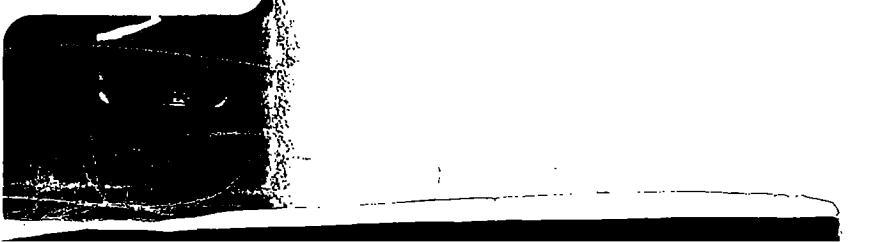


TE
220
.M343
1993x

SHRP-H-681

Maintenance Work Zone Safety Devices Plans



Strategic Highway Research Program
National Research Council
Washington, DC 1994

Strategic Highway Research Program Executive Committee

John R. Tabb, *Chairman*
Mississippi Department of Transportation

William G. Agnew
General Motors Research (retired)

E. Dean Carlson, *ex officio*
Federal Highway Administration

A. Ray Chamberlain
Colorado Department of Transportation

Michael J. Cuddy
New York Department of Transportation

Raymond F. Decker
University Science Partners Inc.

Thomas B. Deen, *ex officio*
Transportation Research Board

Thomas M. Downs
New Jersey Department of Transportation

Francis B. Francois, *ex officio*
American Association of State Highway and Transportation Officials

William L. Giles
Ruan Transportation Management Systems

Jack S. Hodge
Virginia Department of Transportation

Boris Hryhorczuk, *ex officio*
Manitoba Department of Transportation

Donald W. Lucas
Indiana Department of Transportation

Harold L. Michael
Purdue University

Wayne Muri
Missouri Highway and Transportation Department

M. Lee Powell, III
Ballenger Paving Company, Inc.

Rodney E. Slater, *ex officio*
Federal Highway Administration

Henry A. Thomason, Jr.
Texas Department of Transportation

Stanley I. Warshaw
National Institute of Standards and Technology

Roger L. Yarbrough
Apcon Corporation

Key SHRP Staff

Damian J. Kulash
Executive Director

Guy W. Hager
Implementation Manager

Edward T. Harrigan
Asphalt Program Manager

Kathryn Harrington-Hughes
Communications Director

Don M. Harriott
Concrete & Structures/Highway Operations Program Manager

Neil F. Hawks
Long-Term Pavement Performance Program Manager

Harry Jones
Finance & Administration Director

SHRP-H-681
Contract H-109
Product No.: 3008, 3017, 3021

Program Manager: *Don M. Harriott*
Project Manager: *Shashikant Shah*
Production Editor: *Marsha Barrett*
Program Area Secretary: *Carina Hreib*

February 1994

Strategic Highway Research Program
National Academy of Sciences
2101 Constitution Avenue N.W.
Washington, DC 20418

(202) 334-3774

The publication of this report does not necessarily indicate approval or endorsement of the findings, opinions, conclusions, or recommendations either inferred or specifically expressed herein by the National Academy of Sciences, the United States Government, or the American Association of State Highway and Transportation Officials or its member states.

© 1994 National Academy of Sciences

Preface

This is volume II of the final report on project H-109, Maintenance Work Zone Safety Devices Development and Evaluation, and contains plans and specifications of the 12 prototype safety devices that had successfully passed the several phases of testing and evaluation conducted during the course of the study. The results of the testing and evaluation are discussed in Volume I of this report. Also included are the plans for those devices that did not prove successful at some stage of evaluation, but have potential for use with additional modifications and testing.

Since the completion of the study, some of the 12 successful devices have also undergone modifications as a result of feedback from further field evaluation by the states, and/or due to commercial viability. However, the original conceptual designs have remained unchanged.

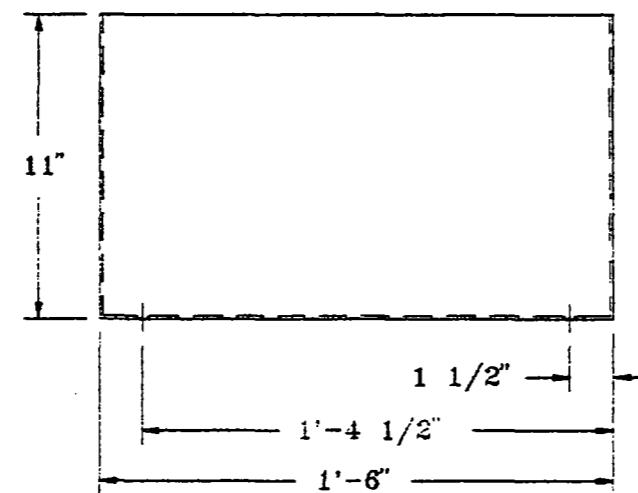
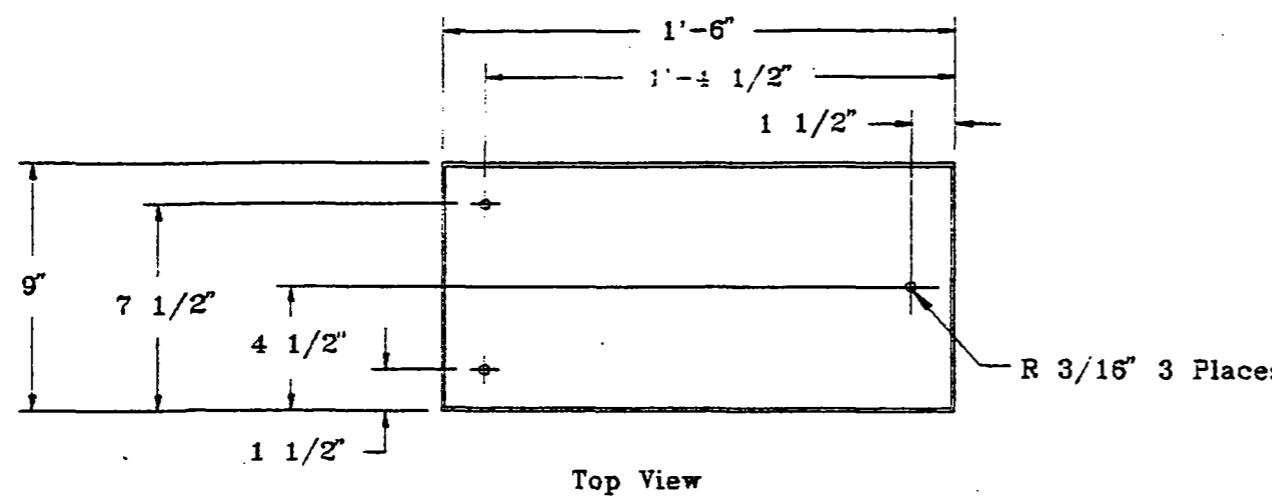
If there are specific questions regarding the plans, the reader should contact the developer of the plans listed on each plan sheet.

Acknowledgments

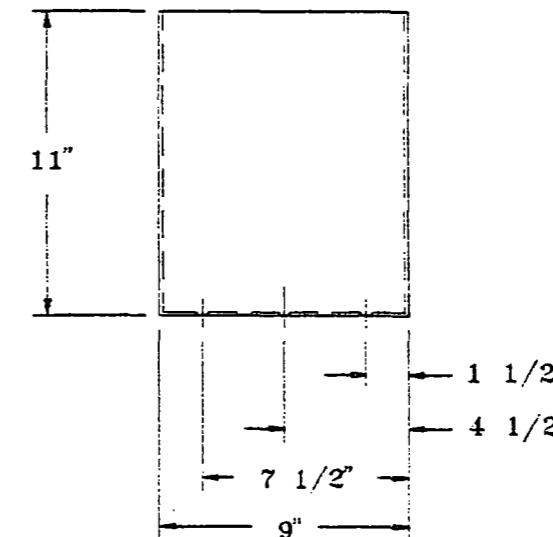
The research described herein was supported by the Strategic Highway Research Program (SHRP). SHRP is a unit of the National Research Council that was authorized by section 128 of the Surface Transportation and Uniform Relocation Assistance Act of 1987.

Contents

Ultrasonic Detection Alarm	Maintenance Vehicle Floodlight
Infrared Intrusion Alarm Detector	Portable Sign and Stand
Pressurized Pneumatic Tube Alarm	Flashing Stop and Slow Paddle
Queue Length Detector	Truck Mounted Message Box
Personnel Protection Trailer Assembly	Flagger Gate Assembly
Aluminum Can TMA	Remotely-Driven Vehicle Manual
Tote Trailer Tilt Bed (Portable Crash Cushion)	
Direction Indicator Barricade	
Opposing Traffic Lane Divider	
Portable Soft Barricade System	
Portable Speed Bump (Portable Rumble Strip)	
Traveled Way Rumble Mat	
Rumble Strip	
Snow Plow Blade Markers	
Diverging Lights Controller	



Side View



End View

Note: Material of Box is 1/8" Aluminum.

shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

(816) 254-1788
FAX (816) 254-4654

TITLE: Ultrasonic Detection Alarm
Detector

DRAWN BY: JMM

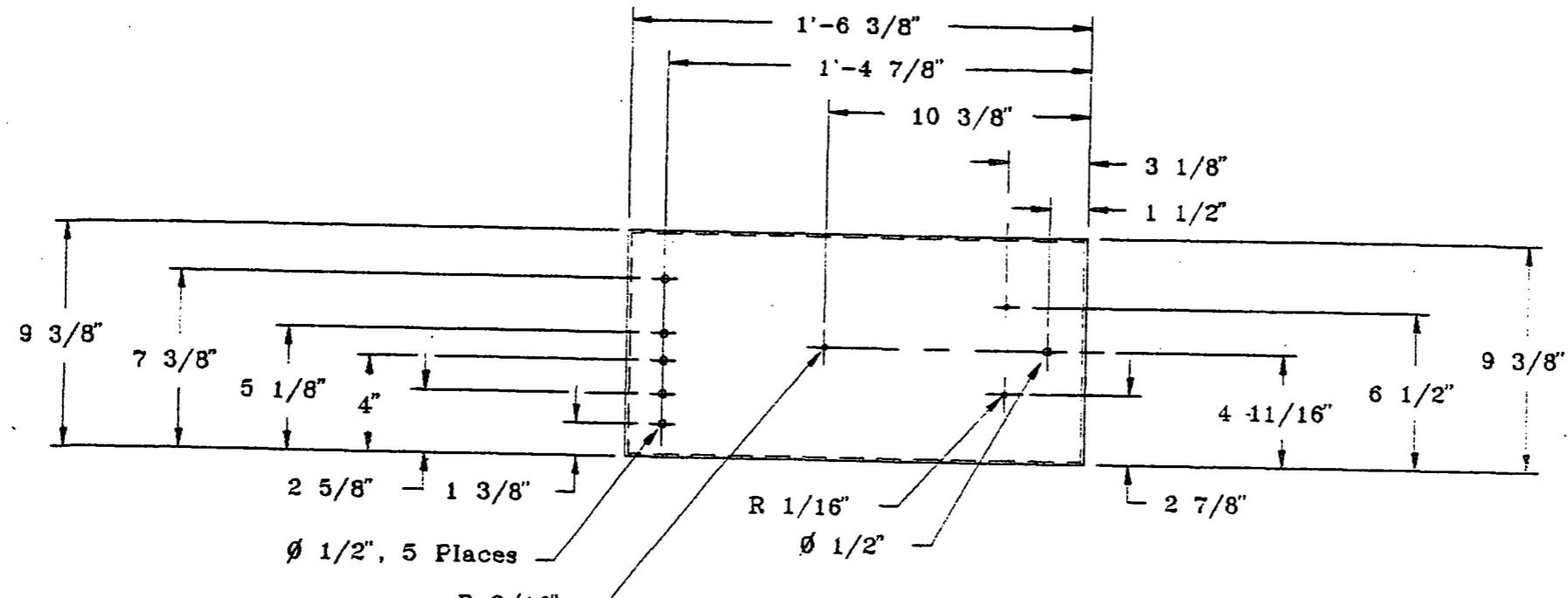
REVISED: ---

ASSEMBLY: Box

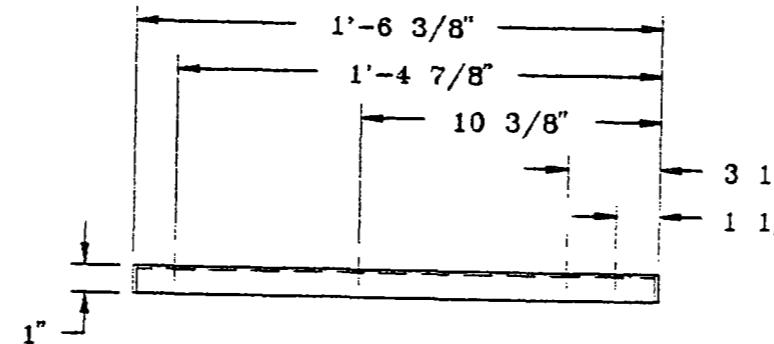
SCALE: None

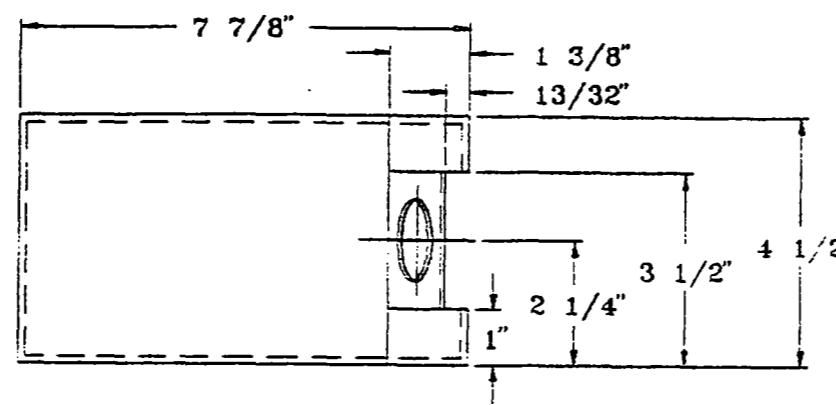
DRAWING NUMBER: 1 of 16

DATE: 8-26-92

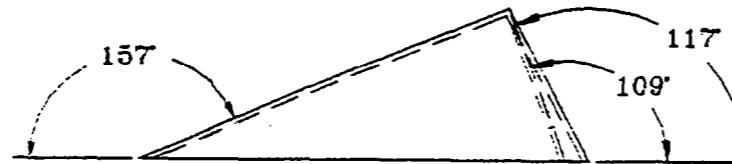


Top View

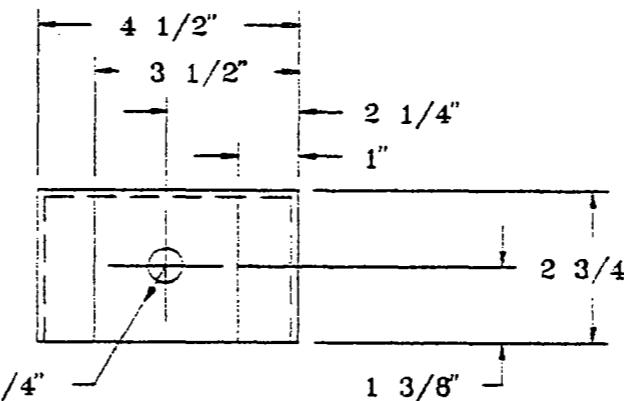




Top View



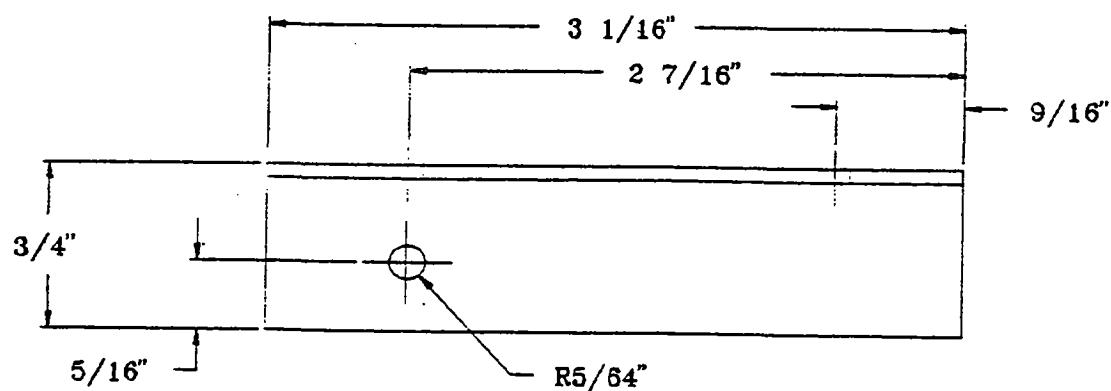
Side View



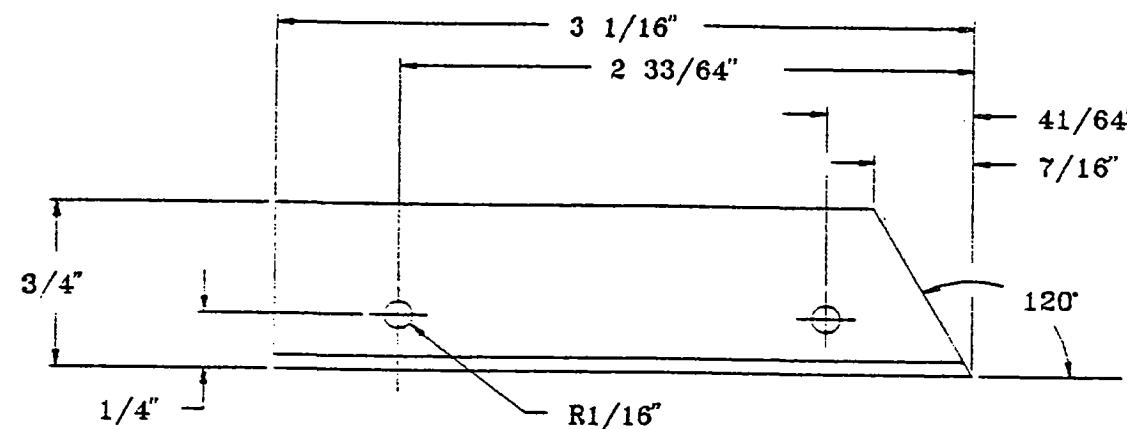
End View

Note: Material of Hood is 1/8" Aluminum.

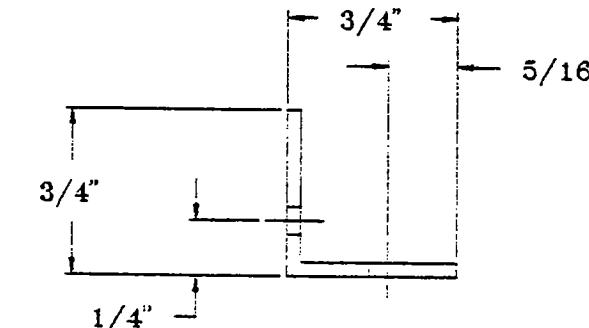
		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		
TITLE: Ultrasonic Detection Alarm		DRAWN BY: JMM
ASSEMBLY: Hood		REVISED: ---
DRAWING NUMBER: 3 of 16		SCALE: None
		DATE: 8-27-92



Top View

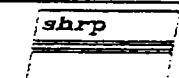


Side View
Typ. Both Sides



End View

Note: Material of Mount is 3/32" Aluminum.



STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

(816) 254-1788

FAX (816) 254-4654

TITLE: Ultrasonic Detection
Alarm

DRAWN BY: JMM

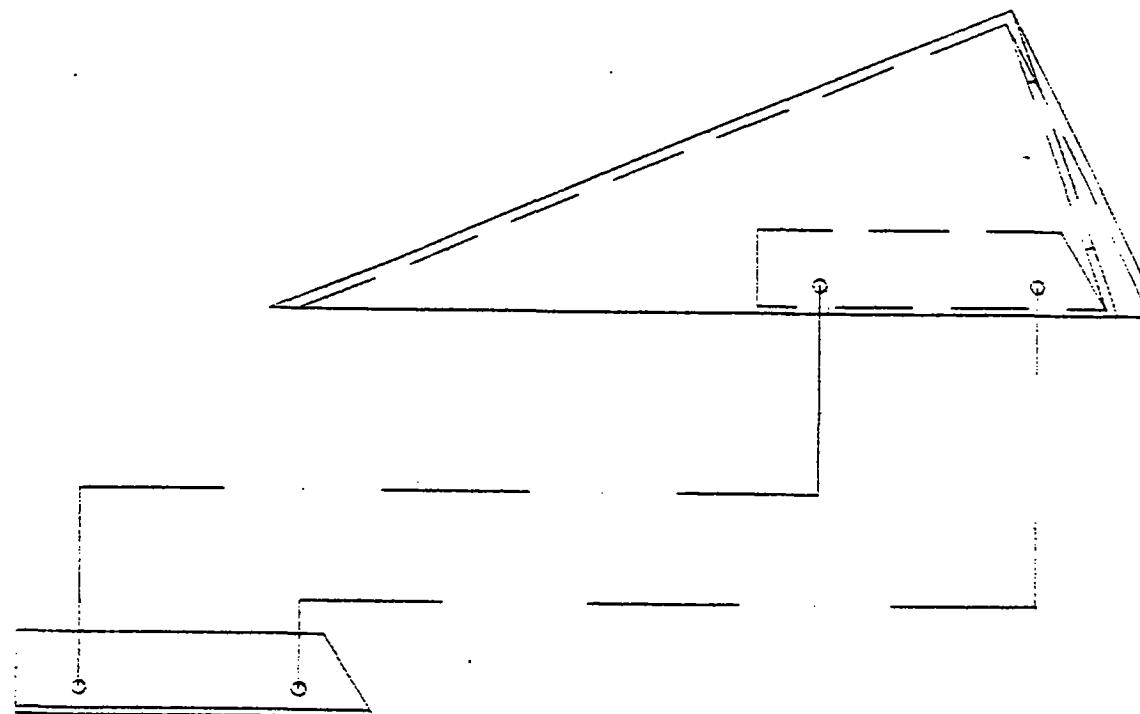
REVISED: ---

ASSEMBLY: Hood Mount

SCALE: None

DRAWING NUMBER: 4 of 16

DATE: 8-27-92



shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

(816) 254-1788
FAX (816) 254-4654

TITLE: Ultrasonic Detection
Alarm

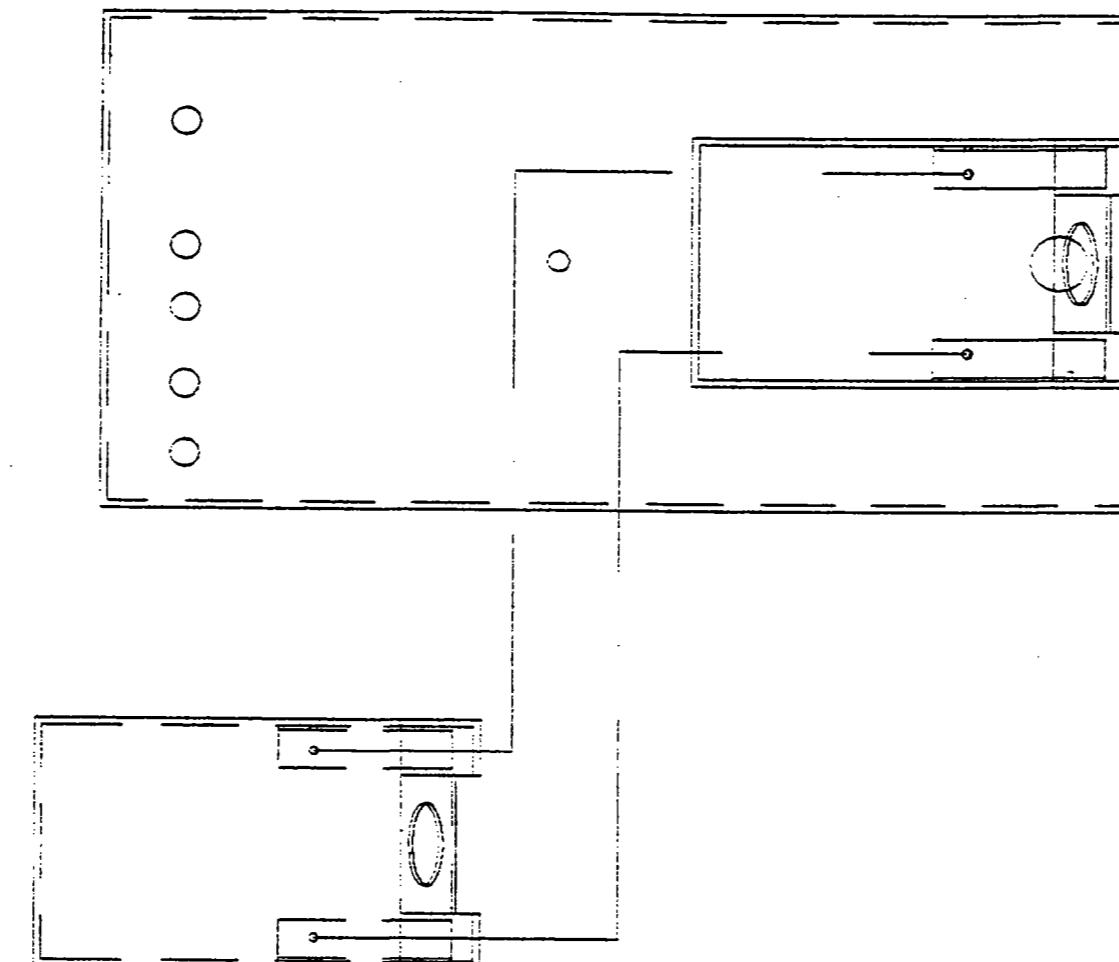
DRAWN BY: JMM
REVISED: ---

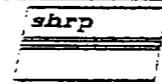
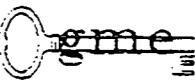
ASSEMBLY: Mount to Hood

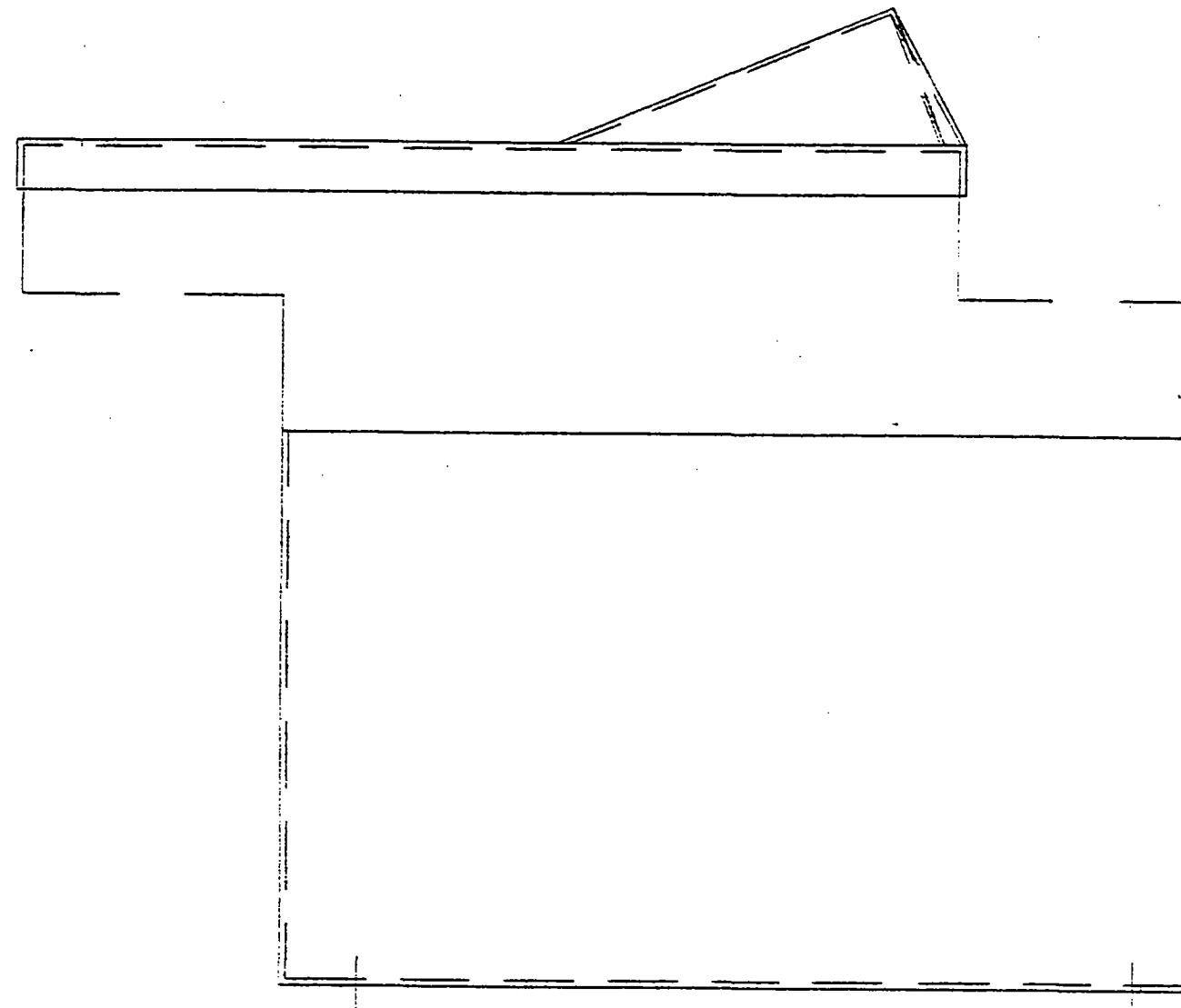
SCALE: None

DRAWING NUMBER: 5 of 16

DATE: 8-27-92



 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc.	
P.O. Box 348 Independence, Missouri 64050	(816) 254-1788  FAX (816) 254-4654
TITLE: Ultrasonic Detection	
Alarm	
DRAWN BY: JMM	
REVISED: ---	
ASSEMBLY: Hood to Lid	
SCALE: None	
DRAWING NUMBER: 6 of 16	
DATE: 8-27-92	



STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

(816) 254-1788

FAX (816) 254-4654

TITLE: Ultrasonic Detection
Alarm

DRAWN BY: JMM

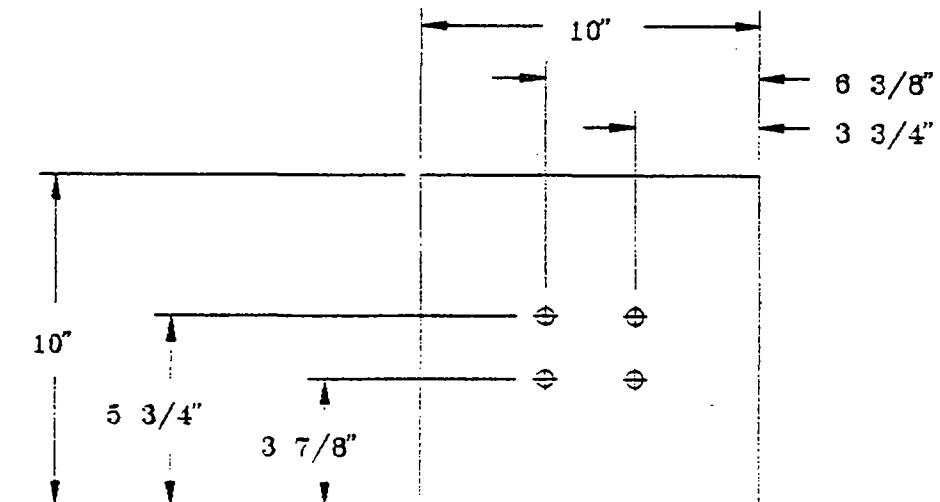
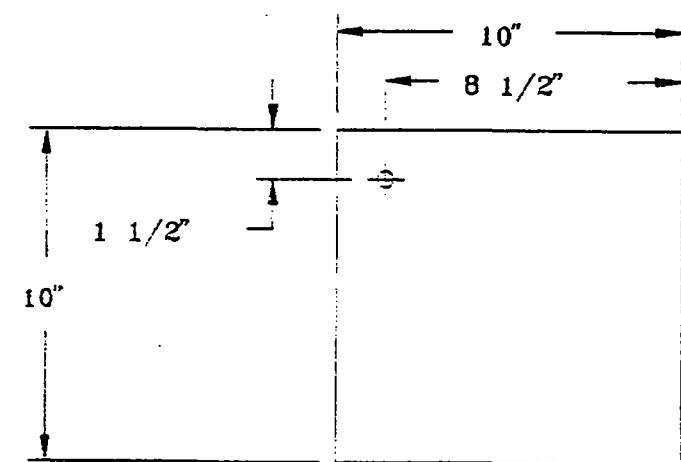
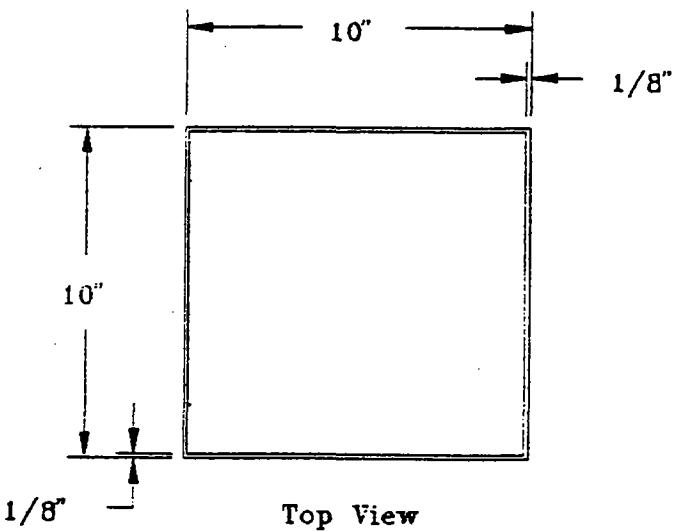
REVISED: ---

ASSEMBLY: Lid to Box

SCALE: None

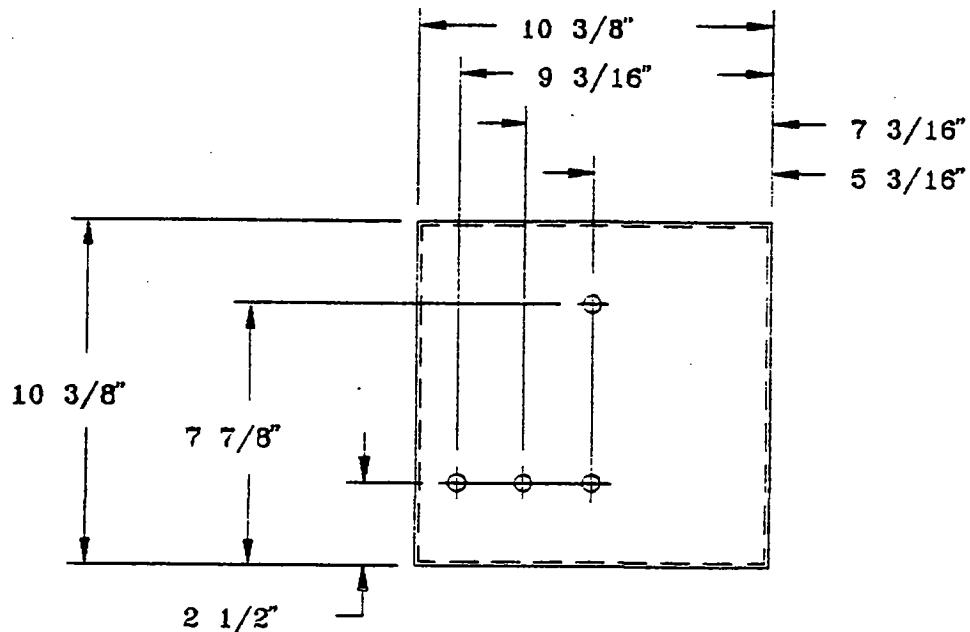
DRAWING NUMBER: 7 of 16

DATE: 8-27-92

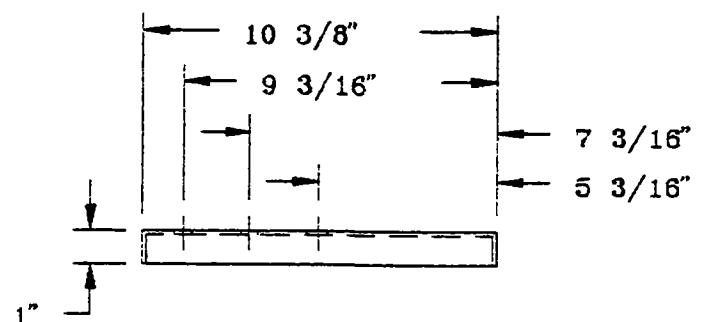


Note: Material of Box is 1/8" Aluminum.

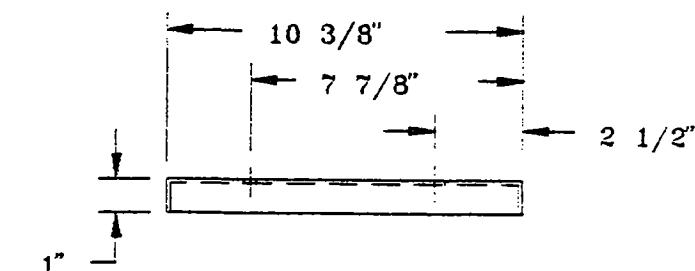
<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 <i>ome</i> FAX (816) 254-4654
TITLE: Ultrasonic Detection Alarm (Receiver)		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: Box		SCALE: None
DRAWING NUMBER: 8 of 16		DATE: 07/16/92



Top View

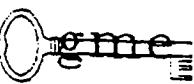


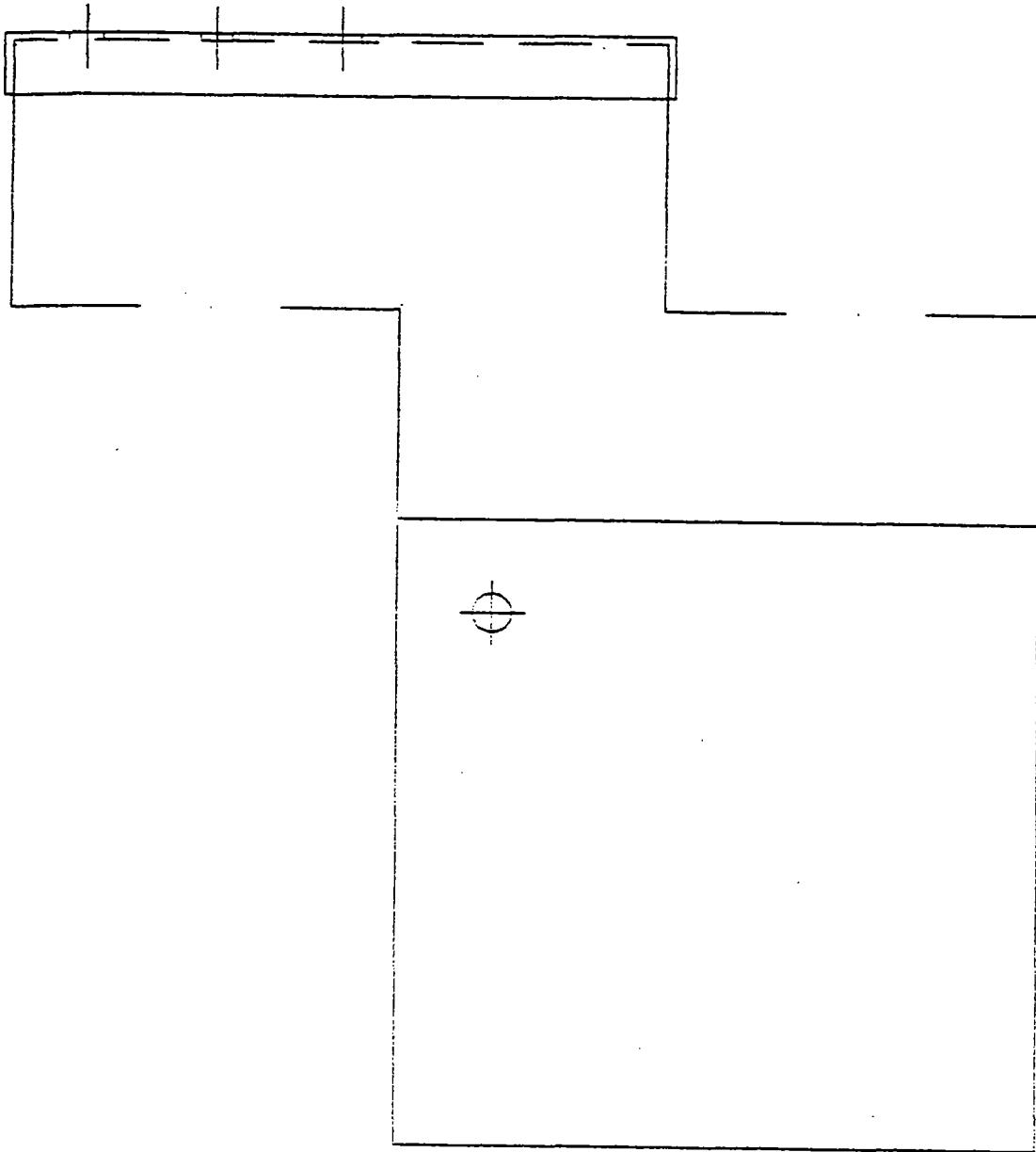
Front View



Side View

Note: Material of Lid is 1/8" Aluminum.

<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788  FAX (816) 254-4654
TITLE: Ultrasonic Detection Alarm (Receiver)		DRAWN BY: JMM
ASSEMBLY: Lid		REVISED: ---
DRAWING NUMBER: 9 of 16		SCALE: None
		DATE: 07/17/92



shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348
Independence, Missouri 64050

(816) 254-1788

FAX (816) 254-4654

TITLE: Ultrasonic Detection
Alarm (Receiver)

DRAWN BY: JMM

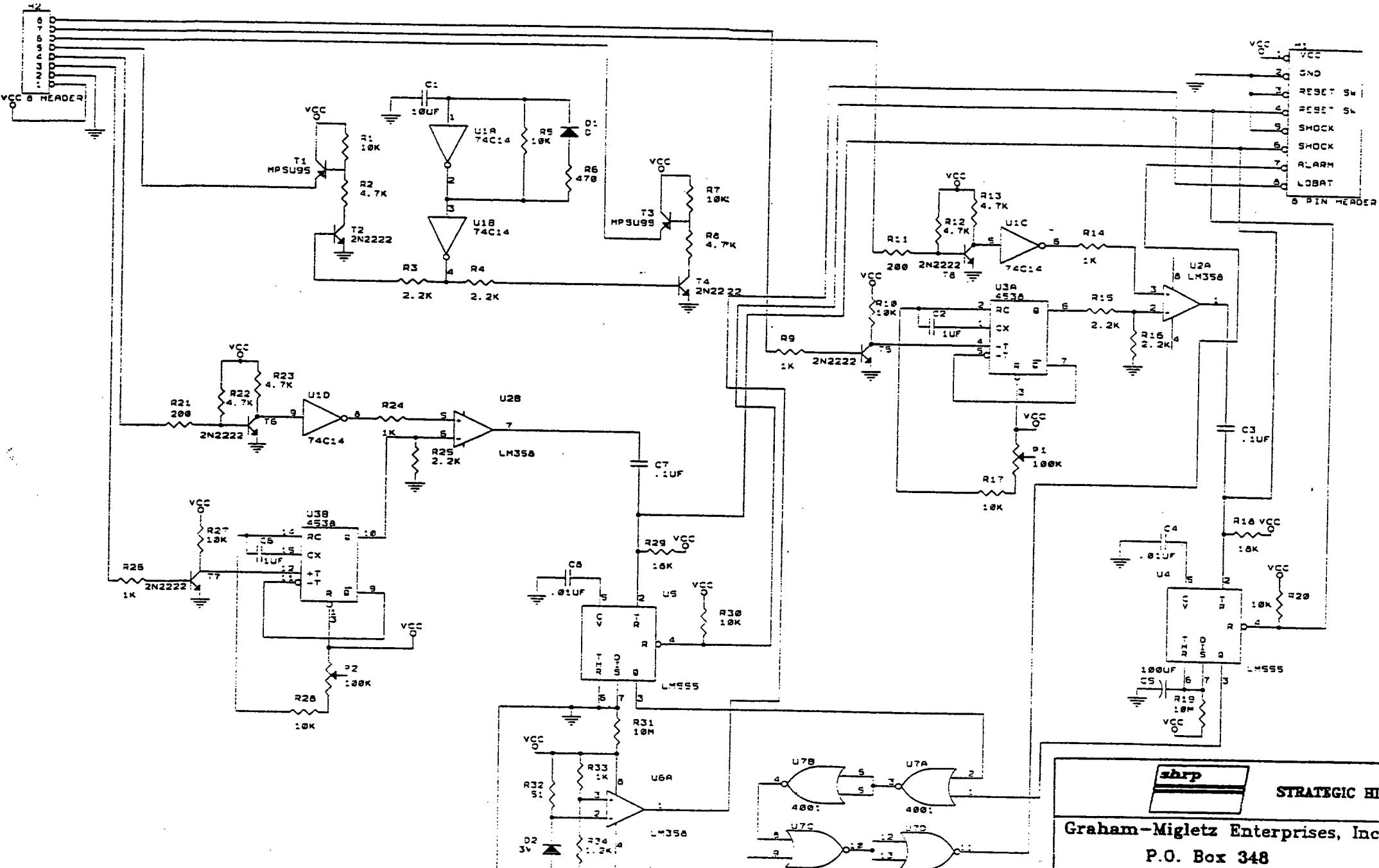
REVISED: ---

ASSEMBLY: Lid to Box

SCALE: None

DRAWING NUMBER: 10 of 16

DATE: 07/20/92



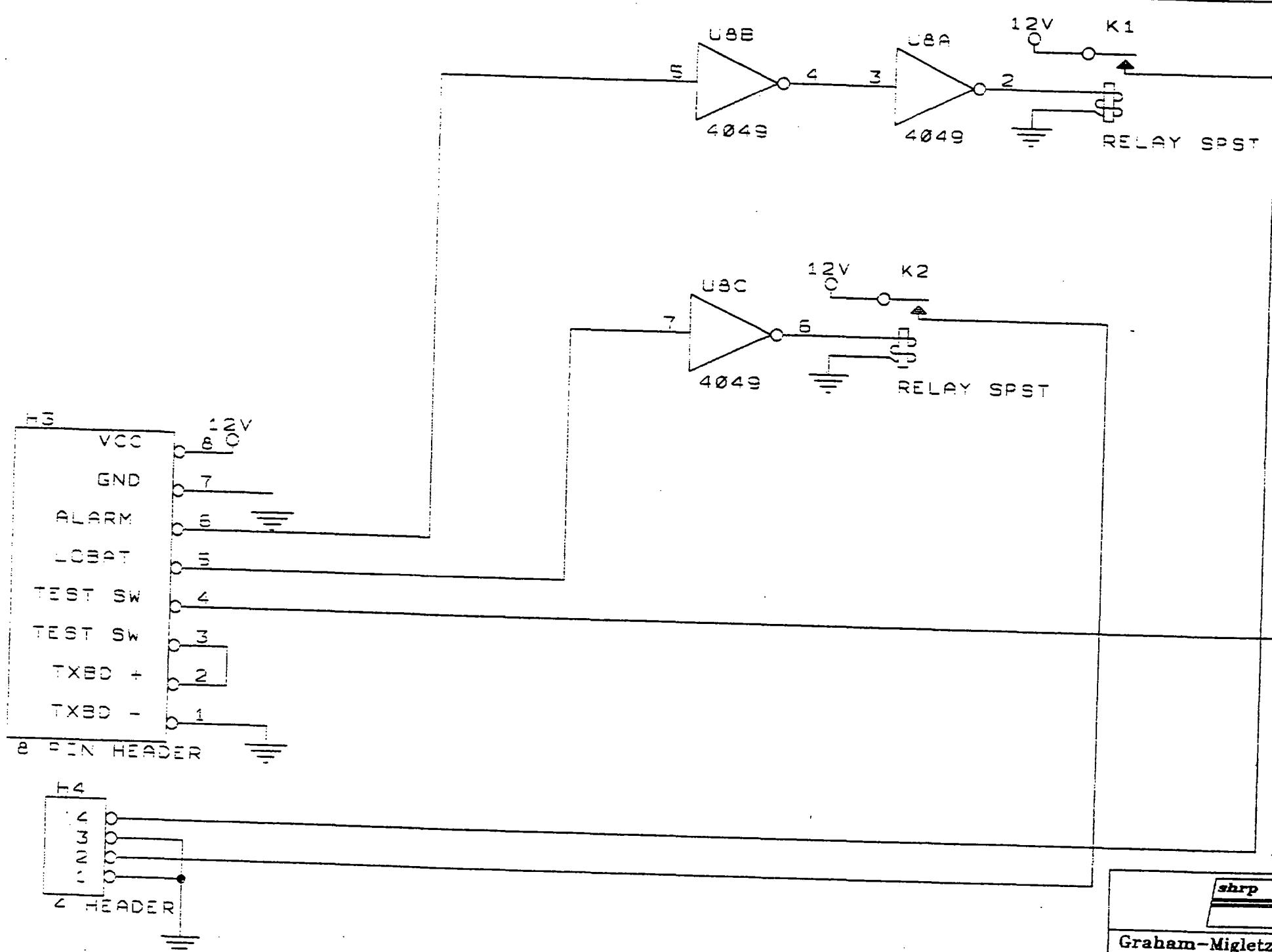
shrp STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

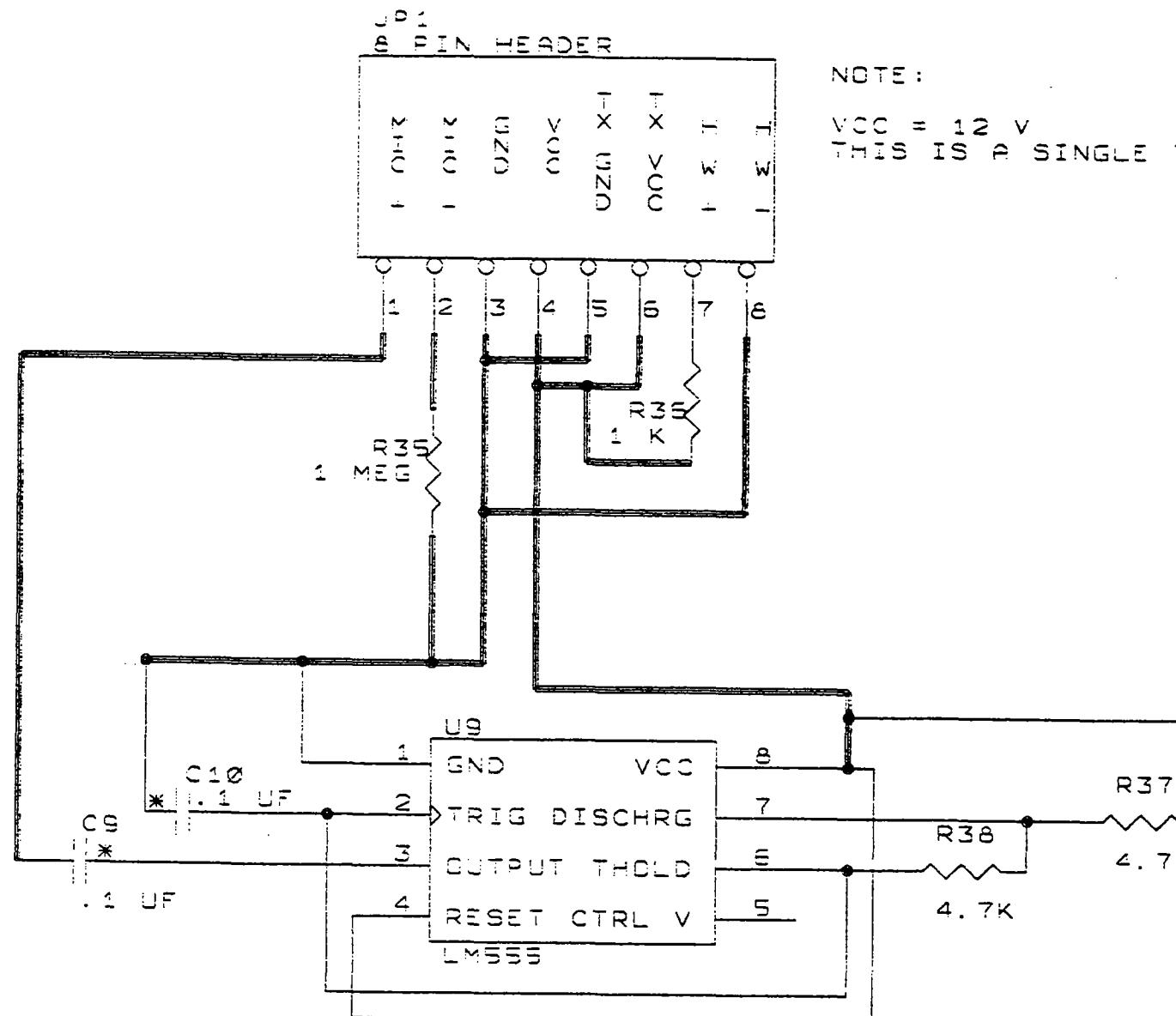
(816) 254-1788

FAX (816) 254-4654

TITLE:	ULTRASONIC DETECTION ALARM	DRAWN BY: BBF
REVISED:	BBF	
ASSEMBLY:	SENSOR BOARD	SCALE: NONE
DRAWING NUMBER:	11 OF 16	DATE: 10-20-92



shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc.		
P.O. Box 348		
Independence, Missouri 64050		
TITLE: ULTRASONIC DETECTION ALARM		DRAWN BY: BBF
		REVISED: BBF
ASSEMBLY: INTERFACE CIRCUIT		SCALE: NONE
DRAWING NUMBER: 12 OF 16		DATE: 10-20-92

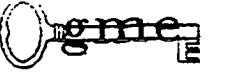


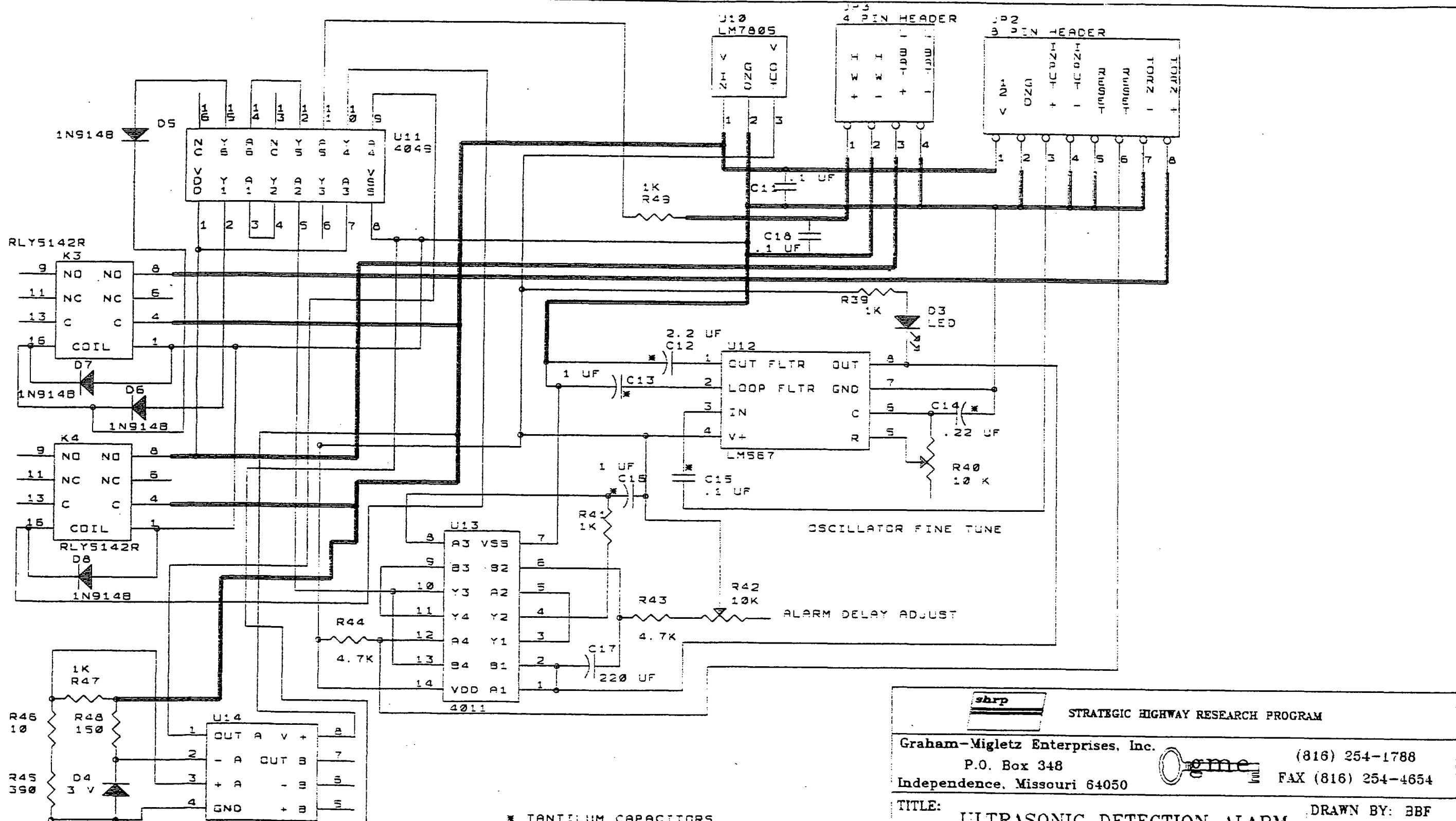
NOTE:

VCC = 12 V

THIS IS A SINGLE TONE GENERATOR PRESET TO 1 KHZ

* TANTILUM CAPACITORS

shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		
(816) 254-1788  FAX (816) 254-4654		
TITLE: ULTRASONIC DETECTION ALARM		DRAWN BY: BBF REVISED: BBF
ASSEMBLY: TRANSMITTER BOARD		SCALE: NONE
DRAWING NUMBER: 13 OF 16		DATE: 10-20-92



shrp STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050

(816) 254-1788

FAX (816) 254-4654

TITLE:

ULTRASONIC DETECTION ALARM

DRAWN BY: BBF

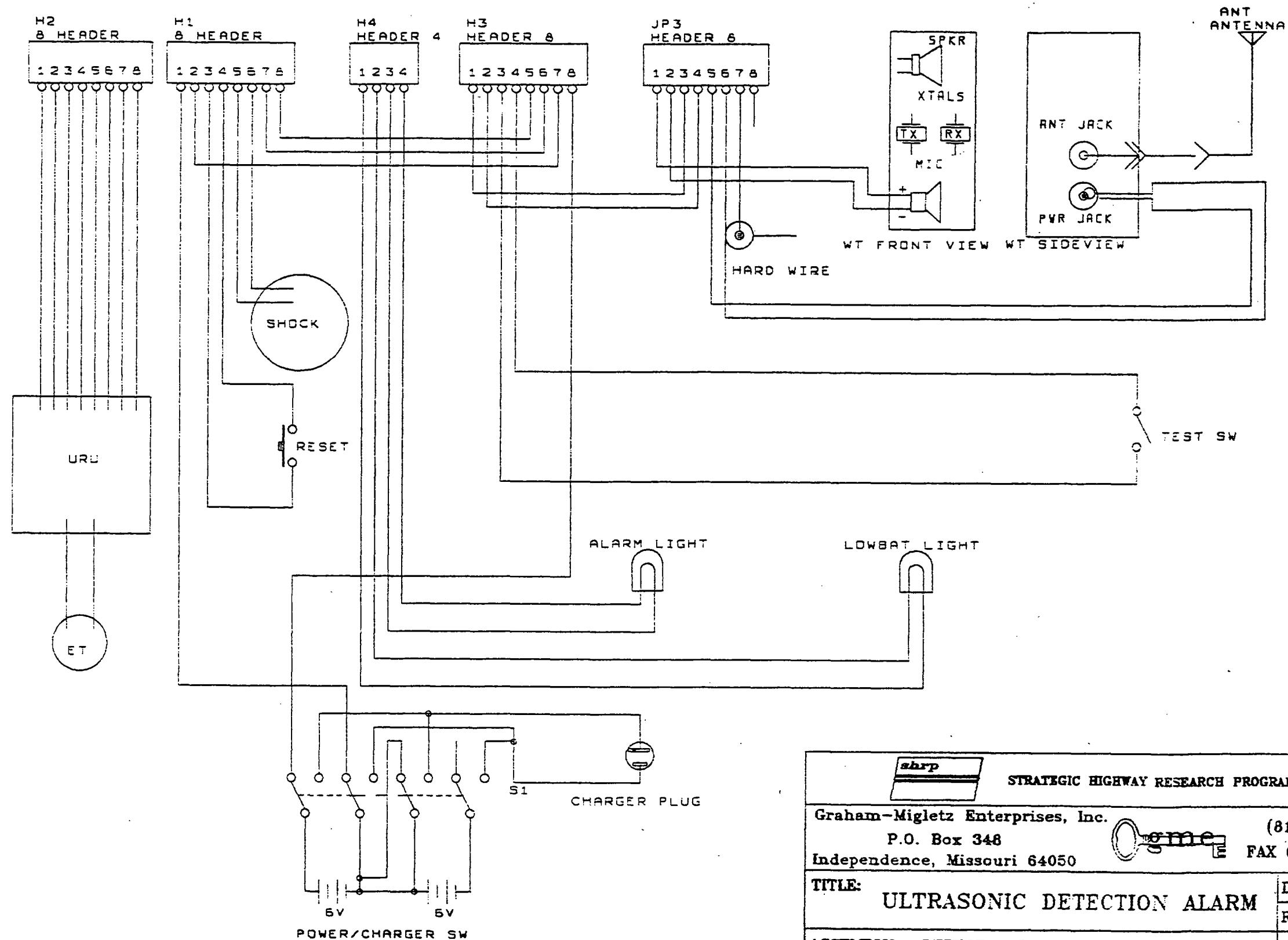
REVISED: BBF

ASSEMBLY: RECEIVER BOARD

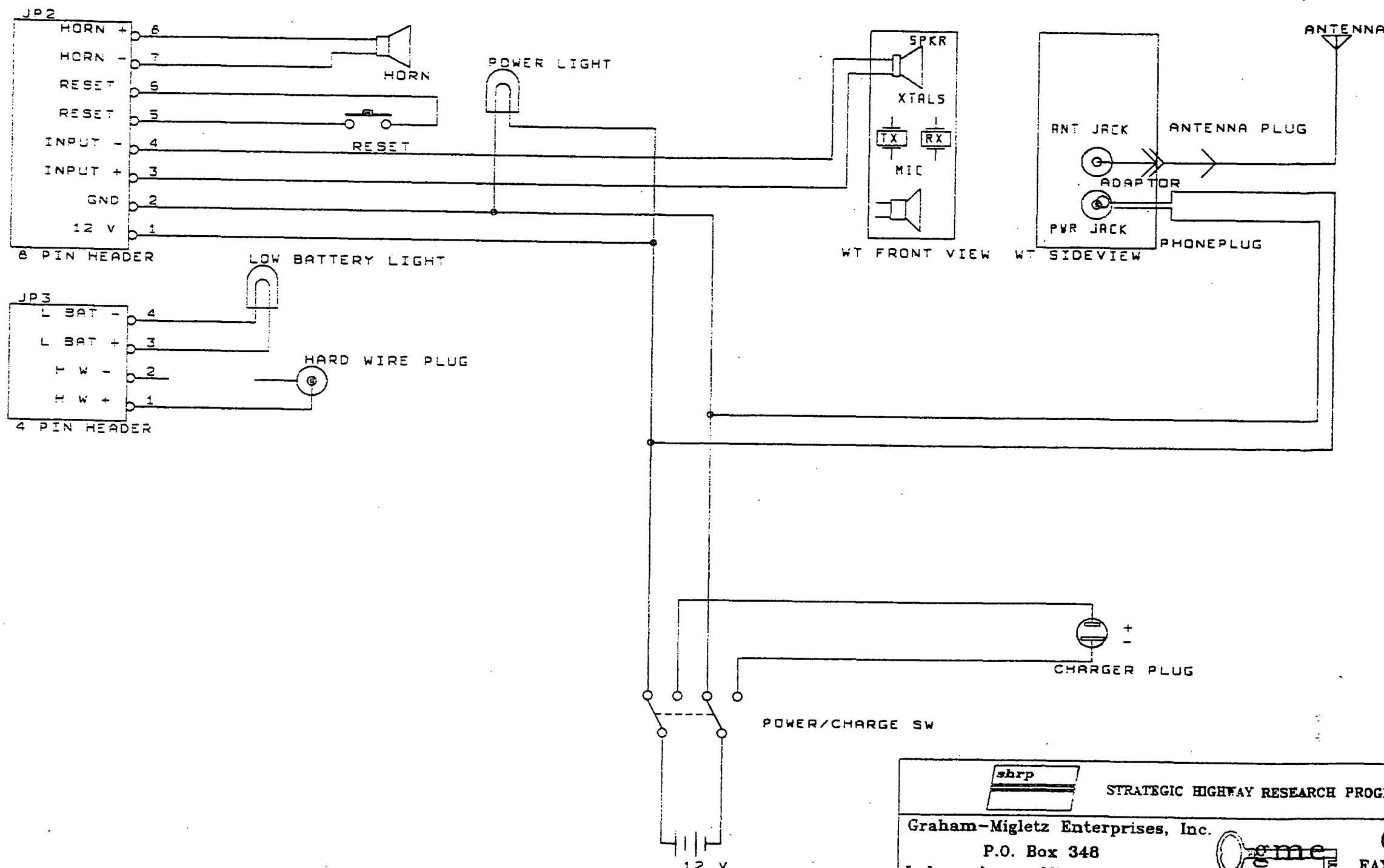
SCALE: NONE

DRAWING NUMBER: 14 OF 16

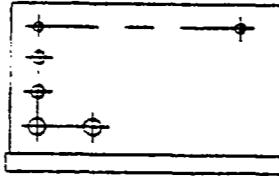
DATE: 10-20-92



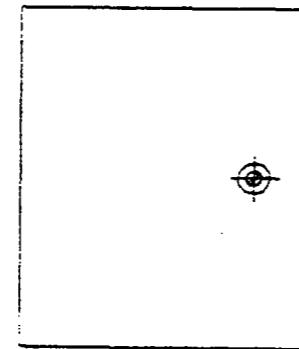
shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc.	
P.O. Box 348	
Independence, Missouri 64050	
(816) 254-1788	
FAX (816) 254-4654	
TITLE: ULTRASONIC DETECTION ALARM	
DRAWN BY: BBF	
REVISED: BBF	
ASSEMBLY: DETECTOR BOX WIRING DIAGRAM	
SCALE: NONE	
DRAWING NUMBER: 15 OF 16	
DATE: 10-20-92	



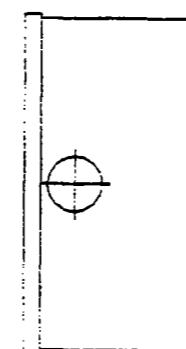
shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. (816) 254-1788	
P.O. Box 348 FAX (816) 254-4654	
Independence, Missouri 64050	
TITLE: ULTRASONIC DETECTION ALARM DRAWN BY: BBF	
REVISED: BBF	
ASSEMBLY: RECEIVER BOX WIRING DIAGRAM SCALE: NONE	
DRAWING NUMBER: 16 OF 16 DATE: 10-20-92	



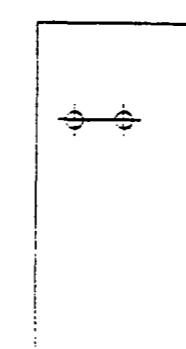
Top View



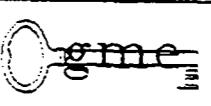
Side View

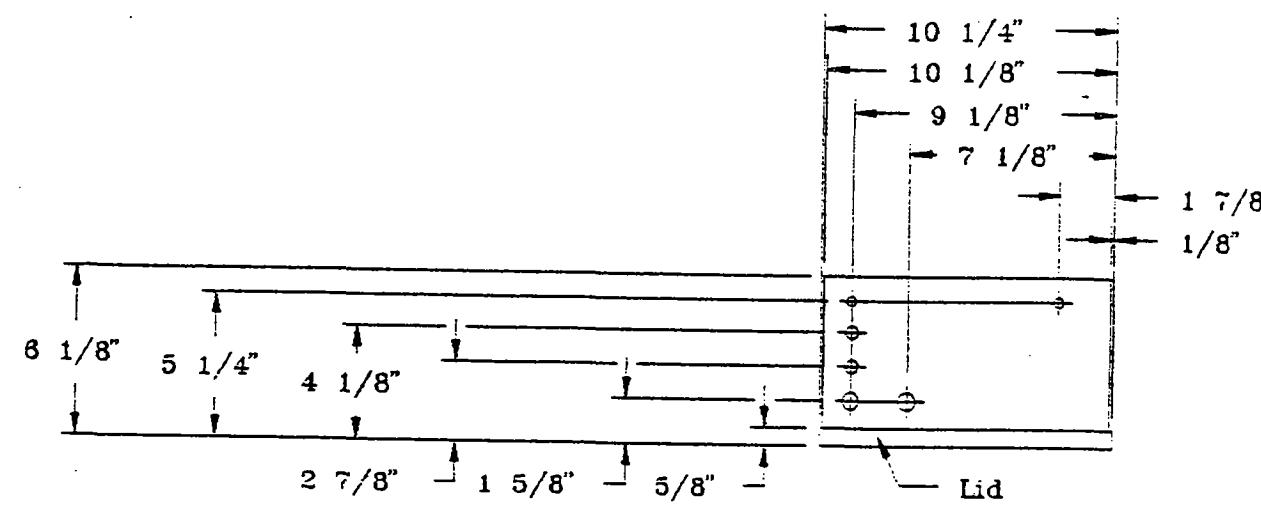


Front View



Back View

<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788  FAX (816) 254-4654
TITLE: Infrared Intrusion Alarm (Detector)		DRAWN BY: JMM
ASSEMBLY: N/A		REVISED: ---
DRAWING NUMBER: 1 of 26		SCALE: None
		DATE: 8-27-92



Top View

shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050

(816) 254-1788

FAX (816) 254-4654

TITLE: Infrared Intrusion Alarm
(Detector)

DRAWN BY: JMM

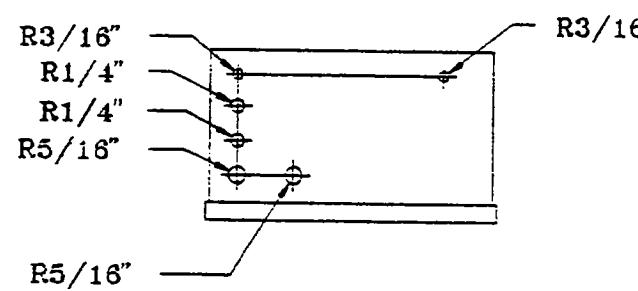
REVISED: ---

ASSEMBLY: N/A

SCALE: None

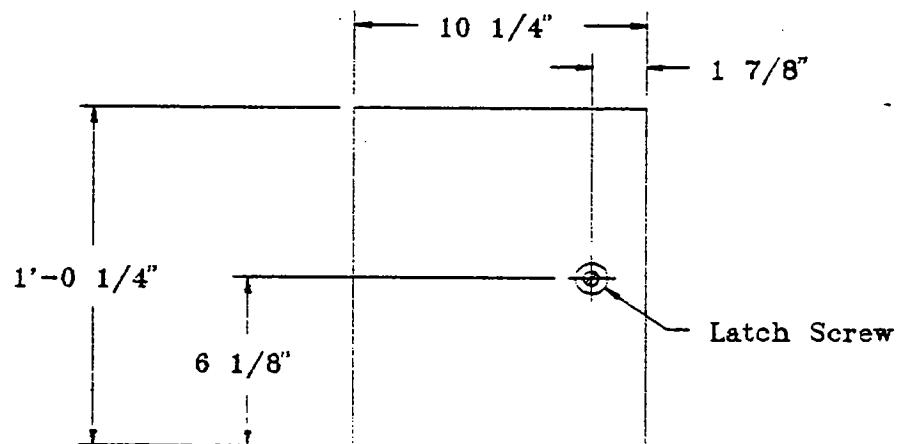
DRAWING NUMBER: 2 of 26

DATE: 8-27-92



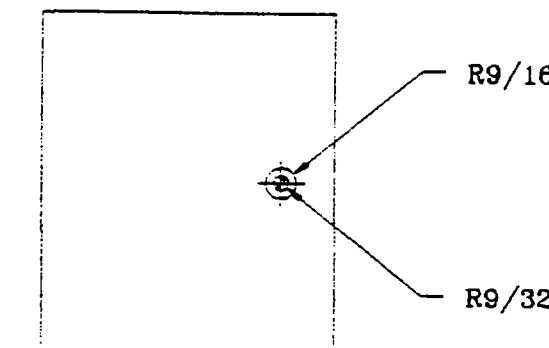
Top View

<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 <i>ome</i> FAX (816) 254-4654
TITLE: Infrared Intrusion Alarm (Detector)		DRAWN BY: JMM
ASSEMBLY: N/A		REVISED: ---
DRAWING NUMBER: 3 of 26		SCALE: None
		DATE: 8-27-92



Side View

shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 FAX (816) 254-4654
TITLE: Infrared Intrusion Alarm (Detector)		DRAWN BY: JMM
ASSEMBLY: N/A		REVISED: ---
DRAWING NUMBER: 4 of 26		SCALE: None
		DATE: 8-28-92



Side View

shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050

(816) 254-1788

~~Gome~~ FAX (816) 254-4654

TITLE: Infrared Intrusion Alarm
(Detector)

DRAWN BY: JMM

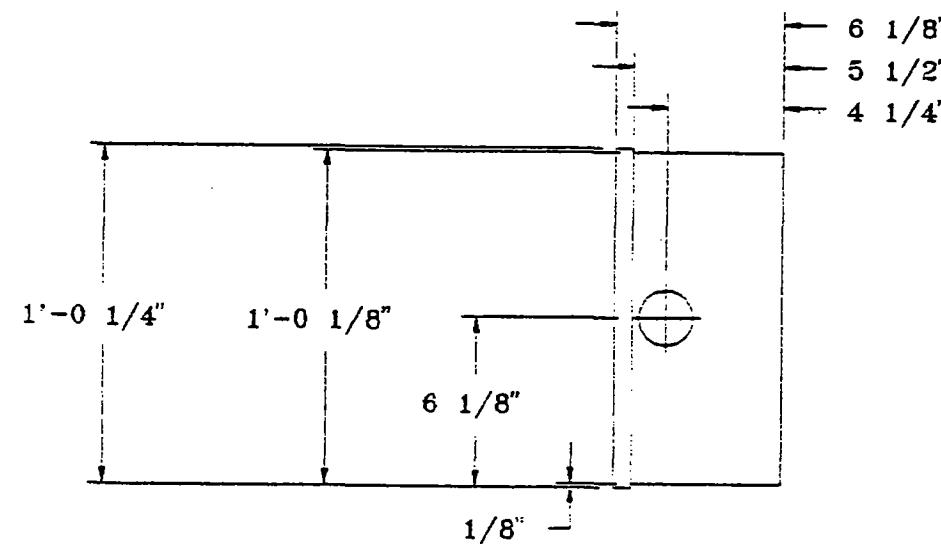
REVISED: ---

ASSEMBLY: N/A

SCALE: None

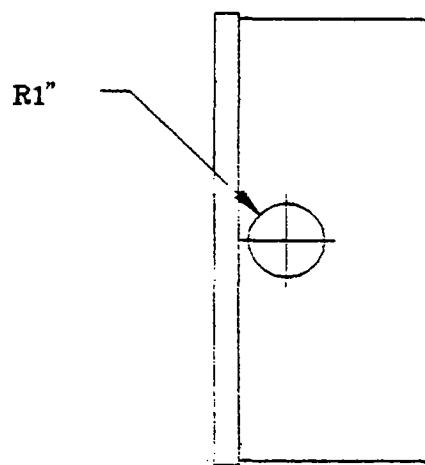
DRAWING NUMBER: 5 of 26

DATE: 8-28-92



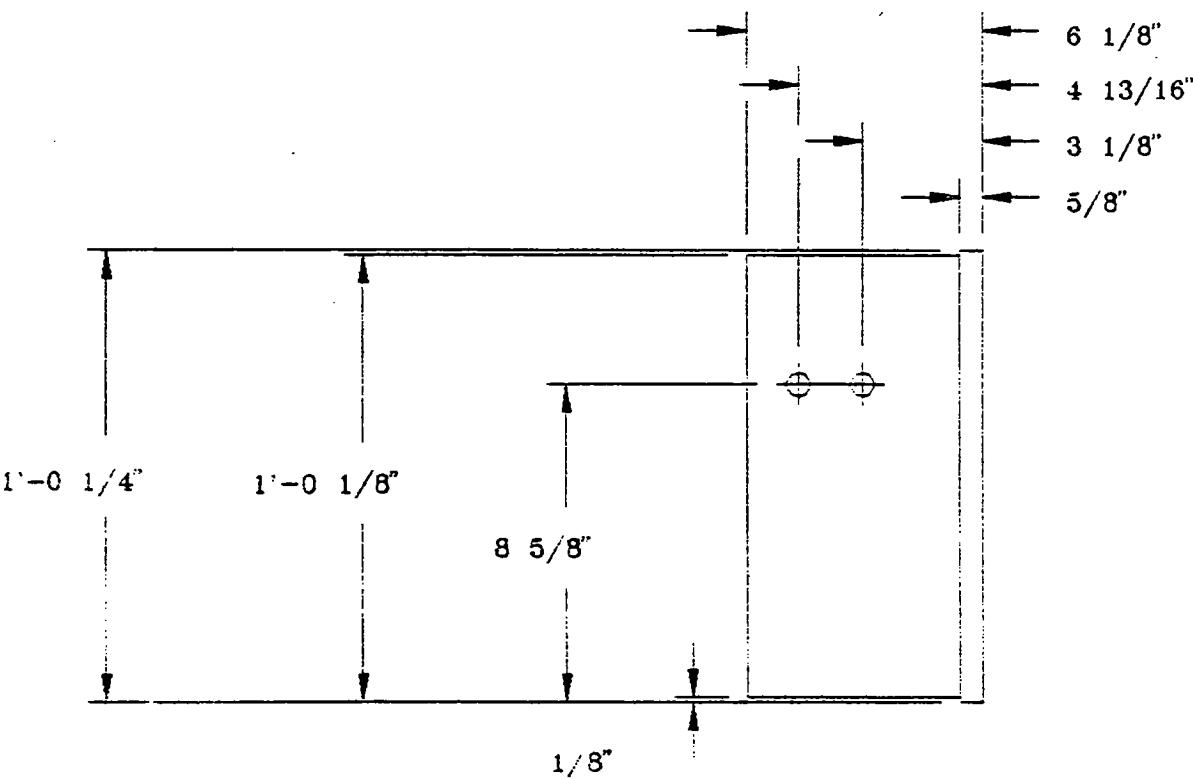
Front View

shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc.		
P.O. Box 348 (816) 254-1788		
Independence, Missouri 64050		
TITLE: Infrared Intrusion Alarm (Detector)		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 6 of 26		DATE: 8-28-92



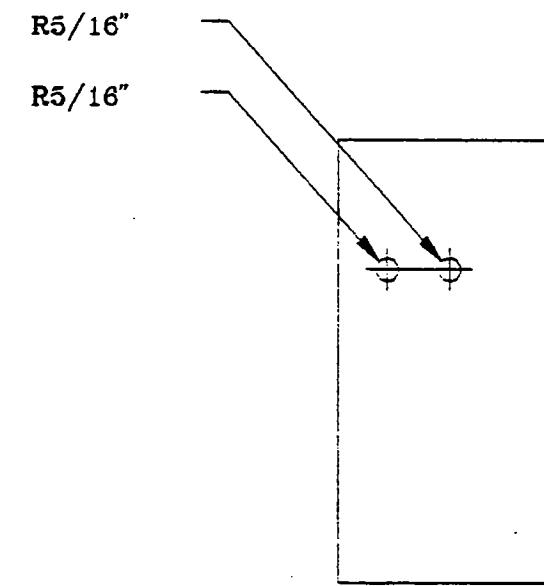
Front View

<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 <i>gme</i> FAX (816) 254-4654
TITLE: Infrared Intrusion Alarm (Detector)		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 7 of 26		DATE: 8-29-92

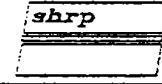


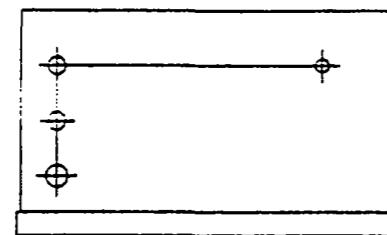
Back View

<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788  FAX (816) 254-4654
TITLE: Infrared Intrusion Alarm (Detector)		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 8 of 26		DATE: 8-29-92

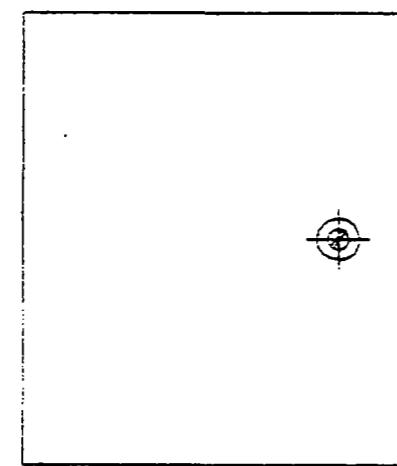


Back View

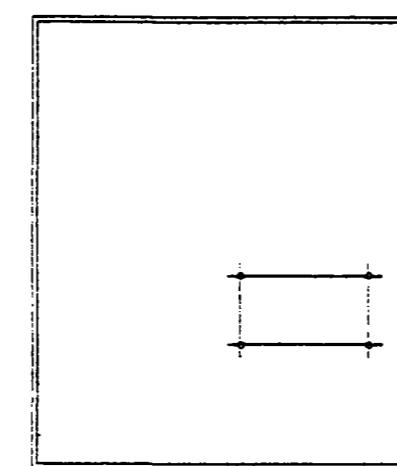
 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. (816) 254-1788 P.O. Box 348  FAX (816) 254-4654 Independence, Missouri 64050	
TITLE: Infrared Intrusion Alarm (Detector)	DRAWN BY: JMM
REVISED: ---	
ASSEMBLY: N/A	SCALE: None
DRAWING NUMBER: 9 of 26	DATE: 8-29-92



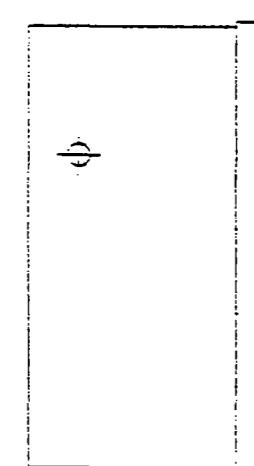
Top View



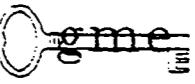
Right Side View

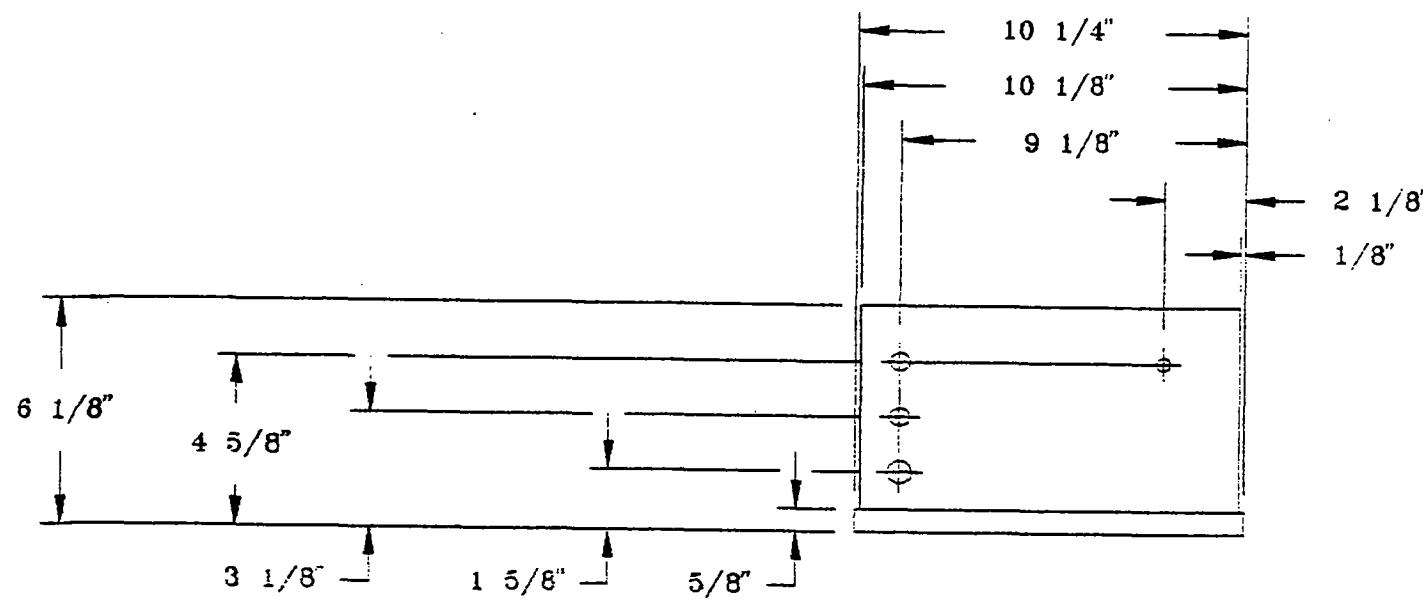


Left Side View



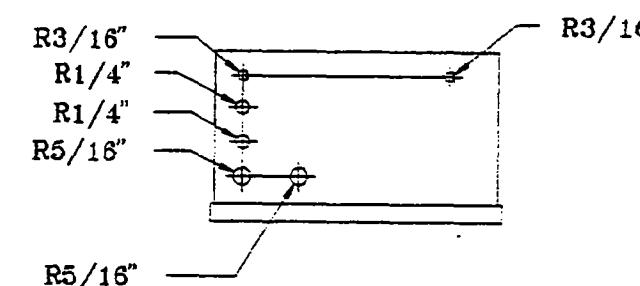
Back View

shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788  FAX (816) 254-4654	
TITLE: Infrared Intrusion Alarm (Receiver)		DRAWN BY: JMM	
ASSEMBLY: N/A		REVISED: ---	SCALE: None
DRAWING NUMBER: 10 of 26		DATE: 8-29-92	



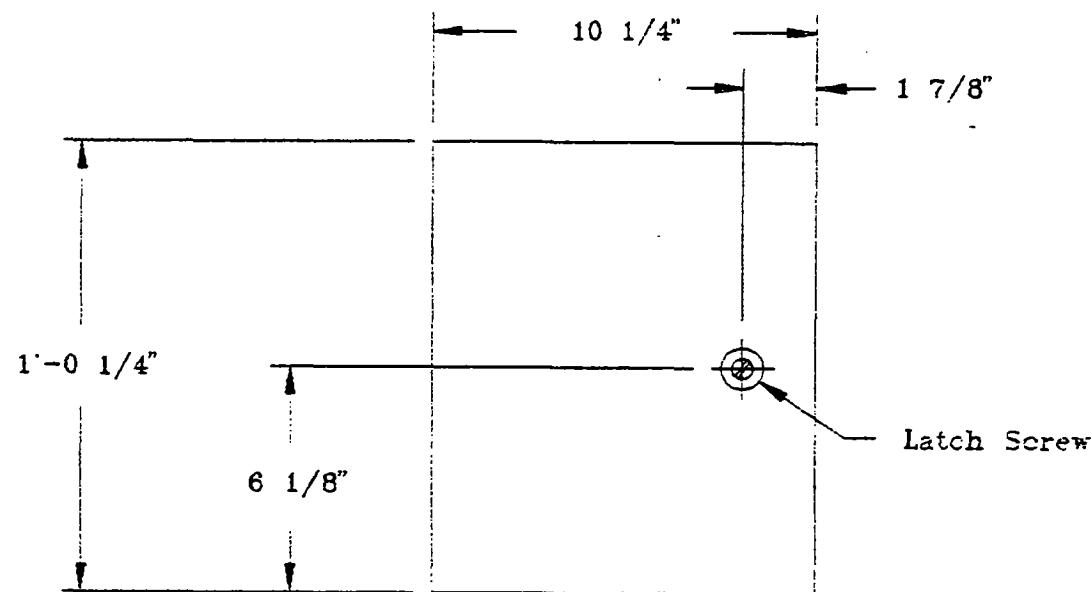
Top View

<i>shrp</i>		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 <i>ome</i> FAX (816) 254-4654
TITLE: Infrared Intrusion Alarm (Receiver)		DRAWN BY: JMM REVISED: ---
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 11 of 26		DATE: 8-29-92



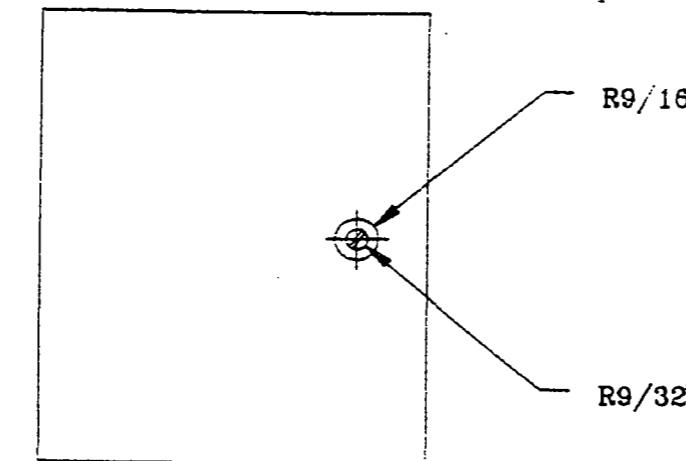
Top View

<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	(816) 254-1788 <i>None</i>	FAX (816) 254-4654
TITLE: Infrared Intrusion Alarm (Detector)		DRAWN BY: JMM
REVISED: ---		
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 12 of 26		DATE: 8-27-92

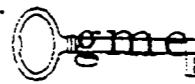


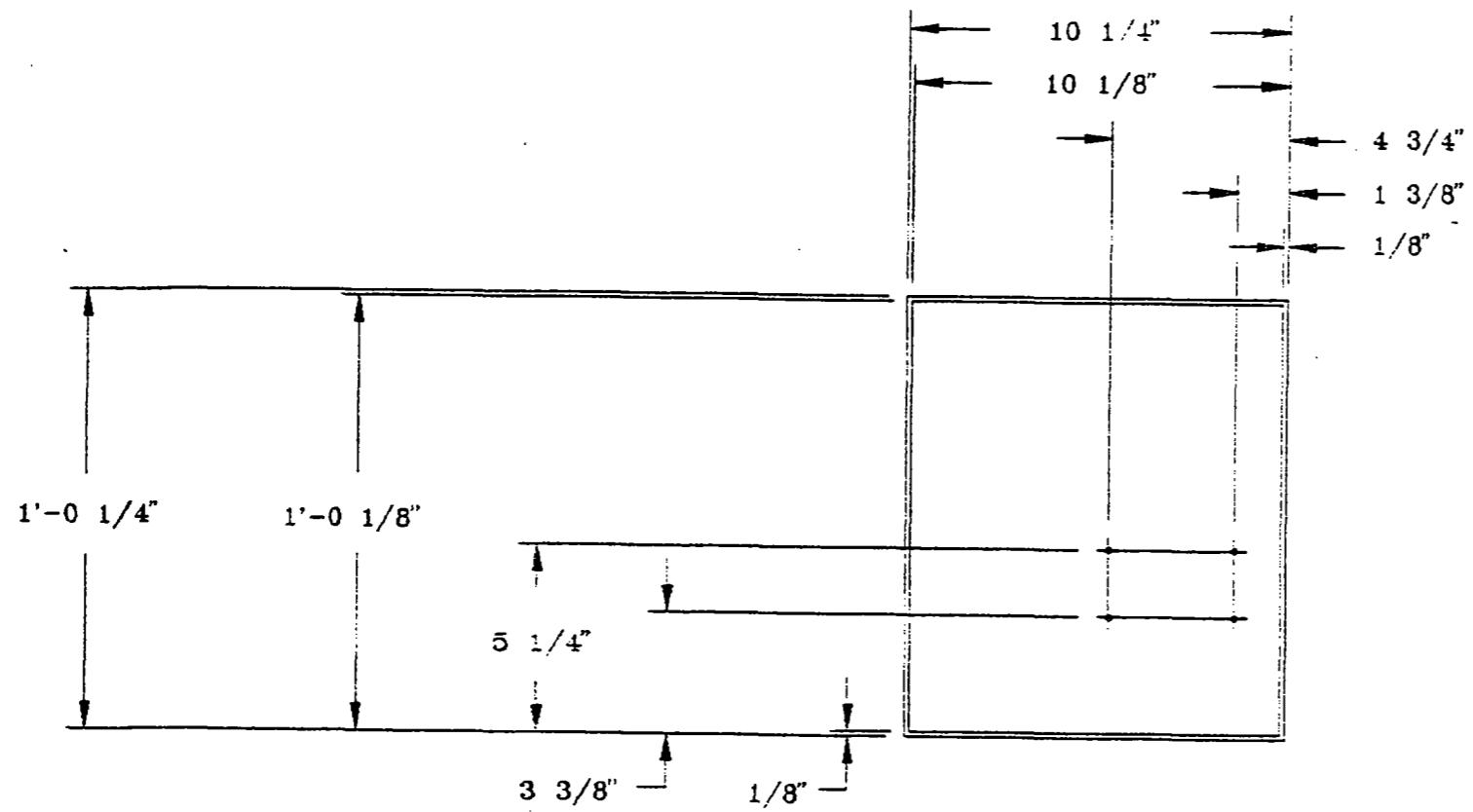
Right Side View

shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. (816) 254-1788		
P.O. Box 348		
Independence, Missouri 64050		
TITLE: Infrared Intrusion Alarm (Receiver)		DRAWN BY: JMM
		REVISED: ----
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 13 of 26		DATE: 8-29-92

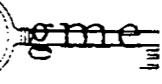


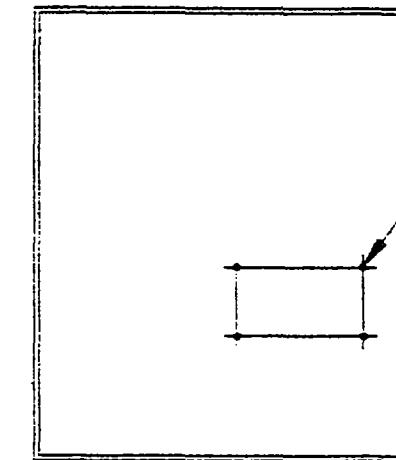
Right Side View

shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788  FAX (816) 254-4654
TITLE: Infrared Intrusion Alarm (Receiver)		DRAWN BY: JMM
ASSEMBLY: N/A		REVISED: ---
DRAWING NUMBER: 14 of 26		SCALE: None
		DATE: 8-29-92



Left Side View

<i>shrp</i>		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788  FAX (816) 254-4654
TITLE: Infrared Intrusion Alarm (Receiver)		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 15 of 26		DATE: 8-29-92



Left Side View

shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

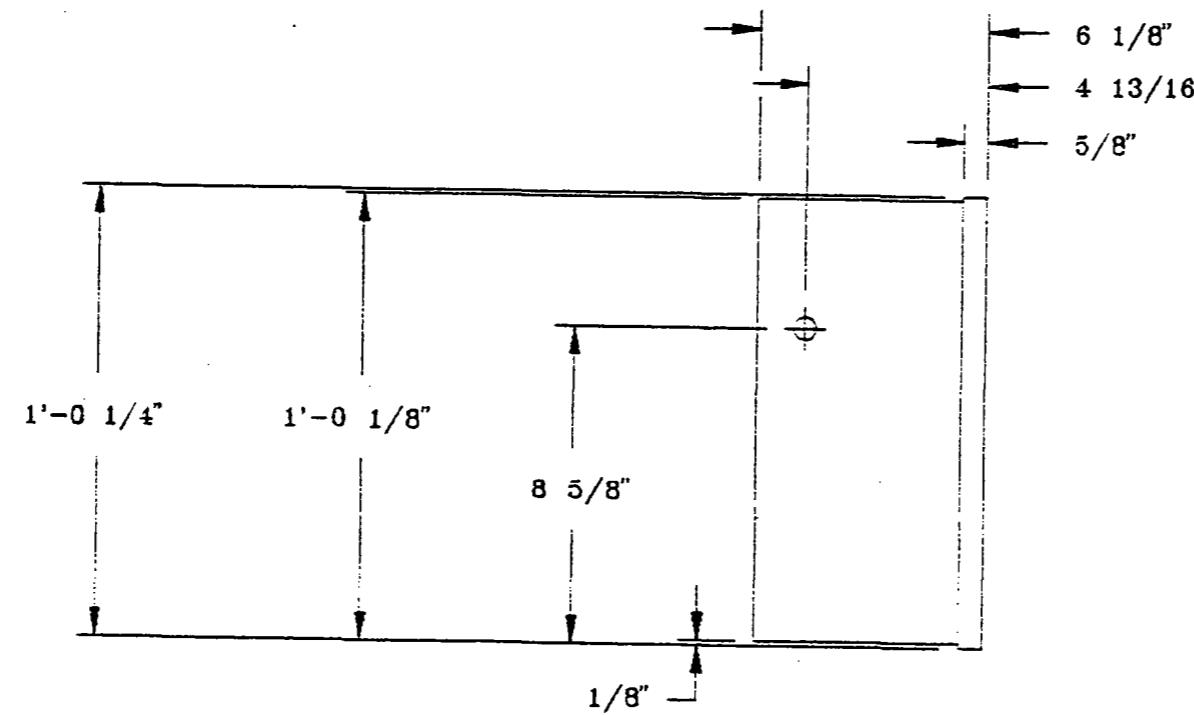
Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

(816) 254-1788
 FAX (816) 254-4654

TITLE: Infrared Intrusion Alarm (Receiver)	DRAWN BY: JMM
REVISED: ---	

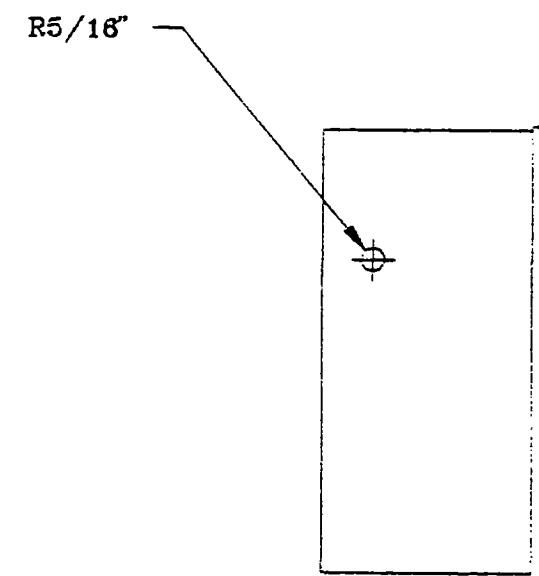
ASSEMBLY: N/A	SCALE: None
---------------	-------------

DRAWING NUMBER: 16 of 26	DATE: 8-30-92
--------------------------	---------------



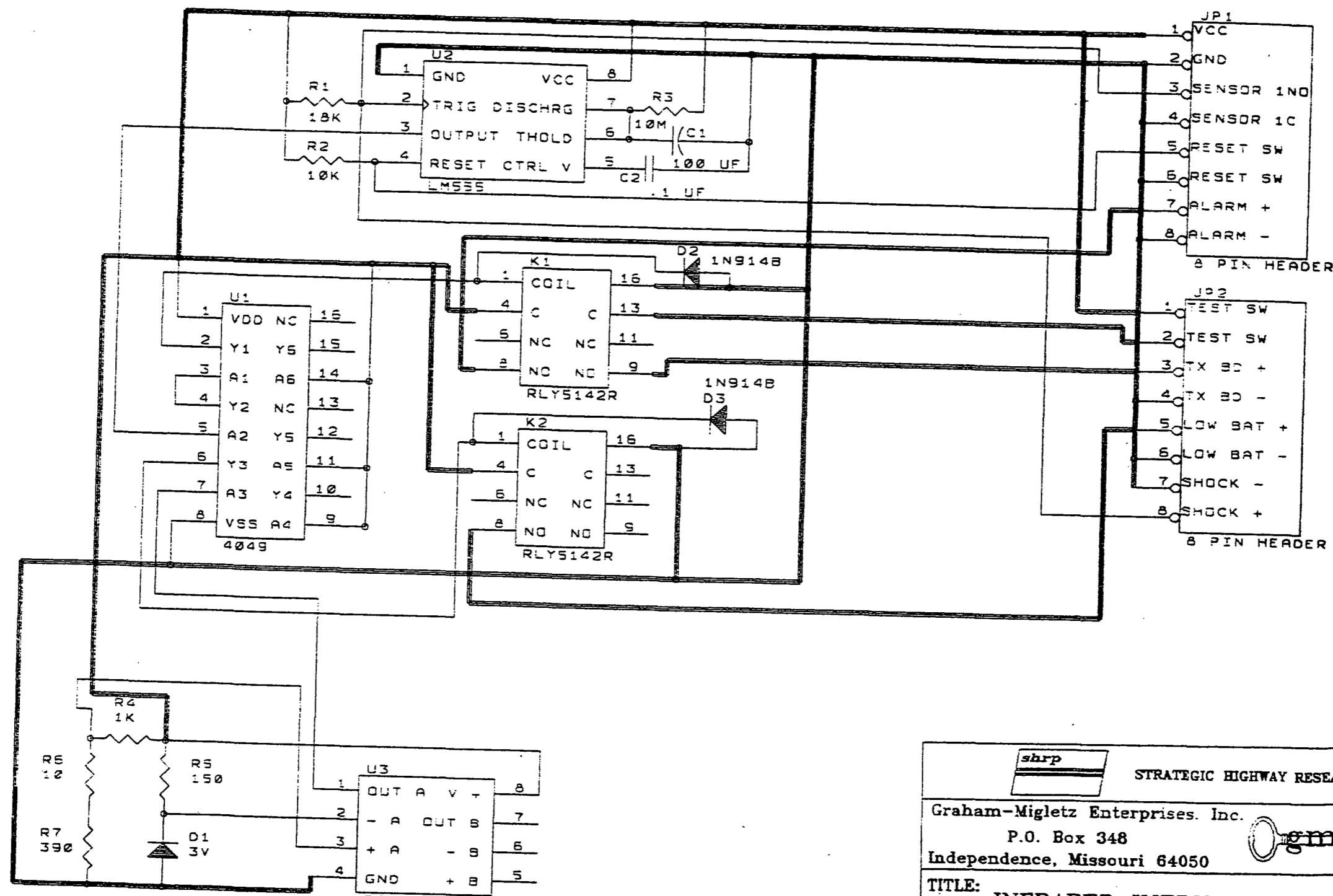
Back View

<i>shrp</i>		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 <i>None</i> FAX (816) 254-4654
TITLE: Infrared Intrusion Alarm (Receiver)		DRAWN BY: JMM
REVISED: ---		
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 17 of 26		DATE: 8-30-92

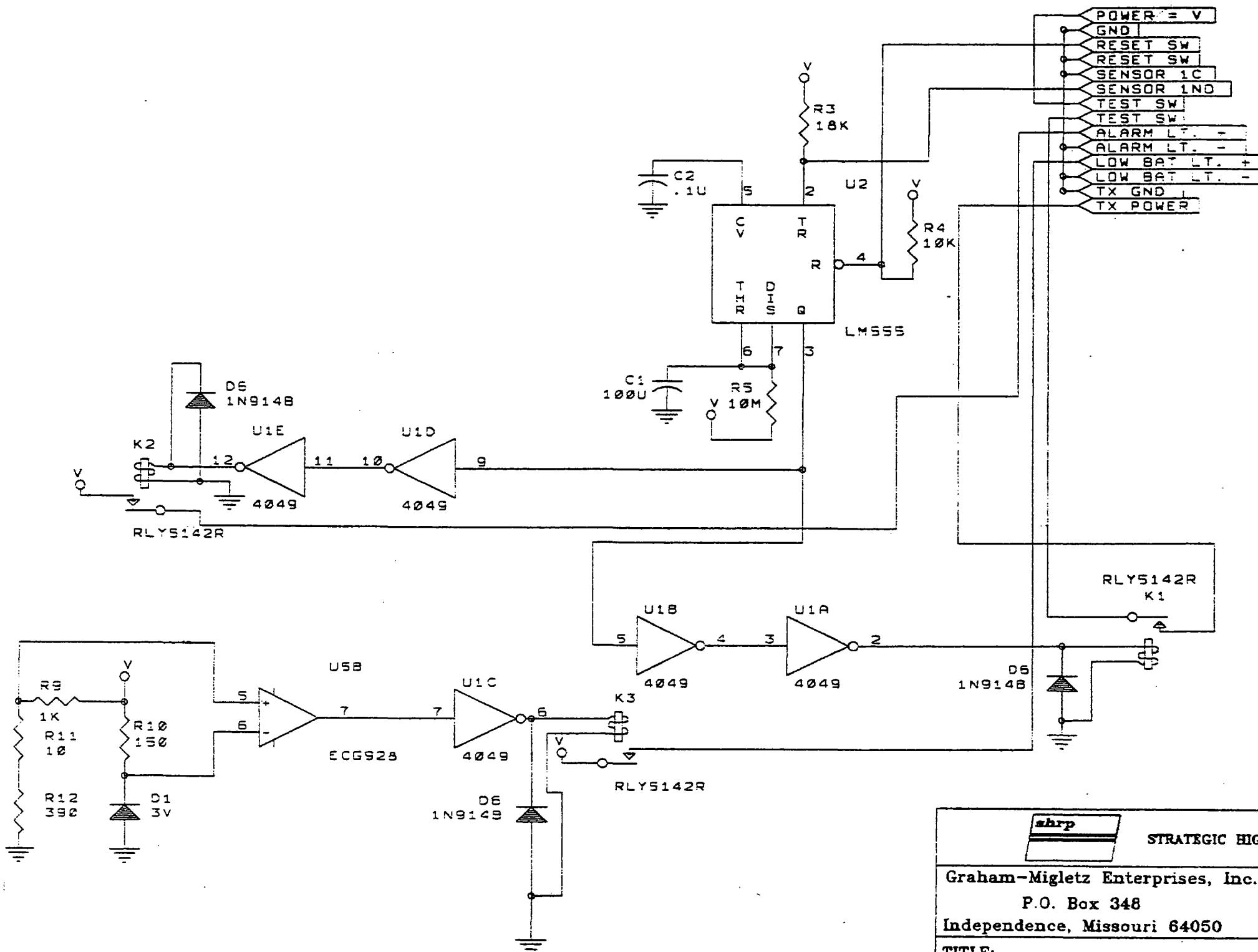


Back View

shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 FAX (816) 254-4654
TITLE: Infrared Intrusion Alarm (Receiver)		DRAWN BY: JMM
		REVISED: ----
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 18 of 26		DATE: 8-30-92



shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	(816) 254-1788  FAX (816) 254-4654	
TITLE: INFRARED INTRUSION ALARM	DRAWN BY: BBF	
	REVISED: BBF	
ASSEMBLY: SENSOR BOARD STYLE/LAYOUT	SCALE: NONE	
DRAWING NUMBER: 19 OF 26	DATE: 10-20-92	



Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

STRATEGIC HIGHWAY RESEARCH PROGRAM

(816) 254-1788

c. some

game

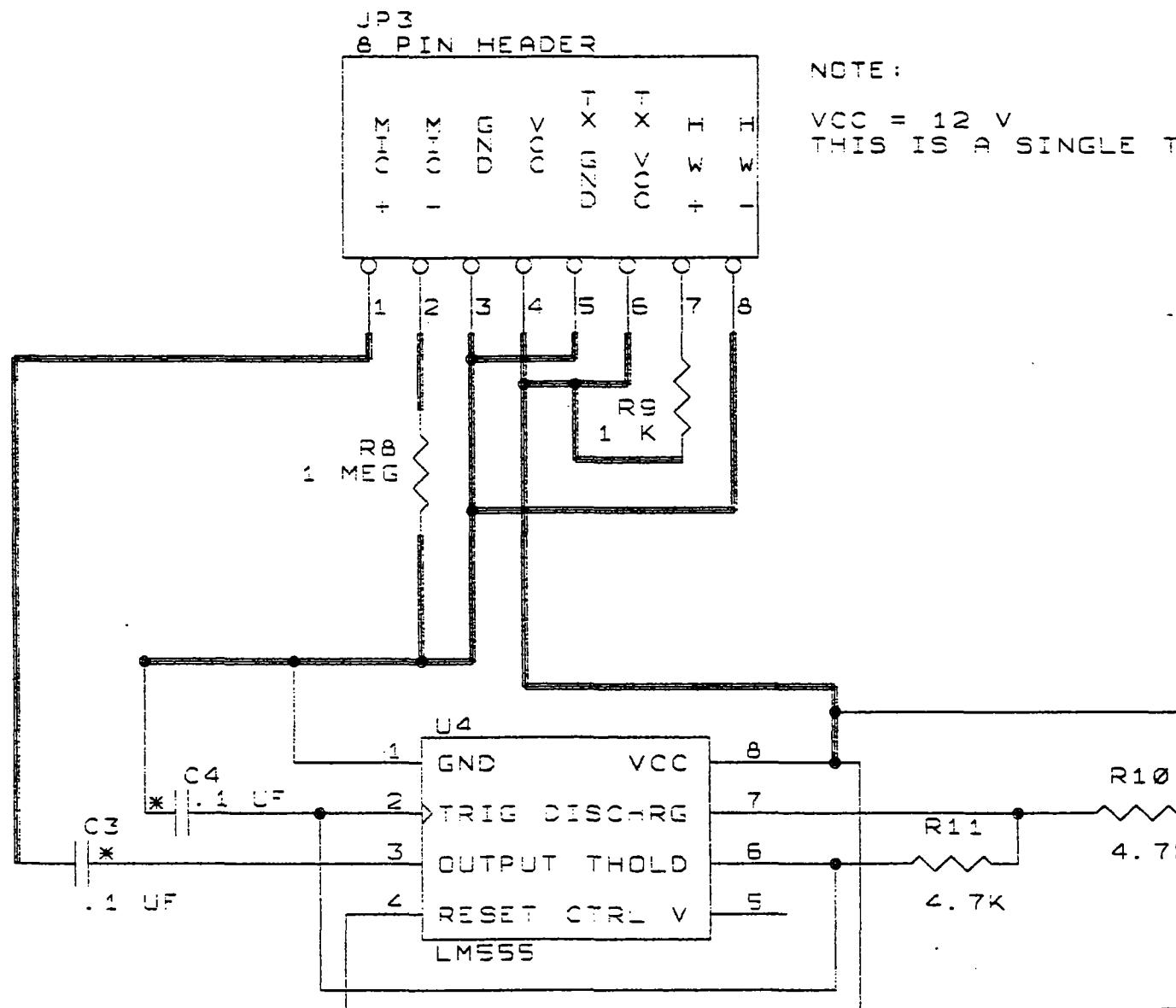
(816) 254-1788

DRAWN BY: RR

REVISED: BBE

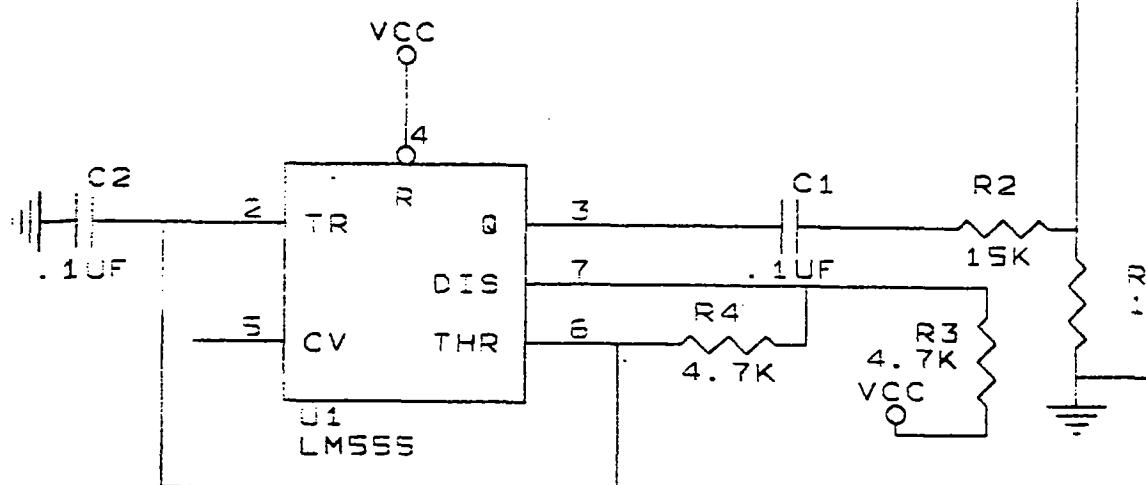
ASSEMBLY: SENSOR BOARD STYLE/SYMBOLIC

SCALE: NONE



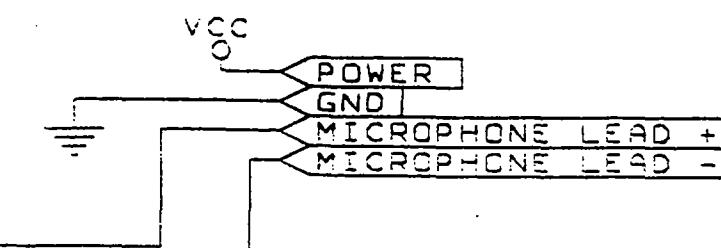
* TANTILUM CAPACITORS

shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. (816) 254-1788 P.O. Box 348 FAX (816) 254-4654 Independence, Missouri 64050		
TITLE: INFRARED INTRUSION ALARM		DRAWN BY: BBF
		REVISED: BBF
ASSEMBLY: TRANSMITTER BOARD STYLE/LAYOUT		SCALE: NONE
DRAWING NUMBER: 21 OF 26		DATE: 10-20-92

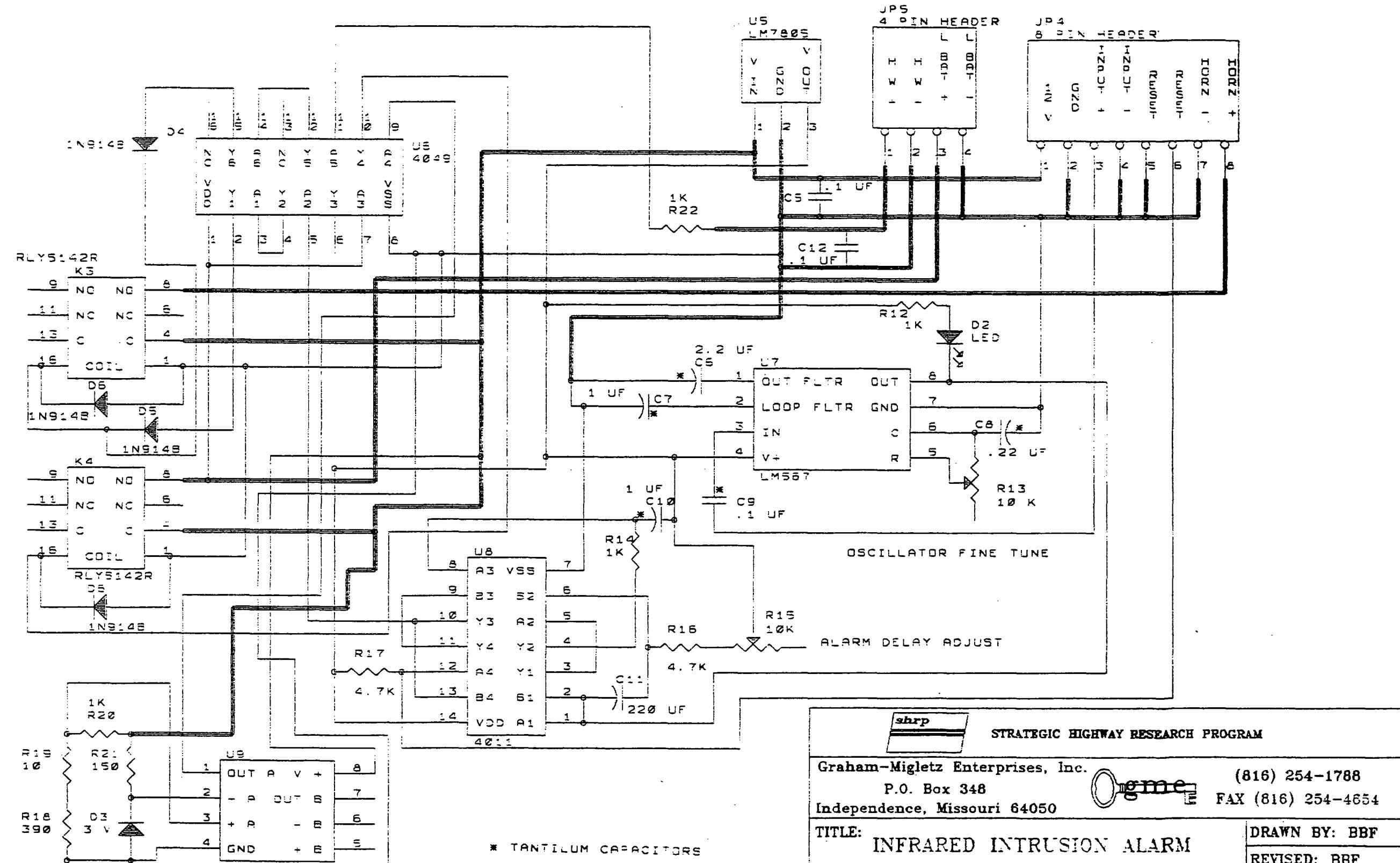


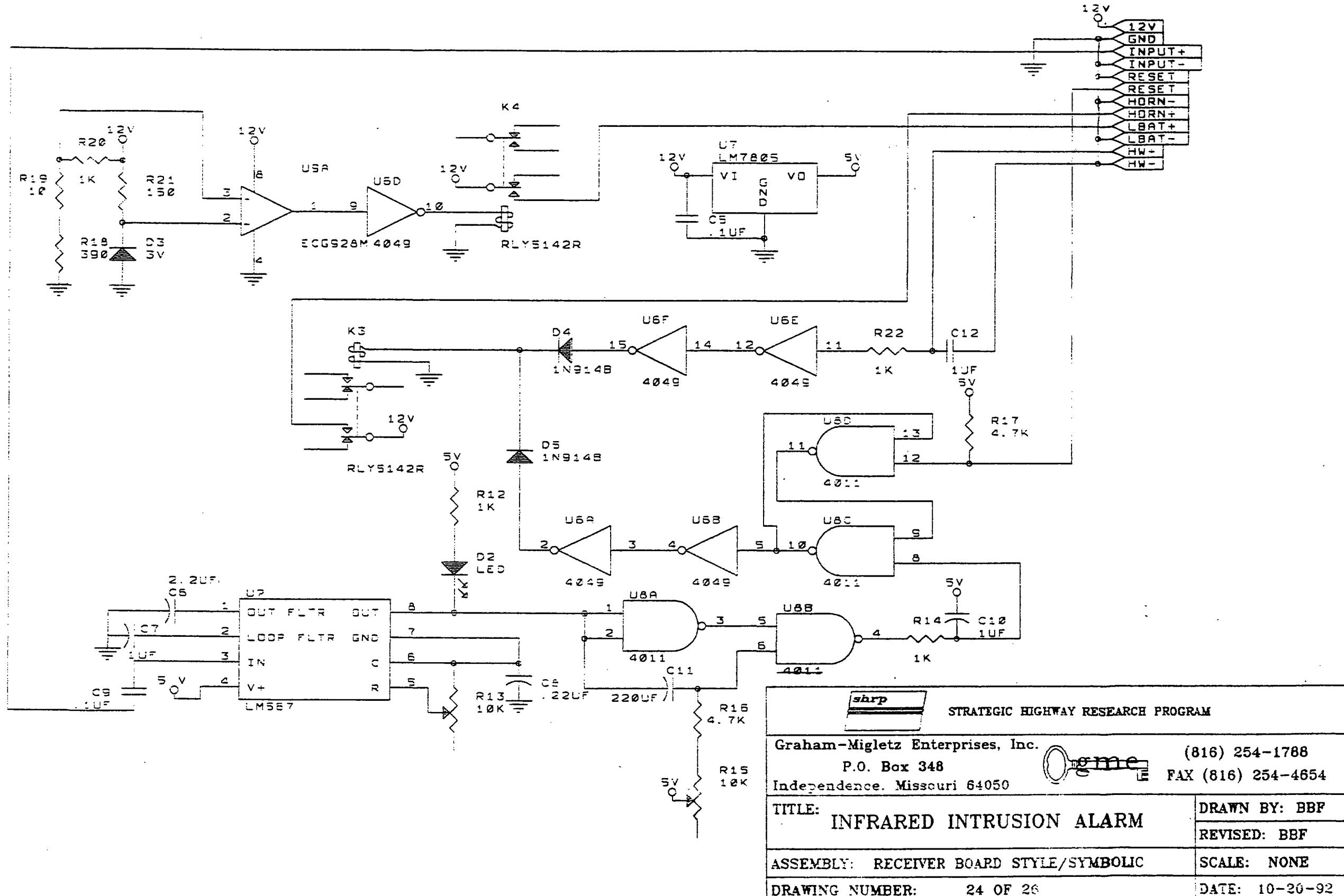
NOTES:

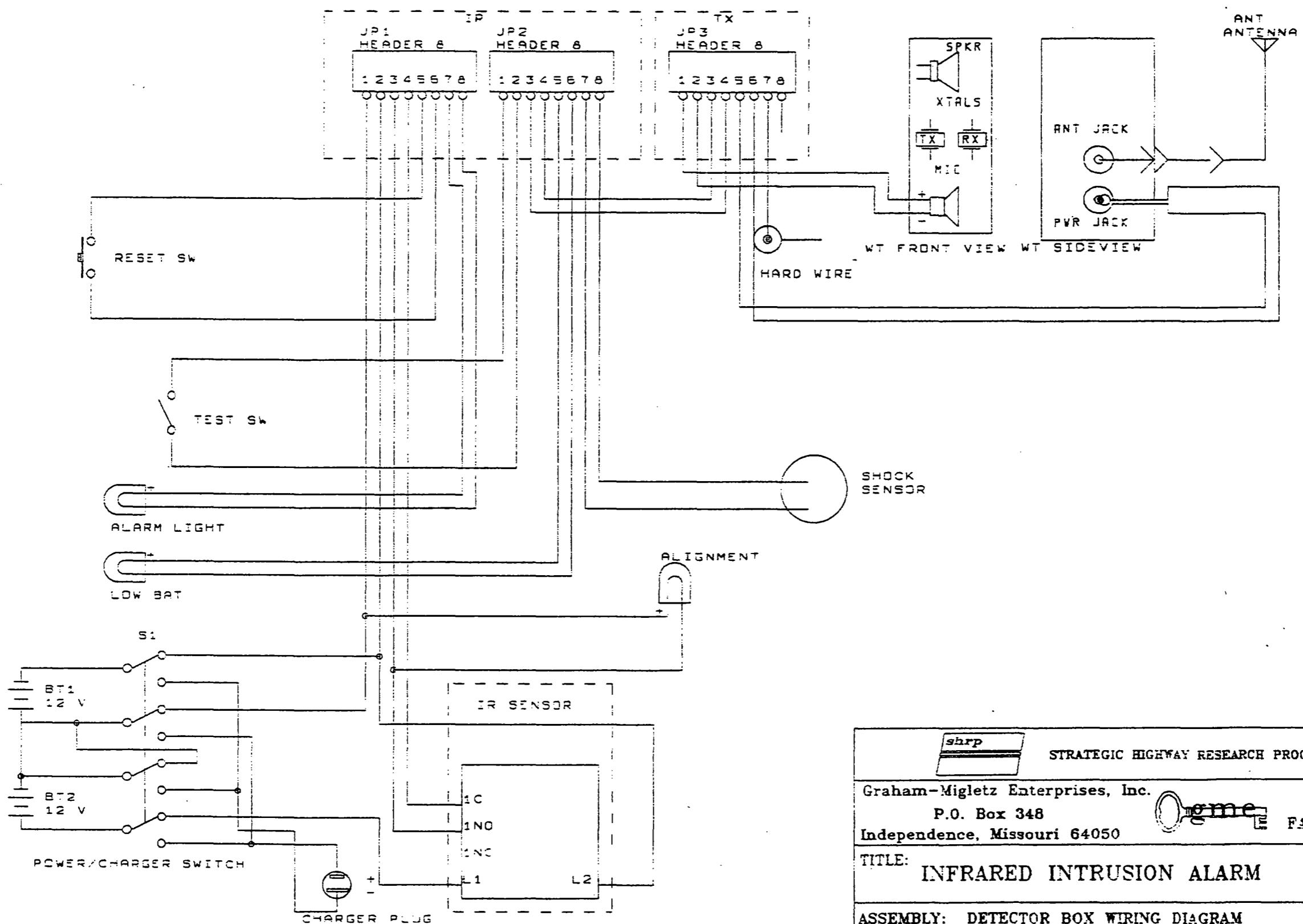
SINGLE TONE GENERATOR (PRESET 1 KHZ)
 VCC = 12 V DC



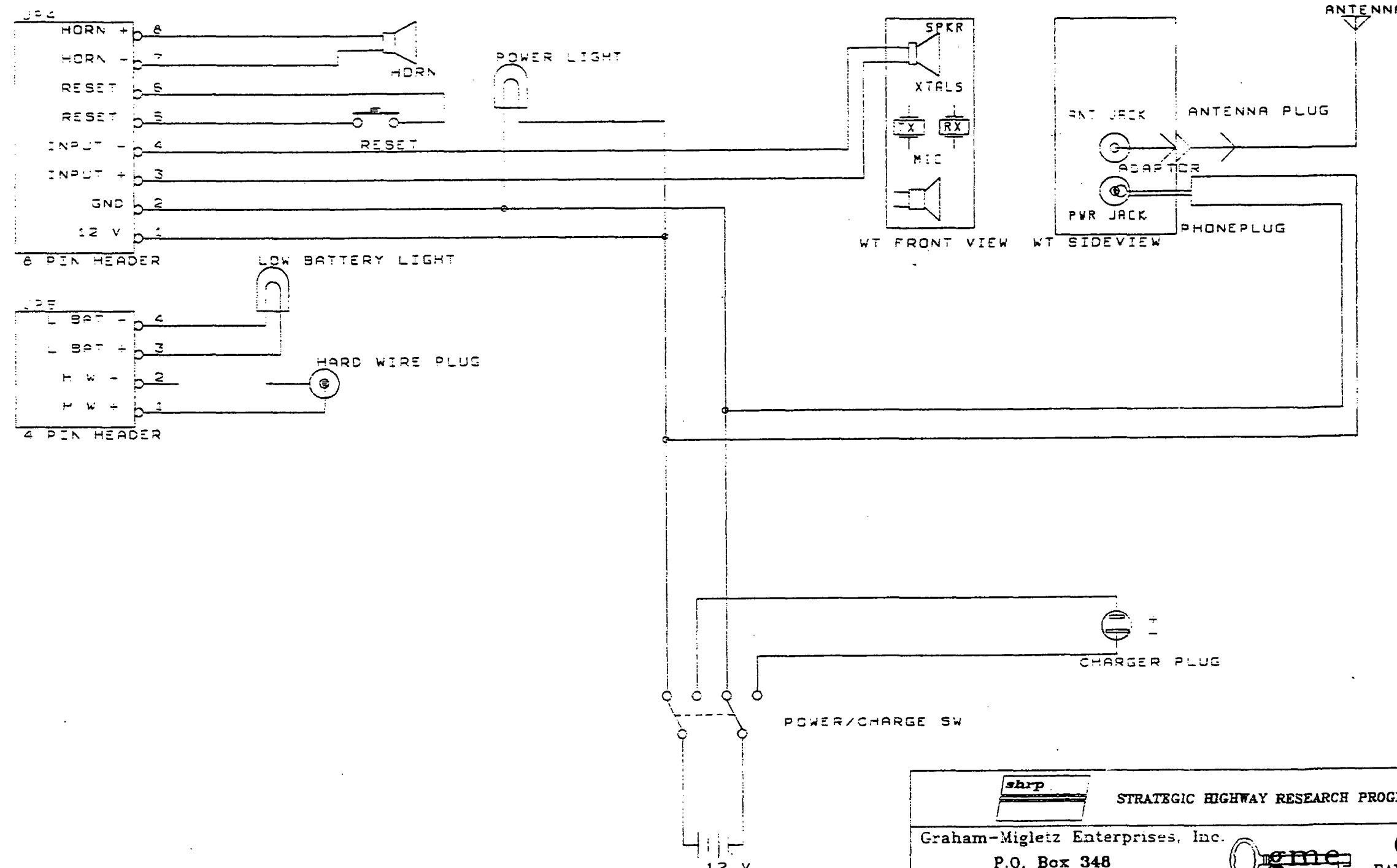
shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		
(816) 254-1788		
FAX (816) 254-4654		
TITLE: INFRARED INTRUSION ALARM		DRAWN BY: BBF
		REVISED: BBF
ASSEMBLY: TRANSMITTER BOARD STYLE/SYMBOLIC		SCALE: NONE
DRAWING NUMBER: 22 OF 26		DATE: 10-20-92



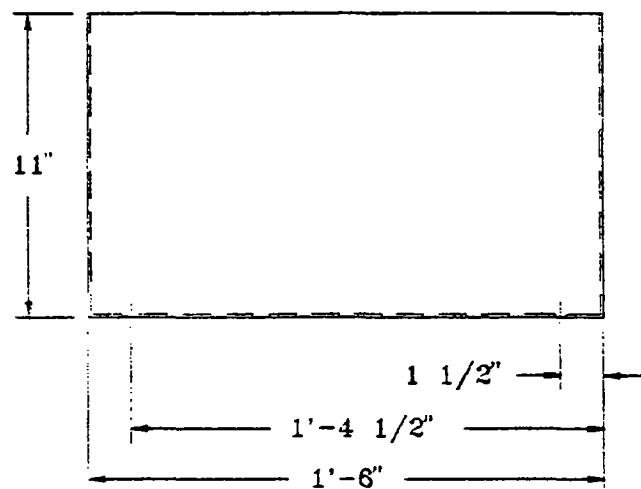
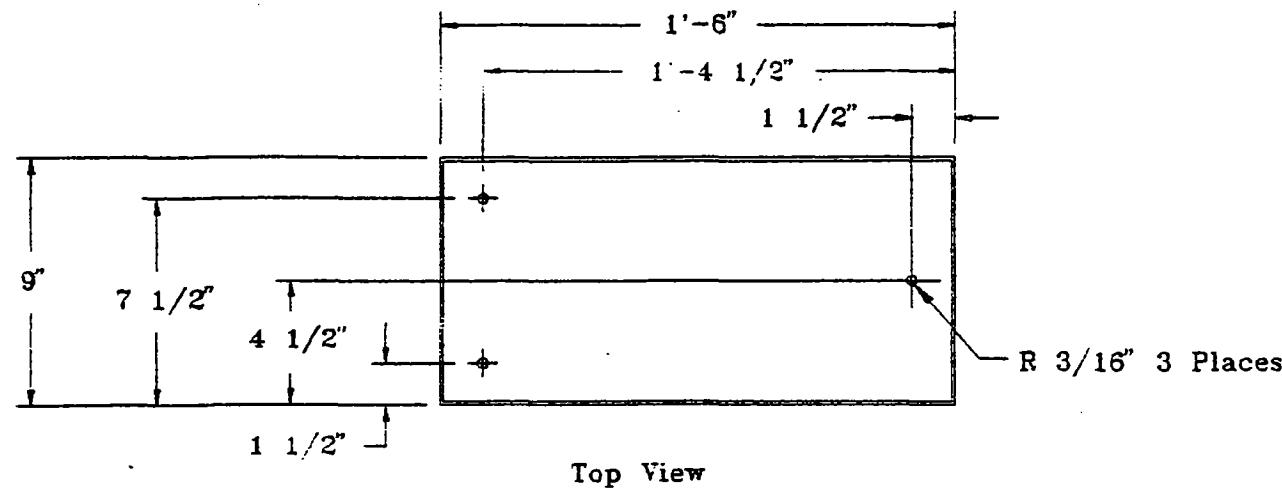




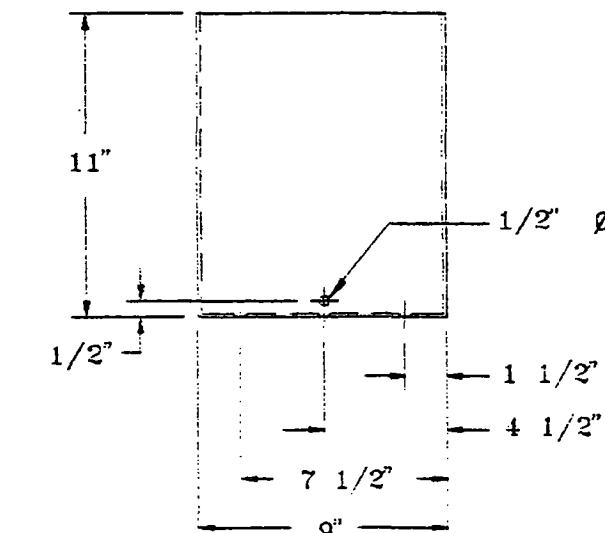
shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	(816) 254-1788 FAX (816) 254-4654
TITLE: INFRARED INTRUSION ALARM	DRAWN BY: BBF
	REVISED: BBF
ASSEMBLY: DETECTOR BOX WIRING DIAGRAM	SCALE: NONE
DRAWING NUMBER: 25 OF 26	DATE: 10-20-92



shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 FAX (816) 254-4654
TITLE: INFRARED INTRUSION ALARM		DRAWN BY: BBF
ASSEMBLY: RECEIVER BOX WIRING DIAGRAM		REVISED: BBF
DRAWING NUMBER: 26 OF 26		SCALE: NONE
		DATE: 10-20-92



Side View



End View

Note: Material of Box is 1/8" Aluminum.

shrp STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050

(816) 254-1788

FAX (816) 254-4654

TITLE: Pressurized Pneumatic
Tube Alarm

DRAWN BY: JMM

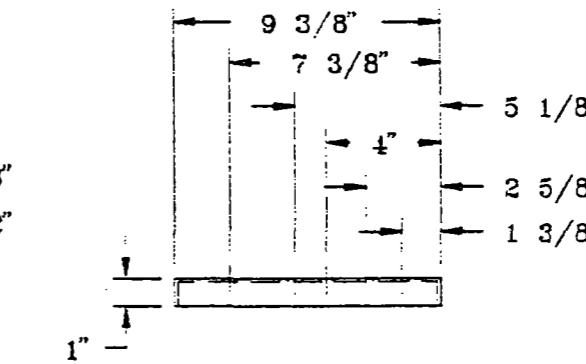
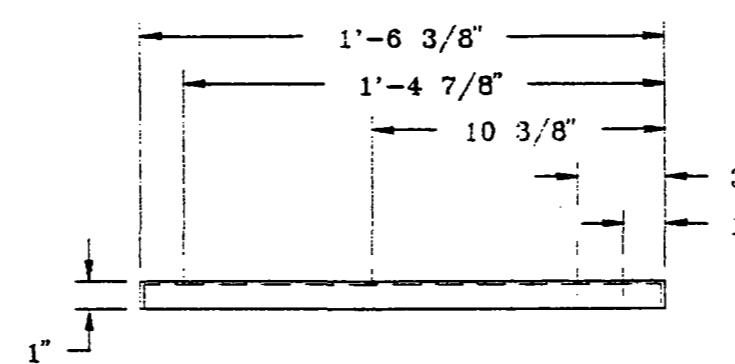
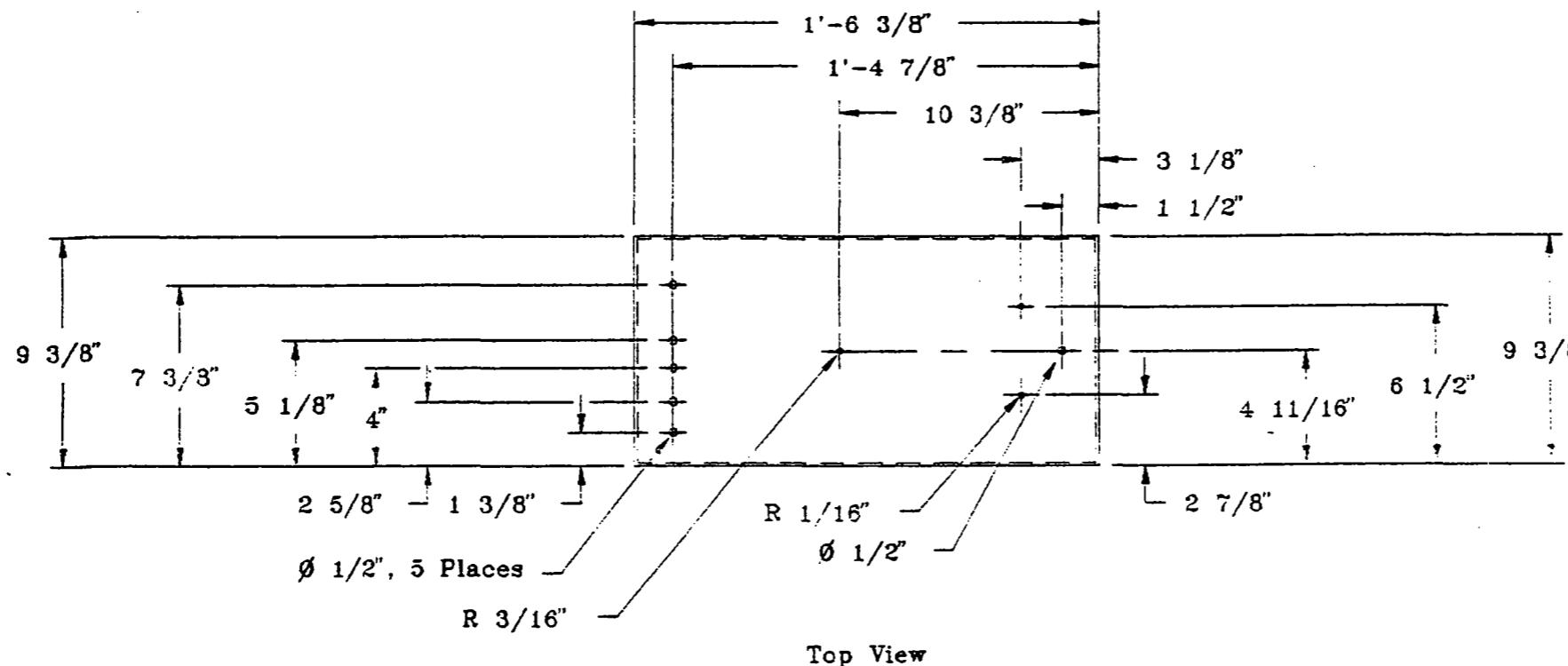
REVISED: ---

ASSEMBLY: Detector Box

SCALE: None

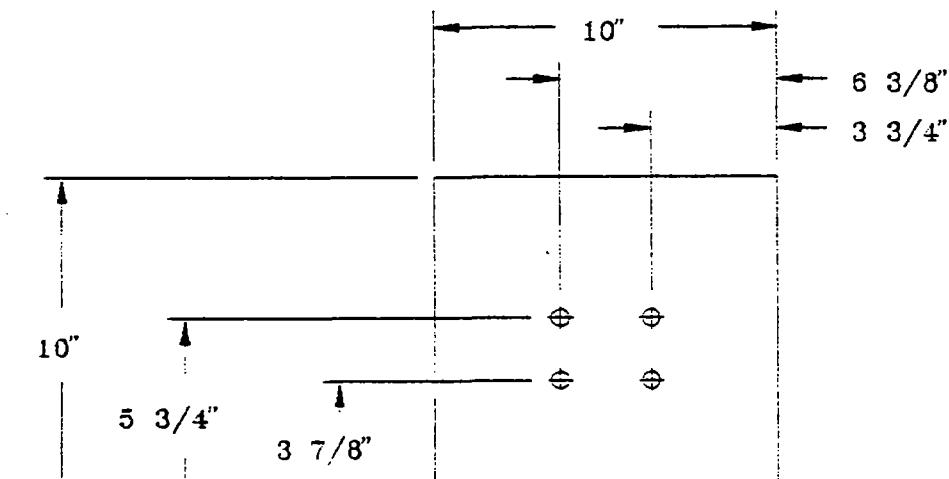
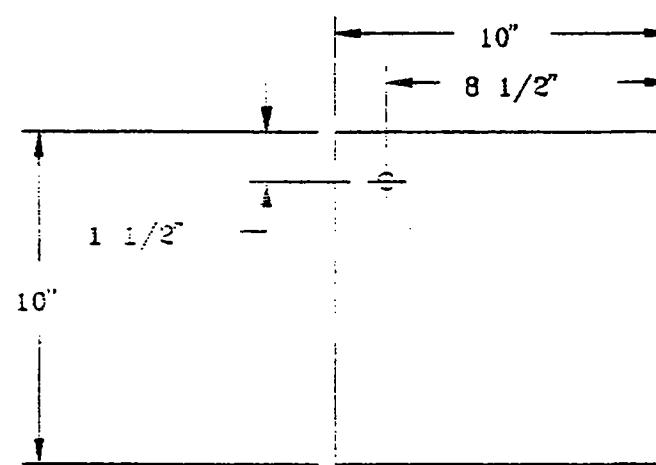
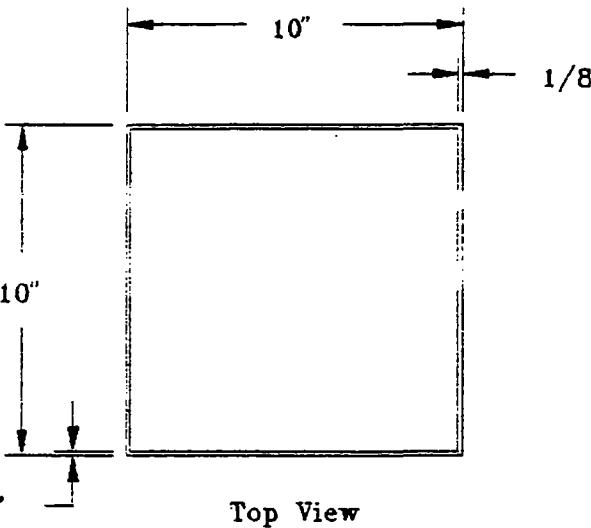
DRAWING NUMBER: 1 of 10

DATE: 8-26-92



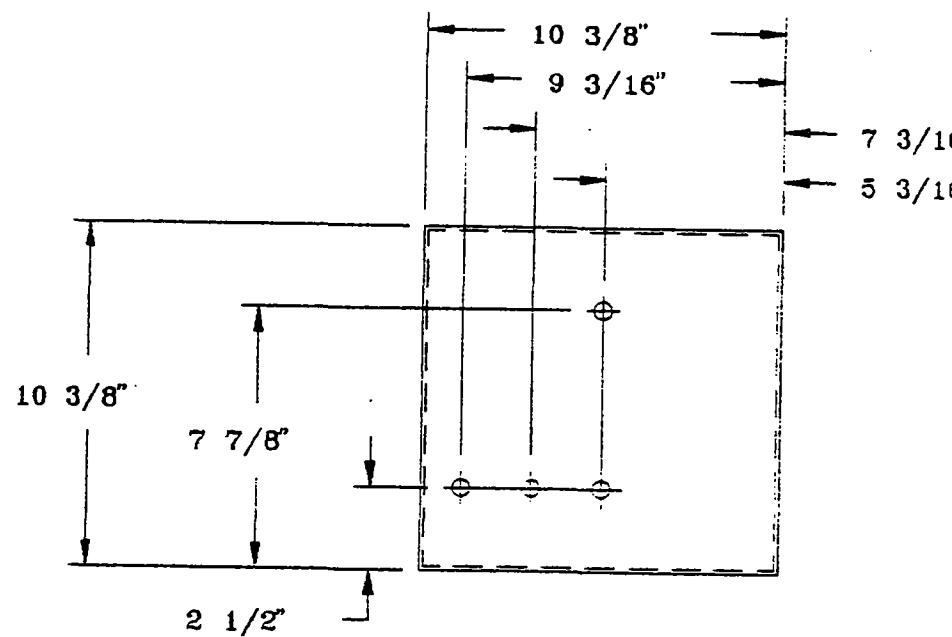
Note: Material of Lid is 1/8" Aluminum.

<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 FAX (816) 254-4654
TITLE: Pressurized Pneumatic Tube Alarm		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: Detector Lid		SCALE: None
DRAWING NUMBER: 2 of 10		DATE: 8-27-92

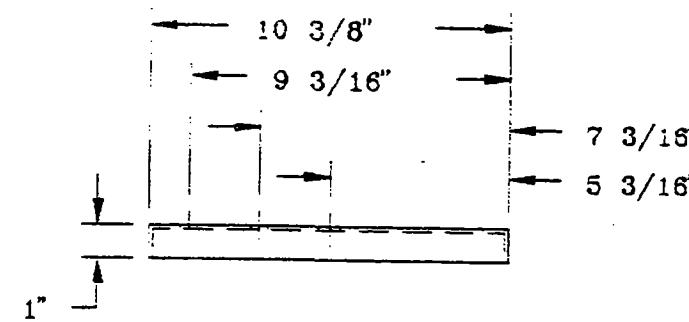


Note: Material of Box is 1/8" Aluminum.

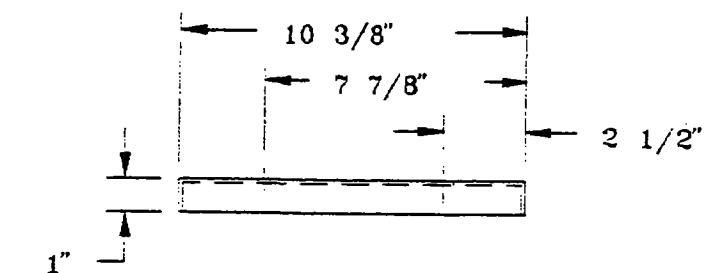
<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 <i>ome</i> FAX (816) 254-4654
TITLE: Pressurized Pneumatic Tube Alarm		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: Receiver Box		SCALE: None
DRAWING NUMBER: 3 of 10		DATE: 07/16/92



Top View

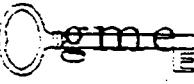


Front View

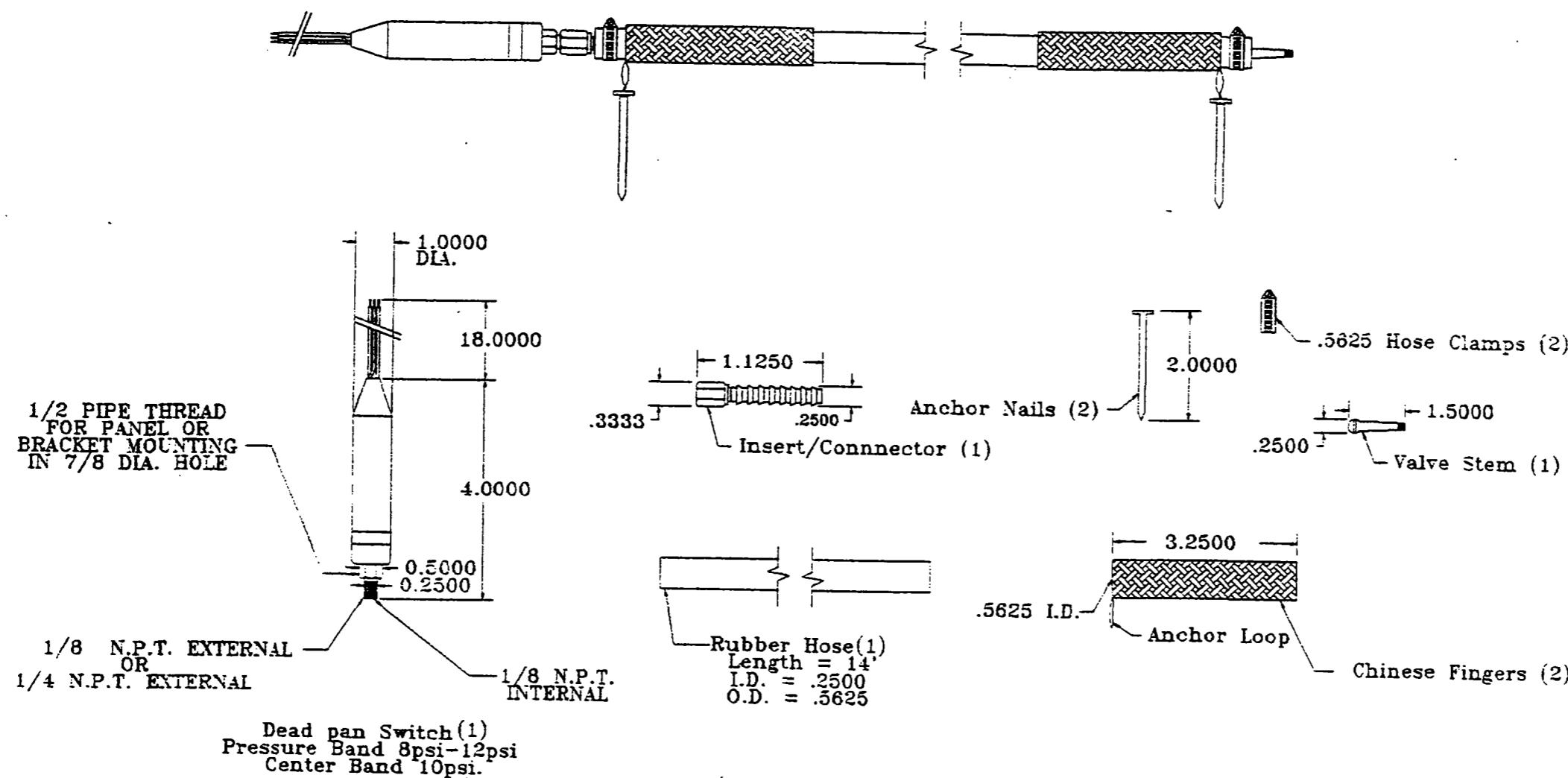


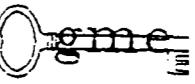
Side View

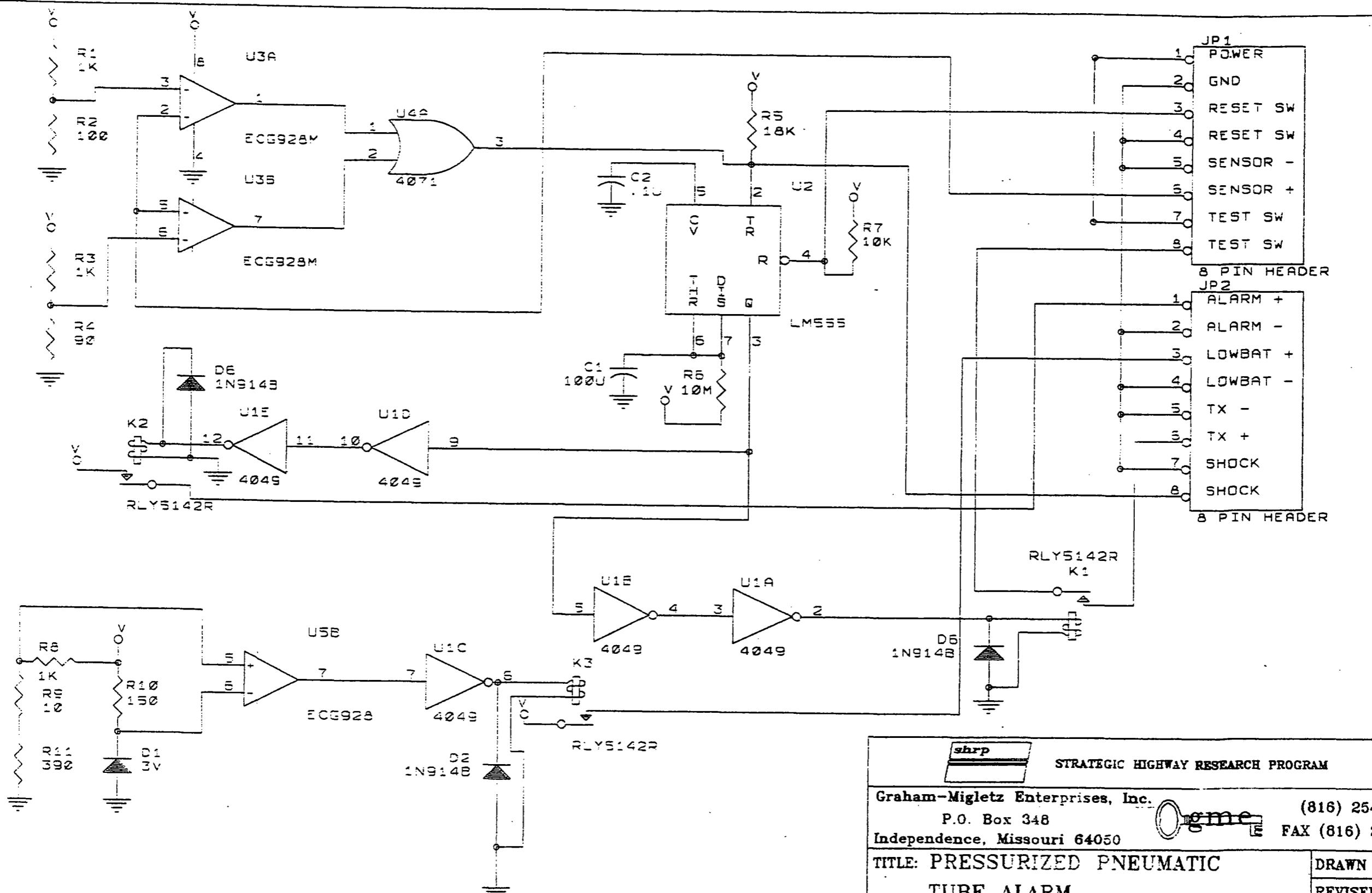
Note: Material of Lid is 1/8" Aluminum.

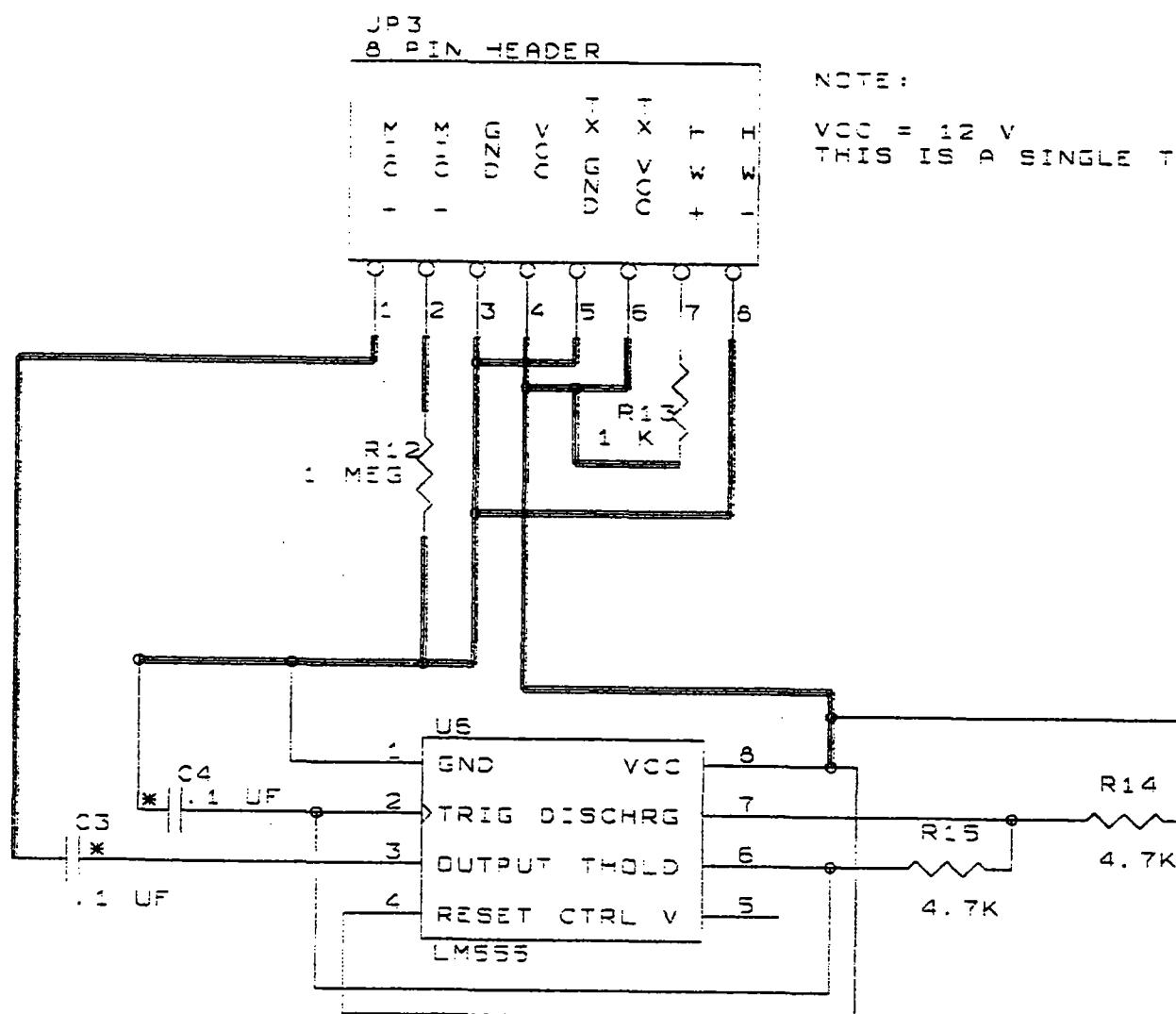
<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788  FAX (816) 254-4654
TITLE: Pressurized Pneumatic Tube Alarm		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: Receiver Lid		SCALE: None
DRAWING NUMBER: 4 of 10		DATE: 07/17/92

* Application Note:
Tube must be pressurized
close to temperature
of usage.



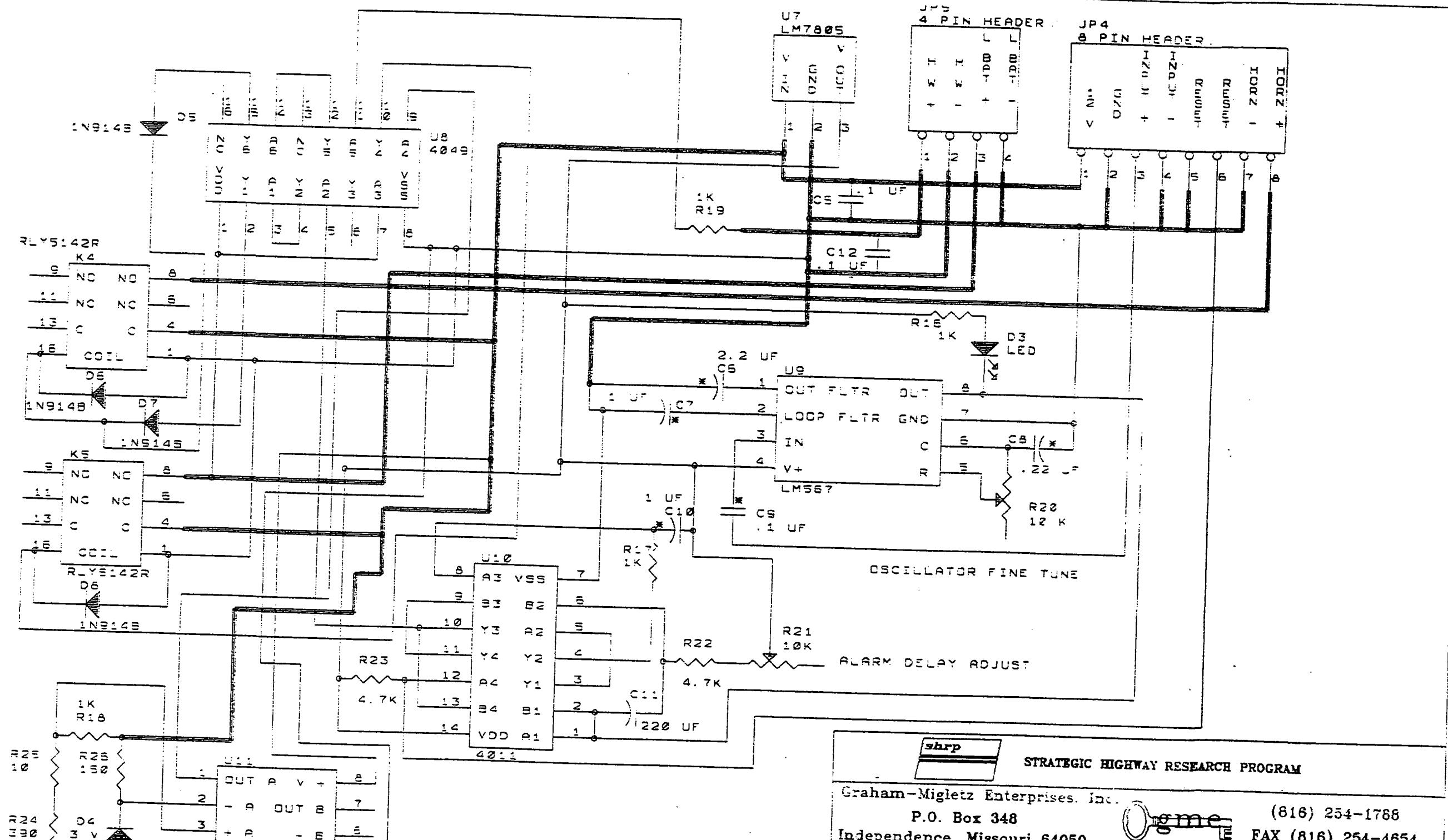
<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc.		(816) 254-1788
P.O. Box 348		FAX (816) 254-4654
Independence, Missouri 64050		
TITLE: Pressurized Pneumatic Tube Alarm		DRAWN BY: JMM
REVISED: ----		
ASSEMBLY: Hose		SCALE: None
DRAWING NUMBER: 5 of 10		DATE: 07/17/92



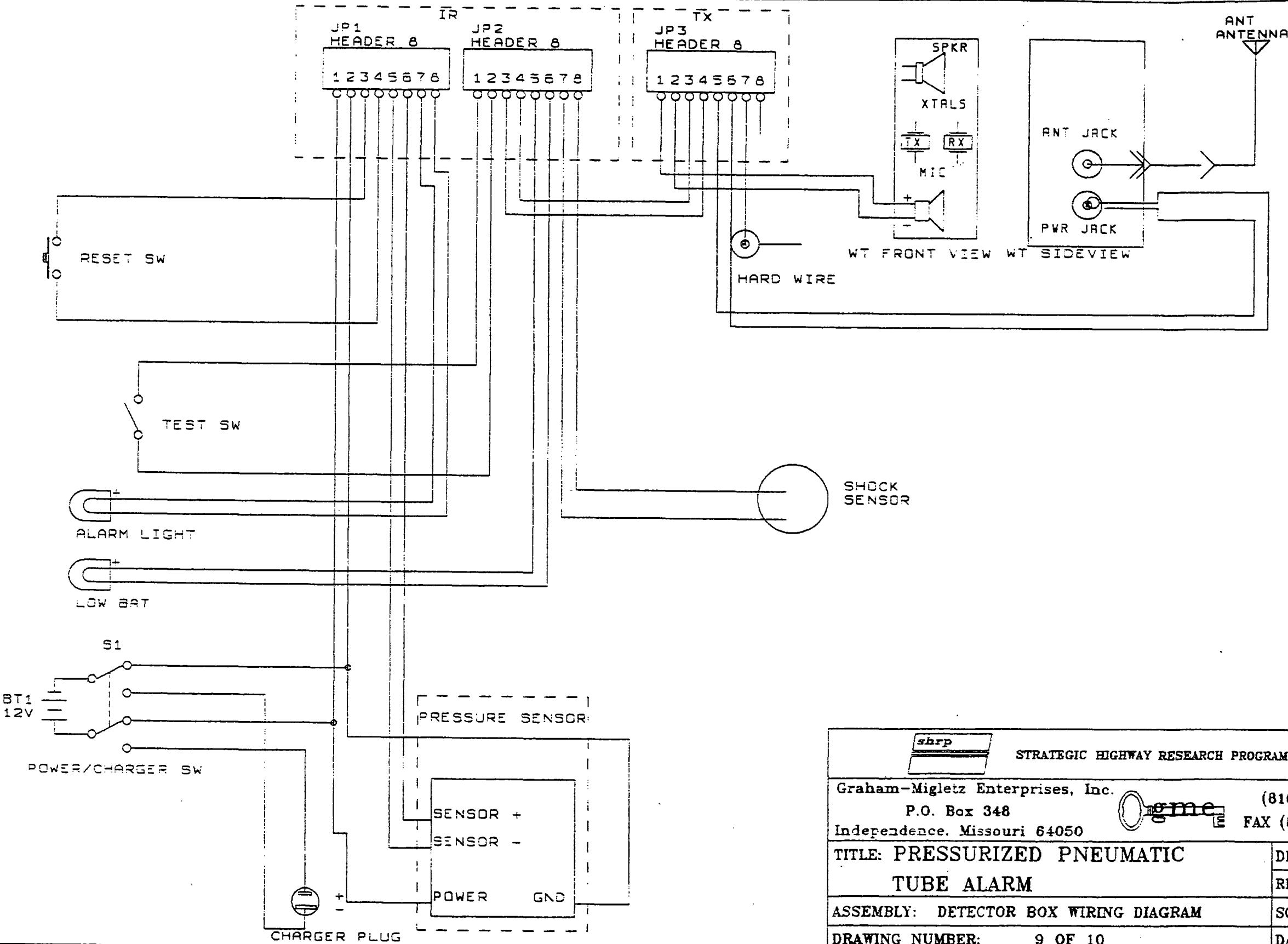


* TANTILUM CAPACITORS

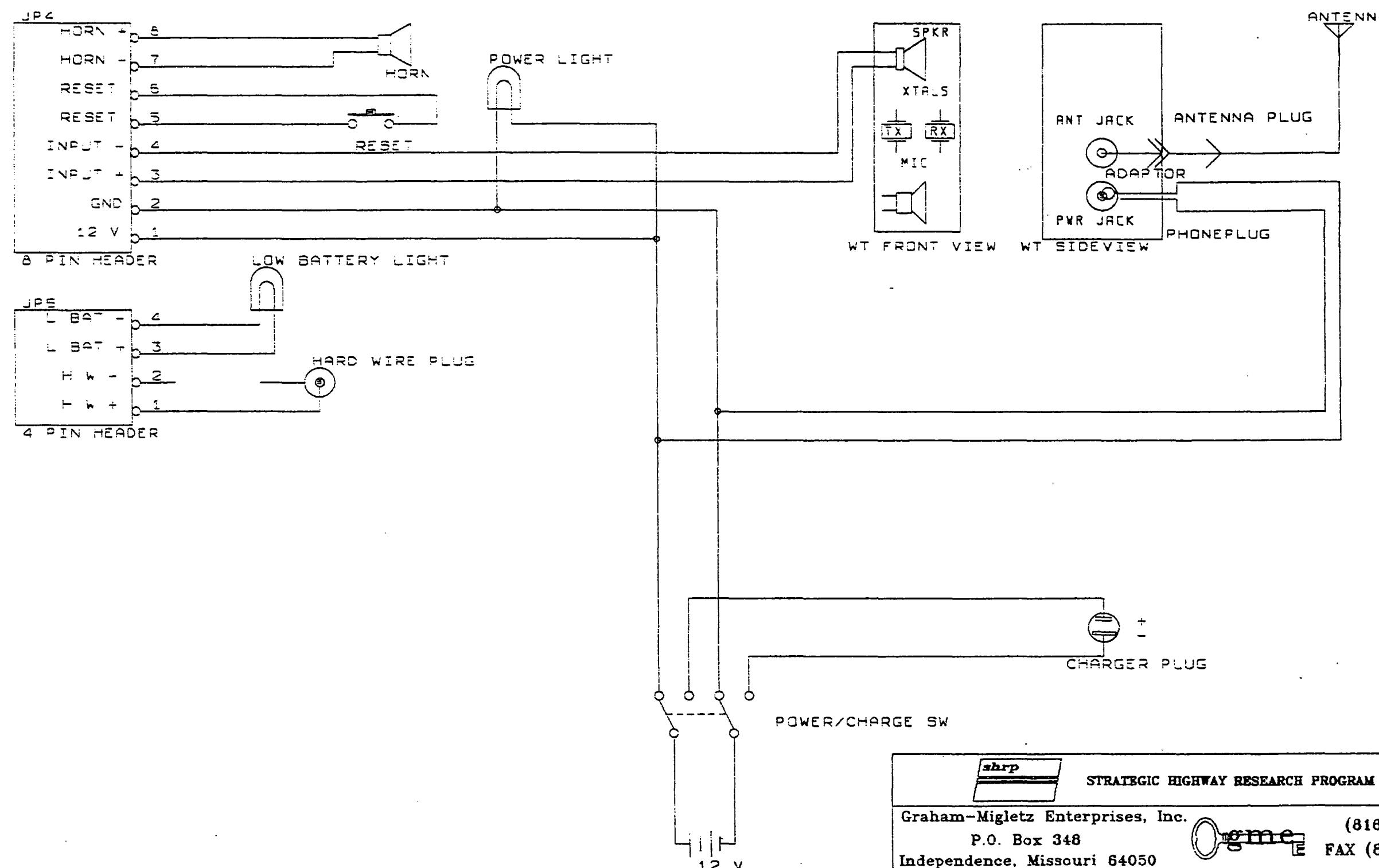
shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 FAX (816) 254-4654
TITLE: PRESSURIZED PNEUMATIC TUBE ALARM		DRAWN BY: BBF
ASSEMBLY: TRANSMITTER BOARD		REVISED: BBF
DRAWING NUMBER: 7 OF 10		SCALE: NONE
		DATE: 10-20-92



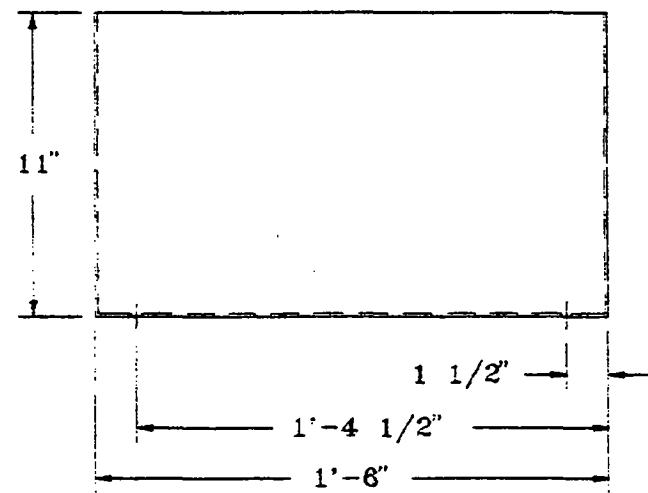
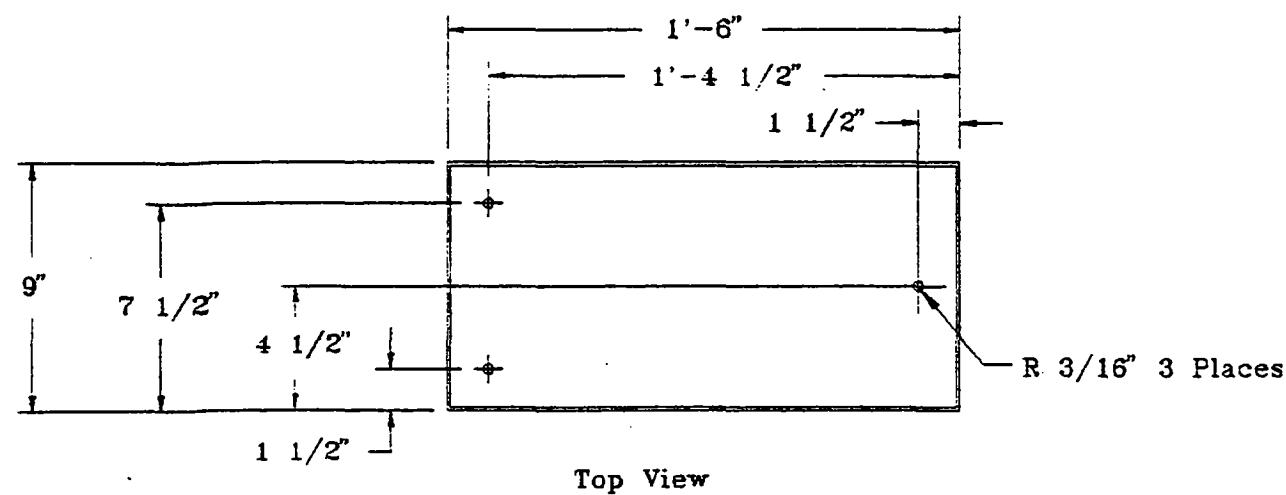
shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1768 FAX (816) 254-4654
TITLE: PRESSURIZED PNEUMATIC TUBE ALARM		DRAWN BY: BBF
ASSEMBLY: RECEIVER BOARD		REVISED: BBF
DRAWING NUMBER: 8 OF 10		SCALE: NONE
		DATE: 10-20-92



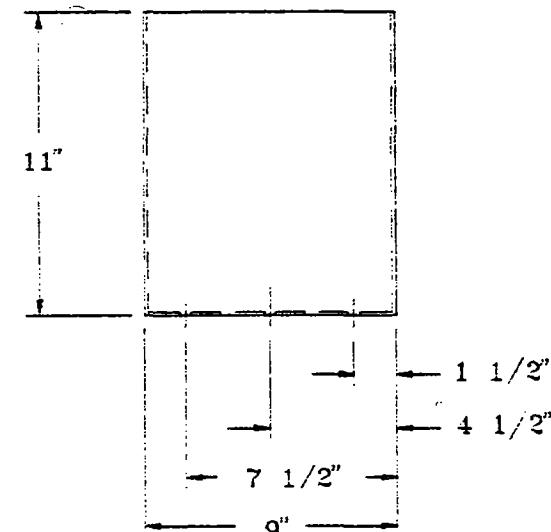
shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	(816) 254-1788 FAX (816) 254-4654
TITLE: PRESSURIZED PNEUMATIC TUBE ALARM	DRAWN BY: BBF
ASSEMBLY: DETECTOR BOX WIRING DIAGRAM	REVISED: BBF
DRAWING NUMBER: 9 OF 10	SCALE: NONE
	DATE: 10-20-92



shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc.		
P.O. Box 348		
Independence, Missouri 64050		
(816) 254-1788		FAX (816) 254-4654
ome		
TITLE: PRESSURIZED PNEUMATIC TUBE ALARM		DRAWN BY: BBF
ASSEMBLY: RECEIVER BOX WIRING DIAGRAM		REVISED: BBF
DRAWING NUMBER: 10 OF 10		SCALE: NONE
		DATE: 10-20-92



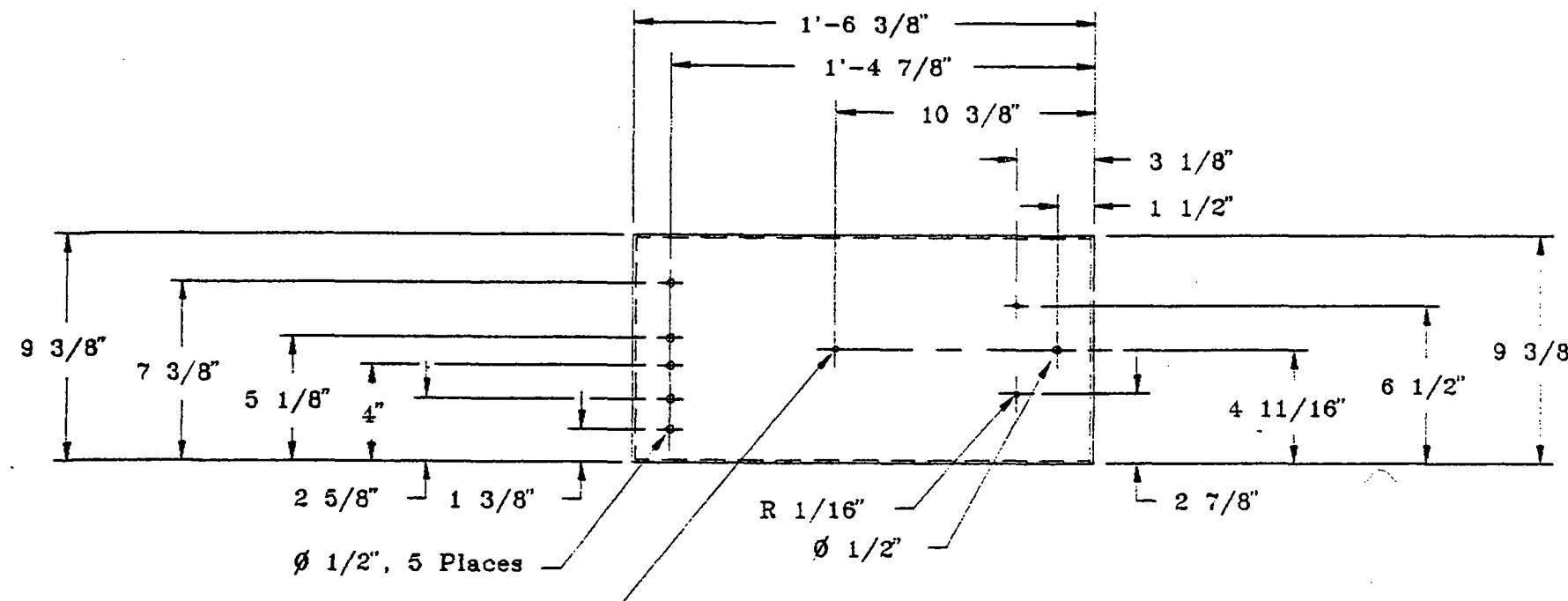
Side View



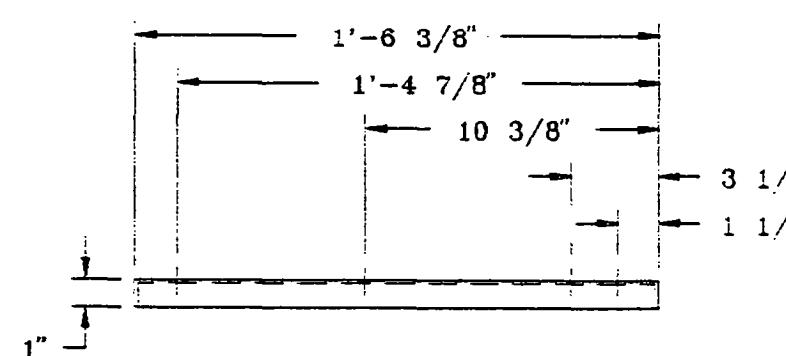
End View

Note: Material of Box is 1/8" Aluminum.

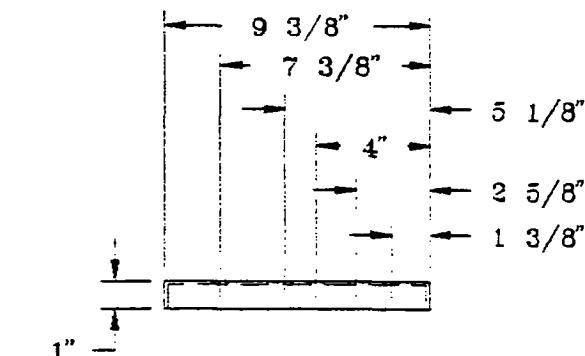
<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 <i>Gme</i> FAX (816) 254-4654
TITLE: Queue Length Detector		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: Box		SCALE: None
DRAWING NUMBER: 1 of 13		DATE: 8-26-92



Top View



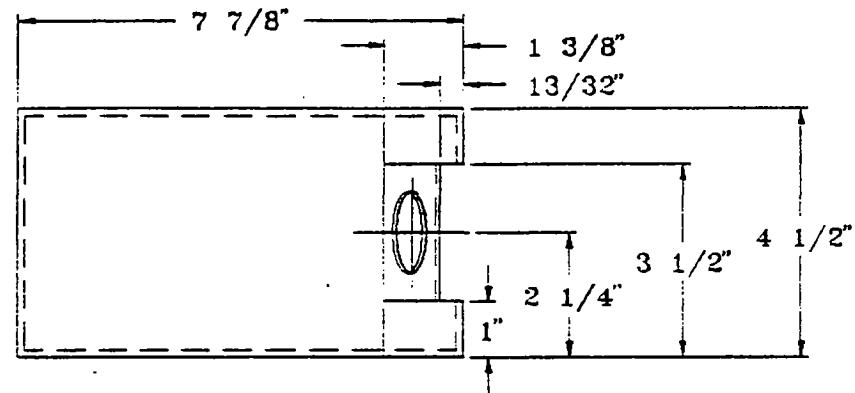
Side View



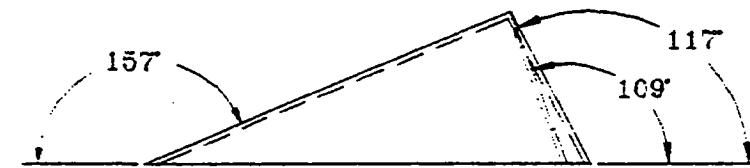
End View

Note: Material of Lid is 1/8" Aluminum.

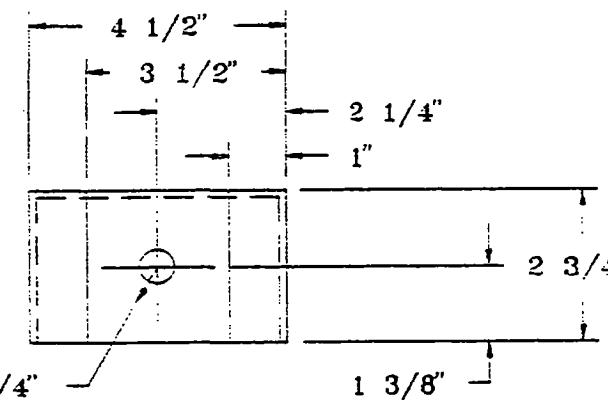
<i>shrp</i>		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 FAX (816) 254-4654
TITLE: Queue Length Detector		DRAWN BY: JMM
ASSEMBLY: Lid		REVISED: ---
DRAWING NUMBER: 2 of 13		SCALE: None
		DATE: 8-27-92



Top View

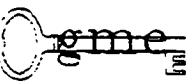


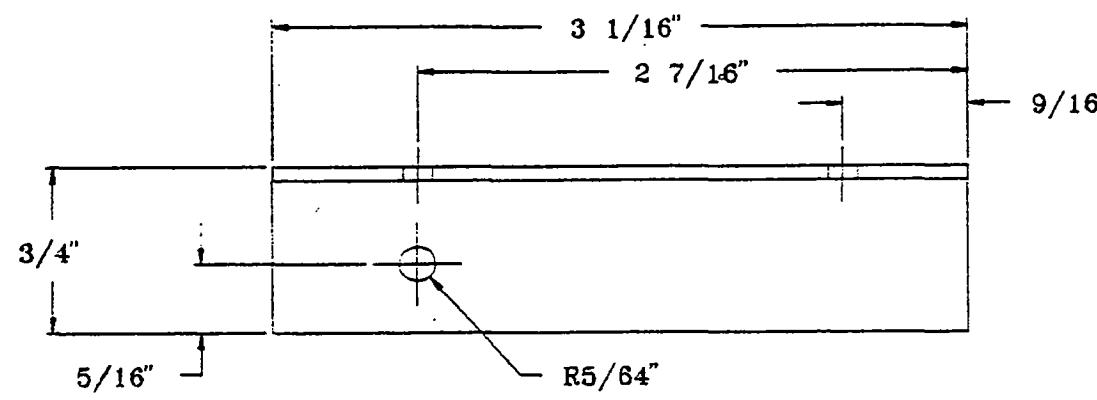
Side View



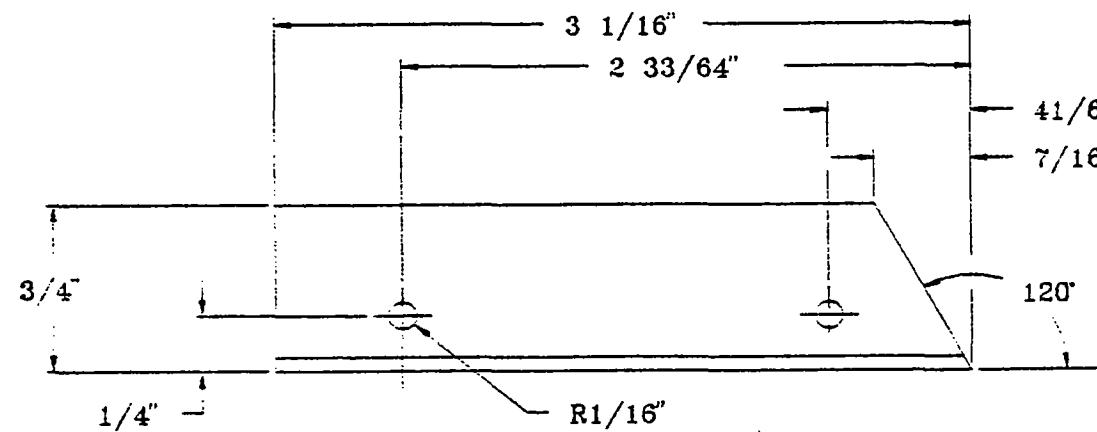
End View

Note: Material of Hood is 1/8" Aluminum.

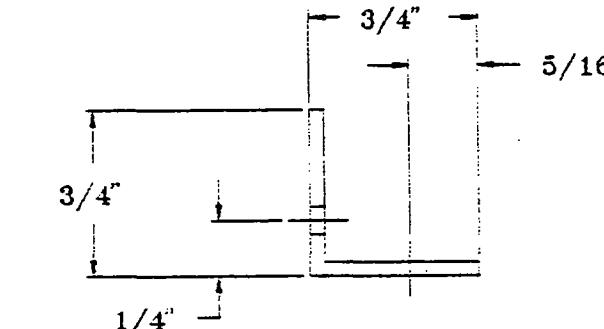
shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788  FAX (816) 254-4654
TITLE: Queue Length Detector		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: Hood		SCALE: None
DRAWING NUMBER: 3 of 13		DATE: 8-27-92



Top View

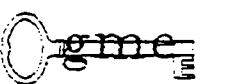


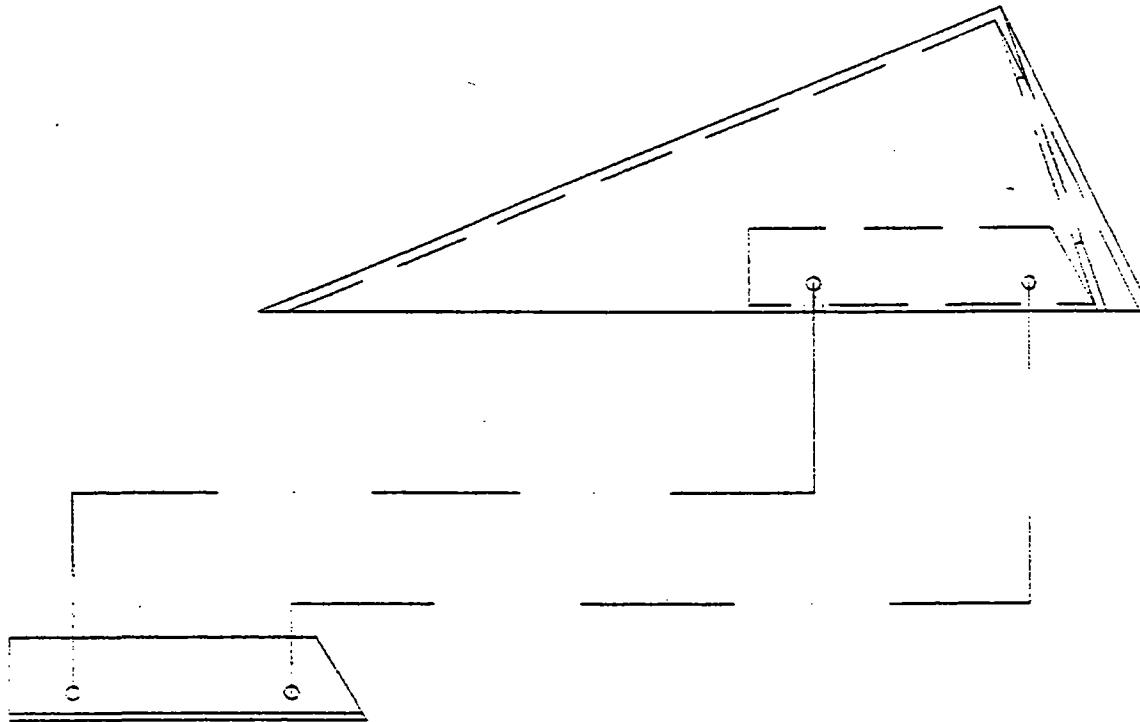
Side View
Typ. Both Sides



End View

Note: Material of Mount is 3/32" Aluminum.

shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788  FAX (816) 254-4654
TITLE: Queue Length Detector		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: Hood Mount		SCALE: None
DRAWING NUMBER: 4 of 13		DATE: 8-27-92



shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

(816) 254-1788
~~gme~~ FAX (816) 254-4654

TITLE: Queue Length Detector

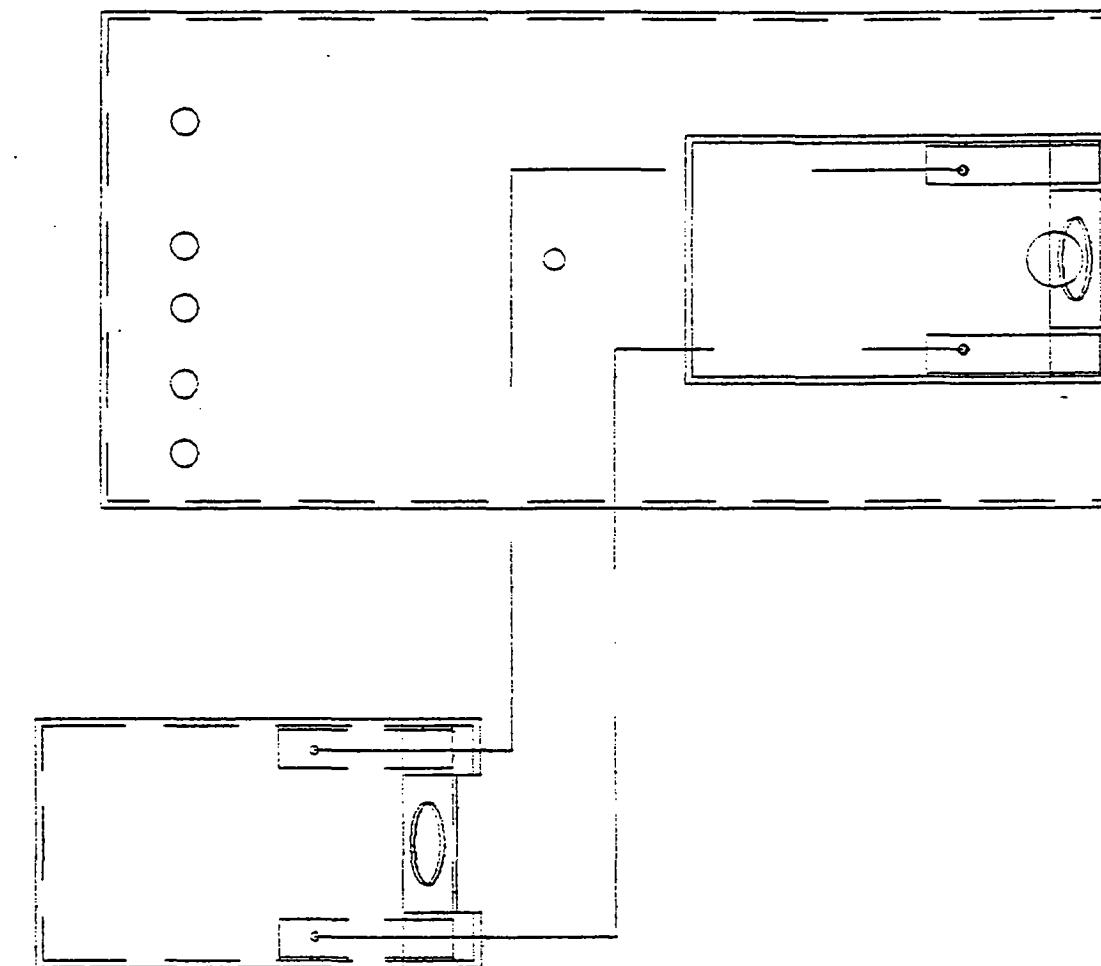
DRAWN BY: JMM
REVISED: ---

ASSEMBLY: Mount to Hood

SCALE: None

DRAWING NUMBER: 5 of 13

DATE: 8-27-92

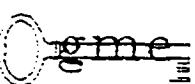


shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

(816) 254-1788

 FAX (816) 254-4654

TITLE: Queue Length Detector

DRAWN BY: JMM

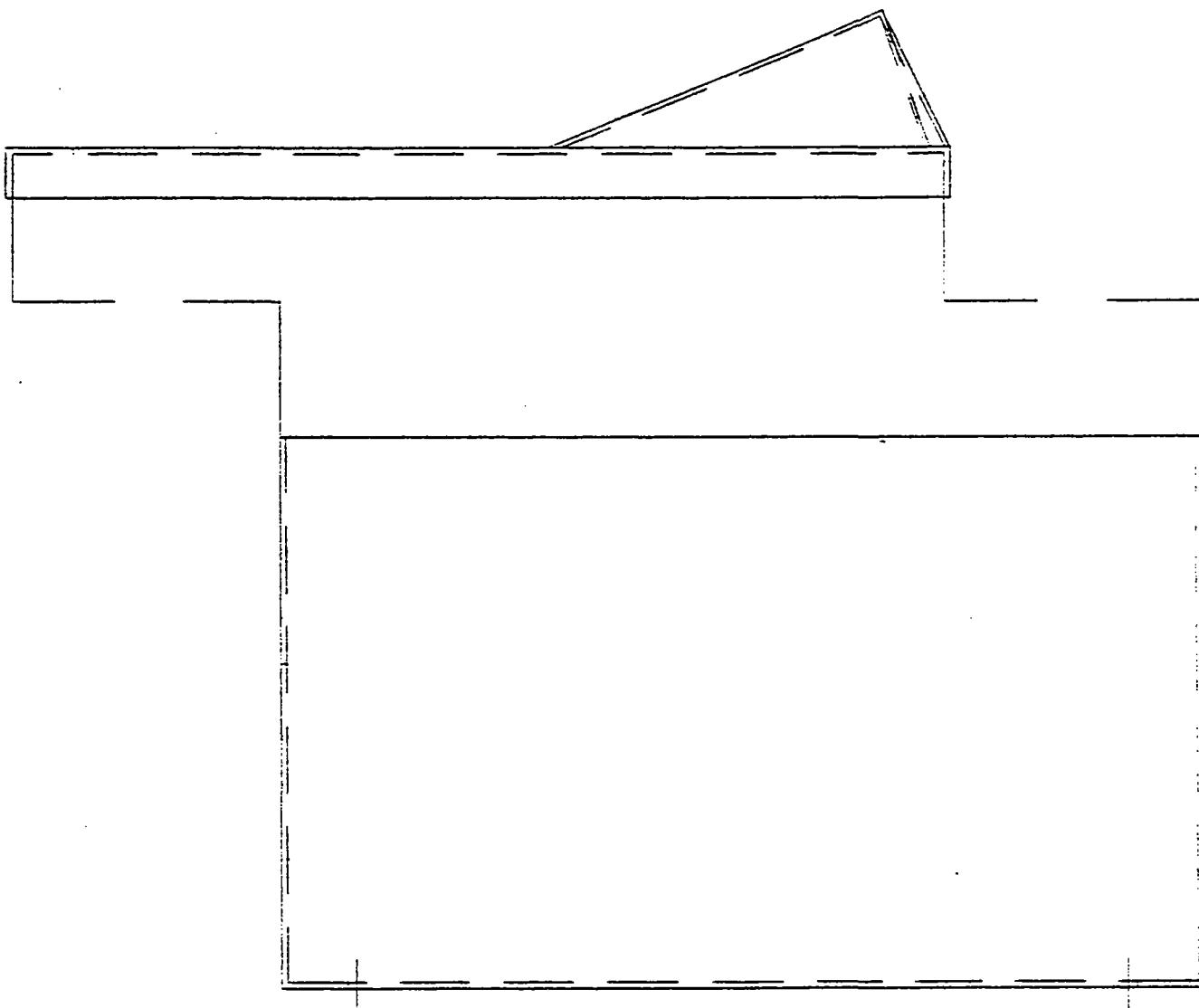
REVISED: ---

ASSEMBLY: Hood to Lid

SCALE: None

DRAWING NUMBER: 6 of 13

DATE: 8-27-92



shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

(816) 254-1788
~~some~~ FAX (816) 254-4654

TITLE: Queue Length Detector

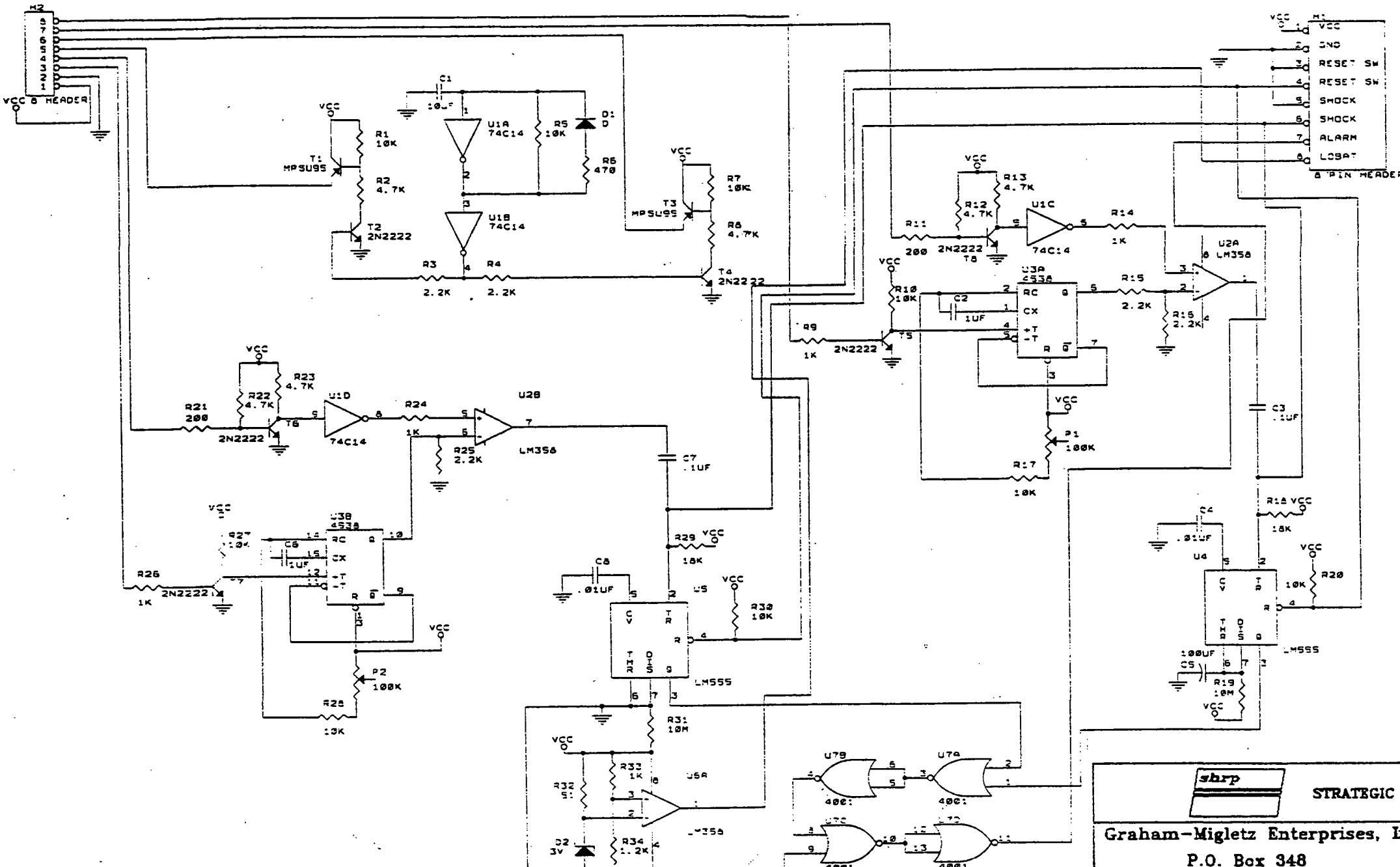
DRAWN BY: JMM
REVISED: ---

ASSEMBLY: Lid to Box

SCALE: None

DRAWING NUMBER: 7 of 13

DATE: 8-27-92



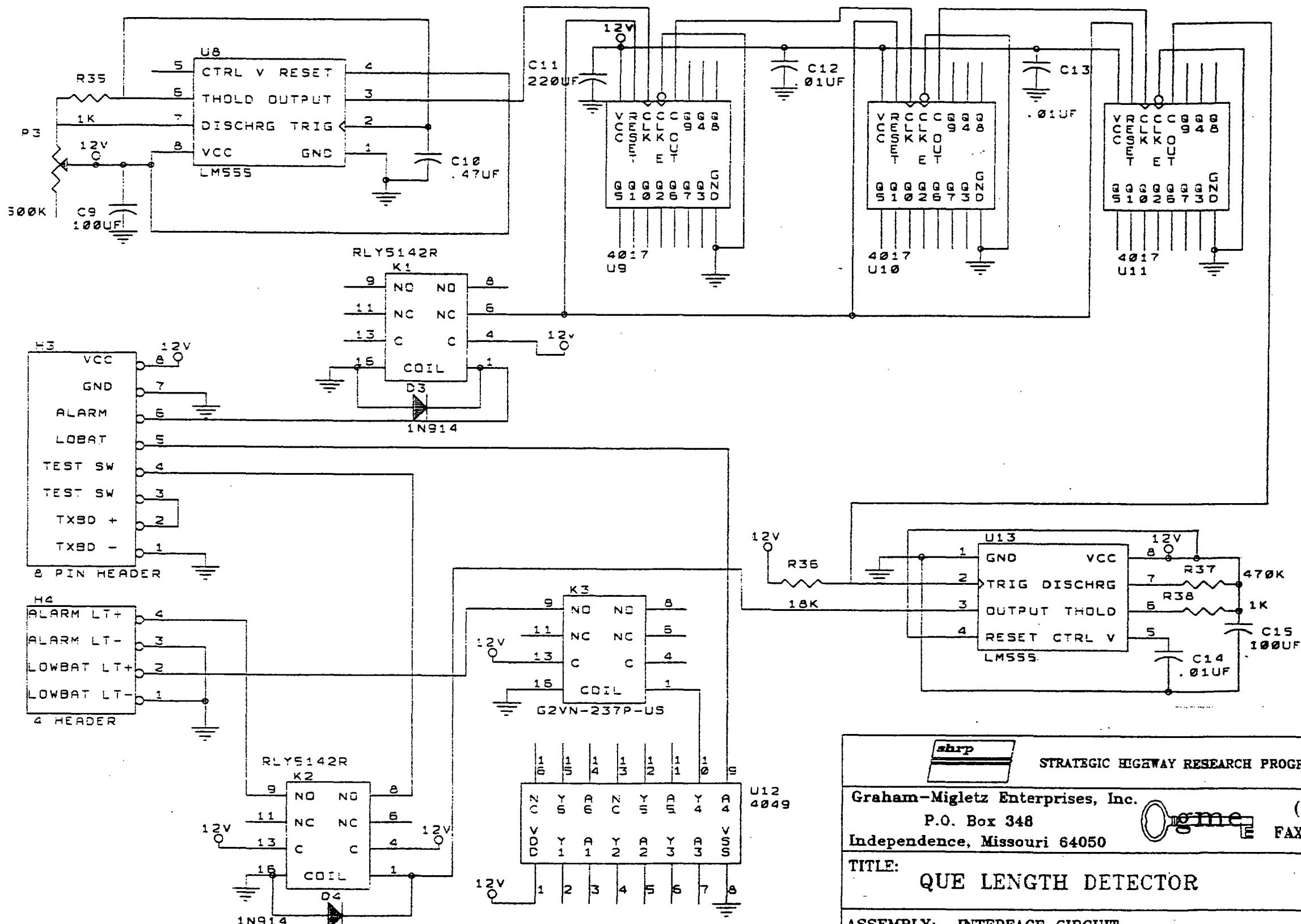
shrp STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

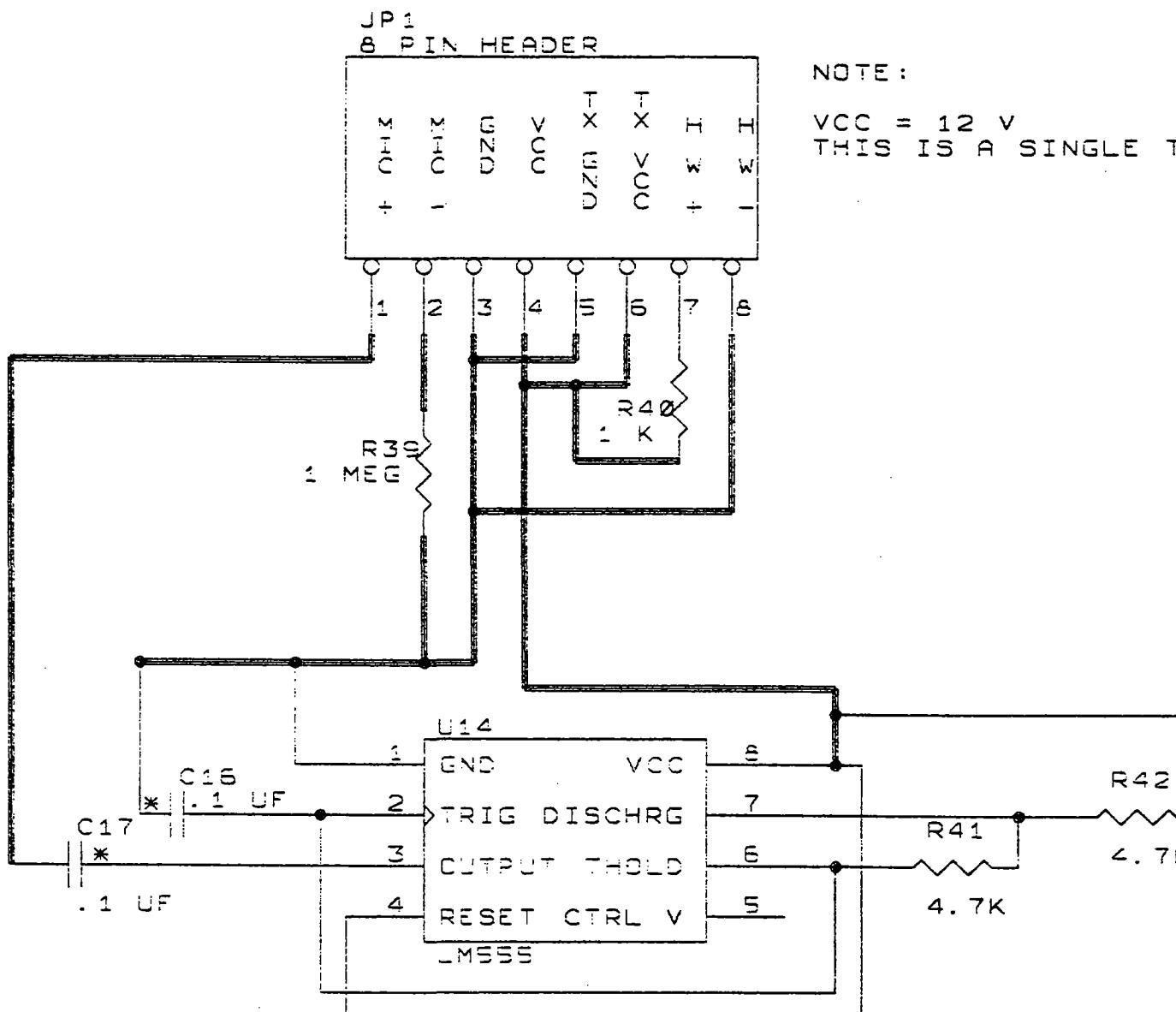
(816) 254-1788

FAX (816) 254-4854

TITLE:	QUE LENGTH DETECTOR	DRAWN BY: BBF
REVISED:	BBF	
ASSEMBLY:	SENSOR BOARD	SCALE: NONE
DRAWING NUMBER:	8 OF 13	DATE: 10-20-92

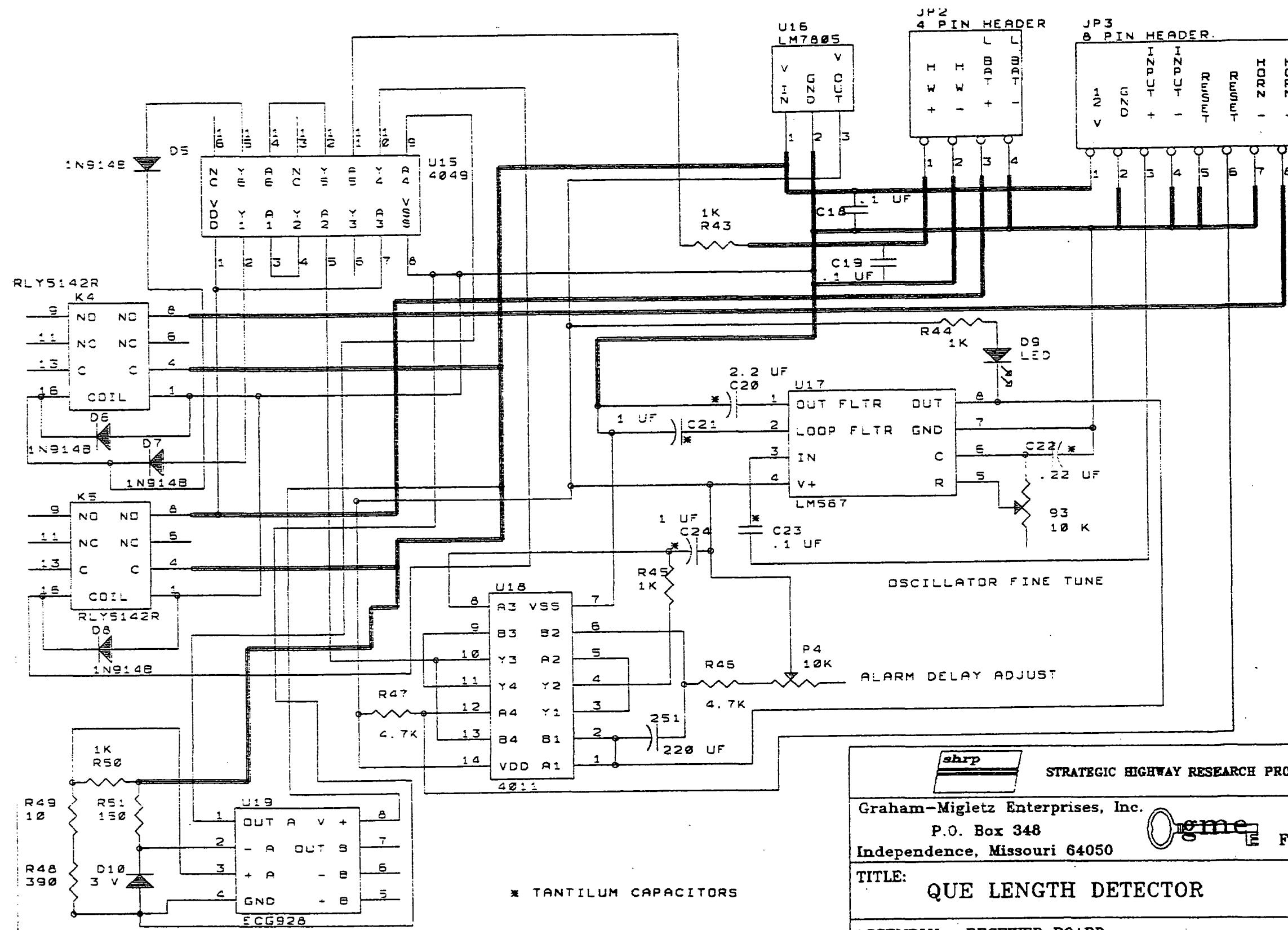


shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc.	(816) 254-1788
P.O. Box 348	FAX (816) 254-4654
Independence, Missouri 64050	
TITLE:	DRAWN BY: BBF
QUE LENGTH DETECTOR	REVISED: BBF
ASSEMBLY: INTERFACE CIRCUIT	SCALE: NONE
DRAWING NUMBER: 9 OF 13	DATE: 10-20-92



* TANTILUM CAPACITORS

shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		
TITLE: QUE LENGTH DETECTOR		DRAWN BY: BBF
		REVISED: BBF
ASSEMBLY: TRANSMITTER BOARD		SCALE: NONE
DRAWING NUMBER: 10 OF 13		DATE: 10-20-92



* TANTILUM CAPACITOR

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050

(816) 254-1788

FAX (816) 254-1654

TITLE

QUE LENGTH DETECTOR

DRAWN BY: BBF

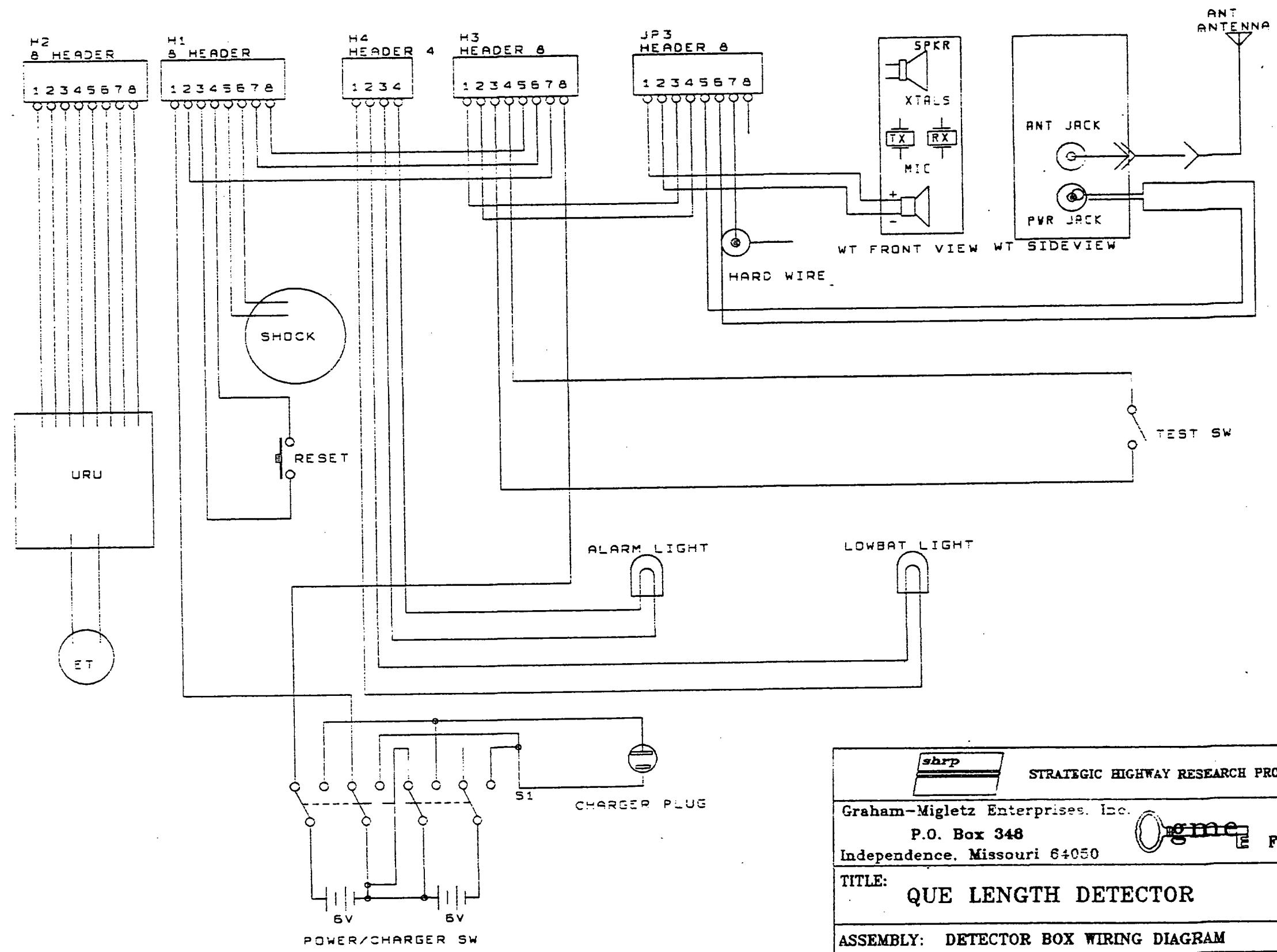
REINHOLD DRE

ASSEMBLY: RECEIVER BOARD

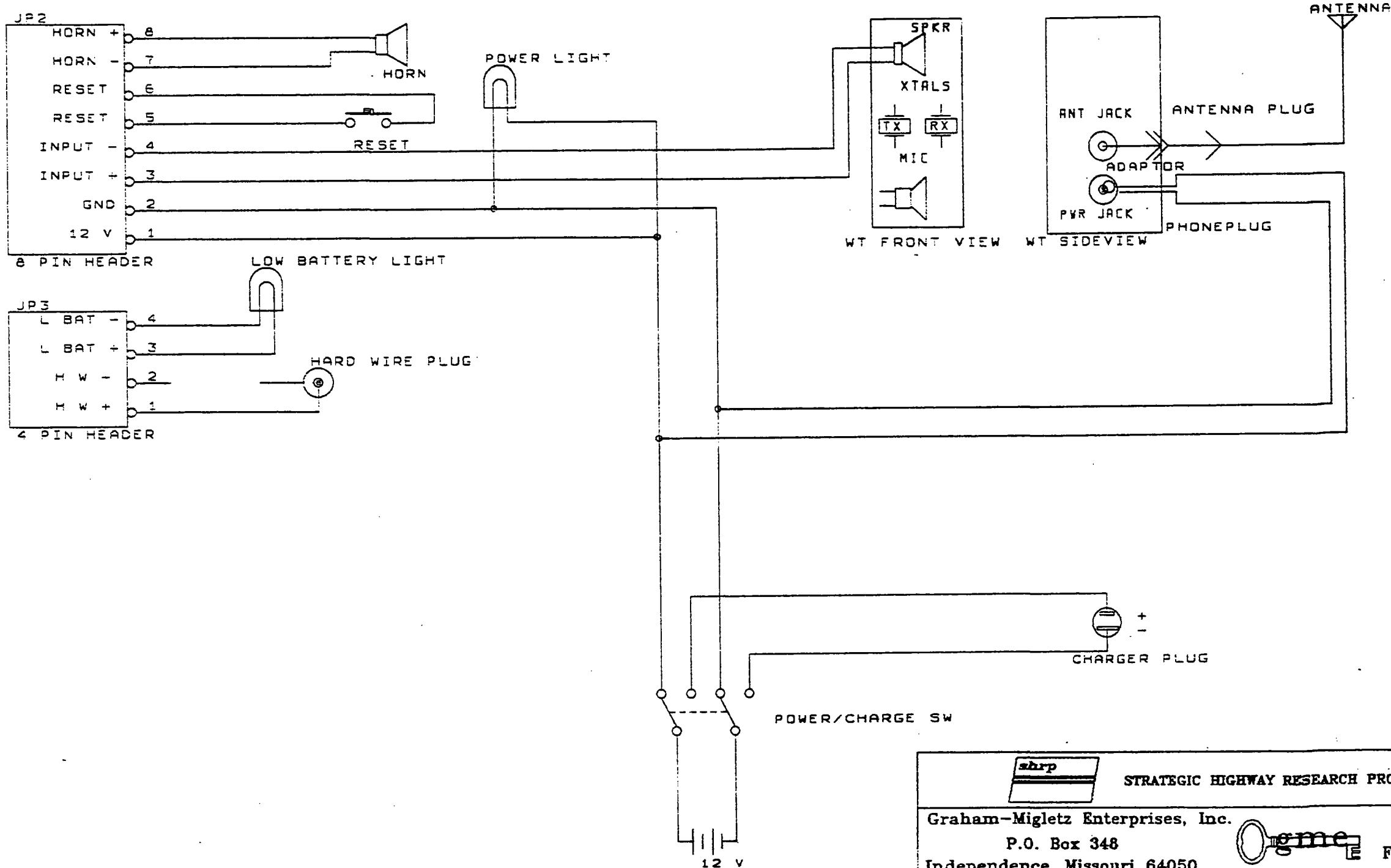
SCALE: NONE

DRAWING NUMBER: 11 OF 13

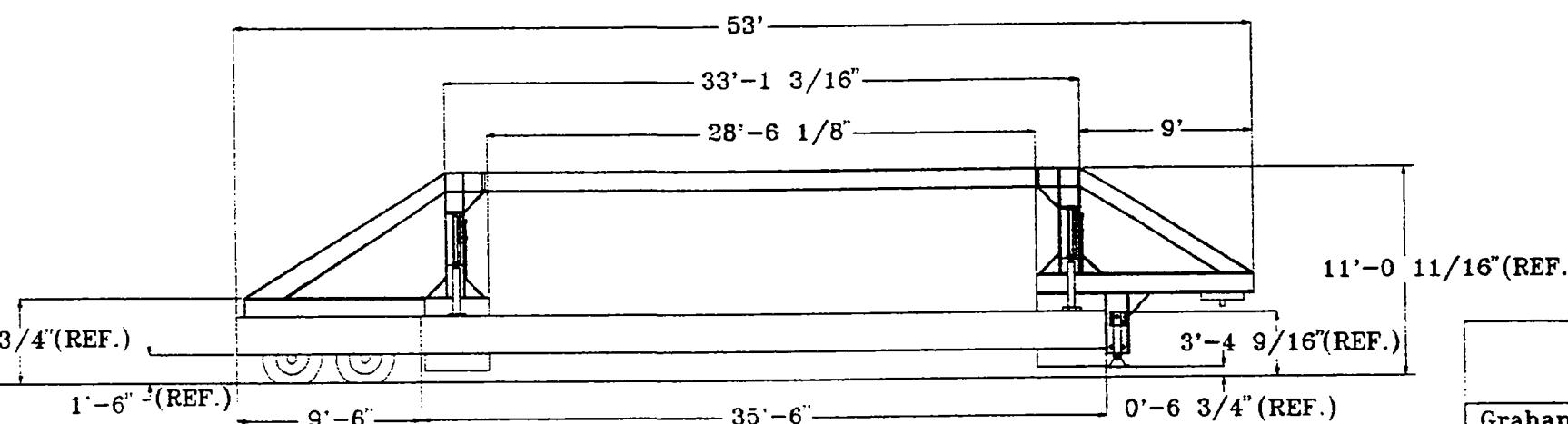
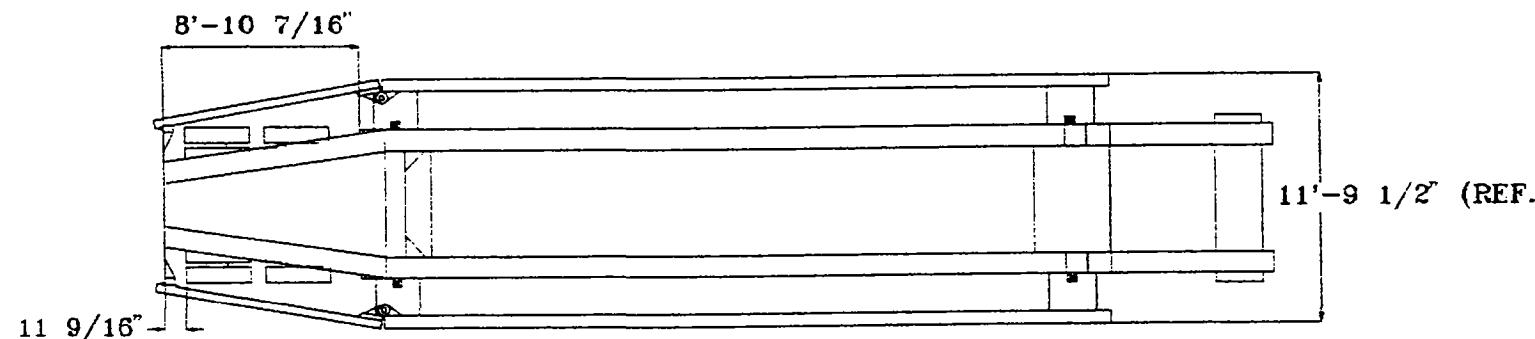
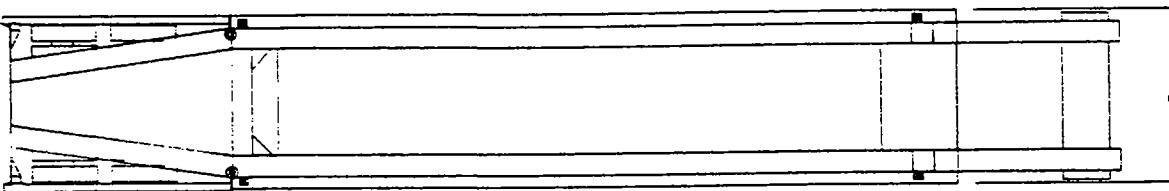
DATE: 10-20-9



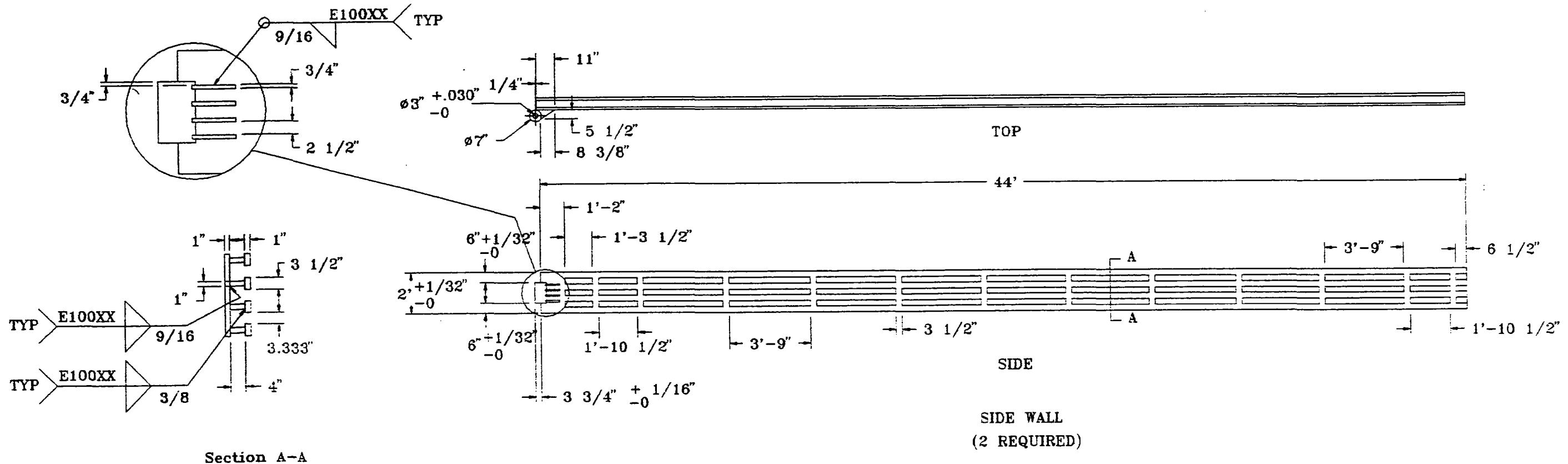
shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. (816) 254-1788		
P.O. Box 348 FAX (816) 254-4654		
Independence, Missouri 64050		
TITLE: QUE LENGTH DETECTOR		DRAWN BY: BBF
		REVISED: BBF
ASSEMBLY: DETECTOR BOX WIRING DIAGRAM		SCALE: NONE
DRAWING NUMBER: 12 OF 13		DATE: 10-20-92



shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc.	(816) 254-1788
P.O. Box 348	FAX (816) 254-4654
Independence, Missouri 64050	
TITLE:	DRAWN BY: BBF
QUE LENGTH DETECTOR	REVISED: BBF
ASSEMBLY: RECEIVER BOX WIRING DIAGRAM	SCALE: NONE
DRAWING NUMBER:	DATE: 10-20-92
13 OF 13	



	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc.	(816) 254-1788	
P.O. Box 348		FAX (816) 254-4654
Independence, Missouri 64050		
TITLE: PERSONNEL PROTECTION TRAILER	DRAWN BY: JMM	
ASSEMBLY	REVISED: RLM	
ASSEMBLY: N/A	SCALE: NONE	
DRAWING NUMBER: 1 OF 21		DATE: 9-14-92



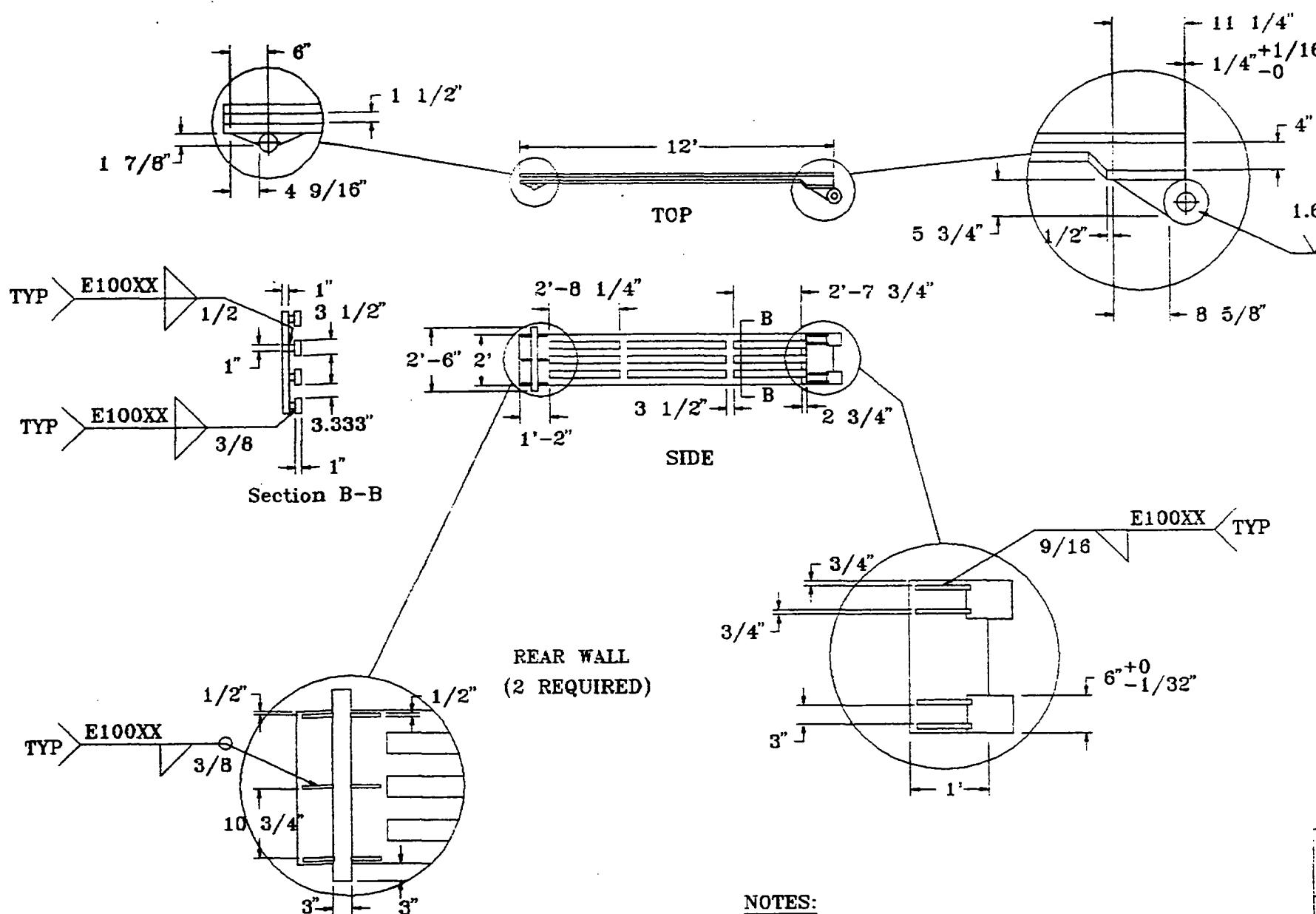
NOTES:

- ① USE COORDINATED 1000 ELECTRODES
- ② PAINT ALL WALLS AND GUSSETTS
WITH RUST-INHIBITIVE PRIMER.
DO NOT PAINT PINS, PIN CAPS,
OR HINGES.

MATERIALS

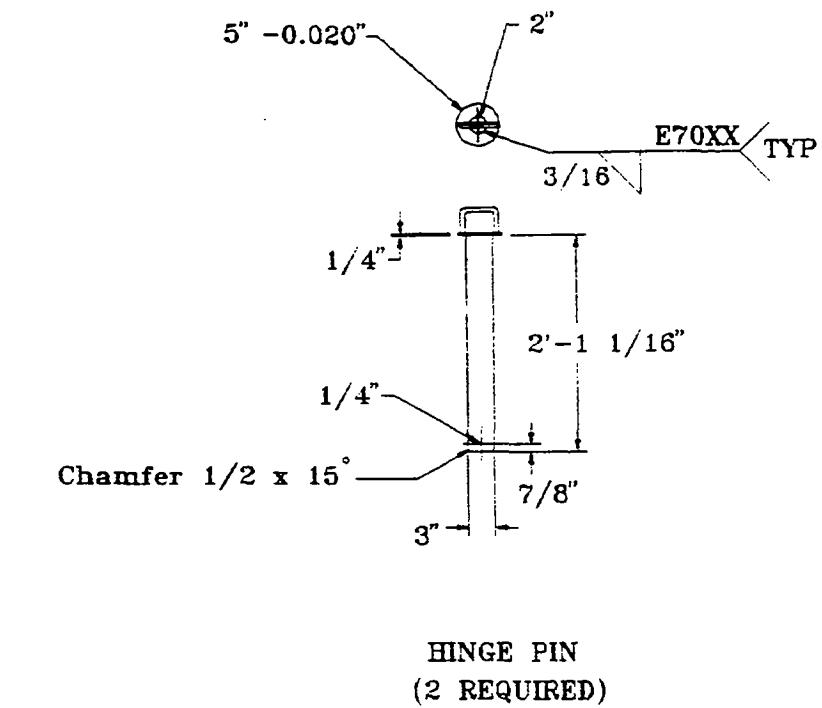
WALLS	: ASTM A514 GRADE H
GUSSETS, PIN CAPS	: ASTM A242 TYPE 2
HINGES, PINS	: AISI C1018

<i>shrp</i>		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 FAX (816) 254-4654
TITLE: SIDE WALL		DRAWN BY: JMM
		REVISED: RLM
ASSEMBLY: PERSONNEL PROTECTION TRAILER		SCALE: NONE
DRAWING NUMBER: 2 OF 21		DATE: 9-15-92



NOTES:

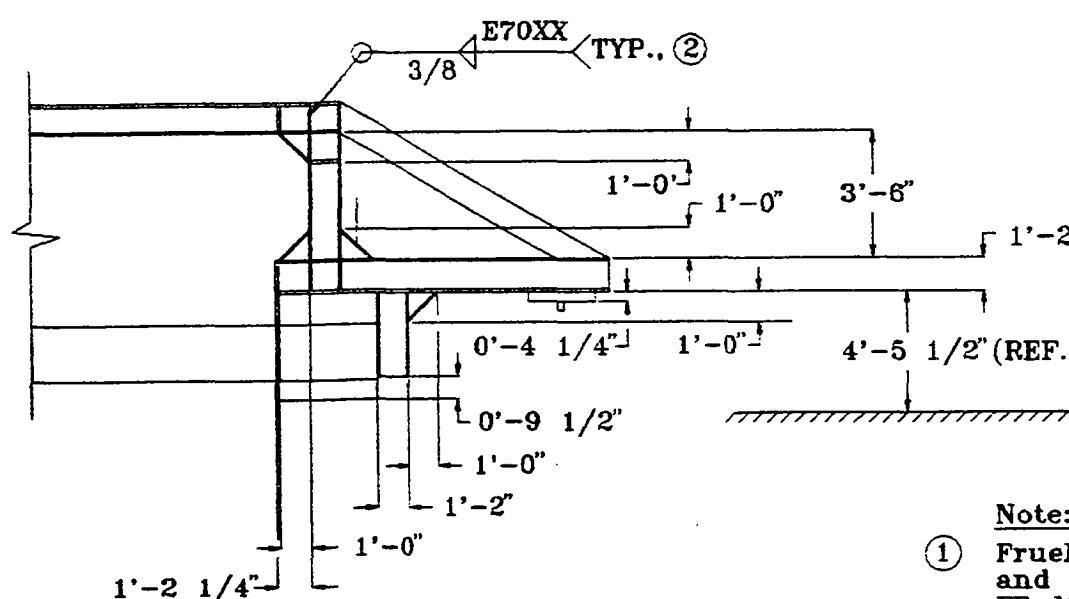
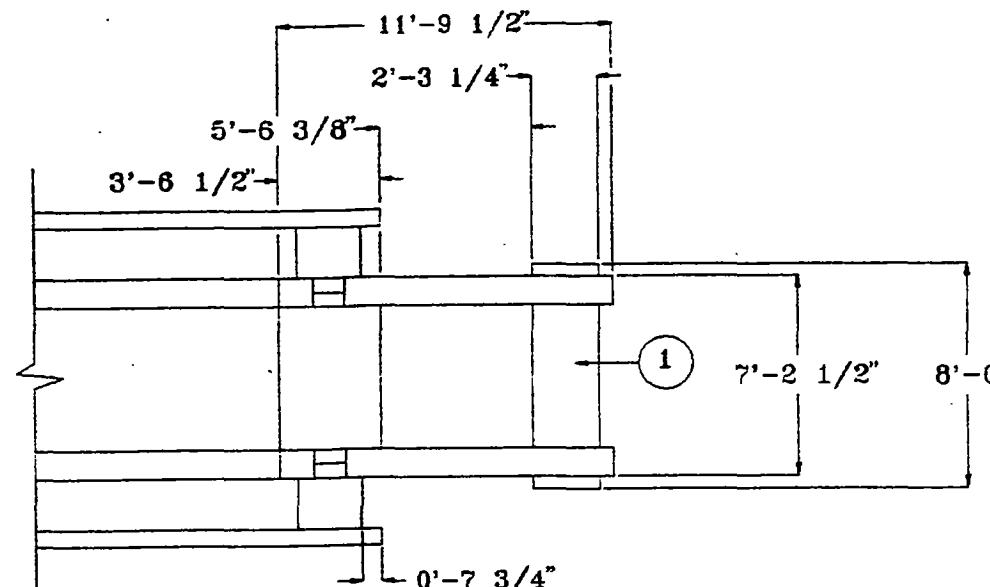
- ① USE COORDINATED 1000 ELECTRODES
- ② PAINT ALL WALLS AND GUSSETTS WITH RUST-INHIBITIVE PRIMER.
DO NOT PAINT PINS, PIN CAPS,
OR HINGES.



MATERIALS

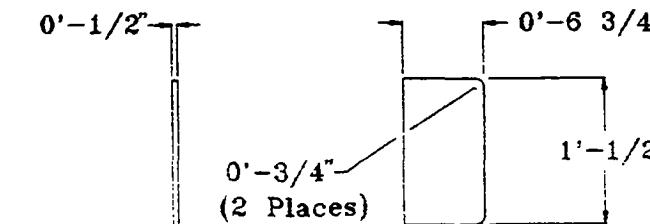
WALLS	: ASTM A514 GRADE H
GUSSETS, PIN CAPS	: ASTM A242 TYPE 2
HINGES, PINS	: AISI C1018

		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc.	(816) 254-1788	
P.O. Box 348		
Independence, Missouri 64050	FAX (816) 254-4654	
TITLE: REAR WALL AND HINGE PIN	DRAWN BY: JMM	
	REVISED: RLM	
ASSEMBLY: PERSONNEL PROTECTION TRAILER	SCALE: NONE	
DRAWING NUMBER: 3 OF 21	DATE: 9-15-92	

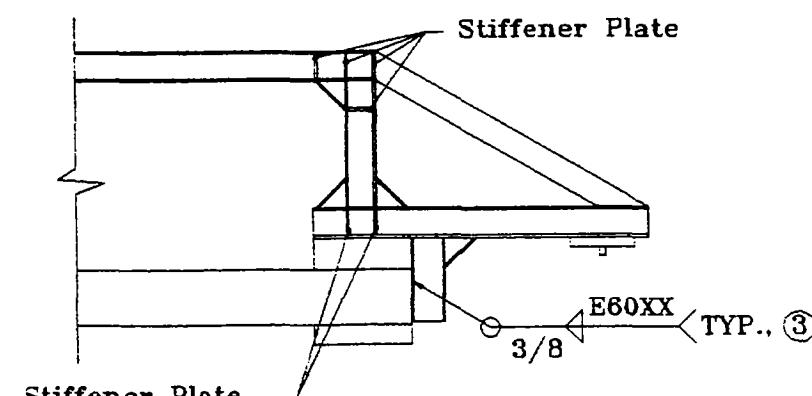


Note:

- ① Fruehauf Upper Coupler and Kingpin Assembly, FB-Model, Part No. BXE 000613 001.
- ② Same weld specification for all stiffener plates.
- ③ Same weld specifications for all beam stiffeners.



Stiffener Plate
(48 Required)



Stiffener Plate

Materials:

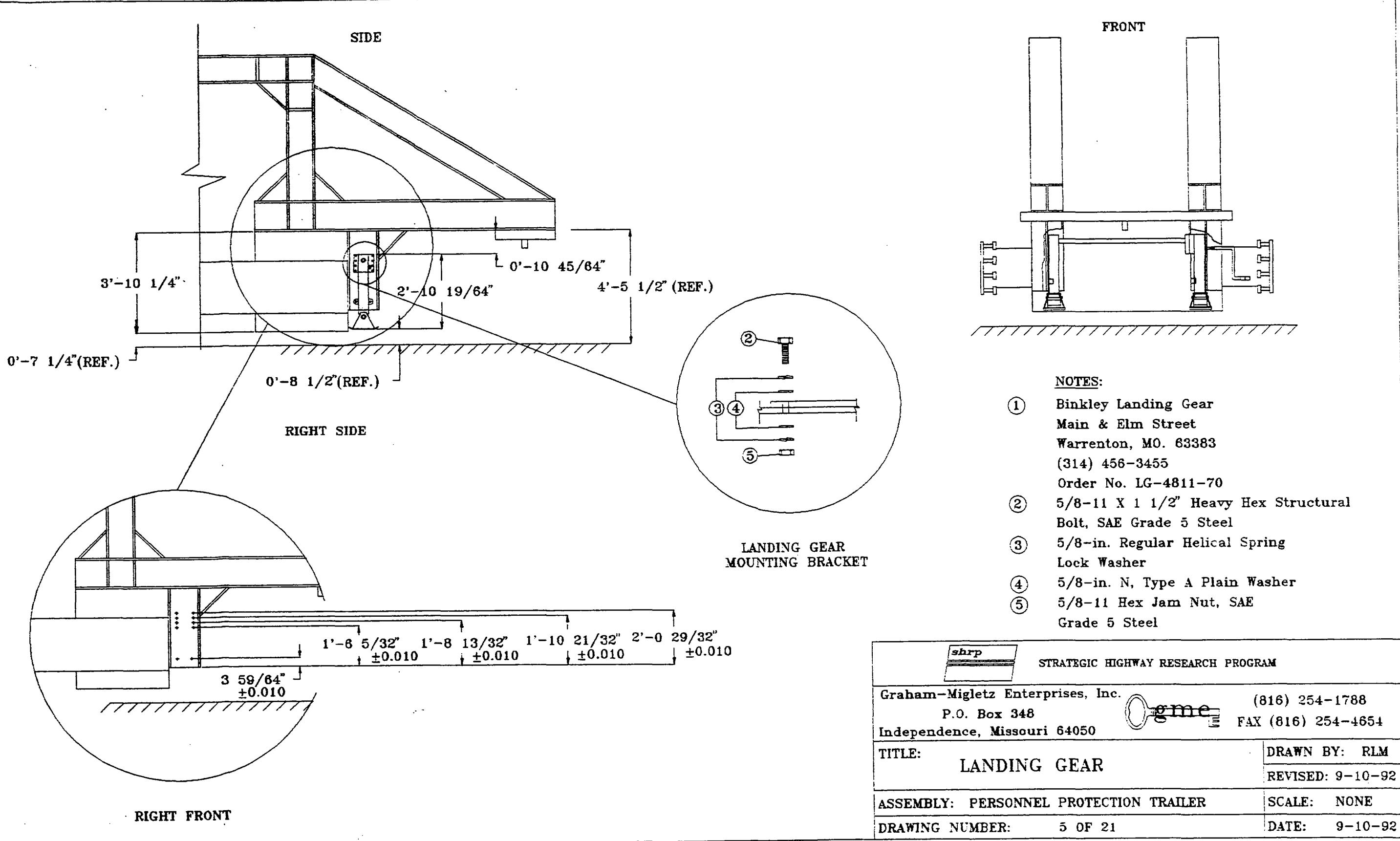
W14 x 90 : ASTM A36

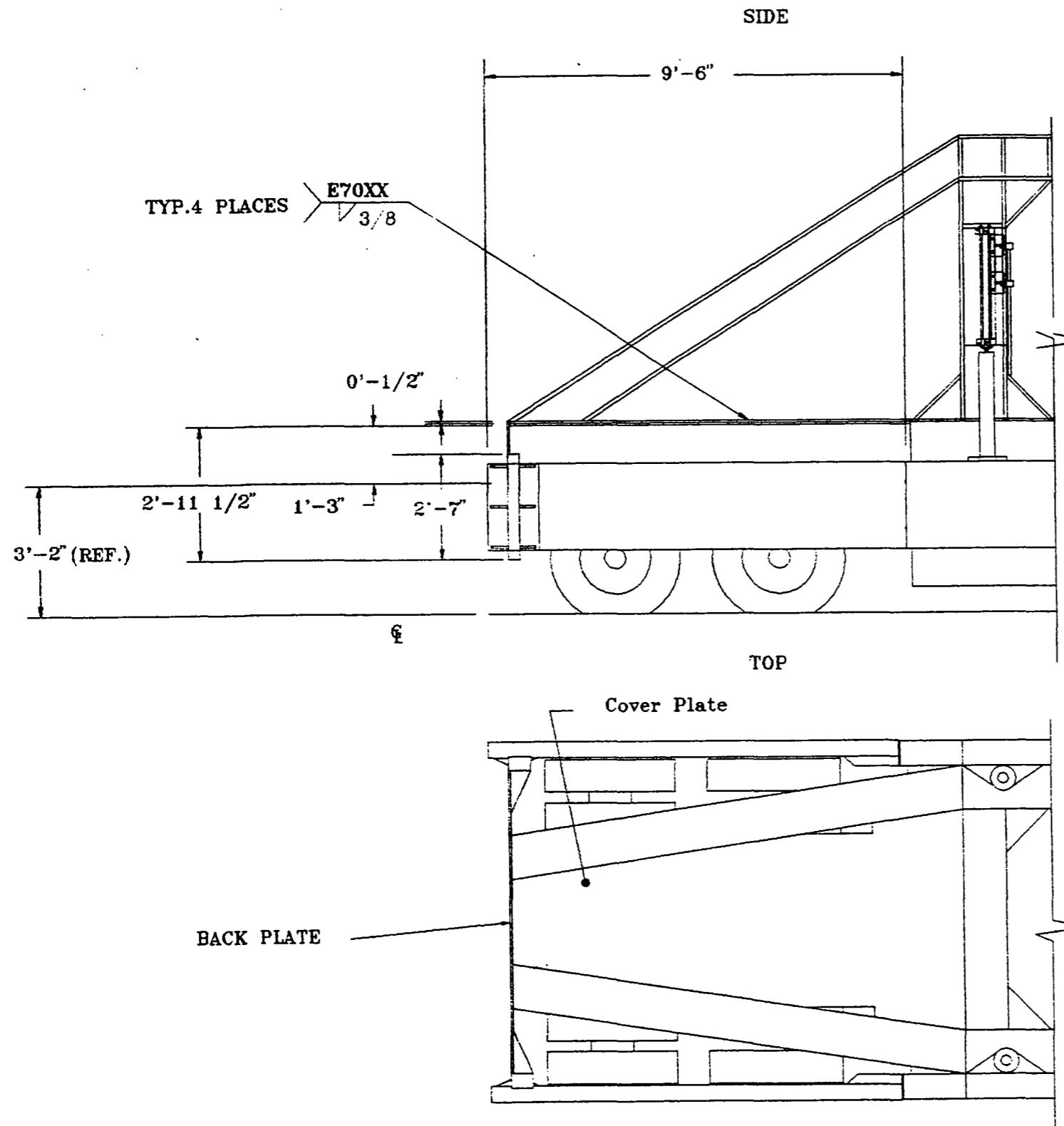
Stiffener Plates : ASTM A242 Type 2

Overhead Beams, Gooseneck Beams, Beam Stiffeners:

W14 x 90, ASTM A36

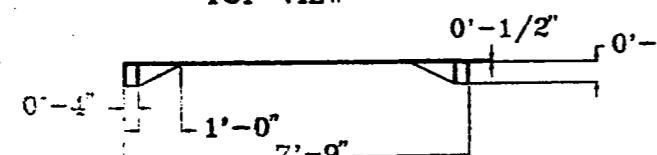
shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc.		(816) 254-1788	
P.O. Box 348		FAX (816) 254-4654	
Independence, Missouri 64050			
TITLE: FRONT		DRAWN BY: JMM	
		REVISED: RLM	
ASSEMBLY: PERSONNEL PROTECTION TRAILER		SCALE: NONE	
DRAWING NUMBER: 4 OF 21		DATE: 9-15-92	



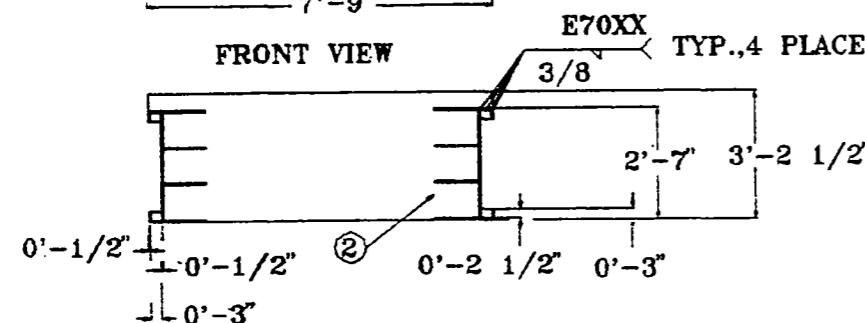


<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 <i>gme</i> FAX (816) 254-4654
TITLE: REAR ASSEMBLY		DRAWN BY: JMM
		REVISED: RLM
ASSEMBLY: PERSONNEL PROTECTION TRAILER		SCALE: NONE
DRAWING NUMBER: 6 OF 21		DATE: 9-14-92

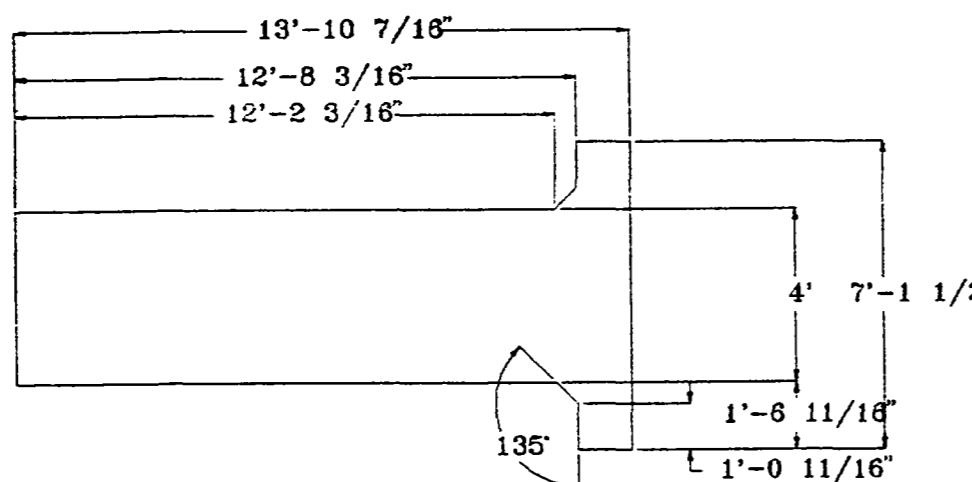
**BACK PLATE
TOP VIEW**



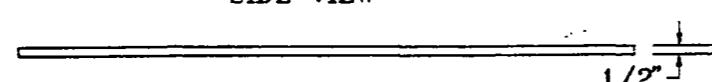
FRONT VIEW



**COVER PLATE
TOP VIEW**

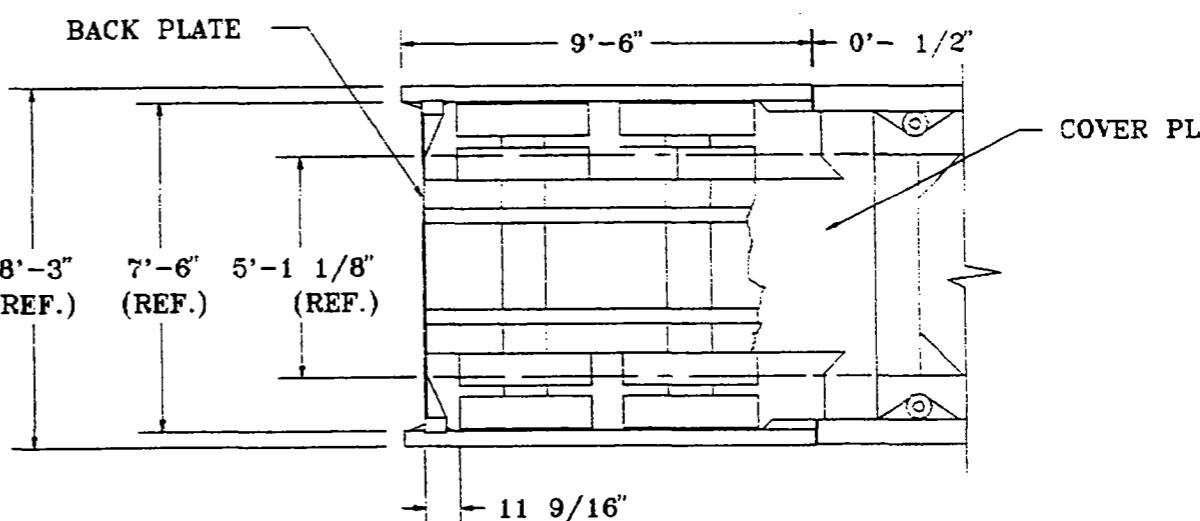


SIDE VIEW



Materials:

Cover Plate: ASTM A242 Type 2



shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050

(816) 254-1788

FAX (816) 254-4654



TITLE: BACK PLATE AND COVER PLATE

DRAWN BY: JMM

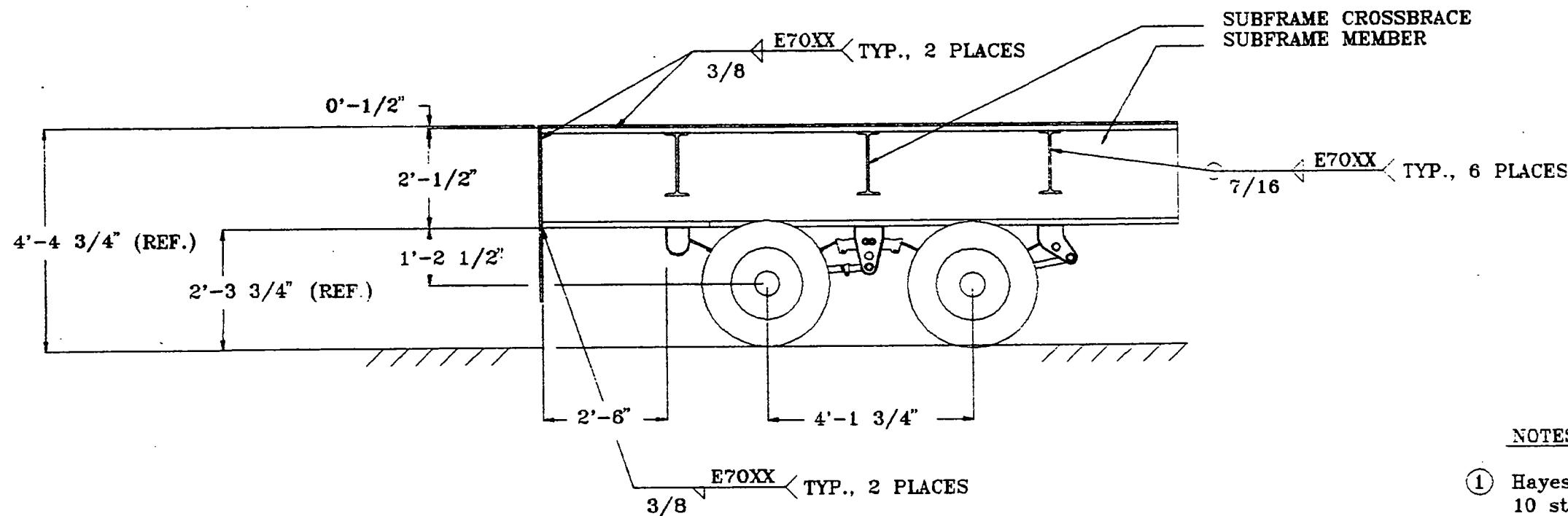
REVISED: RLM

ASSEMBLY: REAR

SCALE: NONE

DRAWING NUMBER: 7 OF 21

DATE: 9-14-92

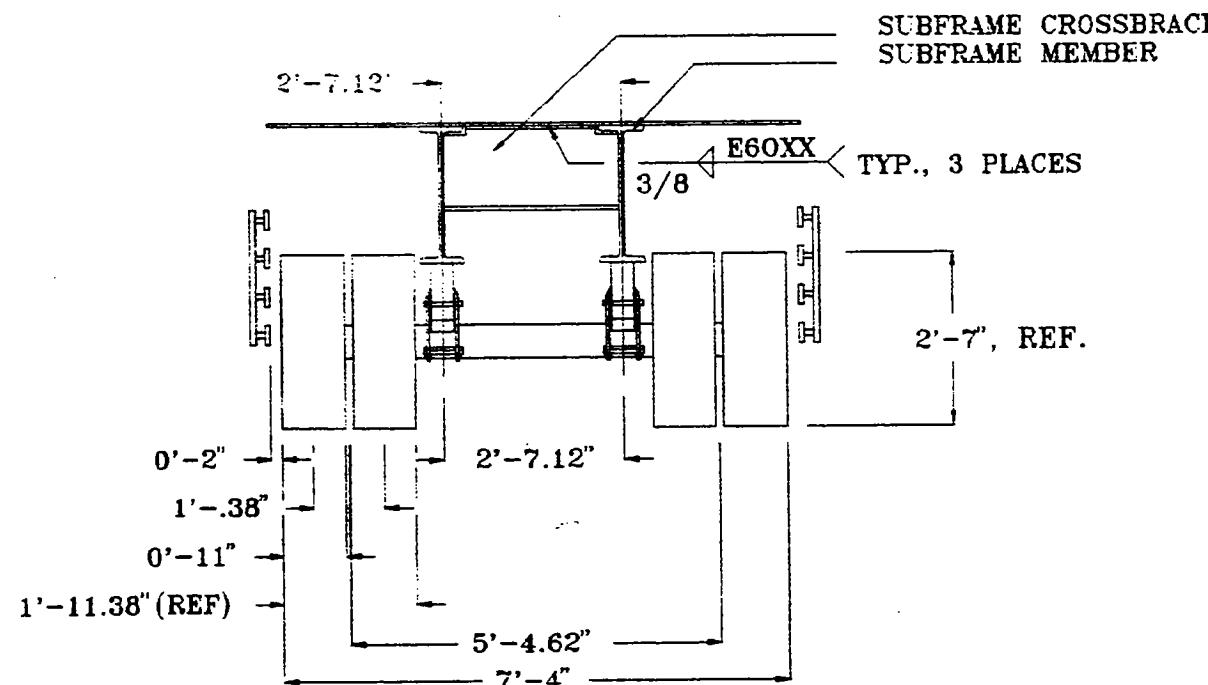


NOTES:

- ① Hayes Axle Model H2312
10 stud
Track: 64 1/2"
Mounting Height: 14 1/2"

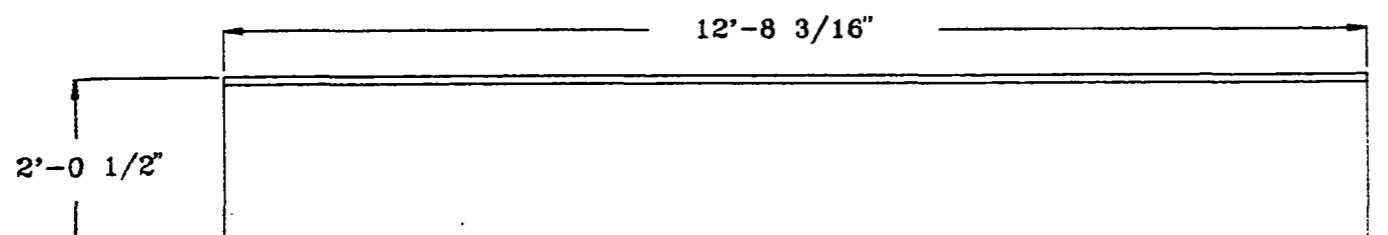
Hayes Axle, Inc.
307 A St.
Seminole, OK. 74868
800-922-9030

- ② Assemble axle and hanger assembly per instructions provided with assembly.

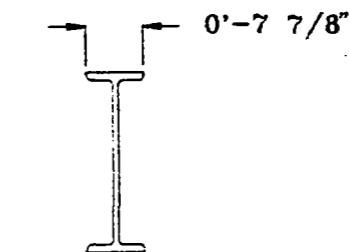


shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. (816) 254-1788		
P.O. Box 348		
Independence, Missouri 64050 FAX (816) 254-4654		
TITLE: SUBFRAME ASSEMBLY		DRAWN BY: JMM
		REVISED: RLM
ASSEMBLY: PERSONNEL PROTECTION TRAILER		SCALE: NONE
DRAWING NUMBER: 8 OF 21		DATE: 9-15-92

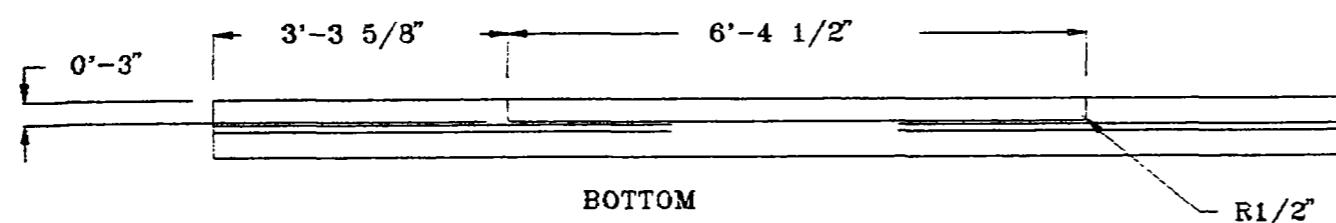
SUBFRAME MEMBERS
(2 REQUIRED)



SIDE



END



BOTTOM

R1/2"

SUBFRAME CROSS BRACE
(3 REQUIRED)

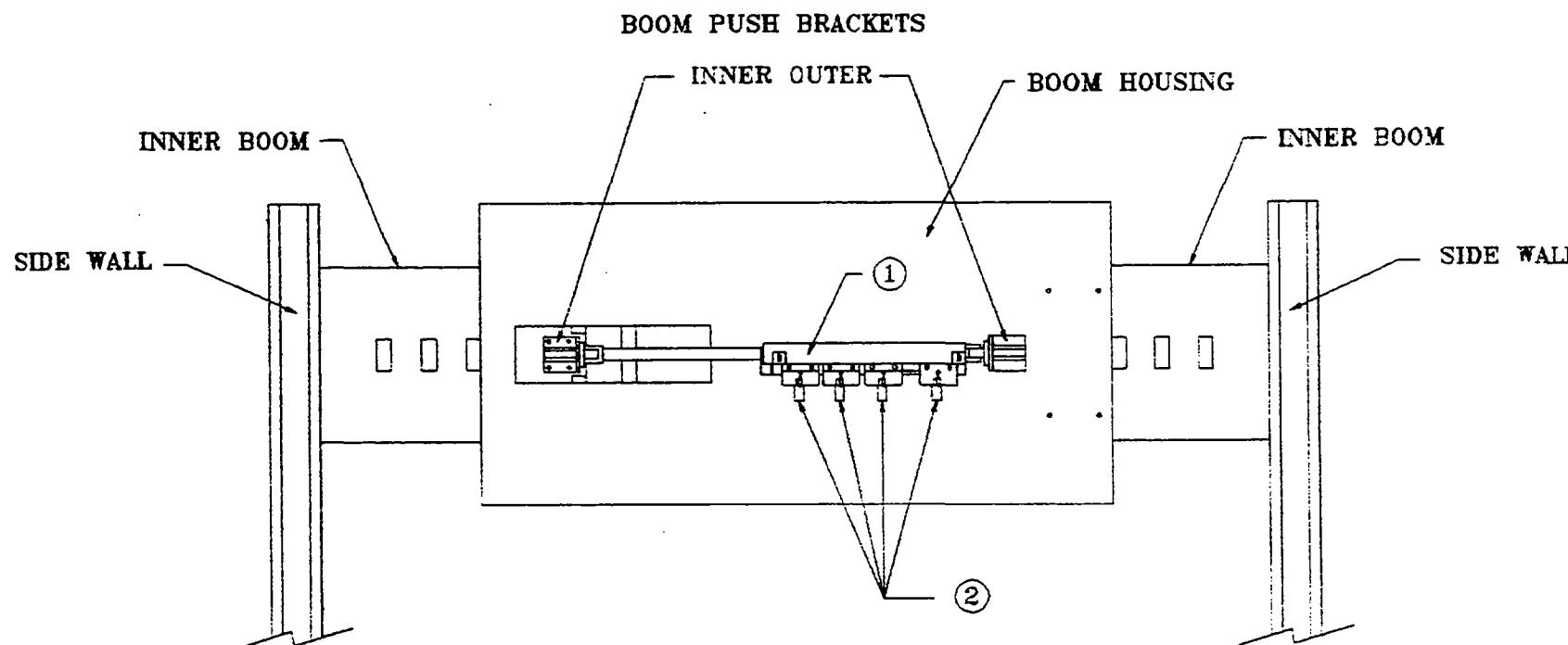


MATERIALS:

SUBFRAME : S24 X 121, ASTM A36

SUBFRAME CROSS BRACE : S15 X 50, ASTM A36

		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. (816) 254-1788		
P.O. Box 348		
Independence, Missouri 64050		
TITLE: SUBFRAME MEMBERS		DRAWN BY: JMM
AND SUBFRAME CROSS BRACES		REVISED: RLM
ASSEMBLY: SUBFRAME		SCALE: NONE
DRAWING NUMBER: 9 OF 21		DATE: 9-15-92



Easy Mount

① Boom Cylinder
Unitrol Corp.
3301 N. Lapeer
Auburn Hills, MI. 48057
(313)-373-2139
Order No. 21000-33.15625
with 2 standard mounting brackets
and 2 standard cams per unit.
4 units required for locking
cylinder.

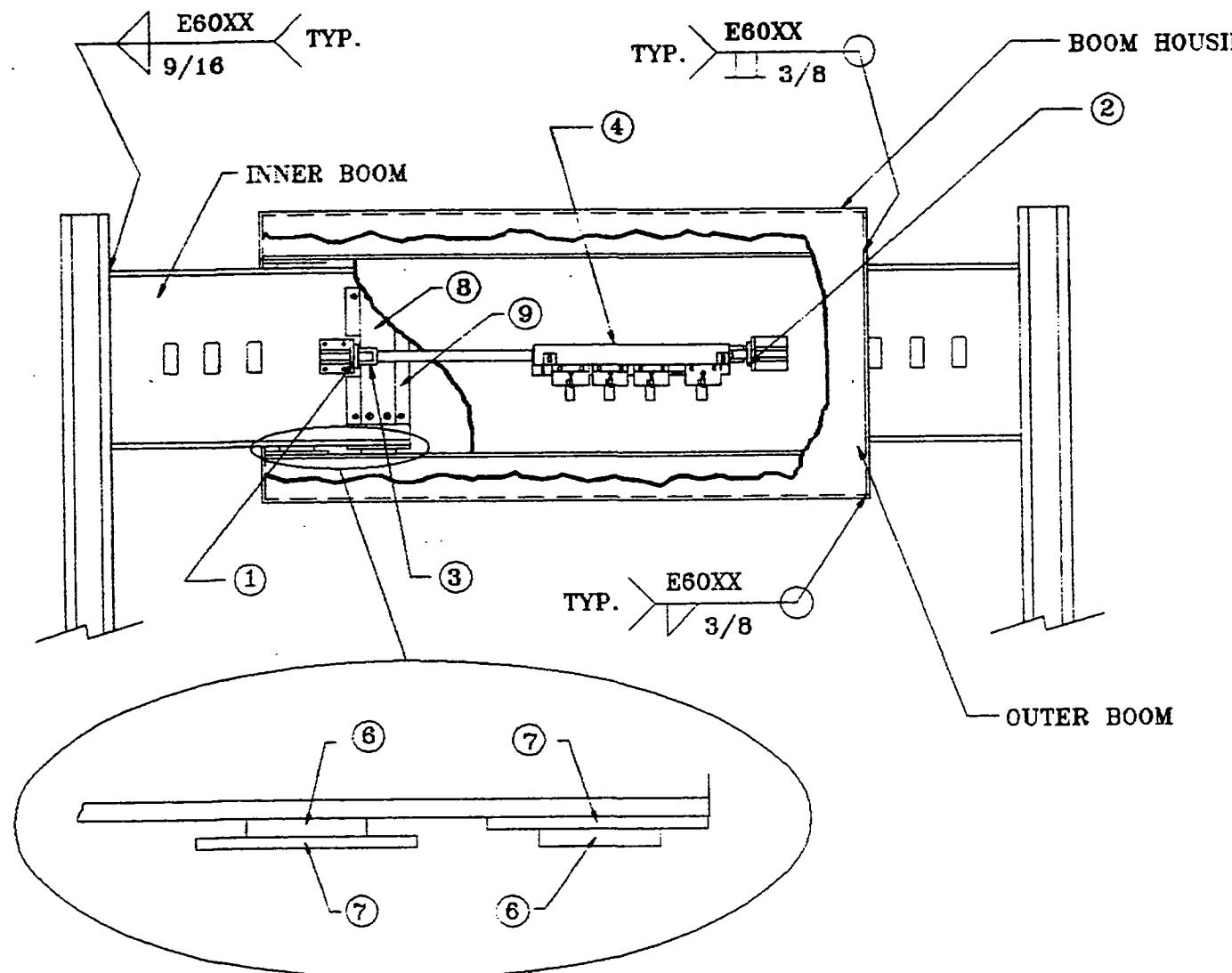
Attach Easy Mount to
hydraulic cylinders per
assembly instructions provided
with Easy Mount package.
Field adjust bracket and cam
positions to accomodate operation
of the locking cylinders per
sequence of operations given
on Hydraulic Circuit Drawings

② Limit Switch 1LS1
Electric Switches, Inc.
2478 Fletcher Dr.
Los Angles, Ca. 90039

Materials

Boom Push Bracket and Plates
ASTM A242 Type 2

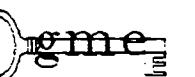
	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 FAX (816) 254-4654
TITLE: BOOM ASSEMBLY		DRAWN BY: RLM
		REVISED: 10-26-92
ASSEMBLY: N/A		SCALE: NONE
DRAWING NUMBER: 10 OF 21		DATE: 10-26-92

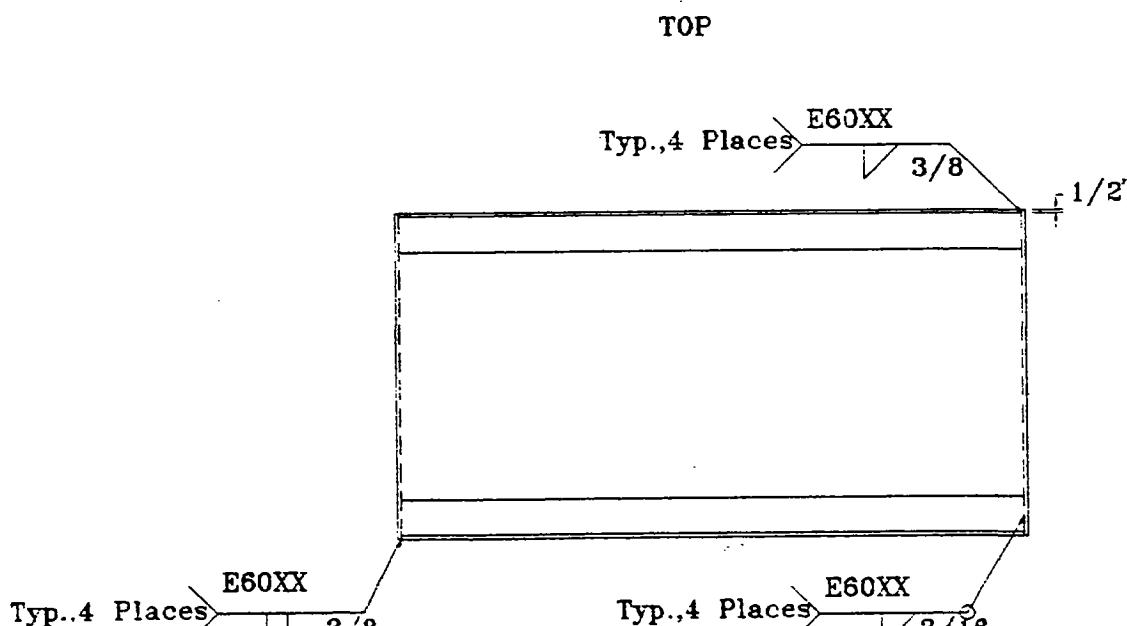
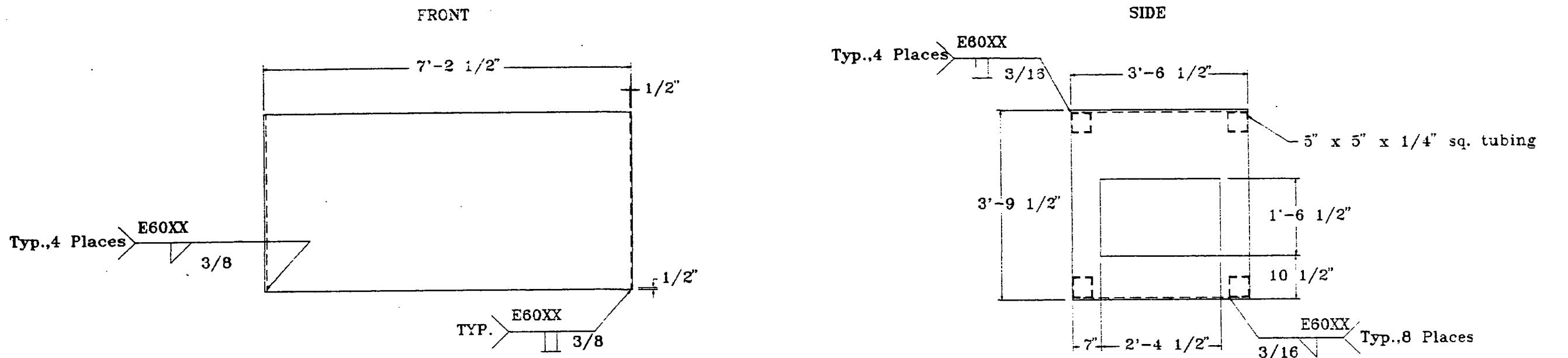


- ① Hydro Line Standard Eye Bracket C-89065X
- ② Hydro Line Standard Eye Bracket C-8904
- ③ Hydro Line Female Clevis C-134-11
- ④ Cylinder, Hydro-Line, 2" Bore, 22" Stroke, 1" Rod Diam.
2X Rod End, 1 - 14 Thread, 1/2" NPT Ports.
- ⑤ Consolidated 1000 Electrodes
- ⑥ Side Boom Pads
- ⑦ Side Boom Plates
- ⑧ Top/Bottom Boom Pads
- ⑨ Top/Bottom Boom Pad Plates
- ⑩ Paint all brackets and plates with one coat of rust-inhibitive primer.

Materials

Boom Push Brackets And Plates: ASTM A242 Type 2
 Boom Pads: Vekton Grade 6 PAM
 Manufactured by:
 Norton-Performance Plastics
 150 Dey Road, Wayne, NJ 07470-4699 USE
 Telephone: (201)696-4700 Telex: 710-988-5834

shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc.	(816) 254-1788	
P.O. Box 348		
Independence, Missouri 64050	FAX (816) 254-4654	
TITLE: BOOM ASSEMBLY	DRAWN BY: RLM	
CUTAWAY VIEW		REVISED: 10-26-92
ASSEMBLY: N/A	SCALE: NONE	
DRAWING NUMBER: 11 OF 21		DATE: 10-26-92



BOOM HOUSING (2 REQUIRED)

Note:

- ① Paint all booms, housings, plates, and brackets with one coat of rust-inhibitive primer.
- ② Inspection plate on forward outer boom faces rear of trailer. Inspection plate on rear outer boom faces front of trailer.



STRATEGIC HIGHWAY RESEARCH PROGRAM

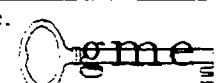
Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050

(816) 254-1788

FAX (816) 254-4654



TITLE:

BOOM HOUSING

DRAWN BY: RLM

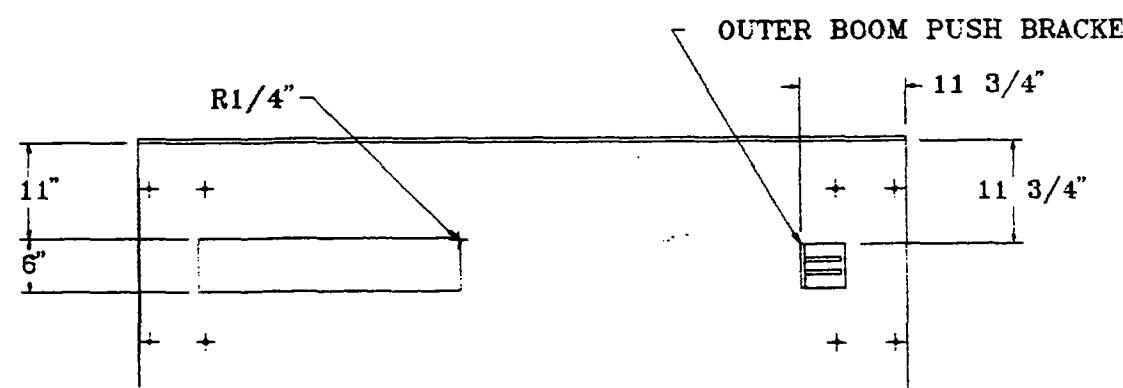
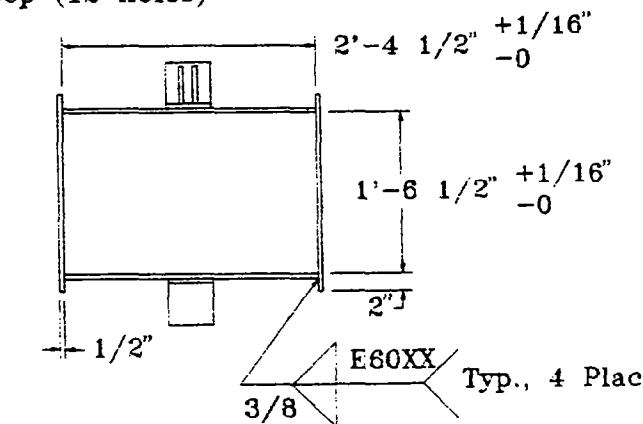
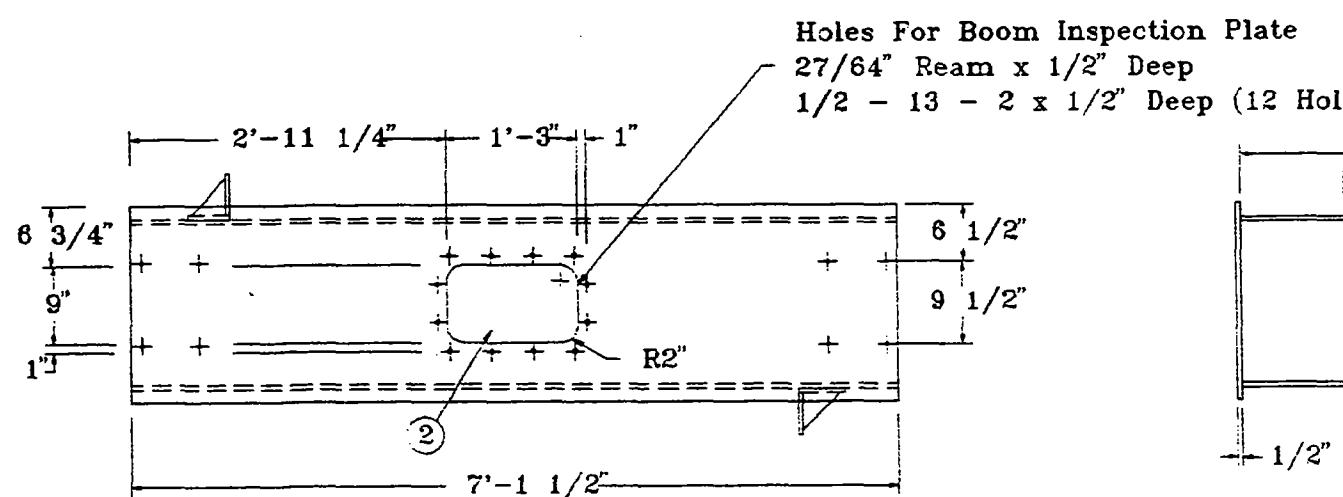
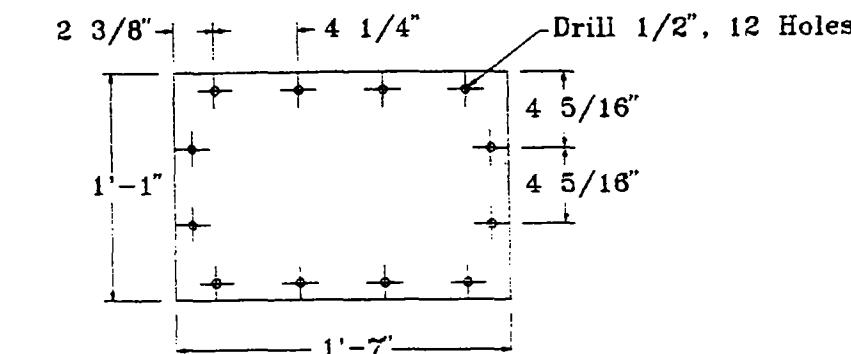
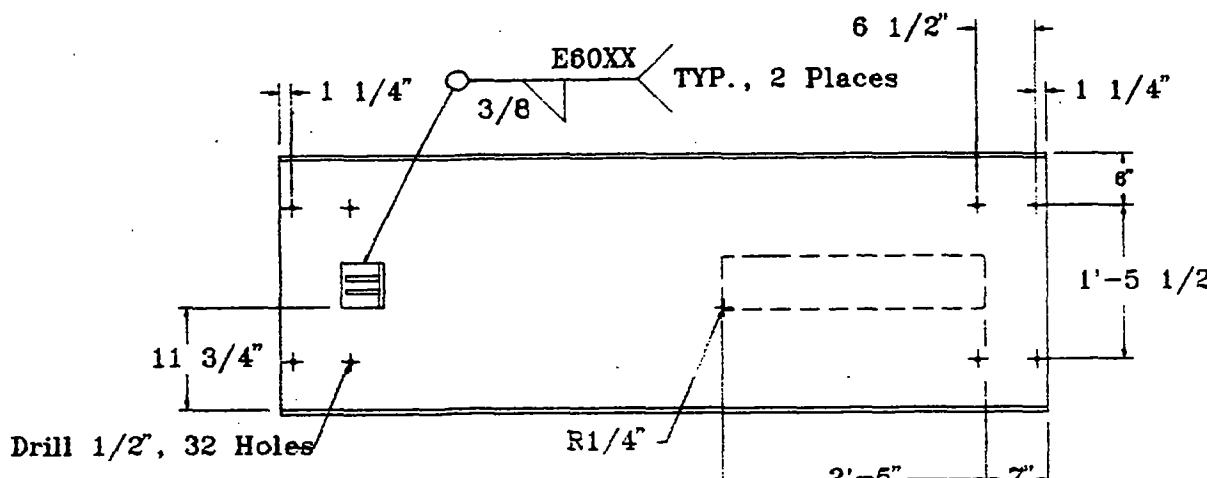
REVISED: 9-9-92

ASSEMBLY: BOOM

SCALE: NONE

DRAWING NUMBER: 12 OF 21

DATE: 9-9-92



OUTER BOOM INSPECTION PLATE

(4 REQUIRED)

PLATE THICKNESS=1/4"

Note:

- Paint all booms, housings, plates, and brackets with one coat of rust-inhibitive primer.
- Inspection plate on forward outer boom faces rear of trailer. Inspection plate on rear outer boom faces front of trailer.

shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

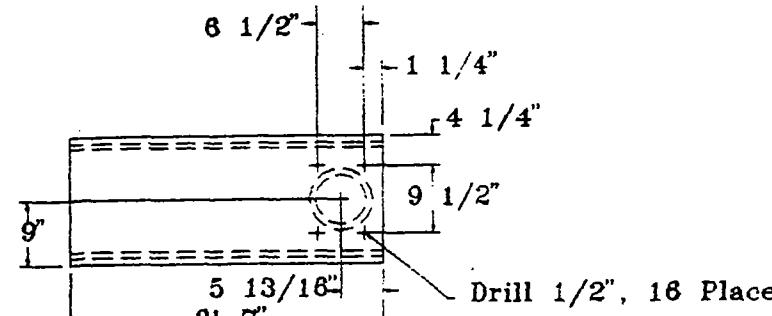
(816) 254-1788

FAX (816) 254-4654

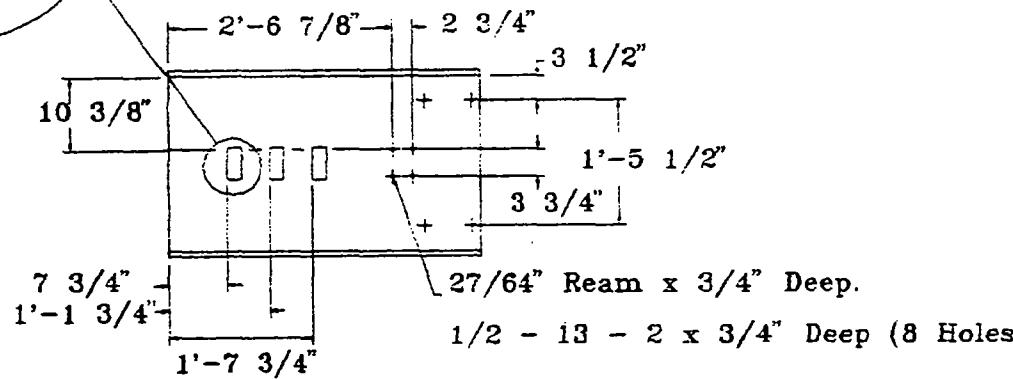
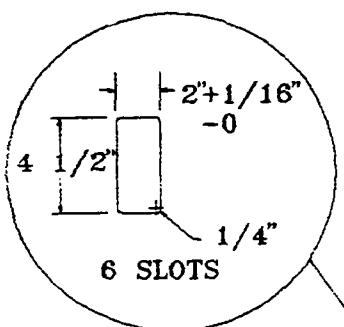
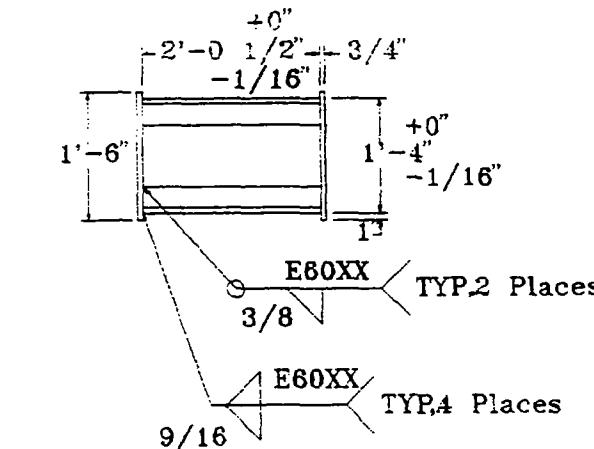
TITLE: OUTER BOOM AND OUTER BOOM INSPECTION PLATE	DRAWN BY: RLM
REVISED: 9-9-92	

ASSEMBLY: BOOM	SCALE: NONE
----------------	-------------

DRAWING NUMBER: 13 OF 21	DATE: 9-9-92
--------------------------	--------------



INNER BOOM (4 REQUIRED)



Note:

- ① Paint all booms, housings, plates, and brackets with one coat of rust-inhibitive primer.
- ② Inspection plate on forward outer boom faces rear of trailer. Inspection plate on rear outer boom faces front of trailer.



STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

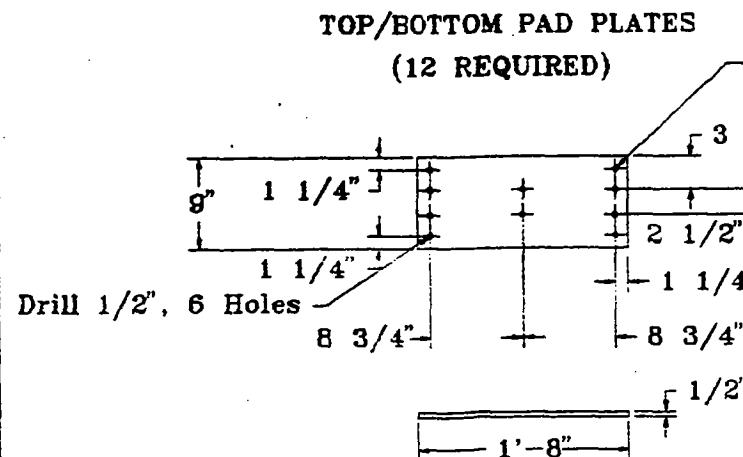
P.O. Box 348

Independence, Missouri 64050

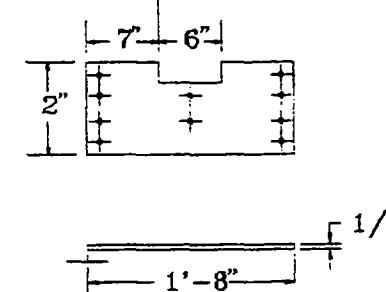
(816) 254-1788

FAX (816) 254-4654

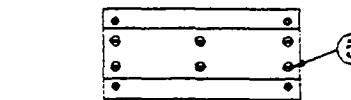
TITLE:	INNER BOOM	DRAWN BY: RLM
REVISED:	9-9-92	
ASSEMBLY:	BOOM	SCALE: NONE
DRAWING NUMBER:	14 OF 21	DATE: 9-9-92



27/64" Ream x 3/4" Deep
1/2-13-2 x 1/2" Deep (6 Holes)



TOP/BOTTOM PAD PLATES
WITH SLOT (4) REQUIRED

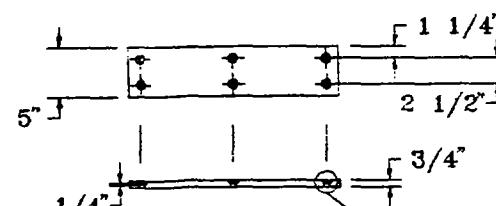


**ASSEMBLY OF BOOM
PADS AND PLATES**

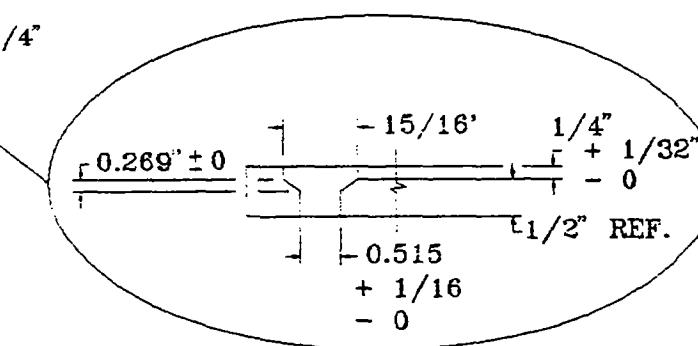
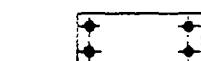
NOTES:

- ① 1/2 - 13 X 2 Heavy Hex Structural Bolt, SAE Grade 5 Steel.
- ② 1/2 - in. Regular Helical Spring Lock Washer.
- ③ 1/2 - in. N, Type A Plain Washer.
- ④ 1/2 - 13 Hex Jam Nut, SAE Grade 5 Steel.
- ⑤ 1/2 - 20 x 9/16 Slotted Countersunk Bolt, SAE Grade 5 Steel.
- ⑥ Paint all brackets and plates with one coat of rust-inhibitive primer.

TOP/BOTTOM BOOM PADS
(16 REQUIRED)

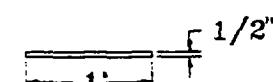
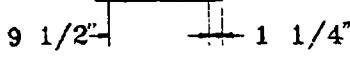


SIDE BOOM PADS
(16 REQUIRED)



27/64" Ream x 1/2" Deep
1/2-13-2 x 1/2" Deep (4 Holes)

Drill 1/2", 4 Places



SIDE PAD PLATES
(16 REQUIRED)

Materials

Boom Push Brackets And Plates:
ASTM A242 Type 2

Boom Pads:
Vekton Grade 6 PAM

 STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050

(816) 254-1788

FAX (816) 254-4654

TITLE:

BOOM PADS & PLATES

DRAWN BY: RLM

REVISED: 9-2-92

ASSEMBLY: BOOM

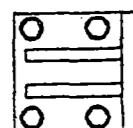
SCALE: NONE

DRAWING NUMBER: 15 OF 21

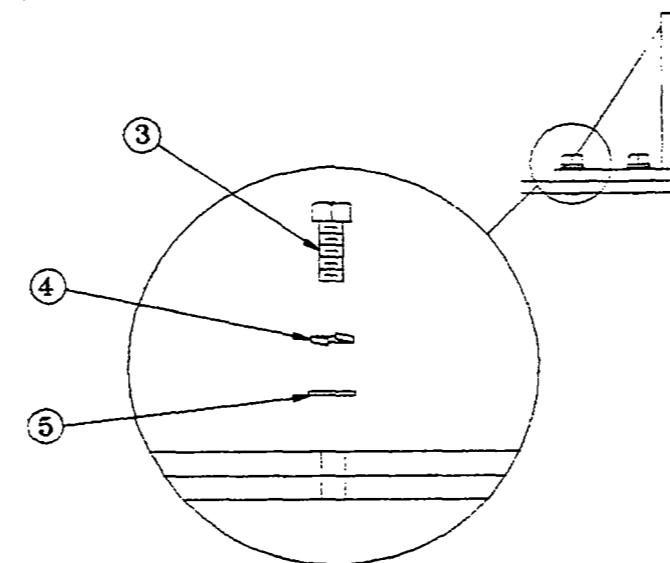
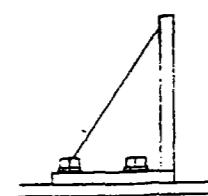
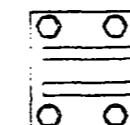
DATE: 9-2-92

NOTES:

Outer Boom Push Bracket

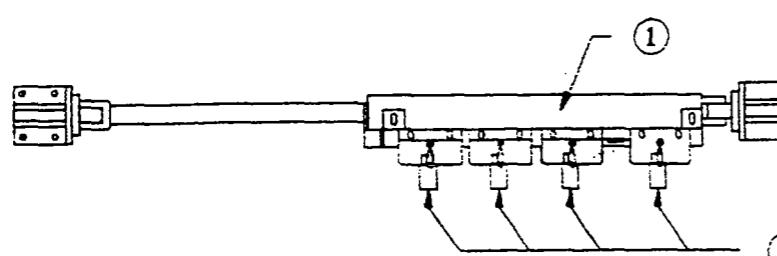


Inner Boom Push Bracket



Assembly of Inner Boom Push Bracket and Inner Boom

Boom Cylinder



- ① Boom Cylinder
Unitrol Corp.
3301 N. Lapeer
Auburn Hills, MI. 48057
(313)-373-2139
Order No. 21000-33.15625
with 2 standard mounting brackets
and 2 standard cams per unit.
4 units required for locking
cylinder.
Attach Easy Mount to
hydraulic cylinders per
assembly instructions provided
with Easy Mount package.
Field adjust bracket and cam
positions to accomodate operation
of the locking cylinders per
sequence of operations given
on Hydraulic Circuit Drawings
- ② Limit Switch 1LS1
Electric Switches, Inc.
2478 Fletcher Dr.
Los Angles, Ca. 90039
- ③ 1/2 - 13 x 1 Heavy Hex Structural Bolt,
SAE Grade 5 Steel.
- ④ 1/2 - in. N, Type A Plain Washer.
- ⑤ 1/2 - in. Regular Helical Spring Lock Washer.
- ⑥ Paint all brackets and plates with
one coat of rust-inhibitive primer.



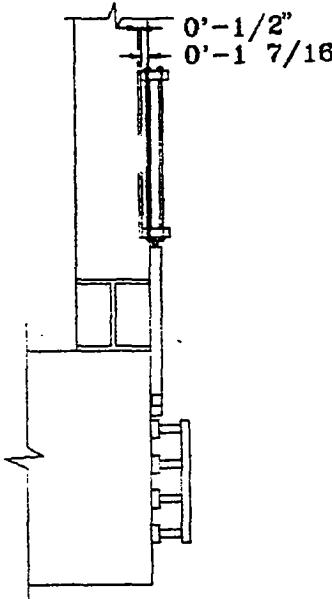
STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

(816) 254-1788
FAX (816) 254-4654

TITLE: BOOM CYLINDER & PUSH BRACKETS	DRAWN BY: RLM
ASSEMBLY: BOOM	SCALE: NONE
DRAWING NUMBER: 16 OF 21	REVISED: 9-2-92
	DATE: 9-2-92

LEFT FRONT BOOM LOCK ASSEMBLY



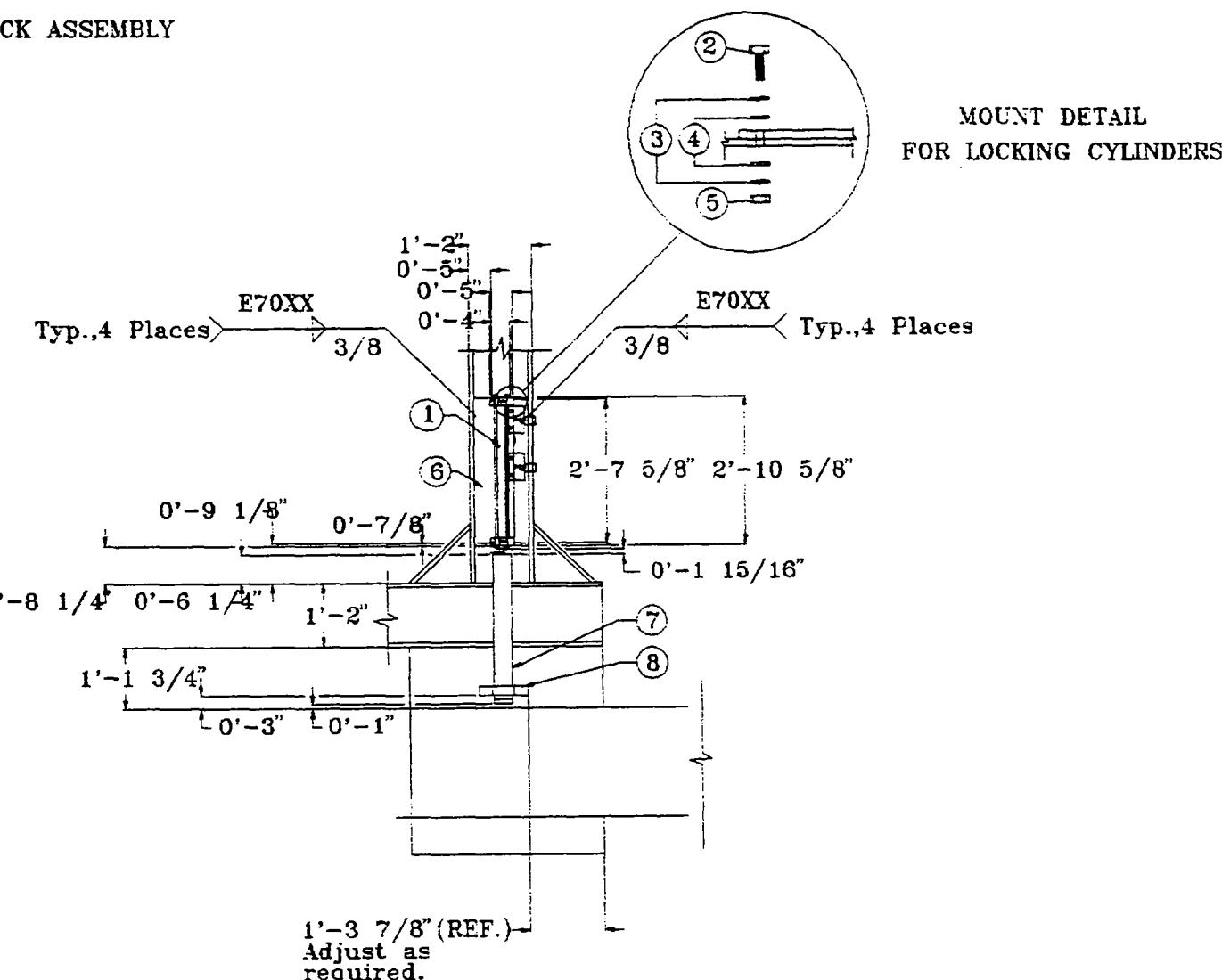
Installation is identical for
Right Front, Right Rear
Left Rear Boomlocks

Notes:

- ① Cylinder, Hydro-Line , N5A,
2" bore, 28" stroke, style
2X rod end.
- ② 9/16 - 12 X 2 Heavy Hex
Structural Bolt, SAE
Grade 5 Steel.
- ③ 9/16 - in. Regular Helical
Spring Lock Washer.
- ④ 9/16 - in. N, Type A Plain Washer.
- ⑤ 9/16 - 12 Hex Jam Nut, SAE
Grade 5 Steel.
- ⑥ Lock Cylinder Mounting Plate
- ⑦ Locking Bolt
- ⑧ Locking Bolt Guide

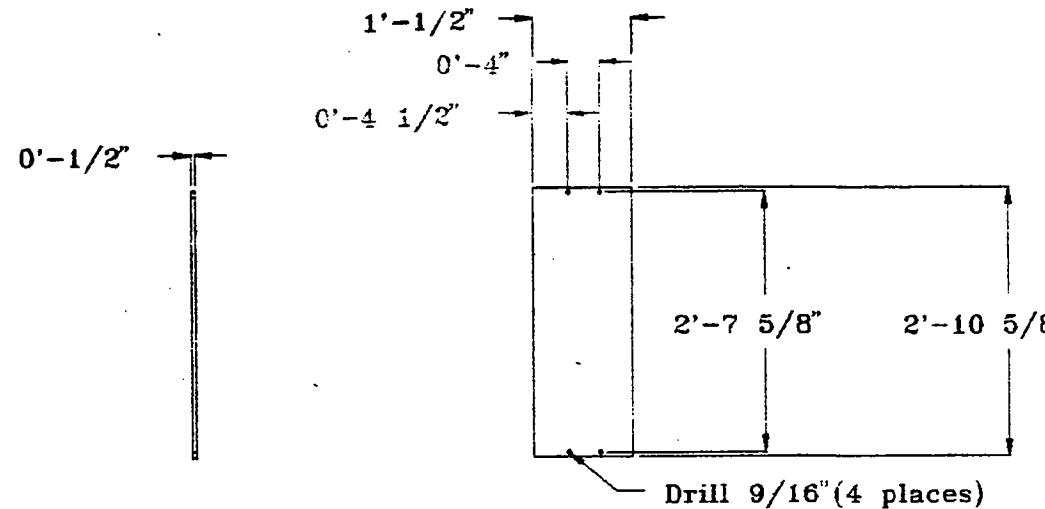
Materials:

Locking Bolts: Rytense 44, 1144, Cold Drawn.
Locking Cylinder Mounting Plates: ASTM A242 Type 2.



LEFT FRONT

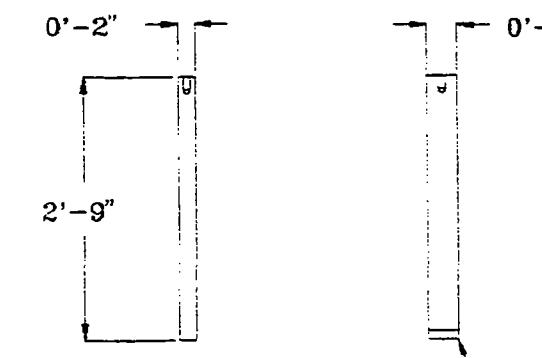
shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc.		(816) 254-1788
P.O. Box 348		FAX (816) 254-4654
Independence, Missouri 64050		
TITLE: BOOM LOCK ASSEMBLY		DRAWN BY: RLM
		REVISED: 9-9-92
ASSEMBLY: BOOM		SCALE: NONE
DRAWING NUMBER: 17 OF 21		DATE: 9-9-92



(A) Lock Cylinder Mounting Plate
(4 Required)

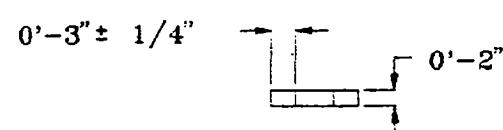
15/16" Drill x 1 9/16" deep,
1-14UNF-2" x 1 5/16" deep.

0'-1"
0'-2"



(B) Locking Bolt
(4 required)

Chamfer 1/4" x 60°



(C) Locking Bolt Guide
(4 Required)

shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050

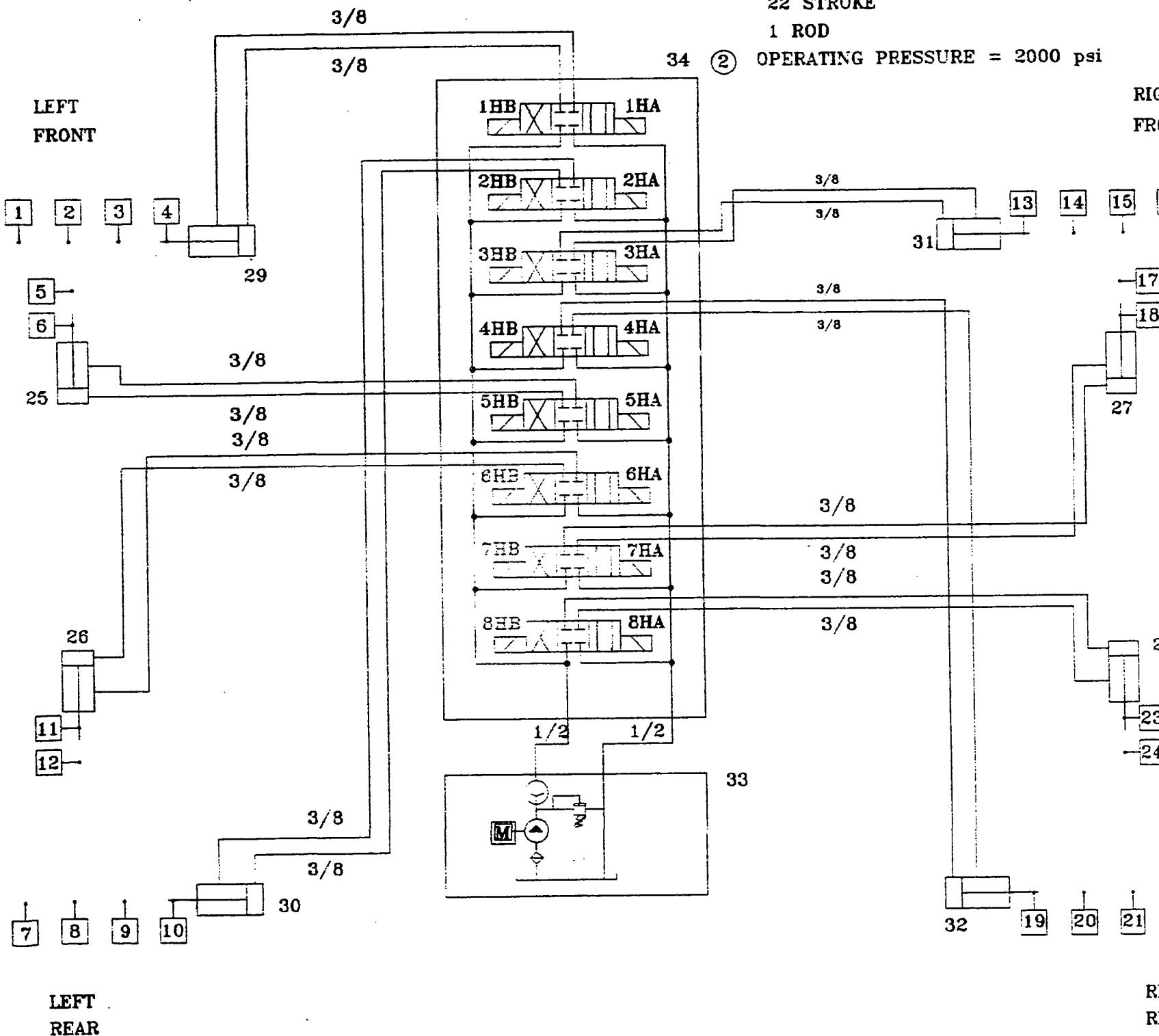
(816) 254-1788

FAX (816) 254-4654

TITLE:	BOOM LOCK DETAILS	DRAWN BY: RLM
ASSEMBLY:	BOOM LOCK	SCALE: NONE
DRAWING NUMBER:	18 OF 21	REVISED: 9-9-92
		DATE: 9-9-92

NOTE

- ① ALL CYLINDERS
2 BORE
22 STROKE
1 ROD
② OPERATING PRESSURE = 2000 p



PART #	ITEM	QTY
1-24	SWITCH, LIMIT	24
25-28	LOCKING CYLINDER	4
29-32	BOOM CYLINDER	4
33	HYDRAULIC POWER UNIT, LOMBARDINI ENGINE 6LD-360	1
34	VALVE BANK, 85004018.8 STATIONS, 8 STATION PARALLEA MANIFOLD 85005114 (WITH MOUNTING FEET) COILS 39610021, TERMINATION OPTION DL.	1

MANUAL CONTROLS

1. EXTEND 10 FT.
 2. EXTEND 11 FT.
 3. EXTEND 12 FT.
 4. RETRACT

TUBING CHART

NOMINAL SIZE	O.D.	WALL THICKNESS
1/2	3/4	0.120

NOTES

SEE FOLLOWING SHEETS FOR SEQUENCE OF OPERATION
&
SOLENOID SCHEMATIC



STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

B2 Box 31

P.O. Box 348

(816) 254-1788



FAX (813) 851-1851

TITLE: HYDRAULIC CIRCUIT

HYDRAULIC CIRCUIT

REVISED: RLM

ASSEMBLY PERSONNEL PROTECTION TRAILER SCALE: NONE

ASSEMBLY: PERSONNEL PROTECTION TRAILER SCALE: NONE

DRAWING NUMBER: 19 OF 21 DATE: 9-10-92

Sequence of operation

Condition at start of Automatic Wall Extend Operation.

Pump running, all solenoids de-energized.
Limit switches 4,6,10,11,13,18,19,23 tripped,
all other not tripped.
Automatic extend cycle on, for either 10,11,or 12 ft. width.

Automatic Extend Cycle

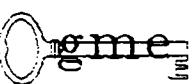
1. 1HA energized, extending cylinder B, tripping limit switch LS3, LS2, LS1. 2HA energized, extending cylinder D, tripping limit switch LS9 or LS8 or LS7. 3HA energized, extending cylinder F, tripping limit switch LS14 or LS15 or LS16. 4HA energized, extending cylinder H, tripping limit switch LS20 or LS21 or LS22.
2. LS3 or LS2 or LS1 de-energize 1HA and energize 5HA. extending cylinder A. LS9 or LS8 or LS7 de-energize 2HA and energize 6HA, extending cylinder C. LS14 or LS15 or LS16 de-energize 3HA and energize 7HA extending cylinder E. LS20 or LS21 or LS22 de-energize 4HA and energize 8HA, extenging cylinder G.
3. Cylinder A trips LS5, de-energizing 5HA. Cylinder C trips LS12, de-energizing 6HA. Cylinder E trips LS17, de-energizing 7HA. Cylinder G trips LS24, de-energizing 8HA.

Conditions at start of Automatic Wall Retract Operation.

Pump running, all solenoids de-energized. Limit switches LS1,7,16,22 or LS2,8,15,21 or LS3,9,14,20 and LS5,12,17,24 tripped. Automatic retract cycle on.

Automatic Retract Cycle

1. 5HB energizes, retracting cylinder A, tripping limit sqitch LS6. 6HB energized, retracting cylinder C, tripping limit switch LS11. 7HB energized, retracting cylinder E, tripping limit switch LS18. 8HB inergized, retracting cylinder G, tripping limit switch LS25.
2. LS6 de-energizes 5HB, then energizes 1HB. LS11 de-energizes 6HB, then energizes 2HB. LS18 de-energizes 7HB, then energizes 3HB. LS23 de-energizes 8HB, then energizes 4HB.
3. Cylinder B trips LS4, de-energizing 1HB. Cylinder D trips LS10, de-energizing 2HB. Cylinder F trips LS13, de-energizing 3HB. Cylinder H trips LS19, de-energizing 4HB.

	STRATEGIC HIGHWAY RESEARCH PROGRAM		
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788  FAX (816) 254-4654	
TITLE: HYDRAULIC CIRCUIT SEQUENCE OF OPERATION		DRAWN BY: JMM	
ASSEMBLY: PERSONNEL PROTECTION TRAILER		REVISED: RLM	SCALE: NONE
DRAWING NUMBER: 20 OF 21		DATE: 9-10-92	

SEQ.	OPERATION	CYCLE TIME (S)					SOLENOIDS																	
		10	20	30	40	50	1HA	1HB	2HA	2HB	3HA	3HB	4HA	4HB	5HA	5HB	6HA	6HB	7HA	7HB	8HA	8HB		
AUTOMATIC EXTEND (10 FT.)																								
1	WALL OUT	9.2					+	-	+	-	+	-	+	-	-	-	-	-	-	-	-	-	-	
2	LOCK		20.8				-	-	-	-	-	-	-	-	+	-	+	-	+	-	+	-	+	
AUTOMATIC RETRACT (10 FT.)																								
1	UNLOCK	15.5					-	-	-	-	-	-	-	-	-	+	-	+	-	+	-	+	-	
2	WALL IN		6.5				-	+	-	+	-	+	-	+	-	-	-	-	-	-	-	-	-	-
AUTOMATIC EXTEND (11 FT.)																								
1	WALL OUT	14.9					+	-	+	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-
2	LOCK		20.8				-	-	-	-	-	-	-	-	+	-	+	-	+	-	+	-	+	-
AUTOMATIC RETRACT (11 FT.)																								
1	UNLOCK	15.5					-	-	-	-	-	-	-	-	-	+	-	+	-	+	-	+	-	+
2	WALL IN		11.1				-	+	-	+	-	+	-	+	-	-	-	-	-	-	-	-	-	-
AUTOMATIC EXTEND (12 FT.)																								
1	WALL OUT	20.5					+	-	+	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-
2	LOCK		20.8				-	-	-	-	-	-	-	-	+	-	+	-	+	-	+	-	+	-
AUTOMATIC RETRACT (12 FT.)																								
1	UNLOCK	15.5					-	-	-	-	-	-	-	-	-	+	-	+	-	+	-	+	-	+
2	WALL IN		15.3				-	+	-	+	-	+	-	+	-	-	-	-	-	-	-	-	-	-

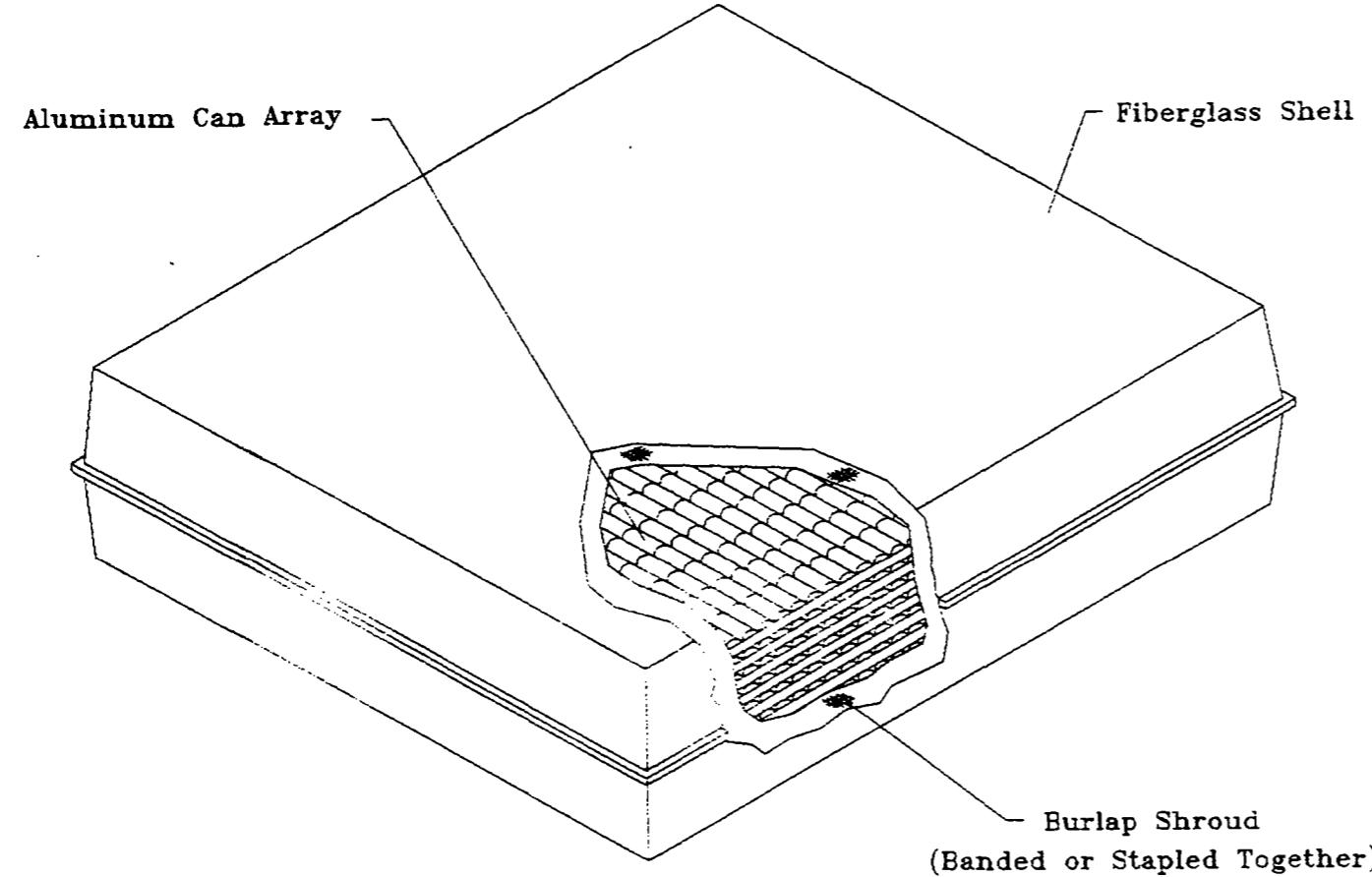
ENERGIZED



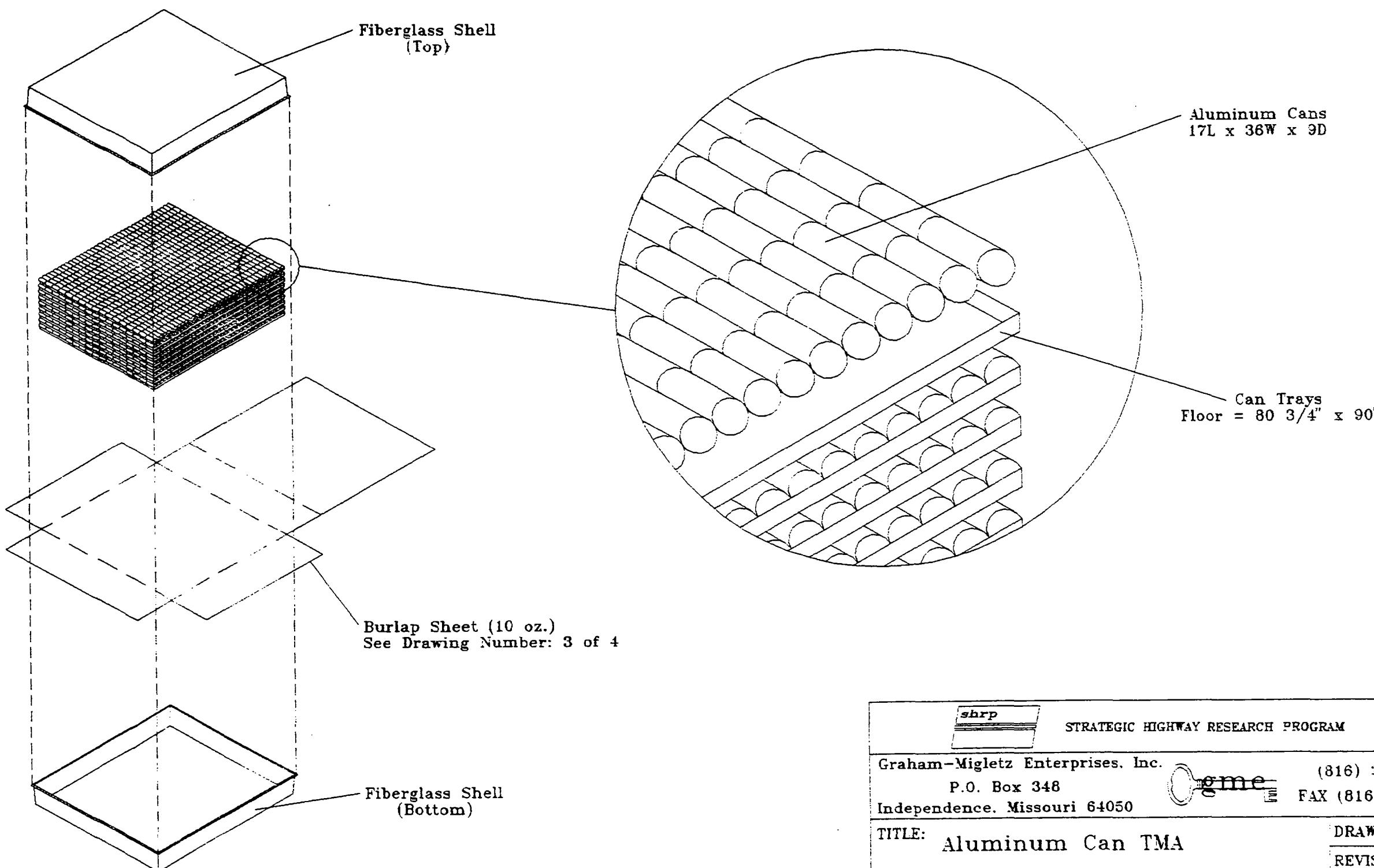
DE-ENERGIZED



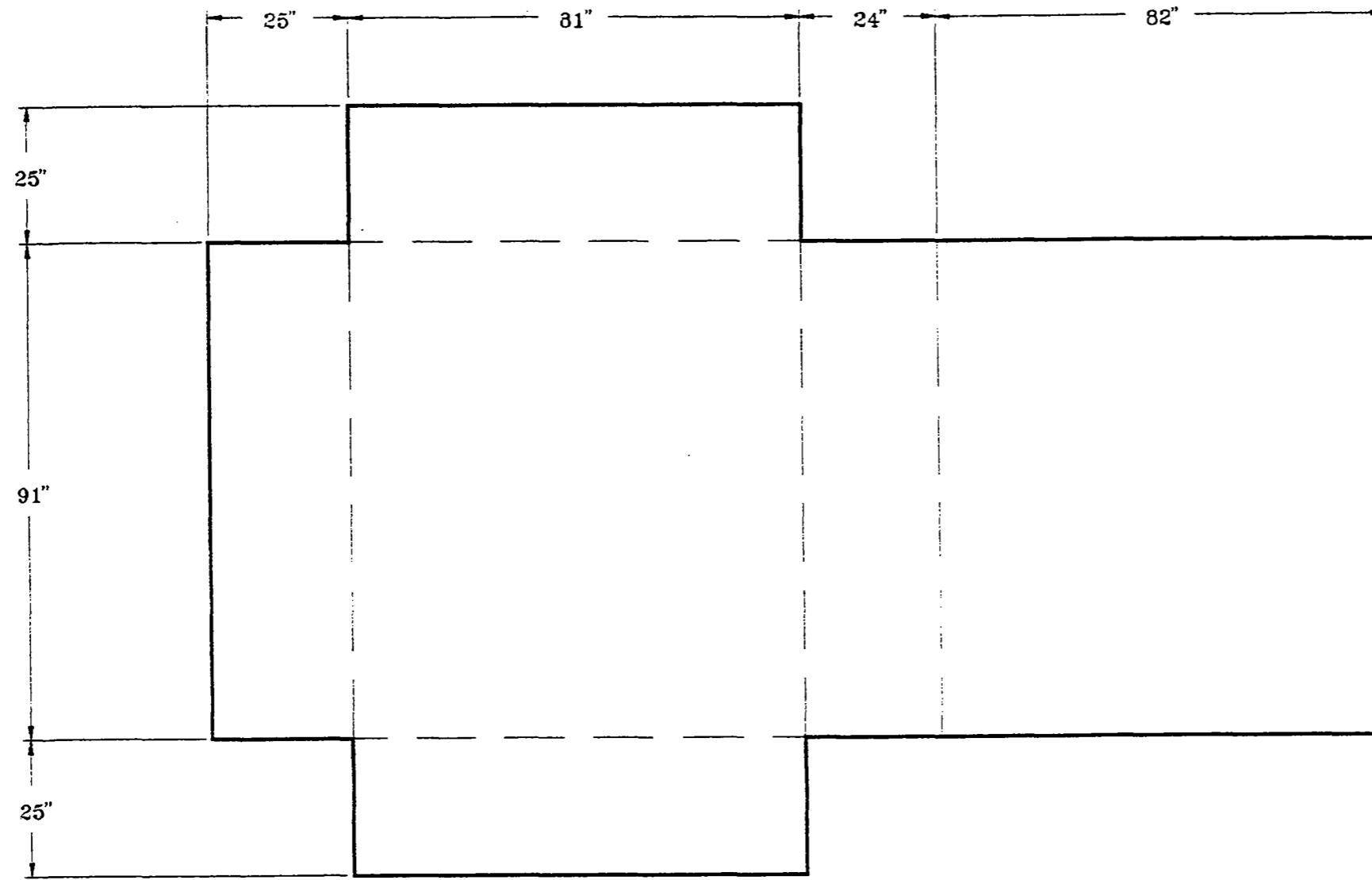
<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc.		
P.O. Box 348		
Independence, Missouri 64050		
TITLE: HYDRAULIC CIRCUIT LOGIC TABLE		DRAWN BY: RLM
ASSEMBLY: PERSONNEL PROTECTION TRAILER		REVISED: 9-10-92
DRAWING NUMBER: 21 OF 21		SCALE: NONE
		DATE: 9-10-92



shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. (816) 254-1788		
P.O. Box 348		
Independence, Missouri 64050 FAX (816) 254-4654		
TITLE: Aluminum Can TMA		DRAWN BY: JMM
REVISED: ---		
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 1 of 4		DATE: 8-26-92



<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc.		
P.O. Box 348		
Independence, Missouri 64050		
TITLE: Aluminum Can TMA		DRAWN BY: JMM
REVISED: ---		SCALE: None
ASSEMBLY: N/A		DATE: 8-26-92
DRAWING NUMBER: 2 of 4		



Note:

Dotted lines indicate
where shroud should be
folded to enclose can array.

shrp

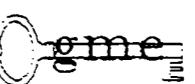
STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050

(816) 254-1788

 FAX (816) 254-4654

TITLE: Aluminum Can TMA
(Burlap)

DRAWN BY: JMM

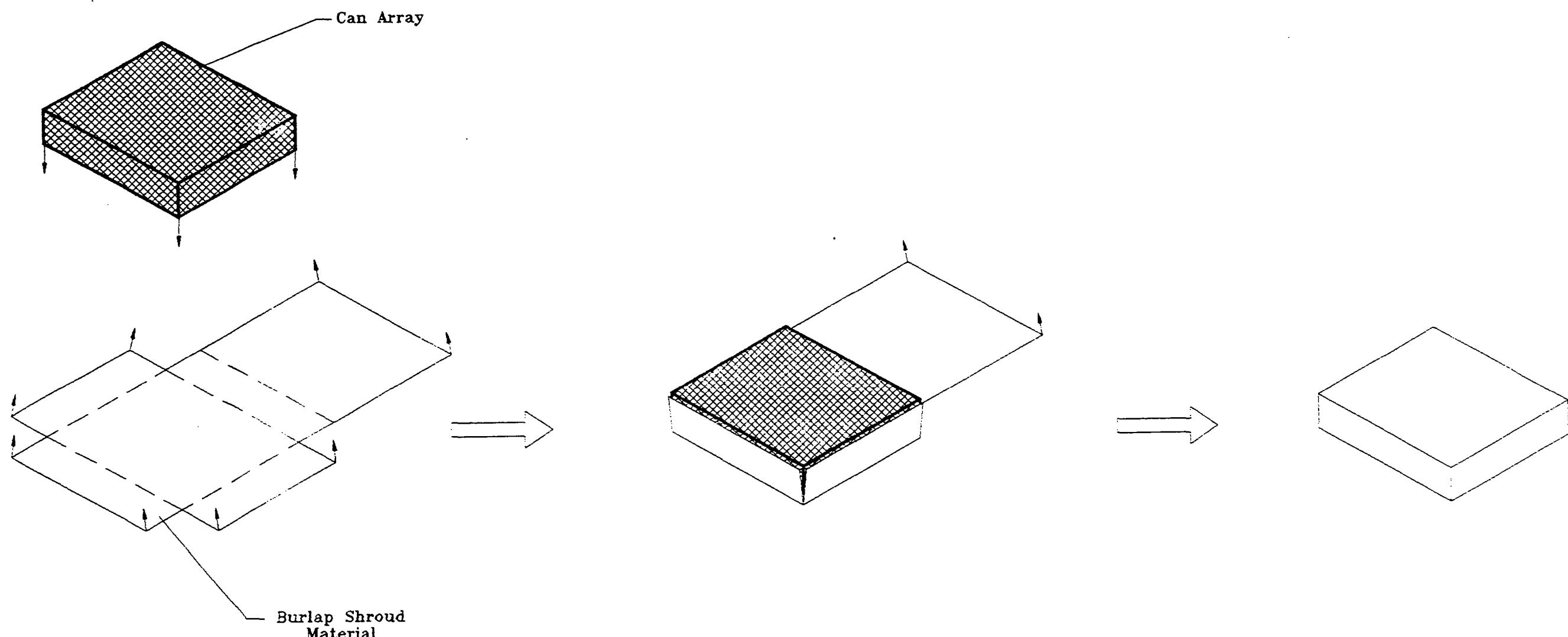
REVISED: ---

ASSEMBLY: N/A

SCALE: None

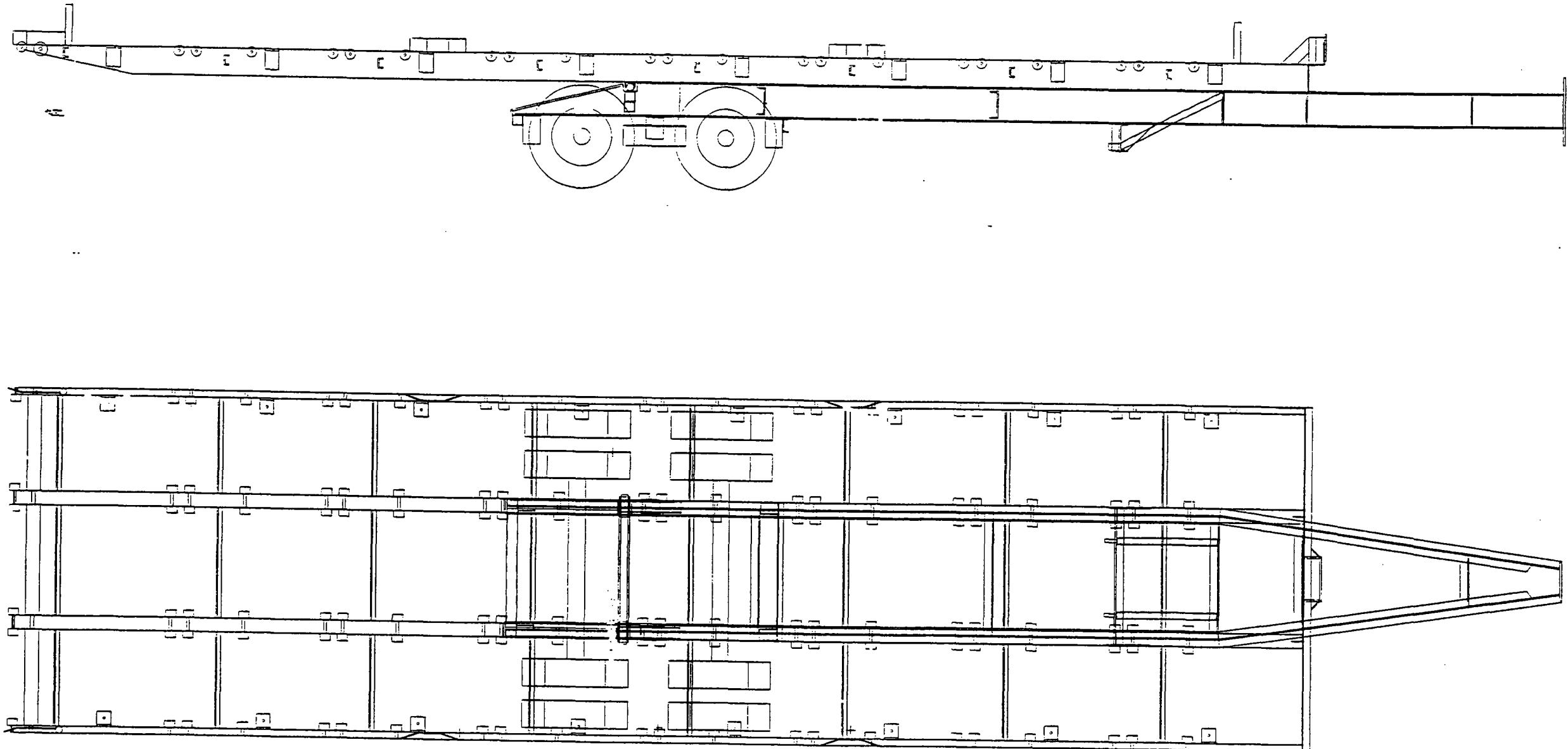
DRAWING NUMBER: 3 of 4

DATE: 8-26-92



Note:
Shroud is folded as shown around can/cardboard tray array,
then banded together or stapled at seams.

shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. (816) 254-1788		
P.O. Box 348		
Independence, Missouri 64050		
TITLE: Aluminum Can TMA (Burlap Shroud)		DRAWN BY: JMM
		REVISED: ----
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 4 of 4		DATE: 8-26-92

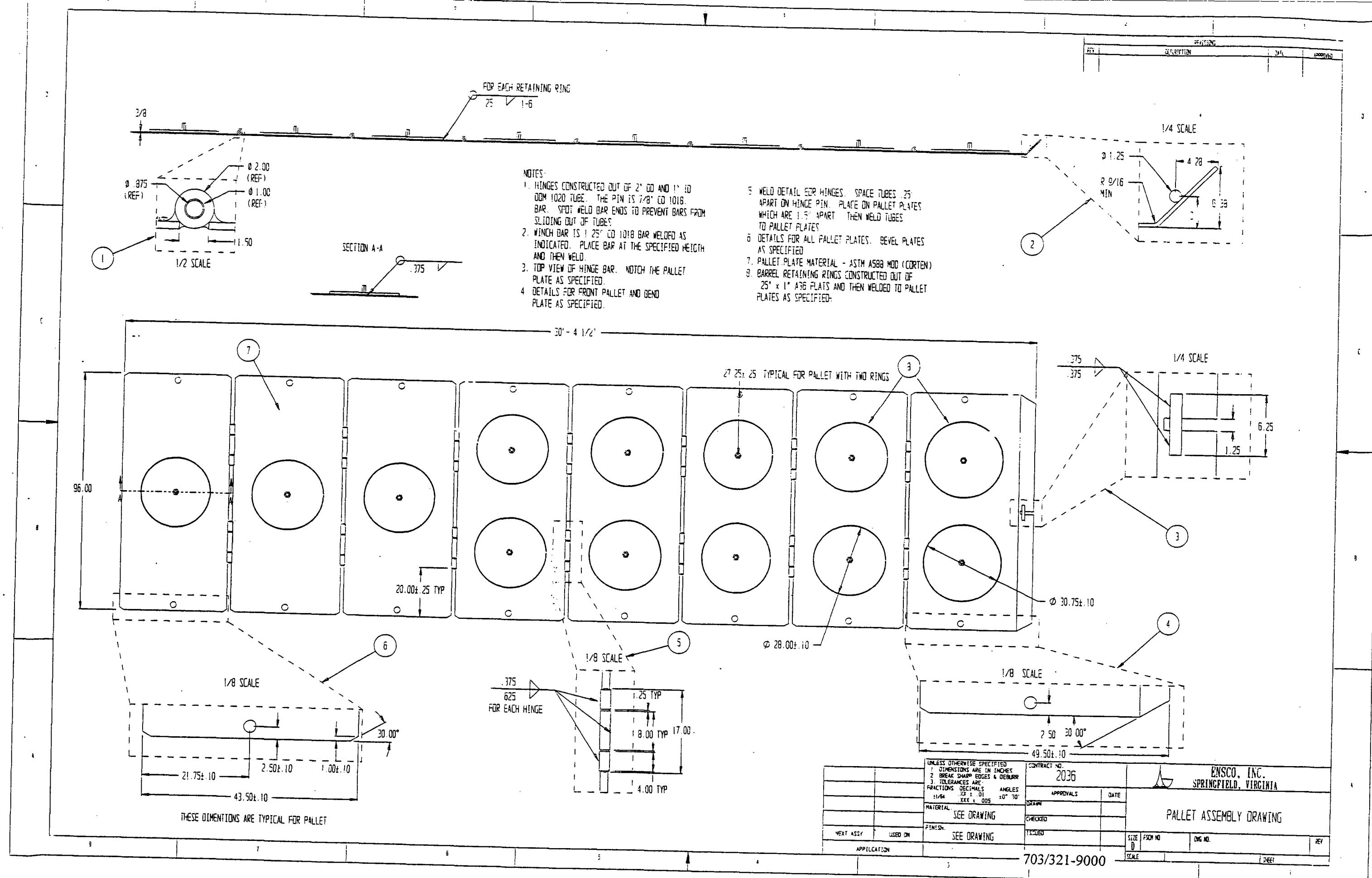


UNLESS OTHERWISE SPECIFIED			CONTRACT NO	2240	APPROVALS	DATE
1 DIMENSIONS ARE IN INCHES 2 BREAK SHARP EDGES & DEBURR 3 TOLERANCES ARE: FRACTIONS DECIMALS ANGLES 1/8" ± .01 1° ± 30'			DRAWN	ERIC SMALLIDGE		
			CHECKED			
MATERIAL	PINNED	APPLIED	SIZE			
			WIDE	ORG NO.	25	
NEXT ASSY	USED ON	APPLICATION	SCALE 1/10			

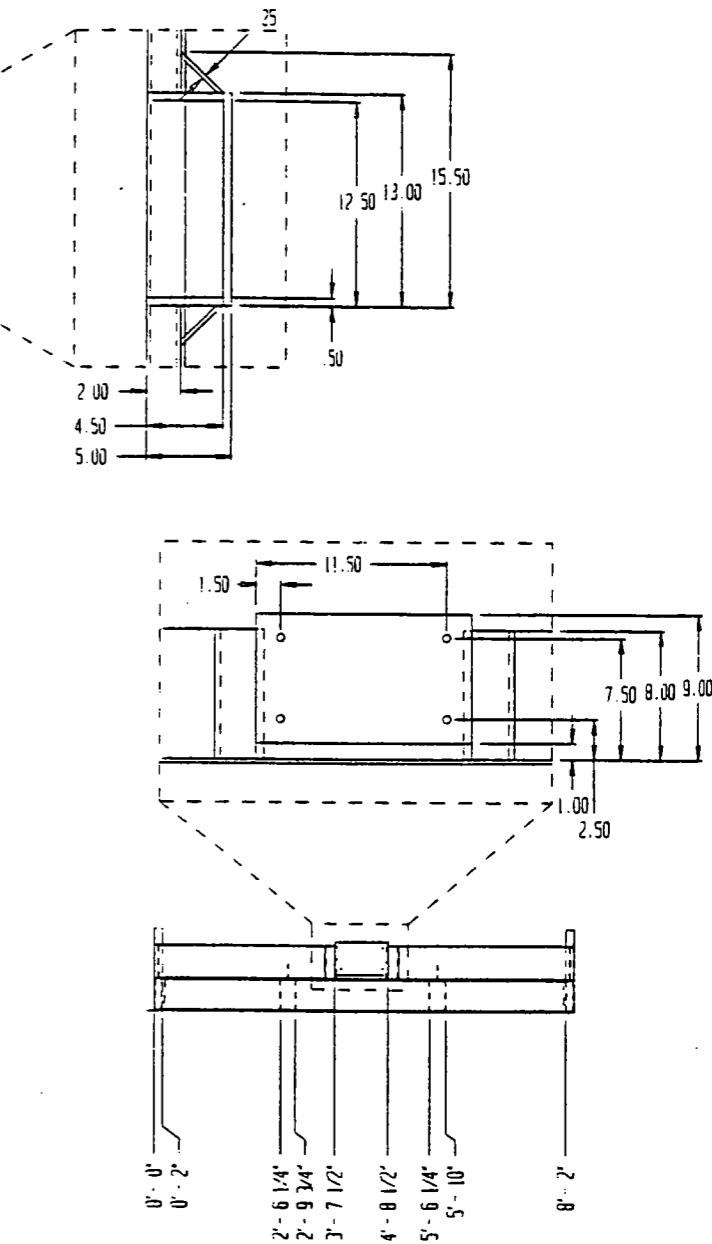
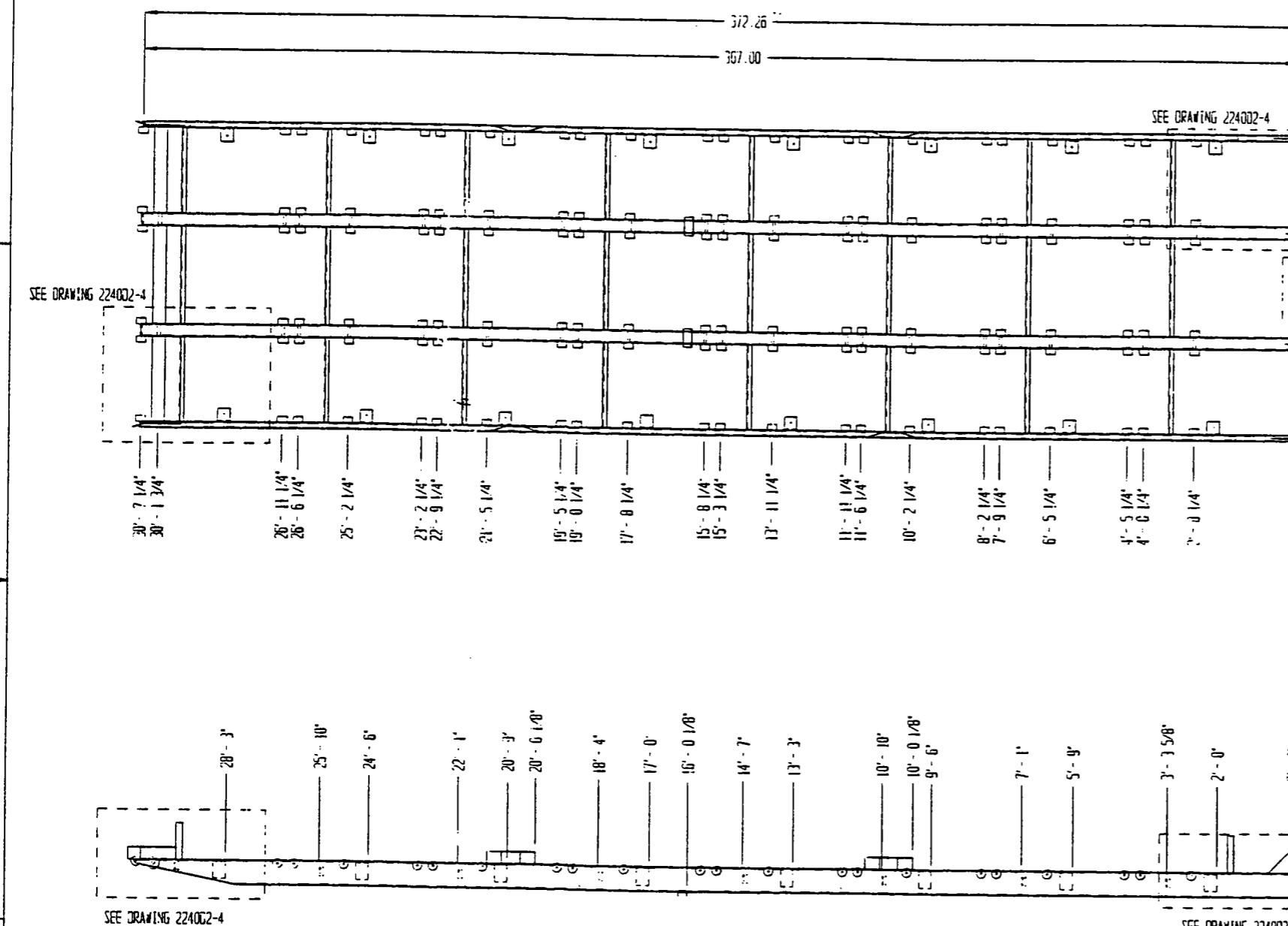
703/321-9000

ENSCO, INC.
SPRINGFIELD, VIRGINIA

TOTE TRAILER TILT BED



REF	DESCRIPTION	Q'TY	APPROVED

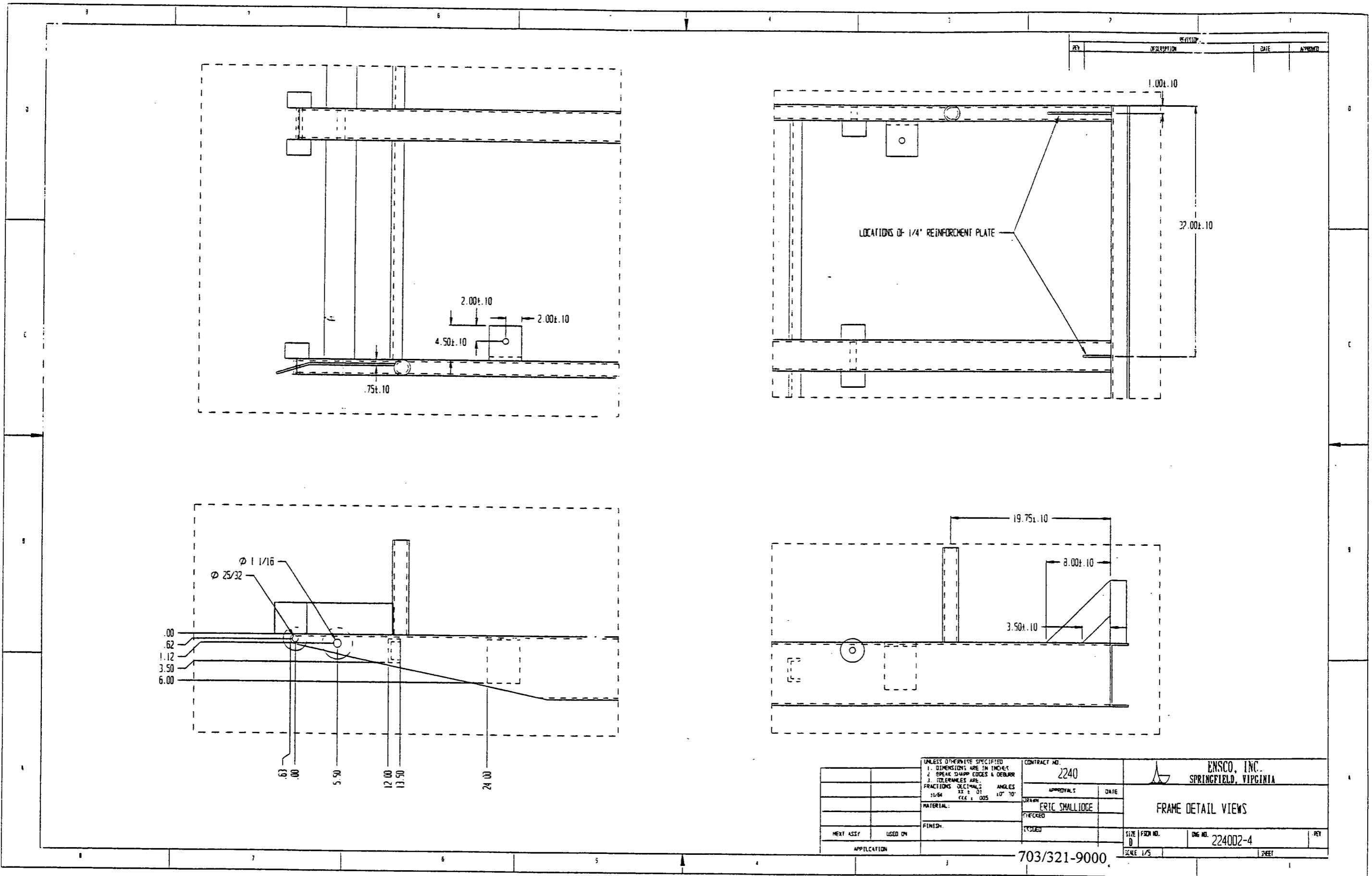


NOTE:
TOLERANCE ON ALL DIMENSIONS
IS +/- 1/8"

UNLESS OTHERWISE SPECIFIED:		CONTRACT NO.
1. DIMENSIONS ARE IN INCHES		2240
2. BREAK SHARP EDGES & DEBUR		APPROVALS
3. TOLERANCES ARE:		DATE
FRACTIONS DECIMALS ANGLES		
1/16 1/8 .01 .010 30°		DRAWN BY ERIC SMALLIDGE
MATERIAL	CHECKED	
FINISH:	REVIEWED	
NEXT ASSY:	USED ON	
APPLICATION		SIZE FORM NO. DNG NO. 7
		LINE 1/20 2001

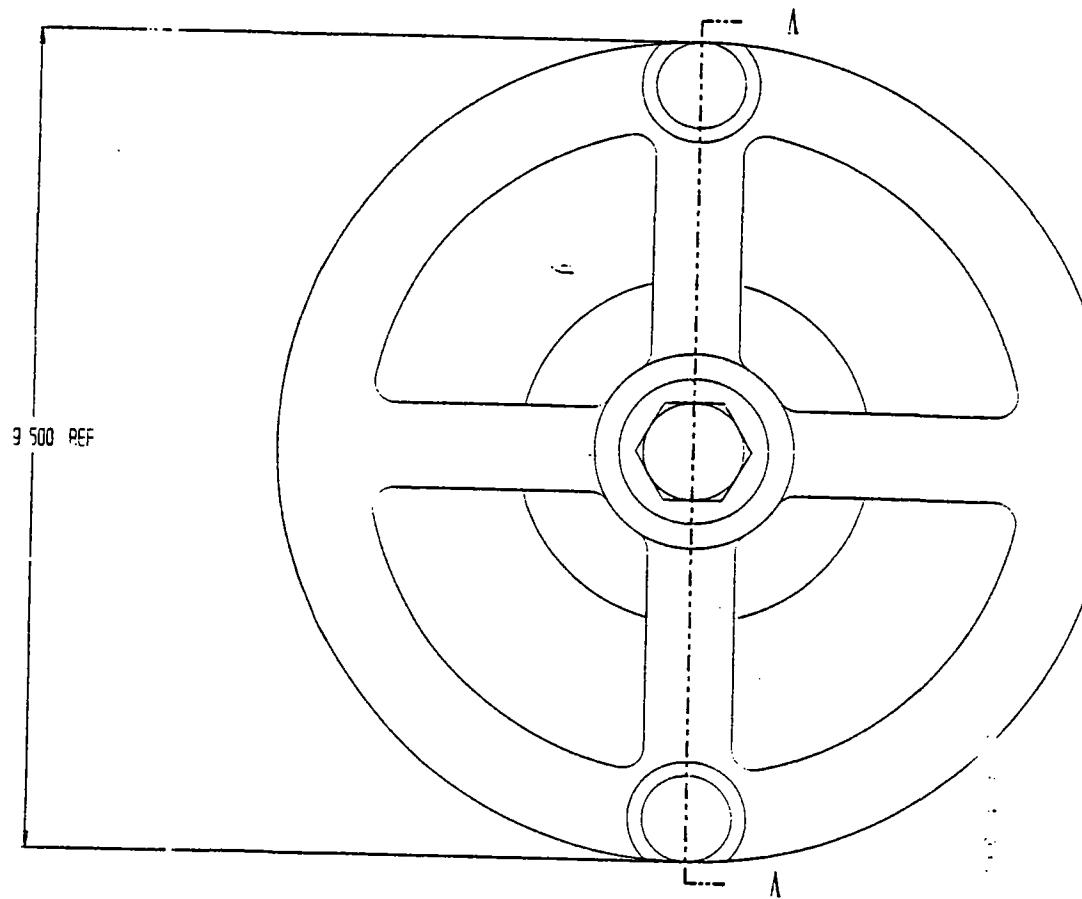
FRAME LAYOUT DETAILS

703/321-9000



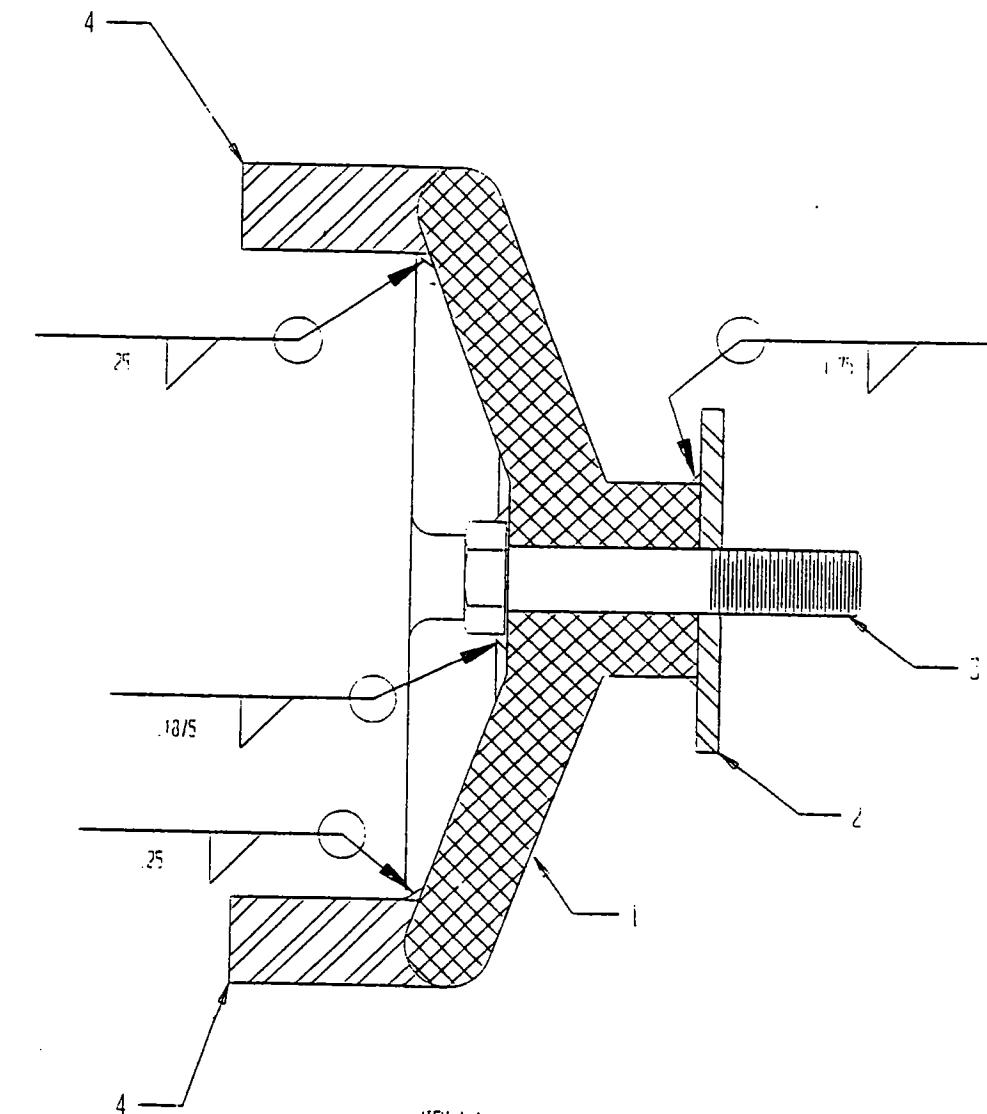
8 7 6 5 4 3 2 1

REVIEWS			
REV	DESCRIPTION	DATE	APPROVED



NOTES

1. McMaster-Carr Cast Iron Handwheel, Part #G025K21
BORE 25/32" HOLE THRU HANDWHEEL FOR TIGHTENING BOLT.
2. BACKING PLATE, 4" OD WITH 25/32" ID, .25" THICK. MATERIAL - ASTM A36.
3. TIGHTENING BOLT - 3/4"x4" UNC GRADE 2 MACHINE BOLT.
4. TIGHTENING LUGS, 1" DIA, ASTM A-36 BAR, TRIM BAR, ENDS TO CONFORM TO HAND WHEEL SHAPE THEN WELD TO HAND WHEEL.



VIEW A-A

UNLESS OTHERWISE SPECIFIED		CONTRACT NO	
1. DIMENSIONS ARE IN INCHES		2036	
2. APPROXIMATE COIDS & DEGREES		SIGNATURE	DATE
3. TOLERANCES ARE		DR. [initials]	6-6-20
FRACTIONS, DECIMALS, AND FEET		CLLC	
INCHES, INCHES, FEET & INCHES		METH. [initials]	
MATERIAL		FINAL	
RE-DRAWING		DATE FORM NO	060 NO 203602-6
TREATMENT		06	0
NONE		APPLY TO	ALL 111
FINISH		STREET NO	6 OF 7
NONE		2	1
APPLICATION		703/321-9000	

ENSCO, INC.
SPRINGFIELD, VIRGINIA

PALLET TIGHTENING HANDWHEELS

8 7 6 5 4 3 2 1

8

7

6

5

4

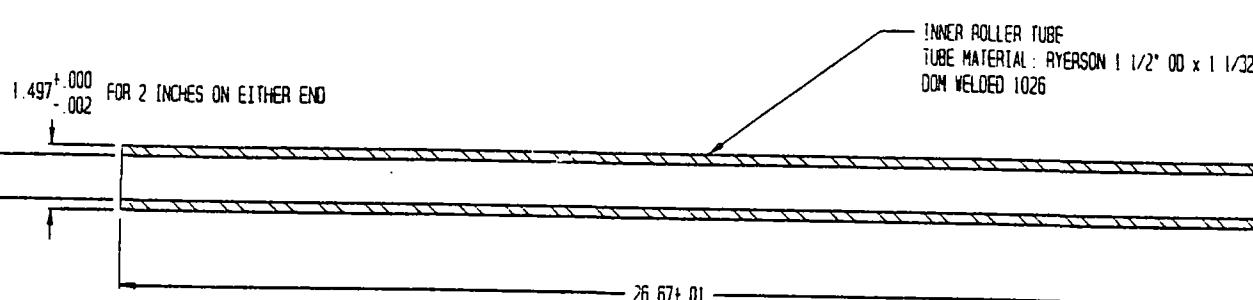
3

2

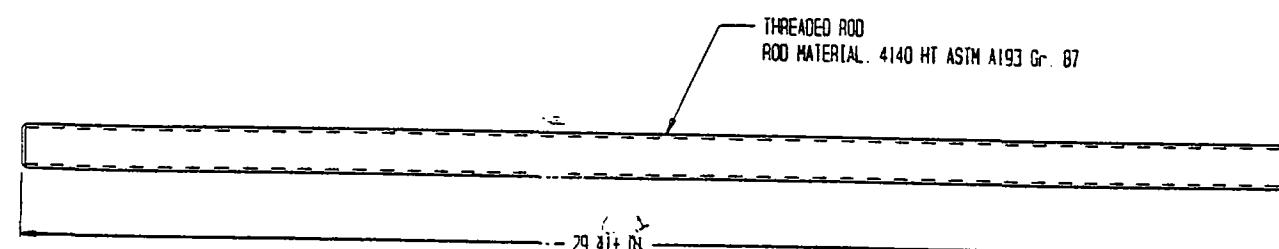
1

REVISIONS

REV	DESCRIPTION	DATE	APPROVED

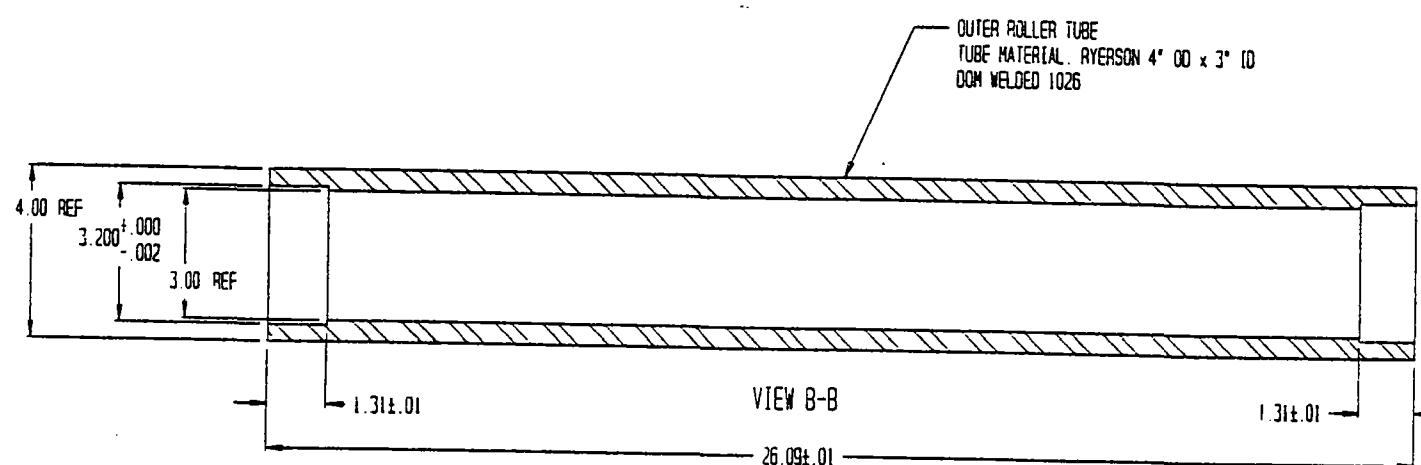


VIEW A-A

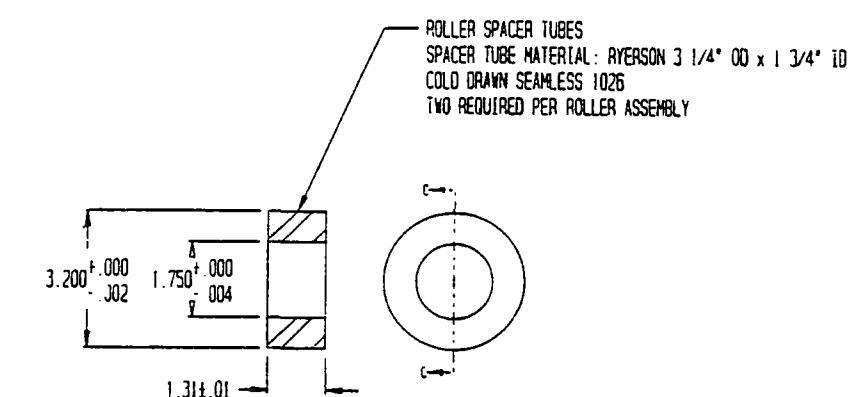
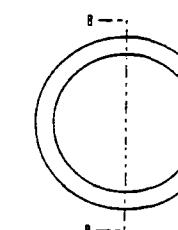


NOTES:

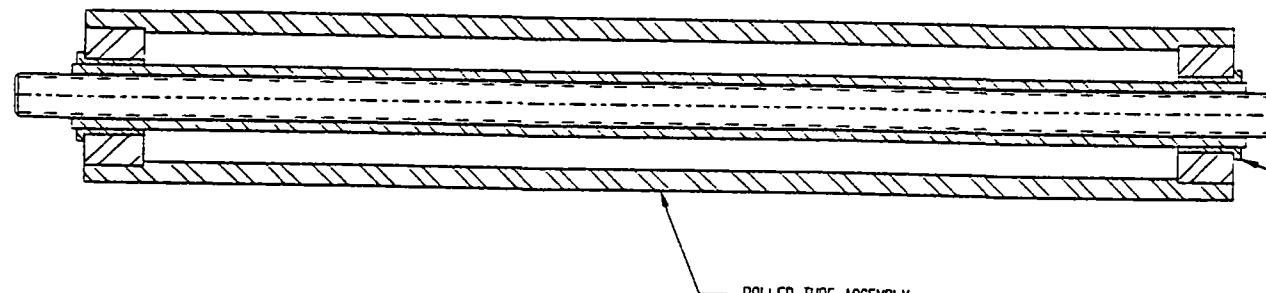
1. THREE ROLLER ASSEMBLIES REQUIRE
FOR THE FRAME.
2. ROLLERS MOUNTED ON FRAME BY USING 3/4"
HEX NUTS AND THE THREADED ROD.



VIEW B-B



VIEW C-C

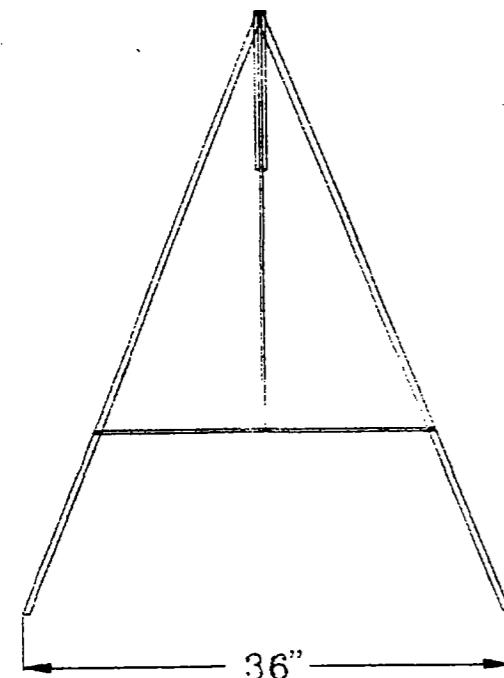


ROLLER TUBE ASSEMBLY

UNLESS OTHERWISE SPECIFIED	CONTRACT NO.
1. DIMENSIONS ARE IN INCHES	2036
2. BREAK SHARP EDGES & DEBURR	SIGNATURE
3. TOLERANCES ARE	DATE
IN CHARTS	DR
4A-14A	CK
4B-14B	7-6-90
4C-14C	
4D-14D	
4E-14E	
4F-14F	
4G-14G	
4H-14H	
4I-14I	
4J-14J	
4K-14K	
4L-14L	
4M-14M	
4N-14N	
4O-14O	
4P-14P	
4Q-14Q	
4R-14R	
4S-14S	
4T-14T	
4U-14U	
4V-14V	
4W-14W	
4X-14X	
4Y-14Y	
4Z-14Z	
4AA-14AA	
4BB-14BB	
4CC-14CC	
4DD-14DD	
4EE-14EE	
4FF-14FF	
4GG-14GG	
4HH-14HH	
4II-14II	
4JJ-14JJ	
4KK-14KK	
4LL-14LL	
4MM-14MM	
4NN-14NN	
4OO-14OO	
4PP-14PP	
4QQ-14QQ	
4RR-14RR	
4SS-14SS	
4TT-14TT	
4UU-14UU	
4VV-14VV	
4WW-14WW	
4XX-14XX	
4YY-14YY	
4ZZ-14ZZ	
4AA-14AA	
4BB-14BB	
4CC-14CC	
4DD-14DD	
4EE-14EE	
4FF-14FF	
4GG-14GG	
4HH-14HH	
4II-14II	
4JJ-14JJ	
4KK-14KK	
4LL-14LL	
4MM-14MM	
4NN-14NN	
4OO-14OO	
4PP-14PP	
4QQ-14QQ	
4RR-14RR	
4UU-14UU	
4VV-14VV	
4WW-14WW	
4XX-14XX	
4YY-14YY	
4ZZ-14ZZ	
4AA-14AA	
4BB-14BB	
4CC-14CC	
4DD-14DD	
4EE-14EE	
4FF-14FF	
4GG-14GG	
4HH-14HH	
4II-14II	
4JJ-14JJ	
4KK-14KK	
4LL-14LL	
4MM-14MM	
4NN-14NN	
4OO-14OO	
4PP-14PP	
4QQ-14QQ	
4RR-14RR	
4UU-14UU	
4VV-14VV	
4WW-14WW	
4XX-14XX	
4YY-14YY	
4ZZ-14ZZ	
4AA-14AA	
4BB-14BB	
4CC-14CC	
4DD-14DD	
4EE-14EE	
4FF-14FF	
4GG-14GG	
4HH-14HH	
4II-14II	
4JJ-14JJ	
4KK-14KK	
4LL-14LL	
4MM-14MM	
4NN-14NN	
4OO-14OO	
4PP-14PP	
4QQ-14QQ	
4RR-14RR	
4UU-14UU	
4VV-14VV	
4WW-14WW	
4XX-14XX	
4YY-14YY	
4ZZ-14ZZ	
4AA-14AA	
4BB-14BB	
4CC-14CC	
4DD-14DD	
4EE-14EE	
4FF-14FF	
4GG-14GG	
4HH-14HH	
4II-14II	
4JJ-14JJ	
4KK-14KK	
4LL-14LL	
4MM-14MM	
4NN-14NN	
4OO-14OO	
4PP-14PP	
4QQ-14QQ	
4RR-14RR	
4UU-14UU	
4VV-14VV	
4WW-14WW	
4XX-14XX	
4YY-14YY	
4ZZ-14ZZ	
4AA-14AA	
4BB-14BB	
4CC-14CC	
4DD-14DD	
4EE-14EE	
4FF-14FF	
4GG-14GG	
4HH-14HH	
4II-14II	
4JJ-14JJ	
4KK-14KK	
4LL-14LL	
4MM-14MM	
4NN-14NN	
4OO-14OO	
4PP-14PP	
4QQ-14QQ	
4RR-14RR	
4UU-14UU	
4VV-14VV	
4WW-14WW	
4XX-14XX	
4YY-14YY	
4ZZ-14ZZ	
4AA-14AA	
4BB-14BB	
4CC-14CC	
4DD-14DD	
4EE-14EE	
4FF-14FF	
4GG-14GG	
4HH-14HH	
4II-14II	
4JJ-14JJ	
4KK-14KK	
4LL-14LL	
4MM-14MM	
4NN-14NN	
4OO-14OO	
4PP-14PP	
4QQ-14QQ	
4RR-14RR	
4UU-14UU	
4VV-14VV	
4WW-14WW	
4XX-14XX	
4YY-14YY	
4ZZ-14ZZ	
4AA-14AA	
4BB-14BB	
4CC-14CC	
4DD-14DD	
4EE-14EE	
4FF-14FF	
4GG-14GG	
4HH-14HH	
4II-14II	
4JJ-14JJ	
4KK-14KK	
4LL-14LL	
4MM-14MM	
4NN-14NN	
4OO-14OO	
4PP-14PP	
4QQ-14QQ	
4RR-14RR	
4UU-14UU	
4VV-14VV	
4WW-14WW	
4XX-14XX	
4YY-14YY	
4ZZ-14ZZ	
4AA-14AA	
4BB-14BB	
4CC-14CC	
4DD-14DD	
4EE-14EE	
4FF-14FF	
4GG-14GG	
4HH-14HH	
4II-14II	
4JJ-14JJ	
4KK-14KK	
4LL-14LL	
4MM-14MM	
4NN-14NN	
4OO-14OO	
4PP-14PP	
4QQ-14QQ	
4RR-14RR	
4UU-14UU	
4VV-14VV	
4WW-14WW	
4XX-14XX	
4YY-14YY	
4ZZ-14ZZ	
4AA-14AA	
4BB-14BB	
4CC-14CC	
4DD-14DD	
4EE-14EE	
4FF-14FF	
4GG-14GG	
4HH-14HH	
4II-14II	
4JJ-14JJ	
4KK-14KK	
4LL-14LL	
4MM-14MM	
4NN-14NN	
4OO-14OO	
4PP-14PP	
4QQ-14QQ	
4RR-14RR	
4UU-14UU	
4VV-14VV	
4WW-14WW	
4XX-14XX	
4YY-14YY	
4ZZ-14ZZ	
4AA-14AA	
4BB-14BB	
4CC-14CC	
4DD-14DD	
4EE-14EE	
4FF-14FF	
4GG-14GG	
4HH-14HH	
4II-14II	
4JJ-14JJ	
4KK-14KK	
4LL-14LL	
4MM-14MM	
4NN-14NN	
4OO-14OO	
4PP-14PP	
4QQ-14QQ	
4RR-14RR	
4UU-14UU	
4VV-14VV	
4WW-14WW	
4XX-14XX	
4YY-14YY	
4ZZ-14ZZ	
4AA-14AA	
4BB-14BB	
4CC-14CC</td	

24" x 12" LARGE ARROW SIGN TYPICAL

(1 DIRECTION - W 1-6)

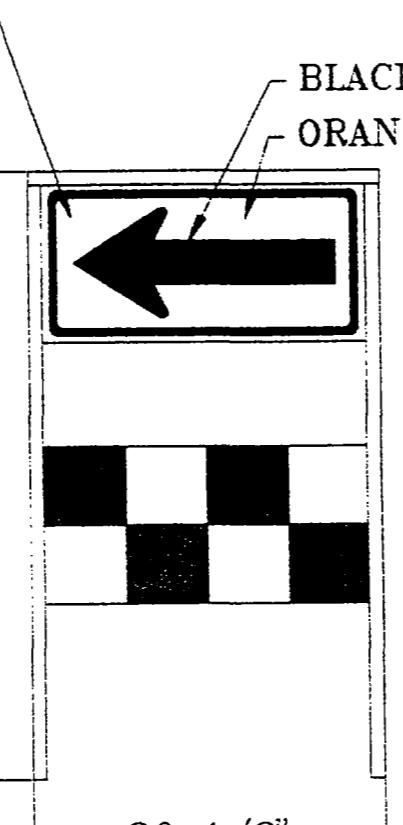


43"

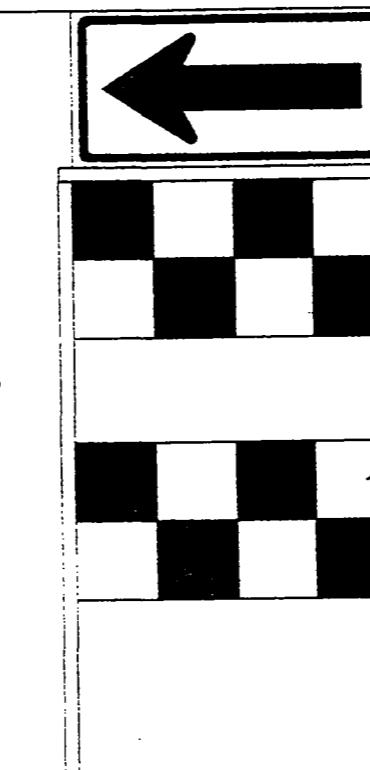
26 1/2"

HINGED PANEL

BLACK
ORANGE



55"

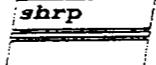


SLIDING PANEL

6" X 6" SQUARE (WHITE) TYPICAL

6" X 6" SQUARE (ORANGE) TYPICAL

24" X 12" PANEL TYPICAL

 STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

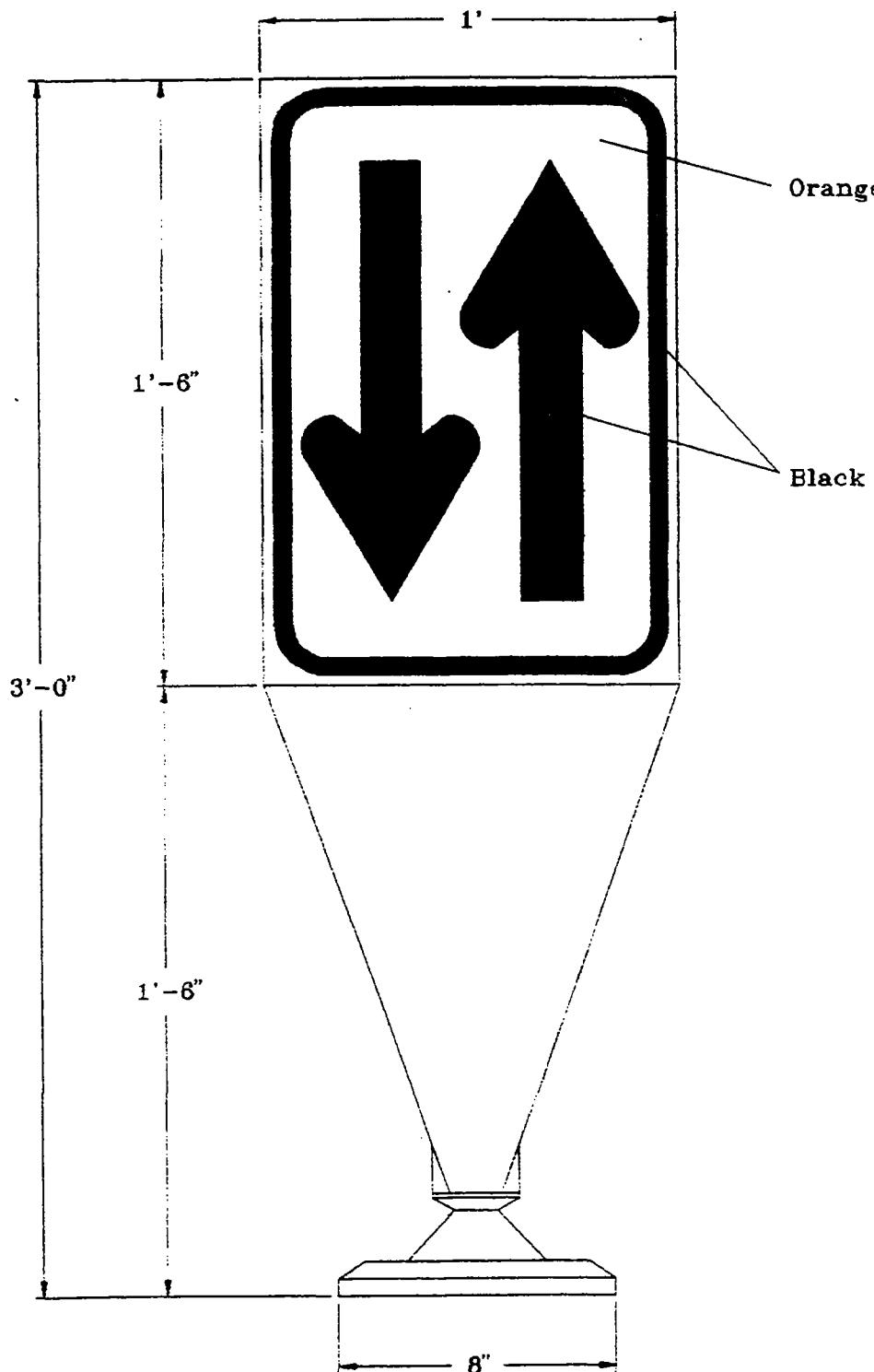
(816) 254-1788

FAX (816) 254-4654

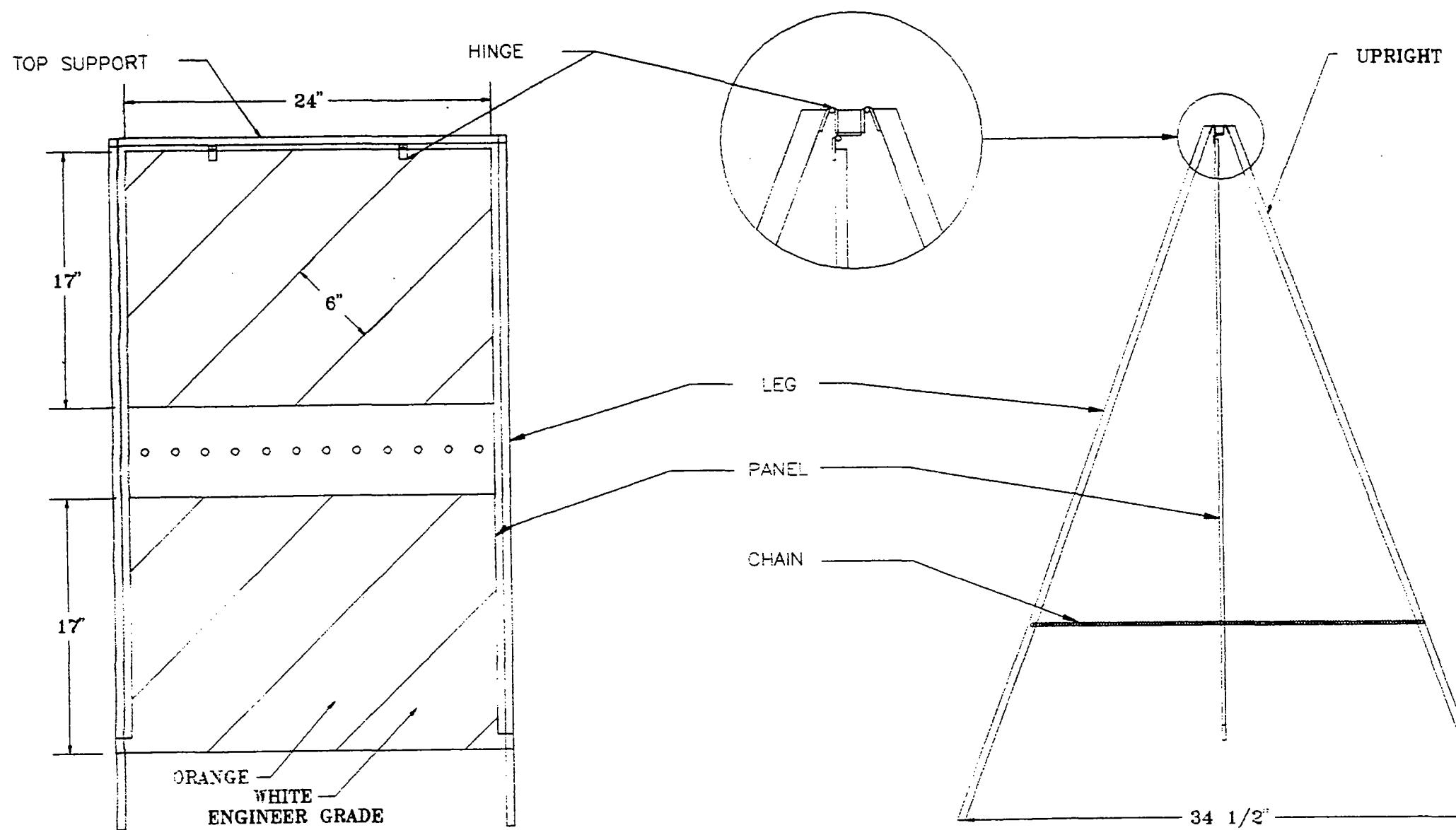
TITLE: DRAWN BY: RLM
DIRECTION INDICATOR BARRICADE REVISED: N/A

ASSEMBLY: N/A SCALE: NONE

DRAWING NUMBER: 1 OF 1 DATE: 9-24-92



<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. (816) 254-1788	
P.O. Box 348 FAX (816) 254-4654	
Independence, Missouri 64050	
TITLE: Opposing Traffic Lane Divider DRAWN BY: JMM	
REVISED: ---	
ASSEMBLY: N/A SCALE: 1/8	
DRAWING NUMBER: 1 of 1 DATE: 8-25-92	



shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

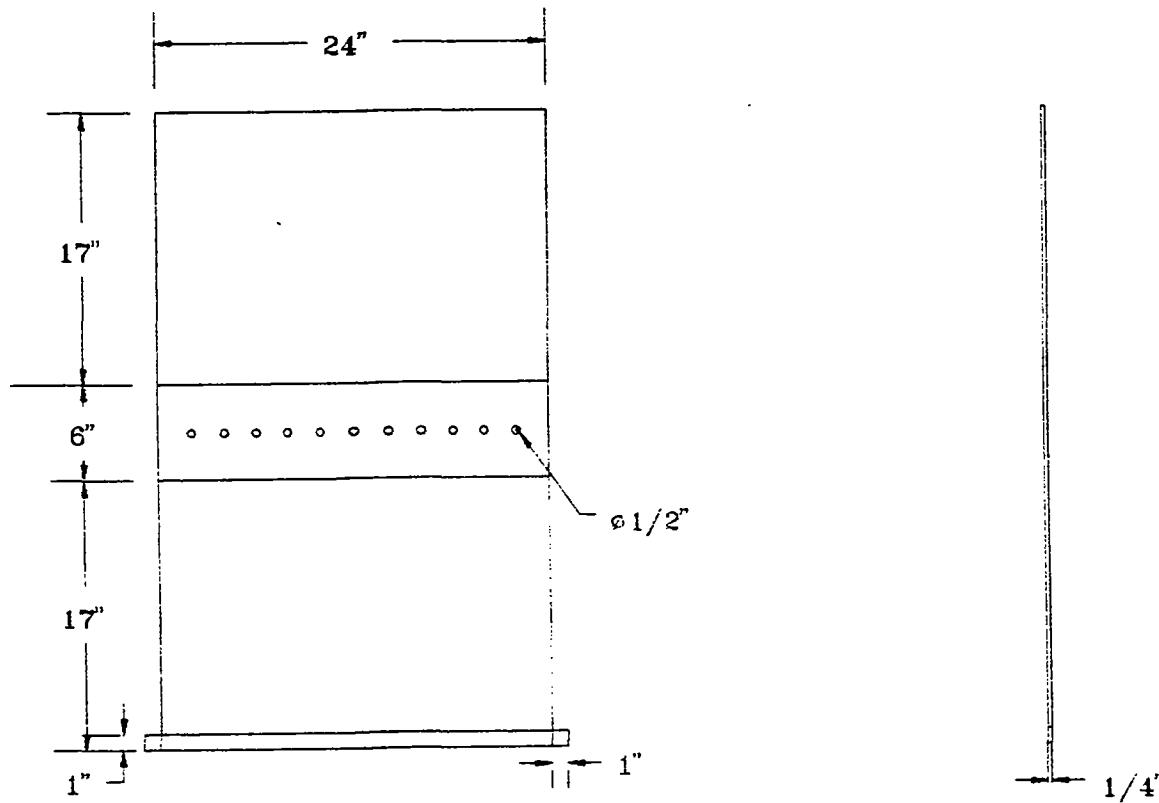
Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

(816) 254-1788

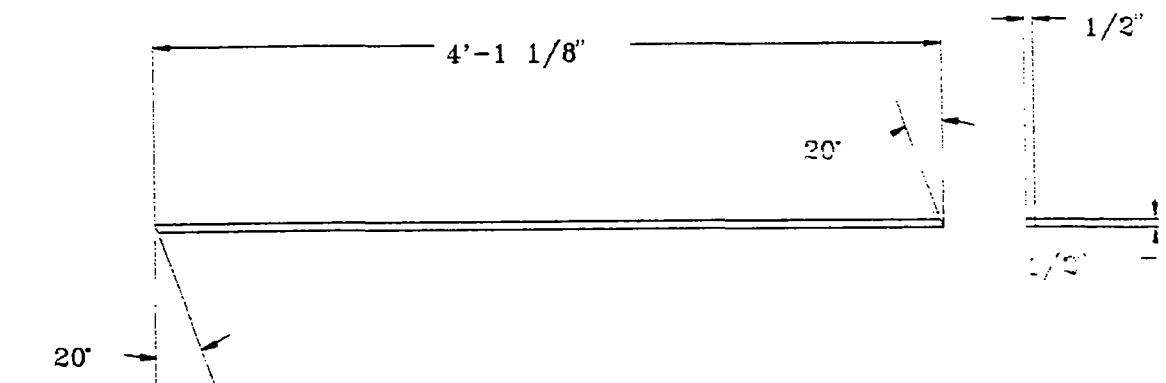
FAX (816) 254-4654



TITLE:	DRAWN BY: JMM
PORTABLE SOFT BARRICADE SYSTEM	REVISED: RLM
ASSEMBLY: N/A	SCALE: NONE
DRAWING NUMBER: 1 OF 4	DATE: 8-13-92



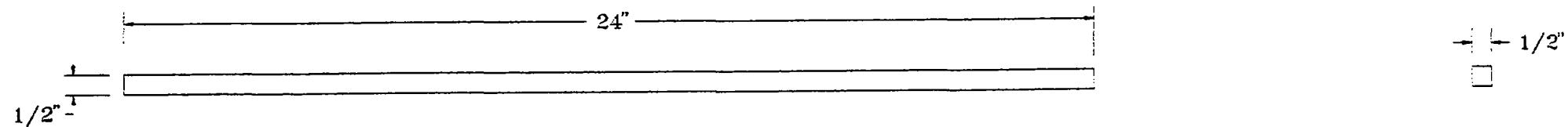
PANEL



LEG SUPPORT

shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. (816) 254-1788	
P.O. Box 348	
Independence, Missouri 64050	
TITLE: DRAWN BY: JMM	
PORTABLE SOFT BARRICADE SYSTEM REVISED: RLM	
ASSEMBLY: N/A	SCALE: NONE
DRAWING NUMBER: 2 OF 4 DATE: 8-13-92	

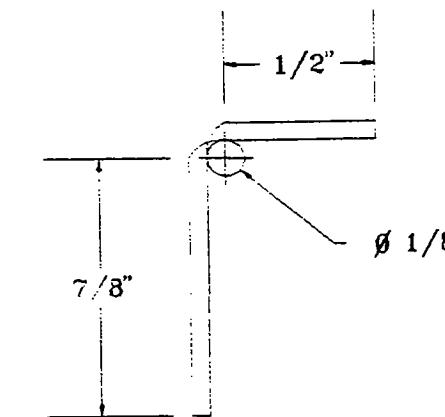
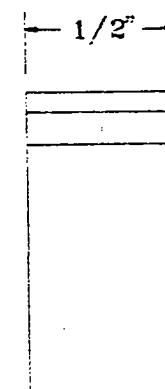
2'-2" CHAIN FOR LEG SUPPORT



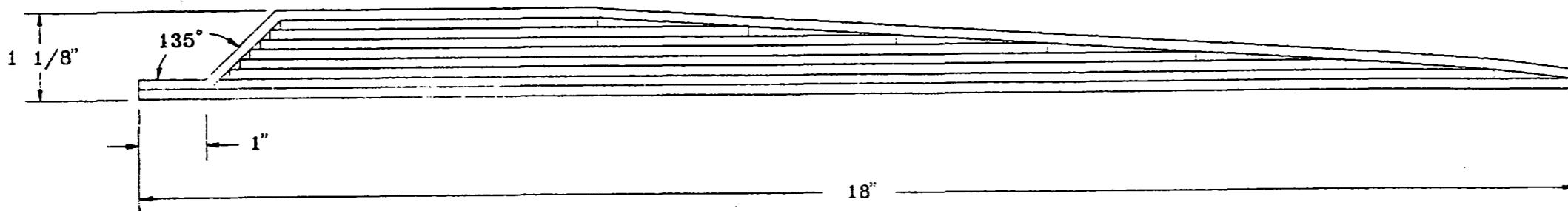
TOP SUPPORT

<i>shrp</i>		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 FAX (816) 254-4654
TITLE: PORTABLE SOFT BARRICADE SYSTEM		DRAWN BY: JMM REVISED: RLM
ASSEMBLY: N/A		SCALE: NONE
DRAWING NUMBER: 3 OF 4		DATE: 8-13-92

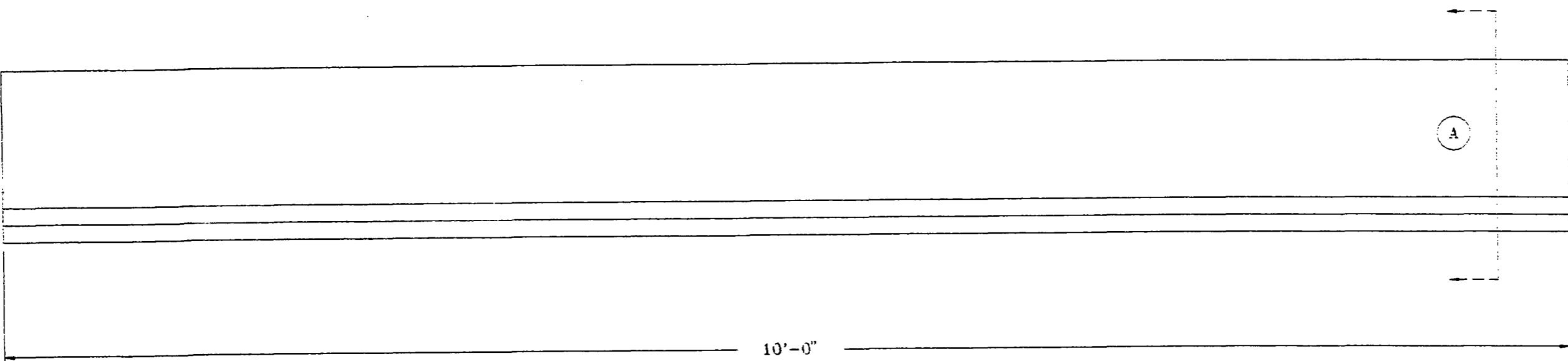
HINGE FOR LEG & PANEL



<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc.		(816) 254-1788
P.O. Box 348		FAX (816) 254-4654
Independence, Missouri 64050		<i>gme</i>
TITLE:	DRAWN BY: JMM	
PORTABLE SOFT BARRICADE SYSTEM		REVISED: RLM
ASSEMBLY: N/A	SCALE: NONE	
DRAWING NUMBER: 4 OF 4		DATE: 8-13-92

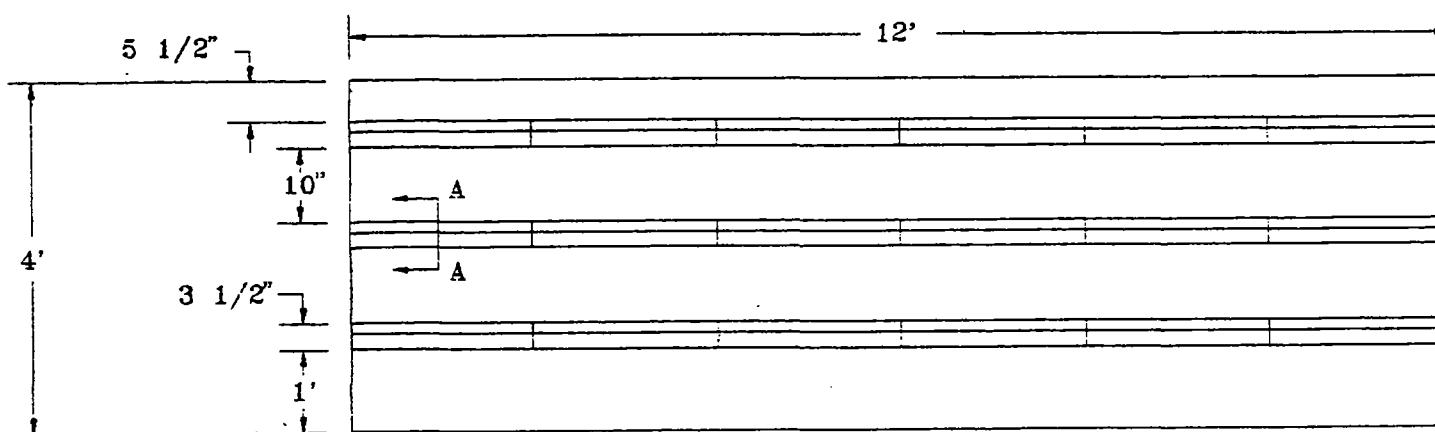


SECTION A



Note: Bump constructed of 1/8" neoprene rubber strips, layered with contact cement to form bump.

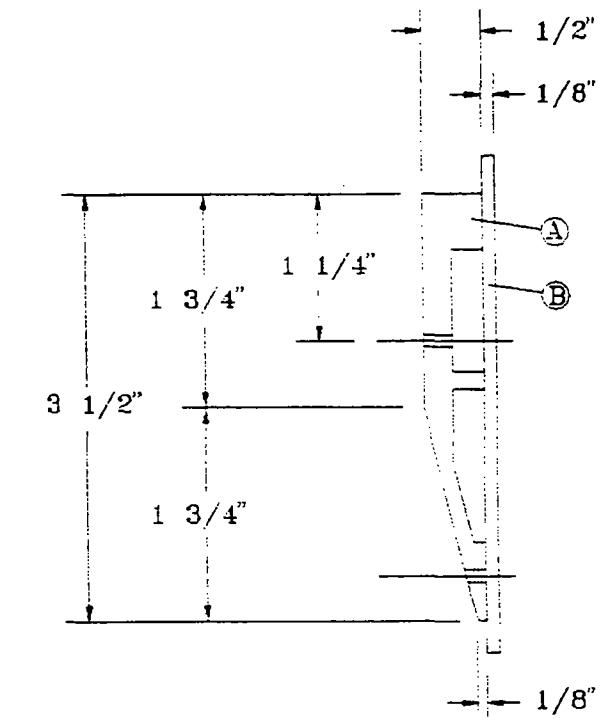
<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc.		
P.O. Box 348		
Independence, Missouri 64050		
TITLE: Portable Speed Bump		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 1 of 1		DATE: 8/25/92



Rumble Mat Assembly



DIRECTION OF TRAFFIC



Section A - A



DIRECTION OF TRAFFIC

(A) - Rumble Bar is AES Plastic (Hard).

(B) - Mat is Neoprene Rubber (Soft).

Note: Each Rumble Bar is Comprised of
Six 24" Sections.

shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050

(816) 254-1788

FAX (816) 254-4654

TITLE: Traveled Way Rumble Mat

DRAWN BY: JMM

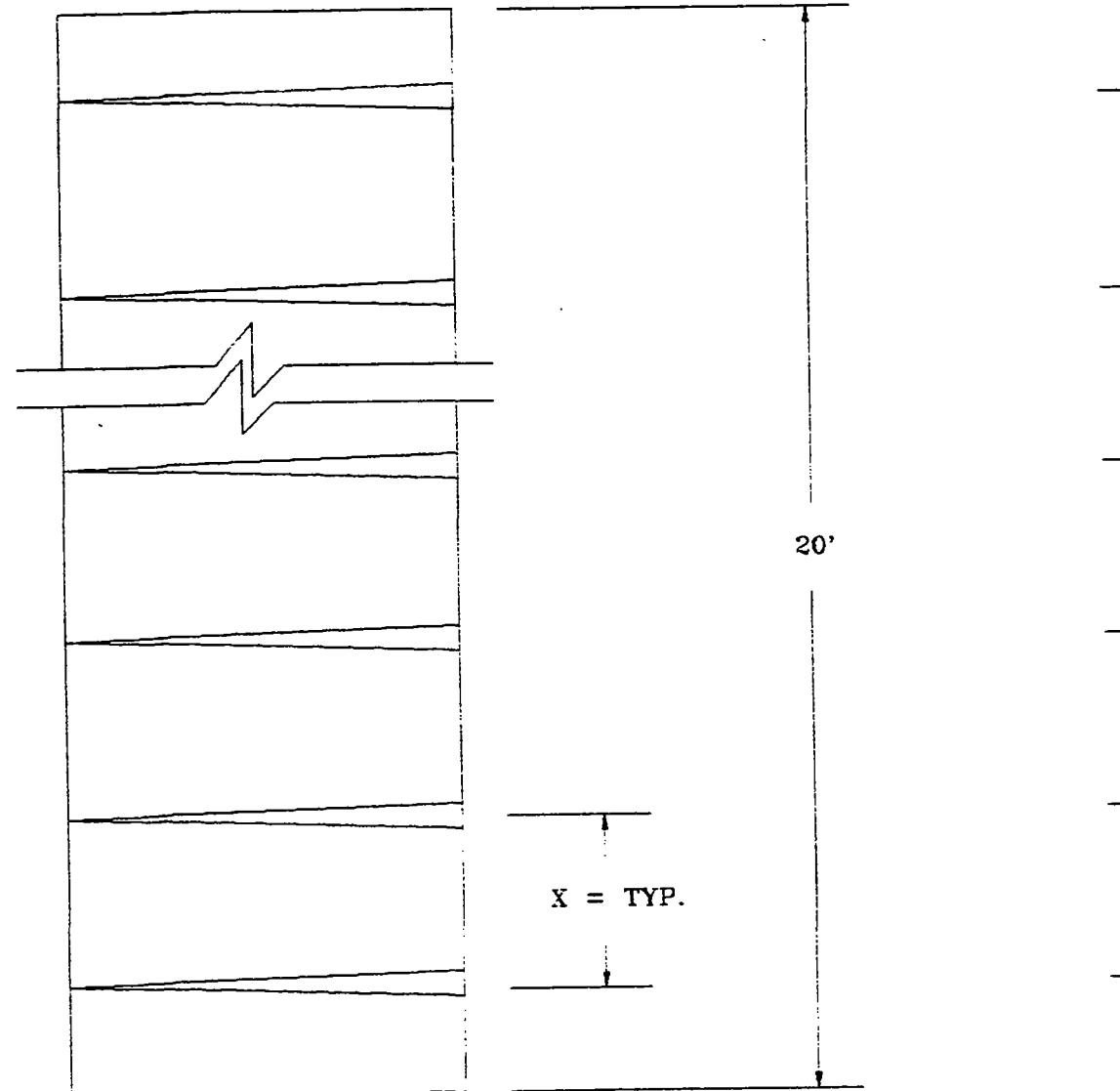
REVISED: ---

ASSEMBLY: N/A

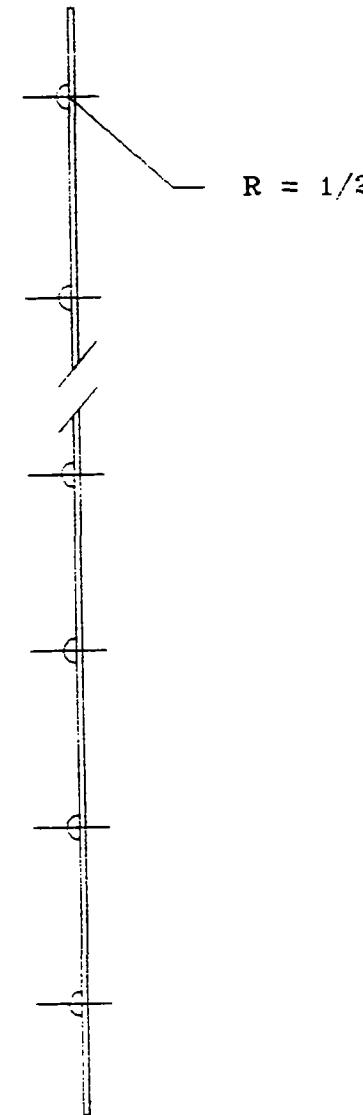
SCALE: None

DRAWING NUMBER: 1 of 1

DATE: 8-25-92



Length = 20 ft.
26 Ridges (Half Cones) Spaced at 9"
X = 9" - Max. Vibration

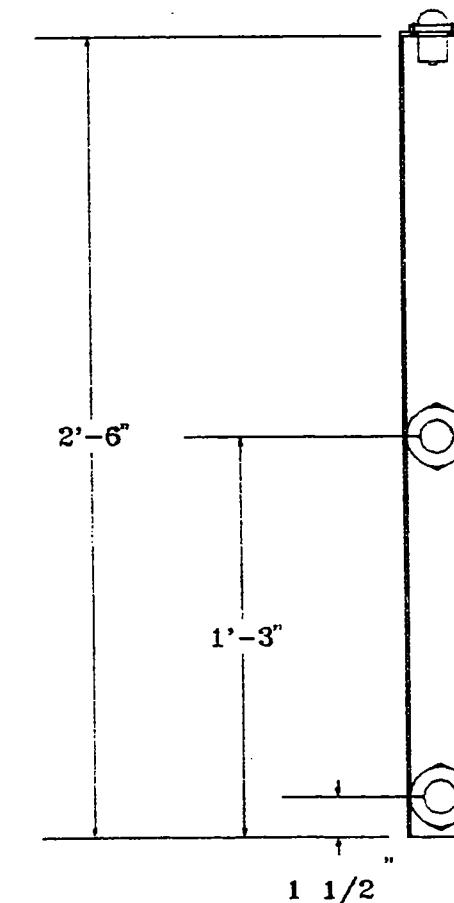
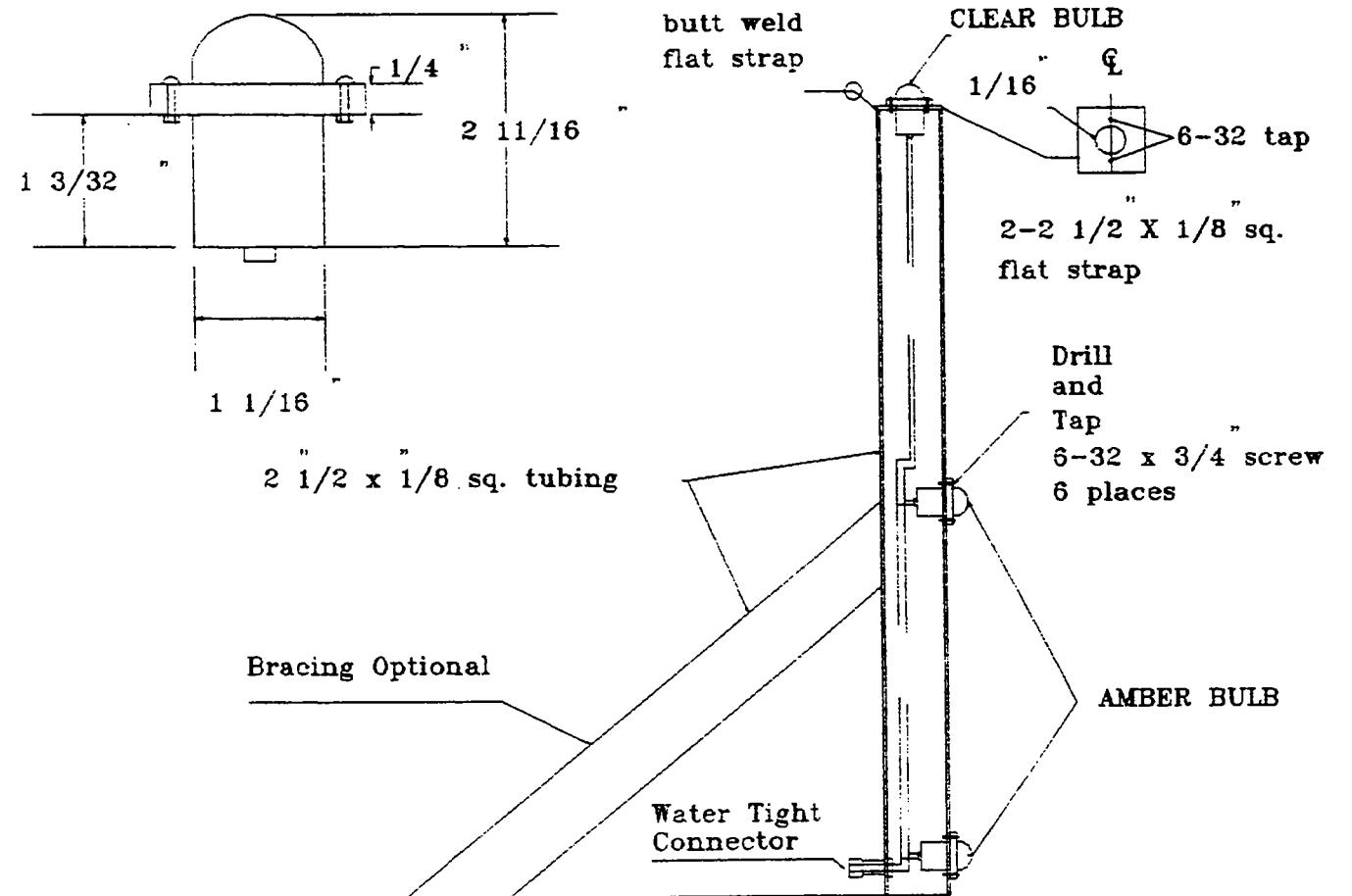


<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc.		(816) 254-1788
P.O. Box 348		FAX (816) 254-4654
Independence, Missouri 64050		
TITLE: Rumble Stripe		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 1 of 1		DATE: 8-25-92

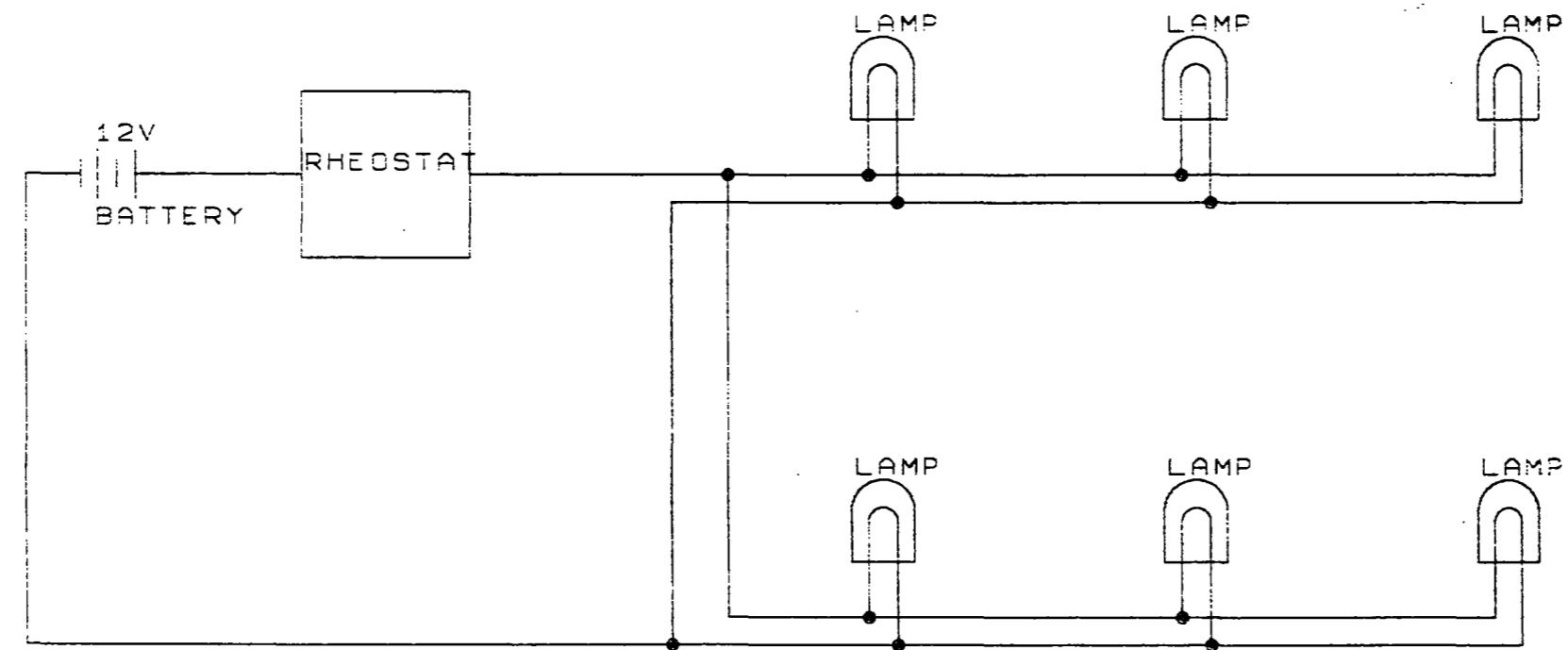
Snow Plow Blade Markers

$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{1}{8}$ " sq. tubing

LIGHT ASSY.



	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	(816) 254-1788 FAX (816) 254-4654	
TITLE: Snow Plow Blade Markers	DRAWN BY: RLM	
	REVISED: RLM	
ASSEMBLY: N/A	SCALE: NONE	
DRAWING NUMBER: 1 OF 2		DATE: 8-10-92



LIGHT ASSEMBLY NUMBER A608
BULB NUMBER A508-14

<i>shrp</i>		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		
TITLE: SNOW PLOW BLADE MARKERS		DRAWN BY: BBF
		REVISED: BBF
ASSEMBLY: ELECTRICAL PLANS		SCALE: NONE
DRAWING NUMBER: 2 OF 2		DATE: 10-20-92

Specifications

Power input	12 volts, D.C.
Power output	3 parallel outputs 12 volts, D.C.
Maximum current	10 amps. per output
Lamp Dim	Manual
Display pattern	Eeprom programable Sequentail Phase 3, 2, 1, off

Sequence timing

Lights on	1 second
Off between phases	1/10 second
Off time between phase 1 and 3	1 second

Dimensions

Height	2.5 inches
Width	7.5 inches
Length	9.375 inches

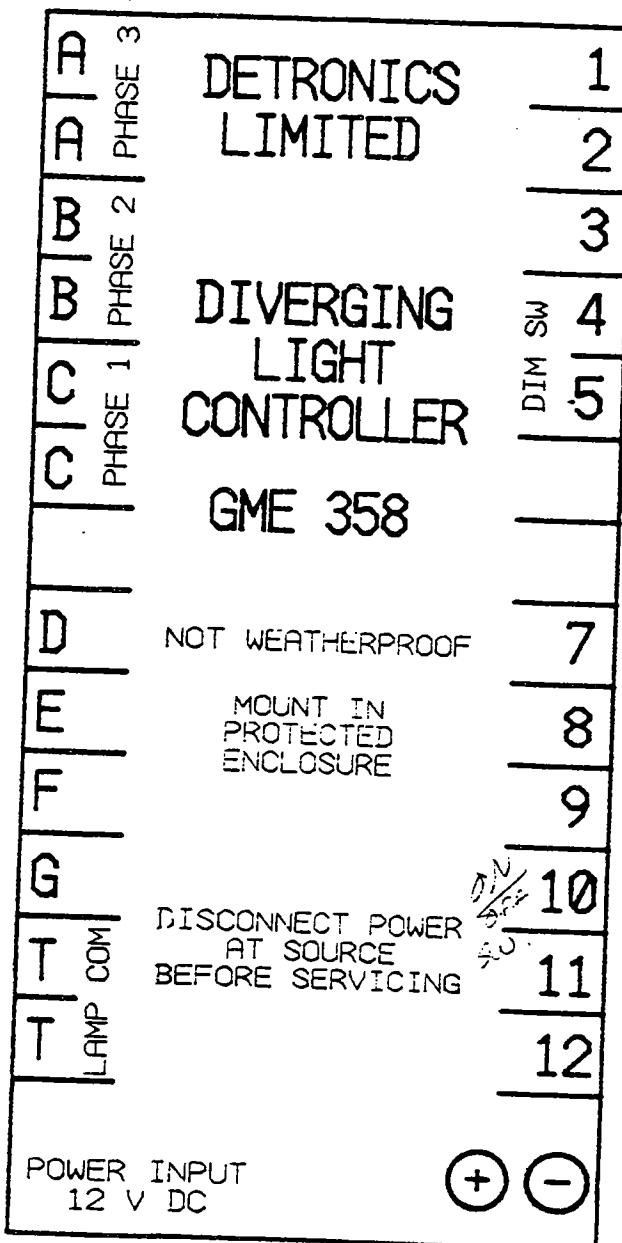
Detronics Limited

Diverging Lights
Controller

Model GME-358

Made for Graham-Migletz Enterprises,
Inc. by

Detronics Limited
4003 Bloomington Rd., RR 4
Stouffville, Ontario
Canada L4A 7X5
Phone 416-640-1216 Fax 416-640-5177



Front Panel of Diverging Light Controller
Install in accordance with instructions

Installation

Mount the GME-358 controller in a weatherproof location.

Connect the controller as shown in the wiring schematic.

- The lamps of the display panel are connected to terminals A,A,B,B, and C,C. 18 gauge wire minimum, use larger guage for long distances to minimize voltage drop.
- The common of all the lamps connects to both terminals marked T,T.
- Manual dim/bright switch connects to terminals 4 and 5.
- Install a 40 Amp. circuit breaker close to the battery in the positive conductor and connect it to the controller + terminal.
- The negative power conductor from the battery connects to the controller - terminal. 10 gauge wire is recommended for the power feeds.
- An on/off switch can be mounted in a conveniant location in the truck cab and connects to terminals 10 and 11 on the controller. 20 gauge wire is adequate. Shielded cable, ie. microphone cable, is recomended, with the shield connected to the controller case by the mounting bolt. Insulate the shield end at the switch.

Please note;

The controller is not weatherproof and must be mounted in a protected location.

The output of the controller is not short circuit protected. Before doing any service to the display panel or the controller, disconnect the power at the battery.

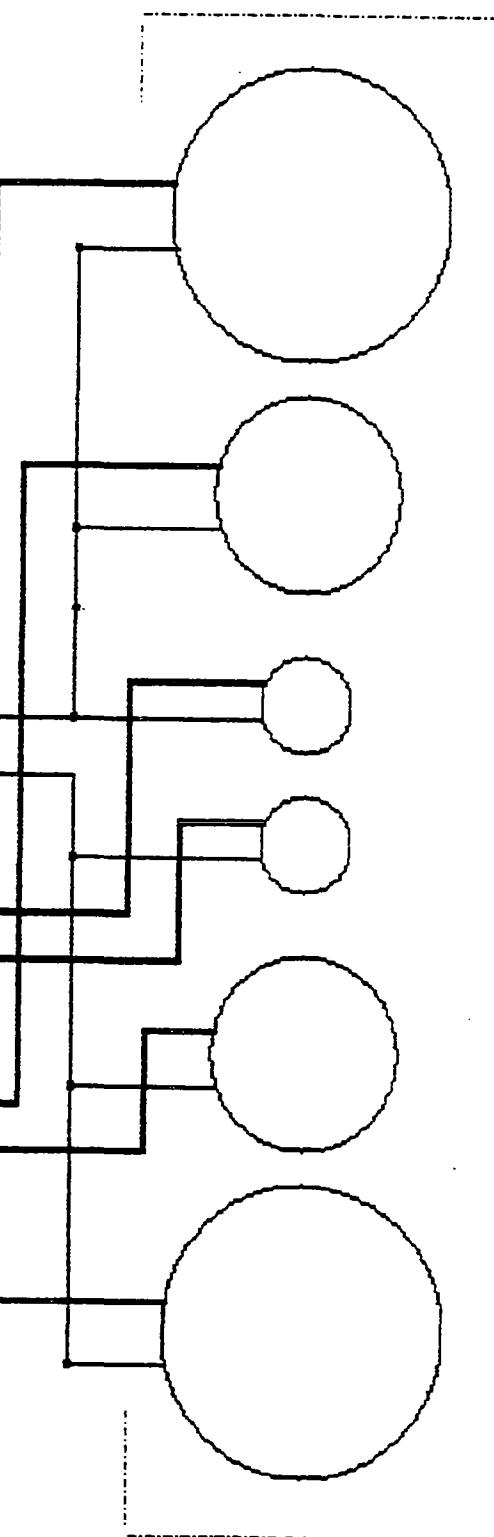
If all the panel display lamps come on and do not flash, check the polarity of the power source.

This device is designed to be powered from a 12 volt, D.C. negitive ground vehicle with a properly functioning electrical system. Do not attempt to power the controller from any other type of power supply.

The display sequence is programed into an integrated circuit and can be changed if desired. Please contact Detronics for additional information. These components are delicate and can be destroyed by improper handling. Do not open the controller.

Thank you for choosing Detronics Limited. If we can ever be of assisstance, please do not hesitate to call, 416-640-1216.

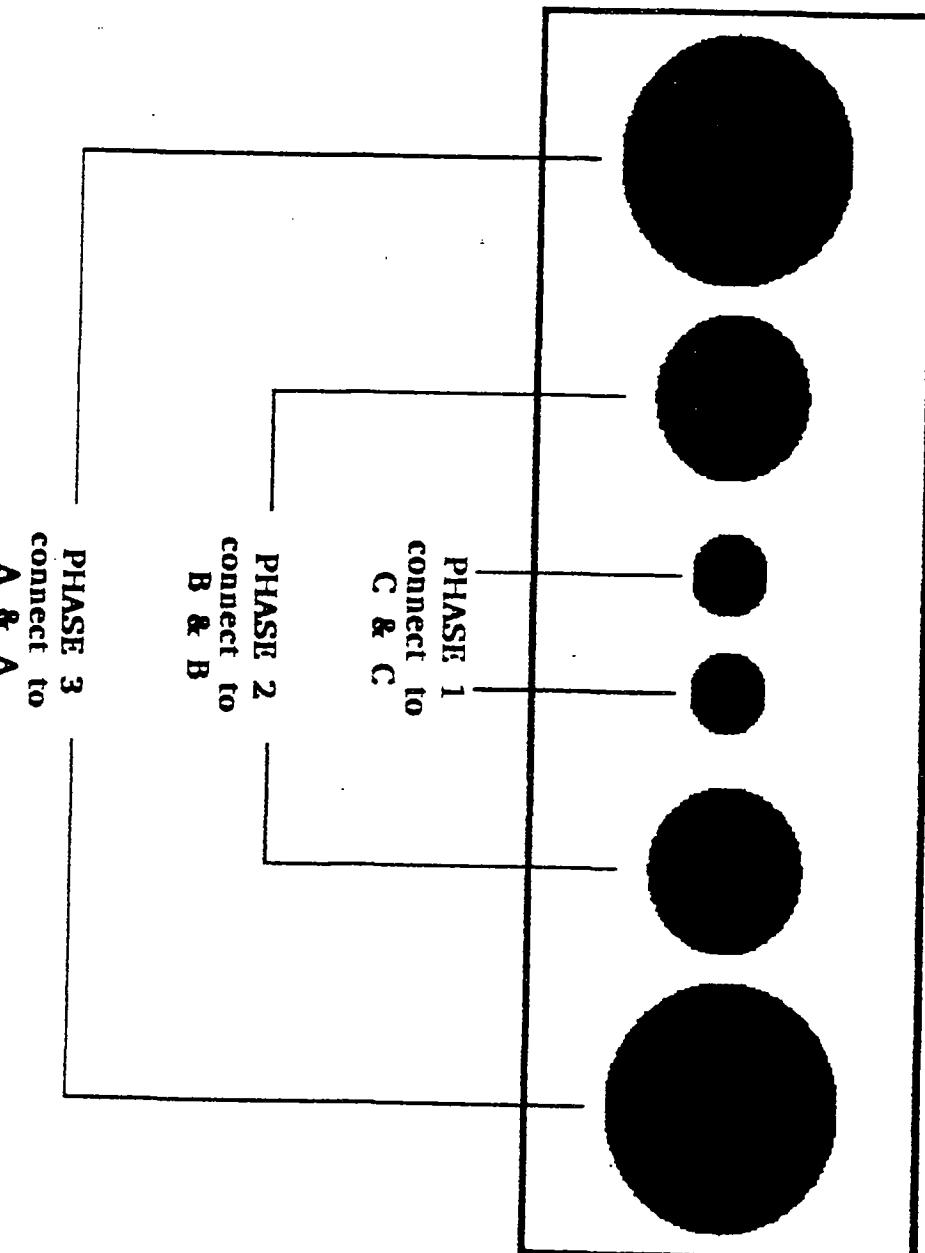
DIVERGING LIGHTS DISPLAY PANEL



Wiring schematic for GME 358 controller to 6 lamp display panel.

Detronics Limited 4003 Bloomington Rd.
Stouffville, Ont. Canada 416-640-1216

DIVERGING LIGHTS DISPLAY
PANEL



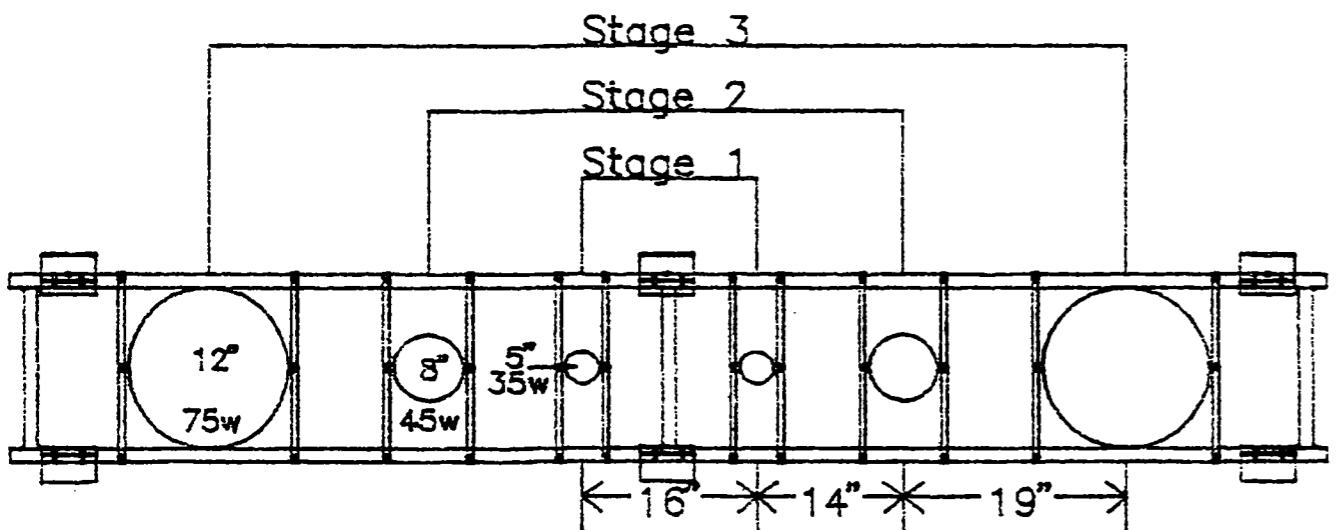
LIGHT SPECIFICATIONS FOR THE DIVERGING LIGHTS

<u>SIZE</u>	<u>DIAMETER</u>	<u>TYPE</u>	<u>WATTS</u>
SMALL	5"	SB	35
MEDIUM	8"	SB	40
LARGE	12"	b	75

SB Sealed Beam
b Bulb

The diameters are the size of the amber lenses, on the small and medium lights they are also the size of the sealed beam.

All lamps are dc.

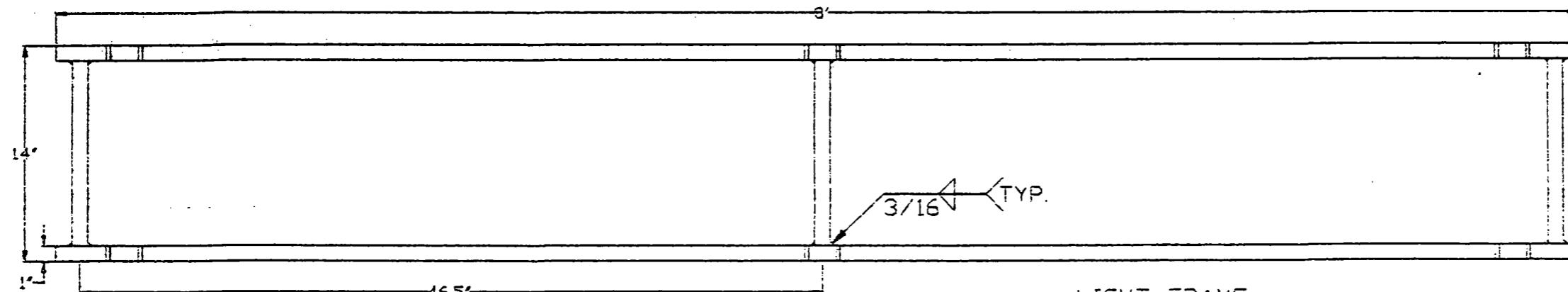
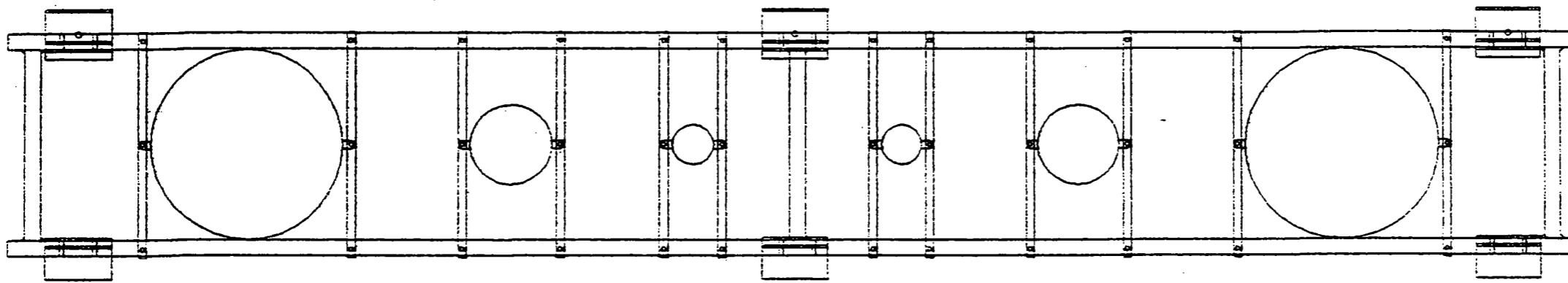


The cycle from stage 1 on to stage 2 on is approx. 2 sec.

A cycle = stage 1 to stage 2 to stage 3.

The 5" and 8" lights are sealed beams.

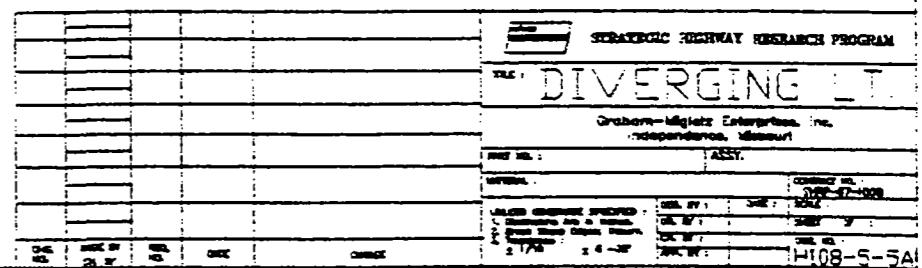
Each light cycle is on about 1 sec.

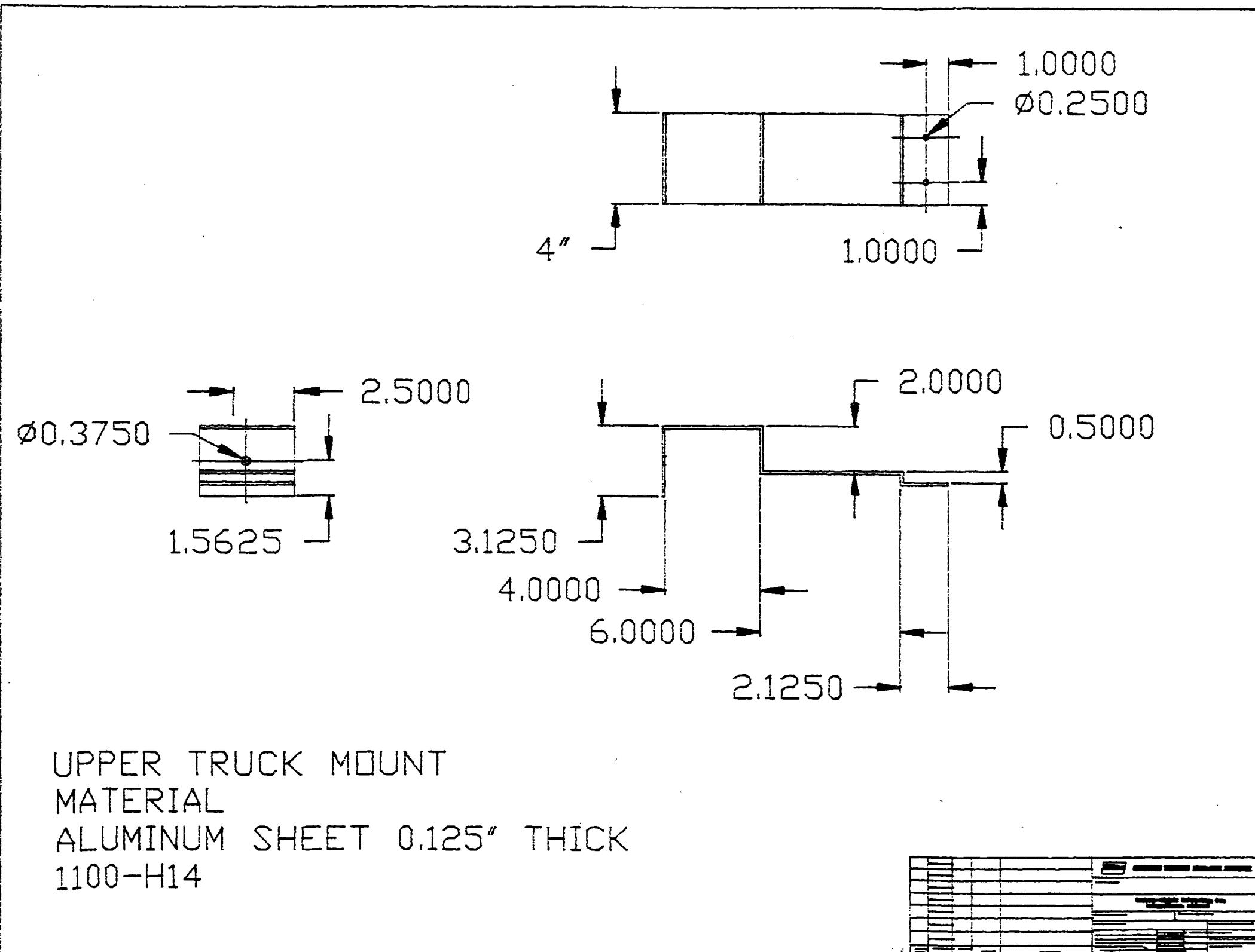


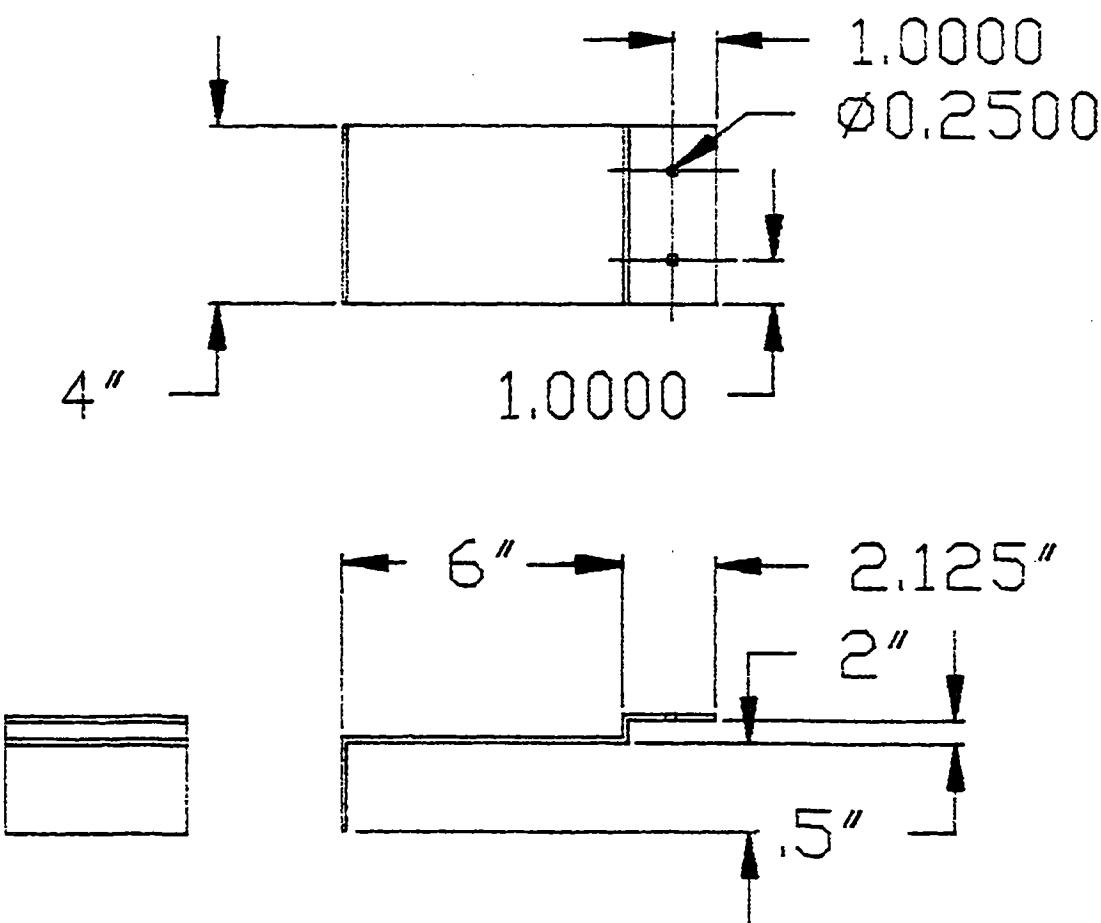
LIGHT FRAME

MATERIAL

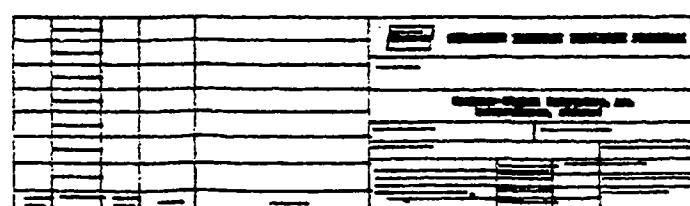
ALUMINUM TUBING 1" X 2" X 0.125"
6063-T52

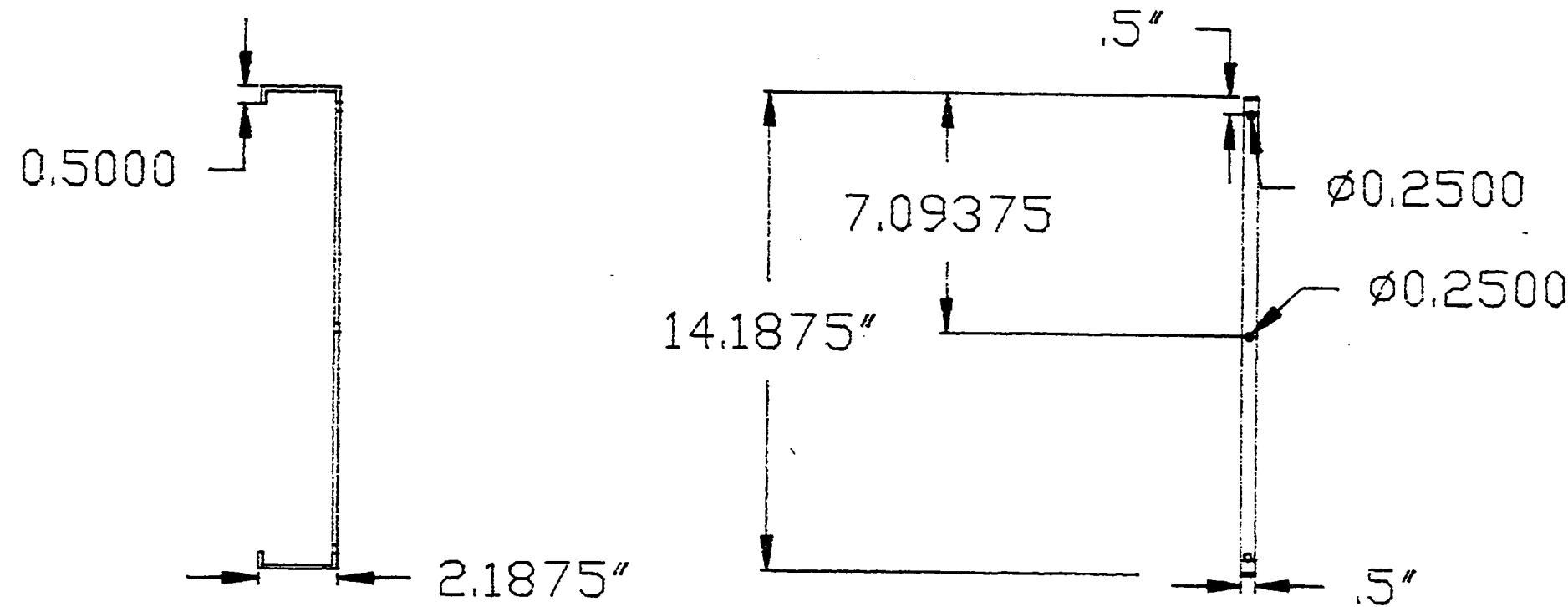






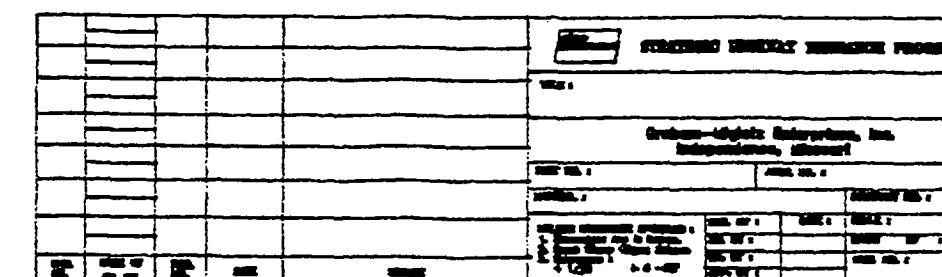
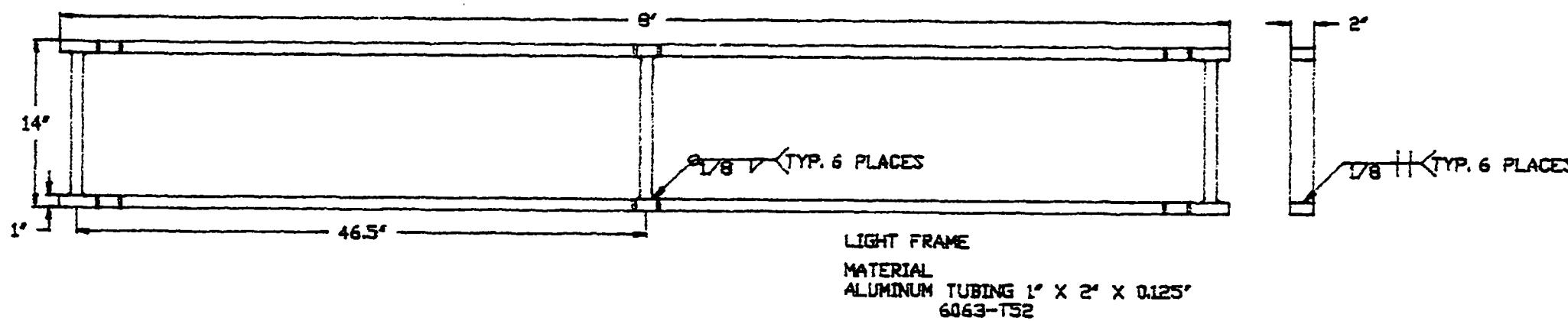
LOWER TRUCK MOUNT
MATERIAL
ALUMINUM SHEET 0.125" THICK
1100-H14

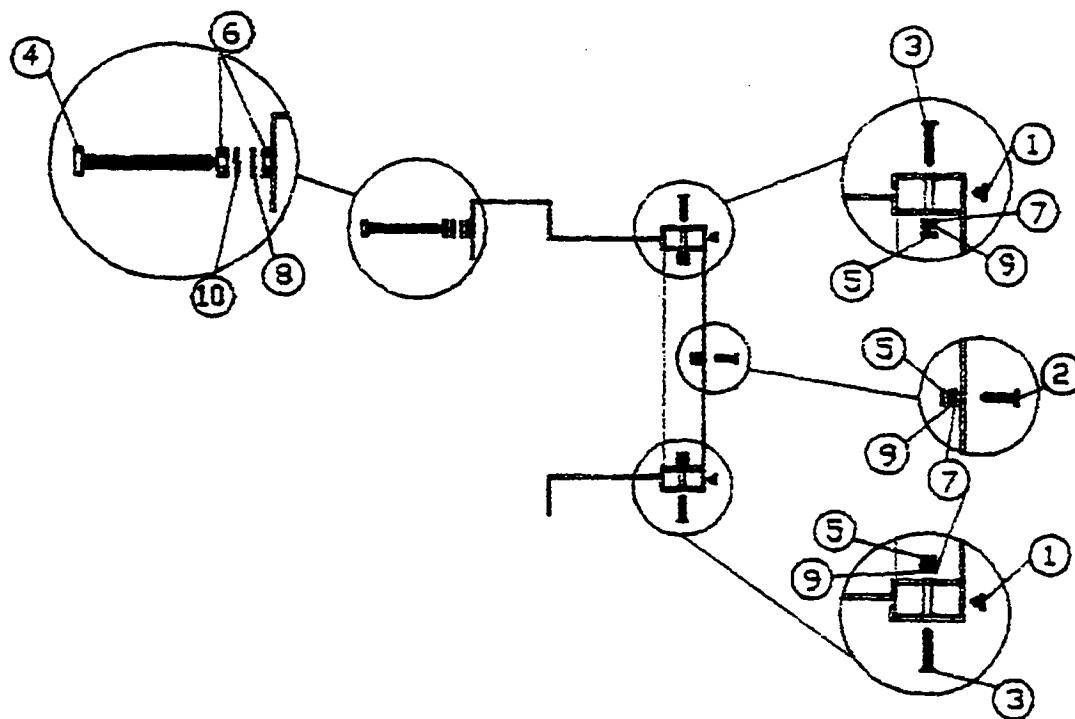




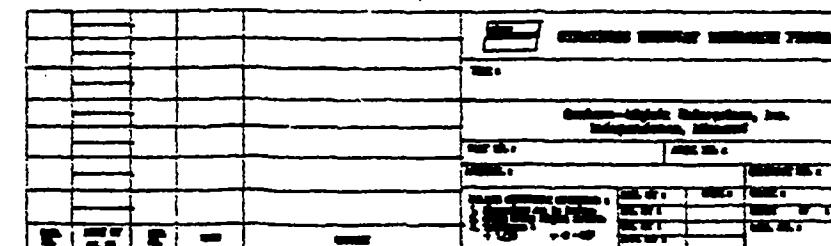
LIGHT BRACKET
MATERIAL
ALUMINUM SHEET 0.125" THICK
1100-H14

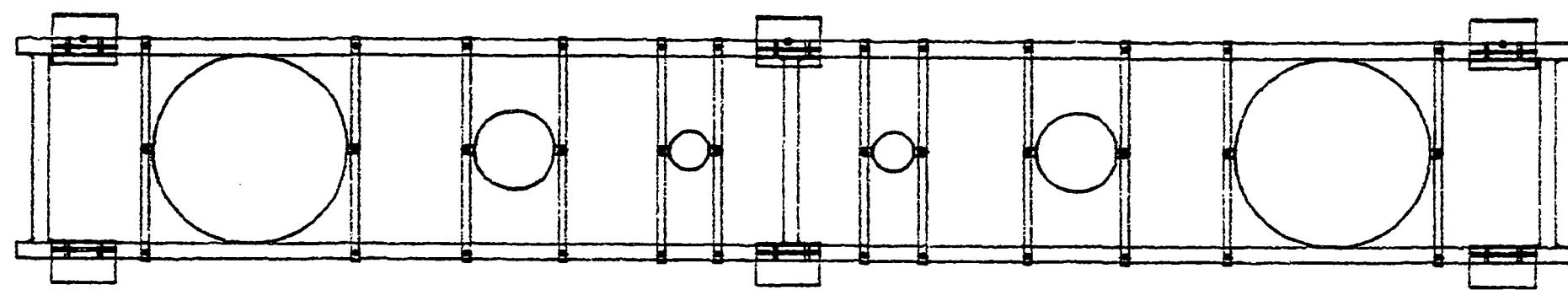


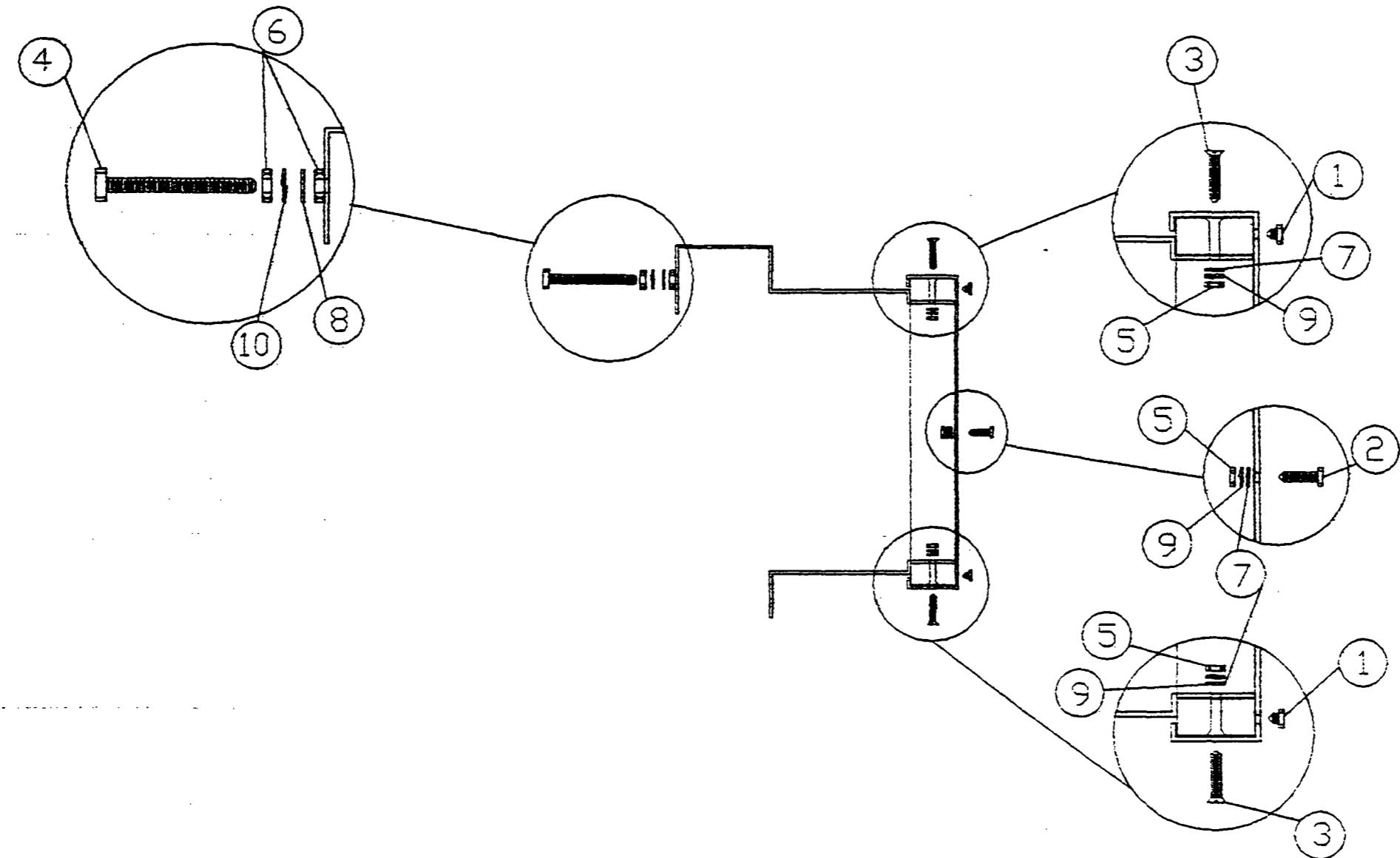




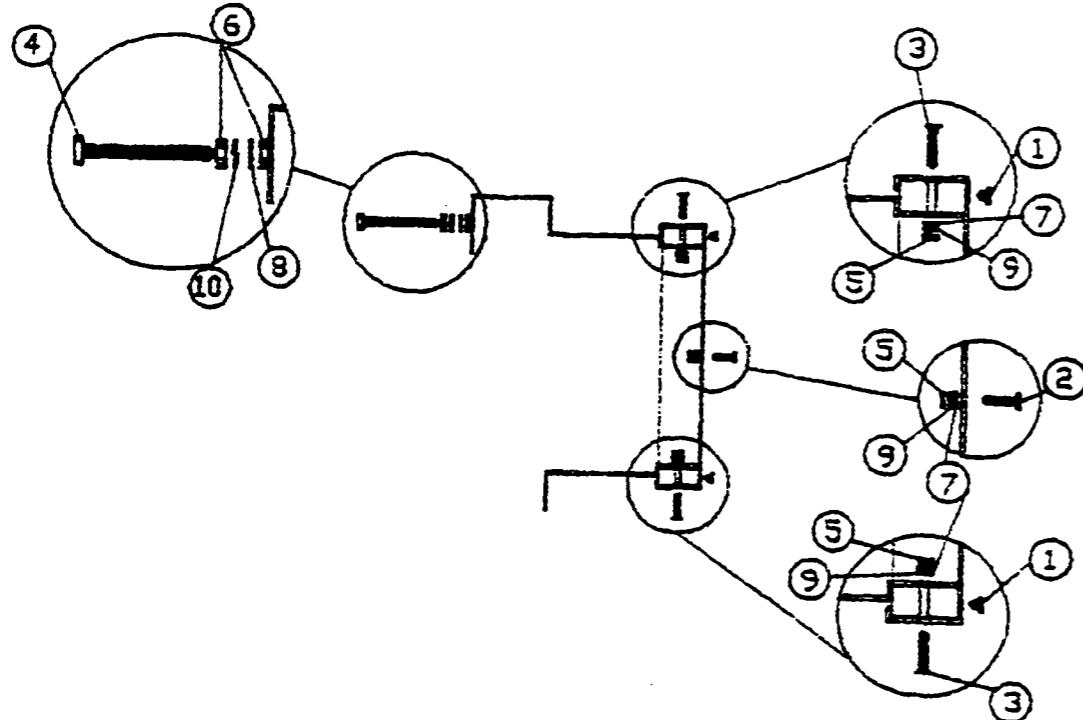
PART #	ITEM	MATERIAL	QTY.
1	1/4-20 UNC - 2A X 1/4 L HEAVY HEX STRUCTURAL BOLT	SAE GRADE 5	24
2	1/4-20 UNC - 2A X 1 L HEAVY HEX STRUCTURAL BOLT	SAE GRADE 5	12
3	1/4-20 UNC - 2A X 1 1/4 L COUNTERSUNK HEAD MACHINE SCREW	SAE GRADE 5	12
4	3/8-16 UNC - 2A X 4 L HEAVY HEX STRUCTURAL BOLT	SAE GRADE 5	3
5	1/4-20 UNC - 2B HEAVY HEX FLAT NUT	SAE GRADE 5	24
6	3/8-16 UNC - 2B HEAVY HEX FLAT NUT	SAE GRADE 5	6
7	1/4 SERIES W TYPE A PLAIN WASHER	SAE GRADE 5	24
8	3/8 SERIES W TYPE A PLAIN WASHER	SAE GRADE 5	3
9	1/4 REGULAR HELICAL SPRING LOCK WASHER	SAE GRADE 5	24
10	3/8 REGULAR HELICAL SPRING LOCK WASHER	SAE GRADE 5	3



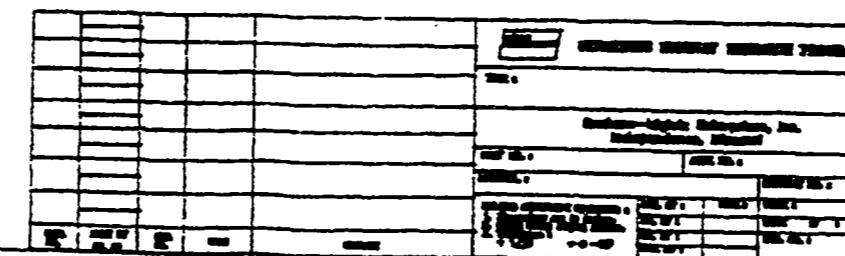


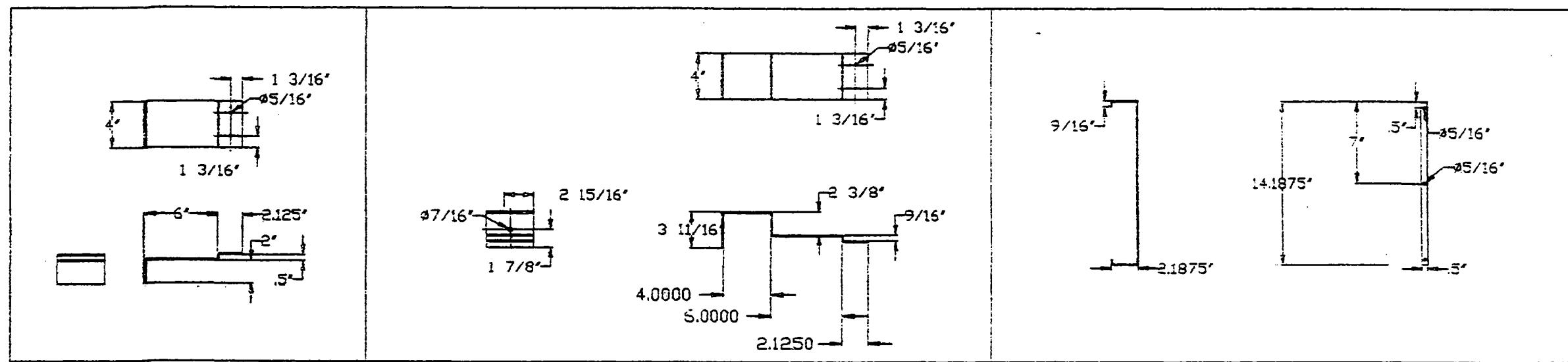


PART #	ITEM	MATERIAL	QTY.
1	1/4-20 UNC - 2A X 1/4 L HEAVY HEX STRUCTURAL BOLT	SAE GRADE 5	24
2	1/4-20 UNC - 2A X 1 1/4 L HEAVY HEX STRUCTURAL BOLT	SAE GRADE 5	12
3	1/4-20 UNC - 2A X 1 1/4 L COUNTERSUNK HEAD MACHINE SCREW	SAE GRADE 5	12
4	3/8-16 UNC - 2A X 4 L HEAVY HEX STRUCTURAL BOLT	SAE GRADE 5	3
5	1/4-20 UNC - 2B HEAVY HEX FLAT NUT	SAE GRADE 5	24
6	3/8-16 UNC - 2B HEAVY HEX FLAT NUT	SAE GRADE 5	6
7	1/4 SERIES W TYPE A PLAIN WASHER	SAE GRADE 5	24
8	3/8 SERIES W TYPE A PLAIN WASHER	SAE GRADE 5	3
9	1/4 REGULAR HELICAL SPRING LOCK WASHER	SAE GRADE 5	24
10	3/8 REGULAR HELICAL SPRING LOCK WASHER	SAE GRADE 5	3



PART #	ITEM	MATERIAL	QTY.
1	1/4-20 UNC - 2A X 1/4 L HEAVY HEX STRUCTURAL BOLT	SAE GRADE 5	24
2	1/4-20 UNC - 2A X 1 L HEAVY HEX STRUCTURAL BOLT	SAE GRADE 5	12
3	1/4-20 UNC - 2A X 1 1/4 L COUNTERSUNK HEAD MACHINE SCREW	SAE GRADE 5	12
4	3/8-16 UNC - 2A X 4 L HEAVY HEX STRUCTURAL BOLT	SAE GRADE 5	12
5	1/4-20 UNC - 2B HEAVY HEX FLAT NUT	SAE GRADE 5	3
6	3/8-16 UNC - 2B HEAVY HEX FLAT NUT	SAE GRADE 5	24
7	1/4 SERIES W TYPE A PLAIN WASHER	SAE GRADE 5	6
8	3/8 SERIES W TYPE A PLAIN WASHER	SAE GRADE 5	24
9	1/4 REGULAR HELICAL SPRING LOCK WASHER	SAE GRADE 5	3
10	3/8 REGULAR HELICAL SPRING LOCK WASHER	SAE GRADE 5	24
		SAE GRADE 5	3





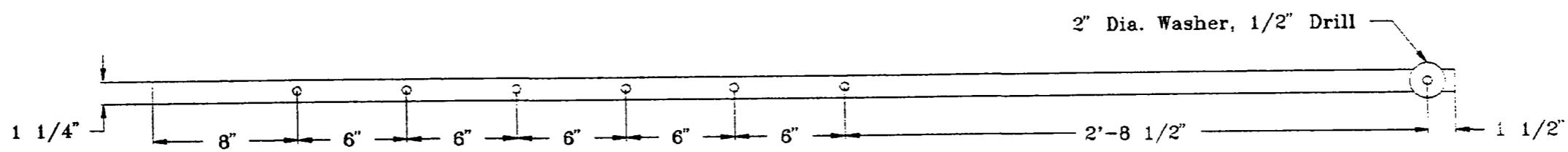
LOWER TRUCK MOUNT

UPPER TRUCK MOUNT

LIGHT BRACKET

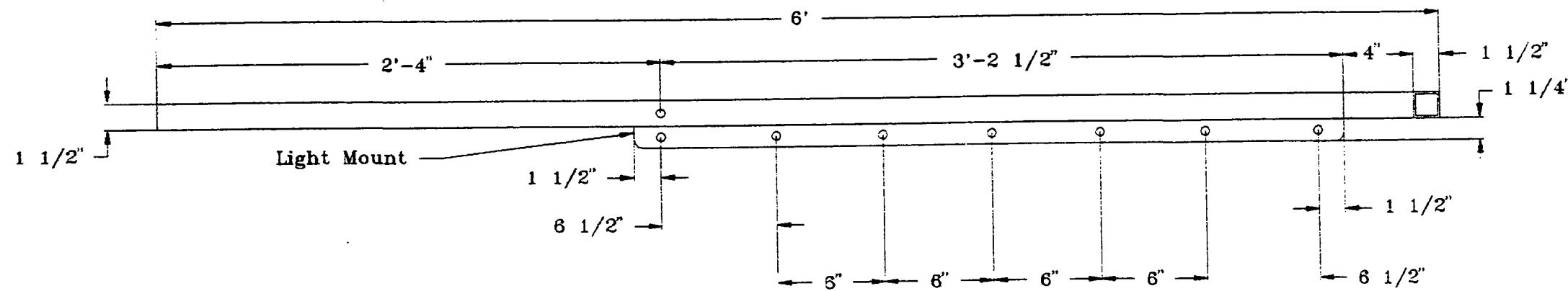
MATERIAL
ALUMINUM SHEET 0.125" THICK
1100-H14

STRATEGIC HIGHWAY RESEARCH PROGRAM											
DIVERGING L											
Grobars-Migatz Enterprises, Inc. Independence, Missouri											
PRINT NO. 1 ACTV.											
DRAWN BY: DATE: 10/10/68											
DESIGNED BY: DATE: 10/10/68											
APPROVED BY: DATE: 10/10/68											
MATERIALS APPROVED BY: DATE: 10/10/68											
100	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
H108-5-5B											

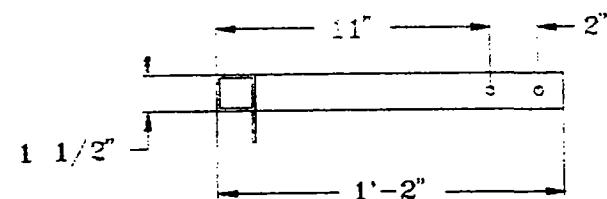


Internal Extension Tube
Typical of Both Sides
All Holes This View 1/2" Dia.
Material is 1/8" Steel

<i>shrp</i>		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 FAX (816) 254-4654
TITLE: Maintenance Vehicle Floodlight		DRAWN BY: JMM REVISED: ---
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 1 of 7		DATE: 8-26-92

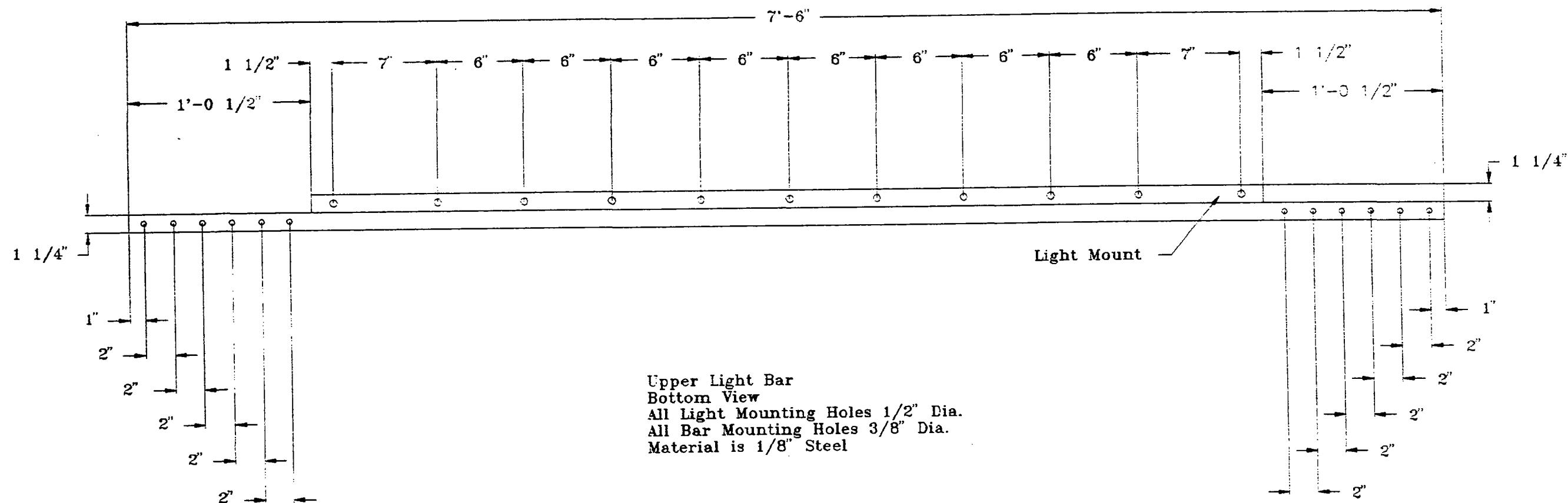


External Extension Tube
Right Side View
Light Mount Typical of Both Sides
All Holes This View 1/2" Dia.
Material is 1/8" Steel



External Extension Tube
Bottom View
All Holes This View 3/8"
Layout Typical of Both Sides
Material is 1/8" Steel

shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc.		(816) 254-1788
P.O. Box 348		FAX (816) 254-4654
Independence, Missouri 64050		
TITLE: Maintenance Vehicle Floodlight		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 2 of 7		DATE: 8-26-92



shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

(816) 254-1788

FAX (816) 254-4654



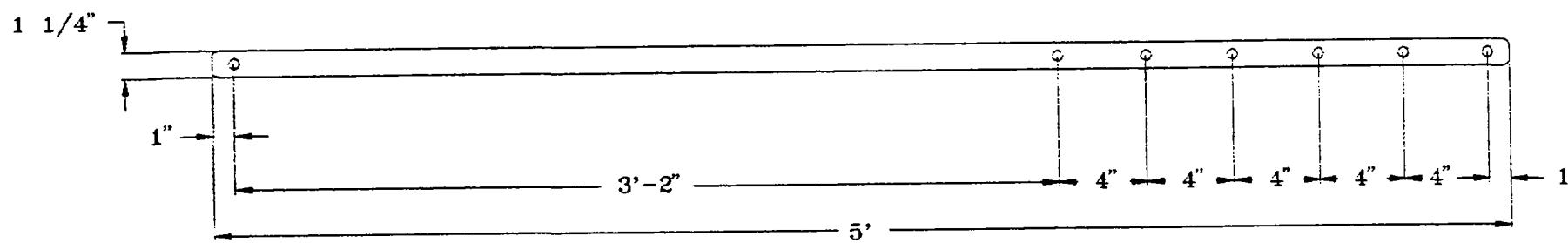
TITLE:	Maintenance Vehicle Floodlight	DRAWN BY: JMM
REVISED:	---	

ASSEMBLY: N/A

SCALE: None

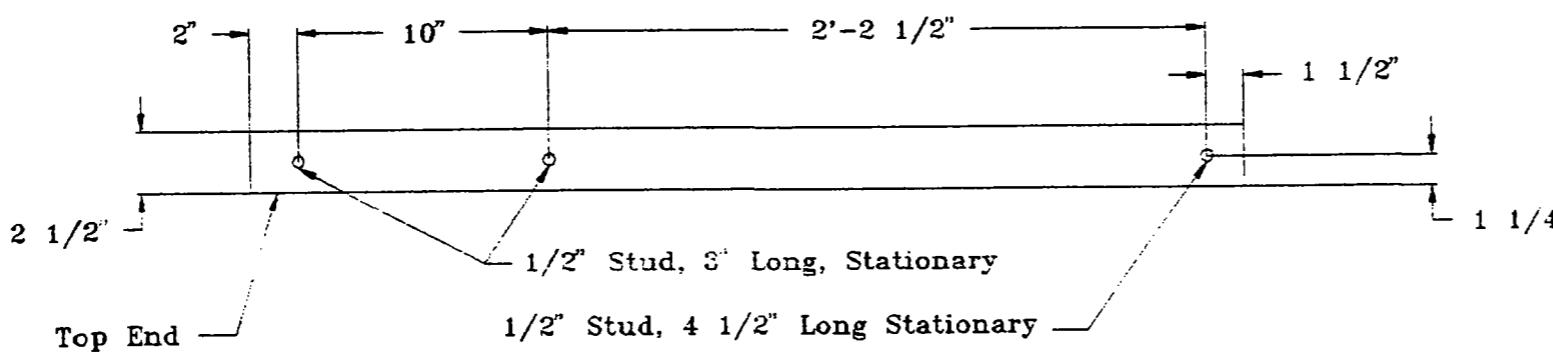
DRAWING NUMBER: 3 of 7

DATE: 8-26-92



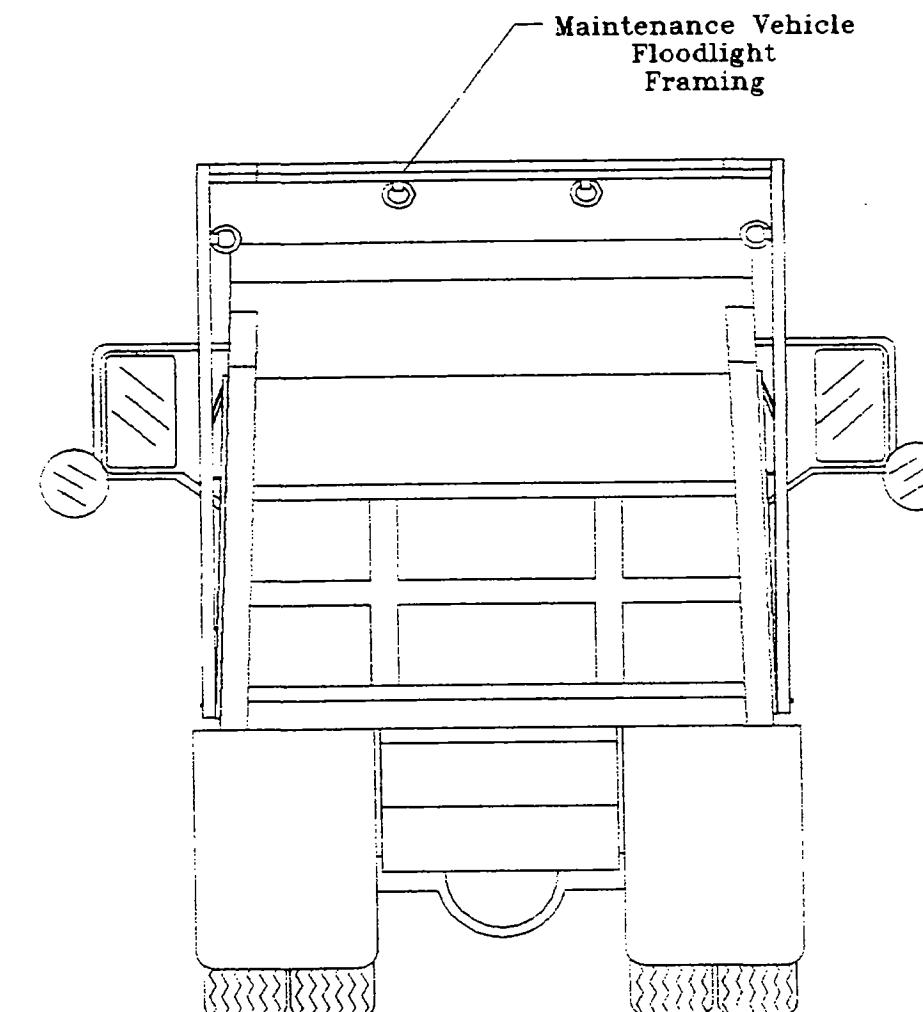
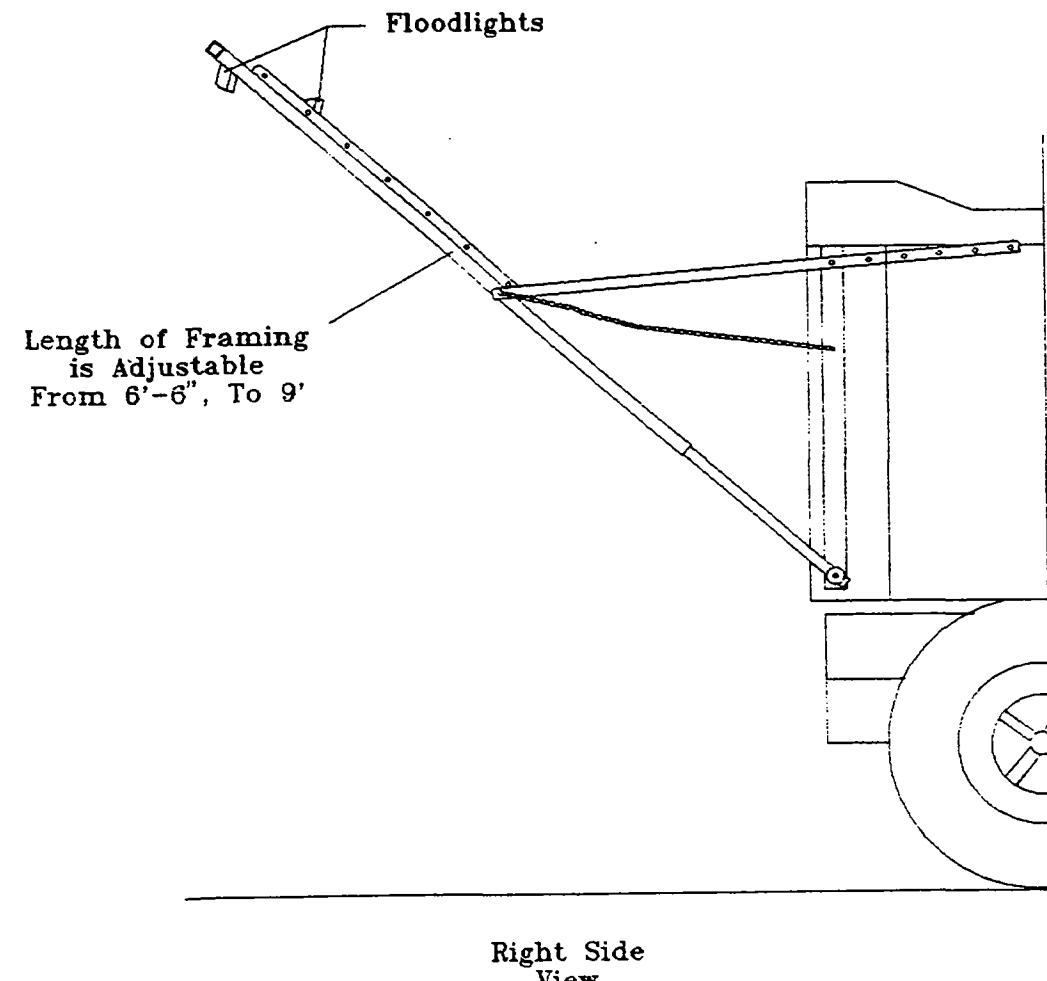
Mounting Strap
Typical of Both Sides
Material is 1/8" Steel
(A 5'-6" Chain is Recommended as a Safety Back up)

shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 FAX (816) 254-4654
TITLE: Maintenance Vehicle Floodlight		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 4 of 7		DATE: 8-26-92

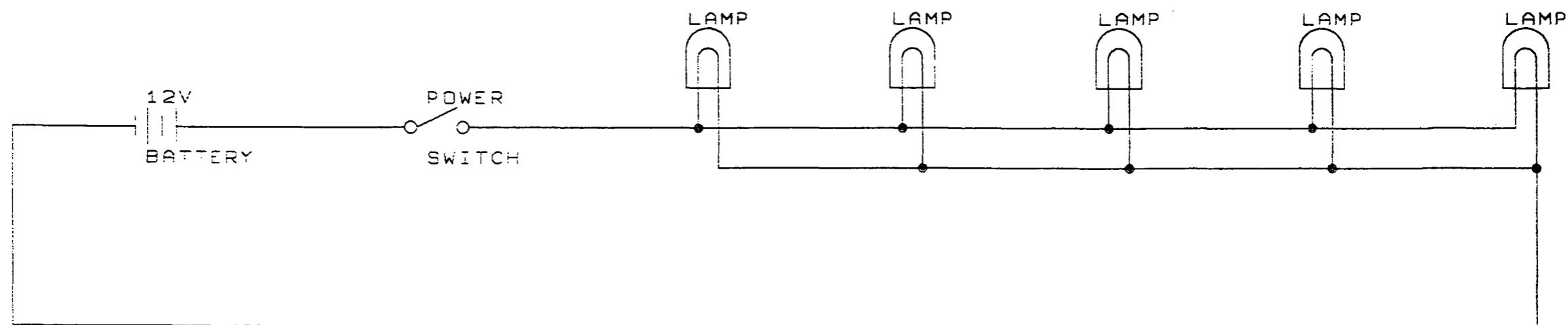


Truck Mount
Material is 1/2" Steel
Layout Typical of Both Sides
Mount Welded to Sides of Truck Bed

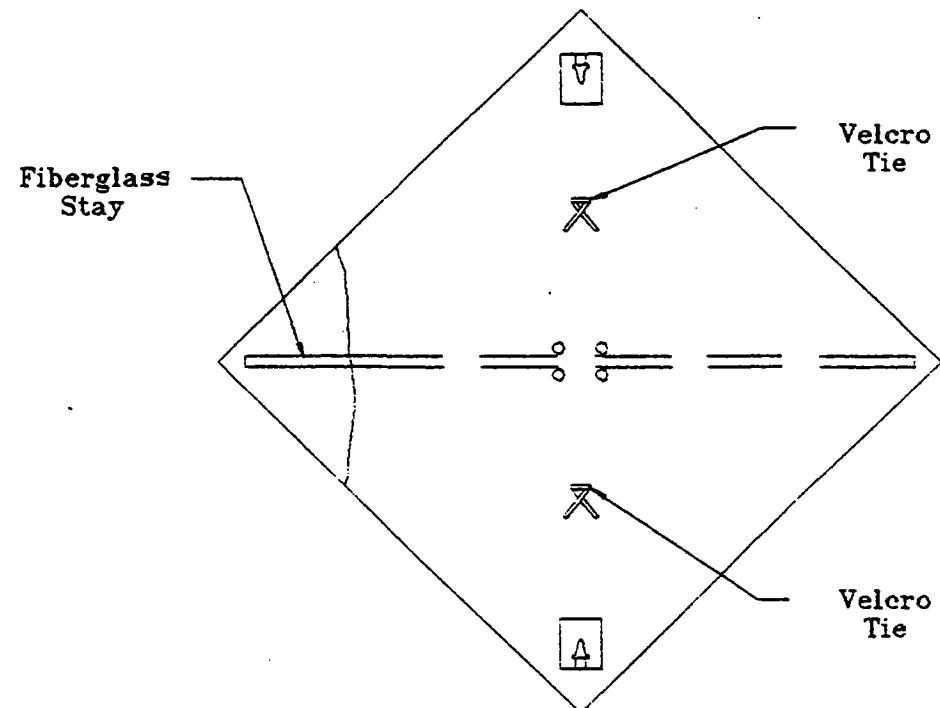
shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. (816) 254-1788 P.O. Box 348 Independence, Missouri 64050		
TITLE: Maintenance Vehicle Floodlight		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 5 of 7		DATE: 8-26-92



<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. (816) 254-1788		
P.O. Box 348 FAX (816) 254-4654		
Independence, Missouri 64050		
TITLE: Maintenance Vehicle Floodlight		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: Truck Mount		SCALE: None
DRAWING NUMBER: 6 of 7		DATE: 8-26-92



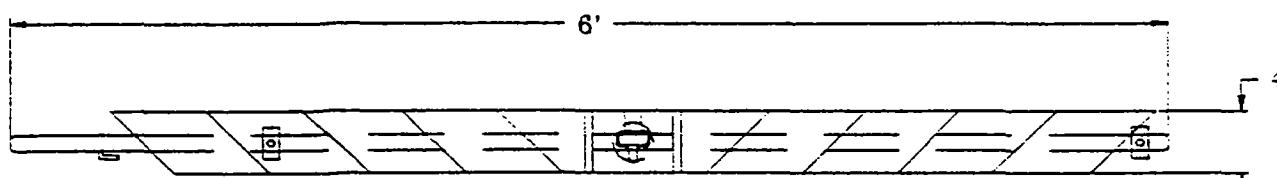
<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. (816) 254-1788		
P.O. Box 348		
Independence, Missouri 64050		
TITLE:		DRAWN BY: BBF
MAINTENANCE VEHICLE FLOOD LIGHT		REVISED: BEF
ASSEMBLY: ELECTRICAL PLANS		SCALE: NONE
DRAWING NUMBER: 7 OF 7		DATE: 10-8-92



Front View

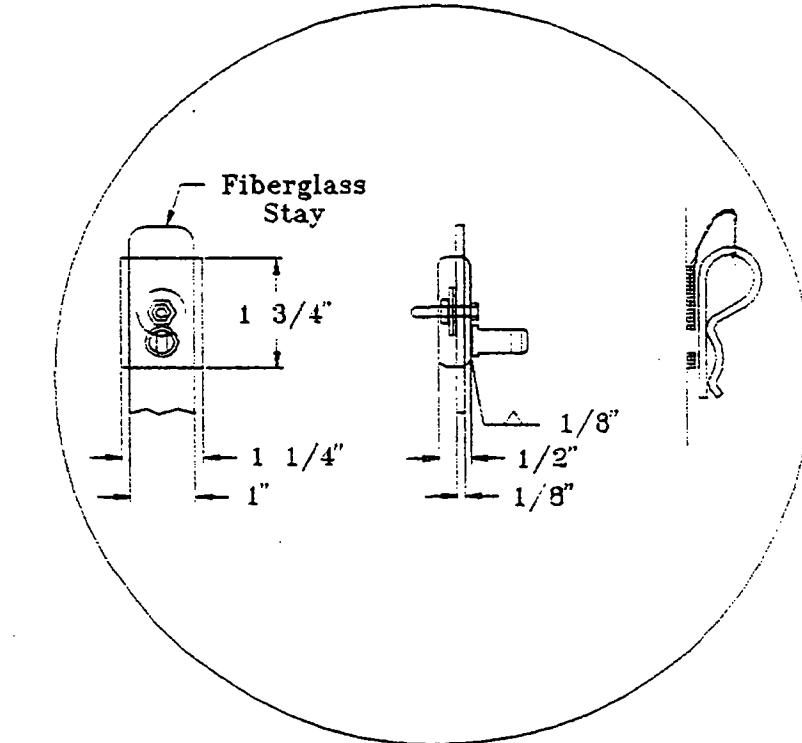
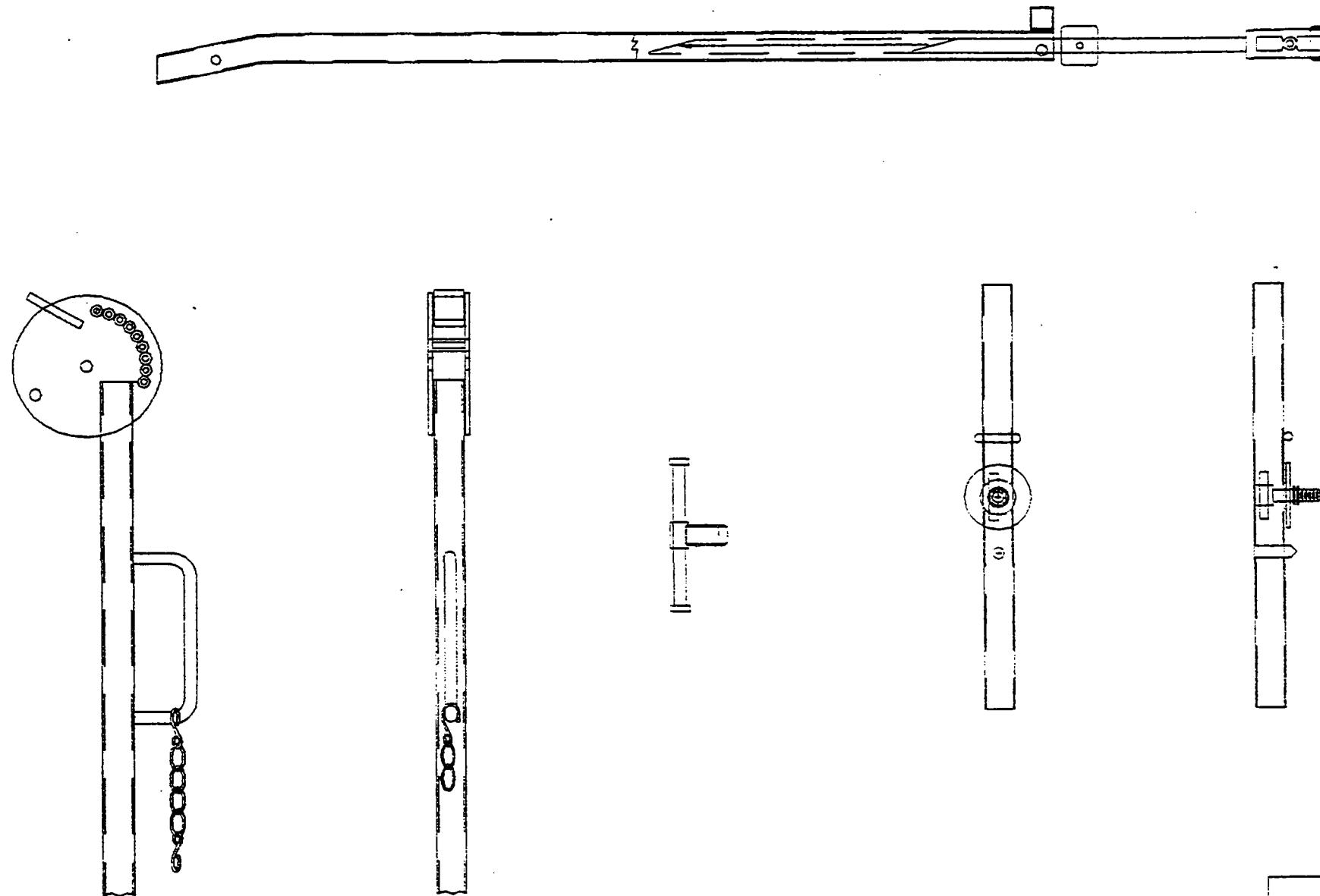


Side View

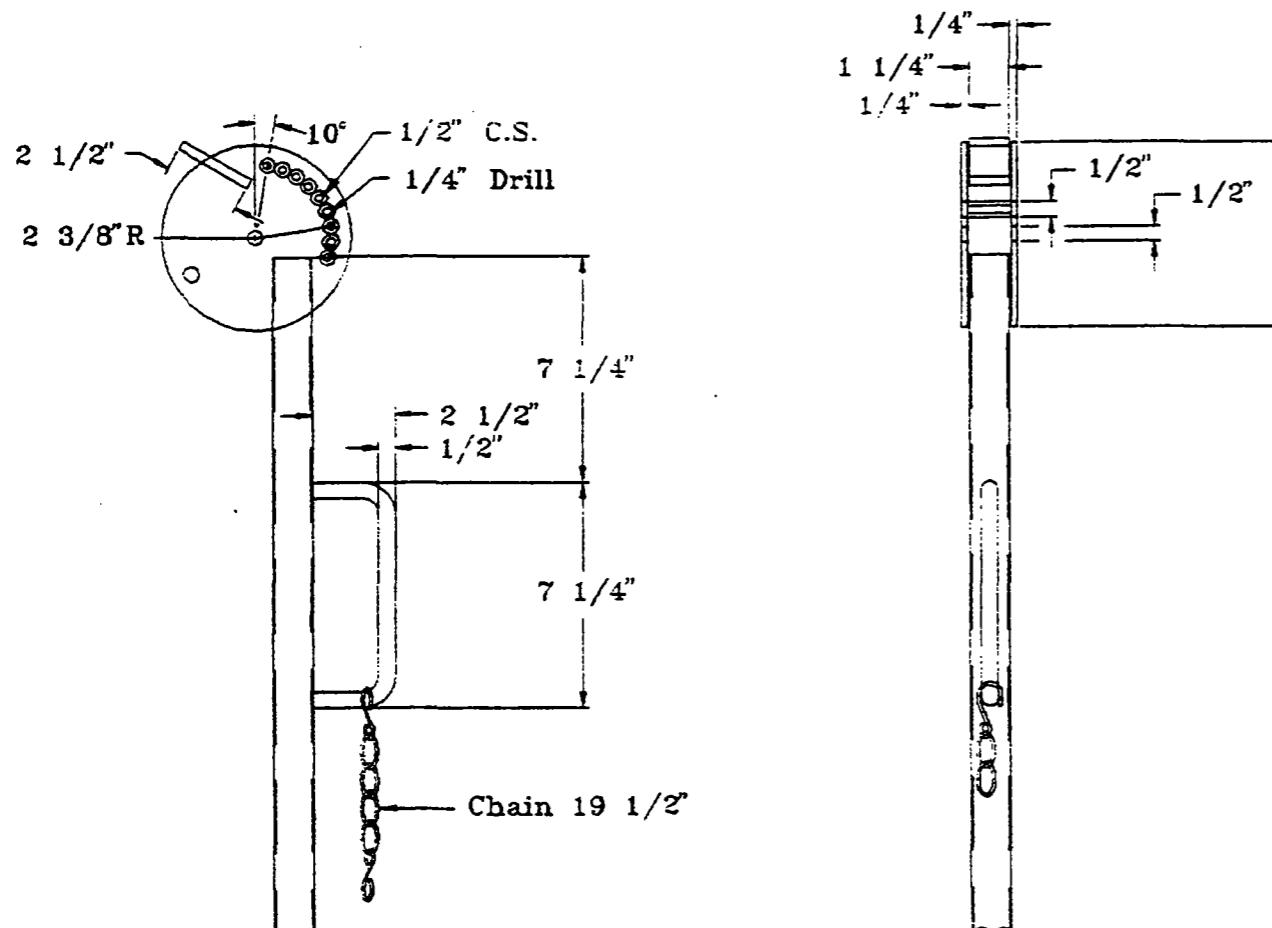


Top View

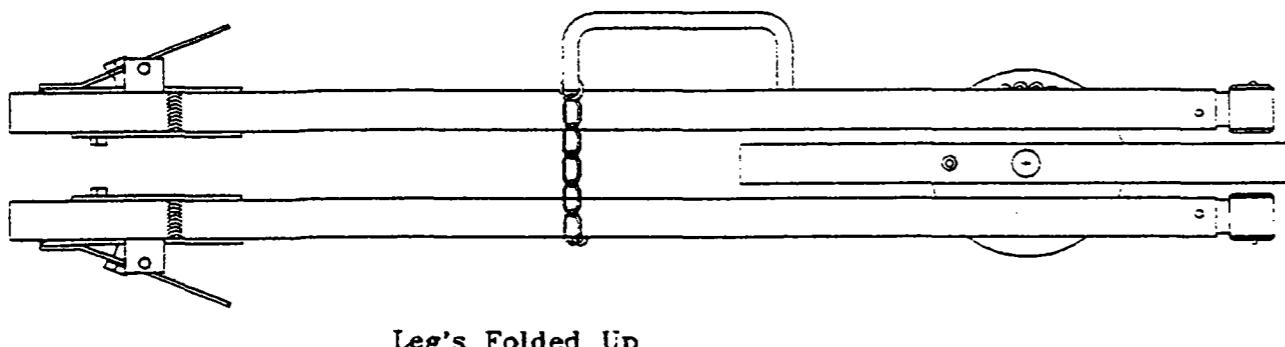
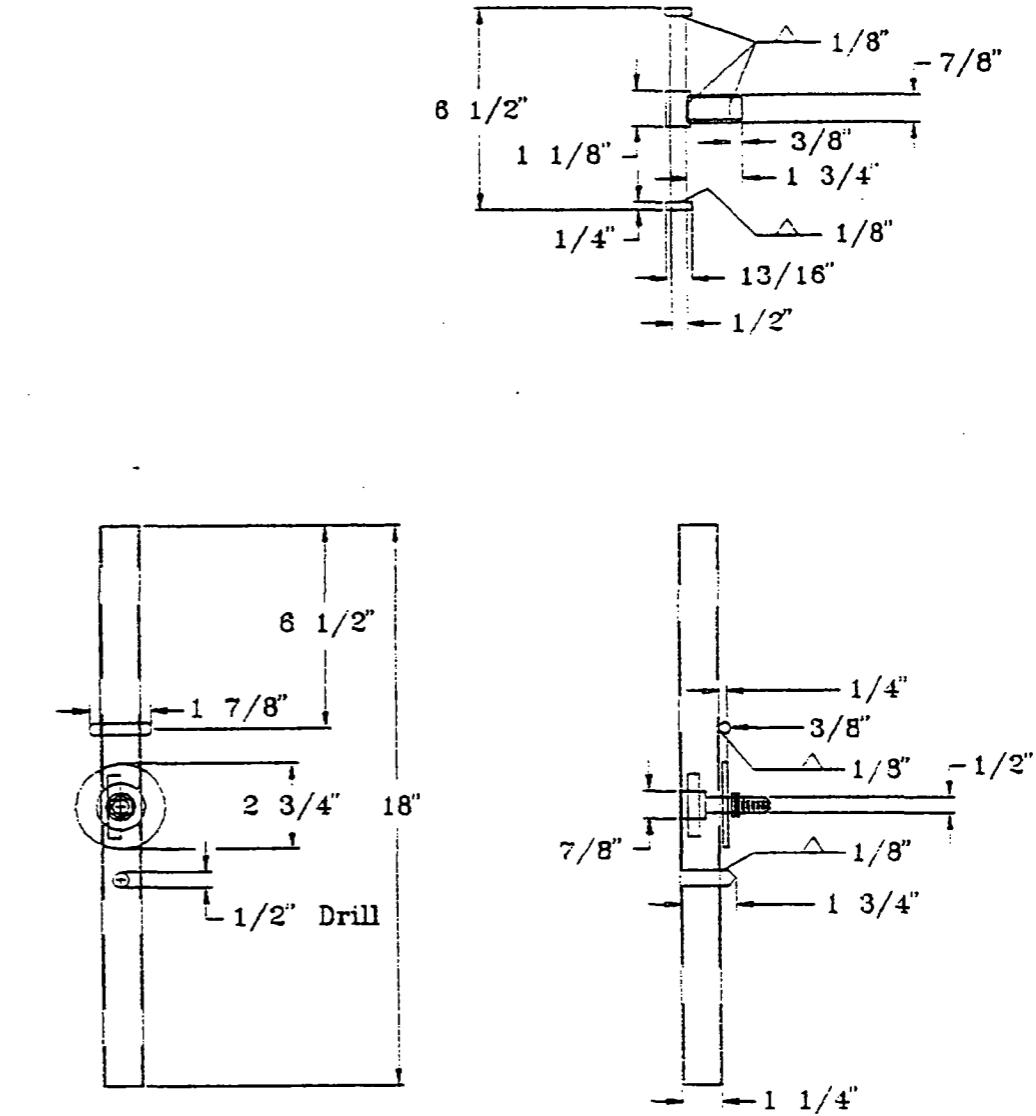
<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc.		(816) 254-1788
P.O. Box 348		FAX (816) 254-4654
Independence, Missouri 64050		<i>sme</i>
TITLE: Portable Sign and Stand		DRAWN BY: JMM
		REVISED: ---
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 1 of 6		DATE: 8-25-92



<i>shrp</i>		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc.	(816) 254-1788	
P.O. Box 348		<i>gme</i>
Independence, Missouri 64050	FAX (816) 254-4654	
TITLE:	Portable Sign and Stand	DRAWN BY: JMM
ASSEMBLY:	N/A	REVISED: ---
DRAWING NUMBER:	2 of 6	SCALE: None
		DATE: 8-25-92

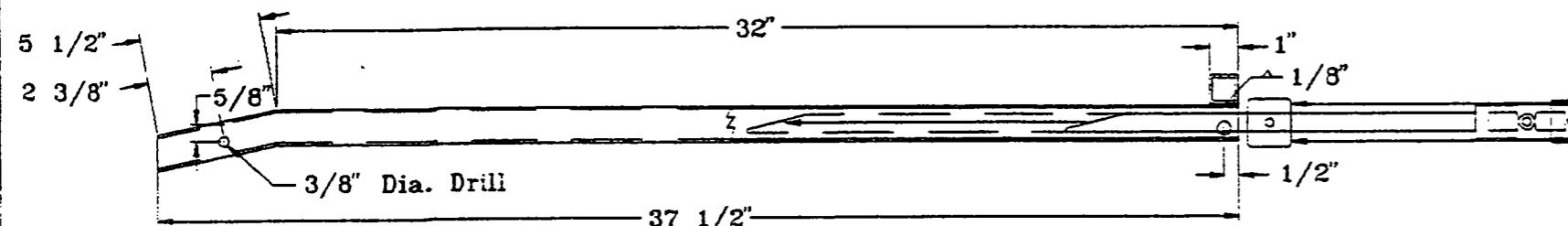
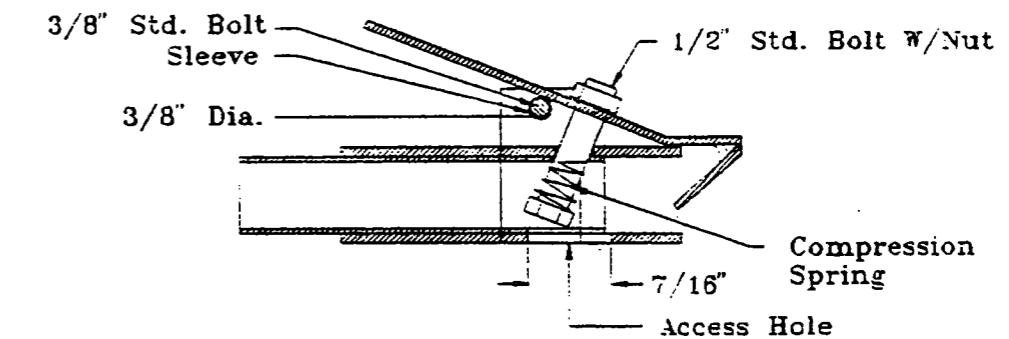
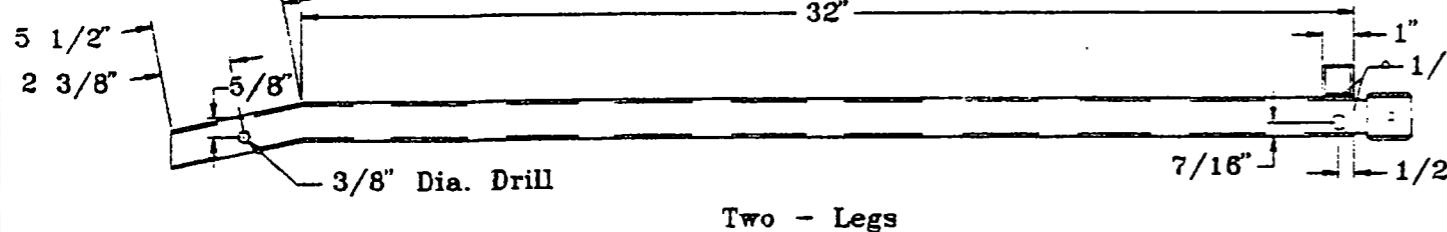


End Same as Section No.1



Leg's Folded Up

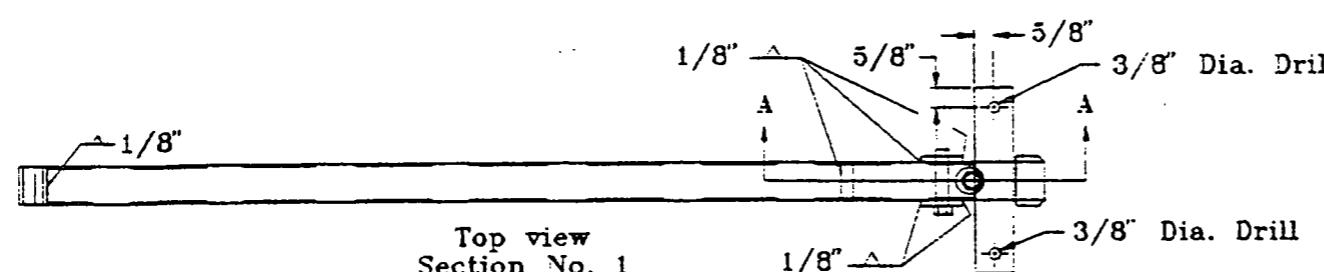
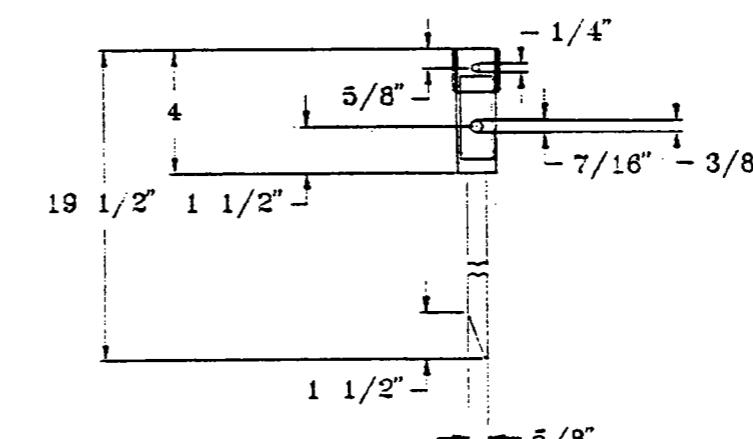
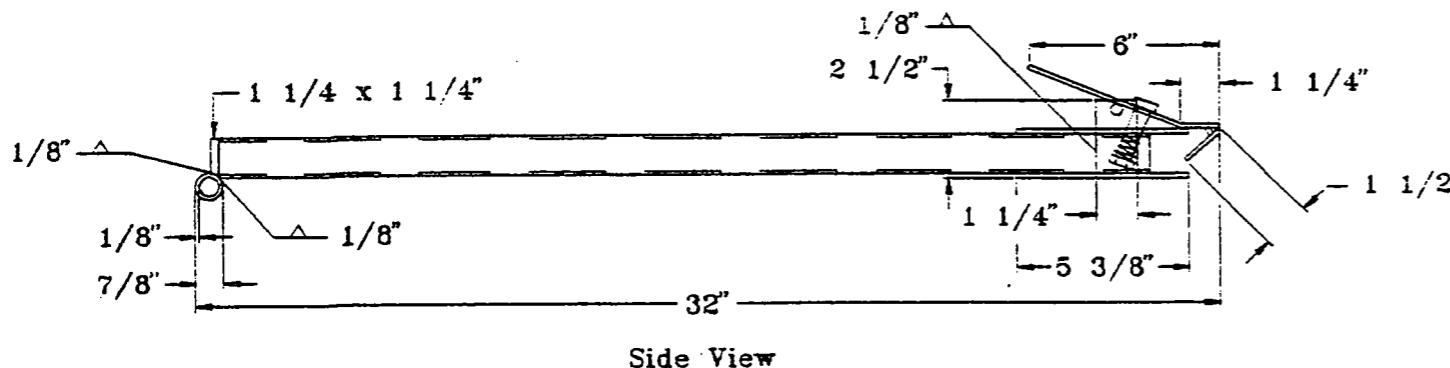
<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc.	
P.O. Box 348	
Independence, Missouri 64050	
(816) 254-1788	
FAX (816) 254-4654	
TITLE: Portable Sign and Stand	
DRAWN BY: JMM	
REVISED: ---	
ASSEMBLY: N/A	
SCALE: None	
DRAWING NUMBER: 3 of 6	
DATE: 8-25-92	



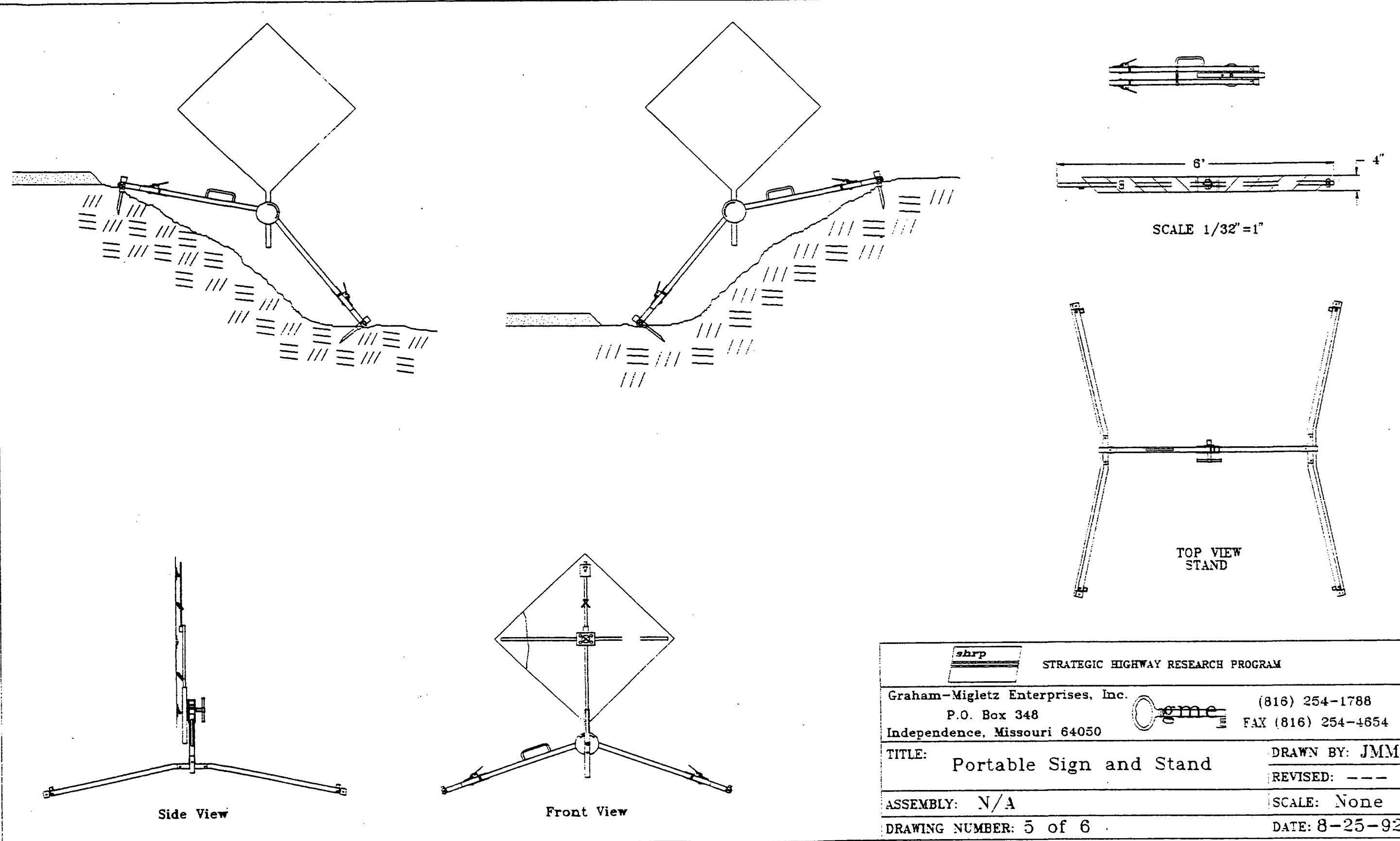
Sec. A-A

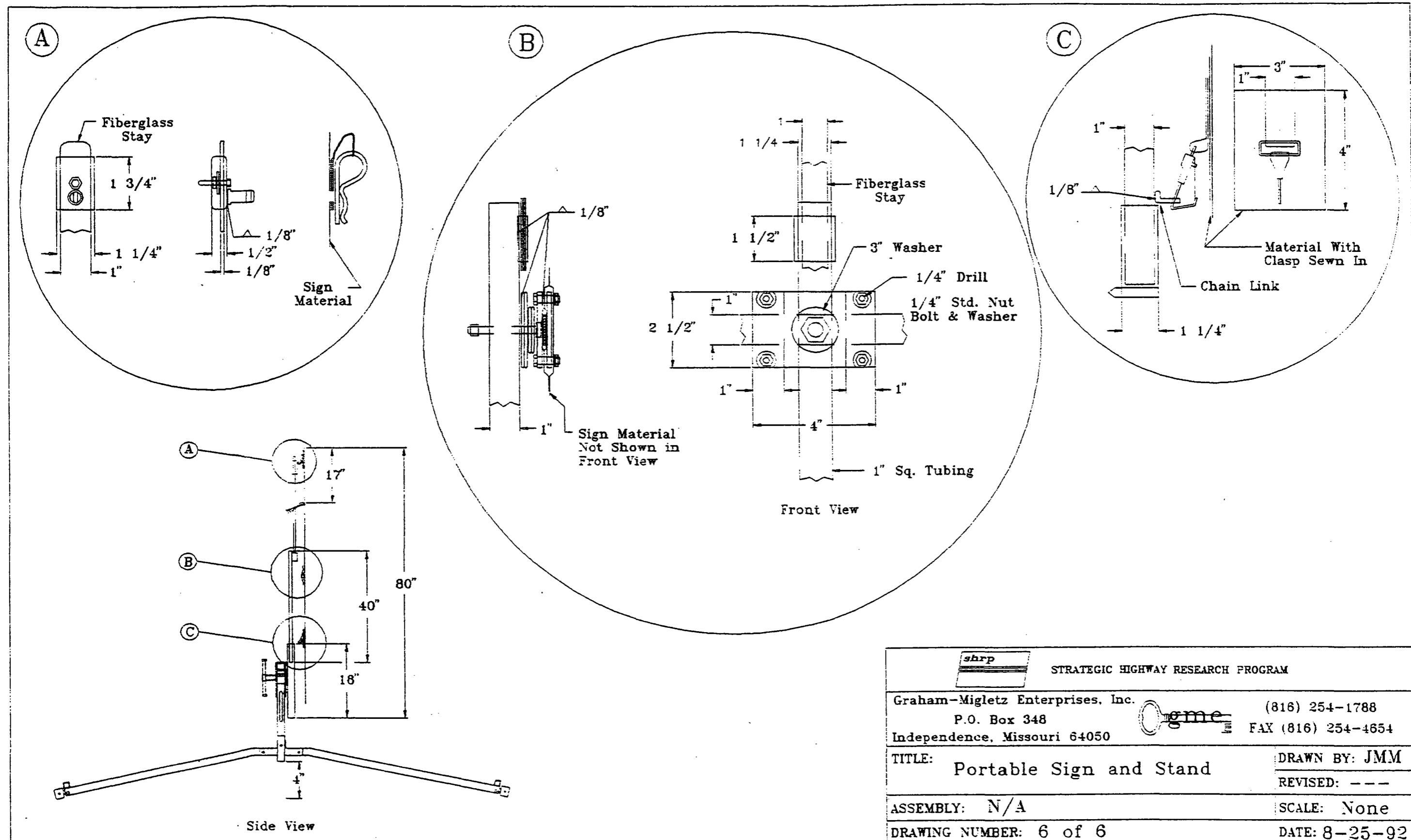


Two - Legs W/Removable
Anchor Pins

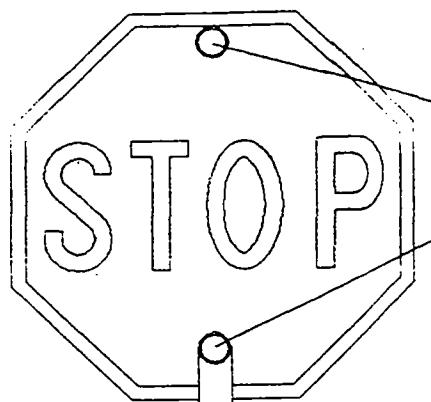


<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	(816) 254-1788  FAX (816) 254-4654
TITLE: Portable Sign and Stand	DRAWN BY: JMM
ASSEMBLY: N/A	REVISED: ---
DRAWING NUMBER: 4 of 6	SCALE: None
	DATE: 8-25-92

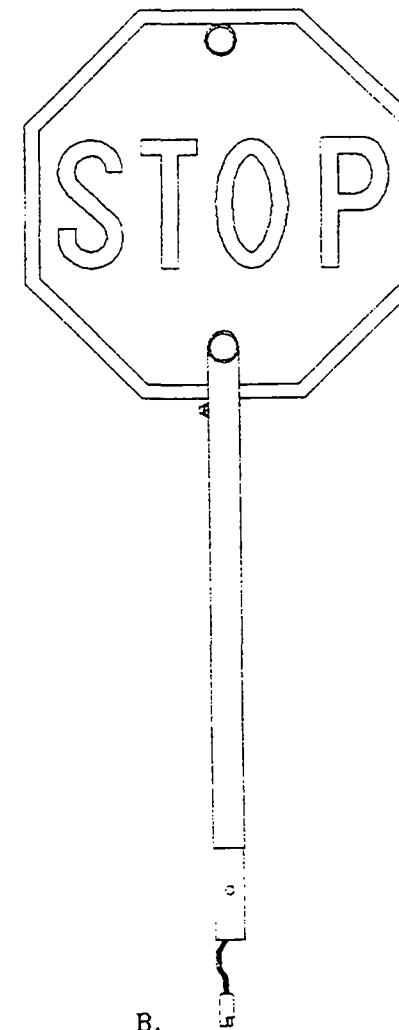




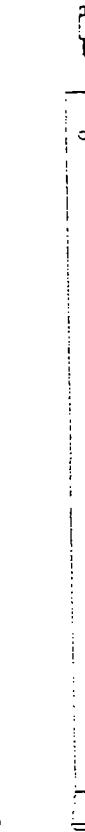
<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 FAX (816) 254-4654
TITLE: Portable Sign and Stand		DRAWN BY: JMM
REVISED: ---		
ASSEMBLY: N/A		SCALE: None
DRAWING NUMBER: 6 of 6		DATE: 8-25-92



Quartz
Halogen
Lamps



B.



C.



D.

A.

- A. Flashing Stop/Slow Paddle - Assembled
- B. Sign Head - Upper Staff
- C. Battery Pack - Lower Staff
- D. Battery Charger

shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

(816) 254-1788
FAX (816) 254-4654

TITLE: Flashing Stop/Slow Paddle

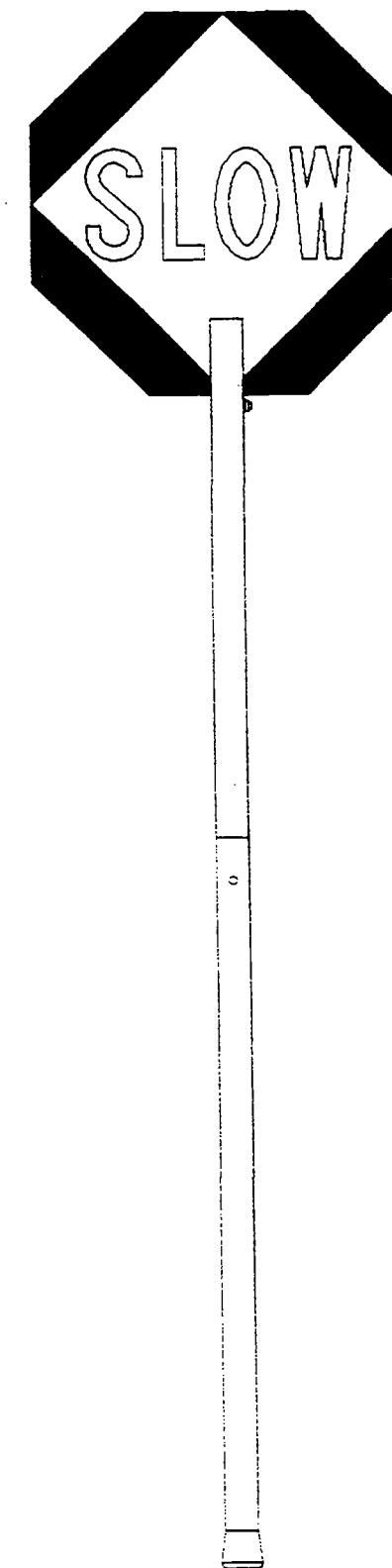
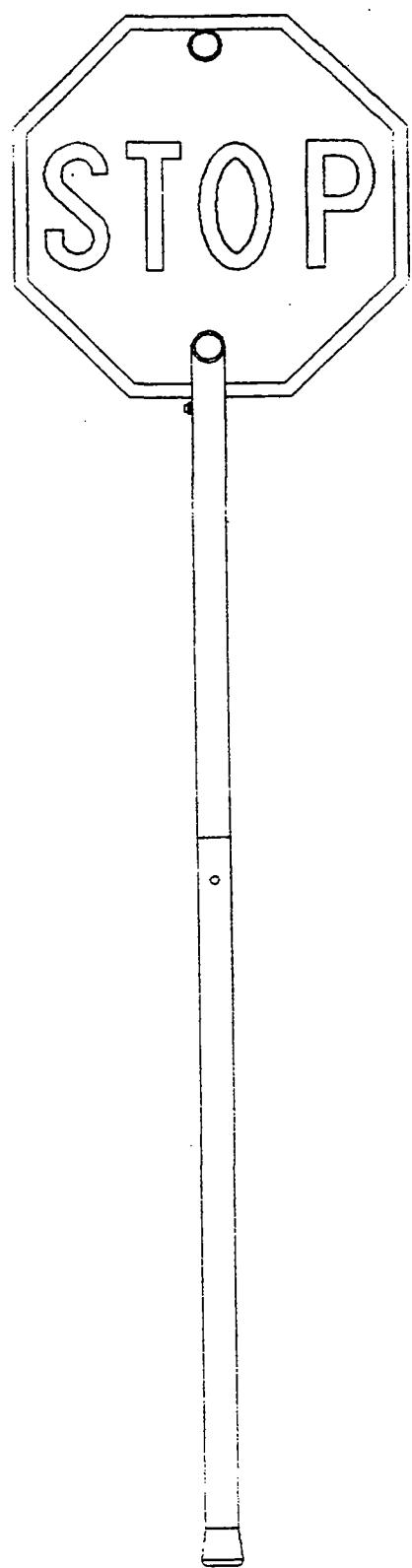
DRAWN BY: JMM
REVISED: ---

ASSEMBLY: N/A

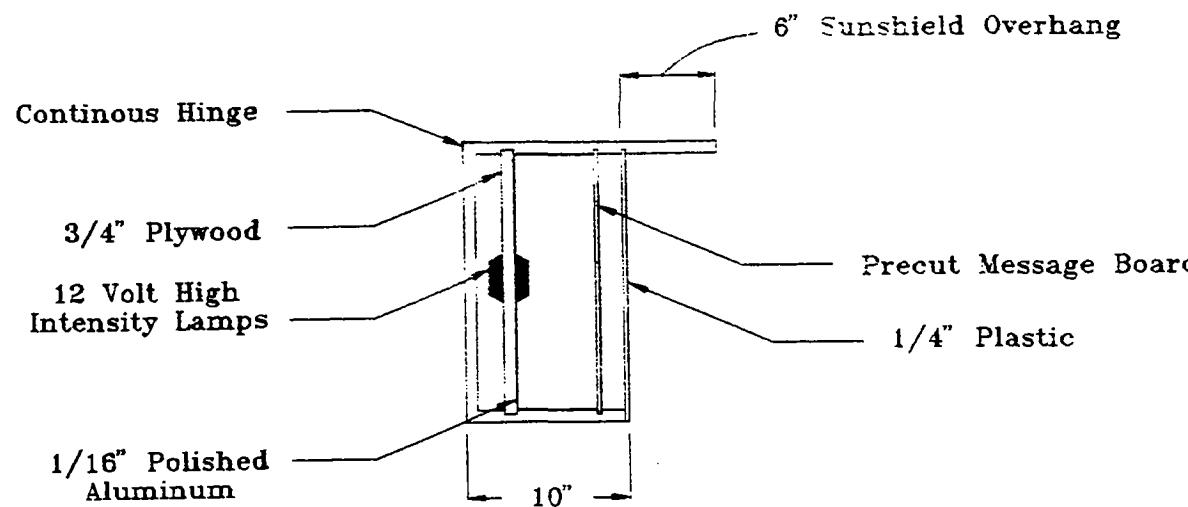
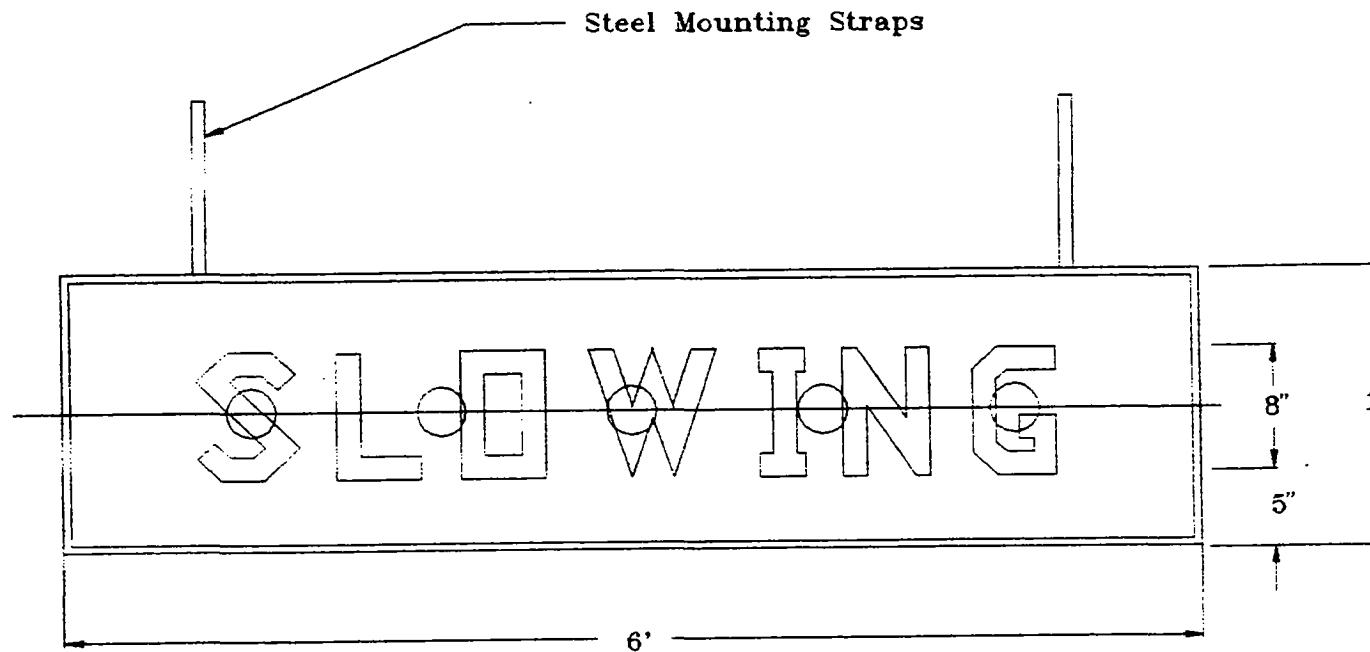
SCALE: None

DRAWING NUMBER: 1 of 2

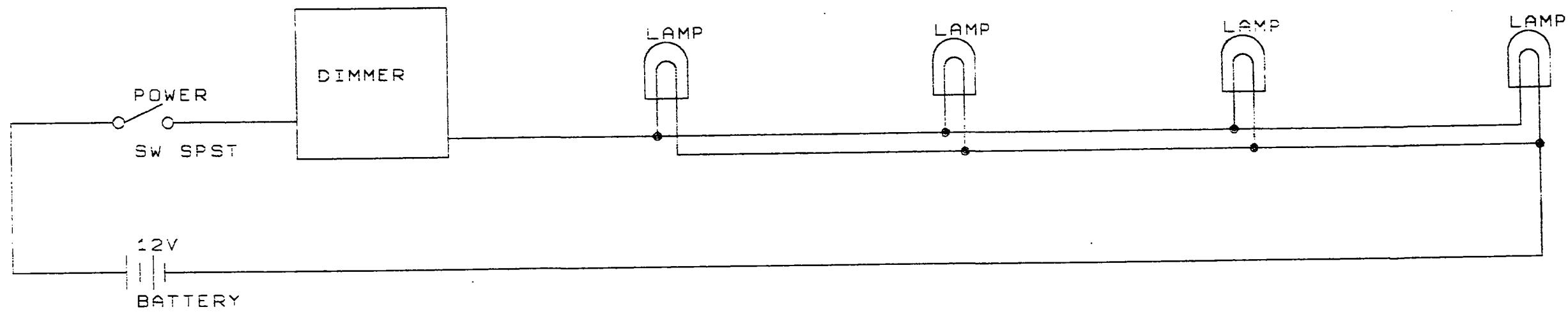
DATE: 8-25-92



<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	(816) 254-1788 <i>some</i> FAX (816) 254-4654
TITLE: Flashing Stop/Slow Paddle	DRAWN BY: JMM REVISED: ---
ASSEMBLY: Front/Back	SCALE: None
DRAWING NUMBER: 2 of 2	DATE: 8-25-92



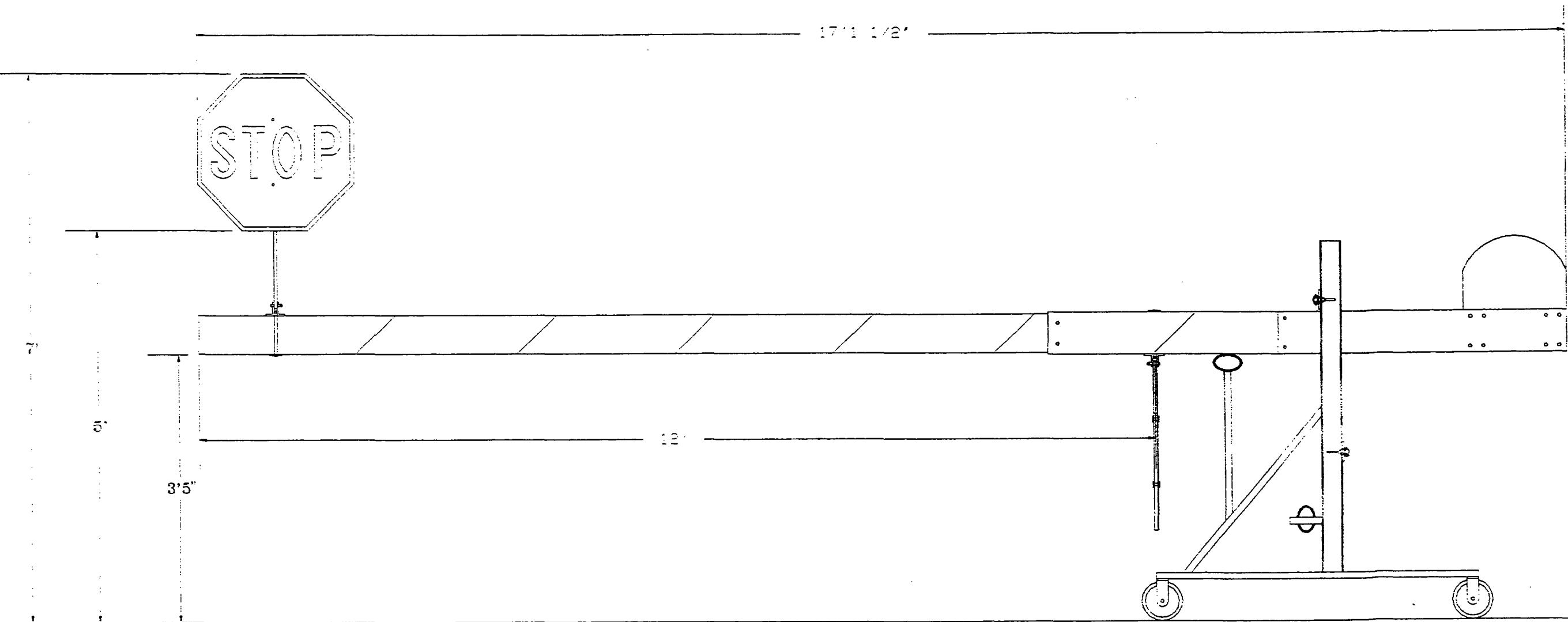
<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. (816) 254-1788	
P.O. Box 348	
Independence, Missouri 64050 FAX (816) 254-4654	
TITLE: Truck Mounted Message Box DRAWN BY: JMM	
REVISED: ---	
ASSEMBLY: N/A SCALE: None	
DRAWING NUMBER: 1 of 2 DATE: 8-25-92	



shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. (816) 254-1788	
P.O. Box 348 Independence, Missouri 64050 (816) 254-4654	
TITLE: TRUCK MOUNTED MESSAGE BOX DRAWN BY: BBF	
REVISED: BBF	
ASSEMBLY: ELECTRICAL PLANS SCALE: NONE	
DRAWING NUMBER: 2 OF 2 DATE: 10-20-92	

FLAGGER GATE

17'1 1/2"



shrp

STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050

(816) 254-1788

FAX (816) 254-4654

TITLE: FLAGGER GATE ASSEMBLY

DRAWN BY: JMM

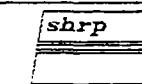
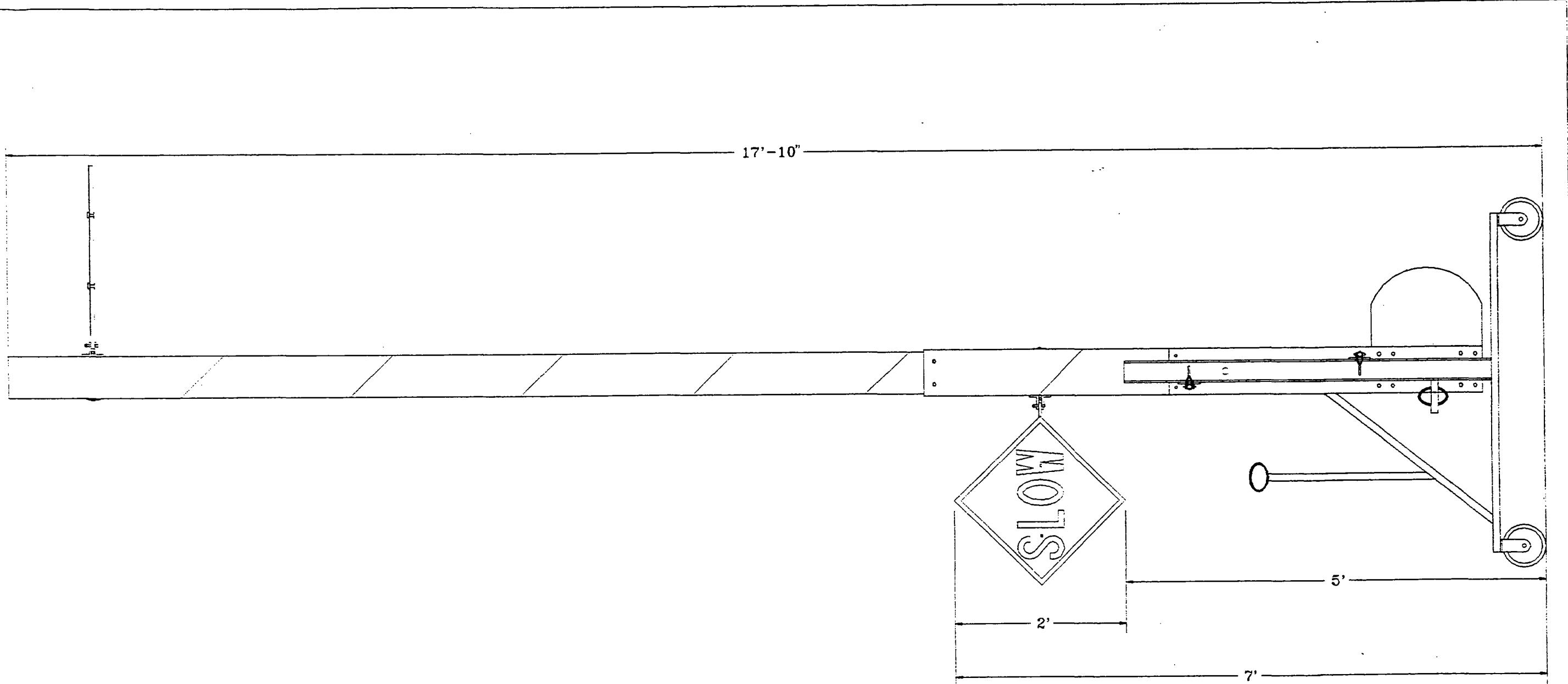
REVISED: RLM

ASSEMBLY: N/A

SCALE: NONE

DRAWING NUMBER: 1 OF 13

DATE: 8-20-92

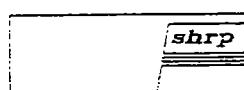
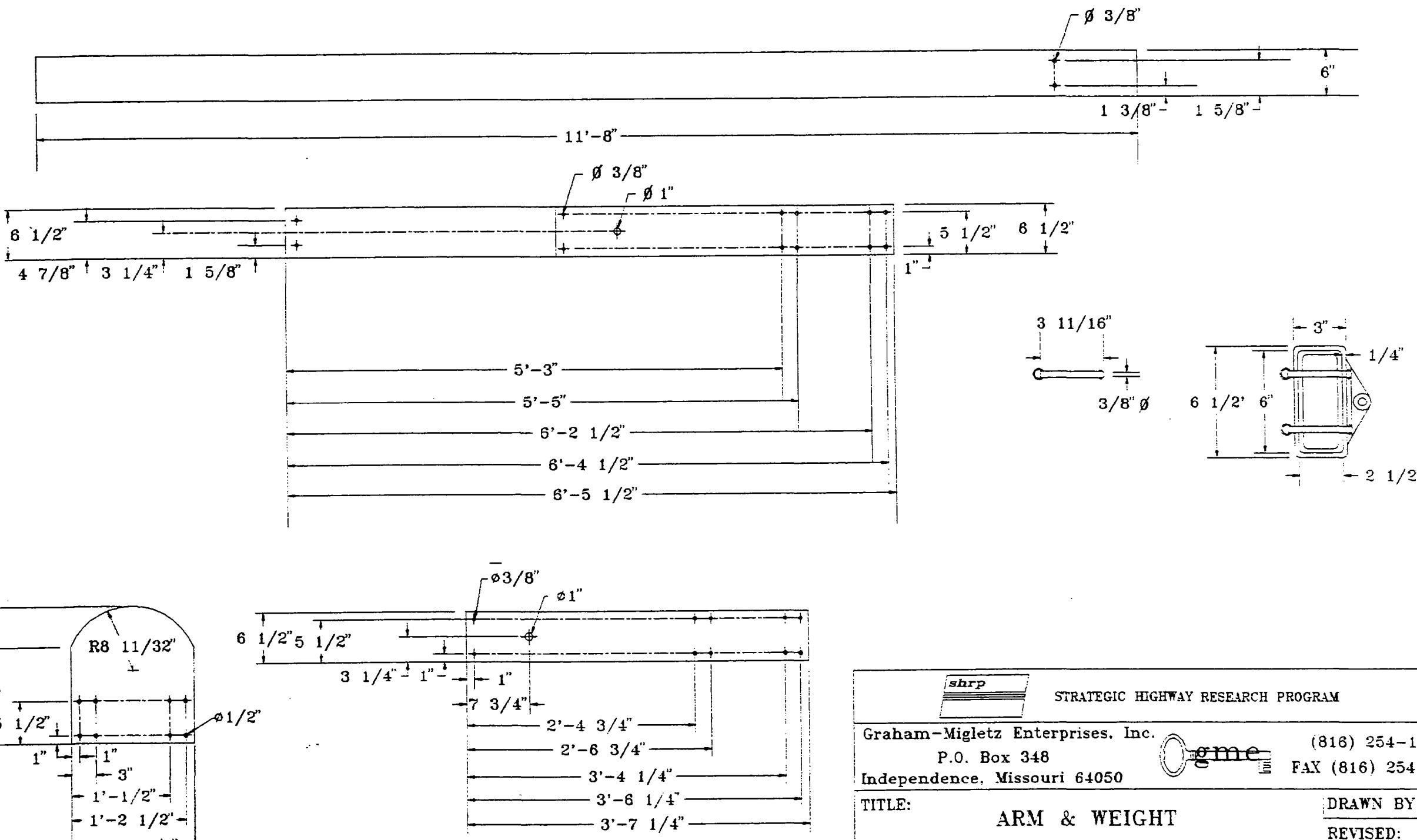


STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

(816) 254-1788
FAX (816) 254-4654

TITLE:	FLAGGER GATE UP MODE	DRAWN BY: JMM
REVISED:	RLM	
ASSEMBLY:	FLAGGRE GATE	SCALE: NONE
DRAWING NUMBER:	2 OF 13	DATE: 8-21-92

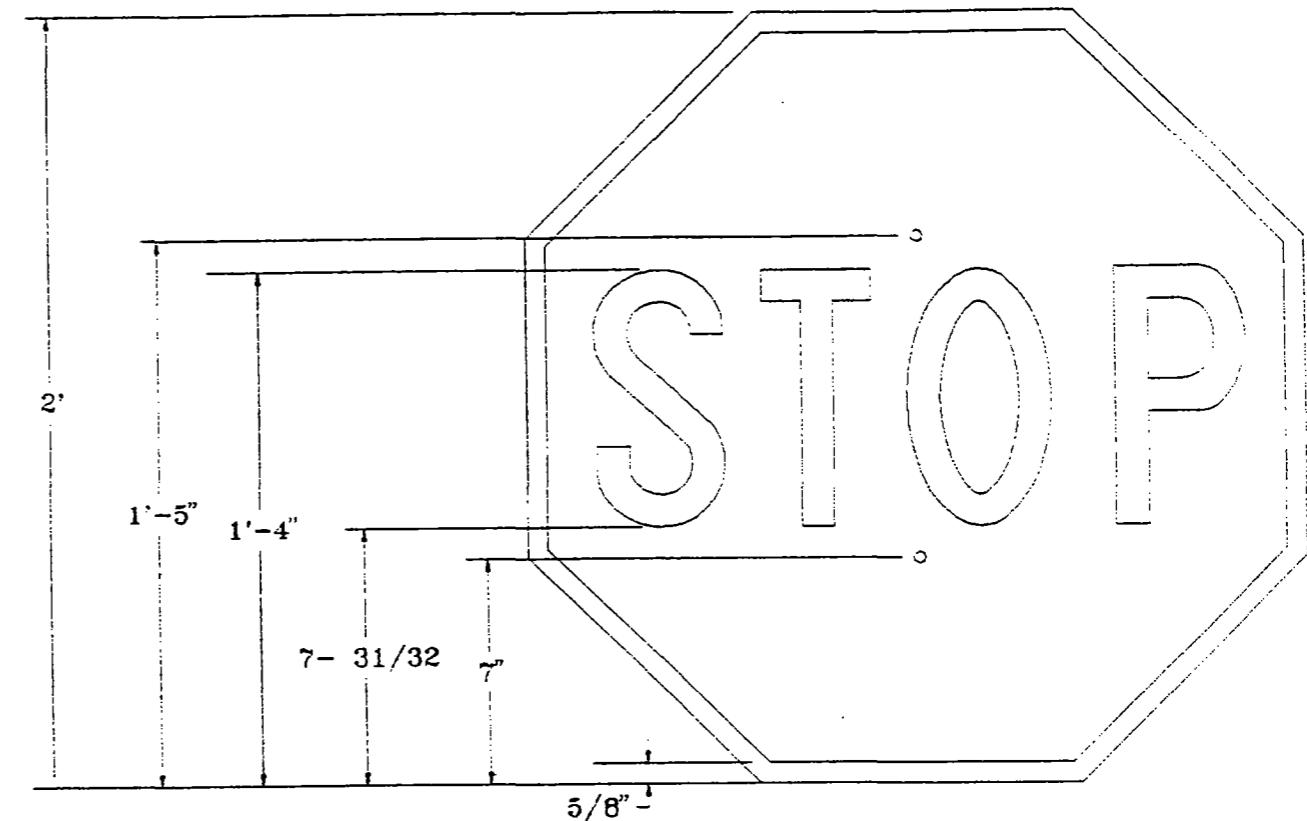
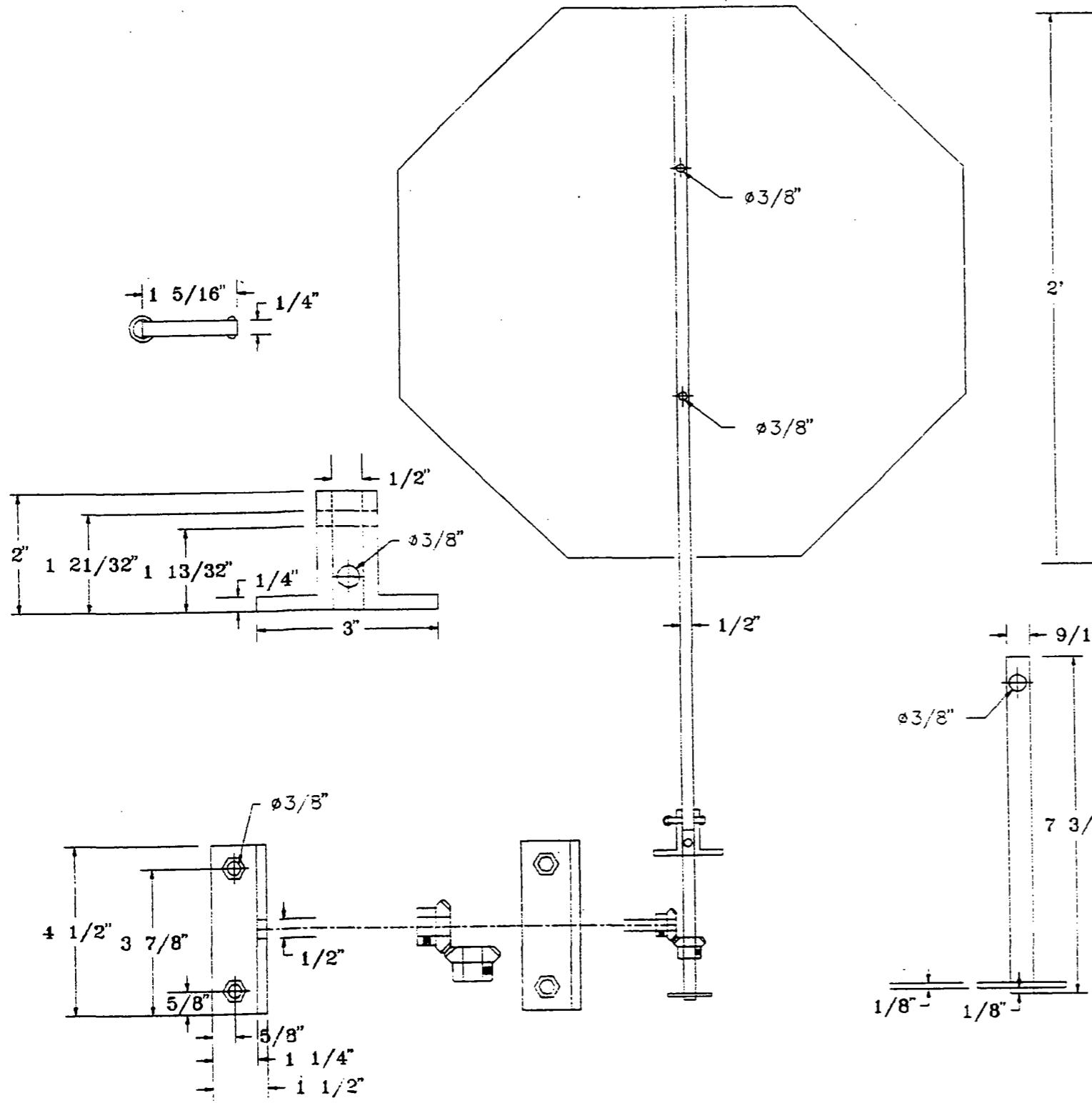


STRATEGIC HIGHWAY RESEARCH PROGRAM

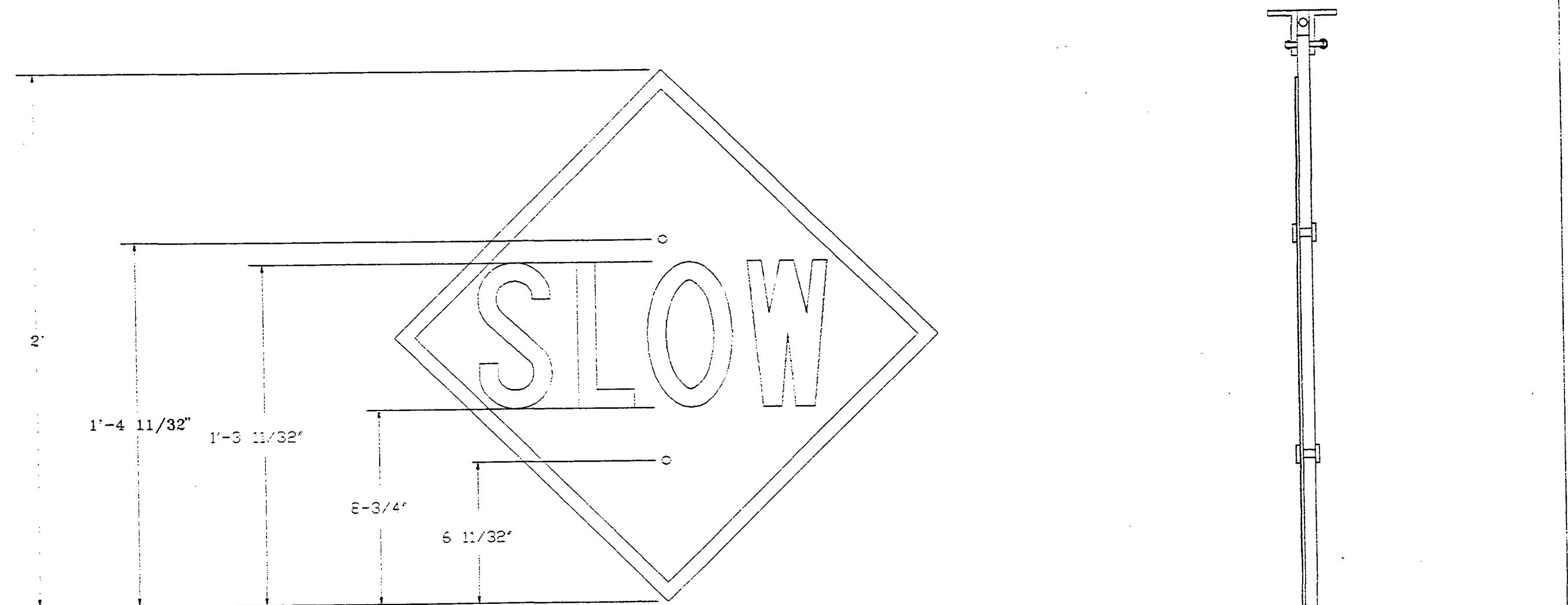
Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

(816) 254-1788
FAX (816) 254-4654

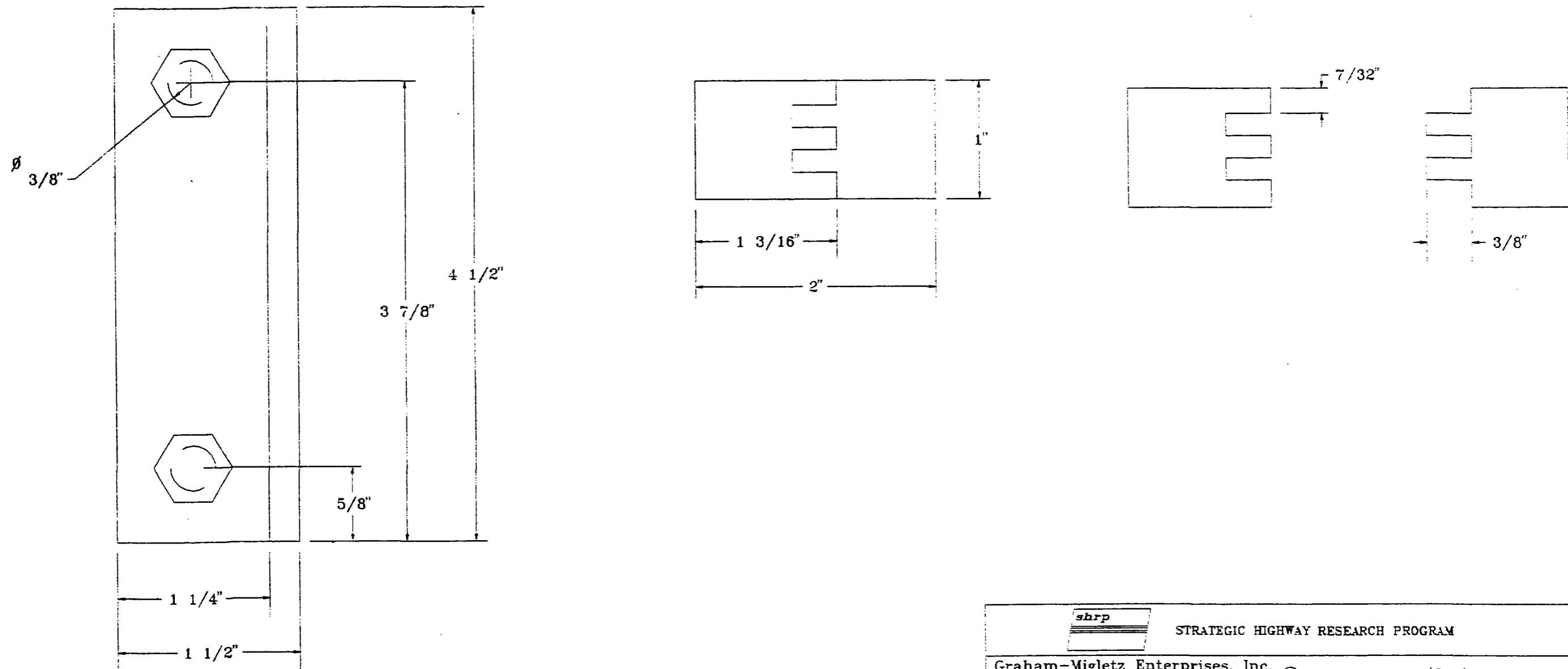
TITLE:	ARM & WEIGHT	DRAWN BY: JMM
REVISED:	RLM	
ASSEMBLY:	FLAGGER GATE	SCALE: NONE
DRAWING NUMBER:	3 OF 13	DATE: 8-20-92

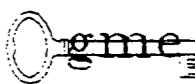


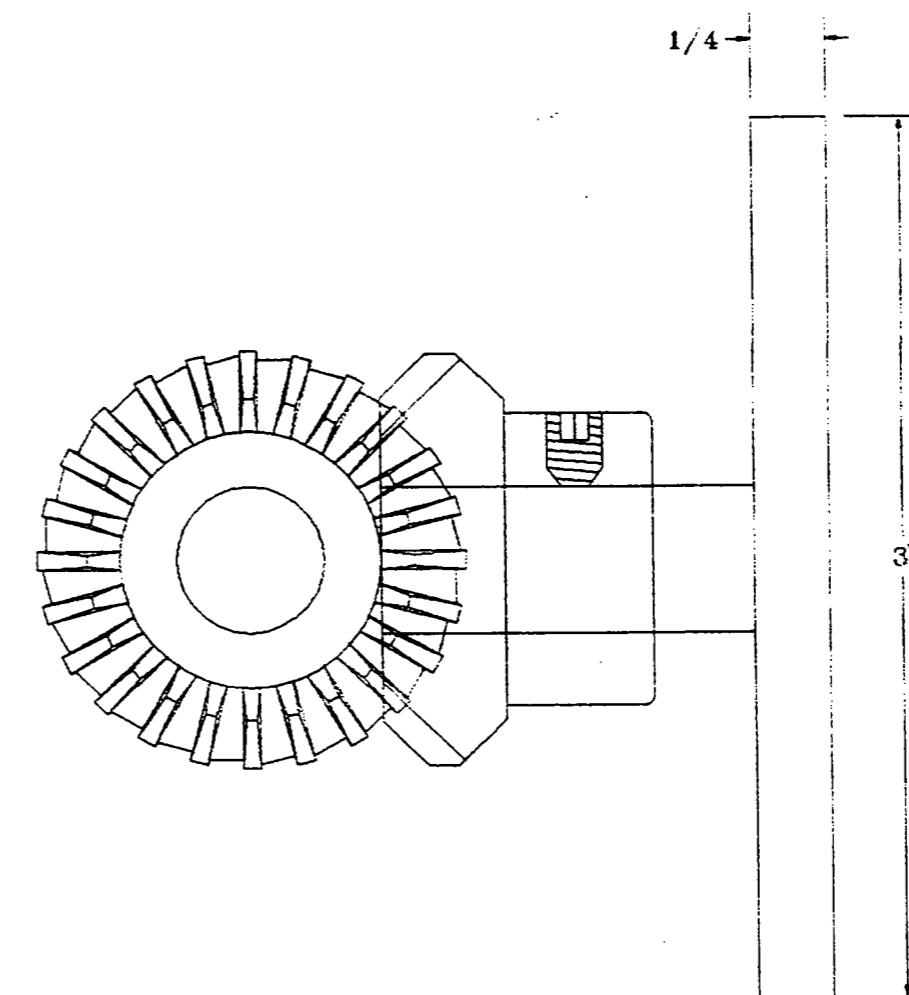
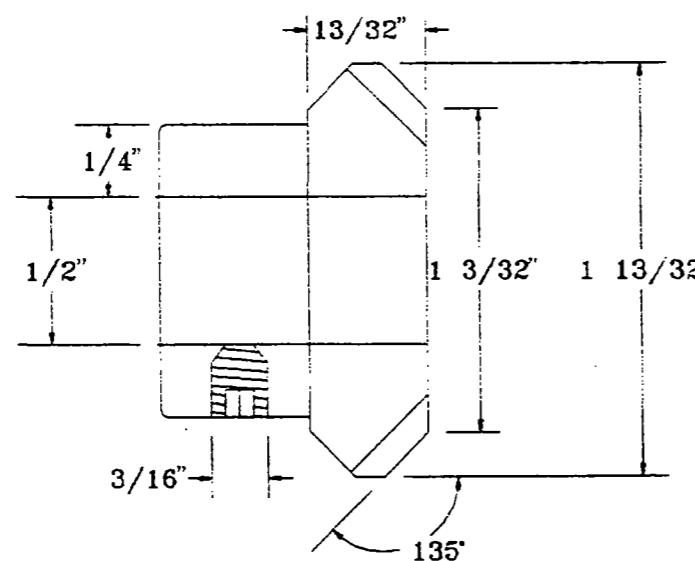
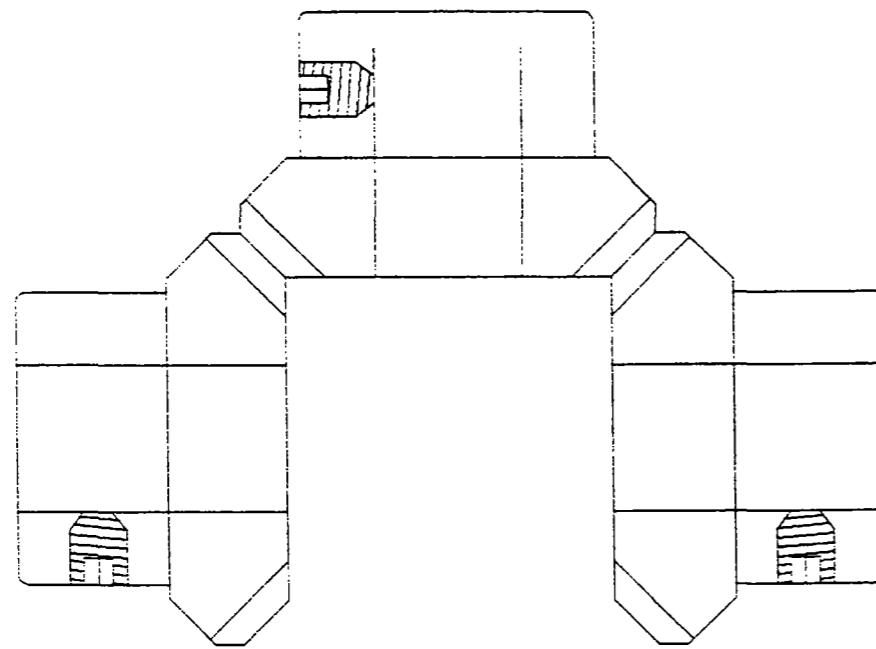
shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc.	
P.O. Box 348	
Independence, Missouri 64050	
(816) 254-1788	
FAX (816) 254-4654	
ome	
TITLE: STOP SIGN	
DRAWN BY: JMM	
REVISED: RLM	
ASSEMBLY: FLAGGER GATE	
SCALE: NONE	
DRAWING NUMBER: 4 OF 13	
DATE: 8-21-92	



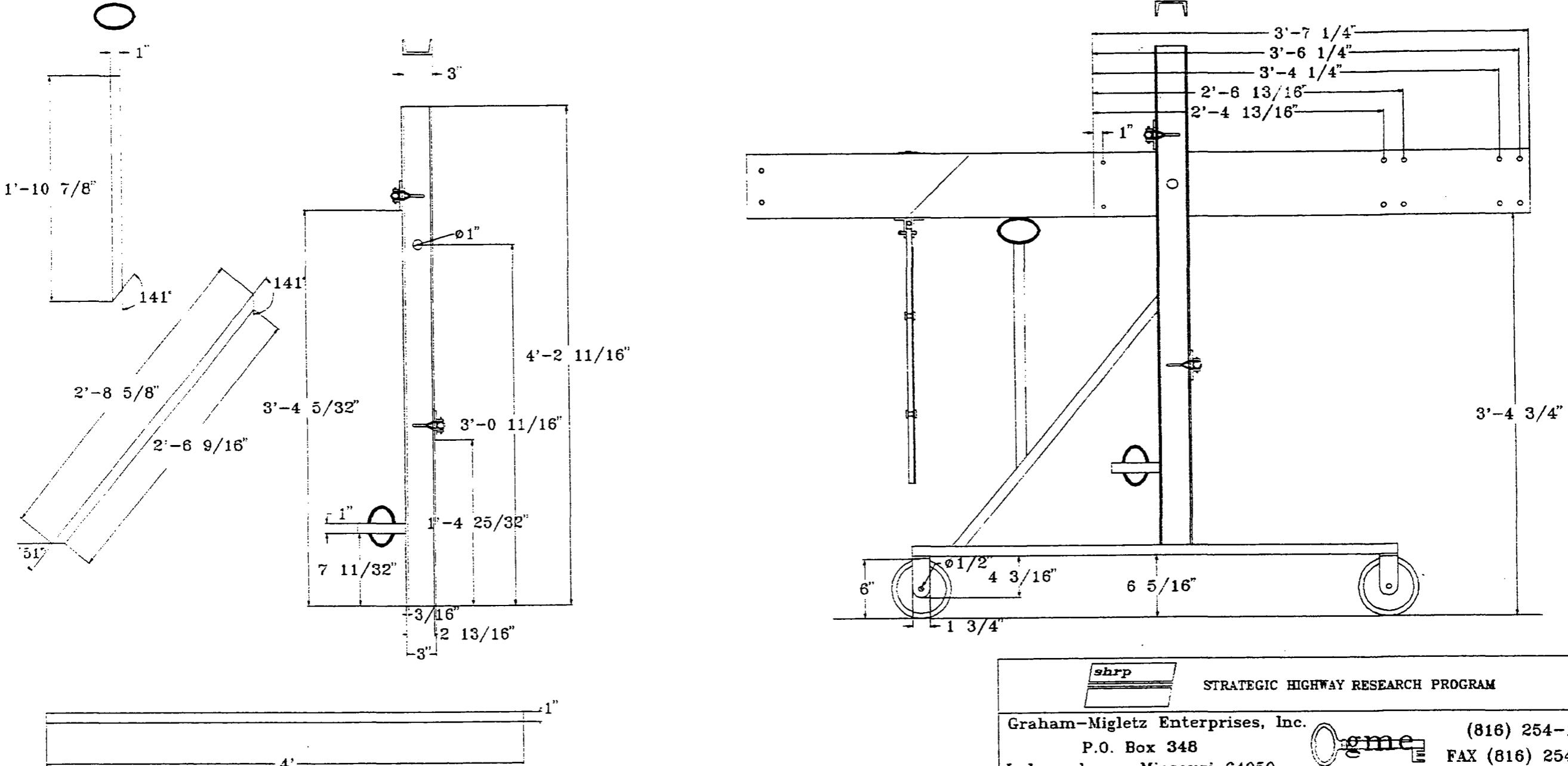
	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	(816) 254-1788 FAX (816) 254-4654
TITLE: SLOW SIGN	DRAWN BY: JMM
	REVISED: RLM
ASSEMBLY: FLAGGER GATE	SCALE: NONE
DRAWING NUMBER: 5 OF 13	DATE: 8-21-92



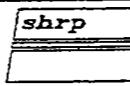
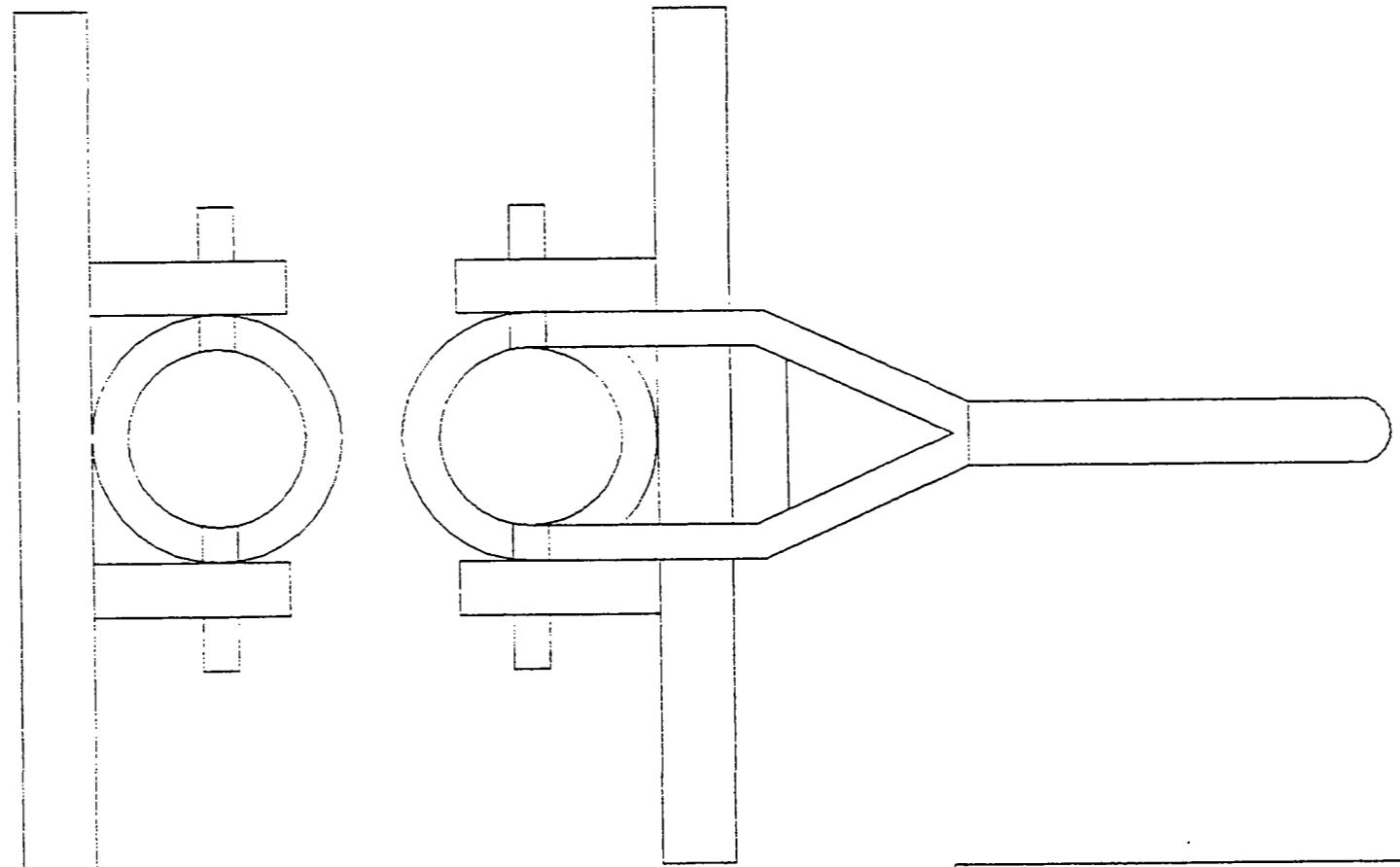
shrp		STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc.		
P.O. Box 348		
Independence, Missouri 64050		
(816) 254-1788		
FAX (816) 254-4654		
TITLE: SHAFT BRACKET & COUPLER		DRAWN BY: JMM
		REVISED: RLM
ASSEMBLY: FLAGGER GATE		SCALE: NONE
DRAWING NUMBER: 6 OF 13		DATE: 9-16-92



<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. (816) 254-1788	
P.O. Box 348	
Independence, Missouri 64050	
FAX (816) 254-4654	
TITLE: BEVEL GEARS DRAWN BY: JMM	
REVISED: RLM	
ASSEMBLY: FLAGGER GATE SCALE: NONE	
DRAWING NUMBER: 7 OF 13 DATE: 8-28-92	



shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	(816) 254-1788  FAX (816) 254-4654
TITLE: BASE	DRAWN BY: JMM
REVISED: RLM	
ASSEMBLY: FLAGGER GATE	SCALE: NONE
DRAWING NUMBER: 8 OF 13	DATE: 9-16-92



STRATEGIC HIGHWAY RESEARCH PROGRAM

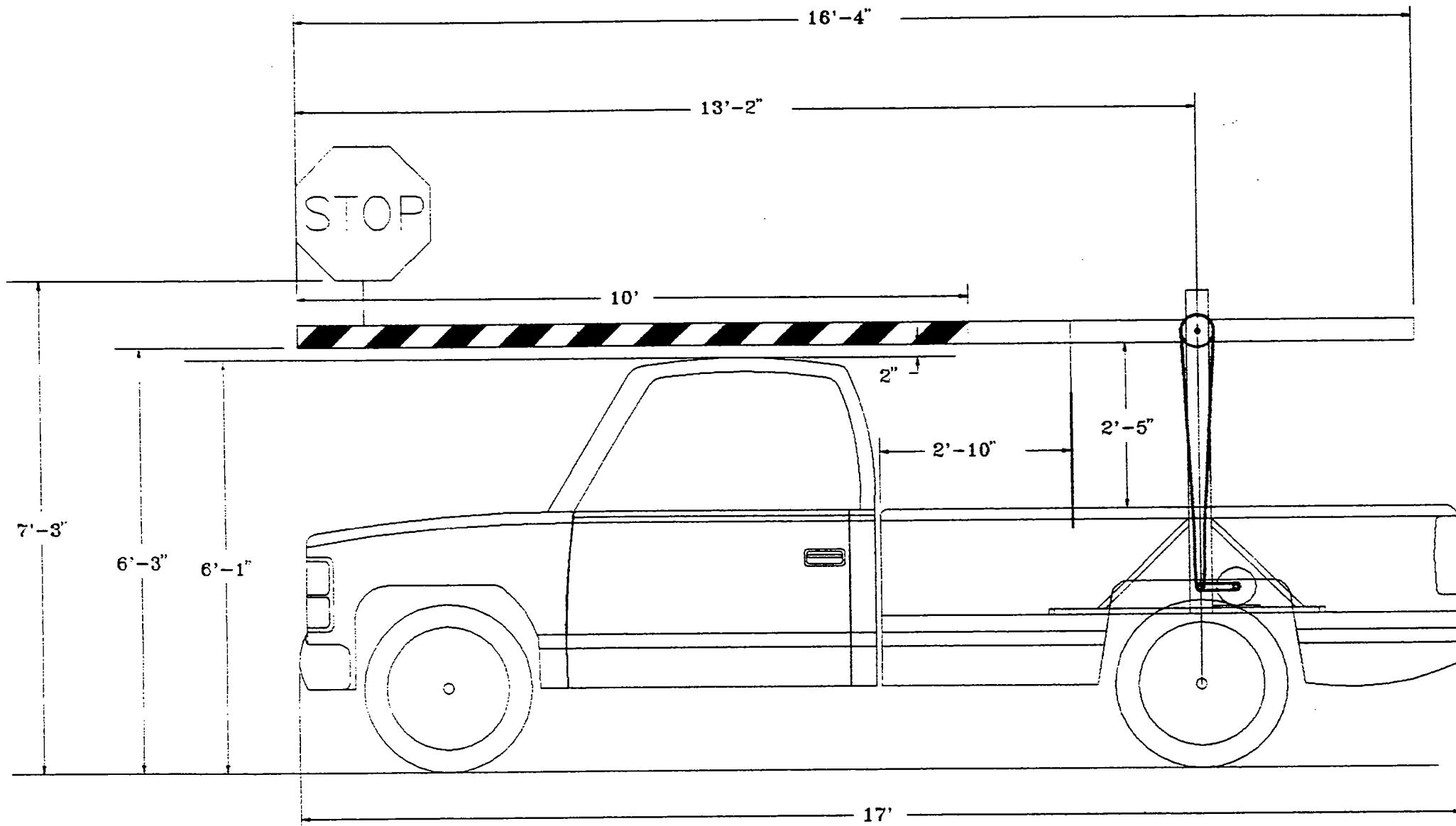
Graham-Migletz Enterprises, Inc.
P.O. Box 348
Independence, Missouri 64050

(816) 254-1788

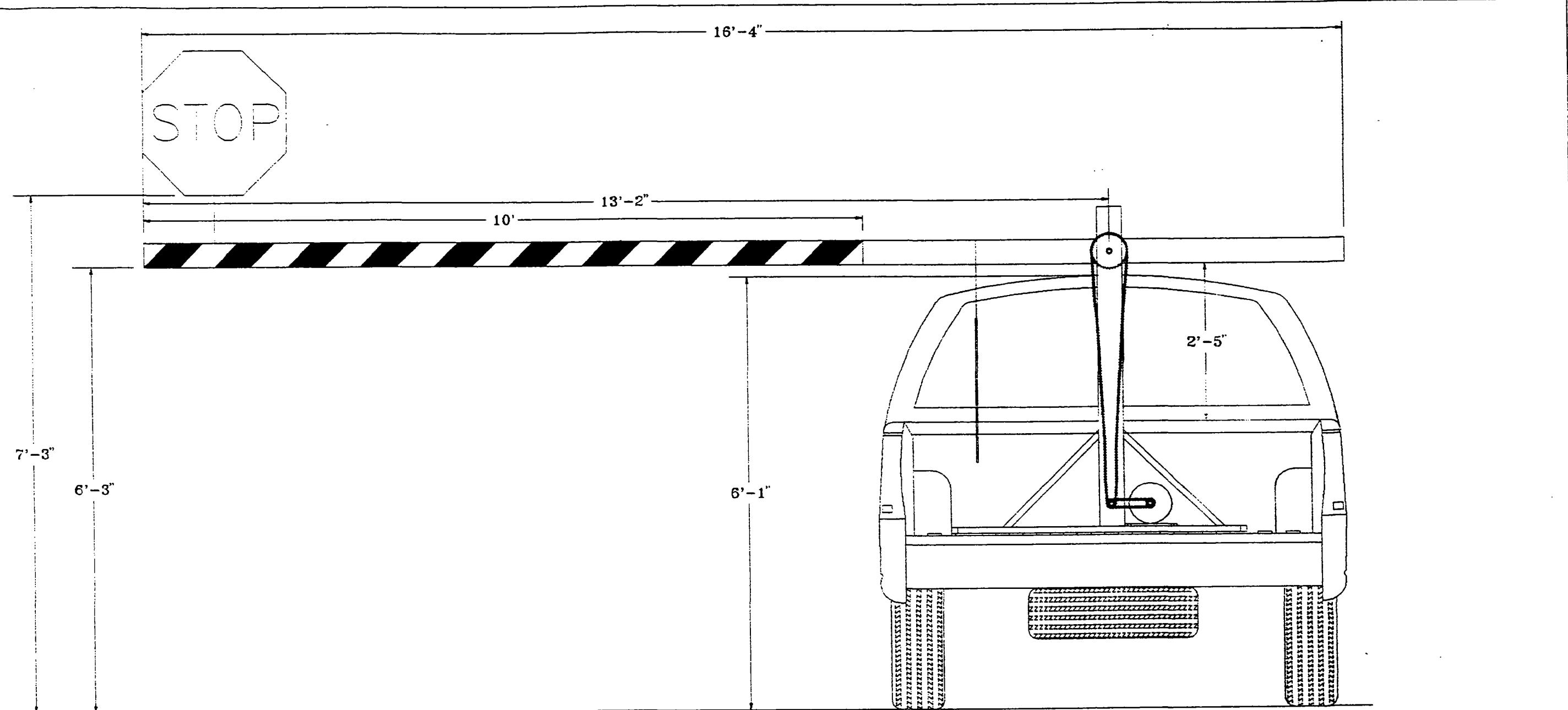
FAX (816) 254-4654



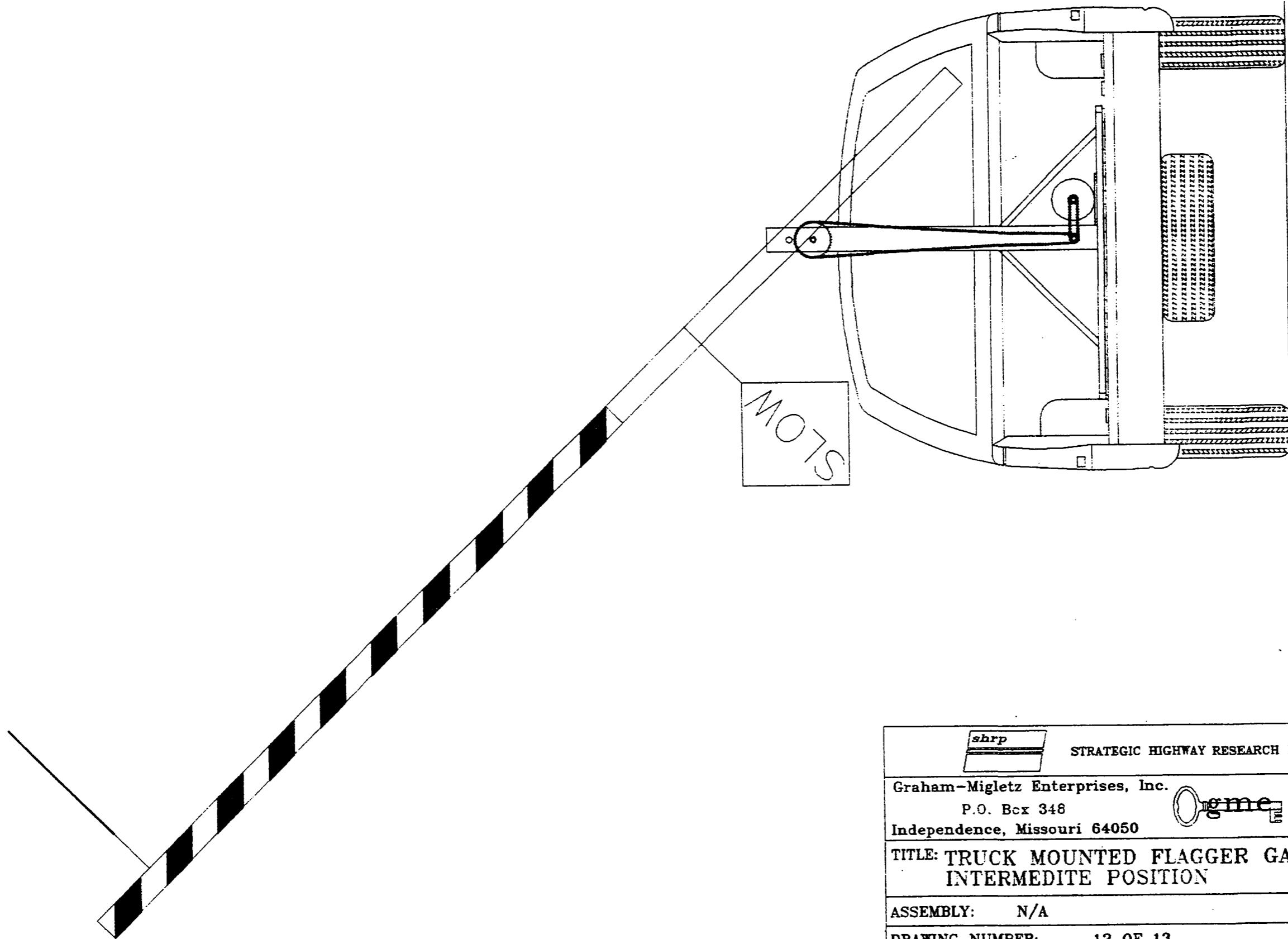
TITLE: HANDBRAKE	DRAWN BY: JMM
REVISED: RLM	
ASSEMBLY: FLAGGER GATE	SCALE: NONE
DRAWING NUMBER: 9 OF 13	DATE: 8-28-92

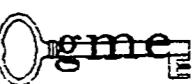


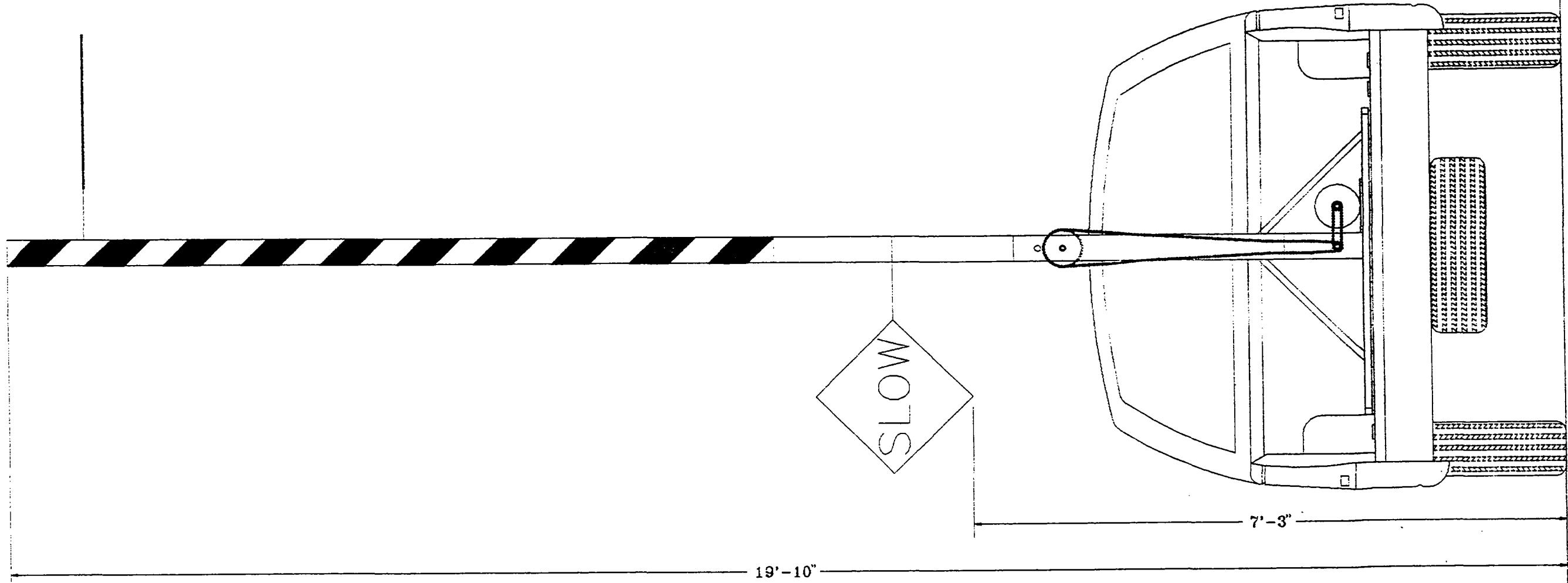
shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	(816) 254-1788 FAX (816) 254-4654
TITLE: TRUCK MOUNTED FLAGGER GATE (TRAVEL MODE)	DRAWN BY: RLM
ASSEMBLY: N/A	REVISED: RLM
DRAWING NUMBER: 10 OF 13	SCALE: NONE
	DATE: 9-17-92



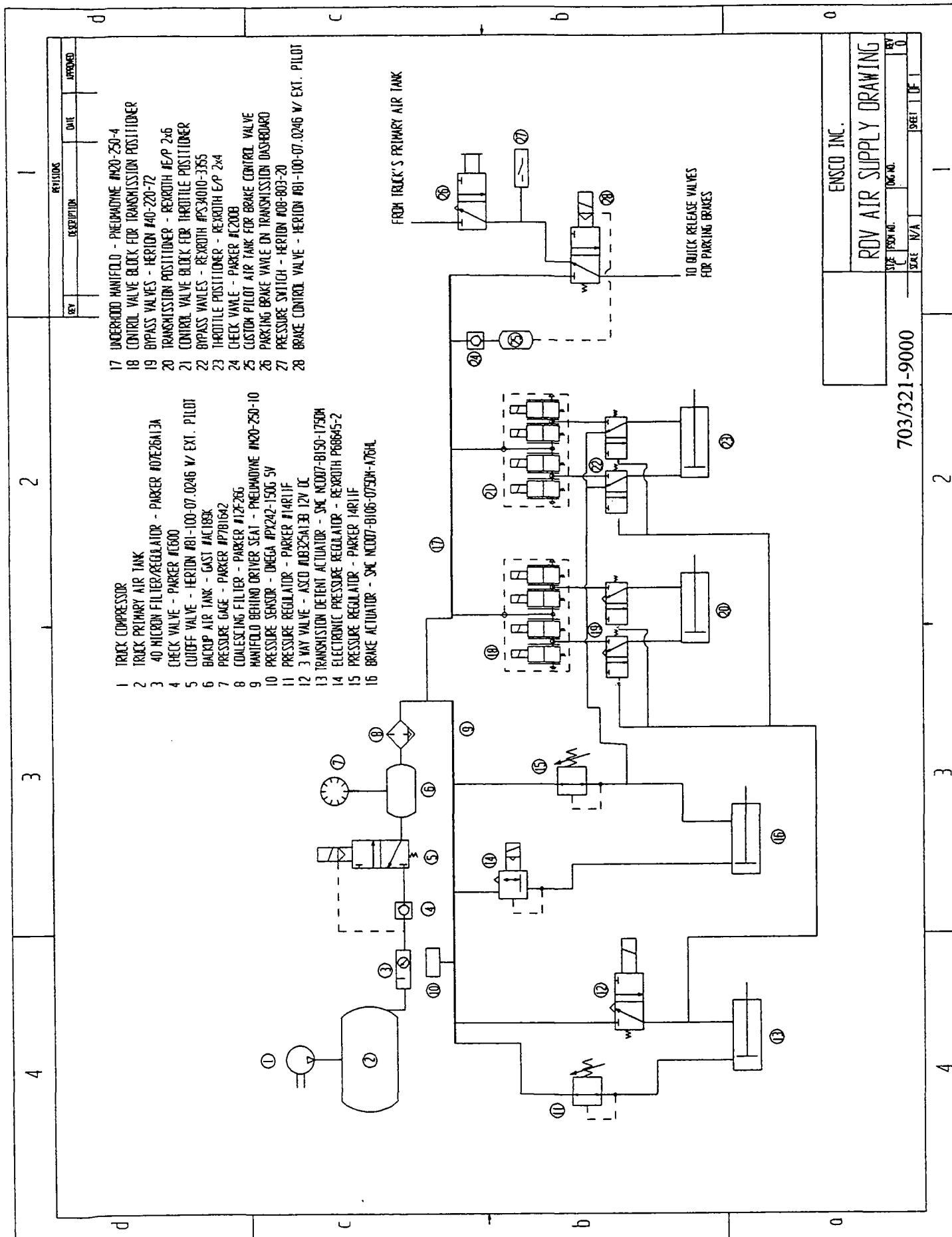
shrp	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	(816) 254-1788 FAX (816) 254-4654
TITLE: TRUCK MOUNTED FLAGGER GATE (STOP MODE)	DRAWN BY: RLM
ASSEMBLY: N/A	REVISED: RLM
DRAWING NUMBER: 11 OF 13	SCALE: NONE
	DATE: 9-18-92



<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	(816) 254-1788  FAX (816) 254-4654
TITLE: TRUCK MOUNTED FLAGGER GATE INTERMEDIATE POSITION	DRAWN BY: RLM
ASSEMBLY: N/A	REVISED: RLM
DRAWING NUMBER: 12 OF 13	SCALE: NONE
	DATE: 9-18-92



<i>shrp</i>	STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc.		(816) 254-1788
P.O. Box 348		FAX (816) 254-4654
Independence, Missouri 64050		
TITLE: TRUCK MOUNTED FLAGGER GATE (SLOW MODE)		DRAWN BY: RLM
		REVISED: RLM
ASSEMBLY: N/A		SCALE: NONE
DRAWING NUMBER: 13 OF 13		DATE: 9-18-92



Remotely-Driven Vehicle—Mechanical System

Introduction:

This section will discuss the various mechanical aspects of the RDV. Each subsystem will be described, its intended function detailed.

How to use this section:

Refer to the drawing on the following page. Most of the mechanical equipment is on this drawing. Equipment that is not on the drawing will be described at the end of the end of this section.

Item 1: Truck Compressor

The truck compressor supplies the compressed air for the RDV control system. The governor for the compressor has been adjusted so that the cut in pressure is 100 psi and the cutout pressure is 130 psi. It is important the cut-in pressure is not tampered with. If the governor is replaced then the replacement should be adjusted such that the cut-in pressure is at least 100 psi.

Item 2: Truck Primary Air Tank

The RDV control system is supplied air from the truck's primary air tank. The air is tapped off the front of the tank near the passenger side front wheel.

Item 3: 40 Micron Filter/Regulator

The 40 Micron Filter/Regulator acts as a pre-filter for the RDV air supply system. The Regulator is set for 100 psi and should not be tampered with unless the supply air is less than 95 psi or greater than 105 psi. Periodically, inspect the filter and change if required. The filter has an automatic drain but it should rarely be required because of the automatic drain the truck's air tanks.

Item 4 Check Valve

The check valve is used to prevent the air in the from venting in case there is a large leak in the trucks air system. Air flows in only one direction towards the backup air tank.

Item 5 Cutoff Valve

The Cutoff valve is used to prevent the trucks main air from slowly leaking over long periods of time through the RDV system. A couple of components of the RDV control system slowly bleed air as part of their normal operation.

When the ignition key is in the OFF position the shutoff valve is closed and does not allow air to flow into the RDV control system. When the ignition key is in the ON position the valve is energized and air flows into the RDV system.

Item 6 Backup Air Tank

The Backup Air Tank is used to help provide a consistent air pressure for the RDV control system.

Item 7 Pressure Gage

A pressure gage is installed on the driver side of the air tank to help verify proper system pressure from the filter/regulator. It should read approximately 100 psi while the RDV system is running.

Item 8 Coalescing Filter

This filter is used to eliminate any rust or scale in the air supplied from the Backup Air tank. It is also a desiccating filter and will filter out particles as small as 5 microns.

The filter should be periodically inspected and replaced if necessary.

Item 9 Manifold behind drivers seat

The manifold behind the drivers seat serves as an air distribution point for the pneumatic system.

Item 10 Pressure Sensor

This sensor is used by the control computer to monitor the system pressure in the manifold behind the drivers seat..

Item 11 Pressure Regulator

This pressure regulator is used to set the return pressure for the transmission detente actuator.

Item 12 3 Way Valve

This valve is mounted behind the drivers seat and serves a multi-function role. It actuates the transmission detente actuator and the bypass valves for both the transmission and the throttle. It is energized only while the RDV control system is operating.

Item 13 Transmission Detente Actuator

This small pneumatic cylinder is used pull the transmission lever to the left while the RDV control system is operating. This allows the lever to operate by the transmission actuator without hanging up on the detentes on the transmission shift lever housing.

Periodically the nut on the detente bracket should be checked for tightness. This nut is on the shaft of the detente actuator.

Item 14 Electronic Pressure Regulator

The Electronic Pressure Regulator is located behind the driver seat. Its function is to modulate the pressure to the brake actuator. It is under control by the computer. It should require little if any service.

Item 15 Pressure Regulator

This regulator is used by both the brake and the throttle actuator to provide back pressure to overcome the stickiness in the cylinders. This helps preserve the tactile qualities of the original truck equipment.

Currently, the regulator is set to 0 psi because of the strong throttle spring that exists on the truck. This causes muscle fatigue while driving the truck at highway speed for long periods of time. The pressure can be adjusted upward but it is recommended that the pressure setting be kept below 4 psi.

Item 16 Brake Actuator

This actuator modulates the brake pedal while the truck is under computer control. It works in conjunction with the electronic pressure regulator.

Item 17 Underhood Manifold

This manifold provides for air distribution for the pneumatic equipment underneath the hood of the truck. It is mounted on the aluminum panel on the drivers side next to the steering column shaft.

Item 18 Control Valve Block for Transmission Positioner

This unit receives signals from a control unit inside the electronic enclosure between the seats. It moves the cylinder by briefly applying/venting air on both sides of the transmission actuator.

Item 19 Bypass Valves for Transmission Positioner

These valves allow the transmission positioner to move freely when the RDV control system is off. Without these valves the transmission actuator would be locked with the air trapped within the cylinder.

These valves are operated by pressure from the 3 way valve behind the drivers seat. Without pressure being supplied to these valves they default to an open position and allow the transmission positioner to move freely. With pressure, the valves redirect the flow such that the Control Valve block can move the transmission positioner.

These valves require no maintenance except for periodically checking for air leaks.

Item 20 Transmission Positioner

This unit is an air cylinder that can be positioned to specified locations by the computer. It is directly acted upon by the Control Valve block.

Item 21 Throttle Control Valve Block

This block serves the same function as the Transmission Control Valve block. It actuates the throttle positioner with respect to the commands from the control computer.

Item 22 Throttle Bypass Valves

These valves serve the same function as the Transmission Bypass valves. They are from a different supplier because because of price and availability reasons. They are essentially 5 way valves that have been converted to 3 way valves by plugging two of the ports on each valve.

Item 23 Throttle Positioner

This actuator is an air cylinder that modulates the throttle for the RDV control system. It is controlled by the Throttle control valve block.

Item 24 Check Valve

This check valve is used in conjunction with the custom pilot air tank (item 25) to prevent back flow from the air tank in case there is a large system air leak.

Item 25 Custom Pilot Air Tank for Brake Control Valve

This tank provides a reliable source of pressure for the brake control valve. This valve is a pilot assisted design that requires a pilot pressure for proper valve operation.

Item 26 Dash-mounted Parking Brake Valve

It important that the parking brake are engaged before the RDV control system will operate.

Item 27 Pressure Switch

This pressure switch is used to verify that the parking brakes are applied before the RDV control system will operate. The pressure level is preset and will not require adjustment unless the switch fails and is replaced.

Item 28 Brake Control Valve

This valves operates the spring brakes for the truck during remote control operation. It is located on the aluminum panel next to the steering column. This unit should not require any maintenance unless it fails.

Steering Actuator

This actuator is mounted by the power steering unit on the truck. It is coupled to the steering column with with a gear belt. The belt tightness should be inspected regularly. When tightening the belt preserve the belt alignment between the pulleys and avoid overtightening the belt.

Operations Section

Scope:
This section will discuss how to operate the truck.

Part 1 Starting the RDV system

- a. Engage the Parking Brake and turn off the engine. Turn off flashers, headlights and turn signals.
- b. Make sure that the EM STOP button is in the up position, the PARKING BRAKE switch is in the ON position, the LIGHTS are in the OFF position, the FLASHERS are in the OFF position and the TRANSMISSION is in NEUTRAL. Turn on the transmitter by pulling up on the power switch. Verify that the transmitter light is not flashing.
- c. Turn the ignition key to the ON position.
- d. Turn the keyswitch on the electronic enclosure to the ON position.
- e. When the flashers come on the STARTER button can be pressed.
- f. If the headlights come on just after the motor starts then the system is building air pressure.
- g. When the headlights and the flashers go out the system is ready for operation.

Part 2 Driving the RDV

- a. To shift the RDV into any gear the PARKING BRAKE must be in the ON position and the truck must not be moving.
- b. The service brakes will not operate while the PARKING BRAKE is in the ON position.
- c. To stop the truck or kill the engine press the EM STOP button.
- d. To restart the truck put the switches on the transmitter in the proper position as described in start truck section. Slowly toggle the LIGHTS switch and then the FLASHERS switch. When the flasher stay on then the truck is ready to be started.
- e. If the truck stops for any reason, other than hitting the EM STOP button on the transmitter, walk over to the truck and read the message on the LCD display. Refer to the following section for the appropriate action to take.
- f. The throttle won't operate unless the PTO (Push To Operate) bar is pressed. There is a 3 second delay in the PTO bar so that the operator can momentarily lift his or her hands without the truck slowing down.

Part 3 Shutting Down the RDV System

- a. Press the EM STOP button on the transmitter.
- b. Press the power switch on the transmitter.
- c. Turn the keyswitch on the electronic enclosure to the OFF position.
- d. The truck can now be driven normally.

Status Messages On LCD Panel

Introduction:

This section will review the status messages on the LCD panel. The status messages will help the operator diagnose why the system is not running. In many cases looking at the LCD panel will allow the operator to take corrective action in case the truck won't start or if the RDV control system shuts down the truck.

RDV system OK

This message displayed while the engine is running and the status of all signals is OK.

Malfunction with Receiver or Transmitter

Emergency stop system activated

This message is displayed when communications with the transmitter and Receiver cease. Check to make sure the transmitter power button is on. The truck may have been driven out of range. Walk 100 ft closer to the truck and try to restart the system. If the truck will not start there is a hardware problem. Shut down the RDV system and check the transmitter battery voltage. If it is OK then the system needs service.

Emergency button hit

Emergency stop system activated

One of the EMERGENCY STOP buttons was pressed. Pull out on the button that was pressed before trying to restart the system.

Impact Switch Activated

Emergency stop system activated

The impact switch was activated. This occurs when the G level in the horizontal plane exceeds 2 g's. The truck can be reset from the transmitter and restarted if everything is OK.

Low air pressure in Truck air system

Emergency stop system activated

The truck's low pressure warning switch was activated. Check the main air system for leaks and verify that the compressor is operating correctly.

Transmission temperature high

Truck stopped for safety

If this message is displayed take the truck back to the shop for servicing.

Coolant Temperature High**Truck stopped for safety**

If this message is displayed, have the truck serviced.

Low Oil Pressure**Truck stopped for safety**

If this message is displayed, immediately have the truck serviced.

Low Coolant Level**Truck stopped for safety**

Add more coolant before operating the truck. The system will not operate until there is enough coolant.

Maximum Truck Speed Exceeded**Emergency stop system activated**

If the truck speed is exceeded then this probably happened while driving the truck in reverse. Reset the system to continue operation. If this happened while driving the truck forward then there is a malfunction with the RDV system that needs to be corrected. Do not use the RDV system until this problem has been fixed.

Verifying that the transmission lever is out of the detent positions

The transmission detent is being moved. If this message is on for more than a second then the actuator is stuck. Verify that the actuator has air pressure. The transmission lever must be pushed to the left before the truck will start. Service the transmission detent unit if necessary.

Large leak in RDV air manifold system**Check all RDV air lines for leaks**

The pressure sensor in the manifold behind the drivers seat has detected insufficient pressure for proper system operation. Check for leaks and that the air supply system is working correctly.

Truck supply voltage insufficient**Check charging system for malfunction**

There is a problem with the charging system. Correct before trying to use the RDV system.

Truck fuel level low**Truck stopped for safety**

The truck was stopped before it ran out of diesel to prevent unpredictable behavior from the truck. Shut down the RDV system until more fuel can be obtained.

Push the PTO bar for truck operation**Truck slowed until PTO is depressed**

Press the PTO bar for the message to go out. The throttle will not work unless the PTO bar is pressed.

Failure with transmission detent system**Truck stopped for safety**

The transmission detent went into the wrong position while the truck was operating. Check the system before restarting.

Engine quit for unknown reason**Truck stopped for safety**

Check the engine function before restarting the RDV system.

Transmitter Tilted**Truck stopped for safety**

The system will shut down if the transmitter is tilted. The RDV system assumes that something has happened to the operator if this has happened. Set the transmitter upright and reset the system to continue operation.

Collision Avoidance system activated**Truck stopped for safety**

The ultrasonic sensors were activated. Reset the system to continue operation.

--Please wait-- Transmission is being shifted to NEUTRAL

This message should be on for less than 6 seconds, if it is on longer then there is a problem with the system that needs to be corrected. It comes on while the transmission actuator is moving the transmission into the correct position.

--Please wait-- Transmission is being shifted into FWD

This message should be on for less than 6 seconds, if it is on longer then there is a problem with the system that needs to be corrected. It comes on while the transmission actuator is moving the transmission into the correct position.

--Please wait-- Transmission is being shifted into REVERSE

This message should be on for less than 6 seconds, if it is on longer then there is a problem with the system that needs to be corrected. It comes on while the transmission actuator is moving the transmission into the correct position.

System ready to be started**Press starter button to start truck.**

This message is displayed when the RDV system is ready to be started.

POWER DISTRIBUTION

All power for the RDV electronics is derived from the trucks 12 volt DC battery and charging system. Power (12vdc) is taken from the truck at two (2) places, one before the ignition switch (from the terminal board mounted in the engine compartment on the firewall) and the other after the ignition switch (from the fuse box). This power is feed thru isolation diodes to two (2) 12vdc sealed lead acid batteries (located in front of the electronics inclosure) [refer to drawing 12VDC DIST]. The purpose of these batteries is to hold the system 12 volts up during heavy power loadings of the trucks batteries and charging system. If these two additional batteries were not installed (or are malfunctioning) the computer system and other electronic could fail during heavy loading of the truck power system, such as when the motor is started. These batteries are being charged any time the trucks main batteries are being charged. These two additional batteries where not sized to run the electronics independent of the trucks power system for more then several hours. It is suggested that any time work is being preformed on the RDV electronics or computer system, and the truck engine is not running, a battery charger be connected to the main batteries on the truck.

It is assumed that during normal operation of the RDV system the engine will be started and stopped numerous times during the day. The electronic and computer system will be able to run for several hours (three to four) with the engine off, with out degrading the performance of the batteries. If these batteries start to show signs of not enough capacity in actual operations then these batteries will have to be replaced with larger batteries.

To apply power to the system first turn on the ignition switch and then turn on the key switch located on the electronics rack. This will apply power to the RDV electronics system and computer. (If the truck is running when the key switch is turned on the engine will stop running.) When the ignition switch is turned on 12vdc is supplied to the system to operate certain safety circuits. Nothing that is powered at this time will effect the normal operation of the truck. When the key switch is turned on power is supplied to all other components of the RDV system and the truck is not driveable in a normal manner.

Power for all systems is derived from the trucks 12 volt system thru the use of DC to DC converters. These converters are located in the power distribution box located on the passengers side of the electronic enclosure, and on the bottom of the electronic enclosure. There are no adjustments on any of the DC to DC converters. Refer to drawings POWER SUPPLY BOX and 90 VDC POWER SUPPLY for the wiring of these converters. There are ten (10) fuses located on the power distribution box, one (1) fuse located in the electronic

enclosure (which is an inline fuse on the power lead to the ultrasonic signal conditioner), and one fuse on the steering controller unit. There are status lights for each power supply located on the signal condition unit located in the RDV electronic enclosure. These lights will be lit if the voltage of the power converters is close to their correct voltage. These lights will not tell you that the voltage is exactly correct. If there appears to be a problem with any part of the RDV system the actual voltages of each power supply should be measured if all of the status lights are lit. To measure these voltages it is necessary to remove the cover of the power distribution box to access to terminal boards for the DC to DC converters located in this box. Refer to drawing POWER SUPPLY BOX to find the points to monitor the voltage. To check the voltages of the DC to DC converters located in the RDV electronic enclosure it is required that you remove the computer from the rack to gain access to the terminal boards and the power supplies. (Any time that access is required to the RDV electronic enclosure the computer must be removed first). Refer to drawing 90 VDC POWER SUPPLY for location to monitor the voltages.

Power for the transmitter is supplied by a 12VDC sealed lead acid battery. It is located on the side of the transmitter and is removable by undoing one captured screw and then undoing one molex style connector. This connector is keyed and can only be connected in one polarity. The RDV system comes supplied with two (2) batteries and a small lead acid charger. To charge a battery connect the battery to the charger, plug in the charger and switch the charger to fast charge. Either when the red light on the charger goes out or before twenty four (24) hours switch the charger to float. In this mode the battery may be connected to the charger for and indefinite time. If the charger is unplugged, disconnect the battery from the charger. It is predicted that a fully charged battery will last a minimum of forty (40) hours. This time is dependent on the actual operation of the truck. The transmitter has two power consumption modes. When not in uses (power on, but no control changed within several minutes) it operates in a low power mode. When constantly in use the transmitter operates in a high power mode. The estimate of operation time is based on operation in the high power mode.

TRANSMITTER RECEIVER

The transmitter receiver is a matched system manufactured for the RDV system by REMTRON. The only suggested maintenance that should be preformed on this sub-system is the changing and recharging of the batteries in the transmitter. The battery is removed from the transmitter by loosening the single captive screw on the side of the transmitter and opening the battery compartment. The battery is connected to the transmitter with a molex style

connector. The connector is keyed to insure that the correct polarity is kept when the unit is plug in. To recharge the battery plug the battery into the supplied charger, plug the charger in to a 120VAC outlet, and switch the charger to high. The charger should be switched to float when the red light on the charger goes out (this indicates that the battery is 90% charged) or less then 24 hours. Never leave the charger plugged in and connected to the battery for more then 24 hours in the high position. The battery may be left indefinitely connected to the charger in the float mode. If the charger is disconnected from the 120VAC, disconnect the battery from the charger. There is a test indication light located on the transmitter. This light has the following meanings:

1. AFTER TRANSMITTER IS TURNED ON
 - A. LIGHT TURNS ON FOR 1/2 SECOND THEN STAYS OFF-
TRANSMITTER OK
 - B. LIGHT BLINKS ON AND OFF AT A STEADY RATE-
COMMAND SWITCH IS ON AT START UP, SET SWITCH OFF AND
RESTART
 - C. LIGHT IS ON OR OFF STEADY-
BATTERY IS DEAD OR TRANSMITTER MUST BE SERVICED
2. LIGHT FLASHES BRIEFLY - LOW BATTERY

The theory and principles of operation are covered in the manual supplied by the manufacture. The operation of the transmitter is covered in the operation of the system section of this manual.

ANALOG SIGNAL CONDITIONING

The analog signal conditioning unit is a 3B unit manufactured by ANALOG DEVICES. The amplifiers in this unit are used to isolate the computer input and output from the rest of the trucks power systems. There is no periodic maintenance needed on this unit. The theory and principles of operation are covered in the manual supplied be the manufacture.

COMPUTER INTERFACE

The computer interface unit contains the isolation of the computer input/output control signals from the rest of the RDV system, the emergency stop system, a +12 VDC DC to DC converter, and status lights for the state of the digital input/output. This unit is the heart of the RDV system since almost all signals are past thru this unit. There are no circuits that need any adjustment in this unit. For detail information on this unit refer to the following drawings:

TRIFACE3.SCH
FROM IO.SCH
TO IO.SCH
EBCOND4.SCH
WATCHDOG.OR3
STEERING ENABLE
PWR_DEL.SCH

JUNCTION BOX

The junction box is mounted under the dashboard on the drivers side of the automatic transmission shifter. The purpose of this junction box is to collect the wiring from the existing truck switches, the truck diagnostic signals, the truck fuel level, the tachometer signal , and the speedometer signal. There are no adjustments required in this box. For detail information on this unit refer to the following drawings:

DASHBOX.SCH
TACSPED.SCH
TRSPEED.SCH
TRSIG.SCH
TRGASOFF.SCH
TRHEAD.SCH
TRSTART.SCH
TRFLSND.SCH
TROIL.SCH
TRCOOLEV.SCH
TRTRANS.SCH
TRCOOL.SCH
TRLOAIR.SCH

CABLE-WIRING NUBERING

CABLE #	DISCRIPTION
1	NOT USED *
2	NOT USED *
3	AIR SOLINOID
4	PRESURE SWITCH BYPASS FAILURE DETECT
5	NOT USED *
6	SOLENOID VALVE REXROTH MV4
7	SOLENOID VALVE REXROTH MV3
8	SOLENOID VALVE REXROTH MV2
9	SOLENOID VALVE REXROTH MV1
10	POSITION RETURN REXROTH (TRANS)
11	THROTLE (ANALOG VOLTAGE FROM COMPUTER)
12	+24VDC THROTLE POWER (REXROTH)
13	TRANS. DETENT SOL.
14	MANIFOLD PRESSURE
15	REX ROTH (THROTLE) (4 PAIR)
	MV1 + YELLOW/WHITE 32
	- GREEN/WHITE 33
	MV2 + RED 27
	- BLACK 28
	MV3 + RED/WHITE 31
	- BLACK/WHITE 30
	MV4 + WHITE 26
	- GREEN 25
16	AIR CUTOFF
17	THROTTLE FEEDBACK POSITION (REXROTH)
	RED 18
	BLACK 11
	CLEAR 12
18	
19	
20	COMPUTER POWER
21	3B POWER
22	
23	2ND KILL SW. (PANIC STOP)
24	TRANS. DETENT SWITCH
25	BYPASS FAILURE DETECT (SW #4)
26	
27	
28	VENT CV (SOL. #3)
29	POWER FOR STEERING AMP
	-15VDC BLACK/WHITE
	+5VDC WHITE/BLACK
	COMMON BLACK/BLUE
	+15VDC BLUE/BLACK
	+96VDC GREEN/BLACK
	BLACK/GREEN
	96VDC COM BLACK/RED
	RED/BLACK
30	+12VDC TB1-1 (NOT KEYSW.)
31	KEY SWITCH
32	OUTSIDE PANIC STOP SWITCHES
33	+12VDC FROM POWER SUPPLY BOX (KEYSW.)

CABLE-WIRING NUBERING

CABLE #	DISCRIPTION
34	+12VDC CLEAR TB3-2 FUSE 5
	GND BLACK TB2-2
	POWER FROM POWER SUPPLY BOX
	+24VDC WHITE TB4-10
	+15VDC GREEN TB4-9
	-15VDC RED TB4-7
	-12VDC YELLOW TB4-5
	+5VDC BLUE TB4-4
	GND BLACK TB5-4
35	STEERING ANALOG
36	REXROTH (TRANS) POSITION FEEDBACK ANALOG
37	RELAY BOX
38	RECEIVER
39	ULTRASONIC SIGNAL
40	IMPACT SWITCH SIGNAL
41	IMPACT SWITCH POWER +12VDC
42	IMPACT SWITCH RESET MANUAL
43	IMPACT SWITCH RESET COMPUTER
44	REXROTH (TRANS) POWER +24VDC
45	REXROTH (TRANS) ANALOG INPUT

* RUN FROM SIGNAL COND. BOX TO DRIVERS SIDE OF FIRE WALL
NOT CONNECTED ON EITHER SIDE

RECEIVER WIRING J3

PIN #	TERMINAL BOARD	SIGNAL	COLOR WIRE
1	TB6-3	+12VDC POWER	RED
2	A8	STEERING	BLUE
3	A9	BRAKES	WHITE
4	A10	FOWARD	GREEN
5	TB3-2	LEFT TURN SIGNAL	BROWN
6	TB3-3	RIGHT TURN SIGNAL	GREEN
7	TB3-4	LIGHTS	RED
8	TB3-7	RARKING BRAKE	BLUE
9	TB3-8	STARTER	WHITE
10	TB3-12	E-STOP	GREEN
11	TB3-13	PTO	BROWN
12	TB3-14	TIILT	GREEN
13	TB4-7	IGNITION	RED
14	TB4-8	TRANS. REV.	BLUE
15	TB4-9	TRANS. NEUT.	WHITE
16	TB4-10	TRANS. FWD.	GREEN
17	TB5-2	OPR (OPR_BIT)	BROWN
18	TB5-4	OPI (REC_STATUS_BIT)	GREEN
19	TB5-3	+12VDC (RELAYS)	RED
20	TB6-4	GND	BLACK
21	A6	GND (ANALOG)	BLACK
22	A6	GND (ANALOG)	BLACK
23	A5	GND (ANALOG)	BLACK
37	TB6-4	GND	BLACK

JUMPERS

FROM	TO	SIGNAL
TB6-1	TB6-2	ON
TB5-3	TB5-1	+12VDC
TB5-1	TB4-15	+12VDC
TB4-15	TB4-12	+12VDC
TB4-12	TB4-6	+12VDC
TB4-6	TB4-1	+12VDC
TB4-1	TB3-1	+12VDC
TB3-1	TB3-6	+12VDC
TB3-6	TB3-11	+12VDC

ADDRESS SWITCH SETTING

BIT POS. (O=OPEN C=CLOSED)

1	C
2	O
3	O
4	C
5	O
6	O
7	C
8	C

RELAY J-BOX INPUT CABLING J5

TER. BOARD	SIGNAL	TRUCK CONNECTION	WIRE COLOR	WIRE #
TS2-1	RIGHT FRONT TURN	C208-7	RED	21
TS2-2	RIGHT REAR TURN	C208-12	ORANGE	22
TS1-5	RIGHT REAR TURN		BROWN	15
TS2-3	LEFT REAR TURN	C208-11	GREEN	23
TS1-6	LEFT REAR TURN	C208-11	YELLOW	16
TS2-4	LEFT TRONT TURN	C208-6	PURPLE	24
TS2-5	FLASHER OUT	C-505 (BL 44)	BLUE	45
TS2-6	HEADLIGHT SW.		RED	26
TS2-7	HEADLIGHT SW.		GREEN	27
TS2-8	START MOTOR	START INTERLOCK SW.	PURPLE	28
TS2-9	FUEL SOLINOID	FUEL CUTOFF SOL.	BLUE	29
TS2-10	FUEL SOLINOID	FUEL CUTOFF SOL.	BLUE	30
TS1-1	TACH	TACH (GR-Y)	ORANGE	11
TS1-3	SPEEDOMETER	SPEEDOMETER (GR)	YELLOW	13
TS3-3	FUEL LEVEL	C401 (OR 286)	ORANGE	33
TS3-4	TRANS TEMP.	C240 (886 BL)	BLUE	34
TS3-5	COOLANT TEMP.	C202 (Y-R)	YELLOW	35
TS3-6	LOW OIL PRES.	C202 (W)	PURPLE	36
TS3-7	LOW COOLANT	C202 (PK)	RED	37
TS3-8	H2O IN FUEL	C202 (GR-W)	GREEN	38
TS3-9	LOW AIR	C211 (GR 730)	ORANGE	39
TS1-12	GND		BLACK	2
TS2-12	GND			
TS1-11	+12VDC BAT.	FUSE BOX UNSW.	RED	1
TS2-11	+12VDC BAT.			

J4 MISC I/O

PIN	SIGNAL	PIN	SIGNAL
1	KILL SW. #1	20	VENT CONTROL
2	KILL SW. #1	21	
3	KILL SW. #2	22	PRESURE SW.
4	KILL SW. #2	23	
5	IMPACT SW.	24	TRUCK VOLTAGE (/2) A/D
6	ULTRASONIC SW.	25	+90VDC
7	TRANS. DETENT SW.	26	+5VDC
8	TRANS DETENT ACT.	27	-12VDC
9	IMPACT SW. RESET	28	+24VDC
10	IMPACT SW. RESET	29	+15VDC
11	STEERING A/D	30	-15VDC
12	BRAKE A/D	31	+12VDC (TRUCK)
13	THROTTLE A/D	32	+12VDC (REG)
14	+12VDC KEYSW.	33	AIR ON SOL.
15	GND	34	STEERING ENABLE
16	FUEL LEVEL A/D	35	
17	SPEED A/D	36	
18	+12VDC NOKEYSW.	37	
19			

TERMINAL STRIP IN BOTTOM OF INSTRUMENT RACK
INTERCONNECT TRUCK WITH J4 ISOLATOR BOX

TERMINAL	SIGNAL
1	STOP SWITCH #1
2	STOP SWITCH #1
3	STOP SWITCH #2
4	STOP SWITCH #2
5	IMPACT SWITCH HI
6	IMPACT SWITCH LO
7	TRANS. DETENT SWITCH HI
8	TRANS. DETENT SWITCH LO
9	IMPACT SWITCH RESET
10	IMPACT SWITCH RESET
11	VENT CONTROL
12	
13	PRESSURE SWITCH #1
14	
15	ULTRASONIC HI
16	ULTRASONIC LO
17	TRANS DETENT SOL. HI
18	TRANS DETENT SOL. LO
19	AIR ON SOL. HI
20	AIR ON SOL. LO

GROUND JUMPERS 6-8-16-20

DIGITAL I/O
STATUS LIGHTS AND BYTE-BIT ADDRESS

LED#	SIGNAL	ADDRESS	ADDRESS
		BYTE-BIT	BYTE-BIT
1	RCVT STATUS	0-0	11
2	EMERG. STOP (RCVR)	0-1	12
3	TILT	0-2	13
4	FOWARD BIT	1-0	14
5	REVERSE BIT	1-1	15
6	NEUTRAL BIT	1-2	16
7	STARTER	1-3	17
8	PARKING BRAKE	1-4	18
9	LIGHTS	1-5	19
10	LEFT TURN	1-6	20
21	FUEL CUTTOF STATUS	7-4	31
22	COOLANT TEMPERATURE	7-5	32
23	LOW OIL	7-6	33
24	WATER IN FUEL	7-7	34
25	LOW COOLANT	6-4	35
26	ENGINE RUNNING	6-5	36
27	PRESURE SW.	7-3	37
28			38
29			39
30			40
41	EMER. STOP	8-2	BRAKE BIT #1 4-0
42	STARTER	8-3	BRAKE BIT #2 4-1
43	LIGHTS	8-4	BRAKE BIT #3 4-2
44	LEFT TURN SIGNAL	8-5	BRAKE BIT #4 4-3
45	RIGHT TURN SIGNAL	8-6	BRAKE BIT #5 4-4
46	TRANS. DETENT	8-7	BRAKE BIT #6 4-5
47	IMPACT RESET	8-0	
48	PARKING BRAKE	8-1	
49	STEERING ENABLE	5-0	
50	WATCHDOG PULSE	5-1	

CHANNELS 1-28 TO COMPUTER
CHANNELS 41-48 AND BRAKE BITS FROM COMPUTER
CHANNELS 33-40 VOLTAGE MONITOR

ZT89CT61 PINOUT

PIN #	BIT	JI	J2	J3	J4
		PORT 2	PORT 5	PORT 8	PORT 11
1	7	I/O 23	I/O 47	I/O 71	I/O 95
3	6	I/O 22	I/O 46	I/O 70	I/O 94
5	5	I/O 21	I/O 45	I/O 69	I/O 93
7	4	I/O 20	I/O 44	I/O 68	I/O 92
9	3	I/O 19	I/O 43	I/O 67	I/O 91
11	2	I/O 18	I/O 42	I/O 66	I/O 90
13	1	I/O 17	I/O 41	I/O 65	I/O 89
15	0	I/O 16	I/O 40	I/O 64	I/O 88
		PORT 1	PORT 4	PORT 7	PORT 10
17	7	I/O 15	I/O 39	I/O 63	I/O 87
19	6	I/O 14	I/O 38	I/O 62	I/O 86
21	5	I/O 13	I/O 37	I/O 61	I/O 85
23	4	I/O 12	I/O 36	I/O 60	I/O 84
25	3	I/O 11	I/O 35	I/O 59	I/O 83
27	2	I/O 10	I/O 34	I/O 58	I/O 82
29	1	I/O 9	I/O 33	I/O 57	I/O 81
31	0	I/O 8	I/O 32	I/O 56	I/O 80
		PORT 0	PORT 3	PORT 6	PORT 9
33	7	I/O 7	I/O 31	I/O 55	I/O 79
35	6	I/O 6	I/O 30	I/O 54	I/O 78
37	5	I/O 5	I/O 29	I/O 53	I/O 77
39	4	I/O 4	I/O 28	I/O 52	I/O 76
41	3	I/O 3	I/O 27	I/O 51	I/O 75
43	2	I/O 2	I/O 26	I/O 50	I/O 74
45	1	I/O 1	I/O 25	I/O 49	I/O 73
47	0	I/O 0	I/O 24	I/O 48	I/O 72
49		5V	5V	5V	5V
2-50		GND	GND	GND	GND
EVEN					

J7 BRAKE OUT

PIN	SIGNAL	COLOR	PIN	SIGNAL	COLOR	
1	SOL. #1	GND.	WHITE	9	+24VDC	BLACK
2	SOL. #2	GND.	GREEN	10	+24VDC	BLACK
3	SOL. #3	GND.	BLUE	11	+24VDC	BLACK
4	SOL. #4	GND.	YELLOW	12	+24VDC	BLACK
5	SOL. #5	GND.	BROWN	13	+24VDC	BLACK
6	SOL. #6	GND.	RED	14	+24VDC	BLACK
7				15	+24VDC	
8						

J8 BRAKE IN AND MICS. (FROM MICRO)

PIN	SIGNAL
31	SOL. #1
29	SOL. #2
27	SOL. #3
25	SOL. #4
23	SOL. #5
21	SOL. #6
2	GND.
15	STEERING ENABLE
13	WATCHDOG PULSE

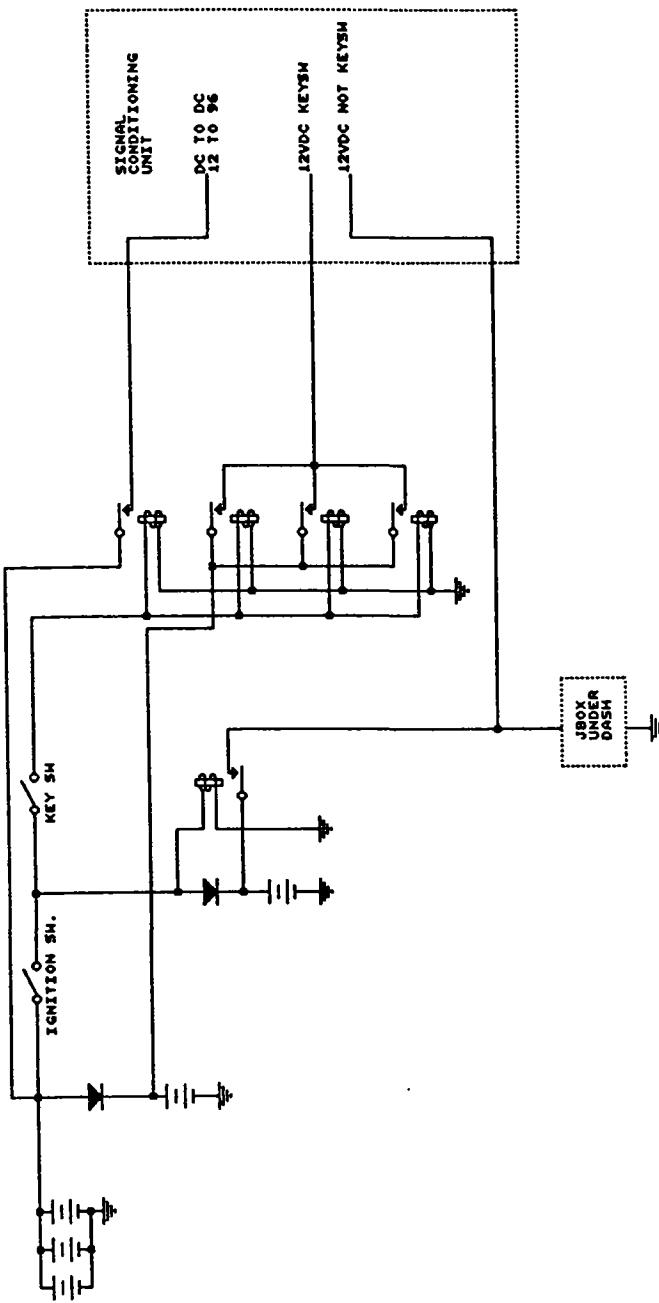
COMPUTER POWER SUPPLY

PIN	VOLTAGE	WIRE COLOR
1	+5VDC	RED
2	GND	BLACK
3	+5VDC	RED
4	GND	BLACK
5	+12VDC	YELLOW
6	GND	BLACK
7	-12VDC	BLUE
8	GND	BLACK
9		

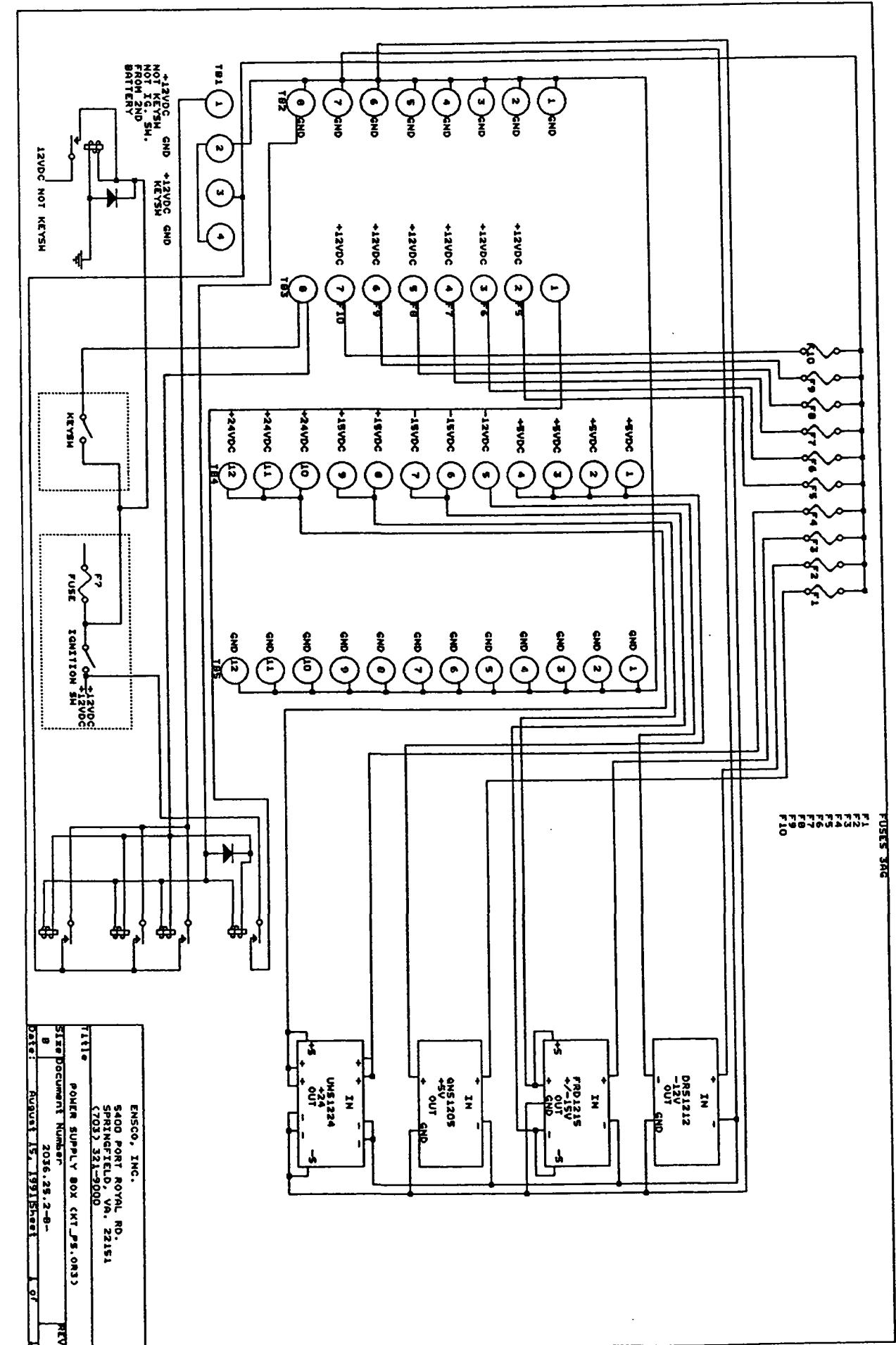
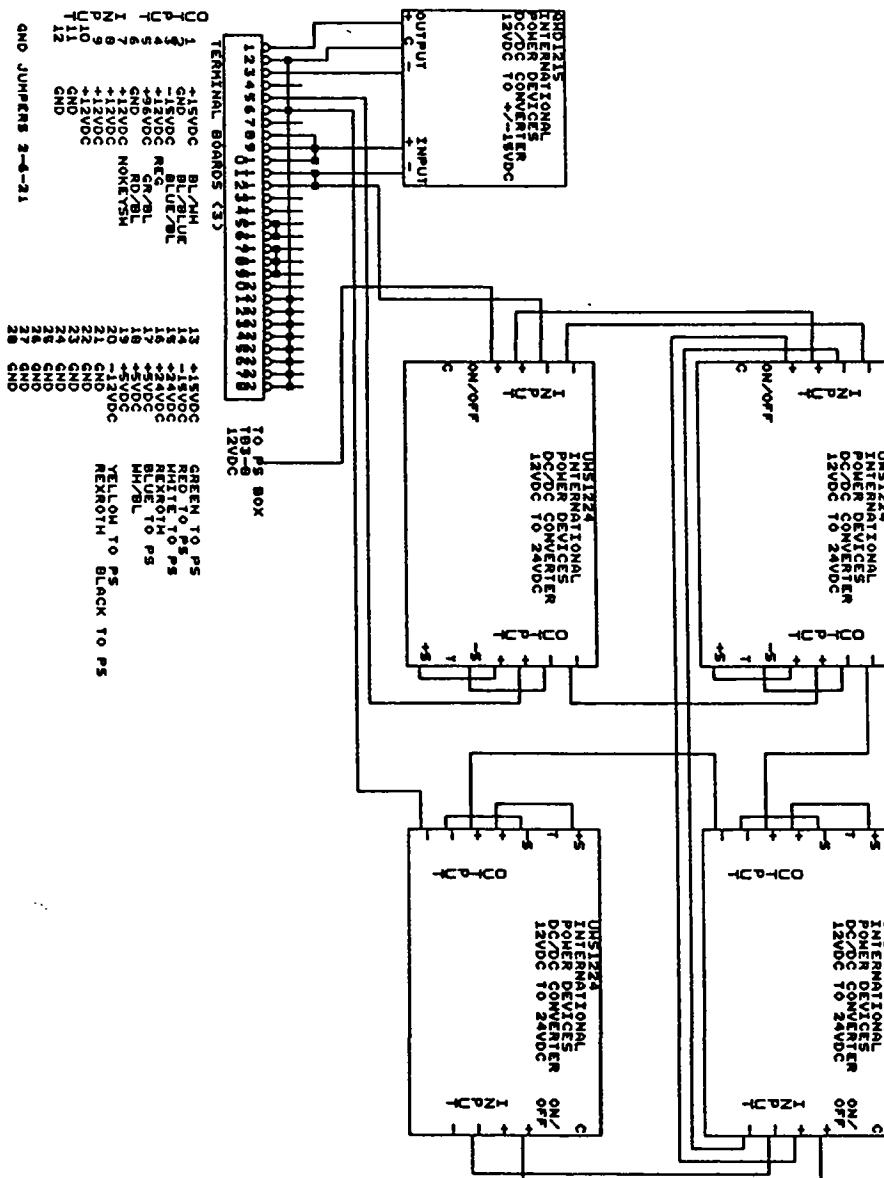
WIREWARP LIST LED PANEL

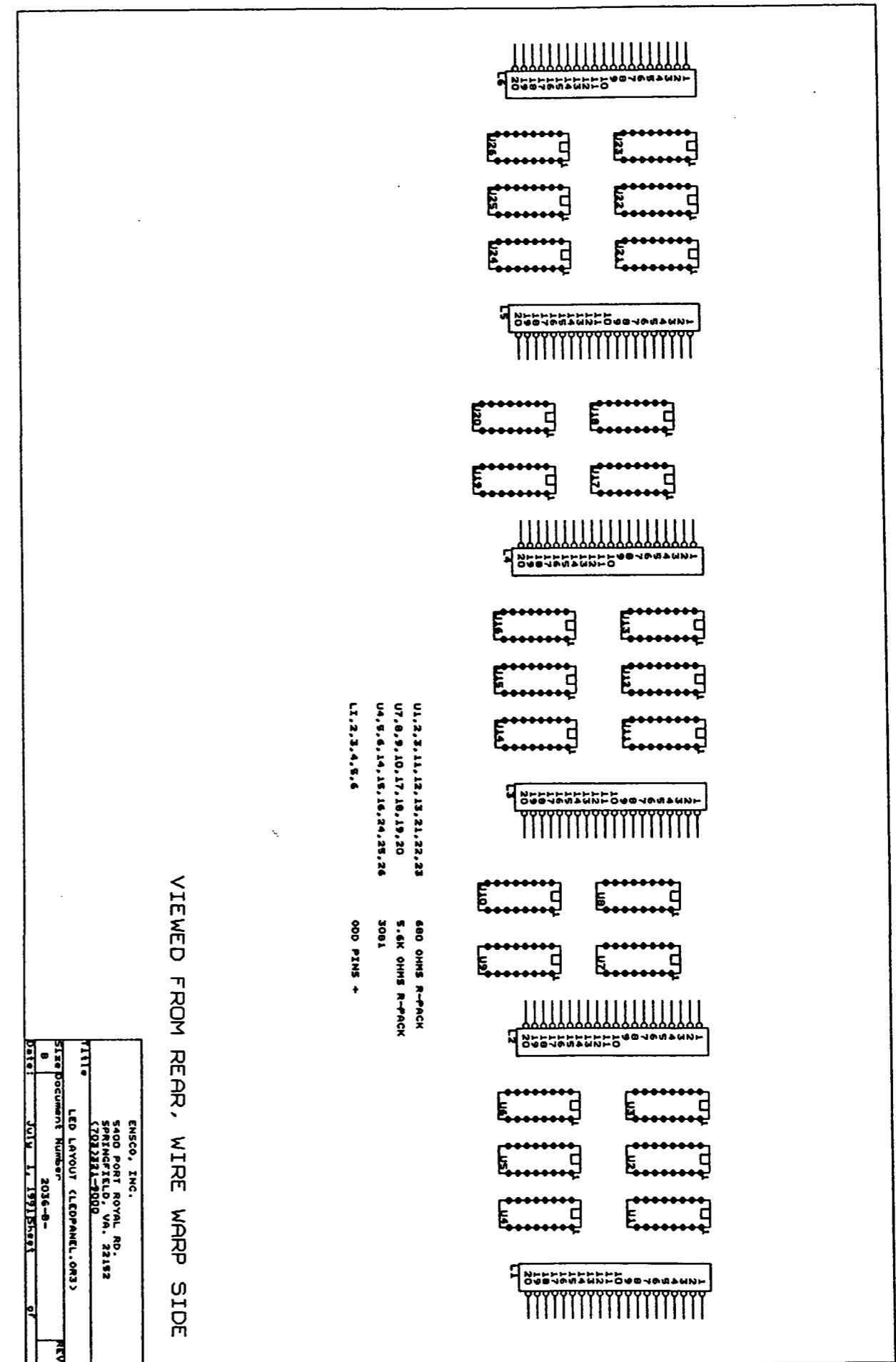
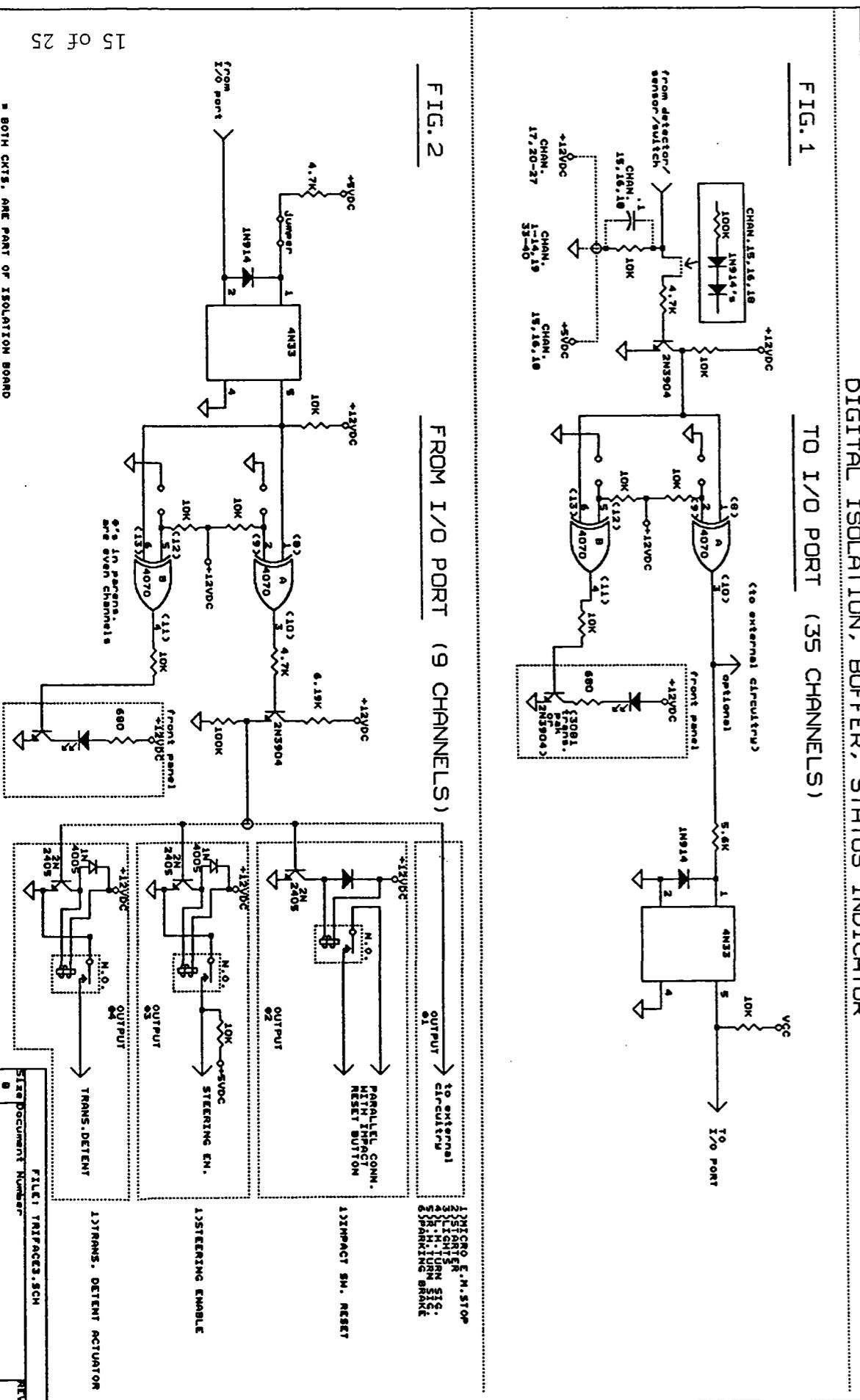
LED TO	RES	RES TO TRANS	TRANS TO RES.	RES TO DIP
		COL	BASE	INPUT
L1-2	U1-1	U1-16 U4-1	U4-16 U7-1	U7-16 J1-1
L1-4	U1-2	U1-15 U4-2	U4-3 U7-2	U7-15 J1-2
L1-6	U1-3	U1-14 U4-14	U4-13 U7-3	U7-14 J1-3
L1-8	U1-4	U1-13 U4-12	U4-11 U7-4	U7-13 J1-4
L1-10	U1-5	U1-12 U4-4	U4-6 U7-5	U7-12 J1-5
L1-12	U1-6	U1-11 U4-9	U4-10 U7-6	U7-11 J1-6
L1-14	U1-7	U1-10 U4-7	U4-8 U7-7	U7-10 J1-7
L1-16	U1-8	U1-9 U5-1	U5-16 U7-8	U7-9 J1-8
L1-18	U2-1	U2-16 U5-2	U5-3 U9-1	U9-16 J1-9
L1-20	U2-2	U2-15 U5-14	U5-13 U9-2	U9-15 J1-10
L2-2	U2-3	U2-14 U5-12	U5-11 U9-3	U9-14 J1-11
L2-4	U2-4	U2-13 U5-4	U5-6 U9-4	U9-13 J1-12
L2-6	U2-5	U2-12 U5-9	U5-10 U9-5	U9-12 J1-13
L2-8	U2-6	U2-11 U5-7	U5-8 U9-6	U9-11 J1-14
L2-10	U2-7	U2-10 U6-1	U6-16 U9-7	U9-10 J1-15
L2-12	U2-8	U2-9 U6-2	U6-3 U9-8	U9-9 J1-16
L2-14	U3-1	U3-16 U6-14	U6-13 U8-1	U8-16 J2-1
L2-16	U3-2	U3-15 U6-12	U6-11 U8-2	U8-15 J2-2
L2-18	U3-3	U3-14 U6-4	U6-6 U8-3	U8-14 J2-3
L2-20	U3-4	U3-13 U6-9	U6-10 U8-4	U8-13 J2-4
L3-2	U11-1	U11-16 U14-1	U14-16 U10-1	U10-16 J2-5
L3-4	U11-2	U11-15 U14-2	U14-3 U10-2	U10-15 J2-6
L3-6	U11-3	U11-14 U14-14	U14-13 U10-3	U10-14 J2-7
L3-8	U11-4	U11-13 U14-12	U14-11 U10-4	U10-13 J2-8
L3-10	U11-5	U11-12 U14-4	U14-6 U10-5	U10-12 J2-9
L3-12	U11-6	U11-11 U14-9	U14-10 U10-6	U10-11 J2-10
L3-14	U11-7	U11-10 U14-7	U14-8 U10-7	U10-10 J2-11
L3-16	U11-8	U11-9 U15-1	U15-16 U10-8	U10-9 J2-12
L3-18	U12-1	U12-16 U15-2	U15-3 U17-1	U17-16 J3-1
L3-20	U12-2	U12-15 U15-14	U15-13 U17-2	U17-15 J3-2
L4-2	U12-3	U12-14 U15-12	U15-11 U17-3	U17-14 J3-3
L4-4	U12-4	U12-13 U15-4	U15-6 U17-4	U17-13 J3-4
L4-6	U12-5	U12-12 U15-9	U15-10 U17-5	U17-12 J3-5
L4-8	U12-6	U12-11 U15-7	U15-8 U17-6	U17-11 J3-6
L4-10	U12-7	U12-10 U16-1	U16-16 U17-7	U17-10 J3-7
L4-12	U12-8	U12-9 U16-2	U16-3 U17-8	U17-9 J3-8
L4-14	U13-1	U13-16 U16-14	U16-13 U19-1	U19-16 J3-9
L4-16	U13-2	U13-15 U16-12	U16-11 U19-2	U19-15 J3-10
L4-18	U13-3	U13-14 U16-4	U16-6 U19-3	U19-14 J3-11
L4-20	U13-4	U13-13 U16-9	U16-10 U19-4	U19-13 J3-12
L5-2	U21-1	U21-16 U24-1	U24-16 U19-5	U19-12 J3-13
L5-4	U21-2	U21-15 U24-2	U24-3 U19-6	U19-11 J3-14
L5-6	U21-3	U21-14 U24-14	U24-13 U19-7	U19-10 J3-15
L5-8	U21-4	U21-13 U24-12	U24-11 U19-8	U19-9 J3-16

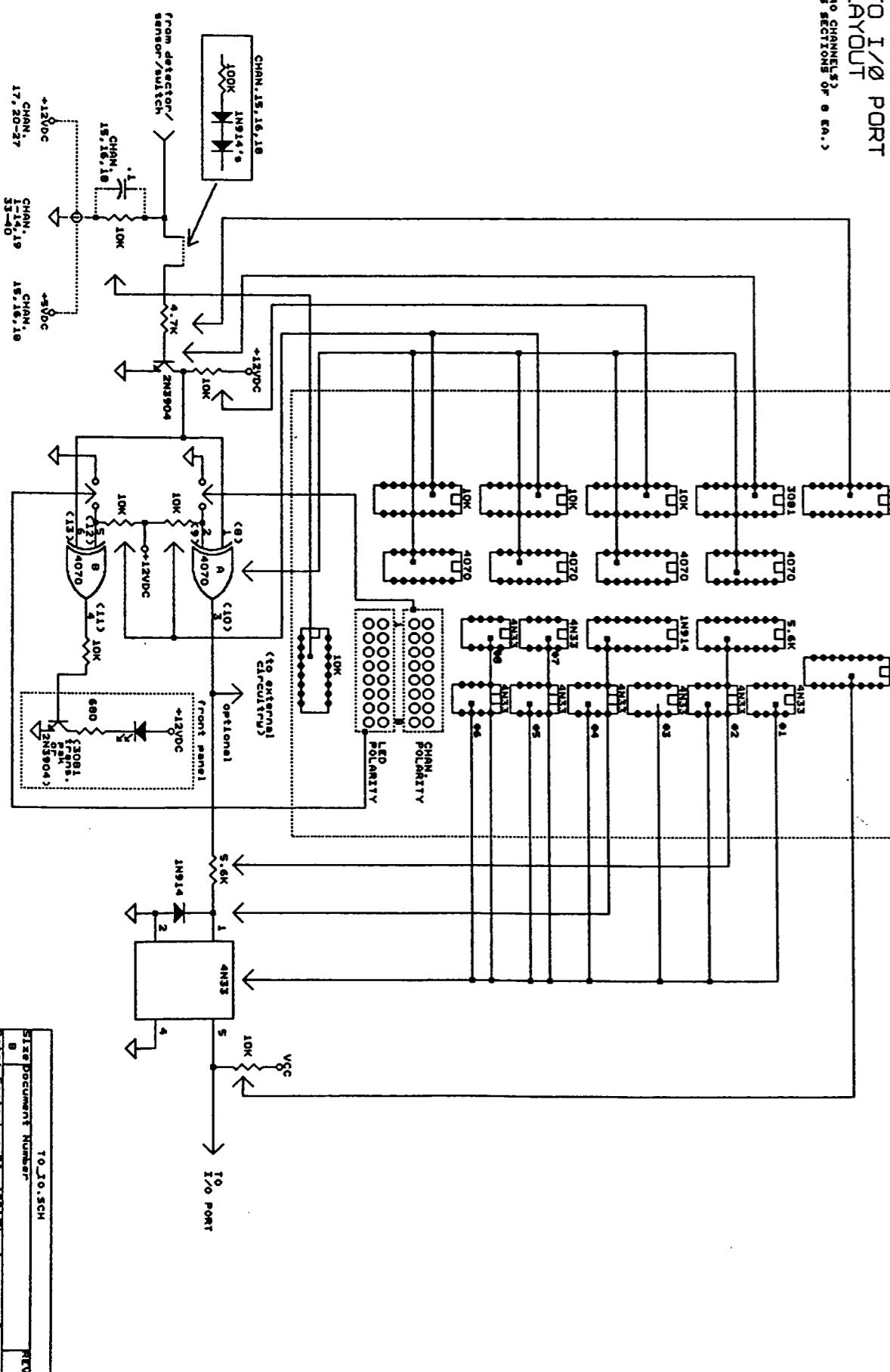
L5-10	U21-5	U21-12	U24-4	U24-6	U18-1	U18-16	J4-1
L5-12	U21-6	U21-11	U24-9	U24-10	U18-2	U18-15	J4-2
L5-14	U21-7	U21-10	U24-7	U24-8	U18-3	U18-14	J4-3
L5-16	U21-8	U21-9	U25-1	U25-16	U18-4	U18-13	J4-4
L5-18	U22-1	U22-16	U25-2	U25-3	U18-5	U18-12	J4-5
L5-20	U22-2	U22-15	U25-14	U25-13	U18-6	U18-11	J4-6
L6-2	U22-3	U22-14	U25-12	U25-11	U18-7	U18-10	J4-7
L6-4	U22-4	U22-13	U25-4	U25-6	U18-8	U18-9	J4-8
L6-6	U22-5	U22-12	U25-9	U25-10	U20-1	U20-16	J4-9
L6-8	U22-6	U22-11	U25-7	U25-8	U20-2	U20-15	J4-10
L6-10	U22-7	U22-10	U26-1	U26-16	U20-3	U20-14	J4-11
L6-12	U22-8	U22-9	U26-2	U26-3	U20-4	U20-13	J4-12
L6-14	U23-1	U23-16	U26-14	U26-13	U20-5	U20-12	J4-13
L6-16	U23-2	U23-15	U26-12	U26-11	U20-6	U20-11	J4-14
L6-18	U23-3	U23-14	U26-4	U26-6	U20-7	U20-10	J4-15
L6-20	U23-4	U23-13	U26-9	U26-10	U20-8	U20-9	J4-16
+12 VOLTS		+12 VOLTS		+12 VOLTS			
L1-1	L1-3	L1-3	L1-5	L1-1	L2-1		
L1-5	L1-7	L1-7	L1-9	L3-1	L4-1		
L1-9	L1-11	L1-11	L1-13	L5-1	L6-1		
L1-13	L1-15	L1-15	L1-17	L2-19	L3-19		
L1-17	L1-19			L4-19	L5-19		
L2-1	L2-3	L2-3	L2-5				
L2-5	L2-7	L2-7	L2-9				
L2-9	L2-11	L2-11	L2-13				
L2-13	L2-15	L2-15	L2-17				
L2-17	L2-19						
L3-1	L3-3	L3-3	L3-5				
L3-5	L3-7	L3-7	L3-9				
L3-9	L3-11	L3-11	L3-13				
L3-13	L3-15	L3-15	L3-17				
L3-17	L3-19						
L4-1	L4-3	L4-3	L4-5				
L4-5	L4-7	L4-7	L4-9				
L4-9	L4-11	L4-11	L4-13				
L4-13	L4-15	L4-15	L4-17				
L4-17	L4-19						
L5-1	L5-3	L5-3	L5-5				
L5-5	L5-7	L5-7	L5-9				
L5-9	L5-11	L5-11	L5-13				
L5-13	L5-15	L5-15	L5-17				
L5-17	L5-19						
L6-1	L6-3	L6-3	L6-5				
L6-5	L6-7	L6-7	L6-9				
L6-9	L6-11	L6-11	L6-13				
L6-13	L6-15	L6-15	L6-17				
L6-17	L6-19						
EMITTERS TO GND		EMITTERS TO GND					
U4-15	U5-15	U5-15	U6-15				
U6-15	U14-15	U14-15	U15-15				
U15-15	U16-15	U16-15	U24-15				
U24-15	U25-15						
U25-15	U26-15						



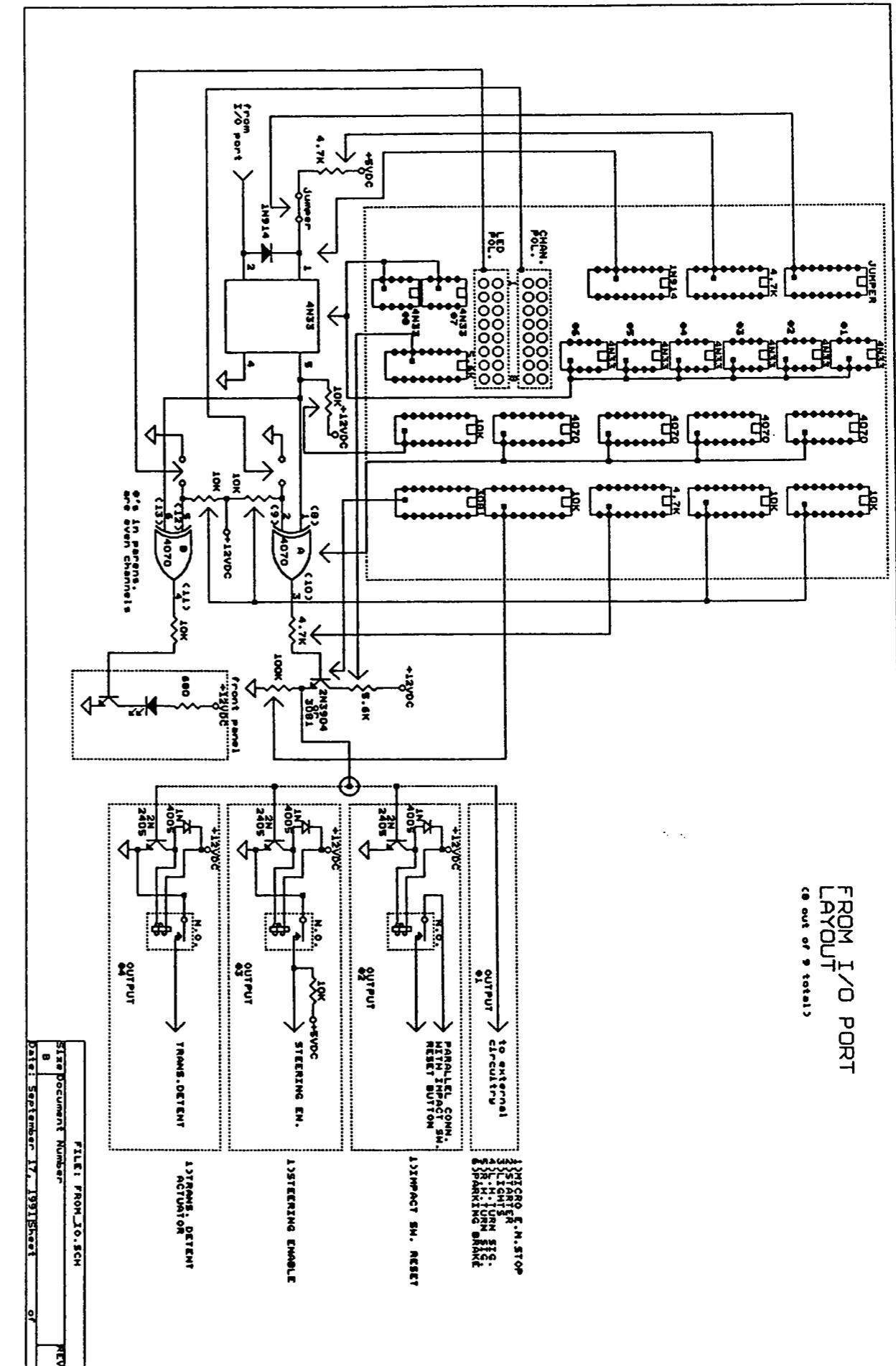
ENSCO, INC.	SAO PORT ROYAL RD.	SPRINGFIELD, VA. 22161	REV A
1703321-2000	12VDC DIST. <12V.DIST.003>		
8	Document Number	2036.25.2-B	
Date:	August 15, 1991 Sheet	1 of 7	







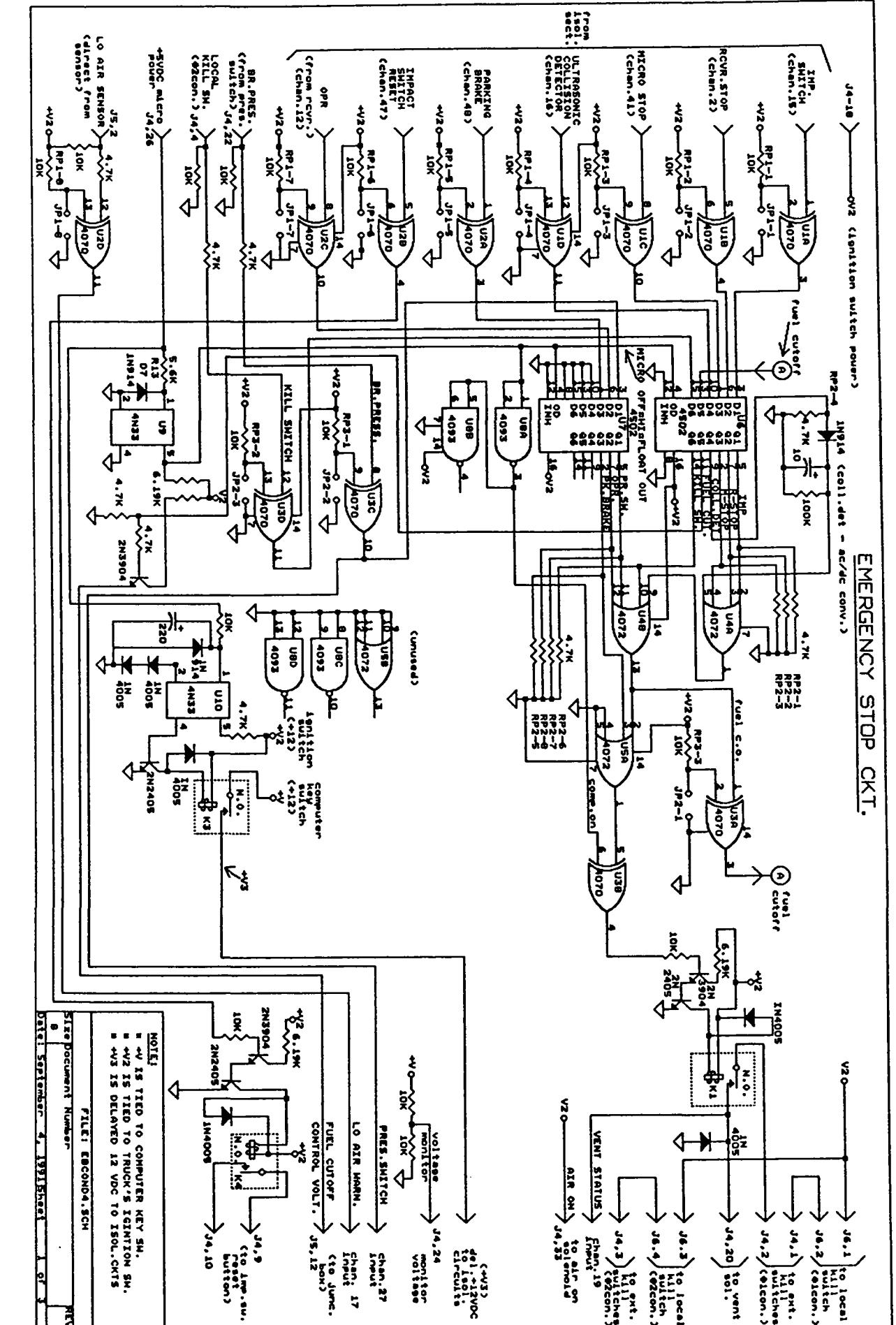
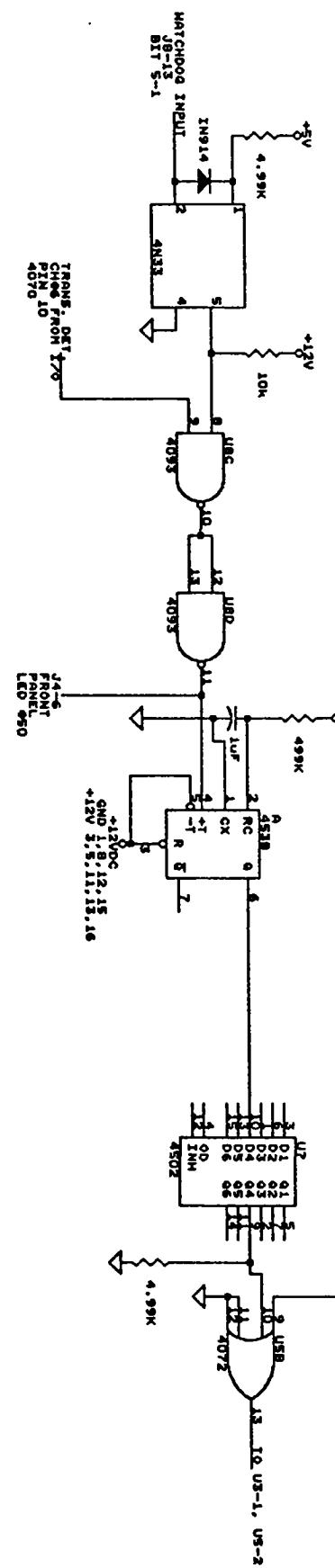
110 CHANNELS
(8 SECTIONS OF 8 EA.)

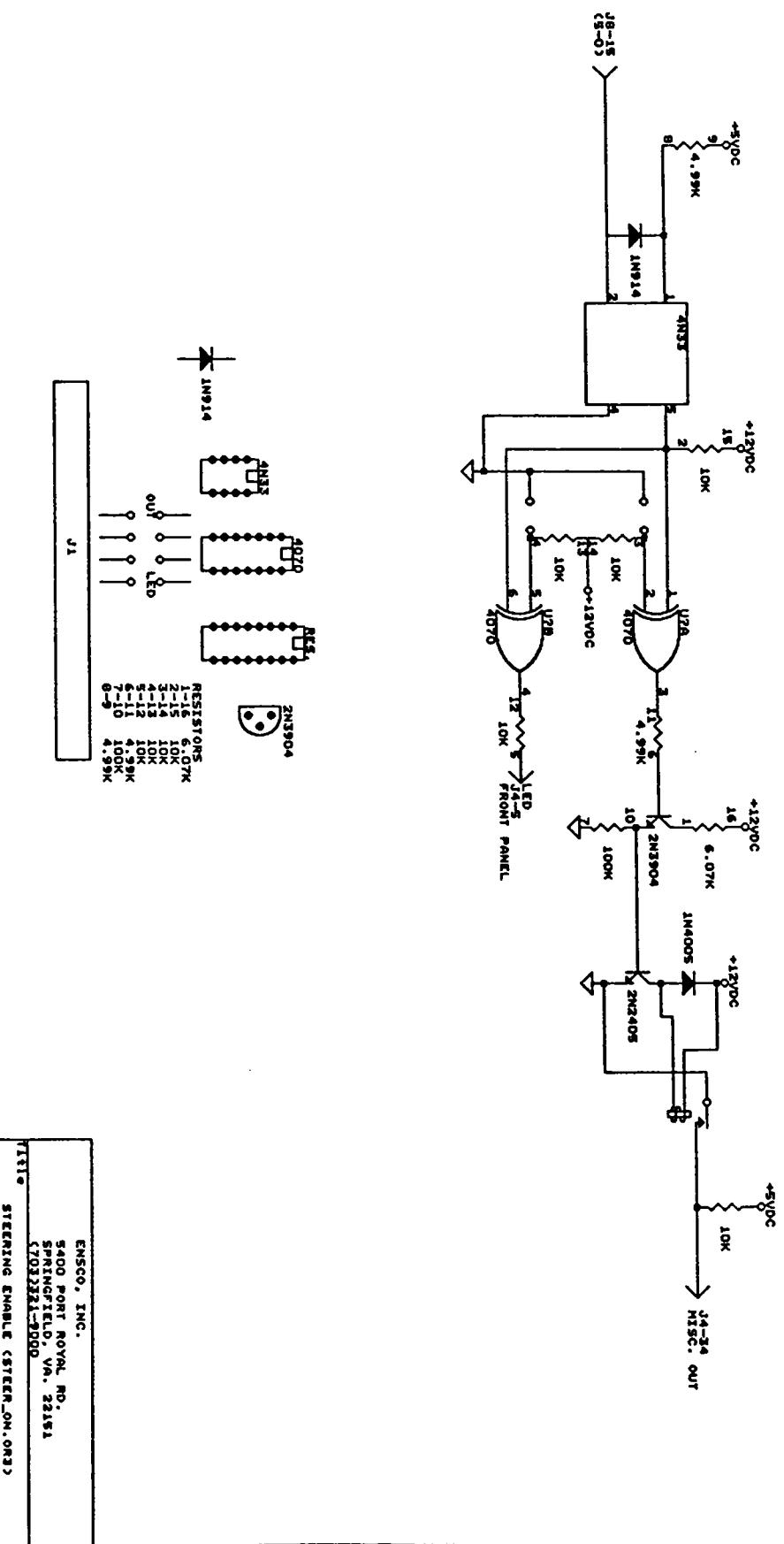
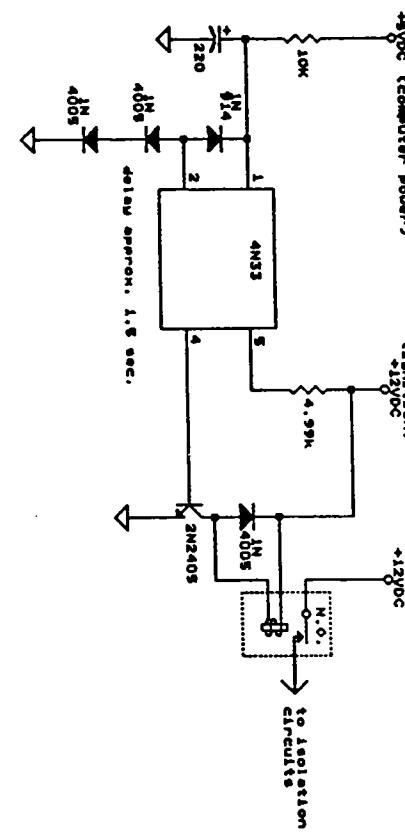


FROM I/O PORT LAYOUT

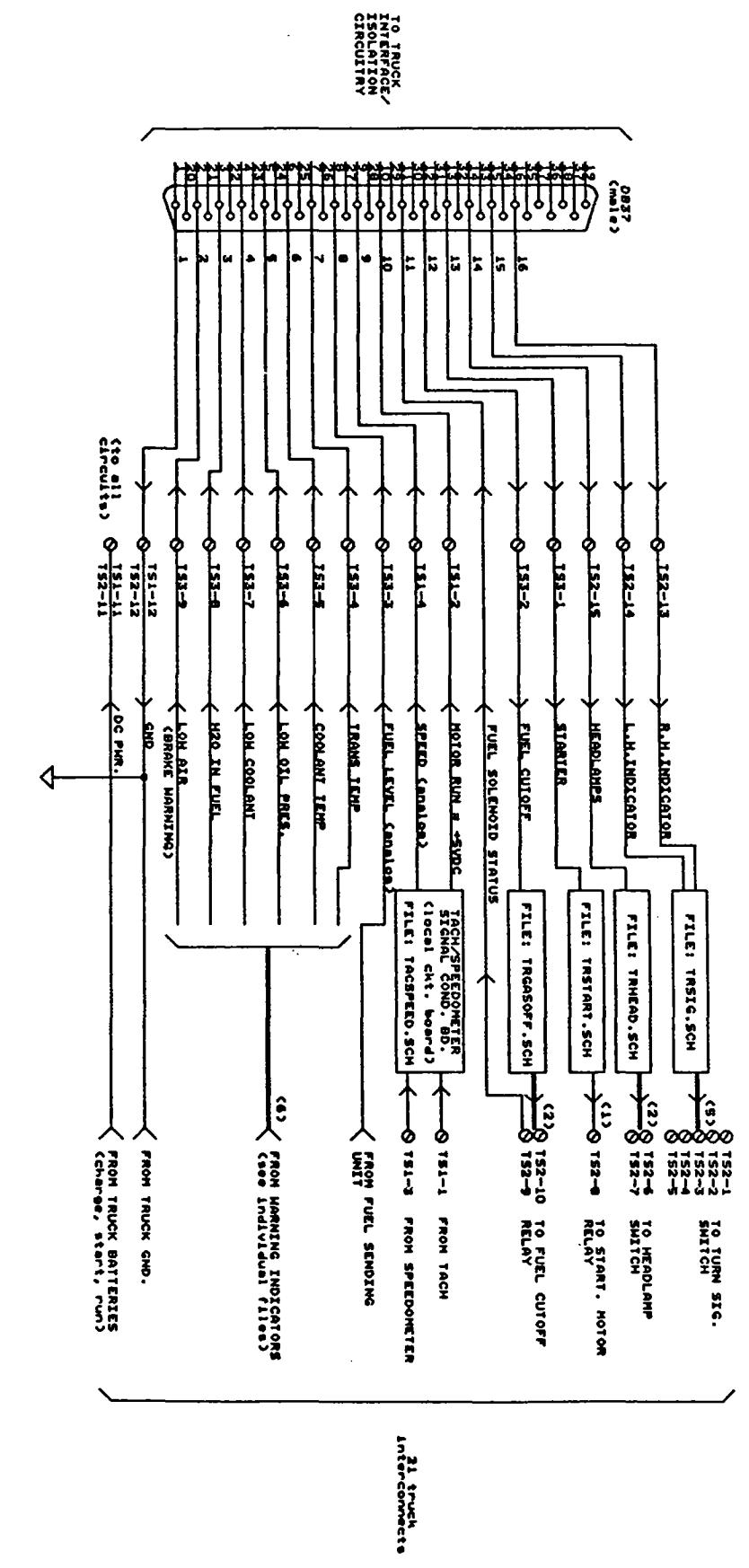
LAYOUT

Step Document Number _____
B
Date: September 17, 1991 Sheet _____ or _____ REV.

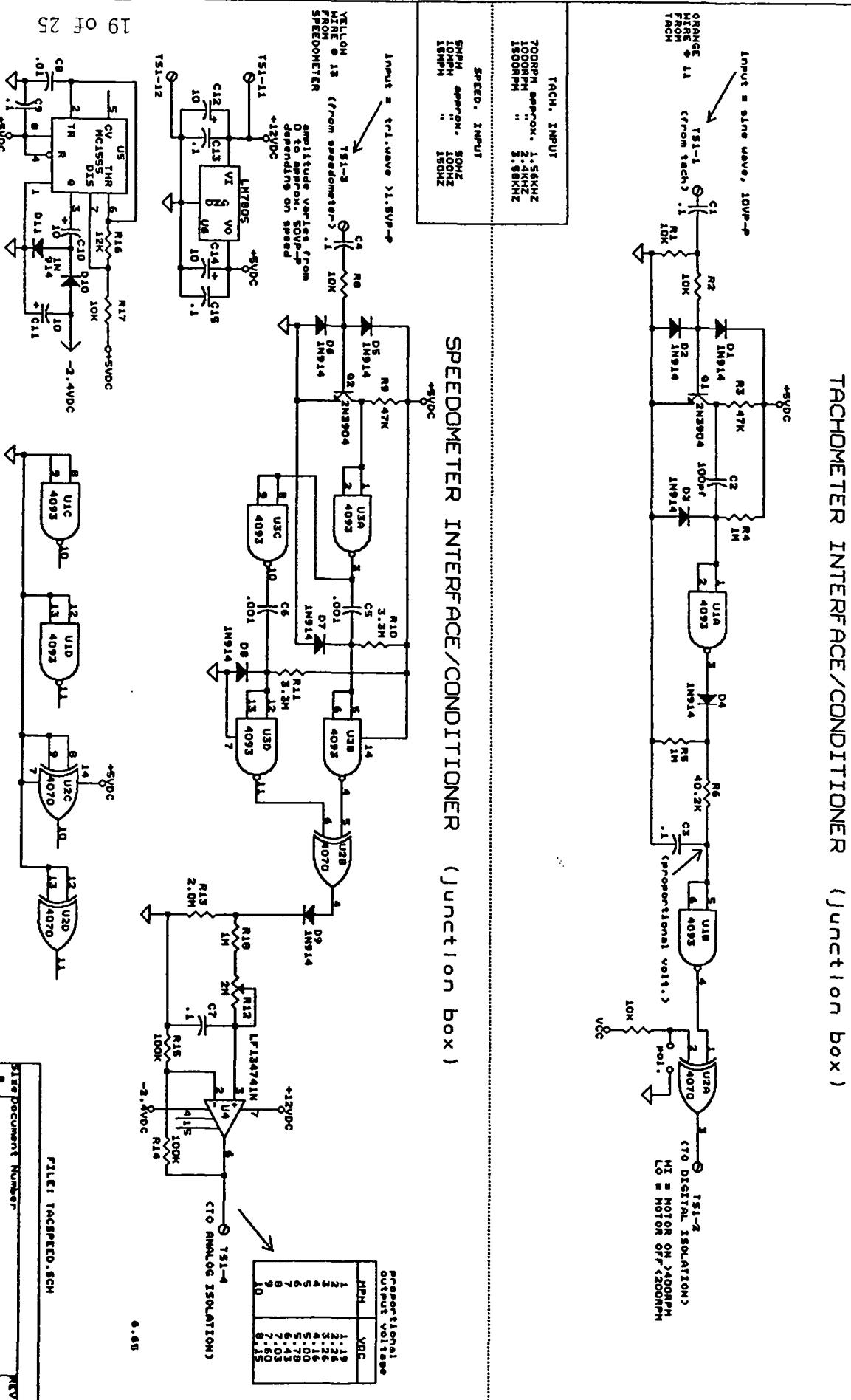




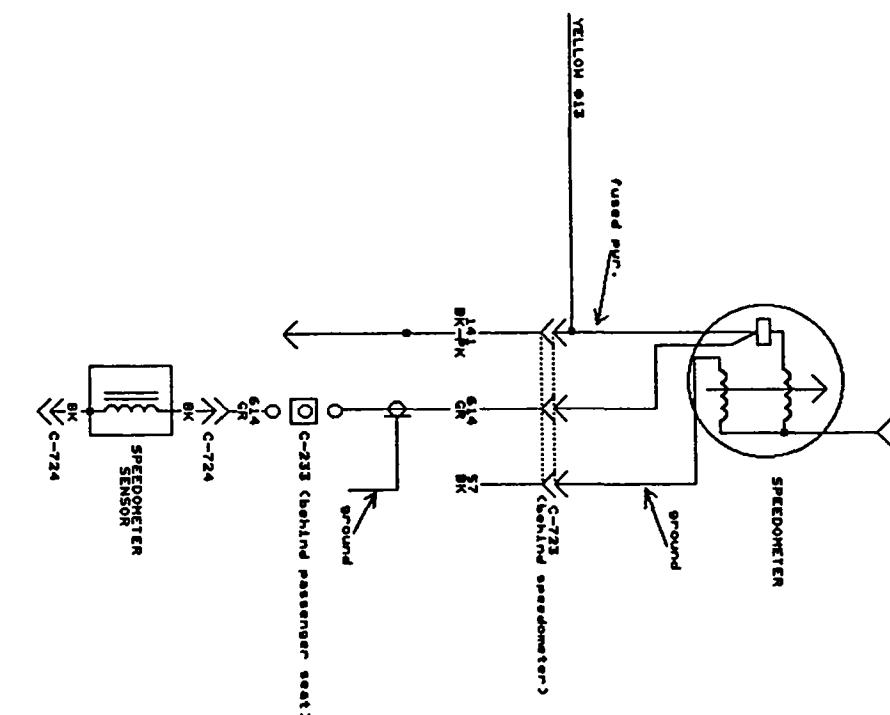
JUNCTION BOX (mounted under dashboard)



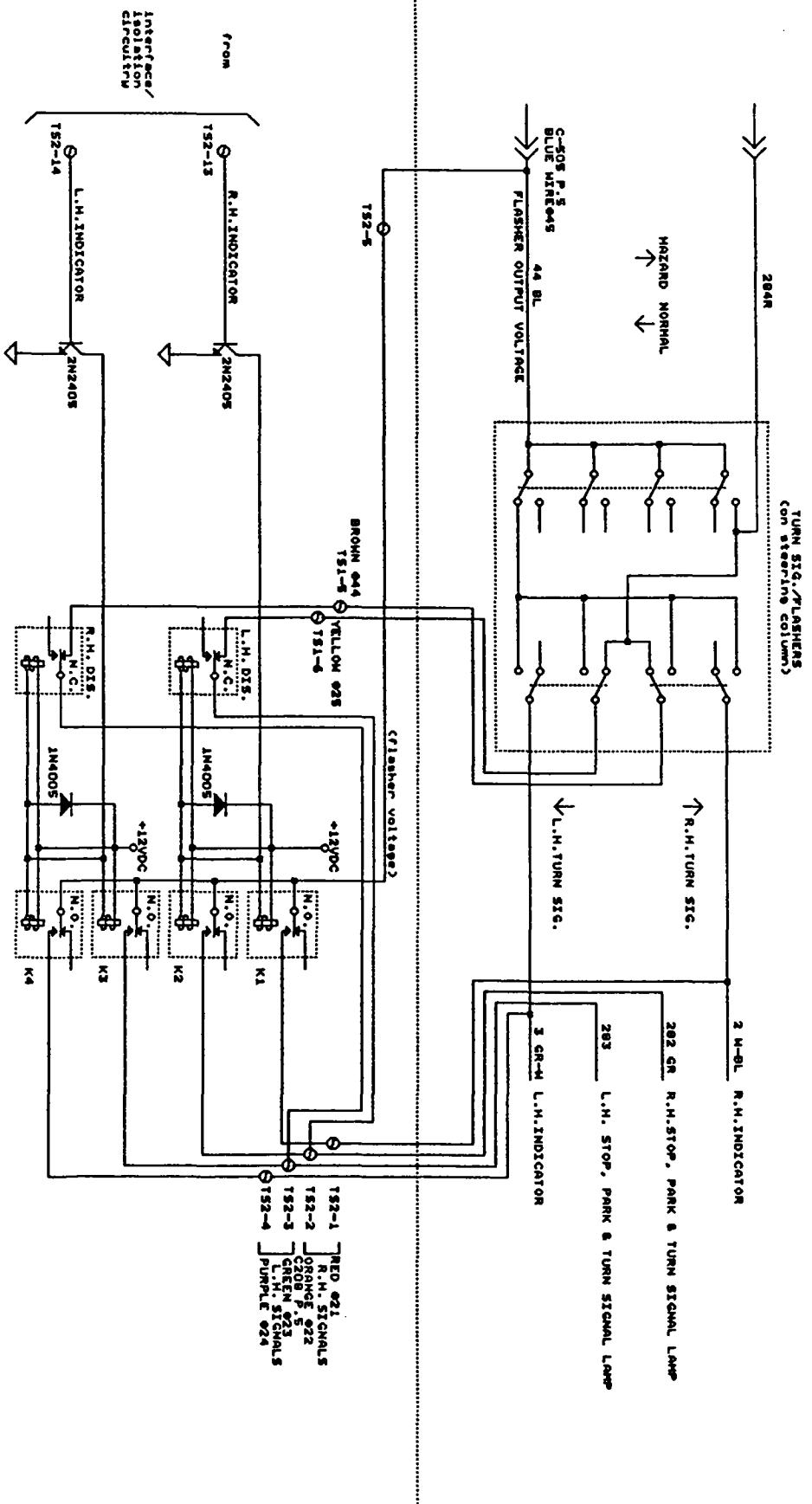
TACHOMETER INTERFACE/CONDITIONER (junction box)



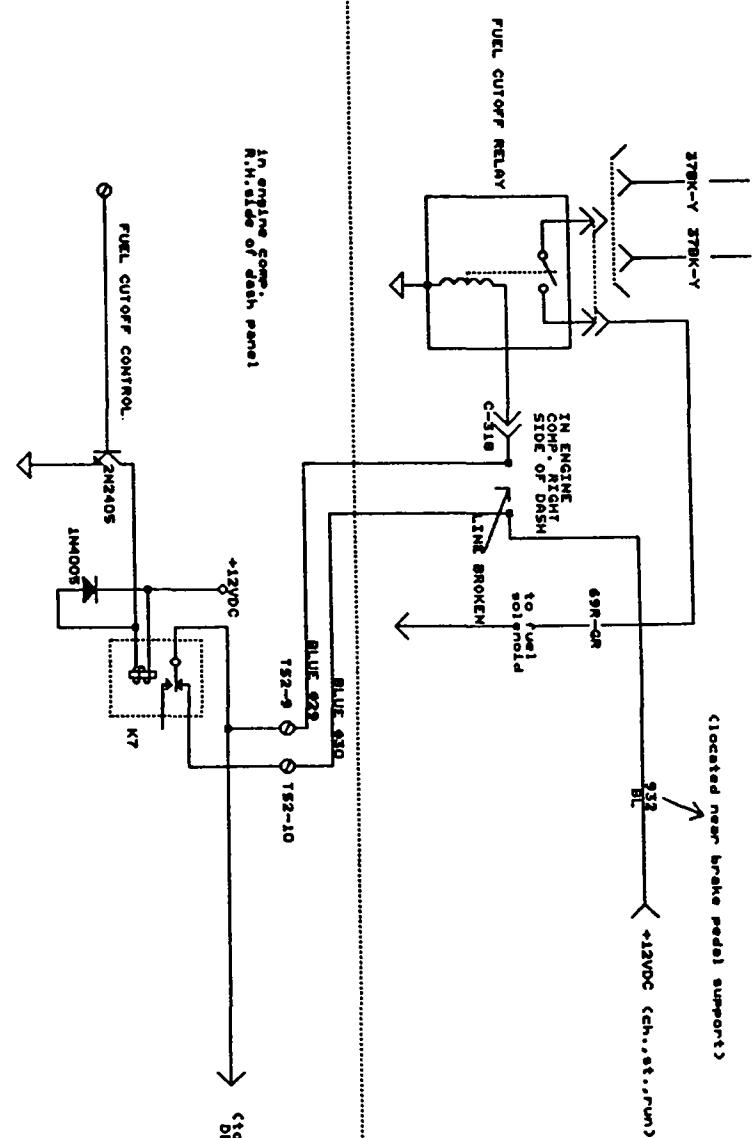
SPEEDOMETER (Partial)



TRUCK FLASHER/SIGNAL ASSEMBLY (partial)



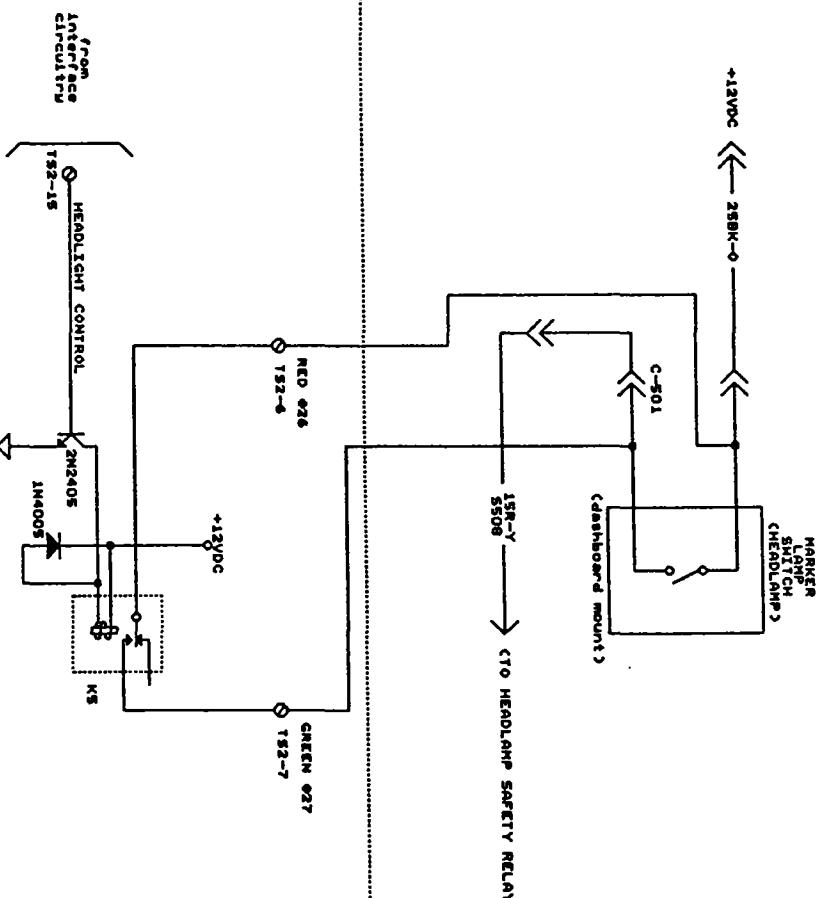
FUEL CUTOFF RELAY (partial)



MICRO CONTROLLED FUEL CUTOFF (junction box)

Site/Document Number	8
Date:	October 8, 1991
	01

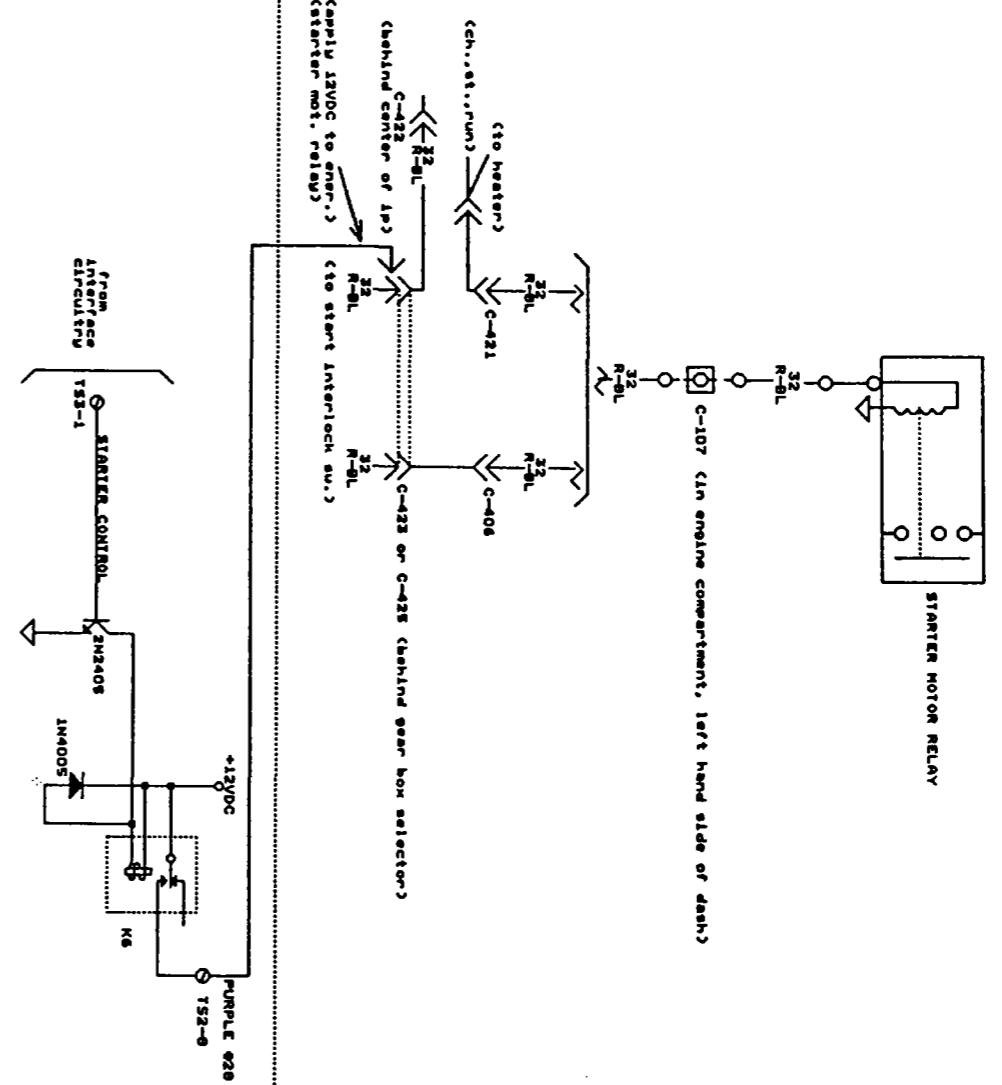
TRUCK HEADLAMP SWITCH (partial)



MICRO CONTROLLED HEADLAMP (junction box)

PALEO INSTITUTE

STABLER MOTOR BEI AY (PARTEI))

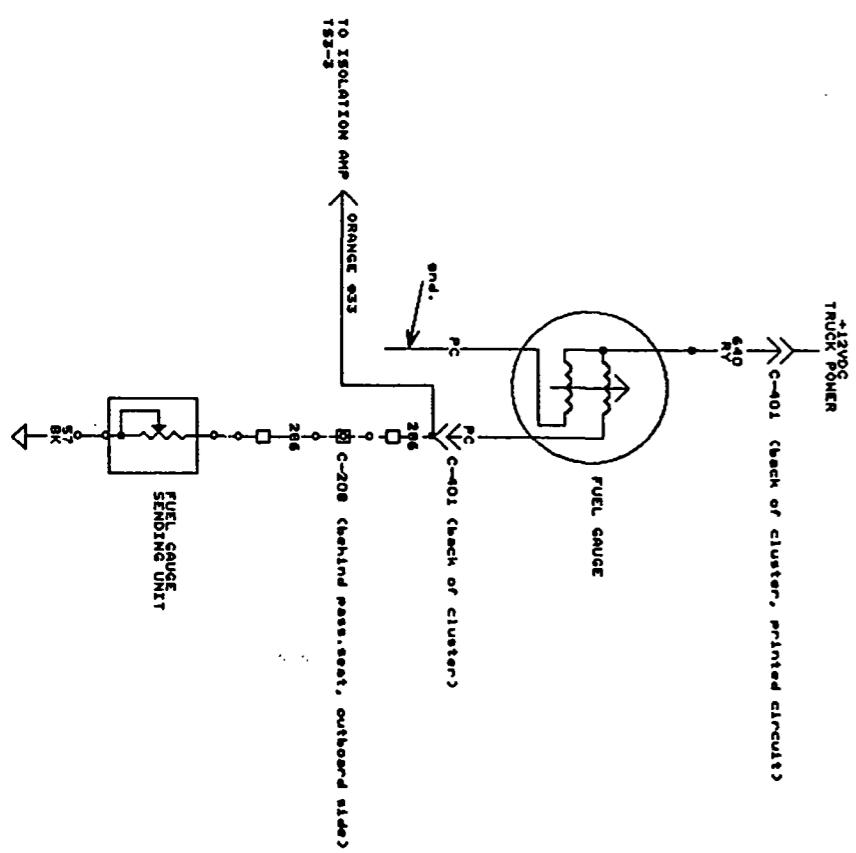


MICRO CONTROLLED STARTER (junction box)

Number

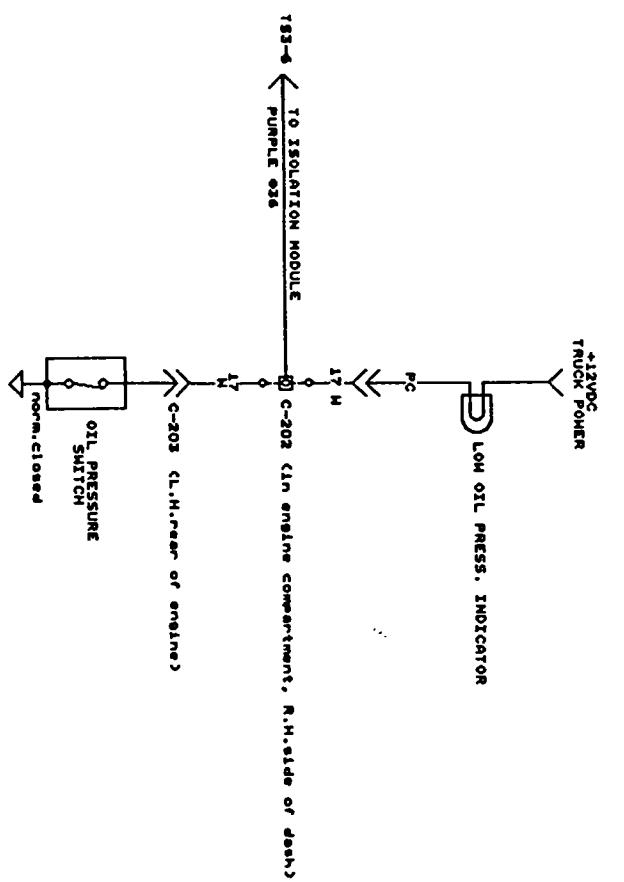
ପାତ୍ର ବିନ୍ଦୁ

FUEL GAUGE AND SENDING UNIT (partial)



LOW OIL PRESSURE (partial)

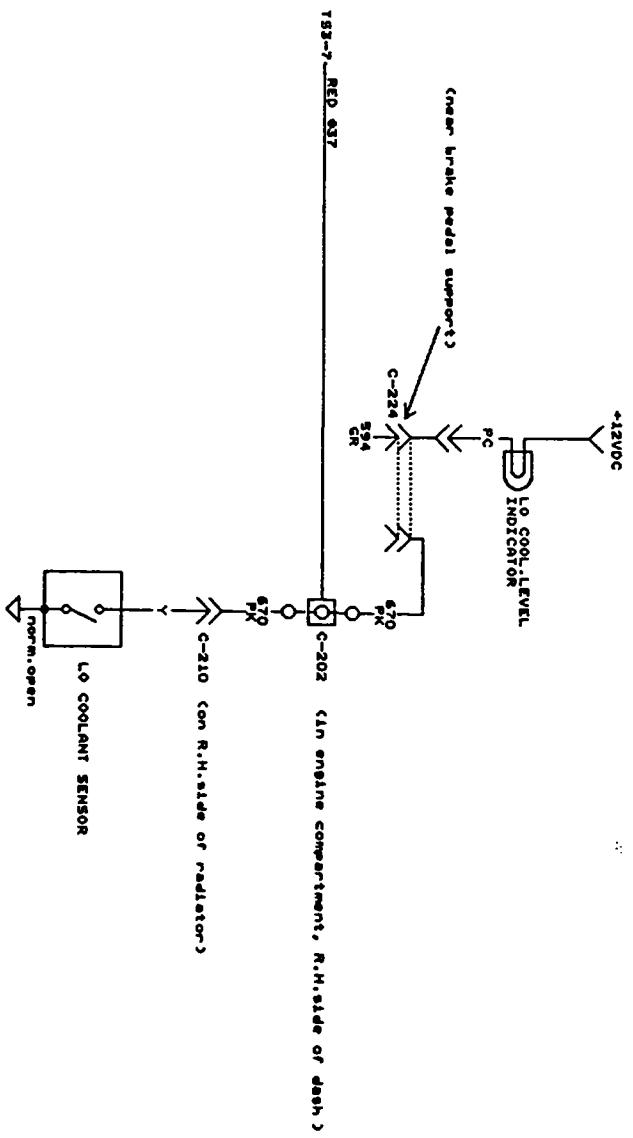
(sensor and indicator)



FILE: TROIL.SCH

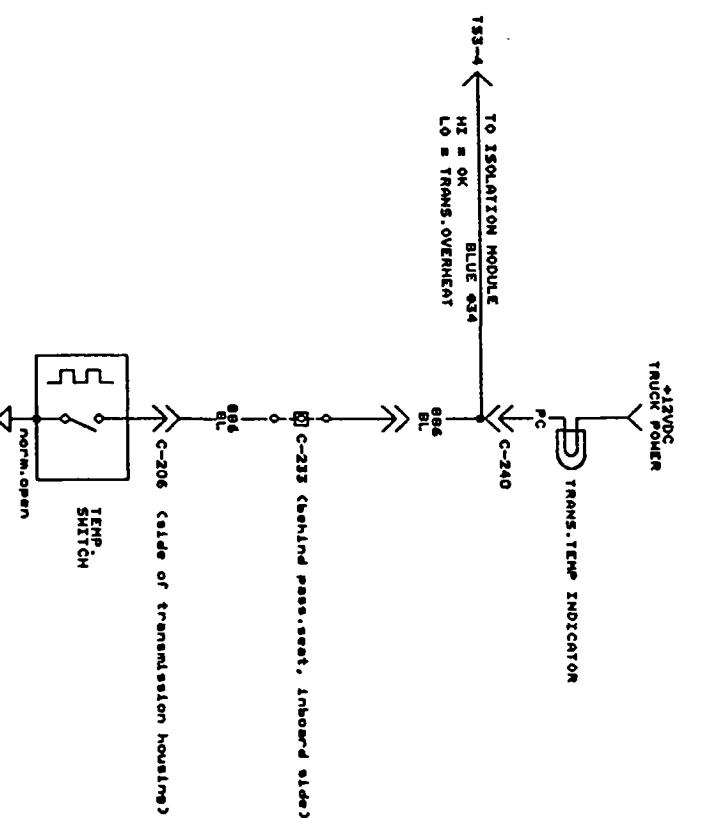
Site Document Number	B
Date:	October 9, 1991 Sheet
Rev	or

LOW COOLANT LEVEL (partial)



TRANSMISSION TEMPERATURE (partial)

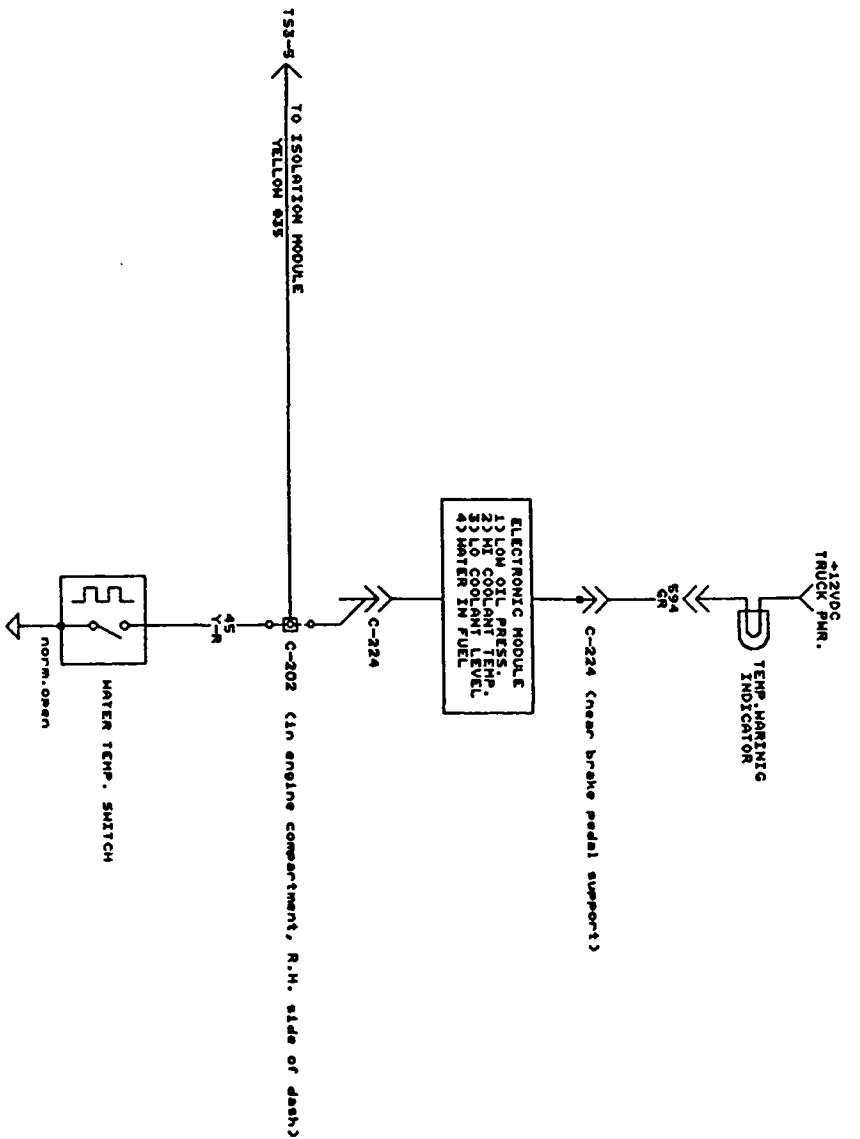
(Indicator and sensor)



FILE: TRTRANS.SCH	
SPEC DOCUMENT NUMBER	REV
0	
DATE	OCTOBER 9, 1991
BY	OT

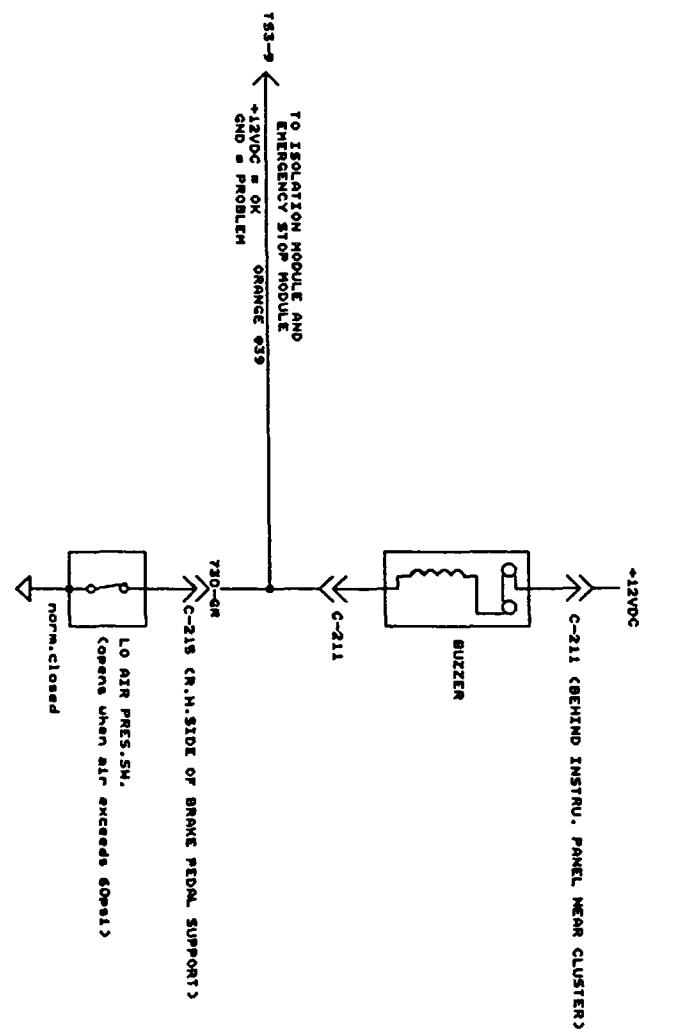
COOLANT TEMPERATURE (partial)

(sensor and indicator)



LOW AIR PRESSURE (partial)

(sensor and buzzer)



FILE: TREL03R.SCH
Size Document Number
B Rev. D Date 15-11-2011

REXROTH E/P POSITIONER

