ROSCOMMON EQUIPMENT CENTER

Project Number 60

September 1998

M548/M1015 Full Tracked Vehicle

Design Packet 60C

12 Volt Alternator System

Northeast Forest Fire Supervisors
in Cooperation with
Michigan's Forest Fire Experiment Station

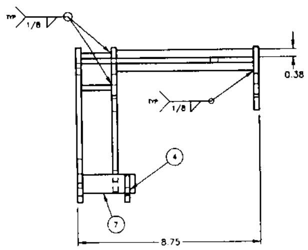
12 Volt Alternator System

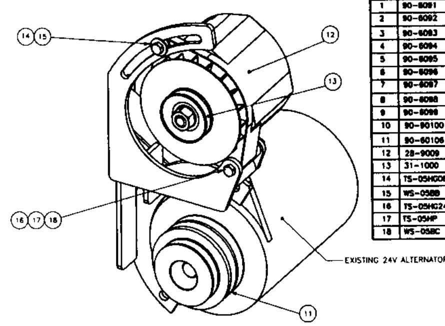
Like other U.S. Military vehicles, the M548 has a 24 volt DC power system. The attached drawings illustrate a method for adding a 12 volt DC power system. The 12 volt system can then be used to power conventional fire accessories such as emergency lights, radios, hose reel rewinds and pump starters. Another option is to totally rewire the M548 for 12 volt. This may be impractical and too costly for this vehicle. Addition of a second alternator to provide 12 volt power is less difficult and costly.

The drawings shown here have four major components:

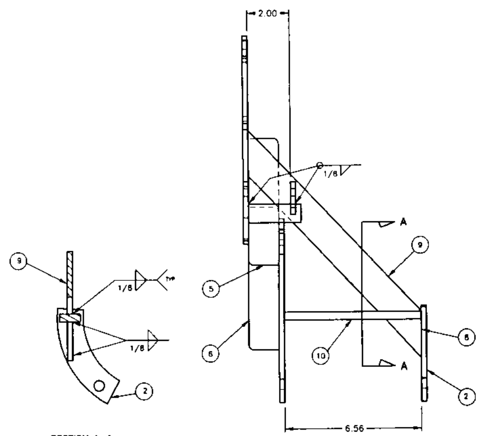
- A 12 volt alternator. The system is designed around a Delco Model 10-SI 60 amp alternator. These are readily available and charge well at low engine speeds.
- A bracket that mounts the 12 volt alternator to the mounting bracket of the existing 24 volt alternator.
- A pulley that replaces the existing 24 volt alternator pulley. The new pulley has an added belt groove to drive the 12 volt alternator. This pulley is a special design.
- A wiring schematic for connecting the 12 volt battery and alternator.

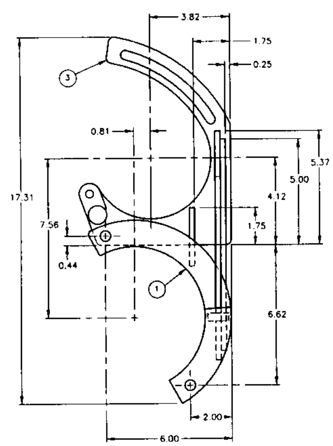
Note that some M548's have a different 24 volt alternator bracket. Some adjustment in the bracket design may be needed to accommodate the 12 volt add on.

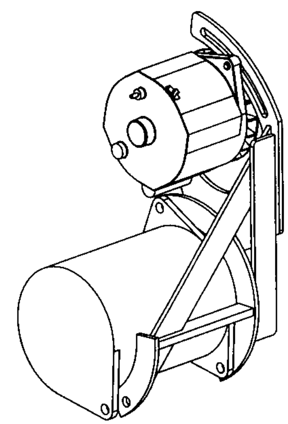




ITEM	PART NO	DWG	DESCRIPTION		QTY	EST WT
1	90-6091	90-60101C	FRONT MOUNT		1	1.08
2	90-6092	90-60101C	REAR MOUNT		1	0.40
3	90-6093	90-60102C	FRONT ALT. MOUNT		1	1.60
4	90-6094	90-60102C	REAR ALT. MOUNT		1	0.06
5	90-6095	90-60102C	SHORT SPACER		1	0.28
6	90-6096	90-60101C	LONG SPACER		1	1.02
7	90-6097	90-60102C	MOUNT BAR/ROUND		1	0.42
8	90-6098	90-60102C	SHORT BRACE		1	0.11
9	90-6099	90-60101C	LONG BRACE		1	1.11
10	90-90100	90-60101C	MOUNT BAR/FLAT		1	0.67
11	90-60106	90-60106B	PULLEY		1	5.18
12	28-9009	90-90096	ALTERNATOR	[illegible]	1	
13	31-1000		V-BELT	[illegible]	1	
14	TS-05HG08		CAPSCREW	[illegible]	1	
15	WS-05BB		WASHER, FLAT	[illegible]	1	
16	TS-05HG24		CAPSCREW	[illegible]	1	
17	TS-05HP		NUT, HEX	[illegible]	1	
18	WS-05BC		WASHER, LOCK	[illegible]	1	

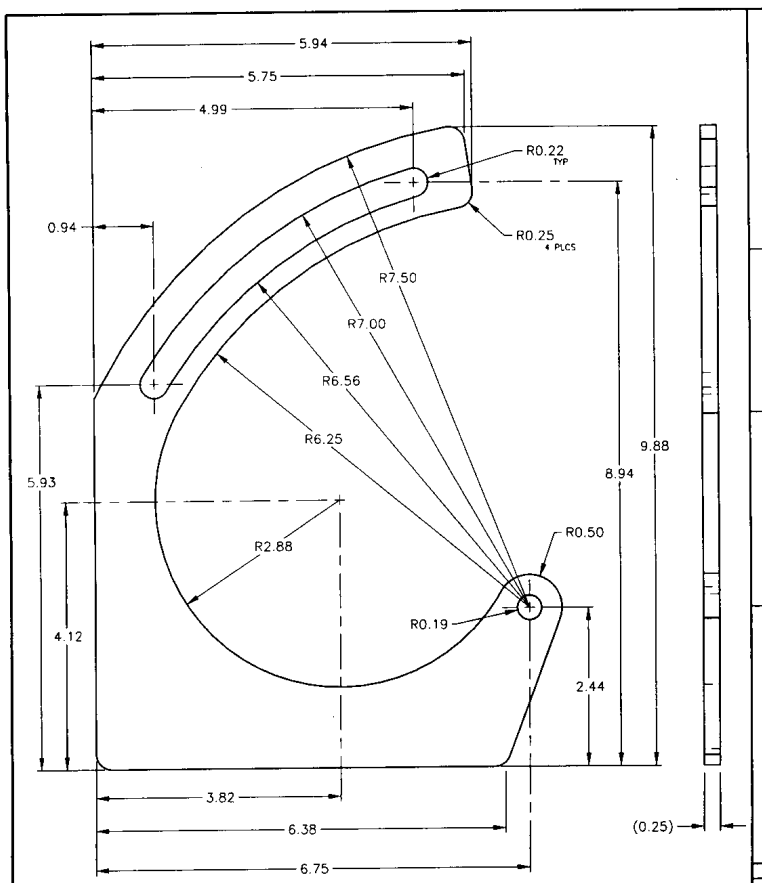






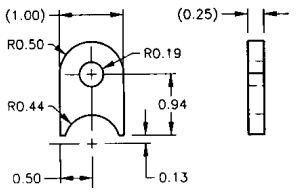
PART NO: 90-60103
EST WT: 6.76 LBS

STD. TOL.		FOREST FIRE EXPERIMENT STATION	DRAWN: DGP
DECIMAL:		P.O. BOX 68 ROSCOMMON, MICHIGAN 48653	CHECKED:
ANGULAR:			APPROVED:
DATE: 8/18/98			ROSCOMMON EQUIPMENT CENTER
SCALE: 1/2			
PROJECT NO.: REC-80	TITLE: ALTERNATOR BRACKET WELD COMPLETE		DWG NO. 90-60103D



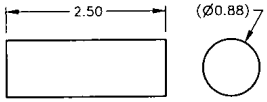
FRONT ALT. MOUNT

PART NO: 90-6093
MAT'L: PLATE 1/4 4X8 HR
G10150
FFES SPEC NO: AA-00448BC
EST WT: 1.60 LBS



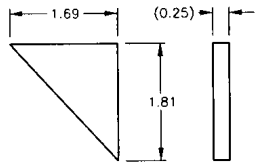
REAR ALT. MOUNT

PART NO: 90-6094
MAT'L: BAR, FLAT 1/4 X 1 HR
G10200
FFES SPEC NO: AB-00404AA
EST WT: 0.06 LBS



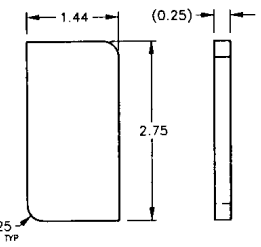
MOUNT BAR

PART NO: 90-6097
MAT'L: BAR, RD 7/8" DIA HR
K02600
FFES SPEC NO: AC-00087AG
EST WT: 0.42 LBS



SHORT BRACE

PART NO: 90-6098
MAT'L: PLATE 1/4 4X8 HR
G10150
FFES SPEC NO: AA-00448BC
EST WT: 0.11 LBS

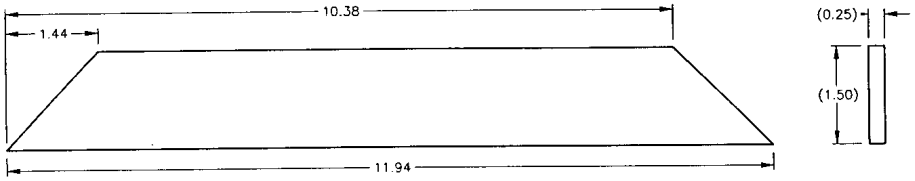


SHORT SPACER

PART NO: 90-6095
MAT'L: PLATE 1/4 4X8 HR
G10150
FFES SPEC NO: AA-00448BC
EST WT: 0.28 LBS

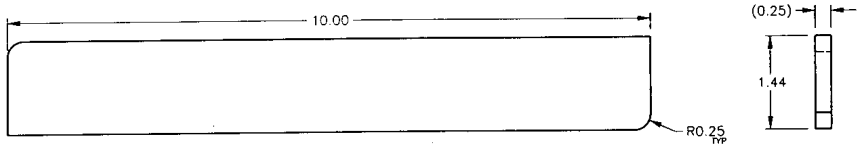
STD. TOL.		DRAWN: DCP	
DECIMAL: 1 PLACE +-0.05, 2 PLACE +-0.01, 3 PLACE +-0.005		CHECKED:	
ANGULAR: +-1 DEG.	NO. BY DATE REVISION	APPROVED:	
DATE: 8/11/98	FOREST FIRE EXPERIMENT STATION		
SCALE: FULL	P.O. BOX 68 ROSCOMMON, MICHIGAN 48653		
PROJECT NO.: REC-60	TITLE: ALTERNATOR MOUNT DETAILS		DWG. NO. 90-60102C

REC ROSCOMMON EQUIPMENT CENTER



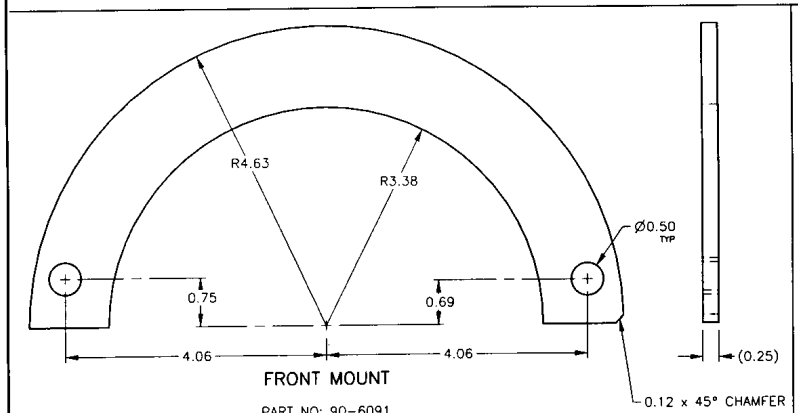
LONG BRACE

PART NO: 90-6099
MAT'L: BAR, FLAT 1/4 X 1 1/2 HR
G10200
FFES SPEC NO: AB-00406AA
EST WT: 1.11 LBS



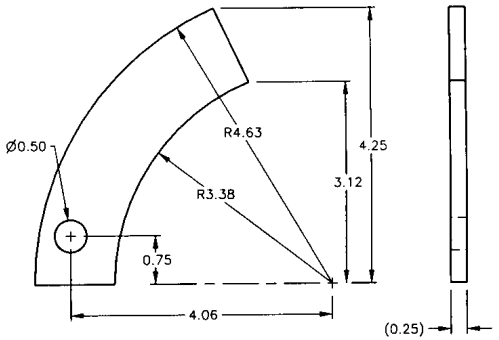
LONG SPACER

PART NO: 90-6096
MAT'L: PLATE 1/4 4X8 HR
G10150
FFES SPEC NO: AA-00448BC
EST WT: 1.02 LBS



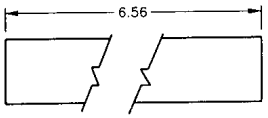
FRONT MOUNT

PART NO: 90-6091
MAT'L: PLATE 1/4 4X8 HR
G10150
FFES SPEC NO: AA-00448BC
EST WT: 1.08 LBS



REAR MOUNT

PART NO: 90-6092
MAT'L: PLATE 1/4 4X8 HR
G10150
FFES SPEC NO: AA-00448BC
EST WT: 0.40 LBS



MOUNT BAR/FLAT

PART NO: 90-60100
MAT'L: BAR, FLAT 3/8 x 1 HR
G10200
FFES SPEC NO: AB-00604AA
EST WT: 0.67 LBS

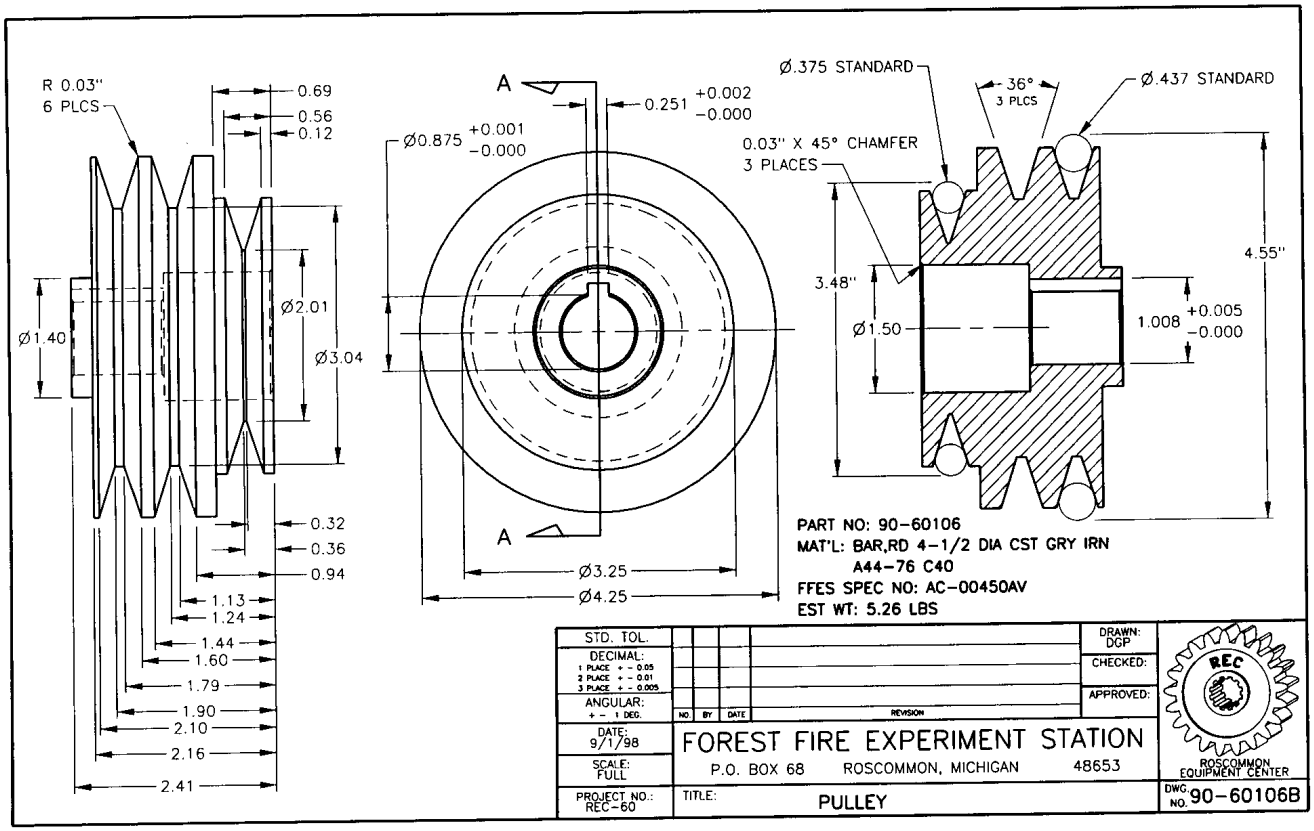
STD. TOL. DECIMAL: 1 PLACE +-0.05, 2 PLACE +-0.01, 3 PLACE +-0.005 ANGULAR: +-1 DEG.	NO.	BY	DATE / REVISION
DATE: 8/11/98			DRAWN: DGP
SCALE: FULL			CHECKED:
PROJECT NO.: REC-60			APPROVED:

FOREST FIRE EXPERIMENT STATION
P.O. BOX 68 ROSCOMMON, MICHIGAN 48653

TITLE: ALTERNATOR MOUNT DETAILS

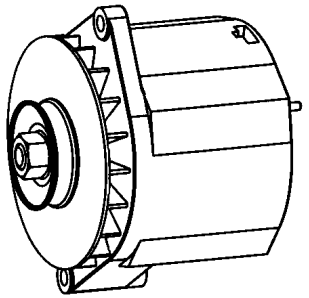
ROSCOMMON EQUIPMENT CENTER

DWG. NO. 90-60101C


R 0.03"
6 PLCS
0.69
0.56
0.12
Ø1.40
Ø2.01
Ø3.04
0.32
0.36
0.94
1.13
1.24
1.44
1.60
1.79
1.90
2.10
2.16
2.41
A
0.251 +0.002 −0.000
Ø0.875 +0.001 −0.000
Ø3.25
Ø4.25
Ø.375 STANDARD
36°
3 PLCS
Ø.437 STANDARD
0.03" X 45° CHAMFER
3 PLACES
3.48"
4.55"
Ø1.50
1.008 +0.005 −0.000
PART NO: 90-60106
MAT'L: BAR,RD 4-1/2 DIA CST GRY IRN
A44-76 C40
FFES SPEC NO: AC-00450AV
EST WT: 5.26 LBS
STD. TOL.
DECIMAL:
1 PLACE ± 0.05
2 PLACE ± 0.01
3 PLACE ± 0.005
ANGULAR:
± 1 DEG.
DATE: 9/1/98
SCALE: FULL
PROJECT NO.: REC-60
NO. BY DATE REVISION
DRAWN: DGP
CHECKED:
APPROVED:
FOREST FIRE EXPERIMENT STATION
P.O. BOX 68 ROSCOMMON, MICHIGAN 48653
TITLE: PULLEY
REC
ROSCOMMON EQUIPMENT CENTER
DWG NO. 90-60106B

ALTENATOR

TYPE: DELCO REMY
RATING: 12 VOLT DC, 60 AMP
EST WT:



APPROVED MANUFACTURERS	PART NO	APPROVED MANUFACTURERS	PART NO
ROSCOMMON AUTOMOTIVE P. O. BOX 7 ROSCOMMON, MI, 48653	AAR/A7128		

FFES PART NO: 28-9009

STD. TOL.		DRAWN: DGP	DNR FOREST MANAGMENT DIVISION
DECIMAL: 1 PLACE + - 0.05, 2 PLACE + - 0.01, 3 PLACE + - 0.005		CHECKED:	
ANGULAR: + - 1 DEG.	NO. BY DATE REVISION	APPROVED:	
DATE: 9/10/98	FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653		
SCALE: 1/2			
PROJECT NO.: REC-60	TITLE: 12 VOLT ALTENATOR		DWG. NO. 28-9009B

REC Newsnote #9 October 1998

Adding a 12 Volt DC Charging Circuit

Roscommon Equipment Center
Northeast Forest Fire Supervisors
in Cooperation with
Michigan's Forest Fire Experiment Station

U.S. Military vehicles operate with 24 volt DC electrical systems. Fire departments converting excess military vehicles to fire fighting equipment generally need 12 volt DC to power many of their accessories. REC Project #2, *Wiring Conversion on Military Vehicles*, highlighted several ways to provide 12 volt power. This Newsnote provides an updated look at one of REC Project #2's alternatives, installing an additional and separate 12 volt electrical system.

In many cases it is not practical to change the vehicle's 24 volt system over to 12 volt. The procedure discussed here allows all of the major components of the 24 volt system to stay intact. The engine starter, the ignition system, generator, regulator and the two 12 volt batteries connected in series continue to function as original equipment. The vehicle's 24 volt lighting system may be transferred to the 12 volt system or left alone on a 24 volt system.

Any additional 12 volt loads such as lights (including head, tail, stop, turn, clearance, emergency beacon), two-way radios, electric rewind hose reels, electric pump engine starters can be connected to the separate 12 volt system. The separate 12 volt system components include a 12 volt alternator with a regulator and a 12 volt storage battery.

The major considerations for installing a separate 12 volt system include:

- Finding a space to mount the alternator. The alternator will be driven by a belt. It is desirable to have the alternator drive sheave installed directly on the end of the engine crank shaft. Drive sheaves can be installed on existing alternators, generators, fan or water pump shafts, but this imposes an additional load on the drive belts and bearings of these components that was not originally intended. This may reduce the life of the belts and bearings.

  Often an extra sheave is not available and one must be specially machined to fit the crank shaft or drive components shaft. Normally, automotive alternators have a drive ratio of about 2:1. This means that the alternator RPM is twice as great as the engine RPM. Make sure that you determine the correct drive ratios. For example, if a drive sheave is connected to the existing 24 volt generator shaft which already runs twice as fast as the engine, a 1:1 ratio would be correct.

- Determine the mounting bracket for the 12 volt alternator. It is important to establish good mounting points for the 12 volt alternator mounting bracket. REC has mounting bracket designs for some military vehicles. Make sure your bracket is attached to the engine block or a component attached to the block and that the belt alignment between the drive and driven pulleys is square.

- Completing the 12 volt circuit. An alternator needs an outside source of current to excite its' magnetic field before it can produce current. We suggest connecting a wire from the power distribution panel (fuse or circuit breaker) to the alternator activation terminal.

- Avoiding battery drain. A switch is needed to disconnect the alternator field activation wire to prevent battery drain. You want the 12 volt electrical circuit to be closed only when the engine is operating. This can be done in a number of ways. The preferred method is using an oil pressure switch to close the field activation wire part of the circuit. This is automatic and will close the circuit only when the engine is running. Other alternatives are use the ignition activated circuit or a manual control in which the operator switches on a toggle switch at startup and turns it off in shutdown. While simple to install, the manual toggle switch operation will result in battery drain or other problems if the procedure is forgotten.

The one page diagram on the next page of this report shows a complete 12 volt DC charging circuit and provides additional details.