.



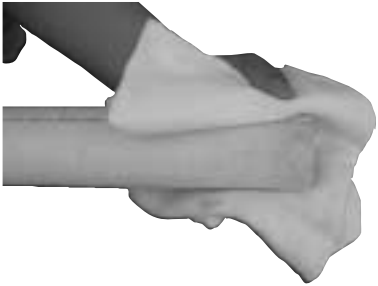
**CAUTION**

Out-of-round pipe can cause fusion failure. Misaligned pipe resulting in binding conditions may contribute to fusion failure.

# Pipe Repair Procedures

Repair of damaged pipe can be accomplished by the utilization of DAEYOUN / MTD Couplings or Repair Saddles.

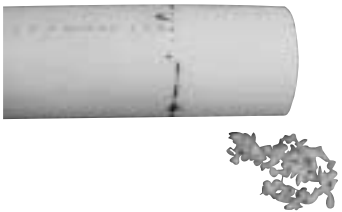
**Caution:** MTD TRI FUSION processor is an electrical device and is not explosion proof.



1. When utilizing couplings for repair, cut out the section of damaged pipe to be repaired. Make sure pipe ends are cut square and follow cleaning and scraping procedures removing burrs, shavings and contamination.

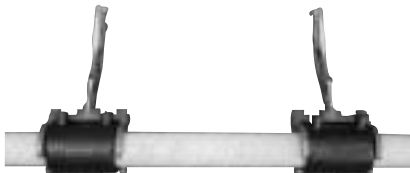
2. Measure and cut replacement section of pipe and make sure ends are cut square within 1/16".

3. Scrape pipe end for the entire length of coupling.



4. To determine stab depth for coupling utilize center line mark and mark stab depth of coupling on pipe. Repeat at other end of replacement section.

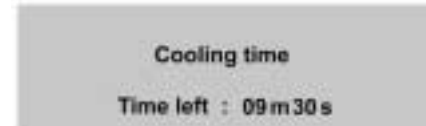
Slide couplings onto replacement piping and apply pressure to remove internal stops.



5. Place new section of pipe in opening and slide coupling over joining area at each end until both measurement marks are visible. Measurement marks should not extend more than 1/16" from coupling end. Repeat on opposite end of the repair section.

6. Maintaining the stab depth, place couplings in clamping device to secure prior to fusion (6" and larger couplings do not require clamping device).

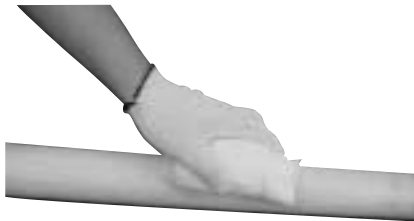
7. Start Electrofusion Process (Resistor, Barcode, Manual) following instruction in MTD TRI FUSION Operation Manual.



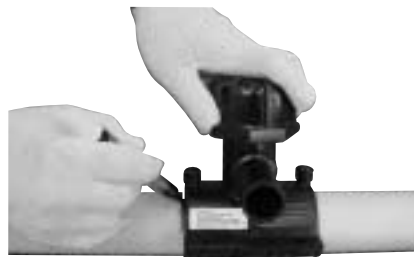
8. See MTD TRI FUSION Manual for cooling mode instructions. After choosing cooling mode, clamping device should remain in place during recommended cooling time. Electrofusion joints should not be subject to stress until total cooling time has elapsed.

# Tapping Tee & Saddle Joining Procedures

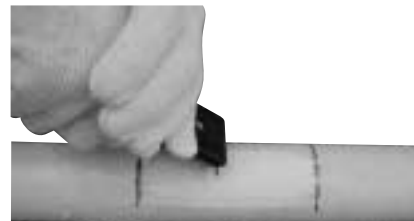
Saddle joining procedures should be used on all DAEYOUN / MTD Saddle and Sidewall Electrofusion Fittings (Tapping Tees, Branch Saddles, Repair Saddles)



1. Clean joining surface with a clean lint free cloth to remove any dirt or contaminants.

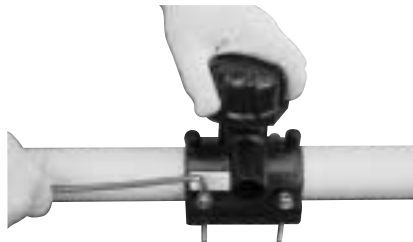


2. Center saddle fusion fitting on pipe and mark for required fusion area.



3. Scrape entire marked surface area for saddle fusion. Do not contaminate by touching with hands

after scraping. If the scraped area becomes contaminated clean with a clean lint free towel and 70 % minimum concentration of isopropyl alcohol.



4. Attach saddle fusion fitting to main by using plastic under carriage or U-bolt clamp provided with each saddle fusion fitting.



5. The MTD TRI FUSION Universal processor must be connected to an adequate AC power source (110 Volt).

Note: If utilizing a generator, the generator must be running and Auto throttle in off position prior to plugging in the processor.

Electrical Requirements are listed on page 10.

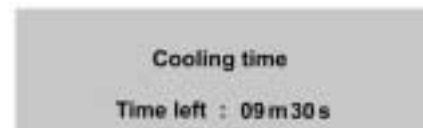
6. The MTD TRI FUSION processor will automatically run a quick diagnostic check of its operational functions (voltage in put/ output, etc.). When diagnostic check is complete "Ready for operation" will appear on the visual display.



7. Attach leads and follow instructions in the MTD TRI FUSION Universal Operation Manual for use in the Resistor, Barcode or Manual mode.

8. Select fusion mode and press start.

9. When the fusion cycle is complete, "Fusion Complete and Recommended Cooling Time" will appear on the visual display.

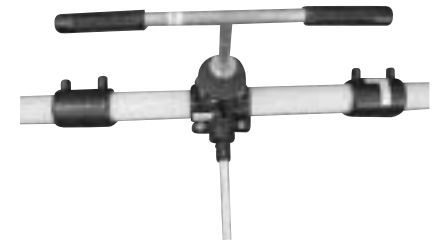


10. See MTD TRI FUSION Manual for

cooling mode instructions. After choosing cooling mode, clamping device should remain in place during recommended cooling time. Electrofusion joint should not be subject to stress until total cooling time has elapsed.

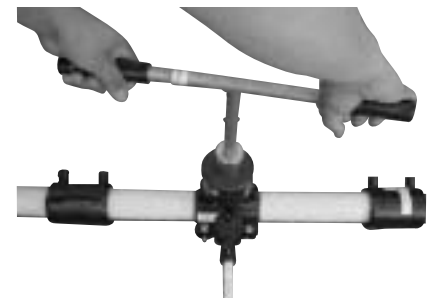
Do not attempt to tap the main until connection is properly cooled.

## Tapping the Main



1. To tap the main, remove the cap from tapping tee and insert tapping tool into cutter.

2. Tapping tool is provided with stop to indicate when tap is complete. Stop will bottom out on top of tapping tee when tap is complete.



## Qualification Procedures

3. After tap, back out cutter to original position. Cutter should be flush with the top of the tapping tee body. This will allow full flow of gas through the tapping tee and not restrict flow.

4. Remove tapping tool and install cap. The cap is provided with slots for ease of tightening with optional specialized tool.



5. Optional protective sleeve can be utilized on outlet of tapping tee to reduce stress.

*The joining procedures for the DAEYOUN / MTD Electrofusion System detailed in this manual have been qualified in accordance with D.O.T. 192.283.*

*Operators responsible for the joining of polyethylene pipe by fusion methods must qualify according to the requirement of Title 49 of the Code of Federal Regulations, Section 192.285.*

*Department of Transportation regulations require that each operator performing fusion joints be qualified in the use of the recommended fusion procedure(s) by the following:*

- A. Qualified training and experience in the use of the applicable fusion procedure.*
- B. Produce a sample joint in accordance with procedure that passes the following tests:*

- 1. The sample joint must be visually examined during and after joining and found to have the same appearance as featured in photographs in this manual.*
- 2. The sample joint must be inspected and approved by an authorized instructor.*
  - a. Perform tensile and pressure test as set forth in 49 C.F.R 192.283 of the Federal Register or*
  - b. Cut sample into at least three longitudinal straps and make visual examination. Samples are to be free of voids or unfused areas on the cut surface of the joint. Test joint by bending, applying torque and impact. Failure shall not occur in the joining area.*

- C. Operators must be re-qualified under an applicable procedure if, during any twelve-month period he/she does not perform any joints under the applicable procedures or has three joints or three percent of the joints he has made, whichever is greater, that are found unacceptable by testing under 40 C.F.R.§192.513.*

*Photographs of acceptable and unacceptable fusions are illustrated on the following pages of this manual.*

*Operators who perform to the following recommended joining procedures and produce acceptable Electrofusion joints as illustrated in this manual should pass and meet the requirements for Electrofusion qualifications under 40 C.F.R.§ 192.513.*



**Testing for Acceptable Electrofusion Joint**

1. Pressure and tensile test must be performed with Title 49 of the Code of Federal Regulations Section 192.283.

**Bend Test**

1. Electrofuse coupling in accordance with Joining Procedures.
2. Allow prepared joint to cool completely prior to bend test.
3. Cut joint into 3 longitudinal 1" wide strips approximately 10" long.
4. Bend the end of strips as shown in above picture. Inspect fusion area and document that fusion is free from any cracks or voids from bending requirements stated in ASTM F1055.

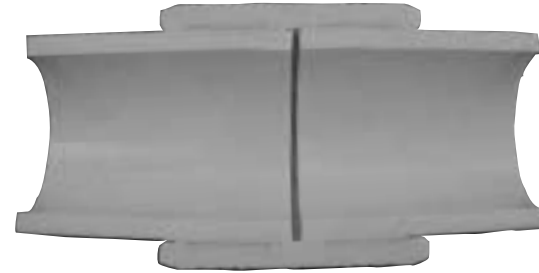


**Test for Qualifying Saddle Fusion**

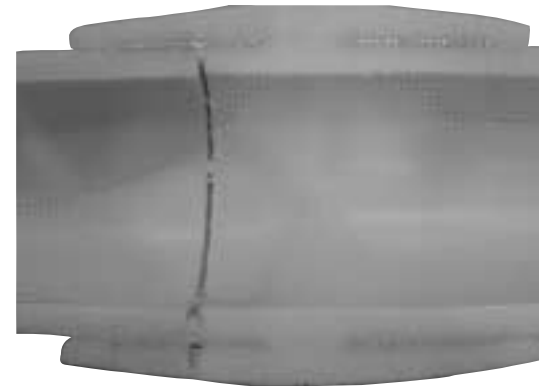
1. Perform saddle fusion in accordance with Tapping Tee & Saddle Joining Procedure.
2. Allow prepared joint to cool completely prior to test.
3. Place saddle fusion joint in vice and examine to make sure fusion area is free of cracks or any voids.



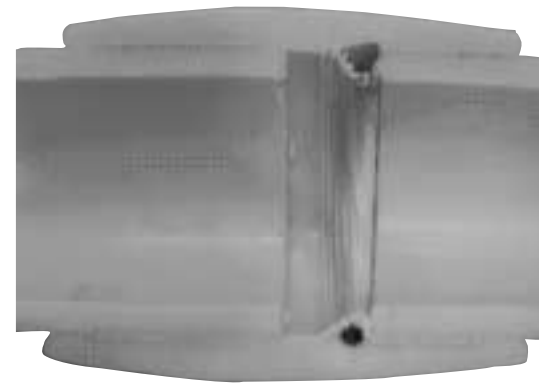
4. Apply torque and impact test as shown in above picture.
5. Visually inspect joint to make sure fusion are is free of cracks or voids.



**SUCCESSFUL FUSION**  
This picture illustrates a qualified fusion resulting from correct stab depth and pipe alignment.



**MISALIGNMENT**  
This picture illustrates an example of improper fusion between pipe and coupling due to coupling misalignment.



**SHORT STAB**  
Improper Fusion Results will occur when the pipe is not properly marked with center line marking on coupling. Short stabs will cause insufficient internal pressure resulting in a defective fusion.